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Plant Protection Society of Slovenia**

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Ocenjevanje tveganja fitofarmaceutskih sredstev

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Pojem ocena tveganja, na splošno, si ljudje različno razlagajo, zato prihaja pogosto do napačnega razumevanja. Pri oceni tveganja tako za industrijske kemikalije, biocide kot tudi za fitofarmaceutska sredstva je potrebno združiti oceno posameznih učinkov (toksikoloških in ekotoksikoloških), ki jih povzročata posamezna kemikalija oziroma sredstvo, in oceno izpostavljenosti. Pri uporabi fitofarmaceutskih sredstev pride do izpostavljenosti okolja ter prek okolja tudi posredno do izpostavljenosti človeka prek hrane. Človek je lahko fitofarmaceutskemu sredstvu izpostavljen posredno npr. prek okolja - z ostanki fitofarmaceutskih sredstev, ki prek polja preidejo v podtalnico, prek te pa v pitno vodo, ali neposredno, ko to sredstvo uporablja. In kaj je tveganje? Tveganje je neželjena posledica določene aktivnosti, v povezavi z verjetnostjo, da se bo ta neželjena posledica zgodila.

Ocenjevanje fitofarmaceutskih sredstev v Evropski Uniji ureja direktiva 91/414/EEC, ki je privzeta tudi v našo zakonodajo. Njen namen je predvsem zaščititi tržišče pred sredstvi, katerih tveganje za človekovo zdravje ni bilo primerno ocenjeno. Poleg tega zahteva učinkovitost sredstev ter da le ta nimajo nesprijemljivih učinkov na okolje, zdravje ljudi in živali, še posebej na podtalnico.

Posamezni koraki ocene tveganja so: ocena podatkov o posameznem sredstvu oziroma o aktivni snovi, ocena učinkov ter ocena izpostavljenosti, ki je za oceno tveganja posebej pomembna. Na koncu, ko združimo oceno učinkov ter oceno izpostavljenosti, dobimo karakterizacijo tveganja. Potrebno je ločiti med oceno tveganja ter odločitvijo kaj bo pristojni organ s tveganjem naredil ("*Risk management Decision Making*"). Z oceno tveganja se želi ugotoviti kako tvegana je določena situacija, naslednji korak pa je odločitev o tem, kako ukrepati v tej situaciji. Pri tem je zelo pomembna odločitev kakšno tveganje je še sprejemljivo.

ABSTRACT

Risk Assessment of Plant Protection Products

The concept of risk assessment in general has different meanings for people and causes a great deal of misunderstanding. In risk assessment of chemicals, biocides and plant protection products, it is necessary to combine an assessment of the effects (toxicological and ecotoxicological) that a particular chemical can cause, with an exposure assessment. The use of plant protection products causes environmental exposure and, via the environment, also the

indirect exposure of man through food products. Man can be exposed to a plant protection product indirectly via the environment - through residues of plant protection products that leach from a field into the ground water and from there into the drinking water, or man can be exposed directly when he uses this product. What is risk? Risk is the probability of the occurrence of an adverse effect on man or the environment resulting from a given exposure to a chemical or mixture. Directive 91/414/EEC covers evaluation of plant protection products in the European Union and it is also implemented in Slovene legislation. The aim of the Directive is to protect the market against products whose risks to human health and the environment have not been properly assessed. In addition to requiring that the efficacy of products is investigated, it states that products should not have unacceptable adverse effects on the environment in general, and on the health of man and animals and on the ground water in particular.

The steps of a risk assessment are: data evaluation of an individual product or active substance, effects assessment and exposure assessment, which is specially important for the risk assessment. By combining effects assessment with exposure assessment, we get risk characterization.

It is necessary to distinguish between risk assessment and the decision on what the competent authority will do about the risk ("Risk Management Decision Making"). With a risk assessment we wish to discover how hazardous a particular situation is. The next step is the decision on what to do in this situation. The decision on what kind of risk is still acceptable for us is very important.



Imisijski monitoring podtalnice kot vira pitne vode – fitofarmacevtska sredstva na vodnem viru Vrbanski plato v Mariboru

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Človek na najrazličnejše načine vpliva na vodne sisteme, bodisi da vodo odvzema ali pa jo onesnažuje, torej vpliva na kakovost in količino vodnih virov. Stanje okolja, ki vključuje vodna telesa, tako podzemna kot površinska, je izredno pomembno tako za bodočo oskrbo z vodo kot tudi za splošno gospodarjenje z vodami. Prav tako predstavljajo nenadomestljiv element, ki podpira vse življenje, ne samo človeška, temveč tudi življenje rastlin in živali ter ekosistema kot celote. Dejstvo je, da npr. podzemna voda večinoma leži pod kmetijskimi zemljišči. V Evropski skupnosti leži 87 % podzemne vode pod kmetijskimi zemljišči in na našem območju ni nič drugače. Tako se srečujemo s povišanimi koncentracijami nitratov in pesticidov v podzemnih vodah.

V Evropski uniji so zaradi nevzdržnega poseganja v okolje, sprejeli direktivo o upravljanju z vodami (Directive 2000/60/EC of European Parliament and of the Council of 23 October 2000 establishing for Community active in the field of water policy). Ne samo, da z njo pričakujejo ureditev na sedanjem območju držav Evropske skupnosti, temveč pričakujejo da tudi držve kandidatke spoštujejo zahteve te direktive. To pa nam po eni strani nalaga prilagoditev naše zakonodaje tej direktivi, po drugi strani pa tudi že pristop do konkretnih rešitev, zajetih v tej direktivi, in njihovega pravočasnega reševanja.

Za zagotovitev informacij o stanju podzemnih voda je Mestna občina Maribor v letu 2001 na podlagi rezultatov predhodnih imisijskih monitoringov in na podlagi Zakona o varstvu okolja, pričela z vzpostavitvijo podrobnejše in posebne mreže imisijskega monitoringa površinskih voda tal in podzemnih voda.

Razmišljanja o tem, da podtalnica Vrbanskega platoja in Dravskega polja ni skrb le Mestne občine Maribor, ampak vseh občin, ki se oskrbujejo iz sistema mariborskega vodovoda in tudi tistih, ki leže na varstvenih pasovih so nas vzpodbudila, da poiščemo rešitev in podlago za sanacijo ogroženega vodovarstvenega območja, iz katerega se napaja s pitno vodo širše območje severovzhodne Slovenije.

Po preliminarni analizi stanja na območju podzemnih voda mariborskega vodovoda in glede na Zakon o varstvu okolja smo zaključili, da je vladna uredba, s katero se določi status ogroženega okolja in režim celovite sanacije, primerna in edina zakonsko ustrezna metoda za izboljšanje kakovosti in varnosti podzemnih voda. Naloge in projekte sanacije vodnih virov sofinancirajo vse občine, ki se oskrbujejo s pitno vodo iz sistema mariborskega vodovoda.

ABSTRACT

Immission monitoring of underground water as the source of potable water – phytopharmaceuticals at the Vrbanski plato water source in Maribor

People impact water systems in various ways. They either draw or pollute water and in this way influence the quality and quantity of water sources. The state of the environment that includes underground and surface water bodies is highly important for future water supply as well as general water management. Besides, water is an irreplaceable component sustaining all forms of life: not only humans but also plants and animals as well as the ecosystem as a whole. It is a well-known fact that most of underground water is under agricultural land. In the European Union, 87% of underground water are under agricultural land. The situation in Slovenia is no different. Consequently, we are faced with increased concentrations of nitrates and pesticides in underground water.

Because of adverse activities affecting the environment the European Union adopted the Water Framework Directive (Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy). It is expected not only to regulate the issues in the territory of present Member States but also to be complied with by candidate countries. We are thus required, on one hand, to align our legislation with this directive, and on the other to tackle concrete issues from the directive and find timely solutions.

To provide information on the state of underground water the Municipality of Maribor began setting up a detailed and special network of immission monitoring of surface and underground water in 2001. The action was based on the results of previous immission monitoring and in compliance with the Environmental Protection Act.

Our belief that underground water of Vrbanski plato and Dravsko polje does not concern only the Municipality of Maribor but all municipalities supplied by Mariborski vodovod (Maribor Waterworks) and those located in water protection zones resulted in our decision to find a solution and a basis for the remediation of the endangered area providing a wider region of north-eastern Slovenia with potable water.

After a preliminary analysis of the situation in the area of underground water pertaining to Maribor Waterworks, we have concluded that, in compliance with the Environmental Protection Act, a governmental decree defining the status of endangered environment and providing for an arrangement for a holistic remediation is a suitable and only legally feasible method for the improvement of quality and safety of underground water. Tasks and projects for the remediation of water sources will be co-financed by all municipalities using potable water from the Maribor water supply system.



Monitoring ostankov pesticidov v živilih in kmetijskih proizvodih ter pitni vodi

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Monitoring ostankov pesticidov v živilih in pitni vodi ima v pristojnosti zdravstvenega sektorja osnovni namen varovanje javnega zdravja, monitoring kmetijskih proizvodov pa v pristojnosti kmetijskega sektorja tudi nadzor nad pravilno uporabo fitofarmaceutskih sredstev, oziroma izvajanje dobre kmetijske prakse. Tako se monitoring ostankov pesticidov v živilih po svojem namenu dopolnjuje z monitoringom ostankov pesticidov v kmetijskih proizvodih. Podobno se monitoring ostankov pesticidov v pitni vodi in virih pitne vode dopolnjuje z monitoringom kakovosti podtalnice, kakovosti izvirov in kakovosti površinskih vodotokov Slovenije. Ti slednji so v pristojnosti ministrstva za okolje, prostor in energijo. Monitoring tako zahteva široko medresorsko sodelovanje in usklajeno delo različnih strokovnjakov in več strokovnih institucij v povezavi s pristojnimi državnimi organi, ki morajo skupaj pripraviti kompleksen program monitoringa z vidika načrtovanja, izvajanja, vrednotenja rezultatov in poročanja oziroma obveščanja. V zadnjem času se vse več pozornosti namenja tudi posredovanju podatkov javnosti. Zaradi bližnjega članstva v Evropski Uniji je za Republiko Slovenijo še dodatna obveznost sporočanje podatkov in njihova izmenjava v skladu z zahtevami EU. Kljub temu, da imamo nacionalno zakonodajo že usklajeno z evropsko, nas čaka v praksi še veliko naporov, da bo njeno izvajanje primerno potekalo. V prispevku so predstavljeni rezultati dosedanjega dela na področju usklajenega nadzora nad ostanki fitofarmaceutskih sredstev - tako glede organizacije nadzora, kakor tudi z vidika vsebine nadzora.

ABSTRACT

Monitoring pesticide residues in foodstuffs, agricultural products and drinking water

From the point of view of the health sector, the basic aim of monitoring pesticide residues in foodstuffs and drinking water is the protection of public health, while monitoring pesticide residues in agricultural products from the point of view of the agricultural sector is also aimed at controlling of the proper use of plant protection products and performance testing of good agricultural practice. In its aim, monitoring pesticide residues in foodstuffs is thus complemented by monitoring pesticide residues in agricultural products. Monitoring pesticide residues in drinking water and in drinking water sources is similarly complemented with monitoring the quality of ground water, spring and surface waters in Slovenia. These latter are within the competence of the Ministry of the Environment. Monitoring thus requires wide inter-sectoral cooperation and coordinated work by different experts from various governmental and expert institutions, which must prepare a complex programme of monitoring, including planning, execution and analysis of the results, and reporting or informing. In recent times, increasing attention has been given to making the information available to the public. Its imminent accession to the European Union gives the Republic of Slovenia an additional obligation to report and exchange monitoring data in line with EU requirements. Although Slovenia's legislation is already harmonised with European legislation, it will take considerable effort before it is properly implemented in practice. This article presents the results attained so far in the area of coordinated monitoring of phytopharmaceutical residues — from the points of view of organisation as well as content.

Povzročitelji endokrinih motenj

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V zadnjih dveh desetletjih smo bili priče številnim zaskrbljujočim poročilom o snoveh, ki lahko motijo endokrino (hormonsko) ravnovesje tako pri človeku kot pri drugih bitjih.

Povzročitelj endokrinih motenj (PEM) je od zunaj vnesena kemična snov oziroma mešanica snovi, ki preko sprememb v delovanju hormonov povzroča neželene učinke na zdravje posameznega organizma ali njegovega potomstva oziroma (sub)populacije.

Mehanizmi delovanja so številni in pestri. PEM se pripisujejo številni učinki: od komaj zaznavnih sprememb v fiziologiji in spolnem vedenju do stalno spremenjene spolne diferenciacije pri vodnih organizmih; pri človeku pa upadanje v kvaliteti semenčic, spremenjeno razmerje med moškimi in ženskimi potomci, naraščanje razvojnih anomalij spolnih organov pri moških, prezgodnja puberteta, moteno delovanje živčnega in imunskega sistema in zvišana pogostost rakavih obolenj v hormonsko odzivnih tkivih. Vrednotenje učinkov je težavno zaradi kompleksnih povezav med različnimi komponentami hormonskega sistema, starosti in razvojne stopnje izpostavljenega organizma. Izpostavljenost različnim odmerkom v različnih obdobjih življenja lahko povzroči različne učinke.

Nesporno je, da nekateri PEM, kot so perzistentni organski onesnaževalci (DDT, PCB), povzročajo motnje delovanja hormonskega sistema pri visokih odmerkih. Polemika v zvezi s povezavo med izpostavljenostjo nizkim odmerkom in razvojem neželenih učinkov se nadaljuje. Kljub biološki verjetnosti, ni zanesljivih dokazov za direktno vzročno povezavo. Najšibkejši člen so pomanjkljivi podatki o izpostavljenosti, ki so kritični za izdelavo verodostojne ocene tveganja.

Ob upoštevanju znanih vplivov endogenih in eksogenih hormonov obstaja verjetnost, da PEM vplivajo na razmnoževanje in povzročajo razvojne motnje. Zaskrbljenost je utemeljena z vidika izsledkov pri laboratorijskih živalih in organizmih v okolju. Vendar je pri ekstrapolaciji na človeka potrebna previdnost in upoštevanje dejstva, da vzročna povezanost v večini primerov zazdaj ni dokazana. Zato področje PEM ostaja pomembna raziskovalna prioriteta.

ABSTRACT

Endocrine disruptors

The last two decades have witnessed several concerned reports on substances which may disturb endocrine (hormonal) balance in man and wildlife.

An endocrine disruptor (ED) is an exogenous substance or mixture that alters function(s) of the endocrine system and consequently causes adverse health effects in an intact organism, or its progeny, or (sub)populations.

Multiple and variable mechanisms of action are involved. The ascribed effects of EDs range from subtle changes in physiology and sexual behaviour to permanently altered sexual differentiation in aquatic organisms; a decline in sperm quality, altered sex ratio, an increase in congenital malformations, precocious puberty, neurobehavioral and immune disturbances and an increased incidence of cancer in hormonally sensitive tissues in man. Their evaluation proves difficult due to the complex relationships among various components of the endocrine system, the effects of age and the developmental stage of exposed organisms. Further, exposure to different doses at various life stages may cause diverse effects.

There is little doubt that some EDs, i.e. persistent organic pollutants (DDT, PCB), may cause endocrine disruption at high doses. However, the association between low-dose exposure and untoward endocrine effects remains controversial. Despite biological plausibility there is no

reliable evidence of a causal relationship. Credible risk assesment is not possible due to insufficient exposure data.

In view of the known effects of endogenous and exogenous hormones it is possible, that EDs affect the reproduction and disturb the development of the progeny. These concerns are substantiated by the results in laboratory animals and wildlife. However, in extrapolating to humans caution is required, as so far most of the proposed associations have not been proven, and the area of EDs remains an important research priority.



EU in letni nadzor nad pesticidi

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V deželah EU letno pregledajo več kot 45.000 vzorcev. Inšpekcijski nadzor in monitoring se izvaja v skladu z direktivami o pesticidih in z direktivo o uradnem nadzoru nad živili. Poleg nacionalnih programov monitoringa, je Evropska komisija državam članicam predlagala sodelovanje v letnih programih monitoringa, ki jih koordinira EU. Število vzorcev, ki jih je potrebno odvzeti znotraj posameznega monitoringa, se določi na osnovi statistike. Znotraj EU je potrebno odvzeti najmanj 459 vzorcev. Skupno število vzorcev mora biti porazdeljeno med članicami glede na populacijo in število potošnikov, a najmanj 12 vzorcev enega proizvoda na leto. Število vzorcev vsakega proizvoda, ki jih je potrebno vzeti, je od 12 do 93 vzorcev v letu 2003. Namen tovrstnih programov je, da ocenimo dejansko vsebnost pesticidov v živilih. V ta program je vsako leto vključenih 8 proizvodov in 42 pesticidov. V 3-letnem ciklusu mora biti vsak pesticid nadzorovan v 20-30 živilih. Za ta namen se lahko uporabi multimetode - »Multi-methods«, ki lahko zaznajo 100 in več pesticidov, potrebne pa so še druge metode. Evropska komisija je izdala osnutek smernic na osnovi »Quality Control Procedures for Pesticide Residue Analysis«. Analitični laboratoriji dežel članic bodo smernice dopolnili in izboljšali. Vse rezultate monitoringov, ki so koordinirani na nacionalni ravni ali na ravni EU, je treba letno poročati Evropski komisiji. Poročila morajo biti izdelana v posebni obliki, vključno z elektronsko obliko ali na disketah. Omenjena komisija podatke zbere in jih primerja. Iz poročila mora biti razvidno, po katerih kriterijih je bil izveden nacionalni monitoring. Prav tako mora biti razvidno število odvzetih vzorcev in opravljene analize, ter podatki o vsebnosti pesticidov. Natančno je potrebno opisati postopke akreditacije laboratorijev, ki opravljajo analize.

ABSTRACT

EU and annual pesticide control

Annually over 45 000 samples are analysed in the EU countries. Inspections and monitoring are carried out in accordance with pesticide directives and the directive of official control of foodstuffs. Besides national monitoring programmes, the Commission has recommended the Member States to participate in a specific EU co-ordinated annual monitoring programmes. A systematic statistical approach of numbers of samples to be taken in each co-ordinated monitoring exercise is necessary. At least 459 samples should be taken across the Community. Collection of the samples should be apportioned between the Member States on the basis of population and consumer numbers, with a minimum of 12 samples per product and per year. Number of samples of each product to be taken varies from 12 to 93 samples in 2003. The aim

of these kinds of programmes is to work towards a system which makes it possible to estimate actual dietary pesticide exposure. Eight products and 42 pesticides are selected each year for this co-ordinated program. Each pesticide should be monitored in 20-30 food products over a series of three-year cycles. Multi-methods capable of detecting up to 100 or more pesticides can be used but also other methods are needed. Draft guidelines concerning "Quality Control Procedures for Pesticide Residue Analysis" have been published by the Commission. These guidelines should be implemented by the analytical laboratories of Member States.

All monitoring results both under national and the EU co-ordinated programmes are reported annually to the Commission. The reports should be produced in a special format – including the electronic format. The formats have been developed to supply the data in a diskette format. The Commission is required to compile and collate this information. In the reports the criteria applied in drawing up national inspection programmes, should be specified. Information should include the numbers of samples to be taken and analyses to be carried out including reporting levels of pesticides. Details of accreditation of the laboratories carrying out analyses should be indicated.

Fitofarmaceutska sredstva

Onesnaženost zelenjave in žit s pesticidi na Finskem

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Med leti 1977 – 1993 je bila na Finskem trikrat ovrednotena vsebnost pesticidov v zelenjavi, sadju in jagodičju iz domače pridelave. V raziskavi je bila ocenjena vsebnost 53 pesticidov, ki so z vidika potrošnika najpomembnejši. Količina zaužitih pesticidov se je zmanjšala. Povprečni dnevni sprejem pesticidov je bil 75 µg/človeka v letu 1992, v glavnem iz uvoženih proizvodov, le 24 % je izviralo iz domače pridelave. Glede na raziskave je povprečni dnevni sprejem pesticidov zelo nizek, le 2-5 % od ADI (acceptable intake level).

Zadnja raziskava iz leta 2000 je poleg zelenjave zajela tudi žita. Rezultati so pokazali, da je bil povprečen sprejem pesticidov 49,9 µg. Vsebnost ostankov pesticidov se je zmanjšala za približno 30 % glede na rezultate raziskave iz 1992, pri čemer so bile za ocenjevanje uporabljene enake metode. Največ (91 %) pesticidov je bilo v uvoženih živilih. Največji sprejem posameznega pesticida je znašal 1,1 % vrednosti ADI. V ekstremnih primerih, ko je analiza zajela le proizvode, ki so vsebovali rezidue, je bil sprejem približno 18 krat večji od povprečja. Celo v teh primerih je bila vsebnost pod dovoljeno mejo in občutno nižja od ADI vrednosti.

Vsebnost pesticidov se ocenjuje z metodo »stepwise«, pri kateri najprej z »grobno« metodo odkrijejo problematične kontaminante in skupine potrošnikov s posebnim tveganjem. Nato z bolj občutljivimi metodami ocenijo vsebnost teh kemikalij in rizične skupine. Na ta način je z najmanjšimi stroški mogoče določiti sprejem pesticidov za celotno skupino potrošnikov. Poleg tega je mogoče zelo točno določiti problematična področja. Metoda "stepwise" se je pokazala kot primerna za oceno tveganja vsebnosti ostankov pesticidov in aditivov v živilih.

ABSTRACT

Pesticide intake from vegetables and grain in Finland

The intake of pesticides from domestic vegetables, fruits and berries has been evaluated in Finland during 1977-1993 three times. In the study it has been estimated the intake of 53 pesticides, which are most important from the consumer's point of view. The daily intake of pesticides has decreased.

The average daily intake was 75 µg per person in 1992 mainly from exported products, only 24 % initiating from the domestic products. According to the studies the average daily intake of pesticides is very low, only 2- 5 % of the acceptable intake level.

The latest study in 2000 covered in addition to earlier products also grain. The study indicated that the average pesticide intake was 49.9 µg. Pesticide intake had declined by about 30% compared with a study conducted in 1992, using same evaluation methods. Most of the intake (91 %) came from imported foodstuffs. Compared to ADI values, the maximum intake of an individual pesticide was 1.1 % of the ADI. The study also evaluated intake in extreme cases where only products containing residues were taken into the assessment. In the extreme cases the intake was about 18 times greater than the average. Even in those cases intake was at a safe level and considerably lower than the ADI value.

The method is based on a stepwise estimation of intake, where in the beginning a rough method is used to find out both problematic contaminants and special risk consumer groups. After that more refined methods will be used to estimate intake of these chemicals and risk groups. By this way it is possible to find out, with as low costs as possible, an intake estimation for total consumer group. In addition to this it is possible to update and clarify very accurately

the problem areas. The stepwise method has shown to be suitable for the risk assessment of intake of pesticide residues and food additives.



Monitoring ostankov pesticidov v sadju in zelenjavi (1996 – 2001) na Poljskem

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Monitoring za ostanke pesticidov v pridelkih je bil l. 1971 izdelan na Inštitutu za varstvo rastlin - Plant Protection Institute (PPI) v sodelovanju z UNDP/FAO. Monitoring se izvaja od l. 1995, pod nadzorom Glavnega inšpektorata za varstvo rastlin - Main Inspectorate of Plant Protection (MIPP). V monitoring je vključenih 6 laboratorijev omenjenega inštituta. Program monitoringa vključuje pesticide, ki jih pridelovalci na Poljskem največ uporabljajo in pridelke, ki so za prehrano bistvenega pomena, s poudarkom na pridelkih iz intenzivne pridelave (iz rastlinjakov in sadovnjakov). Na področju vse države letno naključno vzamejo približno 2200 vzorcev pridelkov. Vzorce zbirajo strokovnjaki iz območnih enot inšpektorata. Vzorce analizirajo takoj, ko je mogoče, najpozneje v 3-4 tednih. Rezultate analiz na ostanke zbirajo deželni inšpektorati provinc - Province Plant Protection Inspectorates (PPPI). V primeru, da ostanki presegajo najvišjo dovoljeno mejo (MRL), so laboratoriji dolžni o tem takoj obvestiti PPPI in MIPP. Končno poročilo o monitoringu konec leta oddajo na MIPP.

Od 1996-2001 je bilo zbranih 13 406 vzorcev pridelkov iz domače pridelave. Monitoring je obsegal 31 vrst pridelkov in 89 pesticidov. 21 % analiziranih vzorcev je vsebovalo ostanke pesticidov. Najdenih je bilo 60 aktivnih snovi. Ostanke so našli predvsem v zelenjavi iz rastlinjakov (27 %) in sadju (27 %), redko pa v zelenjavi s polja (13 %) in drugih pridelkih, npr. koruzi in krompirju (4 %). Največkrat so ostanke našli v vzorcih malin (51 %), paradižnika iz rastlinjakov in s polja (41 in 43 %), jagodah (38 %) in ribezu (33 %). Ostanke enega pesticida so bili najdeni v manj kot 10 % vzorcev posameznih pridelkov. Le ostanke ditiokarbamatov, klortalonila, procimidona, tolilfluanida, diklofluanida, endosulfana, MBC in linurona so večkrat našli v vzorcih iste vrste pridelkov. Glede na veljavne predpise na Poljskem, je bila vsebnost ostankov pesticidov čez dovoljeno mejo v 0,8 % vzorcev, po EU direktivah pa je bilo kršitev več (2,2 %).

ABSTRACT

Polish Monitoring of Pesticide Residues in Fruit and Vegetables (1996-2001)

Polish monitoring of pesticide residue in crops was established in Plant Protection Institute (PPI), in 1971, as a result of co-operation with UNDP/FAO. Since 1995, along with implementation of Act on Plant Protection, the monitoring has carried out on behalf of The Main Inspectorate of Plant Protection (MIPP).

At present, six laboratories of Plant Protection Institute participate in the monitoring. Monitoring programme includes pesticides the most commonly used by Polish farmers and crops which are essential for the diet, but special priorities have crops intensively protected such as greenhouse and orchard crops. Yearly, ca. 2200 samples of mature crops are randomly taken from the production sites on the territory of the whole country by the trained staff of the local plant protection inspectorates. Samples are analyzed as soon as possible, at the latest in 3-4 weeks. The reports on the residue study are sent to Province Plant Protection Inspectorates (PPPI) successively. In case of detection of residues exceeding maximum residue limits (MRLs)

laboratories are obligated to inform about that immediately both PPPI and MIPP. The final report on monitoring is submitted to MIPP in the end of the year.

13 406 samples of domestic crops were collected in the years 1996-2001. Monitoring encompassed 31 crops and 89 pesticides. 21% of analyzed samples contained pesticide residues. 60 compounds were detected. The residues were mainly found in greenhouse vegetables (27%) and fruits (27%), rarely in samples of field vegetables (13 %) and samples of crops like corn and potatoes (4 %). The frequency of residues occurrence was the highest in samples of raspberries (51%), field and greenhouse tomatoes (respectively 43% and 41%), strawberries (38%) and currants (33%). In the most cases the residues of one pesticide were detected in less than 10% of samples of individual crops. Only residues of dithiocarbamates, chlorotalonil, procymidone, tolylfluanid, dichlofluanid, endosulfan, MBC and linuron were more often found in samples of the same kind. Violations of Polish MRLs contained 0.8% of samples, but taking into account EU Directives (Council Directives 76/895/EEC, 86/362/EEC, 90/642/EEC) violations of MRLs were a bit more (2.2%).



Obremenjenost podzemne vode s pesticidi, določena po novi evropski metodologiji

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Leta 2002 je bila v Slovenji sprejeta Uredba o kakovosti podzemne vode, usklajena z okoljsko zakonodajo Evropske skupnosti, ki opredeljuje nov pristop določanja obremenjenosti podzemne vode. Obremenjenost podzemne vode se določa za celotno telo podzemne vode na osnovi določitve kemijskega stanja in dolgoročnih trendov rasti 23 parametrov kemijskega stanja. Parametri kemijskega stanja vključujejo 9 posameznih pesticidov in njihovih razgradnih produktov ter vsoto vseh pesticidov.

Agencija RS za okolje spremlja kakovost podzemne vode od leta 1990 v okviru državnega monitoringa kakovosti voda. Na osnovi rezultatov monitoringa podzemne vode v obdobju 1993 – 2000 je bila po novi metodologiji določena obremenjenost podzemne vode za 13 aluvijalnih vodonosnikov. V prispevku je predstavljena stopnja obremenjenosti podzemne vode s pesticidi v letu 2000 in dolgoročni trendi koncentracije pesticidov v obdobju 1993 – 2000 za posamezen vodonosnik kot tudi na izbranih merilnih mestih.

Najvišja stopnja obremenjenosti s pesticidi je bila določena za vodonosnike SV dela Slovenije. Ugotovljen je bil trend zniževanja vsebnosti atrazina in desetil-atrazina, vendar se koncentracije na večini vodonosnikov še niso znižale do dopustnih meja. Od leta 1996 je bilo na Sorškem polju ugotovljeno naglo povečevanje vsebnosti metolaklora.

ABSTRACT

Determination of groundwater pollution by pesticides according to new European methodology

In Slovenia Decree on Quality of Groundwater, harmonized with EU environmental legislation came into force in 2002 where new methodology of pollution classification for groundwater was determined. Pollution of groundwater body has to be assessed according to determination of chemical status and long-term trends of 23 chemical status parameters. Chemical status parameters include 9 individual pesticides and their metabolites as well as sum of all pesticides.

Environmental Agency of the Republic of Slovenia is responsible for groundwater quality monitoring which has been carried out since 1990. Pollution of 13 alluvial aquifers was assessed according to new methodology basing on statistical calculations of monitoring results in the period 1993 – 2000. In this article the degree of groundwater pollution by pesticides in year 2000 and long-term trends for pesticides in the period 1993 – 2000 for the whole individual aquifer as well as for chosen sampling sites are presented.

The highest degree of groundwater pollution by pesticides was determined for aquifers of NE part of Slovenia. Generally long-term trend of atrazin and desethyl-atrazin declination was found out yet concentrations in most aquifers are still higher than admissible values. Since 1996 we have been detecting rapid increase of metolachlor in the aquifer of Sorško polje.



Rezultati monitoringa ostankov pesticidov v kmetijskih pridelkih v Sloveniji v letih 2001 in 2002

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Na Kmetijskem inštitutu Slovenije že od leta 1987, v okviru strokovnih nalog v kmetijstvu, spremljamo onesnaženost kmetijskih pridelkov z ostanki fitofarmacevtskih sredstev. Stalno spremljanje je zaradi intenzivne pridelave kmetijskih pridelkov in večje rabe kemijskih sredstev za varstvo rastlin nujno. Zbrani podatki, skupaj z ostalimi pridobljenimi v sklopu celovitega nacionalnega monitoringa onesnaženosti okolja, so osnova za oceno obremenjenosti okolja in človeka z ostanki pesticidov. Hkrati služijo za ukrepanje v smislu pravilne rabe sredstev za varstvo rastlin.

Naša dejavnost temelji na smernicah in ciljih Zakona o fitofarmacevtskih sredstvih (Ur.l. RS št. 11/01), na Uredbi o monitoringu pesticidov v živilih in kmetijskih proizvodih (Ur.l. RS št. 13/99) in Pravilniku o mejnih vrednostih pesticidov v oziroma na rastlinah oziroma živilih rastlinskega izvora (Ur.l.RS št. 54/99). Zaradi primerjave stanja obremenjenosti ljudi z ostanki pesticidov v Sloveniji s stanjem tovrstne obremenjenosti ljudi v evropski skupnosti prilagajamo naše delo usmeritvam, ki so podane v priporočilih EU (Commission recommendation 99/333/EC). Program dela je usklajen z izvajalci nacionalnega monitoringa pesticidov v živilih in kmetijskih proizvodih, v okviru Ministrstva za kmetijstvo, gozdarstvo in prehrano in Ministrstva za zdravstvo.

Vzorčenje poteka naključno na pridelovalnih območjih Celja, Kopra, Kranja, Nove Gorice, Novega mesta, Murske Sobote, Maribora in Ljubljane. Vsebnost ostankov fitofarmacevtskih sredstev v vzorcih krompirja, solate in jabolk spremljamo vsako leto, medtem ko je izbor ostalih kmetijskih proizvodov letno usklajen z smernicami EU. V letu 2001 smo iz kmetijskih pridelovalnih območij Slovenije odvzeli vzorce krompirja (30), solate (15), jabolk (15), paradižnika (30), jagod (30), pšenice (24) in ječmena (7). V letu 2002 pa smo jemali vzorce krompirja (30), solate (30), jabolk (30), hrušk (30) in stročjega fižola (30). Vzorčili smo ob spravi kmetijskih proizvodov, po poteku karence za uporabljene pesticide. Vse vzorce smo analizirali na vsebnost izbranih aktivnih snovi.

Ostanke 45 različnih spojin v laboratoriju določamo s tremi različnimi metodami: z multirezidualno metodo za določitev 43 spojin (organskih kloriranih in organskih fosforanih spojin, ter piretroidov), metodo za določitev skupine ditiokarbamatov (maneba, mankozeba,

metirama, propineba in zineba, vsota izražena kot ogljikov disulfid) in metodo za določitev tiabendazola, ter benomila in karbendazima, kjer je vsota izražena kot karbendazim.

ABSTRACT

The results of monitoring the pesticide residues found in agricultural products in Slovenia in the years 2001 and 2002

Agricultural Institute of Slovenia has been monitoring the pollution of agricultural products with residues of phytopharmaceutical products as part of professional projects in agriculture since 1987. Constant measurements are necessary because of intensive production of agricultural products and expanded use of chemical substances for plant protection. The data collected, together with the remaining data gathered in frame of the national monitoring programme of environmental pollution, are the basis for the evaluation of human and environmental exposure to pesticide pollution. At the same time, the data serve for the control of a correct use of plant protection products.

Our activity is based on the directives prescribed in the Law on Phytopharmaceutical Products (Official Gazette of the Republic of Slovenia No. 11/01), on the Decree on Monitoring of Pesticides in Foodstuffs and in Agricultural Products (Official Gazette of the Republic of Slovenia No. 13/99) and on the Regulation on Maximum Residue Levels of Pesticides in and on Plants and Foodstuffs (Official Gazette of the Republic of Slovenia No. 54/99). Our work was adjusted to EU directives (Commission Recommendation 99/333/EC) so that the comparison between human exposure to pesticides in Slovenia and Europe can be made. The performers of national monitoring programme work in collaboration with Ministry of Agriculture, Forestry and Food and Ministry of Health.

The surveillance sampling is performed in the areas of Celje, Koper, Nova Gorica, Novo mesto, Murska Sobota, Maribor and Ljubljana. Every year we follow the concentrations of phytopharmaceutical products in the samples of potato, lettuce and apples. The selection of other agricultural products is harmonised with EU Directives every year. In the year 2001 we sampled potato (30), lettuce (15), apples (15), tomato (30), strawberries (30), wheat (24) and barley (7) in Slovenia. In the year 2002 we collected the samples of potato (30), lettuce (30), apples (30), pears (30) and string beans (30). The sampling was carried out during harvest when the pre-harvest interval for the used pesticides had expired.

Residues of 45 different substances were determined in the laboratory using three different methods: multiresidual method for the determination of 43 substances (organochlorinated, organophosphate and pyrethroids), method for the determination of dithiocarbamate group (maneb, mankozeb, metiram, propineb and zineb, the was sum expressed as carbon disulfide), and method for the determination of thiabendazole (benomil and carbendazim expressed as carbendazim).



Ostanki ditiokarbamatov v gomoljih krompirja

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V letu 2001 smo analizirali 30 vzorcev krompirja in v šestih vzorcih določili vsebnost ostankov ditiokarbamatov nad MRL, ki je 0,05 mg/kg (Ur.l. RS, št.: 54/99). Detekcijo smo opravili s pomočjo reakcije s kislino, pri čemer nastane CS₂, ki smo ga kvalitativno in kvantitativno

določili s plinsko kromatografijo z masno selektivnim detektorjem. V letu 2002 smo v 12 od skupno 30 analiziranih vzorcev ponovno ugotovili presežene vsebnosti ditiokarbamatov. Ugotovljene so bile vrednosti od 0,05 mg/kg do 0,44 mg/kg vzorca. Razčlenili smo dogajanje med rastno sezono v letu 2002 in preučili možne razloge za ugotovljene presežene vrednosti. Glede na poznavanje značilnosti ditiokarbamatov, rastne razmere v katerih so se fungicidi v letu 2002 uporabljali in tehniko pridelovanja so presežene vrednosti ditiokarbamatov v analiziranih vzorcih krompirja verjetno posledica spleta več okoliščin. Izjemno ugodne razmere za razvoj krompirjeve plesni v letu 2002 so narekivale povečano rabo fungicidov, ki večinoma vsebujejo aktivne snovi na osnovi ditiokarbamatov. Zato je mogoča večja skupna koncentracija ostankov ditiokarbamatov konec rastne dobe. Močno izpiranje fungicidov z zelenih delov rastlin na tla in preko tal na gomolje je en od možnih vzrokov za povišane koncentracije ditiokarbamatov v gomoljih krompirja. Vzrok je lahko tudi pomanjkljiva tehnika pridelave krompirja, ki zajema nezadostno osipanje krompirja oziroma intenzivno izpiranje zemlje z gomoljev med rastno dobo zaradi ekstremnih padavinskih razmer v mesecu avgustu. V prihodnje bo potrebno ugotoviti dejanske vzroke za presežene MRL, z njimi seznaniti pridelovalce in jih s svetovanjem usmerjati k pravilni tehnologiji pridelovanja.

ABSTRACT

Dithiocarbamate residues found in potato tubers

30 potato samples were tested for the presence of the residues of dithiocarbamates in 2001. Six of them were found to be above the MRL of 0.05 mg/kg (Off. g. RS, n. 54/99). Qualitative and quantitative detection of CS₂ using gas chromatography with mass selective detection was performed after the reaction with acid. Too high levels of dithiocarbamate residues were found in 12 samples of 30 in 2002. The values of concentrations found ranged from 0.05 to 0.44 mg/kg. The growing season 2002 was analysed and possible reasons for the appearance of the residues were discussed. The residues found in potato tubers were most likely the result of different circumstances acting together due to the characteristics of dithiocarbamates, growing conditions which affected the use of fungicides in 2002, and production technologies used. Good conditions for the development of late blight in 2002 yielded in larger use of fungicides which contained active substances on the basis of dithiocarbamates. That could be the reason for higher concentration of dithiocarbamates at the end of growing season. Severe rinsing of fungicides from green tops into the ground on the surface of the tubers could be one of the reasons for high residue content. Another reason may be the inappropriate potato production technology which includes insufficient row formation causing the erosion of earth from the top of the rows after extreme precipitation in August 2002. In the future it will be necessary to find out the real reasons for high levels of residues in tubers and advise the farmers how to grow potato properly.



Spremljanje onesnaženosti kmetijskih proizvodov z ostanki FFS v Sloveniji v obdobju 1987-2000

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Leta 1987 je Kmetijski inštitut Slovenije, po pooblastilu Ministrstva za kmetijstvo, gozdarstvo in prehrano, vpeljal stalen in sistematičen nadzor ostankov pesticidov v kmetijskih proizvodih.

Z namenom ugotavljanja vsebnosti ostankov pesticidov v čim večjem številu kmetijskih proizvodov v intenzivni pridelavi je bil v skladu z obstoječimi tehničnimi in finančnimi možnostmi sprejet ponavljajoči se triletni načrt dela in sicer:

1. leto: krompir, grozdje; 2. leto: koruza, sadje; 3. leto: vrtnine.

Z uveljavitvijo *Uredbe o monitoringu pesticidov v živilih in kmetijskih proizvodih* (Ur.l. RS, št. 13/99) v letu 1999 pa poteka delo v okviru nacionalnega monitoringa pesticidov, ki predstavlja usklajeno, redno in sistematično preverjanje vsebnosti ostankov pesticidov v živilih in kmetijskih proizvodih. Njegov namen je ugotavljanje skladnosti s predpisanimi najvišjimi dovoljenimi količinami ostankov (MRL), identifikacija kontaminiranih živil in kmetijskih proizvodov, ugotavljanje izvora oziroma vzroka kontaminacije, ugotavljanje skladnosti pridelave z dobro kmetijsko prakso ter izdelava ocene zdravstvene ogroženosti potrošnikov.

Program nacionalnega monitoringa je rezultat sodelovanja Ministrstva za zdravje in Ministrstva za kmetijstvo, gozdarstvo in prehrano.

Izbor kmetijskih proizvodov za dvoletni monitoring je oblikovan na podlagi dveh kriterijev:

- a) značilna prehrana Slovencev - redno, vsako leto spremljamo ostanke FFS v solati, jabolkah, krompirju in mleku;
- b) priporočila EU (Commission recommendation 99/333/EC) in WHO - variabilni del preučevanih kmetijskih proizvodov.

V obdobju 1987-2000 smo analizirali skupno 1693 vzorcev kmetijskih proizvodov (grozdje, jabolka, koruza, krompir, vrtnine), ki so bili skupno analizirani na 49 različnih aktivnih snovi.

Rezultati štirinajstletnih (1987 – 2000) preučevanj vsebnosti ostankov pesticidov v rastlinskih proizvodih v Republiki Sloveniji kažejo, da več kot 48,3 % analiziranih vzorcev ni vsebovalo določljivih ostankov, kar pomeni, da je bila njihova količina, tudi če so v njih bili, tako majhna, da jih z veljavnimi analitskimi metodami ni bilo mogoče dokazati (meja detekcije). 48,9 % analiziranih vzorcev je ostanke sicer vsebovalo, vendar je bila njihova količina nižja od predpisanih MRL. Le 2,8 % vzorcev je vsebovalo prekomerno količino ostankov FFS.

Onesnaženost kmetijskih proizvodov z ostanki FFS v Sloveniji ni zaskrbljujoča. Ugotovljene vrednosti Slovenijo uvrščajo med dežele s sorazmerno nizkimi preseženimi MRL-ji ostankov FFS v kmetijskih proizvodih.

ABSTRACT

Monitoring of pollution of agricultural products with residues of PPP in Slovenia in the period 1987-2000

In 1987, a continuous and systematic control was introduced by the Agricultural Institute of Slovenia upon the authorisation of the Ministry of Agriculture, Forestry and Food, of the pesticide residues in agricultural products.

Aiming at establishing the content of pesticide residues in the biggest number of agricultural products as possible subjected to intensive production, a three-year recurrent working plan was

adopted in compliance with the existing technical and financial possibilities, as follows: 1st year: potatoes, grapes; 2nd year: maize, fruit; 3rd year: vegetables.

With the effective date of the Decree on Monitoring of Pesticides in the Foodstuffs and in Agricultural Products (Official Gazette of the Republic of Slovenia, no. 13/99) in year 1999, work within the framework of the national monitoring of pesticides, representing a coordinated, regular and systematic control of the content of pesticides in foodstuffs and in agricultural products, is carried out. The aim of the work is to establish compliance with the highest prescribed permitted quantities of residues (MRL), to identify the contaminated foodstuffs and agricultural products, to find out the origin or cause of contamination, to establish compliance of production with good agricultural practice and to make the assessment of health endangerment of consumers.

The National Monitoring Program is a result of cooperation of the Ministry of Health and the Ministry of Agriculture, Forestry and Food.

Agricultural products to be included in the two-year monitoring are selected on the basis of the two criteria: a) typical nutrition of Slovenes – regular, each-year monitoring of pesticide residues in green salad, apples, potatoes and milk;

b) recommendation of EU (Commission recommendation 99/333/EC) and of WHO-variable part of the studied agricultural products.

During the period 1987-2000 we analysed in total 1693 samples of agricultural products (grapes, apples, maize, potatoes, vegetable⁹, for in total 49 different active substances.

As found by the 14-year (1987-2000) analysing of the content of pesticide residues in plant products in the Republic of Slovenia, more than 48,3 % of the analysed samples showed to be free from any determinable residues, meaning that the content thereof, although present, was so low that was not possible to be proved with the valid analytical methods (limit of detection). Although 48,9 % of the analysed samples contained the residues, the quantity thereof was lower than the prescribed MRL. Only 2,8 % of samples were found to contain excessive quantities of the pesticide residues.

Pollution of agricultural products with pesticide residues in Slovenia is not to be of any concern. According to the established values, Slovenia is classified among the countries with rather low exceeded MRLs of pesticide residues in agricultural products.



Multirezidualne metode za določanje pesticidov v živilih

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Široka uporaba pesticidov in pojavljanje njihovih ostankov v živilih, je zaradi potencialnega tveganja za človeka pripeljala do potrebe, da se identificira in izmeri nizke koncentracije teh spojin v biotičnih matriksih. Točna določitev ostankov tako številnih kemijskih substanc je zelo kompleksna naloga, ki je še nadalje otežena zaradi prav tako številnih vrst vzorcev. Analitska instrumentacija in metodologije se konstantno razvijajo, da sledijo vedno večjim zahtevam po določanju vedno nižjih koncentracij, ki izhajajo iz vedno strožjih zakonskih določil.

Pri analizi ostankov pesticidov v živilih imamo opravka s spojinami z zelo širokim razponom polarnosti, hlapnosti in topnosti, kar zelo otežuje razvijanje metod. Najbolj cenovno učinkovit pristop k analitiki ostankov so multirezidualne metode, kjer določamo številne spojine z enojnim ekstrakcijskim postopkom in z najmanjšim čiščenjem, ki je združljivo z uporabljenimi tehnikami za detekcijo.

Pomembni faktorji pri multirezidualnih metodah so ustrezno vzorčevanje, ki mora zagotavljati reprezentativnost vzorca, ustrezna izbira dela vzorca, ki ga vzamemo v analizo, homogenizacija, stabilnost pesticida, izbira analitske metode glede na vrsto živila in ciljni ostanek, ekstrakcija ostankov pesticidov, čiščenje ekstraktov, priprava in stabilnost standardnih raztopin, kvantitativna določitev, ki je pogojena z mejnimi vrednostmi in zahtevami za zagotavljanje kakovosti ter potrditev rezultatov.

Strategije za multirezidualno analizo pesticidov so odvisne od več faktorjev, ki vsi izhajajo iz treh osnovnih parametrov: (1) namena analiz, (2) vrste in sestave matriksa in (3) časa, sredstev in tehnologije, ki je na voljo. Namen, za katerega potrebujemo podatke, nam določa tudi smernice za zagotavljanje kakovosti, kot tudi analitske parametre, kot so občutljivost (meja zaznavanja, LOD, meja določanja, LOQ), točnost in preciznost rezultatov, robustnost in prehodnost vzorcev. Te potrebe vplivajo tudi na izbiro pesticidov, ki jih bomo analizirali, kar nato določa polarnostno območje analize. Različne vrste matriksov, ki jih navadno analiziramo na ostanke pesticidov, lahko prav tako vplivajo na pristop k pripravi vzorcev.

Večino pesticidov lahko analiziramo s plinsko kromatografijo v kombinaciji z masno spektrometrijo in/ali elementno selektivnimi detektorji medtem, ko se tekočinska kromatografija uporablja predvsem za slabo hlapne, polarne in termolabilne spojine.

Multirezidualne metode se nenehno razvijajo, ker se pojavljajo novi pesticidi, instrumenti in tehnike, pa tudi zahteve za zagotavljanje kakovosti se pri analitiki ostankov pesticidov v živilih nenehno povečujejo. Moderni pesticidi ne ustrezajo vedno uporabljanim analitskim tehnikam, narašča potreba po analitiki metabolitov, vendar ima veliko teh spojin zelo različne lastnosti kot osnovne spojine, vedno večje število potrebnih analiz daje vedno večje zahteve po prehodnosti vzorcev in ceni, mejne vrednosti so vedno nižje in število registriranih pesticidov vedno večje.

V analitiki ostankov pesticidov je zelo pomembna potrditev rezultatov, ker lahko zaradi kompleksnosti matriksa pride do napačno pozitivnih rezultatov. Še posebej pomembna je potrditev rezultatov za ostanke pesticidov v koncentracijah nad ali blizu mejnim vrednostim ali ko gre za nepričakovane rezultate.

ABSTRACT

Multiresidual methods for analysis of pesticides in food

The widespread use of pesticides and their presence in the food represent the potential risk for consumers. This awareness has led to the need to identify and determine low levels of pesticide residues in biological matrices. Accurate determination of the residues of such numerous substances is a very complex task, which is further complicated by the equally numerous sample matrices. Analytical instrumentation and methodology are constantly evolving to answer the demands for determination of continuously lower concentrations, as a result of more stringent legislation.

The development of analytical methods for pesticide residue analysis is difficult, because of very wide range of polarity, volatility and solubility of modern pesticides. The most efficient approach to pesticide residue analysis is the use of multi-residue methods (MRM). Multi-residue methods enable the determination of large numbers of pesticides with single extraction approach and the least cleanup that is acceptable for a chosen determination system.

The factors that are important for multi-residue analysis are appropriate sampling to obtain representative samples, a portion of the product to which maximum residue levels (MRL) apply should be taken for analysis, homogenisation, pesticide stability, the choice of analytical method with respect to the sample type in target residues, extraction of residues, sample cleanup, preparation and stability of standard solutions, quantitation, quality assurance (QA) and quality control (QC) measures and confirmation of positive results.

Strategies for multi-residue analysis depend on several factors, that all originate in three basic parameters: (1) the purpose of the analysis, (2) sample type and matrix composition and (3)

available time, resources and technology. The purpose of pesticide residue analysis also determine the QA/QC guidelines, as well as analytical parameters such as sensitivity (limit of detection, LOD and limit of quantitation, LOQ), accuracy and precision of the results, robustness and sample throughput. The purpose of analysis also determine the pesticide residues to analyse and at the same time the polarity range of analytes.

Most of the pesticide residues can be analysed using gas chromatography in combination with mass spectrometry and/or element-selective detectors. Liquid chromatography is used for non-volatile, polar and thermolabile compounds. Multi-residue methods are constantly improving, because new pesticides, instruments and techniques are developed and also because of growing demands on QA/QC in pesticide residue analysis. Problems arise because modern pesticides are not always amenable to analytical techniques already in use, the metabolites differ significantly from their parent compounds making their analysis difficult, the number of samples is growing and puts higher demands on sample throughput and price, MRLs get lower and the number of registered pesticides higher. The confirmation of positive results is also very important for MRM, because sample complexity can lead to false positive results. That is especially important when the residue is above or near MRM or the residue is not expected.



Kdaj so podatki določanja depozita fitofarmaceutskega sredstva res povedni?

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Vrednost izmerjenega podatka ni samo rezultat meritve sam po sebi, ampak tudi poznavanje negotovosti, s katero moramo računati, ko določeno vrednost interpretiramo. Zavestno upoštevanje tega dejstva je še posebno pomembno pri obravnavanju rezultatov meritev, ki so odvisni od mnogih dejavnikov, o katerih pogosto ni mogoče imeti natančne kvantitativne predstave. Določanje depozita fitofarmaceutsko aktivne snovi je relativno hiter, navidezno zelo poveden in vse bolj splošno uveljavljen način ocenjevanja kvalitete tretiranja gojenih rastlin s fitofarmaceutskimi sredstvi. Prispevek kritično ocenjuje različne tehnike določanja depozita, njihove prednosti in slabosti ter poglobljeno predvsem natančnost končnega rezultata, ki jo določajo negotovosti v vsaki fazi postopka določanja depozita. Določanje depozita z dodajanjem tracerja v pršilno brozgo je po kemijski analizi enostavno, ne daje pa podatkov o obstojnosti nanosa. Direktno določanje aktivne snovi je tako po določanju nanosa kot glede podatkov o njegovi obstojnosti zadovoljivo, je pa praviloma tehnično zahtevnejše in zaradi velikega števila potrebnih meritev precej drago. Spiranje depozita z umetnih kolektorjev (papirnatih lističev) daje natančne podatke o obravnavani površini in mestu odvzema vzorca, je pa v primerjavi z direktnim spiranjem z rastlinskih listov skoraj neuporabno, kadar hočemo oceniti odtekanje pršilne brozge z rastlin in s tem v zvezi njeno optimalno količino.

ABSTRACT

Power and pitfalls of deposit measurements of phytopharmaceuticals?

The value of a measured value is not just the result of the measurement itself but also the knowledge about the uncertainty, which has to be taken into account when interpreting the result in question. A conscious considering of this fact is of utmost importance when we are dealing with results of measurements depending on numerous factors which lack the necessary

quantitative descriptions. Determining the deposit of phytopharmaceutically active substances is a relatively quick, obviously promising and generally acceptable way of determining the quality of treating cultural plants with phytopharmaceuticals. This contribution gives a critical overview of various techniques for measuring the deposit of phytopharmaceutically active substances, their advantages and disadvantages as well as an in depth analysis about the (un)certainly of the final result, which is determined by the errors committed in each step of the procedure performed. Determining the deposit by adding a tracer to the spraying broth is chemically relatively simple, but gives no results on the deposit stability. Direct determination of the active substance gives reliable results on deposit as well as on its stability but on the other hand it is technically more demanding and becomes rather expensive as many measurements are required to give satisfactory final results. Washing the deposit from artificial collectors (papers) gives good results especially considering the surface treated and the place of the sample taken but becomes rather questionable when dealing with dripping off the plants and determining the optimal quantity of the spraying broth are concerned.



Kemijsko in biotično sledenje organskih fosfornih pesticidov v okolju

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Organske fosforne pesticide uporabljamo v kmetijstvu kot insekticide. Te spojine inhibirajo delovanje encima acetilholinesteraze (AChE), ki uravnava prenos živčnih impulzov v organizmih. Velika uporaba omenjenih pesticidov v intenzivnem kmetijstvu in vpliv tako na tarčne kot tudi na netarčne organizme narekujejo spremljanje zastopanosti teh spojin v okolju, njihovo morebitno adsorpcijo v tleh ter razgradnjo in nastanek metabolitov. S klasičnimi analitskimi metodami (plinsko ali tekočinsko kromatografijo) določamo vsebnost pesticidov v najrazličnejših vzorcih, vpliv uporabe omenjenih spojin na živem svetu pa lahko spremljamo z merjenjem aktivnosti encima acetilholinesteraze v izbranih organizmih.

Glede na procese, ki potekajo v naravi, so možne različne pretvorbe omenjenih pesticidov, kot sta na primer hidroliza in oksidacija. V naših raziskavah smo spremljali pretvorbe izbranih insekticidov diazinona in malationa ter njunih razpadnih produktov v vodi, zemlji in na listnati vrtnini. Vzorcem smo dodali oba pesticida v koncentracijskem območju od 0,1 ppm do 10 ppm in jih v obdobju treh tednov periodično analizirali s plinsko kromatografijo. Rezultate analiz smo uporabili za ugotavljanje, katera od omenjenih pretvorb teh spojin v okolju je prevladujoča. Ugotovili smo, da oba pesticida na zelenjavi v 21 dneh popolnoma razpadeta. Malaokson je vseboval že pripravek sam in po 21 dneh je bilo malaoksona 7,2 mg/kg, kar dvakrat preseže dopustno mejo, ki znaša 3 mg/kg za skupno malation in malaokson. V vodi kakor tudi v zemlji je bistven proces razgradnje hidroliza v primerjavi z oksidacijo.

Spremembe v aktivnosti encima acetilholinesteraze smo spremljali v testnih organizmih tako, da smo v eksperimentu kopenske enakonožne rake vrste *P. scaber* izpostavili različnim koncentracijam diazinona, dodanega v hrano (5, 10, 50 100 oz. 150 µg/g suhe hrane). Vpliv pesticidov smo spremljali z različnimi parametri: smrtnosti, prirasta, levitve ter prehranjevanje v standardnem dvo ali štiritedenskem strupenostnem testu z mokricami ter po končanem eksperimentu z merjenjem aktivnosti AchE. Na osnovi dobljenih rezultatov smo ugotovili, da je možno aktivnosti AchE uporabljati kot biomarker za ugotavljanje izpostavljenosti mokric diazinonu že v krajših poskusih pri koncentracijah 50 in 100 µg diazinona/g suhe hrane, pri

katerih pa se še ne pokaže učinek diazinona na spremembo na ravni organizma, to je na teži in učinkovitosti asimilacije.

ABSTRACT

Chemical and biotical monitoring of organophosphorus pesticides in the environment

Organophosphorus compounds (OP) are mostly used in agriculture as pesticides. They inhibit acetylcholinesterase activity not only in insects but can also affect the nervous system of humans. Large amounts of those pesticides in extensive agriculture and their effects on target as well as on non-target organisms declare monitoring of such compounds in the environment. In particular, their eventual adsorption in soil and degradation and formation of metabolites should be monitored. By using classical analytical methods (gas or liquid chromatography) we are able to determine a content of pesticides in different samples, but the effects of their application on a wide range of living organisms and humans can be followed by measuring the AChE activity in selected organisms.

Regarding the processes in the nature, different transformation of pesticides, such as hydrolysis and oxidation, can occur. In our investigations we monitored the degradation of diazinon and malathion and the formation of their metabolites in water, soil, and on chicory. Both pesticides were added to the samples in the concentration range from 0,1 ppm to 10 ppm and were periodically analysed in the 21 days period by gas chromatography. The pesticides were chosen in order to observe two degradation processes – hydrolysis and oxidation, and to establish which process is dominant. We found out that diazinon and malathion degradation on the chicory was nearly complete within 5 days, whereas the concentration of malaoxon more than twice exceeded the MRL value prescribed in Slovenian legislation (partially due to its presence in the technical product). The main degradation process in water and natural soil was hydrolysis.

The changes in the AChE activity in organisms were monitored in the experiment with terrestrial isopods, *Porcellio scaber*, where organisms were exposed to different concentrations of diazinon, added to the food (5, 10, 50 100 or 150 µg/g dry food). The influence of the pesticide was followed during two and four week exposure by different parameters: food assimilation efficiency, food consumption, growth and mortality. At the end of the experiment all the animals were prepared for the AChE activity analyses. On the basis of our results we found out that, the AChE activity can be used as a biomarker for the detection of low levels of OP exposure. The AChE activity in *P. scaber* is strongly inhibited by the ingestion of diazinon at concentrations having little effect on survival and growth as well as on feeding rate.



Tehnična zakonodaja pri nanašanju fitofarmaceutskih sredstev

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V Sloveniji se lahko uporabljajo in dajejo v promet le naprave za nanašanje fitofarmaceutskih sredstev, s katerimi je ob predpisani uporabi zagotovljeno za ljudi in okolje neškodljivo nanašanje omenjenih sredstev. Naprave morajo imeti certifikat o skladnosti, ki se pridobi z izpolnitvijo tehničnih zahtev za pridobitev te listine. Redni pregledi certificiranih naprav so vsaki dve leti. Celoten potek dela je urejen z zakonom.

ABSTRACT

Technical legislation for the purpose of pesticide application

In Slovenia only devices for pesticide application which provide (act regulated) human and environmental friendly pesticide application. Devices have to have uniformity certificate which can be obtained by fulfilling technical requirements for certificate acquisition. Regular examination of the certified devices is every two years. The entire work process is regulated by the law.



Vloga biotičnega varstva rastlin pri zmanjševanju kontaminacije v kmetijstvu

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Zatiranje škodljivih organizmov s fitofarmaceutskimi sredstvi je v Sloveniji najpogostejši način varstva rastlin. Sredstva, ki imajo dovoljenje za uporabo, se med seboj razlikujejo v kemični zgradbi, načinu delovanja, strupenosti, obstojnosti ter vplivih na ne ciljne organizme in okolje. Precej je že bilo storjenega, da bi se zmanjšala onesnaženost oziroma kontaminacija v kmetijskem prostoru.

Biotično varstvo rastlin spada med varstvene ukrepe, ki so usmerjeni v zmanjševanje neželenih stranskih učinkov sredstev za varstvo rastlin. Uporablja žive koristne organizme in njihove produkte za zmanjšanje populacij škodljivih organizmov. Definicija biotičnega varstva v literaturi ni enotna. Tudi v tem prispevku obravnavamo pod tem pojmom koristne organizme, njihove produkte in še nekatere alternativne biotične načine ter sredstva (rastlinske insekticide, rastlinska olja, biotehnična sredstva in druga).

Predstavljamo sedanje stanje in perspektive biotičnega varstva rastlin v Sloveniji ter raziskave, ki vključujejo predvsem varstvo avtohtonih koristnih organizmov ob uporabi zanje manj škodljivih sredstev, ciljno spuščanje koristnih vrst in druge biotične načine zatiranja škodljivcev. Spremljanje škodljivcev pa poteka s pomočjo feromonov in barvnih lepljivih plošč.

ABSTRACT

The Role of Biotical Control to reduce Contamination in Agriculture

Pesticides are the most tactic for controlling pests in our country. They vary in structure, toxicity, persistence and environmental impact. Sometimes they cause local environmental problems through contamination. Much has been learned about minimising pollution/ contamination by pesticides in the last time.

One of the way in which potential environmental impact of pesticides can be minimised is biotical control. It is the use of living organisms or their products to suppress population of plant pests. The definition of biotical control is not consistent in the literature. In this paper the term includes beneficial organisms and some biotical alternatives (biopesticides, botanical insecticides, semiochemicals, horticultural oils and soaps, ...).

Biotical control tactics, status of current and future researches in Slovenia are presented in this article. Biotical pest control is based on the protection and stimulation of indigenous beneficial species and usage of pesticides no harm to natural enemies, classical biotical control,

inoculative release, biopesticides and secondary plant chemicals. Monitoring of pests is done by pheromone traps and sticky coloured boards.



Učinkovitost ekoloških sredstev za varstvo rastlin iz programa Bio Plantella

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Ekološko kmetovanje je način trajnostnega kmetovanja, ki v pridelavi hrane temelji na ravnovesju v sistemu tla-živali-človek in sklenjenem kroženju hranil v njem. Varstvo rastlin v ekološkem kmetijstvu temelji na izbiri ustreznih vrst in sort, načrtovanju ustreznega kolobarja, mehanskih postopkih oskrbe in varstvu naravnih sovražnikov škodljivcev. Ena izmed osnovnih prepovedi v ekološkem kmetijstvu je uporaba kemično sintetičnih sredstev za varstvo rastlin.

V varstvu rastlin so zato zelo pomembni rastlinski izvlečki, ki so praviloma brez karenčne dobe ali pa je ta zelo kratka.

Namen tega prispevka je predstavitev delovanja in učinkovitosti štirih pripravkov iz programa BIO PLANTELLA, ustreznih za ekološko varstvo rastlin, katerih osnovna aktivna substanca so rastlinski izvlečki.

Sredstvo na osnovi naravnega ogrščičnega olja uporabljamo za zimsko tretiranje sadnega drevja in tudi za varstvo rastlin med rastno dobo proti ameriškem kaparju *Comstocapsus perniciosus* (= *Quadraspidiotus perniciosus*), rastlinjakovemu ščitkarju *Trialeurodes vaporarium*, hmeljevi uši *Phorodon humuli* in navadni pršici *Tetranychus urticae*.

Sredstvo na osnovi sojinega lecitina ima preventivno fungicidno delovanje proti pepelastim plesnim iz rodov *Oidium*, *Erysiphe*, *Sphaerotheca* in ravno tako tudi sredstvo na osnovi njivske preslice *Equisetum arvense*. V prispevku smo predstavili tudi biotično preizkušanje naravnega insekticida na podlagi kalijevih soli maščobnih kislin, ki je učinkovit za zatiranje mehkožnih insektov na okrasnih rastlinah in sadnem drevju.

ABSTRACT

The effectiveness of the ecological products Bio Plantella for plants protection

Organic farming is a way of permanence farming based on a balance of the sistem soil-animals-human and circulation of nutritive substances in this system. Protecting plants in organic production of food bases on selection of sorts of the plants, rotation of crops and different mechanical methods of plants care. In organic farming the use of synthetic chemicals is not allowed. An important way of protecting plants in organic farming is an application of resources based on plants extracts. This resources usually have very short or no waiting time.

The article deals with the results of the testing some products of producing program BIO PLANTELLA. All of them can be used in organic gardening. The first product is a natural insecticide mixture of a wide spectrum for immediate use. It is suitable for the extermination of all types of vermin on lignified plants at the time of dormancy and on most plants at the time of vegetation.

This product exterminates *Comstocapsus perniciosus* (= *Quadraspidiotus perniciosus*), *Trialeurodes vaporarium*, *Phorodon humuli* and *Tetranychus urticae*.

The product based on soja lecithin and the product based on *Equisetum arvense* are the natural fungicides for the prevention and extermination of *Oidium* spp., *Erysiphe* spp., *Sphaerotheca* spp.

In this article we present also the biotical testing of the natural insecticide of potassium salt of fatty acids used for extermination of the soft skin insects on fructiferous and ornamental plants.



SILWET L 77 – novi najuspešnejši in ekološki način aplikacije fitofarmaceutskih pripravkov PRIPRAVKOV

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Crompton Europe Ltd., Velika Britanija

Znanilci sprememb so povsod okoli nas. Razvoj novega fitofarmaceutskega pripravka lahko stane 100.000.000 \$ in več in lahko traja več kot 10 let. Hkrati pa se po vsem svetu uvajajo vsi možni novi okoljevarstveni standardi in zahteve. Nov organsko silikatni dodatek SILWET L 77 lahko služi kot eden izmed uspešnih pripomočkov pri prijaznejši ekološki uporabi pesticidov.

SILWET L-77 nam kot dodatek k obstoječim pripravkom omogoča naslednje: nižjo količino uporabljenega pripravka/ ha pri doseganju enakih rezultatov, manjšo količino potrebne vode/ha boljše prekrivanje listne površine in površine plodov tretiranih rastlin, pripravka z dodatkom SILWETA L- 77 padavine ne morejo izprati, 50 % hitrejše in učinkovitejše delovanje kontaktnih pripravkov, nižjo vsebnost ostankov v tretiranih rastlinah in izboljšano delovanje pripravka (biotični učinek).

ABSTRACT

SILWET 77- the most efficient and ecological way of application of pesticides

The signs of change are everywhere. New pesticide introductions can cost up to 100.000.000 \$. And require more than 10 years in development. Simultaneously, and across the globe, ever-toughening environmental compliance standards continued to be implemented.

The new organosilicone surfactants such as SILWET L-77 can serve as an effective link to more environmentally friendly use of pesticide. SILWET L-77 surfactant when mixed with existing pesticide can provide the following: lower the dose rate/ha with same efficacy level, lower the water volume/ha, superior foliar and fruit coverage of treated plant, rainfastening the pesticide 50% quicker uptake of contact pesticide, lower the residue level, and improve product performance (biotical efficacy).

Fitomikologija

Gliva *Corticium rolfsii* Curzi tudi v Sloveniji

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Leta 2002 so v rastlinjakih, postavljenih v vasi Pristava ob Krki (Krško polje) opazili nenavadno propadanje paradižnika. Posamezni listi, brez vidnih bolezenskih znamenj, so se v vročem vremenu sprva samo povešali navzdol, čez čas pa so se začeli sušiti. Na koncu je propadla cela rastlina. Pritlehni del stebela je trohnel in na površju je rasel dobro viden bel pahljačast in zelo robusten micelij. V bližini okuženega dela stebela smo v zemlji opazili drobne rjavo rdeče sklerocije. Iz okuženih rastlin smo v fitopatološkem laboratoriju Inštituta za fitomedicino s pomočjo standardnih fitopatoloških metod izolirali glivo *Corticium rolfsii* Curzi. Gliva ni značilna za naše klimatske razmere. V prispevku je podana njena morfologija, biologija, bolezenska znamenja, ki jih povzroča in nekateri ukrepi za njeno zatiranje.

ABSTRACT

Fungus *Corticium rolfsii* Curzi found in Slovenia

In year 2002 in the greenhouses in the village Pristava ob Krki (Krško polje) an uncommon decay of tomato was observed. Particular leaves without any symptoms of disease were sagging in hot weather. After some time they begun to dry. Finally, the whole plant died. The stalk was rotten at the bottom. On the surface a white, fan-shaped and robust mycelium, occurred, which was easy to find. In the soil nearby the infected stalk tiny reddish-brown sclerotia were found. In the phytopathological laboratory at the Institute of phytomedicine, fungus *Corticium rolfsii* Curzi was isolated from infected plants using standard phytopathological methods. The fungus is not common in our climate. In the article, morphology, biology, symptoms of diseased plants and some control measures are described.



Pleveli kot vir okužbe z belo gnilobo (*Sclerotinia sclerotiorum*)

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Številne vrste plevelov so lahko sekundarni gostitelji bolezenskim povzročiteljem kmetijskih rastlin, med katerimi imajo pomembno vlogo glive (Anikster 1982, Jenkinson and Parry 1994, Roy et al. 1994, 1997). Baržunasti oslez (*Abutilon theophrasti* Medik.), navadna ambrozija (*Ambrosia artemisiifolia* L.) in navadni bodič (*Xanthium strumarium* L.) so zelo trdovratni pleveli, na primer v posevkih soje, sončnic, koruze in sladkorne pese.

V letih 2001 in 2002 smo na nekaj lokacijah v vzhodnem predelu Hrvaške našli baržunasti oslez, navadno ambrozijo in navadni bodič, ki so bili okuženi z belo gnilobo (*Sclerotinia sclerotiorum* (Lib.) de Bary). Simptomi okužbe na rastlinah baržunastega osleza so se razvili tako na bazalnem delu stebel kakor tudi na zgornjih delih rastlin, na plodovih in semenih. Na rastlinah navadne ambrozije in navadnega bodiča so se simptomi okužbe z belo gnilobo razvili le na

steblih. Izolati glive *Sclerotinia sclerotiorum* iz okuženih plevelov so služili kot vir okužbe za teste patogenosti na soji in sončnicah, v laboratorijskih in poljskih poskusih. Na okuženih rastlinah smo dnevno beležili pege, venenje in poleganje. Na sončnicah so bili prvi simptomi na polju in v laboratoriju vidne drugi dan po okužbi z izolati glive iz baržunastega osleza in navadne ambrozije in tretji dan po okužbi z izolatom iz navadnega bodiča. Na soji so se simptomi v laboratoriju pokazali drugi dan, na polju pa četrti dan po okužbi z izolati iz baržunastega osleza in navadne ambrozije. Prve poškodbe na soji po okužbi na polju z izolatom iz navadnega bodiča so bile vidne tretji dan. Skupno število poleglih rastlin je pokazalo, da so bili vsi testirani izolati bolj patogeni za sončnico kakor za sojo. Okuženost baržunastega osleza, navadne ambrozije in navadnega bodiča z belo gnilobo lahko poveča infekcijski potencial glive v tleh.

ABSTRACT

Weeds as an inoculum source of *Sclerotinia sclerotiorum*

Numerous weed species could be alternative hosts for diseases of cultivated plants, among which fungi play an important role (Anikster 1982, Jenkinson and Parry 1994, Roy et al. 1994, 1997). Velvetleaf (*Abutilon theophrasti* Medik.), ragweed (*Ambrosia artemisiifolia* L.) and rough cocklebur (*Xanthium strumarium* L.) are very aggressive weeds in arable crops such as soybean, sunflower, maize and sugar beet.

Velvetleaf, ragweed and rough cocklebur plants infected with *Sclerotinia sclerotiorum* (Lib.) de Bary (Sclerotinia stem rot, white mold) were recorded on several locations in eastern Croatia during 2001 and 2002. Symptoms on velvetleaf plants occurred on basal stem parts as well as on upper plant parts, fruits and seeds. Symptoms of white mold on ragweed and rough cocklebur plants occurred only on stems. Isolates of *S. sclerotiorum* from diseased weed plants were used as inoculum sources for pathogenicity tests on soybean and sunflower. Pathogenicity tests were done in laboratory and field conditions. Inoculated plants were examined daily to record development of lesions, wilting and lodging. On sunflower plants first lesions in field and laboratory were recorded on the second day after inoculation with isolates from velvetleaf and ragweed and on the third day after inoculation with isolate from rough cocklebur. On soybean plants first symptoms in laboratory were recorded on the second day and in the field on the fourth day after inoculation with isolates from velvetleaf and ragweed. First lesions on soybean after field inoculation with isolate from rough cocklebur was recorded on the third day. Total number of lodging plants showed that all examined isolates were more pathogenic on sunflower than on soybean.

Occurrence of white mold in velvetleaf, ragweed and rough cocklebur can increase inoculum density of *S. sclerotiorum* in soil.



Identifikacija dveh patotipov glive *Verticillium albo-atrum* na hmelju z molekulskimi markerji in umetnimi okužbami hmelja

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Hmeljeva uvelost je ena najpomembnejših bolezni hmelja. Povzročata jo glivi *Verticillium albo-atrum* Reinke & Berthold in *Verticillium dahliae* Klebahn, ki spadata med parazite prevodnega sistema hmelja in mnogih drugih rastlin. Omenjeni glivi na hmelju izzoveta blago in letalno obliko obolenja v odvisnosti od patotipa glive, občutljivosti kultivarja in ekoloških razmer. Bistvena razlika med oblikama obolenja je v tem, da pri letalni obliki rastline propadejo, medtem ko se pri blagi obliki rastline v večini primerov opomorejo in naslednje leto normalno odženejo. V letu 1974 je bila v Sloveniji prvič identificirana blaga oblika hmeljeve uvelosti kot posledica okužb z omenjenima glivama, od leta 1997 pa *V. albo-atrum* v zahodnem delu Savinjske doline povzroča letalno obliko hmeljeve uvelosti in posledično večjo gospodarsko škodo. Identifikacija povzročitelja bolezni in njegovih patotipov je izrednega pomena predvsem pri izbiri ustreznih fitosanitarnih ukrepov in v žlahtnjenju rastlin.

V raziskavi smo analizirali izolate glive *V. albo-atrum* in *V. dahliae* izolirane iz različno obolelega hmelja in drugih gostiteljskih rastlin. Z umetnimi okužbami testnih kultivarjev hmelja smo ugotovili razlike v virulenci med proučevanimi izolati. Pri proučevanju genetske variabilnosti izolatov smo uporabili AFLP molekulska tehnika, kjer smo preizkusili 39 kombinacij začetnih oligonukleotidov in pri tem namnožili 1268 DNA fragmentov v velikosti od 50 do 800 baznih parov. Dobljene rezultate smo statistično ovrednotili z izračunom Jaccardovega koeficienta, ki je služil kot osnova za sestavo dendrogramov z metodo UPGMA. Z AFLP molekulska analizo smo ugotovili dve osnovni skupini, ki ju predstavljajo izolati *V. albo-atrum* in *V. dahliae*. V skupini *V. albo-atrum* smo določili razlike med različno virulentnimi hmeljnimi izolati in izolati iz ostalih gostiteljskih rastlin kar jasno kaže na pojav dveh hmeljnih patotipov *V. albo-atrum* v Sloveniji. V nadaljevanju bomo z ugotavljanjem nukleotidnih zaporedij polimorfni fragmentov poskušali razviti diagnostični marker, ki bo omogočal natančno in hitro identifikacijo patotipov *V. albo-atrum* na hmelju.

ABSTRACT

Identification of two *Verticillium albo-atrum* hop pathotypes using molecular markers and artificial inoculations of hop

Hop wilt is one of the most important diseases of hop. It is caused by *Verticillium albo-atrum* Reinke & Berthold and *Verticillium dahliae* Klebahn, which are among the tracheomycotic parasites of hop and other plants. These fungi induce mild and lethal forms of hop wilt, depending on the pathotype, sensitivity of cultivars and ecological factors. The basic difference between the forms is that the lethal one causes withering of hop, whereas plants in most cases continue to grow with the mild form. In Slovenia, the mild form of hop wilt was first identified as a cause of infections by both mentioned fungi in 1974. Since 1997, *V. albo-atrum* in the west part of the Savinja valley has caused the lethal form of hop wilt and consequently higher economic damage. Identification of the disease agent and its pathotypes is important in order to carry out suitable phytosanitary measures and disease resistance breeding. In our research, we analysed isolates of *V. albo-atrum* and *V. dahliae* isolated from infected hop plants and other hosts. By artificial inoculations of test hop cultivars, we determined differences in virulence among isolates. Genetic variability was evaluated by the AFLP molecular technique, in which we used

39 primer combinations and amplified a total of 1268 DNA fragments in a range of 50 to 800 base pairs. The Jaccard coefficient of similarity was used to generate a similarity matrix, from which a dendrogram was constructed via the UPGMA method. The results of AFLP molecular analysis clearly distinguish *V. albo-atrum* and *V. dahliae* isolates into two groups. In the *V. albo-atrum* group, genetic differences were found between hop isolates in correlation with their virulence, indicating two *V. albo-atrum* hop pathotypes in Slovenia. The research will continue with sequencing of polymorphic fragments to develop a diagnostic marker for quick identification of *V. albo-atrum* hop pathotypes.

Fitobakteriologija

Obvladovanje bakterije *Erwinia amylovora* (Burrill) Winslow in sod. in perspektive varovanega območja Evropske unije

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”Direktiva Sveta 2000/29/ES z dne 8. maja 2000 o ukrepih za preprečevanje vnosa in širjenja organizmov, škodljivih za rastline ali rastlinske proizvode, v Skupnost” opredeljuje, da je varovanim območjem potrebno zagotoviti posebno varstvo pod pogoji, združljivimi z notranjim trgov in načeli proste trgovine, ker so izpostavljena posebni nevarnosti okužbe rastlin. Zakonodaja EU (direktiva Sveta 2000/29/ES in direktive Komisije 2001/33/ES, 2002/28/ES, 92/70/EES, 93/51/ES) je s predpisi o zdravstvenem varstvu rastlin privzeta v domačo zakonodajo. Določa škodljive organizme, za katere je mogoče uveljavljati status varovanega območja, postopek priznavanja, premeščanje rastlin ali rastlinskih proizvodov ter seznam priznanih varovanih območij EU. Republika Slovenija (RS) je v času pristopnih pogajanj na podlagi rezultatov dolgoletnega znanstvenega in strokovnega dela še posebej pa uradnega nadzora bakterijskega hruševega ožiga dokazala neokuženost in dosegla neformalno priznanje varovanega območja za bakterijo *Erwinia amylovora* (Burr.) Winsl. in sod. S podpisom pristopne pogodbe EU bo ozemlje RS tudi formalno priznано kot neokuženo območje, in sicer poleg Češke (Južna Moravska), Španije, Korzike, Irske, severnega dela Italije, Sicilije in Sardinije, Litve, Latvije, dela Avstrije (Gradiščansko, Koroška, Spodnja Avstrija, Tirolska, Štajerska, Dunaj), Portugalske, Slovaške, Finske in dela UK (Severna Irska, otok Man in Kanalski otoki). To pomeni, da bo premeščanje rastlin za saditev iz rodov *Chaenomeles* Lindl., *Cotoneaster* Ehrh., *Crataegus* L., *Cydonia* Mill., *Eriobotrya* Lindl., *Malus* Mill., *Mespilus* L., *Pyracantha* Roem., *Pyrus* L., *Sorbus* L. (razen *Sorbus intermedia* (Ehrh.) Pers.) in *Stranvaesia* Lindl. posebej regulirano. Vsi pridelovalci naštetih gostiteljskih rastlin morajo biti uradno registrirani, voditi evidence in skrbeti za neoporečno zdravstveno stanje rastlin tako, da za razmnoževalni material lahko izdajajo rastlinske potne liste z oznako ‘ZP’ (zona protecta). Rastline za saditev, pridelane v varovanem območju, tako nosijo svojevrstno blagovno znamko, ki zagotavlja kupcem večjo varnost glede zdravja rastlin in s tem pridelovalcem boljše cenovno izhodišče. Ker mora za vzdrževanje varovanega območja državna služba za varstvo rastlin zagotoviti redni sistematični nadzor vključno z laboratorijskim testiranjem, je temeljno vprašanje, ali bo RS znala izkoristiti prednosti varovanega območja tako, da bo bilanca finančnega uspeha pozitivna.

ABSTRACT

***Erwinia amylovora* (Burr.) Winsl. et al. Control and European Union Protected Zone Perspectives**

”Council Directive 2000/29/EC of 8 May 2000 on protective measures against the introduction into the Community of organisms harmful to plants or plant products and against their spread within the Community” regulates that "protected zones" exposed to particular plant health risks should be defined and provided with special protection under conditions compatible with the internal market and the principles of free movement. European Union legislation (Council Directive 2000/29/EC and Commission Directives 2001/33/EC, 2002/28/EC, 92/70/EEC,

93/51/EC) is implemented by national legislation on plant health. Harmful organisms, which are subject to protected zones' status, procedures of recognition, movement of plants or plant products and list of recognised protected zones in the Community are prescribed. During the pre-accession negotiations the Republic of Slovenia has proved *Erwinia amylovora* (Burr.) Winkl. *et al.* pest free status on the basis of the past scientific and expert work and in particular on the basis of official surveys. Accession agreement shall enable the territory of the RS to be officially recognised as protected zone together with Czech Republic (South Moravia), Spain, Corsica, Ireland, northern Italy, Sardinia, Sicily, Lithuania, Latvia, Austria (Burgenland, Carinthia, Lower Austria, Tyrol, Styria, Vienna), Portugal, Slovakia, Finland and UK (Northern Ireland, Isle of Man and the Channel Islands). Movement of plants for planting of *Chaenomeles* Lindl., *Cotoneaster* Ehrh., *Crataegus* L., *Cydonia* Mill., *Eriobotrya* Lindl., *Malus* Mill., *Mespilus* L., *Pyracantha* Roem., *Pyrus* L., *Sorbus* L. (except *Sorbus intermedia* (Ehrh.) Pers.) and *Stranvaesia* Lindl. is regulated. Among others this means that all producers of host plants are to be officially registered, keep records and care for plant health, which is the basis for the issuance of 'ZP' plant passports (Zona Protecta). So plants produced in the protected zone are equipped with a special trademark, which ensures safe and healthy plants for customers and better prices for producers. Since the official plant protection service has to ensure regular systematic surveys including laboratory testing for the maintenance of protected zone, the main question is: Will RS be able to profit from *Erwinia amylovora* protected zone so that financial outcome will be positive?



Inšpekcijski ukrepi in nadzor ob ugotovitvi bakterijskega hruševega ožiga (*Erwinia amylovora* (Burr.) Winslow *et al.*) v Naklem

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Leta 2001 je bila v okviru sistematičnega nadzora bakterije *Erwinia amylovora* (Burrill) Winslow *et al.*, ki povzroča bakterijski hrušev ožig, na samem, na obrobju naselja Naklo, najdena starejša hruška s sumljivimi bolezenskimi znamenji. Laboratorijsko testiranje je potrdilo prvo okužbo s tem škodljivim organizmom v Sloveniji. Fitosanitarna inšpekcija je takoj odredila uničenje okuženega drevesa in začela pregledovati vrtove in starejše ekstenzivne kmečke sadovnjake v krogu 1 km okoli tega drevesa. Laboratorijski testi so potrdili okužbi še na dveh vrtovih. Lastniki so okužena drevesa uničili. Inšpektorji so pregledali tudi intenzivne nasade jablan, ki so bili od prvega okuženega drevesa oddaljeni do 4 km. Odvzeti so bili vzorci za laboratorijsko testiranje, tudi za testiranje latentne okužbe. Rezultati so bili negativni. Leta 2002 so se inšpekcijski pregledi gostiteljskih rastlin na tem območju intenzivirali. Kilometrski pas okoli žarišča bolezni je bil pregledan 3-krat, v 4 km območju so bili pregledani intenzivni nasadi jablan in 50 izbranih opazovalnih točk. 29 opazovalnih točk je bilo izbranih in pregledanih še v območju 5 km okoli naselja Dorfarje, kjer so drevesnice sadnih rastlin in 13 v območju 4 km okoli drevesnice sadnih rastlin v Kamniku. Laboratorijsko testiranje vzorcev, odvzetih pri

navedenih pregledih, je potrdilo okužbi dveh kutin, ki sta bili znotraj kilometrskega pasu okoli prve okužene hruške iz leta 2001. Tudi za ti dve drevesi je bilo takoj odrejeno uničenje.

ABSTRACT

Phytosanitary measures at founding fireblight (*Erwinia amylovora* (Burr.) Winslow *et al.*) in Naklo

During the systematic survey of the bacteria *Erwinia amylovora* (Burill) Winslow *et al.* which causes fireblight was in the outskirts of Naklo in the summer of 2001 found on older isolated pear tree with suspicious disease symptoms. Laboratory testing confirmed the first infection with this pest in Slovenia. The phytosanitary inspection immediately ordered a destruction of the infected tree and started inspected gardens and older extensive farmery orchards in a circle of 1 km around the tree. The laboratory tests confirmed infections in two more gardens. The owners destroyed the infected trees. The intensive apple tree plantations which were up to 4 km away from the infected tree were also examined. Samples for the laboratory testing as well as testing for latent infections were taken. The results were negative. The inspections were intensified in the year 2002. A kilometre around the focal point was inspected three times, in a 4 km area the intensive apple tree plantations were inspected, and 50 observation points were chosen and examined. 29 observation points were chosen and examined in the area of 5 km around Dorfarje, where there are tree nurseries of fruit plants, and 13 in the area of 4 km around the tree nursery of fruit plants in Kamnik. The laboratory testing of samples, taken during all the listed inspections, confirmed an infection of two quince trees within a 1 km circle around the first infected pear tree from the year 2001. Both trees were destroyed.



Uporaba molekularnih metod za določanje bakterije povzročiteljice obročkaste gnilobe krompirja

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Obročkasto gnilobo krompirja povzroča bakterija *Clavibacter michiganensis* (Smith) Davis *et al.* ssp. *sepedonicus* (Spieckermann et Kotthoff) Davis *et al.* Bakterija je v Sloveniji uvrščena na seznam I.A.II. škodljivih organizmov. Diagnostika bakterije v našem laboratoriju poteka v okviru posebnega nadzora, ki ga vrši uradna služba za varstvo rastlin. V Sloveniji bakterije še nismo našli, prvič pa smo bakterijo identificirali v pošiljkah jedilnega krompirja iz uvoza leta 2001. Postopek laboratorijskega testiranja, ki ga predpisuje direktiva EU (98/57/EC), temelji na presevnem serološkem imunofluorescenčnem ali ELISA testu. Če je serološki test krompirjevega ekstrakta pozitiven, je potrebna inokulacija testnih rastlin jajčevcev *Solanum melongena* cv. Black Beauty. Bakterijo iz inokuliranih testnih rastlin izoliramo na gojišča in potrdimo z ustreznimi biokemijskimi testi in molekularnimi metodami. V našem laboratoriju smo za določanje obročkaste gnilobe krompirja uvedli naslednje molekularne metode: PCR, Real Time PCR in metodo FISH (fluorescent *in situ* hybridization), ki omogočajo določanje zastopanosti bakterije v ekstraktih krompirja in potrditev izolirane bakterijske kulture.

ABSTRACT

The use of molecular biology methods for detection of potato ring rot disease

Clavibacter michiganensis (Smith) Davis *et al.* ssp. *sepedonicus* (Spieckermamm et Kotthoff) Davis *et al.* is the causal agent of bacterial ring rot disease of potato. Bacteria is listed on I.A.II. List of harmful organisms in Slovenia. Diagnostic of bacteria in our laboratory is conducted as survey in the frame of official plant protection service. It was not yet found in Slovenia, but we had identified bacterium in imported ware potato for the first time in year 2001. A testing procedure according to EU directive (98/57/EC) is based on screening serological immunofluoresce or ELISA test. If serological test on potato extract is positive, inoculation of test plants *Solanum melongena* cv. Black Beauty is performed. From inoculated test plants bacteria is then isolated on medium and confirmed with different biochemical tests and molecular methods. In our laboratory different molecular methods for detection of ring rot disease in potato extracts and confirmation of bacterial isolates are used: PCR, Real Time PCR and FISH (fluorescent *in situ* hybridization).



Karantenska bakterija *Xanthomonas campestris* pv. *phaseoli* na fižolu

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Bolezni fižola poleg gliv povzročajo tudi bakterije. Bakterija *Xanthomonas campestris* pv. *phaseoli* (predlagano ime *Xanthomonas axonopodis* pv. *phaseoli*), ki povzroča navadno bakterijsko pegavost je na IIA2 karantenski listi. Glavni gostitelj je fižol (*Phaseolus vulgaris*), okužijo pa se lahko tudi druge stročnice. Bolezen je razširjena v Sloveniji in v sosednjih državah. Najugodnejše razmere za razvoj bolezni so deževje, visoka vlaga in višje temperature (28°C). V ugodnih razmerah za razvoj resne epidemije in do polovične izgube pridelka na polju zadostuje že ena okužena rastlina na 10000 zdravih. Bakterija okužuje vse nadzemne dele rastlin. Pege na listih so sprva blede zelene in vlažne, kasneje se povečajo, postanejo uvele in nekrotične. Pogosto so obkrožene s tankim pasom svetlo rumenega tkiva. Z razvojem bolezni se pege združujejo. Okuženo listje je videti osmojeno. Močno okužene rastline so pritlikave in se sušijo. Pege na strokih so mastne, rahlo ugreznjene in rdečerjave.

Najpomembnejši način širjenja te bakterije je sajenje okuženega semena, ki je lahko brez znamenj bolezni tudi v na videz zdravih strokih. V notranjosti ali na površju okuženega semena bakterija preživi vsaj tri leta. Vir okužbe so tudi odmrla deli okuženih rastlin ostalih v zemlji.

Z laboratorijskimi testi dokažemo bakterijo *Xanthomonas campestris* pv. *phaseoli* in bolezen razlikujemo od zelo podobne rjave in mastne pegavosti, ki ju povzročajo nekarantenske bakterije iz rodu *Pseudomonas*. Bakterijo izoliramo na splošnih ali selektivnih gojiščih in značilne kolonije potrjujemo z izbranimi testi. Na voljo so testi patogenosti, serološki, molekularni in drugi testi. Določanje bakterije je težavno pri vzorcih semena z namenom pregledovanja. Bakterij je v okuženem semenu malo in so neenakomerno razporejene. Izolacijo iz semena otežkoča tretiranje semen in druge bakterije. Poglavitni ukrepi preprečevanja bolezni so uporaba zdravega semena, sajenje ob primernem času, kolobar z negostiteljskimi rastlinami in uporaba rezistentnih kultivarjev.

ABSTRACT

Quarantine bacteria *Xanthomonas campestris* pv. *phaseoli* on beans

Apart from fungi bacteria can also cause disease in common beans. *Xanthomonas campestris* pv. *phaseoli* (proposed name *Xanthomonas axonopodis* pv. *phaseoli*) causing common bacterial blight is listed on quarantine list IIA2. The principal host is *Phaseolus vulgaris*, but other legume species can be naturally infected. The disease is widespread in Slovenia and neighbouring countries.

Optimal conditions for disease development are rainfall, high humidity and higher temperatures (28°C). One diseased plant in 10000 healthy plants is enough to cause serious epidemic. Up to 50 percent losses in yield have been recorded. Bacteria infects all above ground parts. Small, water-soaked areas appear on leaves, enlarge, become flaccid and then necrotic. They are often bordered by a small zone of lemon yellow tissue. As lesions coalesce, the plants appear to be burned. Severely infected plants are stunted and wilt. Spots on pods are slightly sunken and red-brown.

Bacteria spread by planting infected seeds. Infected seeds may not show any symptoms and can be developed in non-infected pods. Bacteria can survive in or on the surface of seeds for up to three years. Bacteria can also survive in infested plant debris.

Laboratory test are used to determine *Xanthomonas campestris* pv. *phaseoli* and distinguish it from similar diseases caused by non-quarantine *Pseudomonas* bacteria (halo blight, bacterial brown spot). Bacteria are isolated using general or selective media. Identity of morphologically typical colonies can be confirmed using pathogenicity tests, serological test, molecular methods or others. Testing is difficult in screening tests of bean seeds without symptoms. In seeds bacteria are present in low numbers and unevenly distributed. Isolation of bacteria is further hindered by seed treatment and presence of inhibitory bacteria. Phytosanitary measures include use of healthy seed, accurate timing of planting, rotation with non-host plants and planting of resistant cultivars.

Varstvo vinske trte

Primerjava populacij trtne uši (*Dactulosphaira vitifoliae* Fitch) iz 10 vinorodnih območij Madžarske

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Razvoj odpornih podlag, vzgojenih iz severno ameriških trt (npr. *V. berlandieri* Planch., *V. riparia* Michx., *V. rupestris* Scheele) je omogočil ponovni razvoj evropskega vinogradništva po uničenju, ki ga je povzročila trtna uš (*Dactulosphaira vitifoliae* Fitch, Homoptera: Phylloxeridae). Te podlage pogosto zavirajo razmnoževanje trtne uši na koreninah, zato škoda ni očitna. Lahko pa se veliko število uši naseli na listih. V Evropi so s trtno ušjo naseljeni trije habitati: komercialni vinogradi na podlagah (koreninska oblika uši), matičnjaki za podlage (listna in koreninska oblika uši) in opuščeni vinogradi, v katerih odganjki podlag prerastejo cepiče *V. vinifera* (listna oblika uši).

Raziskave kažejo, da med populacijami trtne uši v Kaliforniji, Avstraliji, Evropi in tudi znotraj Madžarske obstaja genetska variabilnost. V prispevku je opisana evolucija, razvoj in razmnoževanje trtne uši iz 10 vinogradnih območij Madžarske na koreninah *V. vinifera*, cv. Chardonnay in na koreninah podlag Berlandieri x Riparia Teleki 5C, Berlandieri x Rupestris Georgikon 121 v poskusih *in vitro*.

Poskus smo izvedli po metodi Granett (1996) in Kocsis (1998) tako, da smo trtno uš naselili na korenine. Trtna uš se je na koreninah uspešno hranila in razvijala. Jajčeca za naselitev korenin smo zbirali v 6 dnevni presledkih. Razvoj žuželk smo spremljali od izleganja iz jajčec do odraslih osebkov. Ko so se pojavili odrasli osebki, smo jajčeca zbirali v tedenskih presledkih. Povprečja smo primerjali z metodo ANOVA.

Število jajčec trtne uši je od 18. dne dalje zelo hitro naraščalo. Rase, ki so izvirale iz Tokaja in Keszthelyja (380 in 801 jajčece 32. dan) so se hitreje razmnoževale in so bile bolj agresivne kot druge (povprečno število jajčec 89,87). Iz rezultatov lahko povzamemo, da je podlaga Georgikon 121 na trtno uš enako tolerantna kot Berlandieri x Riparia Teleki 5 C. Za kontrolo smo uporabili *V. vinifera* cv. Chardonnay, na kateri se je trtna uš razvijala in razmnoževala intenzivno. Iz tega sledi, da naše vinograde lahko zavarujemo pred trtno ušjo, če bomo neprestano pozorni na preživetje, razvoj in razmnoževanje tega škodljivca in z razvojem programov žlahtnenja podlag, tolerantnih na trtno uš, z vključevanjem novih vrst iz rodu *Vitis*.

ABSTRACT

Comparative evaluation of phylloxera isolations, which originated from 10 Hungarian vinedistricts

The development of resistant rootstocks bred from North American species (e.g. *V. berlandieri* Planch., *V. riparia* Michx., *V. rupestris* Scheele) enabled the redevelopment of European viticulture after the destruction of our vineyard by grape phylloxera (*Dactulosphaira vitifoliae* Fitch, Homoptera :Phylloxeridae). These rootstocks often allow limited growth and reproduction of root-feeding phylloxera without observable vine damage, but may host large numbers of leaf-feeding forms. Three habitats are now commonly inhabited by European phylloxera: commercial vineyards on rootstocks (root-feeding), rootstock mother block (leaf- and root-feeding), and abandoned vineyards, in which rootstocks overtake the *V. vinifera* scions (leaf-feeding).

Studies show genetic variations among the phylloxera population exist in California, in Australia, in Europe, also within Hungary. In our study the evolution, development, reproduction of phylloxera from ten Hungarian vinedistricts are presented on the root of *Vitis vinifera* cv.

Chardonnay and on the root of rootstocks of Berlandieri x Riparia Teleki 5C, Berlandieri x Rupestris Georgikon 121 *in vitro* observations.

Our experiment was established according to the method of Granett (1996) and Kocsis (1998) using root bioassay. Grape phylloxera feed and develop well on excised roots. The eggs were collected in 6 days interval for infestation. The development of the insects was followed from egg hatching stage to adult stage. When phylloxera reached the adult stage than eggs were collected in weekly period. Means are compared by ANOVA.

The number of phylloxera eggs was increased rapidly from 18. day. The strains originated from Tokaj and Keszthely (380 and 801 eggs on 32. day) had higher reproduction and were more aggressive than the others (average production 189,87 eggs).

We can conclude from the results, that Georgikon 121 rootstock as highly phylloxera resistant as Berlandieri x Riparia Teleki 5C. We have used *V. vinifera* cvs. Chardonnay for susceptible control, on what the development and reproduction of phylloxera was intense.

The conclusion is: we can protect our vine from grape phylloxera damage, if attention has paid continuously on survivorship, development, and reproduction of the insect and new *Vitis* sources are involved in breeding phylloxera resistant rootstocks.



Kap vinske trte – fitopatološki problem, ki ostaja

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Kap vinske trte (Esca disease) v Sloveniji zasledujemo že več kot desetletje. V zadnjih letih postaja to glivično obolenje problematično ne le na Primorskem, temveč tudi v Posavju in Podravju. V štiriletnem poskusu (vinorodni okoliš Goriška Brda) in v petletnem poskusu (vinorodni okoliš Vipavska dolina) na sorti Sauvignon, v vinorodni deželi Primorska, smo preučevali možnosti zmanjševanja pojava kapi vinske trte oziroma posledic, ki jih povzroča. V omenjenih vinogradih smo opravili poskuse z različnimi variantami rezi v jesensko-zimskem in spomladanskem času ter preučevali kakšen je učinek premazovanja nastalih ran s fungicidnimi pastami in škropljenjem vinogradov z bakrovimi pripravki po rezi. Ugotavljali smo, ali omenjeni ukrepi vplivajo na pojav kapi vinske trte. V poskusih smo ugotovili, da so bili rezultati v posameznih letih različni in da pozitivnega permanentnega učinka pri omenjenih ukrepih ni bilo.

ABSTRACT

Esca disease – still remaining phytopathological problem in Slovenia

The Esca disease has been observed for over than a decade in Slovenia vinegrowing regions. In the last years, this fungal disease has become a serious problem, not only in Primorska vinegrowing region, but also in Posavje and Podravje vinegrowing regions. In the vinegrowing areas Goriška Brda and Vipavska dolina in Primorska viticulture region, 4 and 5 years respectively, the possibilities for reducing the occurrence of Esca disease and its harmful consequences in vine on cultivar 'Sauvignon' have been studied. Different types of plant pruning in autumn-winter and spring season were performed. Furthermore, the influence of coating the wounds by using fungicidal pastes and spraying the vine with cooper fungicides after the pruning was investigated. A solution how to reduce the occurrence of Esca disease has been searched for. The results varied from year to year and there was no positive effect of investigated methods, that would last permanently.



Programi varstva vinske trte s sredstvi podjetja Bayer CropScience

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Vinogradniki so v zadnjih letih pred pomembno odločitvijo kako izbrati učinkovite in cenovno sprejemljive pripravke za varstvo vinske trte. Zaostrene ekonomske razmere pridelave in neugodne vremenske razmere pri nas močno otežujejo pridelavo kakovostnega grozdja. Novoustanovljena družba Bayer CropScience d.o.o. in njegov dolgoletni partner Pinus TKI d.d. iz Rač ponujata široko paleto pripravkov, ki so ustrezni tako za integrirano kot za konvencionalno pridelavo grozdja. V referatu bodo predstavljene novosti v prodajni paleti za zatiranje peronospore vinske trte (Verita in Melody Duo), kot tudi uveljavljeni pripravki (Antracol, Antracol Combi, Mikal, Éclair, Teldor, Falcon...). Pravilen čas uporabe ustreznega pripravka je predpogoj za zanesljiv uspeh. V obeh podjetjih sledimo najnovejšim smernicam in lahko ponudimo rešitve proti vsem boleznim vinske trte, kar potrjujejo tako poskusi kot tudi široka praksa.

ABSTRACT

Spraying programs in vine with Bayer CropScience plant protection products

Last years vine growers have been challenged with the important decision how to choose biologically effective and price acceptable plant protection products for protection of vineyards. Difficult economical conditions make production of quality grape very tough.

New established company Bayer CropScience d.o.o. offers together with her old partner Pinus TKI d.d. a very wide range of plant protection products which are suitable for IPM and conventional production of grapes. There will be mentioned new products for controlling downy mildew on vine (Verita, Melody Duo) and traditional plant protection products (Antracol, Antracol combi, Mikal Flash)

The right time of use of each product is guarantee for success. In both companies we are following the latest trends in vineyards protection and we are able to give solutions to control all major diseases on vine. This has been confirmed in trials and in the commercial vineyards



Učinkovitost različnih botriticidov pri sorti Rebula (*Vitis vinifera* L.) v vinorodnem okolišu Goriška Brda v letu 2002

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Sorta Rebula ima največji delež (25,5 %) med sortami v vinorodnem okolišu Goriška Brda. Spada med sorte, ki so občutljive na sivo grozdno plesen (*Botryotinia fuckeliana* (de Bary)

Whetzel). Njena občutljivost je odvisna od okoljskih razmer in agro- ter ampelotehničnih opravil. V prispevku so predstavljeni rezultati prvega leta poskusa v okviru petletnega projekta v katerem preizkušamo učinkovitost botriticidov iprodion (Kidan), pirimetanil (Mythos), fludioksinil + ciprodinil (Switch) in fenheksamid (Teldor). Cilj projekta je tudi določitev vpliva prvih treh omenjenih botriticidov na sestavo kvasovk grozdne jagode in dinamiko vinske fermentacije. Poskus je postavljen v bločni zasnovi v vinogradu sorte Rebula z gojitveno obliko enojni Guyot. Bloki predstavljajo potomke štirih elit, kar zagotavlja določeno genetsko izenačenost med trsi. V letu 2002 smo izvedli dve škropljenji: prvo ob zapiranju grozdov in drugo v začetku zorenja jagod. Stopnjo okužbe smo izračunali po Thownsend-Heubergerjevi enačbi in rezultate statistično obdelali. Statistično značilnih razlik v okužbi med obravnavanji ni bilo, obstajale pa so neznačilne razlike med povprečji. Rezultati nakazujejo medsebojno povezanost genetskega materiala in uporabo sredstva, saj je bil vrstni red obsega okužbe od najmanjšega proti največjemu pri potomkah posameznih elit različen. Rezultati ponovitev znotraj obravnavanj so zelo variabilni, kar kaže, da je okužba s sivo grozdno plesnijo pri vinski trti močno odvisna od fiziološkega stanja rastline.

ABSTRACT

Efficiency of different botryticides at cultivar Rebula (*Vitis vinifera* L.) in Goriška Brda vine growing district in 2002

Rebula (*Vitis vinifera* L.) is the most spread cultivar (25.5 % vineyards) in Goriška Brda vine growing district. It belongs to the gray mould (*Botryotinia fuckeliana* (de Bary) Whetzel) susceptible cultivars. Its susceptibility depends on eco-geographical conditions and agro- and ampelotechnical traits. In the present paper the first year results of the five-year project are presented. In the project the efficiency of four commonly used botryticides such as iprodione (Kidan), pyrimethanil (Mythos), cyprodinil + fludioxonil (Switch) and fenhexamid (Teldor) is tested beside the influence of their residues on the grape berries yeast flora composition and on the wine fermentations. Experiment is designed as a block trial in the vineyard of Rebula with single Guyot training system. Blocks represent the progeny of four elite vines to assure defined genetic uniformity. In 2002 botryticides were applied at the two phenological stages: at the closure of the grapes and at the beginning of the ripening. The level of the susceptibility was calculated according to the Thownsend-Heuberger formula and the results were statistically processed. There was no significant difference in the susceptibility between the treatments although the differences between the average values were observed. The results indicated the interaction between genetic material and botryticide treatment due to the different ranks of botryticide efficiency within the progeny of the different elite vines. The results within the treatments are mainly very variable showing that the vine gray mould susceptibility is rather in correlation with the vine physiology.



Pojav migratornih vrst sovč v jugovzhodni Sloveniji in njihov škodljivi vpliv v trajnih nasadih

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V trajnih nasadih jugovzhodne Slovenije v zadnjih nekaj letih ugotavljamo množičen pojav gosenic sovč na vinski trti in sadnem drevju ob brstenju. V nekaterih nasadih je bila objedena večina novo odgnanih brstov. Škode so se začele leta 1999 in so se iz leta v leto stopnjevale. Zaradi nočne aktivnosti gosenic pridelovalci dolgo niso ugotovili vzroka nastale škode. K odkrivanju povzročitelja smo načrtno pristopili v letu 2002, ko smo s pomočjo pridelovalcev zbrali večje število gosenic in jih v laboratoriju vzredili do metuljev. Gosenice smo določili le do rodu, iz bub pa sta izleteli dve sorodni vrsti rodu *Noctua* – *N. fimbriata* Schreber in *N. comes* Hbn. Obe vrsti sta simpatrični in po izvoru pripadata mediteranski favni. Razširjeni sta v Evropi in mali Aziji, kjer naseljujeta vroče in tople lege z zelmi in grmišči. V Sloveniji sta razširjeni na prisojnih in vročih legah, od koder poleti migrirata v visokogorje in na sever, jeseni pa nazaj. Vrsti doslej nista znani kot škodljivki gojenih rastlin, zato je bil tako množičen pojav presenetljiv. Vzrok množičnega pojava vidimo predvsem v višanju povprečnih letnih temperatur, zlasti v poletnem in jesenskem času. S tem se za migratorne vrste ustvarjajo razmere, ki so sicer značilne za južnejše kraje, na območju Balkana. Samice so k odlaganju jajčec privabile tople lege s podrastjo, ki jih v tem območju nudijo sadovnjaki in vinogradi. Gosenice obeh vrst se hranijo na zeleh, grmovju in travah. V tem primeru so se večinoma hranile z brsti vinske trte in jablan. Pri načrtnem zbiranju gosenic smo ugotovili, da so aktivne od 22.00 ure do zore, ko se umaknejo iz rastlin v vrhnji sloj tal, kjer počivajo čez dan. Zaradi objedanja mladih brstov so škode na več območjih presegle ekonomski prag, tako da mnoge trte niso imele odgnanih rodnihih ampak le adventivne brste. V več vinogradih je bilo poškodovanih 60 % rodnihih brstov. Kljub tretiranju z insekticidi se je škoda nadaljevala do zabubljenja gosenic v začetku maja. Metulji so aktivni od junija do pozne jeseni, z diapavzo v poletju. Jeseni odložena jajčeca prezimijo in so izvor gosenic spomladi. Aktivnost metuljev je zazdaj mogoče spremljati le s svetlobnimi pastmi. K iskanju vzrokov pojava gosenic, nastale škode in načrtnemu reševanju problema želimo pristopiti v letošnjem letu.

ABSTRACT

Outbreak of Migratory Noctuid Species in Vineyards and Orchards in SE Slovenia

In permanent plantations of south-east Slovenia in the last few years there was a mass appearance of noctuid caterpillar on grapevine and fruit trees in the time of budding. In some of the plantations, most of the new buds have been eaten away. This kind of damages has begun in the year 1999 and it has intensified from year to year. Because of the night activity of these caterpillars, the growers couldn't find any of the pests. To discover the damage causer we approached systematically in the year 2002, when with the help of the growers we collected bigger number of caterpillars, which we reared in our laboratory to the moth. We determined the caterpillars only by genus. From pupae emerged two related *Noctua* – species: *N. fimbriata* Schreber and *N. comes* Hbn. Both species are sympatric, and by origin they belong to Mediterranean fauna. They are spread in Europe and in Asia Minor, where they inhabit hot and warm habitats with herbs and shrubs. In Slovenia they inhabit warm, to sun-exposed habitat, from where they migrate in summer to the mountains and in the fall they return. These two species aren't known as pests of cultivated plants, that is why so great appearance was a

surprise. We see the cause of so great appearance in growth of average year temperatures, especially in the time of summer and fall. And because of this here are establishing such conditions, which are typical for southern parts, in Balkan region. Females have been attracted to laying eggs here on warm slopes, which they can find in vineyards and orchards. The caterpillars of both species are feeding on herbs, bushes and on grass. In this case they were mostly feeding with buds of grapevines and apple-trees. With planned collecting of caterpillars we established that they are active from 10 o'clock in the evening until dawn, when they return from the plants into the upper layer of soil, where they rest through the day. Because of the fretting of buds, the damage on many areas has exceeded the economic threshold and many of the grapevines didn't have terminal, but only dormant buds. In a lot of vineyards, more than 60% of terminal buds were damaged. Despite insecticide treatments the damage continued until the pupation of caterpillars in the beginning of May. These moths are active from June until late fall, with diapause in the summer. The eggs, which were laid in fall hibernate and are the source of caterpillars in the spring. The activity of the moths is for now possible to track only with the light traps. In this year we want to approach to find out what causes the appearance of caterpillars and the damage on vine and fruit trees.



PYRINEX CS - Mikroinkapsulirani organski fosforni insekticid, idealen za integrirano varstvo sadnega drevja in vinske trte

Andrej KOS

Karsia d.o.o., Dutovlje

Uporaba organskih fosfornih insekticidov se je z uveljavitvijo integriranih načel pridelave močno skrčila, saj veliko pripravkov zaradi svoje strupenosti in negativnega vpliva na koristno entomofavno ni moglo zadostiti zahtevkom ki veljajo pri integrirani pridelavi oz. varstvu rastlin. Tako je ostala le peščica organskih fosfornih insekticidov, ki jih lahko poleg pripravkov iz skupine M.A.C. in IRI, uporabimo v t.i. IPP, kar pa je premalo za dobro in učinkovito varstvo pred škodljivci.

Pri nas se v sadjarstvu ta problem najmočneje občuti pri zatiranju jabolčnega zavijača (*Cydia pomonella*) in breskovega zavijača (*Cydia molesta*), v vinogradništvu pa ni večjih problemov, razen na določenih vinogradnih območjih, kjer so se zaradi večletne uporabe M.A.C. in IRI pripravkov, vrnili kapar, škržati in z njimi seveda tudi virusna obolenja.

Pyrinex 25 CS je organski fosforni insekticid, na osnovi dobro znane učinkovine klorpirifos-etila, vendar je za razliko od drugih, na našem tržišču registriranih pripravkov, formuliran v obliki mikrokapsulirane suspenzije, kar omogoča nadzorovano in postopno sproščanje učinkovine.

Prednosti tega pripravka so: občutno nižja strupenost (akutna oralna LD₅₀ je 40 x višja od formulacije klorpirifos etila EC!) dolgo delovanje - do 3 tednov, manjši vpliv na neciljne osebe- visoka selektivnost, širok spekter delovanja, varnost pri transportu in skladiščenju, majhna nevarnost za uporabnika in okolje, nima vonja, primeren za IPP in programe za preprečevanje pojava odpornosti.

Pripravek je pri nas uspešno prešel uradne biotične poskuse za zatiranje škodljivcev na sadnem drevju in vinski trti ter je v postopku registracije.

V delu so prikazane značilnosti mikrokapsulirane formulacije, s tem v zvezi lastnosti in uporabnost Pyrinex 25 CS ter rezultati poskusov v Sloveniji in tujini.

ABSTRACT

PYRINEX[®] 25 CS - microencapsulated organophosphorous insecticide, a perfect compound in integrated control of fruit trees and grapevine

The use of organo-phosphoric insecticides was strongly reduced by introduction of integrated pest management principles as many of products because of their toxicity and negative influence to useful entomological fauna had not been able to satisfy the requests valid for integrated pest management/production.

So remained only a few of organo-phosphoric insecticides which can be used, besides the products from group M.A.C. and IRI, in IPP but which is not enough for good and efficient pest control.

In our country, in fruit-growing, this problem is the strongest one at codling moth (*Cydia pomonella*) and Oriental fruit moth (*Cydia molesta*) control; in vine-growing there are no bigger problems except on some of vineyard areas where because of several years standing use of M.A.C. and IRI products, Coccina and Cicadina pests came back and with them also virus infections.

PYRINEX 25 CS is organo-phosphoric insecticide on the basis of well-known active ingredient chlorpyrifos-ethyl but it differs from other products which have been registered on our market by being formulated in the form of microencapsulated suspension what enables the controlled progressive release of the active ingredient.

Advantages of this product: very lower toxicity (Acute oral LD50 = 40 x higher than chlorpyrifos-ethyl of EC formulation!), long lasting activity – up to 3 weeks, smaller influence to non-target microorganisms, high selectivity, broad spectrum of activity, less hazardous in transport and warehouse, less danger for the users and reduced environmental contamination, without smell, convenient for IPM programmes and programmes for resistance appearance control.

The product has finished successfully the official biotical trials for the control of pests in fruit-trees and vine plant; it is in the procedure of registration.

In the lecture, the characteristics of microencapsulated formulations, properties and use of PYRINEX 25 CS and results of trials in Slovenia and abroad are shown.



NORDOX 75 WG - nova formulacija

Boris PUŠKAR

Herbos d.d., Sisak, Hrvatska

NORDOX 75 WG je bakreni fungicid (bakrov oksid) za zatiranje rastlinskih bolezní v vinogradništvu, sadjarstvu in vrtnarstvu. Je v obliki močljivih zrn (WG), temno rdeče barve. Z ozirom na ostala bakrena sredstva (bakrov hidroksid in bakreni oksiklorid) se Nordox 75 WG zelo hitro razprši v raztopini ter zadrži 70% delcev manjših od dveh mikronov.

Z isto vsebnostjo bakra (75 %) ta lastnost omogoča novemu proizvodu manjšo porabo za 40-60 % v primerjavi z drugimi bakrenimi pripravki. Nordox 75 WG se uporablja za zatiranje več vrst rastlinskih bolezní, predvsem pa se uporablja za zatiranje peronospore vinske trte (*Plasmopara viticola*) v fenofazi F-K, črne pegavosti na vinski trti (*Phomopsis viticola*) v fenofazi D - E in jablanovga škrlupa (*Venturia inaequalis*) v fenofazi B - C - C3.

V rezultatih raziskave je prikazano delovanje Nordox 75 WG na različne bolezní, na osnovi tega pa lahko trdimo, da je Nordox 75WG najučinkovitejši bakreni fungicid.

Angleški povzetek ni bil predložen.

Varstvo poljščin in vrtnin

Fusarium spp. na sjemenskim i merkantilnim usjevima pšenice u Hrvatskoj u 2002. godini

Bogdan KORIC

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U 2002. godini klimatski uvjeti pogodovali su razvoju fuzarijske paleži klasa, bolesti čiji je uzročnik jedna od gljiva iz roda *Fusarium*. Posebno je jak napad ove bolesti bio u istočnim dijelovima Hrvatske, a to su dijelovi u kojima je većina proizvodnje sjemenskih i merkantilnih usjeva pšenice. Stoga i ne začuđuje da je 13,14 % površine zasijane sjemenskom pšenicom odbijena, jer je imala više od 15 % zaraženih klasova. Uspoređujući broj zaraženih parcela u odnosu na predkulturu vidi se da je najgora situacija bila na površinama koje su bile zasijane po kukuruzu. Dakako da sama činjenica što je predkultura bio kukuruz ne znači i jak napad ove bolesti, jer to ovisi o mnogo više faktora, a posebno o vremenu kada je izvršena preventivna zaštita nekim od fungicida. Nažalost takva zaštita je u mnogo slučajeva došla prekasno ili je izostala posebno na seljačkim gospodarstvima koji su proizvodili merkantilnu pšenicu. Stoga su ti proizvađači imali problema kod predaje svoje pšenice u silose i mlinove radi niske hektolitarske težine. Kako je ta neprimljena pšenica završila o tome nema podataka ali treba napomenuti da gljive uzročnici ove bolesti su ujedno i stvaraoci otrovnih produkata pod nazivom mikotoksini. Kako su prema ispitivanjima prevladavali *Fusarium graminearum* i *Microdochium (Fusarium) nivale* može se očekivati da bi pšenica mogla biti zagađena mikotoksinima koje produciraju ove gljive, a to su deoxynivalenol (DON) i nivalenol (NIV) te nije uputno koristiti je za ishranu stoke.

Angleški povzetek ni bil predložen.



Vpliv fungicidov na maso nadzemnih delov in koreninskega sistema pšenice

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V laboratorijskih razmerah smo preučevali vpliv 15 fungicidov za tretiranje semena na svežo in suho maso nadzemnega dela in korenin pšenice, sorta Novosadska rana 5.

Z uporabo pripravka Vitavax 200 FF, Raxil – S 040 FS, Zorosan tečni, Mankogal S, Real 300 i Temetid super je bila obstoječa sveža masa nadzemnega dela na ravni kontrole, s tem da so ostali uporabljeni pripravki povzročili značilno zmanjšanje pri intervalu verjetnosti 95 in 99 % (vzorec n = 8).

Z uporabo pripravkov Vitavax 200FF in Temtid super je bila sveža masa nadzemnega dela na ravni kontrole pri obeh stopnjah verjetnosti, s tem da so Dividend star 036 FS, Raxil – S 040 FS, Vincit F i Real 300 na ravni kontrole samo pri stopnji verjetnosti 99% (vzorec n = 8). Ostali uporabljeni pripravki so povzročili značilno zmanjšanje suhe mase nadzemnega dela na obeh stopnjah verjetnosti.

Vsi uporabljeni pripravki, razen Vitavax extra in Baytan universal 19,5 WS, so povzročili značilno povečanje sveže mase korenin glede na na kontrolo pri obeh stopnjah verjetnosti pri

tem, da sta navedena dva pripravka povzročila razvoj mase korenin na stopnji kontrole (vzorec n = 8).

Vitavax extra pri oba stopnjah verjetnosti ter Vitavax 200 FF in Raxil T 515 FS so pri stopnji verjetnosti 99 % ustvarili suho maso korenin na stopnji kontrole pri tem, da so ostali uporabljeni pripravki povzročili značilno povečanje suhe mase korenin (vzorec n = 8).

ABSTRACT

Effect of fungicides on mass of the above ground part, and root of wheat

The effect of 15 fungicides on fresh, and dry mass of above ground part, and root of wheat (Novosadska rana 5 variety) was tested under laboratory conditions.

The achieved fresh mass of the above ground part remained at the control level, while other applied formulas caused significant decrease for reliability intervals of 95 and 99% (sample n = 8) when Vitavax 200 FF, Raxil – S 040 FS, liquid Zorosan, Mankogal S, Real 300, and Temetid super were applied.

Dry mass of the above ground part remained at the control level with applied Vitavax 200 FF, and Temetid super for both levels of reliability, while Dividend star 036 FS, Raxil – S 040 FS, Vincit f, and Real 300 were equal to the control only for reliability level of 99% (sample n = 8). The other applied formulas caused significant decrease in dry mass of the above ground part for both levels of reliability.

All applied formulas, except Vitavax extra, and Baytan universal 19,5 WS caused significant increase in fresh mass in relation to control for both levels of reliability, while the two above mentioned formulas caused the fresh mass to be at the level equal to the control (sample no 8). The achieved root dry mass remained at the control level when Vitavax extra at both levels of reliability, and Vitavax 200 FF and Raxil T 515 FS at the reliability level of 99% were applied. The remaining formulas caused significant increase in root dry mass (sample n = 8).



Preučevanje koruzne vešče (*Ostrinia nubilalis* Hbn.) na različnih hibridih koruze na Goriškem

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Koruzna vešča (*Ostrinia nubilalis* Hbn.) je na Goriškem že dolgo znana škodljivka koruze, zato smo v letih 1996, 1997 in 1998 podrobneje spremljali njen pojav. Bionomijo smo spremljali s svetlobno vabo, ki je bila postavljena v posevek koruze. Lov metuljev se je izvajal od začetka maja pa do konca septembra. Štetje in determinacijo ulova smo izvajali dnevno. V letih 1996 in 1997 smo spremljali tudi napad koruzne vešče na različnih hibridih različnih zrelostnih razredov. Izbrani so bili po trije hibridi iz zrelostnih razredov FAO 400, 500, 600 in 700. Od vsakega hibrida smo naključno izbrali in pregledali 60 rastlin v zrelostni fazi pred spravilom. Ocenjevali smo poškodbe na rastlinah in storžih ter število gosenic v steblih. Rezultati so pokazali, da ima koruzna vešča na tej lokaciji dve generacije letno in da je množičnost pojava močno odvisna od vremenskih razmer. Prav tako se število poškodb oziroma odstotek napada razlikuje po posameznih hibridih ter posameznih zrelostnih razredih in je odvisen od množičnosti pojavljanja škodljivca.

ABSTRACT

Study on European corn borer (*Ostrinia nubilalis* Hbn.) on different corn hybrids in Goriška region

The European corn borer (*Ostrinia nubilalis* Hbn.) has been known as a pest of corn in Goriška region for a long time. In the years 1996 - 1998 more intensive studies of the pest were performed. Bionomics was monitored by light traps, placed in the corn field. Moths were caught from beginning of May till the end of September. Moths, catch in the traps were counted and determined daily. In the years 1996-1997 infestation of the pest on some hybrids of different FAO groups was monitored, too. In the experiment 3 hybrids of FAO groups 400, 500, 600 and 700 were observed. In the stage before harvest, 60 plants were chosen randomly and examined. Damage on the plants and ears and the number of the caterpillars in the corn stalk were evaluated. Results of the study have shown that European corn borer has 2 generations per year in this region and intensity of infestation highly depends on weather conditions. The number of damages or percentage of infestation differs among particular hybrids and among particular FAO groups and depends on pest population density.



Tolerantnost nekaterih hibridov koruze na ličinke koruznega hrošča (*Diabrotica virgifera virgifera* LeConte)

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Koruzni hrošč (*Diabrotica virgifera virgifera* LeConte) je gospodarsko pomemben škodljivec koruze v ZDA. Za njegovo zatiranje redno uporabljajo insekticide, to pa poveča stroške pridelave, pomeni tveganje za okolje in lahko povzroči neučinkovitost zaradi razvoja rezistence. Kot nov škodljivec koruze v Evropi je bil koruzni hrošč najden 1992 v Srbiji in se je razširil na Hrvaško leta 1995. Raziskave odpornosti koruze proti koruznemu hrošču so se začele pred več kot 60 leti. Pridelovanje koruze, odporne proti koruznemu hrošču, bi bilo dragocena alternativa pridelavi z uporabo insekticidov za varstvo. Namen te raziskave je bil najti hibride koruze, ki so bolj tolerantni na hranjenje ličink koruznega hrošča.

V raziskavi smo ocenili odpornost 10 hrvaških (Institute of Agriculture, Osjek) in 2 Pioneerjeva komercialna hibrida koruze (Johnston, Iowa, USA) na koruznega hrošča na 4 lokacijah. Zasnova poskusa je bila naključna razporeditev blokih s 4 ponovitvami. 2 lokaciji sta bili v vzhodnem delu Hrvaške (Gunja, Osjek) in 2 v ZDA (Iowa, Missouri). V Missouriju so bile poskusne parcele umetno naseljene z jajčeci koruznega hrošča, na ostalih lokacijah so hibride naseljevale avtohtone populacije. Poškodbe korenin smo ocenili po lestvici (0 – 3), ki jo za ta namen uporabljajo na Iowa State University. Tolerantnost hibridov na hranjenje ličink smo primerjali tako, da smo ovrednotili dolžino korenin in ponovno rast korenin.

Statistično značilne razlike v tolerantnosti med hibridi so bile med lokacijami, v poškodovanosti korenin, dolžini korenin in ponovni rasti korenin. Poškodovanost korenin je bila na lokacijah v

ZDA večja kakor na Hrvaškem. Analize po lokacijah so pokazale, da so se hibridi statistično značilno razlikovali glede poškodovanosti korenin, dolžine korenin in poleganja rastlin na Hrvaškem in v ZDA.

S pridelovanjem hibridov, ki so bolj tolerantni na koruznega hrošča, ne moremo zatreti škodljivca, lahko pa bi zmanjšali količino potrebnih insekticidov.

ABSTRACT

Corn hybrids tolerant to corn rootworm (*Diabrotica virgifera virgifera* LeConte) larval feeding

Western corn rootworm (*Diabrotica virgifera virgifera* LeConte (WCR)) is known as an economic pest of corn in the USA. In the USA, insecticides are regularly used to control WCR, but the cost is high, can pose environmental risks, and may become ineffective due to resistance. As a new corn pest in Europe WCR was recorded 1992 in Serbia and pest arrived in Croatia in 1995. Investigations on resistance to western corn rootworm (*Diabrotica virgifera virgifera* LeConte) began over 60 year ago. Growing corn resistant to corn rootworms would be a valuable alternative to insecticides. The aim of this investigation is find out more tolerant corn hybrids to larval feeding.

Ten Croatian (Institute of Agriculture, Osijek) and two Pioneer Hybrid Inc. (Johnston, Iowa, USA) commercial corn hybrids were evaluated for WCR resistance at four locations using a randomized block design with four replications. Two locations were in east Croatia (Gunja, Osijek) and two were in the USA (Iowa, Missouri). At the Missouri location the plots were artificially infested with WCR eggs; the others contained natural rootworm infestations. At all locations, root injury was rated using the Iowa State University Node-Injury Scale (0-3) and the hybrids' tolerance to larval feeding was compared by evaluating root size and root regrowth.

In an analysis of variance combined across locations, root injury, size and regrowth were significantly different among hybrids and there was a significant location by environment interaction for each response variable. Root injury ratings in the USA were higher than in Croatia. Analysis by location showed the hybrids differed significantly in root injury, root size, and lodging at Croatia and USA side.

Growing hybrids more tolerant to WCR does not eliminate corn rootworm, but it could reduce the amount of insecticides that needed to be applied.



Zatiranje plevelov v koruzi

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V Sloveniji imamo kljub nekaterim prepovedanim aktivnim substancam na določenih območjih še zmeraj širok izbor talnih in kontaktnih herbicidov za zatiranje plevelov v koruzi. Talni herbicidi so zelo občutljivi na pomanjkanje vlage v tleh, izjema je le pripravek Merlin, ki zelo dolgo ohrani svojo učinkovitost.

MERLIN je sistemski talni herbicid za zatiranje vseh enoletnih širokolistnih in nekaterih ozkolistnih plevelov po setvi pred vznikom koruze. Odlično zatira tudi baržunasti oslez (*Abutilon theophrasti*), saj preprečuje njegov vznik še zelo dolgo po škropljenju (do štiri mesece).

Pri zatiranju plevelov po vzniku koruze in plevelov je težava, ker vsi herbicidi iz skupine sulfonilsečnin močno zavirajo rast koruze. To težavo odpravimo z uporabo pripravka EQUIP. EQUIP je vrhunski sistemični herbicid za zatiranje eno- in večletnih ozko- in širokolistnih plevelov. Uporabljamo ga za osnovno varstvo koruze pred pleveli po vzniku le teh ali pa kot korekcijo, kar ostane za talnimi herbicidi (pirnica, divji sirek, ...). EQUIP ima vgrajeno varovalo, ki omogoča, da se aktivna substanca *foramsulfuron* v koruzi zelo hitro razgradi. Tako med vsemi herbicidi iz skupine sulfonilsečnin Equip najmanj zavira rast koruze. EQUIP ima že vgrajeno močilo, kar onemogoča spiranje pripravka že takoj po škropljenju. Z uporabo omenjenih pripravkov dosežete višje in kakovostnejše pridelke koruze.

ABSTRACT

New possibilities to protect maize with Bayer CropScience plant protection products

In Slovenia there are still a lot of soil and contact herbicides to control weeds in maize although there is a ban of some a.i. on water restricted areas. Soil herbicides are very dependent on moisture content in the soil. The exception is only Merlin, which can store its efficacy for a long period. Merlin is systemic soil herbicide to control the majority of annual broadleaf and some grass weeds after sowing but before the maize (start to grow) emerge. Merlin is excellent to control *Abutilon theophrasti* and control prevent the weeds to grow very long after spraying (till 4 month).

Post emergence treatment of maize with sulfonilurea herbicides normally results in retarding the growth of maize. This problem can be overcome with the new sulfonilurea herbicide Equip. Equip is top systemic herbicides to control annual and perennial grass and broadleaf weeds in maize. It can be used as basic post emergence herbicide or as herbicide for correction to control weeds (*Elymus repens*, *Sorghum halepense*) that was not controlled satisfactory after the usage of soil pre emergence herbicides. Equip has in its formulation safener which ensures that foramsulfuron, a.i. in Equip is fast metabolised in maize. This is the reason that Equip is not retarding the growth of the maize as much as other sulfonilurea herbicides. There is a wetting product already added to formulate product and the product is very rainfast even when it rains soon after application.

Soil insecticide and repellent (Gaucho FS 350 and Mesurol FS 500) will be presented too. Higher yield of high quality can be achieved with the usage of above mentioned products.



CALLISTO – herbicid za zatiranje plevelov v koruzi na osnovi mezotriona

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Mezotrion, aktivna učinkovina v pripravku Callisto, je edini herbicid iz skupine zaviralcev encima HPPD, ki omogoča prilagodljivo zatiranje širokega spektra širokolistnih plevelov tako pred kot po vzniku koruze.

Mezotrion so odkrili v raziskavah alelokemikalij, ki jih izloča rastlina *Callistemon citrinus*. Odkrili so, da rastlinska vrsta *Callistemon* izloča alelopatsko spojino leptospermon. Raziskave so vodile do odkritja kalistemonov in mezotriona. Mezotrion ima enak način delovanja kot leptospermon, vendar kaže bistveno večjo učinkovitost. Nevarnost za nastanek odpornosti na mezotrion pri plevelih je zelo majhna, do navzkrižne odpornosti z drugimi skupinami herbicidov

ne more priti. Na občutljivih rastlinah se simptomi najprej kažejo kot beli madeži, nakar rastline odmrejo.

Mezotrion se v rastlinah premešča po ksilemu in floemu. Odpornost koruze na mezotrion temelji na dejstvu, da se mezotrion v rastlini koruze hitro razgradi v neaktivne metabolite. Mikroorganizmi v tleh mezotrion hitro razgradijo predvsem v CO₂, zato je potencial za izpiranje mezotriona v podtalnico zanemarljiv. Mezotrion je malo nevaren za sesalce in ptice, njihova izpostavljenost je nizka, zato je tveganje za neželene učinke zelo majhno. Najpomembnejše prednosti pripravka Callisto so: odlično delovanje na širokolistne plevela in koristno delovanje na travne plevela, odlična selektivnost za koruzo vse do razvojne faze 10 listov, velika prilagodljivost pri izbiri časa škropljenja, tipu tal, vremenskih razmerah in pri mešanju z drugimi herbicidi, ugodne lastnosti pri obnašanju v okolju ter pri vplivu na zdravje ljudi, majhni odmerki, nov mehanizem delovanja, učinkovina na osnovi naravne snovi.

ABSTRACT

CALLISTO – maize weed control herbicide based on mesotrione

Mesotrione, the active ingredient in Callisto is the only HPPD enzyme inhibiting herbicide to provide flexible pre- and post-emergence, broad spectrum, broadleaved weed control. Mesotrione was discovered by studying allelochemicals naturally secreted by bottle brush plant (*Callistemon citrinus*). The allelopathic compound being secreted by the *Callistemon* plants was identified as leptospermone. Synthesis programs led to the discovery of callistemones and mesotrione. Mesotrione has the same mode of action as leptospermone, but much better potency.

Site of action resistance to mesotrione is very low and other herbicide classes does not affect susceptibility to mesotrione. Symptoms in sensitive plants are bleaching followed by necrosis. Mesotrione is translocated throughout weeds in both the xylem and phloem. Maize tolerance to mesotrione is due to rapid breakdown of the herbicide to inactive metabolites in the maize plant. Mesotrione is rapidly degraded in soil by microorganisms primarily to CO₂, consequently the potential ground water contamination is negligible. Mesotrione has low acute toxicity to mammals and birds, and together with the low exposure, the risk of side effects is very low. Main advantages of Callisto are: excellent broadleaf weed control with valuable effect on annual grasses, excellent crop safety even up to 10 leaves of maize, extraordinary flexibility in timing, soil types, weather conditions and mixing, environmental and human safety profile, low use rate, novel mode of action, flexible crop rotations, natural origins.



Sistem za podporo odločanja za varstvo pred krompirjevo plesnijo (*Phytophthora infestans*)

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Prvi uspešen prognostični model v varstvu rastlin je bila “negativna prognoza” za napovedovanje krompirjeve plesni (*Phytophthora infestans*), ki sta jo leta 1966 razvila Schrödter in Ullrich. Od tedaj je bilo veliko navora vloženega v izboljšavo napovedi pojava *P. infestans*. V 90. letih je bil izdelan kompleksen sistem za pomoč pri načrtovanju programa škropljenja s fungicidi proti bolezni *P. infestans* (Decision Support System, DSS). V Nemčiji je vladna služba za varstvo rastlin (Federal Biological Research Centre for Agriculture and Forestry; ZEPP) razvila modele

skupine SIMPHYT. SIMPHYT – DSS je sestavljen iz 3 modelov, pri katerih so vhodni meteorološki parametri temperatura in relativna vlaga.

SIMPHYT 1 napoveduje datum, ko se *P. infestans* prvič pojavi, za 8 časovnih razredov vznika in 2 območji tveganja za različne lege (lokacije). Časovni razredi vznika pokrivajo vsa pomembna območja za pridelavo krompirja v Nemčiji. Lege, kjer je vpliv vlage močnejši (bližina jezer ali rek, namočena tla, zelo občutljive sorte) se obravnavajo v območju tveganja 1, to pomeni, da se bo bolezen verjetno pojavila prej. Območje tveganja 2 obravnava območja z manjšim tveganjem (sušne razmere, srednje občutljive sorte). Napovedi so podane v 8 dnevni presledkih. Namen SIMPHYT 1 je, da napove datum prvega škropljenja in da se izognemo nepotrebnim škropljenjem pred tem datumom.

Modeli so bili v preizkušanju od 1994 – 2002. Delež pravih napovedi prvega pojava bolezni je bil med 87 in 97 %. V letih ko je bil mesec maj izjemno vlažen, je bil delež nižji.

SIMPHYT 2 je DSS, ki spremlja širjenje bolezni *P. infestans* (izračun krivulje širjenja bolezni) in daje priporočila za termine škropljenja in izbiro fungicidov na posamezni lokaciji. Izbira aktivnih snovi in dolžina intervalov med škropljenji se s SIMPHYT 2 spreminja glede na izračunano stopnjo okužbe za posamezno parcelo. Modeli vključujejo nekatere funkcije za kurativno in protektivno delovanje kontaktnih, translaminarnih in sistemskih fungicidov. SIMPHYT 2 zahteva dosledno dokumentiranje vseh agronomskih podatkov o parceli in o vseh škropljenjih.

Poskusi v letih 1994 – 2000 kažejo, da je z uporabo SIMPHYT 2 mogoče »prihraniti« 2 fungicidni škropljenja, ne da bi pri tem zmanjšali učinkovitost varstva v primerjavi z rutinskimi ali konvencionalnimi programi škropljenja.

SIMPHYT 3 je poenostavljen SIMPHYT 2 model, ki deluje na nivoju regije. Izračunava dejanski infekcijski pritisk, z upoštevanjem temperatur in relativne vlažnosti zadnjih 2 tednov. Poleg tega SIMPHYT 3 meri dnevno tveganje za novo okužbo. Iz SIMPHYT 3 modela se izpeljejo bolj splošne strategije za škropljenje. V obdobjih z visokim infekcijskim pritiskom smo uporabili kurativne fungicide v kratkih časovnih presledkih, medtem ko je bilo varstvo proti *P. infestans* v obdobjih z nižjim infekcijskim pritiskom, zadostno pri uporabi kontaktnih fungicidov v daljših časovnih presledkih. Preizkušanje modela SIMPHYT 3 v Nemčiji in Avstriji je dalo dobre rezultate, zato je bil model dobro sprejet.

Rezultati SIMPHYT 1 in 3 so predstavljeni v ISIP (prognostična služba vladne službe za varstvo rastlin Avstrije, Luksemburga in Nemčije, ki deluje na medmrežju: www.isip.de).

ABSTRACT

Decision Support Systems for the Control of Late Blight (*Phytophthora infestans*) of Potato

The first successful forecasting model in crop protection practice of arable crops was the "negative prognosis" of *P. infestans* by Schrödter & Ullrich in 1966. Since that time many efforts have been taken to improve the prediction of late blight epidemics of potato. In the nineties more complex decision support systems (DSS) to assist in the planning of fungicide schedules for the control of *P. infestans* were elaborated in several countries. In Germany the models of the SIMPHYT – family have been developed by the governmental crop protection services (Federal Biological Research Centre for Agriculture and Forestry; ZEPP). The SIMPHYT – DSS consists of three models which are using temperature and relative humidity as meteorological input parameters.

SIMPHYT 1 predicts the date of first appearance of late blight for eight crop emergence - date classes and two risk levels for the production sites. The emergence – date classes cover all relevant potato growing regions in Germany. Sites with a high moisture impact (close to lakes or rivers, waterlogged soils, highly susceptible cultivars) are considered to be of "high risk"(risk level 1), i.e. the disease is likely to occur earlier. Risk level 2 characterises sites with a lower risk

(dry conditions, medium susceptibility). Forecasts are given with a prognostic time span of eight days. The aim of SIMPHYT 1 is to signalise the date of the first fungicide treatment (start of the spraying schedule) and to avoid superfluous sprayings before this date.

The models has been validated from 1994 to 2002. In most of the years the share of correct predictions of first occurrence ranged from 87 % to 97 %. In years with extremely wet May the share was lower.

SIMPHYT 2 is a complex DSS which monitors epidemic progress of late blight (calculation of a disease progress curve) and gives recommendations on timing and choice of fungicides on a plot-specific scale. The choice of active ingredients and the length of spraying intervals is varied by SIMPHYT 2 according to internally calculated infection rates for the plot. The models includes several functions for curative and protective efficacy of contact, translaminar and systemic fungicides over time. SIMPHYT 2 requires a strict documentation of all agronomical data of the potato plot and all fungicide uses.

Trials laid out from 1994 to 2000 showed that according to SIMPHYT 2 – strategy it was possible to save two fungicide treatments without losing control efficacy compared to routine treatments or conventional spraying schedules. SIMPHYT 3 is a simplification of the SIMPHYT 2 model which works on a regional level. It is solely weather – dependant and calculates an actual infection pressure taking into consideration temperature and relative humidity of the last two weeks. In addition SIMPHYT 3 quantifies the daily risk for new infection. From SIMPHYT 3 rather general fungicide strategies can be derived. In periods of high infection pressure curative fungicides should be used in short spraying intervals whereas contact fungicides sprayed in longer intervals control late blight sufficiently in periods with lower infection pressure.

Validation of SIMPHYT 3 in Germany and Austria gave good results thus leading to a high acceptance of the model's strategy.

SIMPHYT 1 and 3 results are presented in ISIP, the internet warning service of the governmental crop protection services of Austria, Luxemburg and Germany.



ELECTIS 76 WG - nov fungicid, na osnovi nove učinkovine zoksamid in mankozeba, za učinkovito zatiranje krompirjeve plesni in peronospore vinske trte

Drago MAJCEN

Karsia d.o.o., Dutovlje

Zatiranje krompirjeve plesni na krompirju in peronospore na vinski trti sta pomembna agrotehnična ukrepa pri pridelavi krompirja in grozdja. Zaradi pojava odpornosti teh dveh gliv na nekatere sistemične pripravke, je vsak nov fungicid za pridelovalce zelo dobrodošel.

Novost na fungicidnem trgu je učinkovina zoksamid, ki spada v kemično skupino metil benzamidov. Že to, da je učinkovina zoksamid iz skupine, v kateri do sedaj poznamo samo herbicide, kaže na zelo specifično delovanje tega fungicida na glive plesnivke.

Zoksamid ima specifično delovanje na glive iz razreda Oomycetes, posebej na krompirjevo plesen (*Phytophthora infestans*) in peronosporo na vinske trte (*Plasmopara viticola*). Odlikuje ga izredno močno preventivno delovanje, povezano z odlično odpornostjo na spiranje in rezidualno delovanje. Ta odlična učinkovitost se pripisuje predvsem močni vezavi učinkovine zoksamid v voščeno prevleko na površini rastlin.

Zoksamid deluje na glivo tako, da preprečuje delitev celičnih jeder, ter se razlikuje od delovanja starejših in novejših fungicidov za zatiranje teh glivičnih bolezni, zato bo nedvomno zanimiv tudi za programe antirezistenčne strategije zatiranja krompirjeve plesni in peronospore vinske trte.

Pri nas v Sloveniji smo v uradnih biotičnih preiskusih testirali kombinacijo zoksamida in mankozeba. Pripravek se imenuje ELECTIS[®] 76 WG.

V delu so prikazane značilnost, način delovanja ter rezultati poskusov v Sloveniji ter tujini.

ABSTRACT

ELECTIS[®] 76 WG - new fungicide on the basis of novel compound zoxamide and mancozeb provides efficient control of potato late blight and downy mildew of grape

The controls of potato late blight (*Phytophthora infestans*) and downy mildew of grape (*Plasmopara viticola*) are the important agricultural measures at the production of potato and grapes. Because of appearance of resistance to these fungi on some systemic products, each new fungicide is very welcome to the producers.

Active ingredient zoxamide belongs to chemical group methyl benzamides and is a novelty on fungicide market. The fact that active ingredient belongs to the chemical group from which we know only herbicides indicates to the very specific action of this fungicide to the mildew. Zoxamide has a specific action to fungi from the class Oomycetes especially to potato blight (*Phytophthora infestans*) and downy mildew on grapes (*Plasmopara viticola*). It exhibits strong preventive activity combined with excellent rainfast and residual properties. These excellent properties result from incorporation of zoxamide into the wax layer of plant tissues. The mode of action of zoxamide involves inhibition of nuclear division. It is different from any of the current and new coming oomycete fungicides. Therefore it will be attracting also for the programmes of anti-resistance strategy of potato blight and downy mildew of grapes.

In Slovenia, in official biotical trials we tested the combination of zoxamide and mancozeb. The product is named ELECTIS[®] 76 WG.

In this lecture, the properties, mode of activity and results of trials in Slovenia and abroad are presented.



SHIRLAN – izjemno učinkovit “multi-site” fungicid za varstvo pred krompirjevo plesnijo

Vasja HAFNER

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Shirlan je izjemno učinkovit “multi-site” fungicid za varstvo pred krompirjevo plesnijo, ki jo povzroča gliva *Phytophthora infestans*. Ker odlično varuje tako listno gmoto kot gomolje, zagotavlja visoke in kakovostne pridelke krompirja. Shirlan vsebuje aktivno snov fluazinam. Uporablja se v majhnih odmerkih, odlikuje pa ga izjemna odpornost proti izpiranju z dežjem.

Fluazinam pripada kemični skupini diarilaminov. Nespecifično ovira energetske procese v mitohondrijih gliv in dihanje. Posledica motenja energetskih procesov je oviranje kalitve spor, tvorbe apresorijev, prodiranja in rasti hif, sporulacije in gibljivosti zoospor. Zaradi velike širine delovanja na razvoj gliv je fluazinam edinstven, saj združuje lastnosti tako sistemskih kot kontaktnih fungicidov v eni učinkovini.

Fluazinam je preventivni in protektivni dotikalni fungicid. Kurativno delovanje je malo izraženo, nima sistemčnega delovanja, odlikujeta pa ga dobro rezidualno delovanje in izredna odpornost na izpiranje z dežjem.

Biotično delovanje fluazinama so raziskali na več vrstah gojenih rastlin. Fluazinam ima širok spekter delovanja in preventivno dobro deluje na naslednje rodove gliv: *Alternaria*, *Botrytis*, *Colletotrichum*, *Phytophthora*, *Pseudoperonospora*, *Plasmopara*, *Sclerotinia*, *Venturia*. Zaradi

specifičnega načina delovanja je nevarnost za nastanek odpornosti gliv na fluazinam izredno majhna.

ABSTRACT

SHIRLAN – multi-site fungicide with particular efficacy against potato late blight

Shirlan is a multi-site fungicide with particular efficacy against potato late blight caused by *Phytophthora infestans*, providing yield and quality benefits through control of foliar and tuber blight. Shirlan contains the active ingredient fluazinam. The product is used at low dose rate and is characterised by a high level of rainfastness.

Fluazinam belongs to the chemical group of the diarylamine. It is a non-specific blocker that disrupts energy production in the fungus mitochondria and inhibits respiration. The results of this energy disruption is an inhibition of: spore germination, appressoria formation, hyphal penetration and growth, sporulation and zoospore mobility. Wide range of impact on fungus makes fluazinam unique since the characteristics of systemic and contact fungicides are combined in a single active ingredient.

Fluazinam is a preventive and protective contact fungicide. It has little curative and no systemic activity but good residual effect and extreme rain fastness.

The fungicidal spectrum of fluazinam has been examined on several crops. Fluazinam has a broad antifungal spectrum and shows good preventive effect against plant diseases caused by: *Alternaria*, *Botrytis*, *Colletotrichum*, *Phytophthora*, *Pseudoperonospora*, *Plasmopara*, *Sclerotinia*, *Venturia*. From the mode of action point of view fluazinam has an extremely low potential of resistance risk.



Prognostični modeli za napovedovanje pesne listne pegavosti (*Cercospora beticola*)

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Pesna listna pegavost (*Cercospora beticola*) je najnevarnejša bolezen na listih sladkorne pese v Nemčiji. Zlasti v toplejših in bolj vlažnih (namakanih) legah lahko povzroči znatne izgube v količini in kakovosti pridelka. Od sredine 90. let to bolezen zatiramo z 1 do 2 fungicidnima škropljenjema. V pomoč pri zatiranju bolezní je bil izdelan obsežen in zahteven monitoring, ki je nastal v sodelovanju vladnih služb za varstvo rastlin, zveze pridelovalcev in sladkorne industrije. Izdelani so bili pragovi, pri katerih ukrepamo, ki temeljijo na številu pojavov bolezní in se spreminjajo glede na začetek epidemije. V l. 1999 smo začeli z razvojem prognostičnih modelov, ki odražajo vpliv vremenskih razmer na razvoj epidemije. Modeli CERCBET so izdelani za pridelovalne razmere v Nemčiji in temeljijo na modelih CERCOESY, ki so jih razvili na Univerzi v Piacenzi (Italija).

CERCBET 1 je empirični statistični model, ki napove, kdaj se bo *C. beticola* na nekem območju prvič pojavila. Vhodni parametri za CERCBET 1 so meteorološki podatki (temperatura in relativna vlažnost) in agronomski parametri (razširjenost sladkorne pese, trajanje kolobarja, intenzivnost bolezní v preteklem letu). CERCBET 1 sešteva vsote temperatur in relativne vlažnosti. Ko so določeni pragovi preseženi, se bo *C. beticola* verjetno pojavila. Za vsak dan napove delež okuženih lokacij (polj) na območju meteorološke postaje. CERCBET 1 je bil v

praksi preizkušan v 7-letnem obdobju (1995 – 2002). Razen v nekaj primerih, se je model pokazal kot zelo natančen. Napovedani termini prvega pojava bolezni in opazovanja na polju so se razlikovali za manj kot 1 teden. Z enako gotovostjo smo ugotovili datum, ko je bilo z vrsto *C. beticola* okuženih 50 % polj v pridelovalnem območju. Takrat je na lokacijah z visokim tveganjem dosežen prvi prag za ukrepanje. CERCBET 1 je bil l. 2000 uspešno vpeljan v prakso in ga uporabljamo pri vodenju monitoringa glive *C. beticola* in za napovedovanje datumov za prvo fungicidno škropljenje na določenem območju.

CERCBET 2 je kompleksen simulacijski model za izdelavo krivulje širjenja glive *C. beticola*. Vhodni parametri so temperature, relativna vlažnost in možnost kondenzacije vlage. Kot dejavnik lahko dodamo tudi občutljivost sorte. Ključna spremenljivka v CERCBET 2 je stopnja okužbe, iz katere se izračunajo nekateri drugi parametri bolezni. CERCBET 2 je znanstveni model, ki služi poznavanju epidemičnega vedenja glive *C. beticola*.

CERCBET 3 je empirični regresijski model, ki je izpeljan iz CERCBET 2. Z uporabo temperatur in relativne vlažnosti kot vhodnih parametrov, CERCBET 3 izračunava dnevno stopnjo okužbe. V drugem koraku se podatki o stopnji okužbe v določenem obdobju seštevajo in tako se določi infekcijski pritisk v tem obdobju. Končno se pojav bolezni izračuna z uporabo nelinearnega regresijskega modela. CERCBET 3 uporabljamo za napoved datuma prvega škropljenja za posamezno lokacijo, v 7 dnevni presledkih. V CERCBET 3 je bil vpeljan še vpliv občutljivosti sorte in namakanja. Na osnovi prognostičnega pristopa za glivo *C. beticola* so izdelani tudi prognostični modeli za druge bolezni, ki se pojavljajo na listih sladkorne pese kakor n. pr. pepelovka (*Erysiphe betae*) in rja (*Uromyces betae*).

ABSTRACT

Forecasting Models for the Prediction of Cercospora Leaf Spot Disease (*Cercospora beticola*) of Sugar Beet

Cercospora beticola is the most damaging leaf disease in German sugar beet growing regions. Severe losses in yield and quality may occur especially in warm and humid areas or in irrigated fields. Since the mid-nineties the disease is controlled regularly by applying one or two fungicide treatments. In order to aid decision-making in controlling the disease a comprehensive and laborious monitoring was organised by governmental crop protection services, growers' unions and sugar industry. Action thresholds have been elaborated which are based on disease incidence counts and which vary according to the start of the epidemic.

In 1999 work was started to develop forecasting models which reflect the influence of weather on the epidemic development of *C. beticola*. Based on the CERCOESY expert system developed at the university of Piacenza (Italy) the CERCBET models were elaborated for German growing conditions.

CERCBET 1 is an empirical statistical model to forecast the first occurrence of *C. beticola* in a region. As input parameters CERCBET 1 uses meteorological data (temperature, relative humidity) and agronomical parameters (sugar beet prevalence, length of crop rotation, *C. beticola* disease severity of the previous year). CERCBET 1 calculates sums of temperature and relative humidity. Once certain thresholds are overridden *C. beticola* is likely to occur. For each day the share of infested fields in a region represented by a meteorological station is predicted. During a seven years period (1995 – 2002) CERCBET 1 has been validated in practice. With a few exceptions the model proved to be very precise. The predicted dates of first occurrence and the respective ones observed in the field in most of the cases differed by less than a week. In addition we found the same precision for the dates when 50% of the fields in a region were infested by *C. beticola*. Then in fields with a high risk the first action threshold is reached. In 2000 CERCBET 1 successfully has been introduced into practice and is used to steer the *Cercospora* monitoring and for signalling the dates for the first fungicide treatments on a regional scale.

CERCBET 2 is a complex simulation model for the disease progress curve of *C. beticola*. Input parameters are temperature, relative humidity and precipitation. In addition cultivar susceptibility may be introduced as a factor. The essential target variable of CERCBET 2 is the infection rate from which several other disease parameters are calculated. CERCBET 2 is a scientific model employed to acquire knowledge on the epidemic behaviour of *C. beticola*.

CERCBET 3 is an empirical regression model which has been derived from CERCBET 2. Using temperature and relative humidity as input CERCBET 3 calculates the daily infection rate. In a second step these infection rates are summed up over a certain period in order to characterise the infection pressure during this period. Finally *C. beticola* disease incidences are calculated by employing a non-linear regression model. CERCBET 3 is used to predict the date of the first treatment on a plot-specific scale with a predictive time-span of seven days. Recently the influence of cultivar susceptibility and irrigation is introduced into CERCBET 3.

Based on the forecasting approach developed for *C. beticola* predictive models for other sugar beet leaf diseases (powdery mildew and rust) are elaborated.



Spremljanje pojava korenjeve muhe (*Psila rosae*)

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Korenjeva muha (*Psila rosae* F.) je splošno razširjen škodljivec korenčka v Sloveniji. V poskusu na polju ob Bregu pri Komendi v katerem smo z rumenimi lepljivimi ploščami spremljali pojav korenjeve muhe v letu 1997, smo ugotovili, da se je druga generacija korenjeve muhe pojavila konec junija in v začetku julija, z vrhom med 24. junijem in 1. julijem. Rumene lepljive plošče smo tedensko pregledali na poskusni lokaciji in v laboratoriju Inštituta za fitomedicino na Oddelku za agronomijo, Biotehniške fakultete v Ljubljani. Podatki so bili obdelani v Komendi. Čas pojava korenjeve muhe smo določili tudi z upoštevanjem vsote temperatur zraka oziroma tal nad določenim temperaturnim pragom. Rumene lepljive plošče so ustrezne za spremljanje korenjeve muhe. V poskusu s sortami oziroma hibridi korenja in pregledom poškodb na korenih ob spravilu, smo ugotovili, da ima sorta oziroma hibrid vpliv na odstotek poškodb korenja. Sorta 'Ljubljansko rumeno korenje' je imela manj poškodb kot 'Berlanda F1', 'Flaker', 'Nantes' in 'Bergen F1'.

ABSTRACT

Monitoring on the carrot rust fly (*Psila rosae* F.)

A carrot rust fly (*Psila rosae* F.) is generally spread pest of carrot all over Slovenia. By way of experiment that took place in year 1997 on the field at Breg near Komenda we attended the appearance of the carrot rust fly with the yellow sticky traps and we found out that the second generation of the carrot rust fly appeared by the end of June and at the beginning of July with the culmination between 24th June and 1st July. Yellow sticky traps were examined once a week on the very place of the experiment and in the laboratory of the Department of Agronomy of Biotechnical Faculty in Ljubljana. The data were analysed in Komenda. The time of appearance has been determined considering the sum of the air and the soil temperatures above a certain temperature threshold. Yellow sticky traps are convenient for observation of the appearance of the carrot rust fly. In the experiment with species and carrot's hybrids and

examination of the lesions on the roots at gathering, we found out that the species or the hybrid has a certain influence on the percentage of the carrot's lesion. The species 'Ljubljansko rumeno korenje' had less lesion as 'Berlanda F1', 'Flaker', 'Nantes' and 'Bergen'.



Uporaba insekticida laser v varstvu rastlin

Pierre FLYE SAINTE MARIE

Dow AgroSciences GmbH

Laser je prvi insekticid iz nove skupine pripravkov, *Naturalytes*. Aktivna snov v insekticidu laser je spinosad, ki jo pridobivamo iz metabolitov splošno razširjene vrste bakterije, *Saccharopolyspora spinosa*. Aktivna snov spinosad je zelo učinkovita proti žuželkam, vključno proti vrstam iz redov Lepidoptera, Diptera, Hymenoptera, Thysanoptera in nekaterim vrstam iz reda Coleoptera. Uporablja se za varstvo v kmetijstvu in hortikulturnih nasadih, v rastlinjakih, na igriščih za golf ter v vrtovih. Aktivna snov spinosad zagotavlja učinkovito varstvo proti škodljivcem, z najmanjšim vplivom na koristne in druge neciljne organizme. Ker je učinkovita pri zelo majhnih odmerkih in je varna za okolje, za sesalce ter koristne organizme, je bila a. s. spinosad registrirana v US EPA programu z manjšim tveganjem (reduced risk program). Leta 1999 je bila nagrajena z Presidential Green Chemistry Award, kar potrjuje pomembnost a. s. spinosad in prizadevanja podjetja Dow AgroSciences za proizvodnjo varnejših in učinkovitejših sredstev za varstvo rastlin. Insekticid laser ima torej naslednje pomembne lastnosti: je zelo učinkovit proti številnim vrstam škodljivcev, uporabljamo ga v nizkih odmerkih, zaradi česar je obremenitev okolja manjša, je nenevaren za koristne organizme, ima poseben način delovanja, pri čemer ni znan pojav navzkrižne odpornosti ter ima nizko strupenost za sesalce, ptice in ribe.

ABSTRACT

Application of Laser in Plant Protection

Laser is the first insecticide proposed for a new class of insect control products, the *Naturalytes*. Active ingredient of Laser called Spinosad is derived from the metabolites of the naturally occurring bacteria, *Saccharopolyspora spinosa*. Spinosad has been shown to be highly active on insects including species from the orders Lepidoptera, Diptera, Hymenoptera, Thysanoptera and a few Coleoptera. Spinosad may be used to control pests in both agricultural and horticultural environments, and also in greenhouses, golf courses, gardens, and around homes. Spinosad has been developed to provide rapid control of the pests with minimum disruption of beneficial insects and other non-target organisms.

Due to its very low effective use rate, safety to the environment, safety to the mammals, and safety to the beneficial insects, Spinosad was registered under the US EPA's reduced risk program. It was also awarded the *Presidential Green Chemistry Award* during 1999, which recognizes the unique contribution of Spinosad and also highlights Dow AgroSciences commitment to producing safer and more effective products for insect control.

Laser provides users with a unique package of very desirable features: highly effective on many pest species, low application rates resulting in low environmental load, safe for use with most beneficial insects, unique mode of action with no known cross-resistance, low mammalian toxicity, and low avian and fish toxicity.



Vpliv različnih plevelov na količino pridelka hmelja

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Neugoden vpliv plevela na rast in razvoj gojenih rastlin je splošno znan, vendar pa se ta vpliv med različnimi gojenimi rastlinami precej razlikuje. Hmelj spada v skupino večletnih rastlin, za katero na splošno velja, da je prag škodljivosti plevelov precej višji kot pri enoletnih rastlinah, določene plevelne vrste pa bi lahko bile v večletnih nasadih kot je hmelj celo zelene.

V prispevku je prikazan vpliv različnih tipov zapleveljenosti na rast in razvoj hmelja, kot tudi na količino pridelka. V raziskavo smo vključili tri vrste zapleveljenosti. Prvi tip zapleveljenosti sestavljajo enoletni širokolistni pleveli, kateri so po našem mnenju zelo konkurenčni hmelju, med njimi najpogosteje zastopana bela metlika (*Chenopodium album* L.) in srhkodlakavi ščir (*Amaranthus retroflexus* L.). V drugo skupino pa smo uvrstili nizke, po našem mnenju slabo konkurenčne plevelne, med katerimi so navadna zvezdica (*Stellaria media* (L.) Vill./Cyr.), razne vrste jetičnikov (*Veronica* spp.), navadni plešec (*Capsella bursa-pastoris* (L.) Medik.) in enoletna latovka (*Poa annua* L.). Ob omenjenih enoletnih plevelih smo v raziskavo vključili tudi po našem mnenju zelo konkurenčne večletne plevelne, topolistno kislico (*Rumex obtusifolius* L.), navadni gabez (*Symphytum officinale* L.) ter njivski slak (*Convolvulus arvensis* L.) Vse tri tipe zapleveljenosti smo primerjali z avtohtono plevelno floro v hmeljišču ter nezapleveljenim hmeljiščem, pri čemer smo ugotovljali razlike v količini pridelka. Ob tem smo v raziskavo vključili tudi proučevanje vpliva trajanja zapleveljenosti. V ta namen smo v rastlinjaku vzgojene plevelne v različnih časovnih obdobjih posadili k hmelju in ugotavljali kako različno trajanje zapleveljenosti vpliva na rast in razvoj hmelja kot tudi konkurenčno sposobnost plevela. Iz rezultatov raziskave je mogoče ugotoviti, da posamezne plevelne vrste zelo različno vplivajo na količino in kakovost pridelka hmelja v odvisnosti od vrste zapleveljenosti kot tudi časa trajanja zapleveljenosti. Raziskava je potrdila, da imajo največji negativen vpliv na količino pridelka hmelja večletni pleveli ter enoletni plevelni vrsti, bela metlika in srhkodlakavi ščir, medtem ko pri zapleveljenosti z navadno zvezdico ter z raznimi vrstami jetičnikov nismo ugotovili večjih negativnih vplivov na količino pridelka.

ABSTRACT

The influence of different weeds on the hop yield quantity

It is common knowledge that weeds affect the development and growth of cultivated plants. Still there is a big difference between different cultivated plants. Hop belongs to a group of perennial plants for which is commonly known that their threshold of harmfulness is much higher than that of annual plants. Some weeds can even be useful or are desired in perennial gardens cultivated with crops such as hop.

This article looks at how different types of weediness affect hop growth and its development, including the quantity of yield. The research deals with three types of weediness. The first type present annual broad-leaved weeds, which in our opinion are very competitive to hop, among which the most frequently found are white broom (*Chenopodium album* L.) and foxtail (*Amaranthus retroflexus* L.). The second group comprises low, in our opinion not very competitive weeds, among which the following can be found: common starlet (*Stellaria media* L.) Vill./Cyr.); some species of speedwell (*Veronica* spp.), *Capsella bursa-pastoris* (L.) Medik. and annual panicle (*Poa annua* L.) Apart from the above listed weeds, in our opinion very competitive perennial weeds, such as acid-leaved sorrel (*Rumex obtusifolius* L.), common comfrey (*Symphytum officinale* L.) and field bind (*Convolvulus arvensis* L.) were also included in

the research. All three types of weediness were compared to autochthonous weed flora in hop gardens and weeds-free hop gardens where we tried to find the differences in the yield quantity. The influence of weediness duration was also studied in this research. For this purpose the weeds bred in the greenhouse were planted in different time periods next to hop and then we studied how different weediness duration affected hop growth and development as well as their competitive capacity. From the results of this research it is possible to conclude that different weed species affect hop yield quantity and quality very differently, depending on the type of weediness and its duration. The research confirmed that perennial and annual weeds such as white broom and foxtail have the biggest negative effect on the hop yield quantity while the weediness with common starlet and speedwell did not prove to have bigger negative effect on the yield quantity.



Pomen izbora sorte in gostote sajenja zgodnjega zelja pri zmanjševanju škodljivosti tobakovega resarja (*Thrips tabaci* Lindeman, Thysanoptera, Thripidae)

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V dveletnem (2000-2001) poskusu smo preučevali pomen dveh agrotehničnih ukrepov pri zmanjševanju škodljivosti tobakovega resarja (*Thrips tabaci*) v zgodnjem zelju. S skupinsko in individualno analizo variance smo ugotovili, da obstajajo med petimi sortami zgodnjega zelja in tremi gostotami sajenja statistično značilne razlike v povprečni masi, povprečni tržni (neto) masi (= povprečna masa – masa poškodovanih listov) in povprečnem indeksu poškodb na zunanjih listih v glavi. V sušnejšem letu 2001, ko je bila intenzivnost gnojenja manjša kot v letu 2002, so bili pridelki zelja manjši, število poškodovanih listov in odstotek njihove poškodovane površine (bronzasti mozolji) pa večja. Sorta 'Vestri', ki je imela v povprečju najtežjo in najbolj trdno glavo, se je pokazala kot najbolj odporna na napad vrste *Thrips tabaci*, sorta 'Parel', katere glava je bila najmanj trdna in med lažjimi med sortami v poskusu, pa je bila najbolj poškodovana od resarja. Pri največji gostoti sajenja (16,6 rastlin/m²) smo ugotovili najmanjšo povprečno maso glave/rastlino in najnižji indeks poškodb na listih, pri najmanjši gostoti sajenja (8,2 rastlini/m²) pa je bila povprečna masa glave/rastlino največja, povprečni indeks poškodb na listih pa največji. Glavnina gospodarsko pomembnih poškodb zaradi hranjenja tobakovega resarja na zunanjih listih glave je bila med 3. in 6. listom, čeprav smo poškodbe ugotovili do 15. zunanega lista v glavi. S preračunom podatkov povprečne mase pridelka in indeksa poškodb na listih na površinsko enoto (m²) ugotavljamo, da po najvišjem povprečnem neto pridelku izstopata sorta 'Vestri' in gostota sajenja 30 x 40 cm (= 8,2 rastlini/m²), ki ju zato priporočamo za gojenje zgodnjega zelja na okolju prijazen način.

ABSTRACT

The role of cultivar choice and plant density of early cabbage on decreasing of onion thrips (*Thrips tabaci* Lindeman, Thysanoptera, Thripidae) damage

In a two year experiment (2001-2002), we examined the role of two agrotechnical measures on onion thrips (*Thrips tabaci*) damage to early cabbage. With group and individual analysis of

variance we concluded that there are statistically significant differences in average weight, average net weight (that equals average weight minus the weight of the damaged leaves) and average index of damage to the outer leaves of the heads between five varieties of early cabbage and three plant densities. In the drier year of 2001, when the intensity of fertilization was less than in 2002, the cabbage yield was smaller, but the number of damaged leaves and the percentage of the damaged area (rough bronze blisters) was larger. The 'Vestri' variety, which had on average the firmest and tightest head, showed itself to be the most resistant to a *Thrips tabaci* attack; the 'Parel' variety, which had the least firm head and was amongst the lighter of the varieties used in the experiment, was the most damaged by the thrips. Where the plants were seeded most densely (16.6 plant/m²) we discovered the lightest on average weight of the head/plant and the lowest index of damage on the leaves. Where the plants were seeded least densely (8.2 plants/m²), the average weight of the head/plant was highest as was the average index for damaged leaves. The most of economically important damage due to the feeding of the onion thrips on the outer leaves was between the third and sixth leaf, although we did find damage to the fifteenth outer leaf. A calculation of the average weight of the yield and index of damage to the leaves in the area of one metre squared (m²) shows that the largest average net weight of yield comes from the 'Vestri' variety grown 30 x 40 cm apart (or a density of 8.2 plants/m²). As a result, we recommend the growth of early cabbage in this manner.



Hmeljev bolhač (*Psylliodes attenuatus* Koch) vse pogostejši škodljivec hmelja v Sloveniji

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Na hmelju (*Humulus lupulus* L.) poleg škodljivcev, ki se pojavljajo vsako leto, zadnjih nekaj let vse pogosteje ugotavljamo tudi hmeljevega bolhača (*Psylliodes attenuatus* Koch). Hmeljev bolhač ima v Sloveniji dve generaciji letno. Včasih so ga hmeljarji poznali le spomladi na odganjajočem hmelju. Poškodbe, ki jih tedaj povzroča na listih in poganjkih, so lahko tolikšne, da vplivajo na pridelek in je zato potrebno uporabiti ustrezen insekticid. V zadnjem času vse pogosteje opažamo poškodbe, ki jih povzroča druga generacija hmeljevega bolhača poleti, ki poleg listov poškoduje tudi storžke in s tem zmanjša pridelek in njegovo kakovost. Vzrok tem prereznožitvam v zadnjih letih je moč iskati v več vzrokih, med katerimi sta v ospredju zmanjšana uporaba insekticidov s širokim spektrom delovanja in sprememba klimatskih razmer.

ABSTRACT

Hop flea beetle (*Psylliodes attenuatus* Koch) one of the most common hop pests in Slovenia

Apart from other typical hop pests that appear every year, hop flea beetle (*Psylliodes attenuatus* Koch) has been more and more present. Hop flea beetle has two generations a year. In the past hop growers saw its occurrence only in spring on shooting hops. The damage that it can cause on leaves and shoots in spring can affect the yield that is why the use of suitable insecticide is necessary. Lately we have noticed the damage caused by the second generation of hop flea beetle in summer which not only affects the leaves but also the cones, which affects the yield quantity and quality. The reason for this spreading in the past few years can be found in many causes among which take far the most important role lesser use of broad spectre activity insecticides and the change in climate.



Odvračalni učinek nekaj naravnih snovi na nekatere fitofagne vrste insektov

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Razvoj okolju prijaznih metod za varstvo rastlin vse bolj pridobiva na pomenu. Ena od teh je uporaba naravnih odvrčal. V laboratorijskih poskusih smo ugotavljali učinek 3 rastlinskih izvlečkov: velikega trpotca (*Plantago major* L.), ogrščice (*Brassica napus* var. *napus* L.), lipovca (*Tilia cordata* Mill.) in enega encimskega inhibitorja, izoliranega iz vrste *Schistocerca gregaria*, tripsin himotripsin inhibitorja (SGTCI), na hranjenje dveh pomembnih škodljivcev: koloradskega hrošča (*Leptinotarsa decemlineata* Say) in obrobkarja (*Sitona* spp.). Odvrčalni učinek 4 snovi je bil preučen z metodo "circular leaf disc dual choice bioassay". Po 24 urah smo izmerili ostanek listne površine s planimetrom. Kot standard smo uporabili izvleček rumenega skrečnika (*Ajuga chamaepitys* L.) in baker. Izvlečke testiranih rastlin smo pripravili z namakanjem listov v vodi. Testirani odmerki SGTCI so bili med 1 – 2 mg/ml. Najpomembnejši rezultati analize so naslednji (podani z odvrčalnim učinkom): AF = (1 – tretirano/kontrola) x 100: pri ličinkah *L. decemlineata*: SGTCI (1,0 mg/ml): 59 %, baker (standard): 45 %, pri hroščih *L. decemlineata*: SGTCI (1,0 mg/ml): 15 %, baker (standard): 0 %, izvleček *P. major*: 35 %, izvleček *T. cordata*: 49 %. Pri odraslih osebkih vrst *Sitona*: SGTCI (1,0 mg/ml): 0 %, izvleček *A. chamaepitys* (standard): 100 %, izvleček *B. napus* var. *napus*: 86 %, izvleček *T. cordata*: 94 %. Rezultati kažejo, da ima SGTCI znaten odvrčalni učinek le proti ličinkam *L. decemlineata*, med testiranimi rastlinskimi izvlečki pa je bil izvleček *T. cordata* najbolj učinkovit proti odraslim osebkom vrst *Sitona*.

ABSTRACT

Antifeedant effects of several natural substances on some phytophagous insect species

Nowadays increasing efforts are made to develop environmentally safer pest control methods. One such method can be the use of natural antifeedants. Laboratory experiments were conducted to determine the effects of three plant extracts (*Plantago major* L., *Brassica napus* var. *napus* L., *Tilia cordata* Mill.) and one enzyme inhibitor isolated from the desert locust (*Schistocerca gregaria* trypsin chymotrypsin inhibitor = SGTCI) on the food consumption of two major insect pests (*Leptinotarsa decemlineata* Say, *Sitona* spp.). The insect antifeedant activity of the four substances was investigated by circular leaf disc dual choice bioassay. After 24 hours the surfaces of the leaf disc remnants were measured with leaf area analyzer. *Ajuga chamaepitys* L. extracts and copper were taken as standard. The tested 3 plant extracts were prepared from leaves diluted with water. SGTCI was tested with doses between 1-2 mg/ml. The most important results of the bioassay are the following (given in antifeedant activity: AF = (1 - Treated/Control)x100: with *L. decemlineata* larvae: SGTCI (1,0 mg/ml): 59%, copper (as standard control): 45%, with *L. decemlineata* adults: SGTCI (1,0 mg/ml): 15%, copper (as standard control): 0%, *Plantago* extract: 35%, *Tilia* extract: 49%. With *Sitona* adults: SGTCI (1,0 mg/ml): 0%, *Ajuga* extract (as standard control): 100%, *Brassica* extract: 86%, *Tilia* extract: 94%. The results show that SGTCI showed appreciable antifeedant activity only against *L. decemlineata* larvae, while amongst the tested plant extracts *Tilia* was the most active as antifeedant against *Sitona* adults.



Izpopolnjen program varstva krompirja s proizvodi Pinus in Bayer CropScience

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Že družba Bayer AG je z intenzivnimi raziskavami v zadnjih letih obogatila programe varstva krompirja. Z novimi proizvodi kot so: fungicid Melody duo, insekticid Calypso, herbicid Plateen in komb. pripravek Prestige, se je program varstva že znotraj palete Pinus, kot dolgoletnega partnerja, osvežil. Z ustanovitvijo družbe Bayer Crop Science pa se je odprla možnost za še bogatejše programe.

V referatu bodo predstavljene tri možne alternative varstva krompirja, katerim je osnova intenzivnost pojava krompirjeve plesni.

ABSTRACT

Improved programme of potato protection based on Pinus and Bayer CropScience pesticides

In the last few years has company BAYER AG by intensive research enriched the crop protection programmes of potato. Through new products like, fungicide Melody duo, insecticide Calypso, herbicide Plateen and combined formulation Prestige, has the protection programme, also within the sales products of PINUS, as a long lasting business partner, freshened up. The establishment of the company Bayer Crop Science has opened a possibility for even more new programmes.

In this presentation are three protection alternatives of potato presented and all are based on intensity of appearance of potato mildew.



Določanje vpliva paše jelenjadi (*Cervus elaphus* L.) na zmanjšanje proizvodnosti travinja - izkušnje iz Kočevskega

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V letu 2002 smo na treh lokacijah na Kočevskem (Mala gora, Cvišlerji in Mačkovec) v obdobju od 3. dekade marca do 1. dekade oktobra preučevali vpliv paše jelenjadi (*Cervus elaphus* L.) na zmanjšanje proizvodnosti travinja v bližini gozdov. Za ugotavljanje gospodarske škodljivosti teh prežvekovalcev smo uporabili železne kletke (1 x 0,5 x 0,5 m), s katerimi smo pred jelenjadjo zavarovali izbrane dele zemljišč, z njimi pa smo si tudi pomagali pri natančnem določanju

površine parcelic (0,5 m²), na katerih smo ugotavljali pridelek zelinja. Razlike med tremi obravnavanji v poskusu (stalno zavarovane parcele, parcele, ki so bile pred jelenjadjo zavarovane le dva do tri tedne pred košnjo in nezavarovane parcele) smo ugotavljali po sušenju zelinja štirih vzorčenj. Ugotovili smo, da se jelenjad na travinju prehranjuje skozi vso rastno dobo, da je regeneracijska sposobnost ruše zaradi paše jelenjadi največja poleti, srednja zgodaj spomladi in najmanjša jeseni. Na nezavarovanih parcelah smo ugotovili v povprečju približno 50 % zmanjšanje pridelka, na najbolj izpostavljenih legah pa je bil pridelek zračno suhe snovi manjši za skoraj 80 %.

ABSTRACT

The effect of red deer (*Cervus elaphus* L.) grazing on decreasing grassland production - experiences from Kočevje region (Slovenia)

The effect of red deer grazing on grassland productiveness at forest border was studied on three locations (Mala gora, Cvišlarji and Mačkovec) at Kočevje region in year 2002. The experiment lasted from the third decade of March till the first decade of October. Portable cages of size 1 x 0,5 x 0,5 m were used to exclude red deer to graze the herbage. At four sampling dates in the season herbage air dry matter was measured at three different treatments (cage-protected plot, cage-protected plot only two to three week before sampling date and unprotected plot). The results from experiment showed us that red deer grazed on grassland through all season and that regeneration capability of sward was the highest in summer, middle in spring and smallest in autumn. On unprotected plots in average 50 % reduction of herbage was found with the most distant sites also up to 80% reduction.

Fitovirologija

Določanje fitoplazme leptonekroze koščičarjev (European Stone Fruit Yellows, ESFY) v Sloveniji

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Fitoplazme, mali prokarionti brez celične stene, živijo v gostiteljskih rastlinah le v sitastih ceveh. Prenašajo se z žuželčjimi prenašalci in vegetativnim razmnoževanjem. Leptonekroza koščičarjev je nevarno obolenje, ki ga povzroča fitoplazma *European Stone Fruit Yellows* (ESFY) iz skupine metličavosti jablan (*Apple proliferation group*). V zadnjih letih na osnovi vizualnih pregledov sadovnjakov poročajo o povečani zastopanosti in širjenju teh obolenj v Sloveniji, zato smo uvedli občutljive in specifične molekularno biotične teste za njihovo določanje. ESFY fitoplazmo smo potrdili z metodami verižne reakcije polimeraze (PCR), *nested* PCR in polimorfizmom dolžin restriksijskih fragmentov (RFLP) v marelicah, breskvah, nektarinah, mirabolanah in slivah iz različnih predelov Slovenije.

ABSTRACT

Detection of European Stone Fruit Yellows phytoplasma in Slovenia

Phytoplasmas are small wall-less prokaryotes that live exclusively in sieve tubes of their plant hosts and are transmitted by insect vectors and vegetative propagation. In Europe, stone fruits are severely affected by European Stone Fruit Yellows (ESFY) caused by phytoplasmas belonging to apple proliferation group (16SrX). Recently, progress of ESFY disease in Slovenia was reported based on visual assessments of symptoms. For the routine detection of ESFY sensitive and specific molecular methods were introduced. The presence of ESFY phytoplasmas was confirmed by polymerase chain reaction (PCR), nested PCR and restriction fragment length polymorphism (RFLP) analyses in apricot, peach, nectarine, myrabolan and plum trees from different regions in Slovenia.



Vpliv okužbe z virusom šarke (PPV) na količino in kakovost pridelka različnih sort breskev

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Spomladi leta 2001 smo vizualno in serološko pregledali številne breskove nasade na okuženost z virusom šarke (PPV). Na osnovi rezultatov DAS-ELISA testov smo izbrali z virusom PPV okužena in neokužena drevesa za ugotavljanje vpliva okužbe na količino in kakovost pridelka različnih sort breskev. Rezultati ponovnega testiranja spomladi leta 2002 so pokazali zelo hitro širjenje okužbe, saj smo virus PPV potrdili pri 43,8 odstotka v letu 2001 še negativnih dreves. Na

osnovi teh ugotovitev predvidevamo, da so vsi nasadi, kjer smo izvajali poskuse, v začetnem stadiju okužbe. Rezultati vrednotenja pridelkov v letih 2001 in 2002 kažejo, da je v prvih letih vpliv okužbe z virusom PPV na skupno količino pridelka majhen. Statistično značilno večji skupni pridelek zdravih dreves v primerjavi z okuženimi smo potrdili samo v letu 2001 v mlademu nasadu sorte Veteran, pri sorti Norman pa so v letu 2001 zdrava drevesa pokazala statistično značilno večji učinek rodnosti za skupni pridelek (skupni pridelek / presek debla). Kakovost plodov okuženih dreves znižuje pojav plodov z znamenji okužbe na kožici, ki je odvisen predvsem od sorte in pri določenih sortah občutno vpliva na količino pridelka prve kakovosti. Obenem kažejo rezultati laboratorijskih analiz trend zniževanja notranje kakovosti plodov z razvojem okužbe.

ABSTRACT

Influence of PPV infection on yield quantity and quality of different peach varieties

In spring 2001 numerous peach orchards throughout Slovenia were screened visually and serologically for the presence of PPV infection. Based on the results of DAS-ELISA analyses PPV positive and PPV negative trees were selected in several orchards of different peach varieties in order to study the influence of PPV infection on yield quality and quantity. Re-testing of trees in spring 2002 showed rapid spread of infection in the orchards, since 43,8 percent of trees with negative results in 2001 were confirmed to be DAS-ELISA positive in 2002. Based on these results we presume that all the orchards included in evaluation were in the early stages of PPV infection. Results of yield evaluation in the years 2001 and 2002 indicate that the influence of PPV on total yield is small in the early stages of virus spread. Statistically significant differences in total yield were found only in the young orchard of cv. Veteran in the year 2001. Similarly in 2001 healthy trees of cv. Norman showed statistically significant higher total yield efficiency (total yield per trunk cross-sectional area) than infected ones. The appearance of sharka symptoms on fruit skin depended on the variety and in certain varieties markedly diminished yield of first quality fruits. Results of the laboratory analyses of acid and sugar content also indicate a decrease of inner quality of fruits with the development of infection.



Pomen plevelnih rastlin za ohranjanje in širjenje virusa šarke (PPV)

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Virus šarke (PPV) ima številne gostitelje in se zelo hitro širi. Razen gojenih in divjih vrst iz rodu *Prunus* raziskovalci poročajo o številnih drugih lesnatih in zelnatih gostiteljih, ugotovljenih v laboratorijskih in delno v naravnih razmerah. Pomen plevelnih rastlin za širjenje šarke je slabo raziskan. Da bi ugotovili možen pomen plevelnih rastlin kot vira okužbe z virusom PPV, smo v letih 2000, 2001 in 2002 v breskovih nasadih na več lokacijah v JZ in SV Sloveniji nabrali 569 vzorcev plevelov. DAS-ELISA zbranih vzorcev je potrdila virus PPV v nekaterih razširjenih plevelnih vrstah. Nekatere izmed njih do sedaj še niso bile znane kot gostitelji šarke. V prispevku bo poleg rezultatov predstavljen tudi pomen drugih dejavnikov, ki lahko vplivajo na uspešnost širjenja virusa PPV.

ABSTRACT

The role of weed species in preservation and distribution of PPV virus

PPV is polyphagous and very epidemic. Apart from cultivated and wild *Prunus* species several other woody and herbaceous species have been identified as PPV hosts under experimental and to a lesser extent also under field conditions. The role of weed species in the spread of PPV is not yet understood. In order to study the importance of weed species as a possible reservoir of PPV, 569 samples of weed species were collected in the years 2000, 2001 and 2002 at different locations in SW and NE of Slovenia. DAS-ELISA analyses of collected samples showed positive results for several common weed species. Some of these species have not yet been reported as PPV hosts. The significance of these findings and the role of other factors in the virus spread will be discussed in the presentation.



Vpliv interakcije med virusi in herbicidi na gostiteljske rastline

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Ker 50 odstotkov prodaje pesticidov predstavljajo herbicidi, je s praktičnega vidika dobro poznati koristne stranske učinke nekaterih herbicidov, vključno z vplivom na odnos gostitelj-virus. V tem smislu je najbolj znano protivirusno delovanje triazinov, karbamida, dinitroanilina in herbicidov tipa avksinov. Namen raziskave je bil, preučiti vpliv nekaterih aktivnih snovi v herbicidih (pendimetalin, napropamid, fluazifop-P-butil) na lokalne (Obuda pepper virus – *Nicotiana glutinosa*, Obuda pepper virus – *Chenopodium amaranticolor*) in sistemične (Obuda pepper virus – paprika (*Capsicum annum*), Obuda pepper virus – *N. tabacum* 'Samsun', alfalfa mosaic virus – *C. amaranticolor*) okužbe.

Raziskave kažejo, da je vpliv herbicidov na odnos gostitelj – virus močno odvisen od vrste in varietete gostitelja, tipa herbicidov, načina aplikacije in odmerka. Pri lokalni okužbi rastlin vrste *N. glutinosa* z Obuda pepper virus, je pendimetalin zmanjšal število lezij za 55 %. Pri sistemični okužbi smo opazili 4 tipe reakcije na herbicid: (1) zaradi uporabe herbicidov rastline niso bile okužene, (2) rastline so bile okužene, vendar je bila koncentracija virusov znatno nižja kot pri pozitivni kontroli, (3) herbicidi niso vplivali na koncentracijo virusov v listih in (4) herbicidi so (samo v enem primeru) znatno povečali koncentracijo virusov.

Rezultati kažejo, da nekateri herbicidi delujejo ne le na plevela temveč zavirajo tudi gospodarsko pomembne vrste virusov, ki se pojavljajo v agroekosistemih.

Zahvaljujemo se National Scientific Research Found (OTKA T 037819) za finančno podporo.

ABSTRACT

Interaction of viruses and herbicides on host plants

Regarding, that 50 percent of pesticide sales is made up by herbicides, from practical point of view it is important to know the beneficial side effect of several herbicides, including the effect on host-virus relations. The best known in this respect is the antiviral activity of triazine, carbamide, dinitroaniline and auxine-type herbicides.

The aim of our study was to examine the effect of some active herbicide ingredients (pendimethalin, napropamide, fluazifop-P-butyl) on local (Obuda pepper virus - *Nicotiana glutinosa*, Obuda pepper virus - *Chenopodium amaranticolor*) and systemic (Obuda pepper virus - pepper, Obuda pepper virus - *Nicotiana tabacum* 'Samsun', alfalfa mosaic virus - *Chenopodium amaranticolor*) host - virus relations.

It is concluded that the effect of herbicides on host-virus relations greatly depends on hosts (species, varieties), type of herbicides, mode and dosage of application. In Obuda pepper virus - *Nicotiana glutinosa* local host-virus relations pendimethalin reduced the number of the local lesions by 55%. In systemic host virus relations four types of herbicide effect were observed: (1) Plants were not infected due to the herbicide treatments, (2) Plants infected, but the virus concentration was significantly lower, as compared to positive control, (3) Herbicides did not influence the virus concentration in the leaves, and (4) Herbicides (only in one case) significantly enhanced virus concentration.

Our results pay attention to the fact, that certain herbicides may play important role not only against weeds, but also have inhibitory effect on economically important viruses, occurring in agricultural ecosystems.

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Odpornost in občutljivost rastlin iz družine razhudnikov (Solanaceae) na viruse

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V "rodovniku" mnogih kulturnih rastlin najdemo divje vrste iz roda *Solanum*. Njihovi geni so tudi v sortah krompirja in so zelo pomembni pri žlahtnjenju na odpornost. Izgube pridelka krompirja zaradi bolezni in škodljivcev se ocenjujejo na 22 % letno. Virusi imajo visoko prioriteto v Evropi in Severni Ameriki. Namen raziskave je bil, preučiti občutljivost oz. odpornost divjih vrst iz roda *Solanum* na NTN raso krompirjevega virusa Y (*Potato virus Y*, PVY^{NTN}) in najti potencialne vire odpornosti v rodu *Solanum*, ki bi jih lahko uporabili pri žlahtnjenju krompirja.

Preučevali smo odpornost in občutljivost 21 akcesij 11 severno-ameriških divjih vrst iz roda *Solanum*, ki oblikujejo gomolje (*S. abacajense* P. I. 442700, 458403, *S. acroglossum* P. I. 498204, *S. alandiae* P. I. 243501, 498085, 498087, *S. astleyi* P. I. 545848, 545959, *S. iopetalum* P. I. 275181, *S. morelliforme* P. I. 545720, 545775, *S. moscopanum* P.I. 570629, 570630, 570632, 570633, *S. multiinterruptum* P.I. 498265, 498266, 498267, *S. orophilum* P.I. 590894, *S. piruae* P.I. 473501, *S. santolallae* P.I. 195168) na krompirjev virus Y (PVY^{NTN}). Sedem rastlin iz vsake akcesije smo mehanično okužili, v fazi 8 – 10 listov. Pri okuženih rastlinah smo spremljali pojav znamenj lokalnih in sistemskih okužb. Pet tednov po okužbi smo rastline testirali z direktno serološko metodo DAS-ELISA. Na rastlinah vrste *N. tabacum* 'Xanthi-nc' smo izvedli ponovno okužbo (reinfekcijo). Akcesije smo ocenili kot najbolj odporne (imune), če simptomi niso bili vidni, biotični testi neuspešni (negativni) in absorpcijske vrednosti okuženih vzorcev niso presegale dvakratne vrednosti neokužene kontrole. Glede na rezultate je na krompirjev virus Y (PVY^{NTN}) najodpornejša vrsta *S. moscopanum* (P. I. 570630) in se lahko uporablja kot vir odpornosti na PVY pri žlahtnjenju krompirja.

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ABSTRACT

Resistance and susceptibility of Solanaceous plants to viruses

The wild *Solanum* species occur in the pedigree of many cultivars. Genes from several wild *Solanum* species are introduced into potato cultivars. They are very important in breeding for resistance. The yield losses caused by diseases and pests in potato are estimated at 22 % per year. Viruses have high priority in Europa and North Amerika. The objective of our work was to study the susceptibility or resistance of wild *Solanum* species to NTN strain of *Potato virus Y* (PVY^{NTN}) and to identify potential resistance sources in the *Solanum* genus that could be used in the potato breeding program.

We have studied the resistance and susceptibility of 21 accessions of 11 South-American tuber bearing wild *Solanum* species (*Solanum abacajense* P.I. 442700, 458403, *S. acroglossum* P.I. 498204, *S. alandiae* P.I. 243501, 498085, 498087, *S. astleyi* P.I. 545848, 545959, *S. iopetalum* P.I. 275181, *S. morelliforme* P.I. 545720, 545775, *S. moscopanum* P.I. 570629, 570630, 570632, 570633, *S. multiinterruptum* P.I. 498265, 498266, 498267, *S. orophilum* P.I. 590894, *S. piruae* P.I. 473501, *S. santolallae* P.I. 195168) to PVY^{NTN}. Seven plant from each accessions were mechanically inoculated at 8-10 leaves stages. Inoculated plants were symptomatologically checked for local and systemics symptoms. Five weeks after inoculation plants were tested using direct DAS-ELISA serological method. Back inoculation was also made to *Nicotiana tabacum* 'Xanthi-nc' plants. Accessions were considered extreme resistant (immune), if the symptoms could not be seen, biological tests were unsuccessful and the absorbance values of the infected samples did not exceed twice that of the healthy control ones.

According to the results *S. moscopanum* (P.I. 570630) showed extreme resistance to PVY^{NTN}. Therefore this accession can be used as resistance sources of PVY in potato breeding.

We are grateful to the National Scientific Research Found (OTKA T34371) for their financial support.



Primerjava različnih diagnostičnih metod za detekcijo virusa nekrotičnega rumenenja listnih žil pese (BNYVV)

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Virus nekrotičnega rumenenja listnih žil pese (*Beet necrotic yellow vein furovirus* - BNYVV) je povzročitelj rizomanije, bolezni ki povzroča veliko ekonomsko škodo pri pridelavi sladkorne pese. Okužba zniža pridelek sladkorja, saj je nižja količina pridelka in/ali količina sladkorja. Pridelek se lahko zmanjša na četrtino normalnega. Zaradi velikega gospodarskega pomena virusne okužbe in ker je vnos virusa in njegovo širjenje v zavarovanih območjih prepovedano, je pomembna njegova zgodnja in zanesljiva detekcija. Za detekcijo virusa v korenih pese in pri ugotavljanju virusa v tleh se navadno še vedno uporablja serološki test ELISA. Ker pa je predvsem testiranje zemlje zelo dolgotrajno, se v zadnjem času uporabljajo za detekcijo tudi metode na osnovi verižne reakcije s polimerazo (PCR). Te lahko skrajšajo čas analize skoraj za polovico. Že v predhodnih raziskavah smo ugotovili, da so molekulske biotične metode precej občutljivejše od seroloških, opazili pa smo tudi razlike v občutljivosti različnih oblik reverzne transkripcije in PCR po predhodni imunski vezavi virusa (IC RT-PCR). V prispevku bodo predstavljeni rezultati primerjave občutljivosti metod.

ABSTRACT

Comparison of different methods for detection of *Beet necrotic yellow vein furovirus* (BNYVV)

BNYVV is a causal agent of rhizomania, serious disease of sugar beet. It can cause large scale reductions in yield through reduction of root weight and/or sugar content. Sugar beet varieties tolerant to rhizomania are available, but their use is limited because of lower yield. Early and reliable detection of infection is necessary because of big economic impact of the disease and because the introduction of the virus into and spread within protected zones is banned by the law. Serological test ELISA is usually used for detection of the virus in sugar beet and in soil but because the testing of the later lasts about 6 weeks molecular methods based on polymerase chain reaction (PCR) are being used in last years. They can significantly reduce testing time. In the preliminary research differences in the sensitivity between ELISA and molecular methods and also between different immuno-capture reverse transcription PCR (IC RT-PCR) protocols were observed. The results of the further study will be presented.



Prvo obsežnejše laboratorijsko testiranje trsnih rumenic v Sloveniji kaže na splošno zastopanost rumenice tipa počrnelosti lesa

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Na Nacionalnem inštitutu za biologijo smo v letu 2002 v okviru posebnega nadzora nad trsnimi rumenicami, ki ga vrši uradna služba za varstvo rastlin, prvič izvedli obširnejše laboratorijsko testiranje trsnih rumenic v Sloveniji.

Trsne rumenice povzročajo fitoplazme različnih tipov, od katerih sta najpomembnejša zlata trsna rumenica (Flavescence doree, FD), ki se nahaja na karantenski AII listi ter rumenica tipa počrnelosti lesa (Bois noir, BN), ki je na teh listah ni. Za nadzor nad trsnimi rumenicami je nujno poznavanje tipa fitoplazme, ki daje osnovne smernice za strategijo zatiranja. Tip fitoplazme pa je mogoče določiti le z laboratorijskim testiranjem.

V testiranje so bili zajeti le trsi z izraženimi bolezenskimi znamenji. Razen redkih izjem smo v vseh obolelih trsni uspeli dokazati fitoplazme in v veliki večini smo uspeli določiti tudi tip fitoplazme. Rezultati laboratorijskega testiranja v letu 2002 kažejo na splošno zastopanost fitoplazme BN v vseh vinorodnih območjih v Sloveniji. V prispevku bomo prikazali kompleksen pristop pri izvajanju laboratorijskih testiranj ter razpravljali o rezultatih testiranj.

ABSTRACT

First large-scale laboratory testing of grapevine yellows in Slovenia indicates a widespread presence of Bois noir

First large-scale laboratory testing of GY was carried out at the National Institute of Biology as survey, in the frame of official plant protection service in 2002.

Grapevine yellows are dangerous diseases caused by different types of phytoplasma. The two most important types are Flavescence doree (FD), which is a AII listed quarantine organism, and Bois noir (BN), which doesn't have a quarantine status. Infected grapevine express exactly

same type of symptoms regardless of the type of the phytoplasma. In order control of the grapevine yellows it is essential to know the phytoplasma type, which provides basic indication to choose proper and efficient control measures. Only the laboratory testing methods provide tools for the determination of the phytoplasma type.

The testing in 2002 included only the vines expressing disease symptoms. Almost in all tested vines we were able to confirm the presence of phytoplasma, and in the great majority of them we also determined the phytoplasma type. The results showed the widespread presence of the Bois noir phytoplasma in all vine growing regions of Slovenia. A complex approach in laboratory testing scheme used in a 2002 survey and the results of the testing will be discussed.



Identifikacija potencialnih naravnih prenašalcev trsnih rumenic v Podravski vinorodni deželi

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Pri iskanju vzrokov za epifitotični pojav trsnih rumenic v podravski vinorodni deželi v letih 2001-02 in rešitev za njihovo omejevanje je bilo ugotavljanje številčnosti znanih in potencialnih naravnih prenašalcev te bolezni temelj za nadaljnje raziskave in ukrepanje. Laboratorijske analize vzorcev vinske trte s simptomi trsnih rumenic v l. 2002 so pokazale, da je na tem območju zastopana trsna rumenica počrnelosti lesa (Grapevine bois noir phytoplasma - BN). Ker so naravni prenašalci teh bolezni vinske trte škvržatki (Auchenorrhyncha), je bilo najprej potrebno napraviti inventar vrst, ki se pojavljajo v okuženih vinogradih. Inventarizacija škvržatkov je bila izvedena v treh izbranih vinogradih v podravski vinorodni deželi, v katerih je bil delež okuženih trsov zelo velik (od 40 – 80 % trsov s simptomi BN): Turški vrh v Halozah (UTM - WM83), Strezetina (UTM - WM84, Svetinje – Malek v Slovenskih goricah (UTM – WM94). Vrsto sestavo in pogostnost škvržatkov smo ugotavljali:

- a) s pomočjo rumenih lepljivih plošč, ki smo jih izobesili na žice med trse ter jih mesečno menjavali in popisali vrste in številčnost škvržatkov;
- b) z lovom škvržatkov z insektsko mrežo v juniju in v začetku septembra in sicer posebej na trsah in posebej na podrasti.

Inventarizacija škvržatkov v izbranih vinogradih je pokazala razmeroma veliko številčnost imaga sklenokrilega škvržatka (*Hyalestes obsoletus*), prenašalca fitoplazme BN, v vseh treh vinogradih v obdobju od začetka junija do konca julija. V njih so v podrasti obilno zastopane tudi nekatere njegove priljubljene gostiteljske rastline, zlasti njivski slak (*Convolvulus arvensis*), mestoma tudi velika kopriva (*Urtica dioica*). Opazili smo pozitivno korelacijo med abundanco teh gostiteljskih rastlin in številčnostjo sklenokrilega škvržatka. Poleg sklenokrilega škvržatka smo našli še naslednje vrste škvržatkov, ki so v literaturi omenjeni kot potencialni prenašalci rumenic tipa stolbur na zelnatih rastlinah: *Aphrodes makarovi*, *Euscelis incisus*, *Anoplotettix fuscovenosus*, *Neoliturus fenestratus*. Skupaj je bilo ugotovljenih 43 vrst škvržatkov, večji del teh se zadržuje na podrasti. Prava ampelofagna vrsta je le zeleni škvržatek (*Empoasca vitis*), ki se je najbolj obilno lovila na rumene plošče. Neposredno na vinski trti so bile poleg omenjene vrste najdene še naslednje: *Neoliturus fenestratus*, *Anoplotettix fuscovenosus*, *Philaenus spumarius* in *Hyalestes obsoletus*. Od teh je prava arborikolna vrsta le še *Anoplotettix fuscovenosus*, mednje pa spada tudi vrsta *Fieberiella flori*, ki se je ujela le na rumene lepljive plošče. Z nobeno metodo spremljanja v podravski vinorodni deželi doslej nismo ugotovili ameriškega škvržatka

(*Scaphoideus titanus*), ki je prenašalec zlate trsne rumenice (Flavescence dorée phytoplasma). Ta predhodna raziskava nakazuje povezanost med epifitotičnim pojavom BN in njenim prenašalcem – sklenokrili škrlatkom (*Hyalestes obsoletus*) v podravski vinorodni deželi.

ABSTRACT

Identification of potential natural vectors of grape yellows in Drava wine-growing region

During 2001-02 an epidemic occurrence of grape yellows in Drava wine-growing region has been observed. The phytoplasma from the stolbur group, which is associated to the grapevine bois noir (BN), was always found during laboratory tests carried out in 2002 on symptomatic vine stocks from selected vineyards. In these vineyards investigations on leafhopper and planthopper (Auchenorrhyncha) fauna as potential natural vectors of phytoplasmas, which might be the cause of rapid disease proliferation, were carried out. Three vineyards, where the infection rate of BN was very high (40-80 % of vine stocks), were selected for the further faunistic investigations: Turški vrh v Halozah (UTM - WM83), Strezetina (UTM - WM84, Svetinje – Malek v Slovenskih goricah (UTM – WM94). Two methods were used to find out the presence and frequency of single species:

- a) Using yellow sticky traps, which were changed and controlled monthly;
- b) Collecting of hoppers with an entomological net in June and at the beginning of September, separately on grapevines and on undergrowth vegetation.

A comparatively large population of planthopper *Hyalestes obsoletus*, which is known as the vector of stolbur phytoplasma, was found in the three selected vineyards in the period from the beginning of June till to the end of July. Their main host plants, especially *Convolvulus arvensis* and somewhere *Urtica dioica* too, were also largely present in all three vineyards. A positive correlation was noticed between the capture of *Hyalestes obsoletus* and the abundance of these weeds. Some other leafhoppers mentioned in the literature as possible vectors of the stolbur phytoplasmas on herbaceous plants (e.g. *Aphrodes makarovi*, *Euscelis incisus*, *Anoplotettix fuscovenosus*, *Neoaliturus fenestratus*) were abundantly collected. 43 Auchenorrhyncha species all together were found in the three locations, the majority of them on undergrowth vegetation. The leafhopper *Empoasca vitis* was the only true ampelophagous species, abundantly trapped on yellow sticky plates. The following species were also swept directly from grapevines: *Neoaliturus fenestratus*, *Anoplotettix fuscovenosus*, *Philaenus spumarius* and *Hyalestes obsoletus*. Only one of them, the *Anoplotettix fuscovenosus* is a true arboricolous species. Another arboricolous species, the *Fieberiella flori*, was only trapped in a very low number on yellow stick plates. The leafhopper *Scaphoideus titanus* the vector of FD (Flavescence dorée phytoplasma) has been found nowhere in this part of Slovenia yet. The present preliminary investigation indicates a possible close relation between *Hyalestes obsoletus* populations and current epidemic occurrence of BN in Drava wine-growing region.



Prva detekcija virusnih delcev *Rupestris stem pitting associated virus 1 (RSPaV-1)* povezanih z boleznijo razbrazdanja lesa vinske trte

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Rupestris stem pitting associated virus (RSPaV) spada v rod *Foveavirus*. Virus RSPaV-1 je povezan s tisto komponento bolezni razbrazdanja lesa vinske trte (Rugose wood disease complex, RW), ki povzroča razbrazdanje lesa na lesnem indikatorju *Rupestris du Lot* (*Rupestris stem pitting*). Do sedaj še nikomur ni uspelo dejansko tudi videti virusnih delcev RSPaV-1, kar bi predstavljalo prvi neposreden dokaz, da je dejavnik komponente razbrazdanja lesa resnično virusnega izvora. V soku z RSPaV-1 okuženih rastlin vinske trte smo s transmisijsko elektronsko mikroskopijo z metodo lovljenja (ISEM) in dekoracije s protitelesi proti rekombinantnemu virusnemu plaščnemu proteinu opazovali filamentozne virusne delce povprečne dolžine 750 nm. Virusne delce RSPaV smo zasledili v okuženih rastlinah vinske trte gojenih v tkivni kulturi, v rastlinjaku ter v vinogradu, nismo pa jih zasledili v kontrolnih zdravih rastlinah gojenih v istih razmerah. Rezultati ISEM se ujemajo z rezultati zastopanosti virusne dsRNA, metode imunskega pivnika (Western blot) in ELISA testa. Virusnih delcev RSPaV-1 z metodo ISEM nismo uspeli dekorirati s protitelesi proti virusoma *Grapevine virus A (GVA)* in *Grapevine virus B (GVB)*, ki sta oba prav tako povezana z boleznijo razbrazdanja lesa vinske trte. Plod tega raziskovalnega dela predstavlja prvi neposreden dokaz o obstoju virusnih delcev RSPaV-1 in obeta pomembno orodje pri razumevanju etiologije te bolezni.

ABSTRACT

First detection of *Rupestris stem pitting associated virus particles (RSPaV-1)* associated with the *Rugose wood disease of grapevine*

Rupestris stem pitting associated virus (RSPaV), a member of the *Foveavirus* genus, is associated with the *Rupestris stem pitting* component of the *rugose wood (RW)* disease complex of grapevines. Heretofore, particles of RSPaV have not been visualized. In this work, flexuous rod particles about 750 nm in length were detected in sap of infected grapevines, by immunosorbent electron microscopy (ISEM). Since particles were unstable in plant sap, selection of young shoot tissue and use of short incubation times were essential for observing intact particles. RSPaV particles were detected in tissue culture, greenhouse and field grown infected plants but not in healthy control plants. ISEM detection of particles corresponded to the presence of dsRNA, and detection of RSPaV by Western blot and ELISA. In contrast, the particles were not decorated by antibodies to GVA and GVB, two other viruses associated with RW. This first definitive detection of RSPaV particles will help towards understanding the etiology of the RW disease complex.



Najpogostejši virusi na izbranih okrasnih rastlinah in vrtninah v Sloveniji

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V letih 2000, 2001 in 2002 smo testirali več kot 1100 vzorcev okrasnih rastlin, med njimi največ krizantem in pelargonij ter vrtnin, med njimi največ rastlin paradižnika in paprik, tudi predstavnike bučnic in čebulnic, na 23 različnih ekonomsko pomembnih virusov. Večino vzorcev so nabrali fitosanitarni inšpektorji v okviru posebnega nadzora, ki ga vrši uradna služba za varstvo rastlin. Bolezenska znamenja na vzorcih smo primerjali z dobljenimi rezultati serološkega testa ELISA. V primeru nejasnih rezultatov, oziroma neznanega povzročitelja, smo vzorce testirali še z elektronsko mikroskopijo in testnimi rastlinami. Na rastlinah krizantem smo najpogosteje našli tospoviruse TSWV – virus pegavosti in uvelosti paradižnika (SLO II.A.II lista), INSV – virus nekrotične pegavosti vodenke (SLO II.A.II lista) in CSNV – virus stebelne nekroze krizantem (EPPO čakalna lista). Pogosto najden virus na krizantemah je tudi CVB (*Chrysanthemum virus B*), ki pa navadno ne povzroča bolezenskih znamenj. Pelargonije so pogosto okužene z virusom PFBV – virus razbarvanja cvetov pelargonij, redkeje pa tudi s TSWV, INSV, CMV – virus mozaika kumar in PLPV – virus črtavosti pelargonij. Pogosto najdena virusa na rastlinah paprike in paradižnika sta CMV in PVY – krompirjev virus Y. Poleg virusa CMV in PVY pa smo na rastlinah paprike in paradižnika našli tudi AMV – virus mozaika lucerne, TSWV, INSV (le na papriki) in TMV – virus mozaika tobaka (le na paradižniku). PVY smo našli tudi na surfinijah. Virus CMV pa smo določili, poleg omenjenega, tudi na solati in bučnicah ter na okrasnih rastlinah ajuge in astre. Poleg CMV bučnice pogosto okužuje tudi ZYMV – virus rumenega mozaika bučk ter WMV (*Watermelon mosaic virus*) o katerem smo že predhodno poročali. Na poru in čebuli smo našli tospovirus IYSV – virus rumene pegavosti irisa (EPPO čakalna lista), ki se v Evropi in v svetu izredno redko pojavlja, podobno kot virus CSNV. Poleg zgoraj omenjenih rastlin smo tospoviruse našli tudi na drugih okrasnih rastlinah, npr. CSNV na gerberi, INSV na ciklami itd.

ABSTRACT

The most frequent viruses on selected ornamental plants and vegetables in Slovenia

More than 1100 samples of ornamentals, mostly chrysanthemum and pelargonium, and vegetables, among them mostly pepper and tomato but also cucurbits and *Allium* species, were tested for the presence of 23 different viruses in years 2000, 2001 and 2002 in Slovenia. Phytosanitary inspectors in the frame conducted by official plant protection services collected most of samples. Symptoms were compared with results of ELISA tests. In the case of unclear results or unknown cause of disease, the samples were additionally tested with electron microscopy and test plants. In chrysanthemum plants, we frequently found tospoviruses TSWV (*Tomato spotted wilt virus*, SLO II.A.II list), INSV (*Impatiens necrotic spot virus*, SLO II.A.II list) and CSNV (*Chrysanthemum stem necrosis virus*, EPPO alert list). Frequently found virus on chrysanthemum is also CVB (*Chrysanthemum virus B*), which is usually symptomless. Pelargonium plants are frequently infected with PFBV (*Pelargonium flower break virus*), sometimes also with TSWV, INSV, CMV (*Cucumber mosaic virus*) and PLPV (*Pelargonium line pattern virus*). Viruses that were frequently found on red pepper (*Capsicum annum*) and tomato (*Lycopersicon esculentum*) are CMV and PVY (*Potato virus Y*). Besides CMV and PVY, the pepper and tomato are infected with AMV (*Alfalfa mosaic virus*), TSWV, INSV (only pepper) and TMV (*Tobacco mosaic virus*) (only tomato). PVY were found also on Petunia. CMV was

found also on lettuce and cucurbits and on ornamental plants such as Ajuga and Aster. Besides CMV, ZYMV (*Zucchini yellow mosaic virus*) and WMV (*Watermelon mosaic virus*) were frequently found on cucurbits. Tospovirus IYSV (*Iris yellow spot virus*, EPPO alert list) was found on leek and onion, which is along with the findings of CSNV a rare incidence in Europe. Tospoviruses were found also on other ornamental plants such as CSNV on Gerbera, INSV on Cyclamen etc.



Identifikacija virusa stebelnih nekroz krizantem - CSNV v Sloveniji

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Med najpomembnejše viruse, ki okužujejo krizanteme sodijo *Tomato aspermy virus* (TAV), *Chrysanthemum virus B* (CVB) in tospovirusi ter viroid *Chrysanthemum stunt viroid* (ChSVd). Njihovo določanje z laboratorijskimi metodami je predpisano v EPPO certifikacijski shemi za krizanteme. Na krizantemah so bili do sedaj odkriti trije tospovirusi: *Tomato spotted wilt virus* (TSWV) in *Impatiens necrotic spot virus* (INSV), ki sta splošno razširjena, ter *Chrysanthemum stem necrotic virus* (CSNV), ki so ga našli v Braziliji, v Evropi pa le kot posamične okužbe na Nizozemskem. TSWV in INSV sta uvrščena na slovenski listi IIAII, medtem, ko se CSNV nahaja na EPPO čakalni listi.

Tospovirusi se prenašajo z resarji in sadilnim materialom. Najpogostejša bolezenska znamenja so nekroze listov, včasih tudi stebel in cvetov. Včasih opazimo tudi značilna bolezenska znamenja v obliki koncentričnih obročev. Na podlagi bolezenskih znamenj tospovirusov med seboj ne moremo ločiti. V Sloveniji smo večkrat, odkar poteka posebni nadzor tospovirusov, ki ga vrši uradna služba za varstvo rastlin, laboratorijsko dokazali TSWV in INSV. Prvi sum na okužbo s CSNV pa se je pojavil šele v letu 2001. Ugotovili smo navzkrižno reaktivnost virusa CSNV s protitelesi proti TSWV, kar pomeni, da je pri krizantemah možno zamenjati okužbo s CSNV z okužbo s TSWV. To je tudi ena od možnih razlag, da o CSNV ni poročil iz drugih evropskih držav. Za identifikacijo CSNV smo poleg ELISA testa uporabili tudi različne testne rastline ter verižno reakcijo s polimerazo (PCR). Virus smo izolirali in določili delno nukleotidno zaporedje izbranega gena, na podlagi katerega smo dokazali njegovo identiteto.

Tospovirusi se v krizantemah običajno nahajajo v nizkih koncentracijah, možne so tudi latentne okužbe. Dokazali smo jih v listih, steblih in koreninah krizantem. V letu 2002 pa smo CSNV dokazali tudi v gerberi.

ABSTRACT

Identification of Chrysanthemum stem necrosis virus - CSNV in Slovenia

The most important viruses infecting chrysanthemums are: *Tomato aspermy virus* (TAV), *Chrysanthemum virus B* (CVB) and tospoviruses, as well as the viroid *Chrysanthemum stunt viroid* (ChSVd). Their detection is described in EPPO certification scheme for chrysanthemum plants. Three different tospoviruses were described in chrysanthemum plants: *Tomato spotted wilt virus* (TSWV) and *Impatiens necrotic spot virus* (INSV), which are both commonly present, and *Chrysanthemum stem necrotic virus* (CSNV), which was apart from Brasil found in Europe

only in few cases in the Netherlands. TSWV and INSV are listed in IIAII, while CSNV is listed in EPPO alert list.

Tospoviruses are transmitted by thrips and planting material. Most commonly observed symptoms are necrosis on leaves, rarely on stems or flowers. Sometimes typical concentric rings are present. Notably, it is not possible to distinguish among individual tospoviruses based on their symptoms. In the frame of monitoring performed by plant protection services in Slovenia, TSWV and INSV were found regularly, while first suspect of finding the CSNV occurred in 2001. A closer study showed that CSNV cross reacts with antisera against TSWV. These results may indicate that it is possible to confuse CSNV infections with the TSWV infections. However, this is to be taken with caution as only one of the possible explanations, since CSNV was not reported from other European countries. Apart from ELISA, different test plants and PCR were used for CSNV detection and identification. We isolated the virus and sequenced a selected gene to further support the evidence on CSNV identity in our samples.

Tospoviruses are present in chrysanthemums in low titers, but we were able to detect them also as latent infections. Beside in chrysanthemum leaves, we detected CSNV also in stems and roots. In 2002 we detected CSNV also in Gerbera.

Varstvo sadnega drevja

Izkušnje z zatiranjem sadnega listnega duplinarja (*Leucoptera scitella* Zell.) v nasadih jablan v severovzhodni Sloveniji

Jože MIKLAVC, Gustav MATIS, Konrad BEBER

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V obdobju med letom 2000 in 2002 smo v nasadih jablan v severovzhodni Sloveniji natančno spremljali pojav in razvoj sadnega listnega duplinarja (*Leucoptera scitella* Zell.), ki je najpomembnejša vrsta listnih zavrtačev na jablani. V tem obdobju smo proti temu listnemu zavrtaču preizkusili insekticide na osnovi sledečih aktivnih snovi; triflumuron, teflubenzuron, tebufenozid, spinosad, metoksifenoizid, imidakloprid, acetamidprid, lufenuron, tiakloprid, tiametoksam, heksaflumuron, deltametrin. Poskusi so bili izvajani v nasadih jablan, kot tudi na izoliranih drevesih in samo proti prvi generaciji. Rezultati so pokazali, da enkratno škropljenje ni dovolj učinkovito, zaradi zelo dolgega obdobja leta metuljčkov prve generacije.

ABSTRACT

Experience with control of pear leaf blister moth (*Leucoptera scitella* Zell.) in apple orchards in northeastern region of Slovenia

During the period 2000 and 2002 we were precisely attending the appearance and development of pear leaf blister moth (*Leucoptera scitella* Zell.) in northeastern region of Slovenia. This species is economically most important pest which belong to the group of leafminer moths. In the above mentioned period we were testing the following insecticides based on active substances: triflumuron, teflubenzuron, tebufenozid, spinosad, metoksifenoizid, imidakloprid, acetamidprid, lufenuron, tiakloprid, tiametoksam, heksaflumuron, deltametrin. We did trials only against the first generation of pear leaf blister moth in apple orchards and on the isolated tress. Results showed that single spraying is not enough effective, because the first generation of pear leaf blister moth has a long flight period.



Škodljive vrste zavijačev v nasadih jablan in možnosti uspešnega zatiranja

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V severovzhodni Sloveniji lahko štejemo le sedem vrst zavijačev za bolj ali manj gospodarsko pomembne. Po pomenu in škodljivosti izstopa jabolčni zavijač, ki je zelo dobro prilagojen v našem okolju in je permanenten škodljivec jaboljk, hrušk, orehov in nekaterih drugih sadnih rastlin. Po gospodarskem pomenu lahko izstopajo še tri druge vrste zavijačev lupine sadja in sicer: sadni zavijač (*Adoxophyes reticulana* Hb., rjavi sadni lupinar (*Arhyps podana* Scop.) in pasasti sadni lupinar (*Pandemis heparana* Den.et. Schiff.). V ekstenzivno oskrbovanih nasadih se lahko včasih v močnejšem obsegu pojavljata rdeči in sivi brstni sukač (*Spilonota ocellana* F. in *Hedya nubiferana* Hw.) V zadnjih dveh – treh letih smo na plodovih jaboljk tudi opazili značilne poškodbe, ki jih pripisujemo gosencam breskovega zavijača (*Cydia molesta* Busck). Jabolčni zavijač (*Cydia pomonella*) povzroča v zadnjih letih sadjarjem obilo težav. Vzrokov za to je gotovo več. Ugodne vremenske razmere v zadnjem desetletju so prav gotovo vplivale na

povečanje populacije jabolčnega zavijača. Menimo, da je razloge za ponekod nezadovoljivo zatiranje jabolčnega zavijača iskati v popuščanju učinkovitosti nekaterih insekticidov, v pomanjkljivi aplikaciji, prenizkih odmerkih glede na habitus dreves in v nedoslednem redčenju plodov. V tem obdobju smo proti jabolčnemu zavijaču preizkusili insekticide na osnovi sledečih aktivnih snovi; teflubenzuron, tebufenozid, spinosad, metoksifenozid, lufenuron, tiakloprid, diazinon, klorpirifos etil, klorpirifos-metil, virus granulose in oksidemeton metil + beta ciflutrin. Rezultate biotičnega preizkušanja učinkovitosti prikazujemo v tem prispevku.

ABSTRACT

Harmful species of Tortricids in apple orchards and possibility to it successfully control

In northeastern region of Slovenia seven different sorts of Tortricids are important and known as having more or less important influence on the productivity. Among them the most important is Codling moth, who is well accomodated to the climate in the above mentioned area. It is known as a permanent pest of apples, pears, walnuts and some other fruit-trees.

Besides the Codling moth there are also three other noxious spieces Summer fruit tortrix, Fruit tree tortrix, Apple brown tortrix.

In insufficiently treated orchards Eye-spotted bud moth and Green budworm moth can be found. In last two or three years several damages made by Oriental fruit moth were found on apples.

Codling moth represents a cause of problems in many orchards in recent years. These problems are somehow due to weather conditions in the previous decade. But it is believed that the main reasons for the insufficient extermination of the Codling moth can be found in weakening effectiveness of some insecticides, deficient application, to low doses of insecticides according to tree habitat and in inconsequent attenuation of fruits.

In the period of our trials several insecticides based on different active substances were tested. These substances were: teflubenzuron, tebufenozid, spinosad, metoksifenozid, lufenuron, tiakloprid, diazinon, klorpirifos etil, klorpirifos-metil, granulose virus and oksidemeton metil + beta ciflutrin .The results of the biotical testings of sufficiency are shown in this article.



Ekonomičnost vzgoje matičnih dreves jablan in breskev v mrežnikih v Sloveniji

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Zdravstvena (fitosanitarna) kakovost sadik in razmnoževalnega blaga jablan in breskev v Sloveniji ni zadovoljiva glede na sodobne standarde o kakovosti sadik, ki so uveljavljeni v EU. Pridelava sadik je močno ogrožena zaradi možnosti okužb od številnih virusov, bakterij in fitoplazm (Plum pox virus, Apple proliferation phytoplasma, ESFY phytoplasma, ...). Če ne želimo postati preveč odvisni od uvoza sadilnega blaga iz drugih držav moramo izboljšati razmere za vzgojo matičnih dreves in za pridelavo certificiranih sadik. Ena od oblik za povečanje fitosanitarne kakovosti razmnoževalnega materiala sadnih rastlin je vzgoja matičnih rastlin v zavarovanem okolju. Ta sistem pridelovanja je običajno drag, vendar je sajenje okuženih sadik za sadjarje še dražje. V sestavku je predstavljena primerjava modelnih kalkulacij stroškov pridelave oces - cepičev jablan in breskev pri klasičnem pridelovanju v izoliranih matičnih nasadih in v matičnih nasadih vzgajanih v mrežnikih. Predstavljen je celoten pregled

stroškov pridelovanja in izračun lastne cene cepičev - očes pri pridelovanju v mrežnikih z različnimi konstrukcijskimi značilnostmi in iz različnih vgrajenih materialov.

ABSTRACT

The economics of growing the apple and peach mother plants (basic propagating stock) in protected-environment conditions (screen-houses) in Slovenia

The existing phytosanitary quality of Slovenian apple and peach planting and propagating material does not meet the requirements of the stricter EU standards - regulations. The production of apple and peach propagating and planting material is hindered by infections caused by important disease agents (Plum pox virus, Apple proliferation phytoplasma, ESFY phytoplasma, ...). If we want to avoid the dependence on the imports of planting material from other countries too much, we have to improve conditions for breeding of mother plants and production of certified planting material. One of the methods for improving phytosanitary quality of propagating plant material is growing it in protected environment conditions (i.e. in screen-house conditions), where insect vector intrusion is almost fully prevented. Usually such growing systems are expensive, but growing of plants of bad quality and infected with diseases is even more expensive for growers. In the article the comparison between model calculations for production of apple and peach propagating material in classical manner and in screen-house conditions is made. The detailed overview of production costs and prices for scions or buds produced in classical production system and by production in different types of screen-houses, constructed from different materials (frames from rustless metal, nets from PVC, roofs from PVC or fibreglass or polycarbonate, ...) is presented.



Laser (Spinosad A, D), biotični insekticid

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Laser je mešanica dveh sorodnih spinosinov (A in D), derivatov bakterije *Sacharopolyspora spinosa*. Laser predstavlja ekotoksikološko zelo ugoden pripravek, katerega je možno koristiti za različne namene – za zatiranje škodljivcev. V prispevku bodo na osnovi uradnih poskusov predstavljeni insekticidni učinki pripravka Laser.

ABSTRACT

Laser (Spinosad A, D), biological insecticide

Product Laser is a mixture of two related spinosins (A and D), derivatives of bacteria *Sacharopolyspora spinosa*. From the eco-toxicological point of view it is a very favourable formulation, which can be used for different purposes in the pest control. In the presentation will be introduced insecticide effect of the formulation Laser based on formal trials.



MOSPILAN – rezultati biotičnih preizkušanj in nova priporočila za uporabo

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Mospilan je insekticid iz kloronikotinilne skupine insekticidov. Osnovni proizvajalec je Nippon Soda CO. LTD. iz Japonske. V Sloveniji ga zastopa družba Agroruše d.o.o.. Aktivna snov v pripravku MOSPILAN je acetamiprid. Acetamiprid deluje podobno kot ostala sredstva iz kloronikotinilne skupine na širok spekter škodljivcev, ki se prehranjujejo na gojenih in drugih rastlinah z grizenjem in sesanjem. Ima odlično sistemsko razporeditev po rastlini. Na organizme deluje želodčno in kontaktno. Najnovejša preizkušanja na Kmetijskem zavodu Maribor, ki so bila opravljena v letu 2002 pa potrjujejo izkušnje iz prakse, da je Mospilan tudi v nižjih odmerkih zelo učinkovit. Na podlagi priporočil firme Nippon Soda in dobrih rezultatov biotičnih preizkušanj priporočamo nižje odmerke Mospilana 20 SP kot so bili registrirani do sedaj. Sredstvo za varstvo rastlin Mospilan se tako priporoča za zatiranje sadnega listnega duplinarja (*Leucoptera scitella*) v odmerku 0,4 kg/ha, za zatiranje jabolčne grizlice (*Hoplocampa testudinea*) v odmerku 0,4 kg/ha, za zatiranje listnih uši (*Aphididae*) v odmerku 0,25 - 0,4 kg/ha, za zatiranje hruševe bolšice (*Cacopsylla pyri*) v odmerku 0,6 kg/ha, ter proti koloradskemu hrošču (*Leptinotarsa decemlineata*) v odmerku 0,1 kg/ha.

ABSTRACT

MOSPILAN- results of biological testing and new recommendation of usage

Mospilan is an insecticide from a chloronicotinyl group of substances for plant protection. Its major producer is Nippon Soda CO. LTD. from Japan. In Slovenia it is represented by the Agroruše Company. The active substance in Mospilan is acetamiprid. Acetamiprid has a similar effect as other substances from the chloronicotinyl group. It effects a wide spectre of pest species that feed on cultivated plants and other plants with biting and sucking. It has great systemic disposal in plant. The target insect species is impacted through both ingestion and contact routes. The most recent tests which had been done by the Maribor Agriculture Institute in 2002 confirm the practical expertise that Mospilan is also very effective at lower rates of usage. On the basis of recommendations of the company Nippon Soda and positive results of biological testing we recommend lower rates of Mospilan 20 SP as they have been registered until now. Mospilan is recommended for suppressing the pear leaf miner (*Leucoptera scitella*) applied at rate 0,4 kg/ha, the apple sawfly (*Hoplocampa testudinea*) at rate 0,4 kg/ha, leaf aphids (*Aphididae*) at rate 0,25-0,4 kg/ha, the pear psylla (*Cacopsylla pyri*) at rate 0,6 kg/ha and Colorado potato beetle (*Leptinotarsa decemlineata*) at rate 0,1 kg/ha.



Stemini – bioregulatorji prihodnosti

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V prispevku je predstavljena paleta bioregulatorjev naravnega izvora (izvleček iz plevelne rastline navadni kokalj - *Agrostemma githago*), in sicer: frutastemin - sadje, vitastemin - vinska trta, zeastemin - kuzuza, tomatostemin - paradižnik, paprika, betastemin - sladkorna pesa,...

Izdelki so popolnoma nestrupeni in v 30-letni praksi niso pokazali nobenih negativnih učinkov na človeka, gojene rastline in ekosistem. Pokazali pa so pozitivne učinke na zaprašena semena, ki imajo boljšo začetno kalivost, in na tretirana tla, kjer se hranila spreminjajo v bolj dostopne oblike. Tretirane rastline so dale kvantitativno večji pridelek, bile so odpornejše na bolezni, pozebo, sušo, previsoko vlago (povodnji), hitreje so celile rane (toča, cepljenje,...) in so imele več suhe snovi v plodovih.

Za svoje odkritje je znanstvenica dr. Danica Gajić prejela zlato medaljo za življenjsko delo od Svetovne organizacije za intelektualno lastnino v Ženevi.

ABSTRACT

Stemins – bioregulators for the future

A group of natural bioregulators (extract from the weed plant *Agrostemma githago*) is presented: frutastemine – fruits, vitastemine – vine, zeastemine – maize, tomatostemine – tomato and pepper, betastemine – sugar beet,...

The substances are completely non-toxic. In the 30-years of practice they have not shown any negative effects on human, cultivated plants and ecosystem. But they have shown positive effects on dusty seeds, which germinate better when treated, as well as on treated soil, where nutrients are transformed into easier accessible forms. Treated plants gave higher yield, they were more resistant to diseases, frost damage, water shortage, excessive humidity; wounds caused by hail or grafting were healed sooner and they had more dry substance in fruits.

Scientist Dr. Danica Gajić was given a golden medal for her life long work by the World Organisation for Intellectual Property in Geneva.

Splošna sekcija

Predvidene klimatske spremembe v Sloveniji in njihov vpliv na rastlinske bolezni in škodljivce

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Meritve meteoroloških spremenljivk v zadnjih 50 letih kažejo na spremembe nekaterih klimatskih značilnosti našega planeta. Povprečna globalna temperatura na zemeljskem površju se je v 20. stoletju zvišala za 0.6 ± 0.2 °C. Tudi v Sloveniji se je povprečna temperatura zraka v zadnjih 50 letih dvignila za 1 ± 0.6 °C, bistvenih sprememb v letni količini padavin pa ni. Klimatski modeli napovedujejo v prihodnjih 50 letih, da se bo povprečna temperatura na zemeljskem površju dvignila za 0,8 do 2,6 °C, predvsem kot posledica naraščanja števila prebivalstva (od 8,4 do 11,3 milijarde) in človeških aktivnosti, ki spreminjajo transmisivne lastnosti atmosfere. Ogrevanje bo izrazitejše v hladni polovici leta in v severnih geografskih širinah. Količina padavin naj bi se globalno povečala, a ne v vseh regijah. Čeprav so dolgoročne klimatske napovedi še nezanesljive, še zlasti bodoči scenariji podnebja v regionalni prostorski skali, pa lahko predvidevamo, da bodo klimatske spremembe močno vplivale na rastlinske bolezni in škodljivce.

Zaradi milih zim bo prezimilo več škodljivcev, toplejše in bolj vlažno podnebje bo ugodnejše za rastlinske bolezni, kar bo vodilo k večji porabi sredstev za varstvo rastlin. Z naraščanjem temperatur se bo življenjska sposobnost nekaterih škodljivcev povečala, večje bo število letnih generacij in upravičeno pričakujemo pritisk do sedaj tipičnih predstavnikov emtomofavne toplejših območij proti krajem, kjer jih do sedaj ni bilo. Verjetni bodo tudi premiki insektov na višje ležeče predele (pašniki, travniki), kjer bo posredno večja škoda na krmnih rastlinah. Globalno ogrevanje bo pomembno vplivalo na parazitske glive, ki povzročajo rastlinske bolezni, in ki imajo vrstno specifično določene minimalne, optimalne in maksimalne vrednosti temperature zraka kot tudi vlažnosti za svoj razvoj. Višje dnevne temperature bodo ustrezale večini parazitskih gliv in podobno bo veljalo tudi za vlažnejše okolje, zato se največ bolezni pojavi v toplih, vlažnih dneh.

ABSTRACT

Pests and disease response to climate change in Slovenia

Increasing greenhouse gas concentrations in the atmosphere are expected to have significant impacts on the world's climate on a timescale of decades to centuries. Evidence from long-term monitoring studies is now accumulating and suggests that the climate of the past few decades is anomalous compared with past climate variation. Global mean surface temperatures have increased for more than 0.6°C since the late 19th century. The end of 20th century has been anomalously warm. In Slovenia average air temperature has increased by 1 ± 0.6 °C in the last 50 years. Climate models predict that the mean annual global surface temperature will increase 0,8–2,6°C by 2050, mainly due to human activity which is perturbing the Earth's energy balance by altering the properties of the atmosphere and the surface. Warming will be more pronounced during winter and at higher latitudes. All climate models predict an increase in global mean precipitation, but some regions might get drier. Forecasts of climate change are inevitably uncertain, especially multi decadal forecasts and regional climate change predictions.

Among biological consequences of global warming pest and diseases problems will certainly increase with climate change. Plant diseases are particularly sensitive to warmer and wetter weather conditions. As climate changes we can expect pest insects to expand their range and changing climate may also put organisms into contact with new, vulnerable hosts. Since

temperature directly affects many attributes of insect biology, population responses may vary dramatically in response to anticipated warmer climates. Shifts may favor more rapid developmental and growth rates, increased survival or higher fecundity. The change in temperature will have direct effects on insects by affecting their development, and also indirect effects via their host plants and natural enemies. Many species will extend their northern boundary, while southern boundaries would remain stable, thus, effectively expanding their range. In particular, rising temperatures will encourage the uphill spread of insects. Climate change could lead to an increasing need to use pesticides, with accompanying health risks and economic costs.



Vpliv predvidenih podnebnih sprememb na škodljivost tobakovega resarja (*Thrips tabaci* Lindeman, Thysanoptera, Thripidae)

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Pri dinamiki razvoja tobakovega resarja (*Thrips tabaci*) imajo pomembno vlogo predvsem temperaturne razmere, ki jih v modele razvoja navadno vključimo prek temperaturnih vsot. Temperaturne vsote se v kmetijstvu uporabljajo kot merilo za energijo, ki jo rastline in tudi njihovi škodljivci prejmejo v določenem obdobju. Predvidene podnebne spremembe bodo prek višjih temperatur zraka vplivale na število rodov tobakovega resarja in s tem zelo verjetno na njegovo škodljivost na gojenih rastlinah.

V prispevku smo za leti 1999 in 2000 za lokacijo Ljubljana ovrednotili uporabnost preprostega modela temperaturnih vsot za ocenjevanje (določanje) števila rodov tobakovega resarja. Osnovni podatki so bili rezultati monitoringa škodljivca s svetlo modrimi lepljivimi ploščami v nasadu čebule (*Allium cepa* L.) na Laboratorijskem polju Biotehniške fakultete v Ljubljani. Izdelane modele smo nato uporabili za ocenjevanje sprememb v številu rodov tobakovega resarja v spremenjenih podnebnih razmerah. Temperaturne razmere v 21. stoletju v Ljubljani smo ocenili s pomočjo projekcij simulacij treh različnih modelov splošne cirkulacije, ki vključujejo IPCC A2 in B2 scenarija emisij toplogrednih plinov in sulfatnih aerosolov v 21. stoletju. Zaradi predvidenega dviga temperatur zraka se bo razvojni krog škodljivca sklenil hitreje, takšne okoljske razmere pa bodo omogočile razvoj večjega števila rodov tobakovega resarja med rastno dobo.

ABSTRACT

The potential impact of climate change on harmfulness of onion thrips (*Thrips tabaci* Lindeman, Thysanoptera, Thripidae)

The development dynamics of onion thrips (*Thrips tabaci*) strongly depends on temperature conditions, which are usually represented in models as degree-days. In agriculture, degree-days are used as a measure of energy received by crops as well as their pests in a specific time period. Potential climate change will affect the temperature conditions and so the development

of onion thrips resulting in change in number of its generations and most probably on its harmfulness on cultivated plants.

In this paper, simple degree-days model for predicting the occurrence of onion thrips and the number of generations was tested with measurements for the years 1999 and 2000. Basic data present the results of onion thrips' monitoring in onion (*Allium cepa* L.) on the Laboratory field of the Biotechnical Faculty (Ljubljana) using the sticky boards of light blue colour. The same model was used for prediction of dynamics of onion thrips in climate change conditions. The temperature conditions in 21st for location Ljubljana were estimated on the base of three different general circulation models simulations that include IPCC A2 and B2 emission scenarios for greenhouse gasses and sulfate aerosols. The expected increase in temperature will result in faster development of onion thrips and so in more generations of onion thrips per year.



Vpliv načina gnojenja z mineralnimi gnojili na razvoj bolezni in napad škodljivcev jablane

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V nasadu jablan sort Idared in Zlati delišes smo tri leta proučevali vpliv načina gnojenja z mineralnim gnojilom (Polyfeed NPK 20/20/20 + mikro-hranila, Haifa chemicals LTD Izrael) na stopnjo okužbe jablan od jablanovega škrlupa (*Venturia inaequalis* (Cooke) Winter), jablanove pepelaste plesni (*Podosphaera leucotricha* (Ell. & Ev.) Salmon) in napada zelene jablanove uši (*Aphis pomi* de Geer), sadnega listnega duplinarja (*Leucoptera scitella* Zell.), jabolčne grizlice (*Hoplocampa testudinea* Klug.) in jabolčnega zavijača (*Laspeyresia pomonella* L.). Mineralno gnojilo raztopljeno v vodi smo nanašali na tla ob drevesih s škropilnico z uporabo ročnih škropilnih palic. Poskus je bil zasnovan kot poljski poskus z več dejavniki (faktorski poskus) v naključnih blokih. Skupni hektarski odmerek proučevanega gnojila letno je znašal 300, 1200 ali 2400 kg na hektar. Skupno porabljeno količino gnojila letno smo aplicirali v dveh, treh ali štiri enako velikih obrokah. Povečevanje skupnega odmerka apliciranega gnojila je v dveh od treh proučevanih let povzročilo značilno povečanje okužbe od škrlupa in pepelaste plesni ter povečan napad od zelene jablanove uši in sadnega listnega duplinarja. Na napad plodov od jabolčne grizlice in jabolčnega zavijača skupni odmerek gnojila ni imel značilnega vpliva. Število aplikacij mineralnega gnojila ni imelo značilnega vpliva na razvoj proučevanih bolezni in škodljivcev jablan.

ABSTRACT

The impact of fertilisation with mineral fertilisers on development of some apple diseases and pests

The influence of amount and time of placement of mineral fertiliser (Polyfeed NPK 20/20/20 + micro-nutrients, Haifa chemicals LTD Israel) on development of pests and diseases on Idared and Golden Delicious apple trees was investigated in a three-year study. The following diseases and pests were studied: apple scab (*Venturia inaequalis* (Cooke) Winter), apple powdery mildew (*Podosphaera leucotricha* (Ell. & Ev.) Salmon), green apple aphid (*Aphis pomi* de Geer), blister moth leafminer (*Leucoptera scitella* Zell.), apple sawfly (*Hoplocampa testudinea* Klug.) and codling moth (*Laspeyresia pomonella* L.). The field experiment was organised in factorial randomised complete block design. Three rates of studied fertiliser were

tested, i.e., 300, 1200 and 2400 kg per hectare yearly. The fertiliser was applied as aqueous solution by spraying on soil surface near the trees in two, three or four equal amounts. The amount of applied fertiliser had a significant impact on the rate of scab (leaves and fruit) and mildew (leaves) infection in two of three years. The same effect was noticed in case of attack of green apple aphid and blister moth. The attack of apple codling moth and sawfly on apple fruit was not influenced significantly by different fertiliser rates. The number of fertiliser applications (time of placement) did not significantly affect the infection or attack rates of diseases and pests.



Vpliv dolžine presledkov med škropljenji na učinkovitost varstva jablan pred boleznimi in škodljivci pri uporabi zmanjšanih odmerkov pripravkov

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V triletnem poljskem poskusu na jablanah sorte Braeburn smo proučevali vpliv presledkov med škropljenji in zmanjševanja odmerkov pripravkov na razvoj jablanovega škrlupa (*Venturia inaequalis* (Cooke) Winter), jablanove pepelaste plesni (*Podosphaera leucotricha* (Ell. & Ev.) Salmon), zelene jablanove uši (*Aphis pomi* de Geer), sadnega listnega duplinarja (*Leucoptera scitella* Zell.), jabolčne grizlice (*Hoplocampa testudinea* Klug.) in jabolčnega zavijača (*Laspeyresia pomonella* L.). V poskusu zasnovanem v faktorski bločni zasnovi smo proučevali naslednje dejavnike: odmerek pripravka (90% in 60% odmerka od predpisanih odmerkov), presledke med škropljenji (7 dni (20 škropljenj letno), 14 dni (10 škropljenj letno)) in tip pripravka po načinu delovanja (kontaktno delovanje / sistemsko delovanje). Testirali smo 8 škropilnih programov. Štirje programi so temeljili na uporabi kontaktnih fungicidov in insekticidov (kaptan, mankozeb, ditianon, žveplo, dinokap, diklofluanid, diazinon, fosalon, klorpirifos-metil, deltametrin), štirje pa na podlagi sistemskih fungicidov in insekticidov (miklobutanil, penkonazol, difenkonazol, krezoksim-metil, trifloksistrobin, imidakloprid, tiakloprid, tiametoksam, dimetoat). Pri vsaki od obeh skupin programov smo uporabljali 90% ali 60% odmerka pripravkov v 7 ali 14 dnevni presledkih. Zmanjševanje odmerkov pripravkov je v vseh letih pri vseh proučevanih boleznih in škodljivcih povzročilo značilno povečano okužbo oz. napad od le teh. Zmanjšanje stopnje učinkovitosti pripravkov zaradi podaljšanja presledkov iz 7 dni na 14 dni je bilo v večini primerov značilno večje pri kontaktnih, kot pa pri sistemskih pripravkih. Zmanjšanje odmerka iz 90% na 60% je v večini primerov povzročilo večje zmanjšanje učinkovitosti delovanja pri 14 dnevni presledkih, kot pri 7 dnevni presledkih. V nekaterih primerih smo pri uporabi 30% odmerkov v 7 dnevni presledkih dosegli podobno učinkovitost, kot pri uporabi 90% odmerkov v 14 dnevni presledkih. To kaže, da bi bilo možno nekoliko zmanjšati odmerke pripravkov (približno za 20%), če bi značilno povečali število škropljenj. Zaradi neugodnega razmerja med stroški za pripravke in stroški aplikacije pripravkov, takšni škropilni programi verjetno ne bi omogočili ekonomskih prihrankov pri varstvu jablan pred škodljivci in boleznimi, prispevali pa bi k zmanjševanju vnosa pesticidov v okolje.

ABSTRACT

The impact of spraying interval length on development of apple diseases and pests in conditions of protection with reduced dosages of pesticides

A three year field trial on Braeburn apples was carried out to study the impact of spraying interval length and pesticide rate reduction on development of apple scab (*Venturia inaequalis* (Cooke) Winter), apple powdery mildew (*Podospahera leucotricha* (Ell. & Ev.) Salmon), green apple aphid (*Aphis pomi* de Geer), blister moth leafminer (*Leucoptera scitella* Zell.), apple sawfly (*Hoplocampa testudinea* Klug.) and codling moth (*Laspeyresia pomonella* L.). The trial was organised in factorial randomised block design, with three factors studied. First being pesticide rate (90% or 60% rate of recommended rates), second the length of spraying interval (7 day interval – 20 sprayings a year, 14 day interval – 10 sprayings a year) and the third type of pesticide according to the mode of action (protectant / systemic – curative). Eight spray programs were tested. Four protectant programs were based on the use of protective pesticide substances (captan, mancozeb, dithianon, sulphur, dinocap, dichlofluand, diazinon, phosalon, chlorpyrifos-methyl, deltamethrin) and four after-infection spray programs were based on systemic curative substances (myclobutanil, penconazole, difenconazole, kresoxim-methyl, trifloxystrobin, imidacloprid, thiocloprid, thiametoxam, dimethoate). In both groups of programs 90% and 60% pesticide rates were used in 7 or 14-day intervals. The reduction of pesticide rates caused the significant increase in disease infection rate and pest attack rate at all studied diseases and pests. The reduction of pesticide efficiency because of prolongation of spray intervals from 7 day to 14-day intervals was in most cases significantly greater in protectant pesticide formulations than in systemic formulations. The reduction of pesticide rate from 90% to 60% rate lead to greater efficiency reduction in case of 14-day spraying program than in 7-day spraying program. In some cases the established efficiency at 30% rate of pesticides sprayed in 7-day intervals was similar to the efficiency established at 90% rates of pesticides sprayed in 14-day intervals. Our assumption therefore is that sometimes pesticide rates can be reduced for approximately 20% if we shorten spray intervals significantly. Because of permanent unfavourable relations between costs for pesticides and costs for their application, the spraying systems with application of low rates of pesticides in very short intervals probably will not lead to economic benefit, but such an approach could contribute to the reduction of pesticide flow into the environment.



Jablanov škrlup: bibliometrična analiza - prekrivanje zbirk in osrednje revije

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Jablanov škrlup, ki ga povzroča gliva *Venturia inaequalis*, velja za najpomembnejšo bolezen jablan, varstvo pa zahteva intenzivno rabo fungicidov. V prispevku je analizirana literatura s tega področja, ki je bibliometrično ovrednotena na podlagi obsega, rasti in vključevanja relevantnih podatkov v revije, bibliografske podatkovne zbirke, in nekatere zbirke s polnimi besedili. V analizo prekrivanja je vključenih pet bibliografskih podatkovnih zbirk: AGRIS, AGRICOLA, CAB, SCISEARCH in Biological Abstracts (BIOSIS), ki so bile izbrane glede na vključenost relevantnih dokumentov. Rezultati kažejo, da se zbirke med seboj precej prekrivajo, večino relevantnih dokumentov pa najdemo že v zbirkah AGRIS in CAB. S pomočjo Jaccardovega in ekvivalenčnega koeficienta smo ugotavljali tudi trend prekrivanja med zbirkama. Članki so po

revijah razporejeni v skladu z Bradfordovim zakonom, po katerem je glavnino relevantnih informacij mogoče najti že v nekaj virih. Tretjino vseh relevantnih člankov vključuje že 5% analiziranih revij.

ABSTRACT

Apple scab: a bibliometric analysis - database overlap and core journals

Apple scab, caused by the fungal pathogen *Venturia inaequalis*, is considered to be the most important disease of apple worldwide. Its control requires intensive use of fungicides. In the paper apple scab-related publishing was bibliometrically evaluated with the view of growth, quantity and coverage of relevant information in periodicals, bibliographic databases, and some full-text databases. Five bibliographic databases (AGRIS, AGRICOLA, CAB, SCISEARCH and Biological Abstracts (BIOSIS)) were examined with regard to inclusion of scab-relevant documents. The results show high overlapping, however, the majority of scab-related documents can be found in two databases: AGRIS and CAB. Trend of overlapping was analyzed with Jaccard's and Equivalence index. Scatter of journal-articles is in accordance with Bradford's bibliometric law, and shows that 5% of all journals account for a third of all relevant articles.



Nadgradnja in prenovljene vsebine informacijskega sistema za varstvo rastlin Fito-info

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Od svojih začetkov, v letu 1997, slovenski informacijski sistem za varstvo rastlin – Fito-info nenehno doživlja vsebinske spremembe, predvsem zaradi povečevanja njegovega obsega. V prvi fazi je vseboval le podatke o registriranih fitofarmacevtskih sredstvih (FFS), seznam trgovin, kjer se prodajajo in nekaj osnovne zakonodaje. Kasneje so bile dodane še informacije o toksikologiji FFS, opisi in slike škodljivih organizmov, začeli smo tudi s poskusno objavo prognostičnih obvestil Opazovalno-napovedovalne službe za varstvo rastlin Slovenije. V zadnjem letu dni pa Fito-info doživlja popolno vsebinsko prenovo in precejšnjo nadgradnjo sistema z novimi informacijami. V letu 2002 je tako zaživel modul za objavo prognostičnih obvestil in elektronsko obveščanje naročenih uporabnikov prek elektronske pošte in kratkih SMS sporočil. V tem letu smo sistemu dodali še obsežen šifrant organizmov, imenovan Cirsium, ki vsebuje sistematiko organizmov, domača imena v različnih jezikih, slike, opise organizmov, in povezave na podsisteme, ki jih obsega Cirsium, kot je sortna lista, seznam FFS, seznam zakonodaje, karte razširjenosti organizmov ipd. Šifrant organizmov obsega podatke za okrog 200.000 različnih taksonov in okrog 130.000 domačih imen organizmov, od katerih jih je nekaj manj kot desetina slovenskih in več kot 3000 fotografij. Zadnja dva modula sta zasnovana kot relacijski podatkovni bazi na SQL strežniku, internet aplikacije pa so razvite na osnovi IIS in dinamičnih ASP strani. V zadnjem času smo začeli s preoblikovanjem preostalega dela sistema iz statičnih html dokumentov v relacijsko podatkovno bazo, ki bo omogočala sprotno ažurnost sistema ob vsaki vneseni spremembi v sistem. Razvoj sistema finančno in strokovno podpira

Uprava RS za varstvo rastlin in semenarstvo, razvoj pa poteka v sodelovanju z več raziskovalnimi institucijami.

ABSTRACT

Upgrade and new issues of Fito-info - Slovenian information system for plant protection

From the first beginning in the year 1997, Slovenian information system for plant protection – Fito-info has been continually changing in his issues, mostly because of upgrading with new topics. In the first phase it consisted only from of data about the registered pesticides, list of stores where they are sold and some basic data about the legislation on the field of plant protection. Later the information about the toxicology of active ingredients and pesticides, systematic, description and images of harmful organisms where added in the system too. We also started with the publishing of information, which were issued by the Warning and forecasting service of Slovenia. In the last year Fito-info was redesigned and upgraded with many new information. In the year 2002 the information systems for prognosis and control measures against several diseases and pests were added. This is an automatic module, updated from official institutions in Slovenia, which are authorised for issuing official information on prognosis and control measures against harmful organisms. Information's are in the real time available on the Internet page of Fito-info, and sent to the farmers or specialists via e-mail or SMS messages to the mobile phones. In the same year we started the development of a new application called Cirsium, which contains information on living organisms (systematic, common names in different languages, images, description of organisms, connections to other modules, which are related to the organism e.g. registered cultivars, pesticides, legislation, distribution maps etc.). At the present this module contains more than 200,000 Latin names of taxa, more than 130,000 common names of taxa from which one tenth are Slovenian, and more than 3,000 images. Last two modules are designed as relational databases on SQL server; Internet interfaces are developed in IIS and dynamic active server pages (ASP). Recently the redesigning of the system from html documents to the relational database have begun, which enables real time updating of the system from authorised users. Development of the system is financially and professionally supported by the Administration for Plant Protection and Seeds and is a result of cooperation of several research institutions.



Šifrant organizmov in njegova uporaba v informacijskih sistemih

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Šifrant organizmov je relacijska podatkovna baza, ki vsebuje standardizirane podatke o živih organizmih, vključno z latinskimi in domačimi imeni v različnih jezikih, njihovo sistematiko, slikami, opisi, terenskimi podatki in razprostranjenostjo v Sloveniji. Na hierarhično urejeno sistematiko so vezani še podatki o fitofarmaceutskih sredstvih vezanimi na organizme, o sortni listi, registru semenskega materiala, z laboratorijskimi analizami in zakonodajo, ki se sklicuje na organizme, z uporabno vrednostjo organizmov, o pojavljanju organizma v literaturi ipd. Vanj so vključena latinska in domača imena iz različnih nomenklaturnih virov in seznamov: Bayerjev

šifrant organizmov, ITIS-ov seznam organizmov, Mala flora Slovenije, Flora Europaea, Register Flore Slovenije, Lepidoptera Europae, Phanart, veliko je tudi originalnega dela različnih specialistov. Vsi sezname in nomenklturni viri so medsebojno povezani, tako da omogočajo vnos in izpis podatkov po različnih nomenklturnih virih. Tako je mogoče slediti originalno vnesene zapise in jih s pomočjo povezanih različnih nomenklturnih virov izpisati na želeni nomenklturni vir. Zaradi hierarhične urejenosti je mogoče prikazati uvrstitev vsakega taksona v sistem in sumarne podatke na različnih ravneh (na ravni rodu, družine, razreda). Urejen in vzdrževan šifrant služi kot pripomoček za vnos imen organizmov, pretvarjanje manj ustreznih poimenovanj (sinonimov) v potrjena imena in vključevanje podatkov o organizmih v analize in izpise. Šifrant organizmov je v letu 2002 postal standard za uporabo znotraj Ministrstva za kmetijstvo, gozdarstvo in prehrano in bo postopoma vgrajen v vse aplikacije, kjer so organizmi del informacijskih sistemov. V uporabi je tudi v informacijskih sistemih več raziskovalnih institucij, ki uporabljajo aplikacije Flovegsi in Cirsium.

ABSTRACT

Species list and its application in the information systems

Species list adopted for use in information systems is organized as relational database, which includes standardized organisms data, including scientific Latin names and common names in different languages, systematic, images, descriptions, usefulness, references, field data and distribution data in Slovenia. Hierarchically organized species list is used for maintaining Variety list, Pesticide list, Seeding material registry, laboratory analyses of pests and diseases and legislation that include organism names. Species list is compiled from different sources: Bayer species list, IT IS database, Mala flora Slovenije, Flora Europaea, Registry of Slovene flora, Lepidoptera Europae, Phanart. Different taxonomical specialists prepared particular part of the species list. All mentioned name sources are relational linked. Therefore it's possible to enter, display and output species names in various nomenclature sources. Organization of species list enables to get systematic for each species and to get summarized data on different taxonomical levels (for genus, family, class...). Maintained species list is helpful tool for entering species data, translating synonyms to valid species names, outputting data in different nomenclature sources, and for including species names and data in different analyses and outputs. Species list has become official list of organisms for use on Ministry of agriculture, forestry and food in year 2002. Gradually it is going to be incorporated in all information systems, in which organisms appear. It is also used at the research institutions that are using Cirsium and FloVegSi program packages.



Mejni prehodi za fitosanitarne inšpekcijske preglede po vstopu v Evropsko unijo

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Z vstopom Republike Slovenije v Evropsko unijo leta 2004, bodo cestni mejni prehodi Obrežje, Jelšane in Gruškovje, Letališče Ljubljana-Brnik, Luka Koper in železniški mejni prehod Dobova postali vstopna inšpekcijska mesta iz t.i. tretjih držav v Evropsko unijo.

Znotraj Evropske unije velja prost pretok blaga s sistemom rastlinskih potnih listov zato je učinkovit fitosanitarni nadzor na zunanjih mejah izjemno pomemben. Fitosanitarni nadzor poteka v skladu z določbami direktive 2000/29/EC. Z direktivo 98/22/EC iz leta 1998 so bili uzakonjeni minimalni pogoji za izvajanje fitosanitarnega nadzora na inšpekcijskih vstopnih mestih iz tretjih držav.

Fitosanitarni nadzor pošiljk rastlin ob uvozu v Republiko Slovenijo je bil primerljiv z inšpekcijskimi postopki, ki se izvajajo v Evropski uniji, že od leta 1994. S številnimi dejavnostmi v zadnjih petih letih je bil nadzor izpopolnjen v smislu določb zakonodaje Evropske unije, ni pa še končana izgradnja novih vstopnih inšpekcijskih mest.

Večina sedanjih mejnih prehodov z državami Evropske unije je tehnično ustreznih. Slabše so razmere na mejnih prehodih z Republiko Hrvaško, ki so bila kot mejna inšpekcijska mesta določena takoj po osamosvojitvi Slovenije in kjer se razmere v zadnjih desetih letih niso bistveno izboljšale. Dejavnosti za izgradnjo novih mejnih prehodov potekajo od leta 1998. Leta 2001 je Vlada Republike Slovenije sprejela dodatne sklepe in določila Servis skupnih služb vlade RS za koordinatorja in glavnega investitorja izgradnje vstopnih inšpekcijskih mest tako za fitosanitarne kot veterinarske in zdravstvene inšpekcije.

ABSTRACT

Border crossings designated for phytosanitary inspection control after accession to European union

With the accession of the Republic of Slovenia to the European Union in 2004, Obrežje, Jelšane and Gruškovje road border crossings, Ljubljana-Brnik Airport, the Port of Koper, and Dobova railway border crossing will become border inspection points of entry to the European Union for third countries.

Due to the fact that a free flow of goods that relies on plant passports is in use within the European Union, effective phytosanitary control on external borders of the European Union is extremely important. This control is implemented in compliance with the provisions of Directive 2000/29/EC. Directive 98/22/EC of 1998 established the minimum statutory conditions for the implementation of phytosanitary control at border inspection points of entry for third countries.

The phytosanitary control of plant consignments on their import to the Republic of Slovenia that has been in operation since 1994, is comparable to EU inspection procedures. Numerous activities within the last five years have upgraded this control in line with the provisions of the *acquis communautaire*, although the construction of new border inspection points has not yet been completed.

Most of the existing border crossings with the European Union are technically adequate. The situation is worse at the border crossings with the Republic of Croatia, which were set up as

border inspection points soon after Slovenia gained independence, and their state has not changed much during the last ten years. Preliminary activities for the construction of new border crossings have been in progress since 1998. In 2001, the Government of the Republic of Slovenia adopted additional decisions and appointed the Joint Services of the Government as co-ordinator and main investor in the construction of border inspection points for phytosanitary, veterinary as well as health inspection.



Najpomembnejše bolezni in škodljivci kmetijskih rastlin v Bosni in Hercegovini

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Med patogeni, ki povzročajo zelo resne bolezni kmetijskih rastlin v Bosni in Hercegovini so: *Fusarium* spp. (fuzarioze), *Phytophthora* spp., *Puccinia* spp. (rje), *Erysiphe* spp. (pepelovke), virusne bolezni krompirja in koščičarjev, *Erwinia amylovora* (hrušev ožig).

Najpomembnejši škodljivci so: *Diabrotica virgifera virgifera* (koruzni hrošč), *Ostrinia nubilalis* (koruzna vešča), *Leptinotarsa decemlineata* (koloradski hrošč), *Haplocampa flava* in *H. minuta*, *Tortrix* spp. (zavijači), Aphididae (listne uši), *Frankliniella occidentalis* (cvetlični resar), *Psilla* spp.

V prispevku so opisani najpomembnejši stadiji bolezni in razvojni krogi škodljivcev, prognoza ter varstveni ukrepi proti določenim škodljivcem in povzročiteljem bolezni. Predstavljena je organizacija Službe za varstvo rastlin v BiH.

ABSTRACT

The most important diseases and pests of the agricultural plants in Bosnia and Herzegovina

Among pathogens that cause very serious diseases on the agricultural plants in Bosnia and Herzegovina are the following: *Fusarium* spp. (*Fusarium* diseases), *Phytophthora* spp. (*Phytophthora* diseases), *Puccinia* spp. (rust diseases), *Erysiphae* spp. (Powdery mildew diseases), virus diseases on potato and stone fruits, *Erwinia amylovora* (fire blight of pears and apples).

The most important pests are: *Diabrotica virgifera virgifera*, *Ostrinia nubilalis*, *Leptinotarsa decemlineata*, *Hoplocampa flava* and *H. minuta*, *Tortrix* spp., Aphididae, *Frankliniella occidentalis*, *Psilla* spp.

In the paper for particular pathogens and pests the most important part of the diseases and life cycles, forecasting and control measures were considered.

The structural organization of the Plant Protection Services in B&H has been presented.



Škodljivi organizmi v parkih in drevoredih v Novem Sadu

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V letih 2001 in 2002 smo v parkih in drevoredih v Novem Sadu med rastno dobo opazili veliko škodljivih organizmov. Škoda, ki jo povzročajo je lahko neposredna, s tem ko ovirajo življenjske procese v rastlinah in njihov razvoj in posredna, ker zmanjšajo estetsko vrednost zelenja. Prispevek obravnava najpomembnejše škodljive organizme na tistih rastlinskih vrstah, ki so v parkih in drevoredih največkrat zastopane in ukrepe za njihovo zatiranje. Posamezne škodljivce smo najpogosteje determinirali *in situ*, ko pa to ni bilo mogoče, smo vzorce pregledali in škodljive organizme determinirali v laboratoriju.

Med škodljivci so prevladovale sesajoče žuželke iz družin Aphididae, Acarinae, Cicadidae, Coccidae in Eryophidae, kostanjev listni zavrtač (*Cameraria ohridella*) in platanov listni zavrtač (*Litocolletis platani*), medtem ko so bile druge vrste zastopane manj številno.

Poleg škodljivcev rastline okužujejo tudi bolezni. Velik problem na platani povzročajo: gliva *Apiognomonina veneta*, listna sušica divjega kostanja (*Guignardia aesculi*), gliva *Dothistroma pini* na boru, javorova pepelovka (*Uncinula aceris*), hrastova pepelovka (*Microsphaera alphitoides*), mahonijina pepelovka (*Microsphaera berberidis*), brezova pepelovka in pepelovka na turški leski (*Phyllactinia corylea*).

Našteti škodljivi organizmi poškodujejo listno tkivo in tako zmanjšajo asimilacijsko površino, kar povzroči nižji prirast, zmanjšajo estetsko vrednost okrasnega zelenja in pogosto povzročijo odmiranje dreves.

Ukrepi za zatiranje škodljivih organizmov so dali zadovoljive rezultate. Številčne populacije različnih škodljivcev v Novem Sadu so se zmanjšale do te mere, da ne povzročajo več znatne škode, tako da se drevje in okrasno grmičevje lahko razmeroma normalno razvija.

ABSTRACT

Harmful organisms in parks and tree rows of Novi Sad

A great number of harmful organisms were observed during the vegetation growth periods in 2001 and 2002 in Novi Sad parks and tree rows. They were harmful to various extents, both directly reducing life processes and normal development, and indirectly affecting the aesthetic appearance of urban greenery.

This paper surveys the most significant harmful organisms of the plant species most represented in our parks and tree rows, as well as the control measures aiming at the suppression of harmful organisms

Individual harmful organisms were most often determined *in situ*, but when it was not possible, the samples were taken for laboratory analysis, where the necessary procedure for determination was carried out.

The dominant harmful insects were sucking insects and in the fam. Aphididae, Acarinae, Cicadidae, Coccidae and Eryophidae, leaf miners on horse chestnut (*Cameraria ohridella*) and plane (*Litocolletis platani*), whereas other species were less represented.

In addition to insects, the leaves of trees and shrubs were infected by leaf diseases. It is significant that a great problem on the plane leaves is caused by the fungus *Apiognomonina venete*, fungus *Guignardia aesculi* on horse chestnut, fungus *Dothistroma pini* on Austrian pine, as well as agents of mildew on maples (*Uncinula aceris*), oak (*Microsphaera alphitoides*), mahonia (*Microsphaera berberidis*), birch and Turkish hazel (*Phyllactinia corylea*).

The above harmful organisms by their presence damage the leaf tissue, and thus reduce the assimilation area causing lower increment, impair aesthetic appearance and often lead to tree dying.

The measures undertaken to protect urban greenery produced satisfactory results. This can be concluded from the fact that high populations of many harmful organisms present in Novi Sad have been reduced to a lower level, at which they do not cause any significant damage, and in this way a relatively normal development of trees and shrubs is made possible.

Entomologija in nematologija

Škodljivost, bionomija in variabilnost trtne uši (*Dactulosphaira vitifoliae* Fitch) ter varstvo vinske trte pred tem škodljivcem

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Trsi, ki jih napade trtna uš slabo rastejo, dajejo manjši pridelek in nazadnje odmrejo. Poškodbe trtne uši so posledica hranjenja na koreninah in so vidne na celicah, koreninah, sistemsko na celotnih trsih, v rodnosti vinograda in njegovi vitalnosti. Naša opazovanja kažejo, da so na trsih škodljive tudi različno virulentne glive, ki naselijo poškodovane korenine. Tudi šiške, ki se oblikujejo na listih, so poškodba. Spremlja jih manjša rast poganjkov na podlagah, kar predstavlja gospodarski problem v matičnjakih, kjer pridelujejo podlage. Opažamo tudi pojav trtne uši na listih *Vitis vinifera*, kar pa je manj pogosto in zazdaj ne povzroča škode na trsih ali zmanjšanega pridelka.

Razvoj in uspešnost trtne uši je odvisen od tipa tal, kakovosti korenin in temperature v tleh. Razlike so v stopnji odpornosti ali občutljivosti sort, mikrobiotični aktivnosti v tleh in v genotipih trtne uši. Čeprav lahko virulentnost trtne uši demonstriramo v laboratoriju, so rezultati različne virulentnosti v poljskih poskusih, ki so vidni kot poškodbe, lahko opazni le na podlagah z nizko odpornostjo. Pri zelo odpornih podlagah so poškodbe lahko omejene na mlade (lasaste) korenine (nodozitate).

Varstvo pred trtno ušjo je lahko preventivno (karantenski ukrepi) ali aktivno, ko se trtna uš prvič pojavi na listih (kemično varstvo). Najboljša rešitev pa je ponovna zasaditev z visoko odpornimi podlagami. Raziskave interakcij med trtno ušjo in fakultativnimi patogeni z razmerami v tleh in fiziologijo vinske trte bodo pomagale zapolniti vrzeli v znanju in se tako izogniti potencialnim dolgoročnim problemom s podlagami.

ABSTRACT

Grape phylloxera damage, ecology, variability and management

Vines damaged by grape phylloxera grow and yield poorly, and eventually die. Grape phylloxera damage to vines as a result of the root feeding can be seen on cells, on whole roots, systemically on whole vines, and at the vineyard level on field productivity and vineyard survival. Our evidence suggests that damage is caused by attack of wounded roots by a number of facultative fungal pathogen species of varying virulence.

Leaf galls are also a form of damage. Leaf galls have been associated with decreased shoot growth of rootstocks and this is an economic problem for rootstock mother block production. Phylloxera feeding on *V. vinifera* leaves is beginning to be seen but is not common and has not yet been strongly associated with vine damage or depressed yield.

Developmental rate and success of grape phylloxera depend on the nature of the soil, qualities of roots, and temperature. Variability of the system can be seen in the vine (varying level of resistance and susceptibility of cultivars, stress), soil microbial ecology, and phylloxera genotypes. Though differences in grape phylloxera virulence can be demonstrated in the laboratory, field evidence of differences in virulence that result in vine damage can only be seen

with weakly resistant rootstocks. Evidence with strongly resistant rootstocks may be restricted to phylloxera on immature roots (nodosities).

Management can be preventive (quarantine), active, when phylloxera first arrives or presents itself on leaves (chemical control), but the best solution is replanting with highly phylloxera-resistant rootstocks. Research on interactions of phylloxera and the facultative pathogens with soil ecology and vine physiology will help fill in our knowledge gaps and avoid the potential of long-term problems with rootstocks.

Gospodarsko pomembne vrste resarjev (Thysanoptera) v Sloveniji in ZR Jugoslaviji

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Prispevek prikazuje dosedanja dognanja o razširjenosti gospodarsko pomembnih vrst resarjev (Thysanoptera) (fitofagov in vektorjev virusov, oprashačev, predatorjev) v Sloveniji in ZR Jugoslaviji. V delu obravnavamo poškodbe resarjev na različnih gojenih rastlinah in razpravljamo o vzrokih, ki so vplivali na današnji pomen 20 vrst resarjev v obeh državah. Glede na njihove najpomembnejše gostitelje smo obravnavane vrste razdelili v sedem skupin: škodljivci vrtnin na prostem, škodljivci vrtnin in okrasnih rastlin v zavarovanih prostorih, škodljivci okrasnih rastlin na prostem, škodljivci žit, škodljivci metuljnic, izraziti polifagi in predstavniki posebne skupine, kamor smo uvrstili resarje, ki so bili doslej najdeni le v eni od obeh držav.

ABSTRACT

Ekonomski značajne vrste tripsa u Sloveniji i FR Jugoslaviji

U radu su prikazani rezultati dosadašnjih istraživanja rasprostranjenja 20 ekonomski značajnih vrsta tripsa (fitofagnih vrsta, vektora virusa, oprashača, predatora) u Sloveniji i FR Jugoslaviji. Takodje su predstavljene štete koje prouzrokuju ovi tripsi na raznim biljkama hraniteljicama. Kada se uzmu u obzir najvažniji domaćini navedenih ekonomski značajnih vrsta formirano je sedam grupa štetočina: štetni tripsi na povrću napolju, štetni tripsi na povrću i ukrasnim biljkama u zatvorenom prostoru, štetni tripsi na ukrasnim biljkama napolju, štetni tripsi žita, štetni tripsi na biljkama fam. Fabaceae, štetni tripsi - izraziti polifagi i ekonomski značajne vrste tripsa nadjene u jednoj ili drugoj državi.

ABSTRACT

Economically important Thysanoptera species in Slovenia and FR Yugoslavia

The article presents so far existing results about geographical distribution of economically important Thysanoptera species (phytophagous thrips, virus vectors, pollinators, predators) in Slovenia and FR Yugoslavia. Damage caused by thrips' feeding on different host plants are presented as well as the reasons that influenced on the present importance of 20 Thysanoptera species in both countries are discussed. Taking into account the most important hosts of treated thrips species, seven groups are formed: the pests of outdoor growing vegetables, the pests of vegetables and ornamentals in greenhouses, the pests of outdoor growing ornamentals, cereal pests, the pests of Fabaceae, the polyphagous species, and the members of extra group that is made up of the species which are so far found only in one of both countries.



Nove vrste listnih zavrtačev v Sloveniji

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V obdobju zadnjih dveh let smo v Sloveniji našli novi vrsti listnih zavrtačev iz reda metuljev. Zaradi povečanega uvoza okrasnih rastlin v zadnjih letih so se povečale tudi možnosti za vnos novih škodljivcev, kar je bil najverjetnejši vzrok za intercepcijo omenjenih vrst. *Argyresthia trifasciata* Staudinger, 1871 je bila opisana iz Švice, vendar je njen pravi izvor še vedno nejasen. V osemdesetih letih se je s trgovanjem okrasnih rastlin razširila v več evropskih držav in po severni hemisferi ter postala gospodarsko pomembna vrsta. Kot škodljivca jo omenjajo na različnih vrstah *Juniperus* sp., *Thuja* sp., *Chamaecyparis* sp. in *Cupressopyaris leylandii*. V Sloveniji smo jo našli 9. maja 1998, v Gančanih v Prekmurju. Osebek, ujet na svetlobno vabo, smo določili šele to zimo. Vrsto smo našli v naselju, kjer ni drevesnic, kar kaže, da se je vrsta tukaj že ustalila. *Caloptilia azaleella* (Brants, 1913) najverjetneje izvira iz Japonske, čeprav je opisana z Nizozemske. Znana je kot škodljivec na različnih vrstah azalej - slečev (*Rhododendron* sp.). S povečanim trgovanjem s sleči se je razširila v mnoge evropske države, v vzhodni Aziji in Severni Ameriki. V Sloveniji smo jo prvič našli v drevesnici na Viču v Ljubljani v letu 2001 na slečih, ki so bili prejšnje leto uvoženi iz Nemčije. Metuljčke smo nabrali, ko so se izlegli iz napadenih rastlin, v času od 17. aprila do 10. maja 2001. Škoda, ki jo vrsti povzročata niti ni tako pomembna kot ekonomska škoda, ki nastane zaradi zmanjšane prodaje. Težko je namreč prodajati napadene rastline, še posebno zunaj državnih meja, čeprav omenjeni vrsti nista uvrščeni med karantenske. Pri nas se obe vrsti lahko razmnožujeta v naravnih razmerah, zato pričakujemo, da se bosta pri nas še širili.

ABSTRACT

New leaf miner species established in Slovenia

Two new species of leaf miners from the group of Lepidoptera were newly found in Slovenia. Both of them are known as pests of ornamental shrubs. Because of increased import of different ornamentals in the last years possibility of interception of new pest species has increased too. This was also the reason for interception of these two species. *Argyresthia trifasciata* Staudinger, 1871 was described from Switzerland but its origin has not been cleared yet. In the eighties it spread with ornamentals in many neighbouring countries and further in the northern hemisphere. It is known as pest on *Juniperus* sp., *Thuja* sp., *Chamaecyparis* sp., *Cupressopyaris leylandii*. In Slovenia one specimen was found in Gančani (NE Slovenia) on May 9, 1998, which was identified this winter. This specimen was caught on the light trap in the village. *Caloptilia azaleella* (Brants, 1913) most probably originates from Japan but it was described from Holland. This species it is known as a pest on different *Rhododendron* species. With increased trade of azaleas it spreads in many countries in Europe, East Asia and North America. In Slovenia it was for the first time found in nursery at Ljubljana Vič in 2001 on azaleas, which were imported from Germany previous year. We collected adult moths emerged from infested shrubs from April 17 until May 10, 2001. Damage on the plants, caused by this two species is not as important as an economic impact on the trade. It is very difficult to sell infested plants, especially abroad, even though they are not listed as quarantine ones. In

Slovenia both species can survive and develop in natural conditions. So we expect that their spread in Slovenia will be continued.



Obvladovanje karantenskih listnih zavrtalk (*Liriomyza* spp.) v Sloveniji

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V Sloveniji in tudi v EU so pod fitosanitarnim nadzorom štiri vrste listnih zavrtalk iz rodu *Liriomyza* Mik. [Diptera, Agromyzidae]. Vrsta *Liriomyza sativae* Blanchard, 1938 je na seznamu I.A.I in je v Evropi še ni, bila pa je že večkrat prestrežena pri uvozu rastlin iz tretjega sveta. Ostale tri vrste – *L. bryoniae* (Kaltenbach, 1858, *L. huidobrensis* (Blanchard, 1926) in *L. trifolii* (Burgess, 1880) - so v Evropi razširjene, vendar pod fitosanitarnim nadzorom in razvrščene na seznam I.A.II. Vrsta *L. bryoniae* je avtohtona palearktična vrsta in je tudi v Sloveniji splošno razširjena. Na seznamu karantenskih vrst je zaradi možnosti zamenjave z vrsto *L. huidobrensis*. Vse štiri vrste so izrazito polifagne z zelo širokim izborom gostiteljskih rastlin. *L. huidobrensis* je izvorno neotropska, *L. trifolii* pa nearktična vrsta. Obe sta zdaj razširjeni tudi v Evropi predvsem v pokritih prostorih. V Sredozemlju lahko preživita tudi na prostem in povzročata precejšnjo škodo pri gojenju okrasnih rastlin in vrtnin. Obe vrsti sta bili v zadnjih letih večkrat prestreženi tudi pri uvozu okrasnih rastlin in vrtnin v Slovenijo. V l. 1999 sta bili v Sloveniji najdeni dve žarišči vrste *L. huidobrensis*, v l. 2001 pa še eno, vedno v pokritih prostorih. Vsa dosedanja žarišča so bila z ustreznimi karantenskimi in varstvenimi ukrepi sanirana.

Pojavljanje vrste *L. trifolii* v Sloveniji je bilo potrjeno v poznih sedemdesetih letih v rastlinjakih v okolici Brežic. Bolj sistematično spremljanje te vrste na ozemlju Slovenije v zadnjih letih kaže, da je večina ostalih pisnih navedb o pojavljanju te vrste na prostem najverjetneje napačnih in se po vsej verjetnosti nanašajo na vrsto *L. congesta* (Backer, 1903). Pri pregledu 28 vzorcev metuljnic z značilnimi poškodbami, 11 vzorcev žerk iz teh rogov in 4 vzorcev vzgojenih imagov v l. 2001 nismo nikoli našli vrste *L. trifolii*. Iz tega sklepamo, da karantenske vrste *L. trifolii* v Sloveniji ni in da so zato poostreni fitosanitarni ukrepi še vedno smiselni in potrebni.

V primeru pojava novih žarišč karantenskih listnih zavrtalk je potrebno napadene rastline ali njihove dele takoj uničiti in izvesti preventivno tretiranje proti morebitnim preživelim osebkom. Proti žerkam so razmeroma učinkoviti pripravki na osnovi abamektina, ciromazina in piretroidov. Za popolno eradikacijo je proti odraslim osebkom potrebno izvesti tudi zaporedno zaplinjevanje s sulfotepom. Za množično obvladovanje teh vrst v rastlinjakih se v praksi uspešno uporablja parazitoid *Diglyphus isaea*. V prispevku bodo podrobneje predstavljene posamezne vrste in poškodbe, ki jih povzročajo na gostiteljskih rastlinah.

ABSTRACT

Control of quarantine leaf miners (*Liriomyza* spp.) in Slovenia

There are four *Liriomyza* species [Diptera, Agromyzidae] currently under the phytosanitary control in Slovenia and in the EU. The *Liriomyza sativae* Blanchard, 1938 was put on the I.A.I list. It is not present in EU yet, but it has been repeatedly intercepted during import inspections of consignments from the third countries. The remaining three species – *L. bryoniae* (Kaltenbach, 1858, *L. huidobrensis* (Blanchard, 1926) and *L. trifolii* (Burgess, 1880) - are present in EU, but the phytosanitary measures are widely implemented. The *L. bryoniae* is a

palaeartic species, native and widely spread also in Slovenia. It was put on the quarantine list to prevent possible confusion with the closely related *L. huidobrensis*. The four species discussed are extremely polyphagous with a very large host range. *L. huidobrensis* is a neotropical and *L. trifolii* a not arctic species, both are currently present and widely disseminated throughout the Europe, mainly in greenhouses. In Mediterranean countries serious outbreaks and economic damages in the outdoor fields have been also reported. Both species have been repeatedly found during the import inspections of flowers and vegetables in Slovenia too. Two focuses of *L. huidobrensis* were found in greenhouses in 1999 and another one in 2001. In all these cases the quarantine and chemical eradicating measures were successfully carried out.

The first confirmed occurrence of *L. trifolii* in Slovenia was recorded in the late 1970's in the vicinity of Brežice. Other records concerning the outdoor occurrence of this species on Leguminosae were in all probability erroneous and they most likely refer to *L. congesta* (Backer, 1903). Examination of 28 samples of Leguminosae leaves with characteristic leaf-mines (collected in different localities mostly in the south-western and south part of Slovenia), 11 preparations of larvae and 4 reared adults from those leaves in 2001 were carried out, but *L. trifolii* was never found. These investigations and the official samples submitted for diagnosis in the last few years permit the conclusion that *L. trifolii* is not present in Slovenia yet and therefore the appropriate phytosanitary measures are still necessary to prevent its introduction.

In case of accidental occurrence of quarantine *Liriomyza* leaf miners in greenhouses, the infested plants or their parts should be destroyed and preventive chemical treatments against surviving specimens should be carried out. The insecticides abamectin, cyromazine and some pyretroides have shown comparatively good effectiveness against maggots. For a complete eradication of these pests in greenhouses some additional fumigations with sulfotep against the adults are usually recommended. The parasitic wasp *Diglyphus isaea* is also very available for the control of these leafminers in greenhouse crops. A more detailed overview of quarantine *Liriomyza*-species and their effect on crops will be further discussed.



Nove vrste feromonskih vab za hrošče (Coleoptera), ki so jih razvili na Raziskovalnem Inštitutu za varstvo rastlin v Budimpešti

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V zadnjem desetletju je poudarek pri raziskavah feromonov prešel od škodljivcev iz reda Lepidoptera k drugim škodljivcem. Sestava feromonov številnih pomembnih vrst škodljivcev iz reda Lepidoptera je bila uspešno identificirana in pridobljeno znanje se je preneslo v prakso varstva rastlin. Pri drugih redovih žuželk, npr. Coleoptera pa je znanje nezadostno, celo v primeru nekaterih ključnih škodljivcev. Na Inštitutu za varstvo rastlin (Plant Protection Institute) raziskujemo možnosti varstva proti nekaterim pomembnim škodljivcem (hroščem), z vidika kemijske ekologije. V prispevku so podani nekateri novejši rezultati.

Pred kratkim smo odkrili spolni feromon (E)-2-nonenol za 2 škodljivi vrsti iz družine pahljačnikov (Scarabaeidae), ki se hranita na listih: *Anomala vitis* in *A. dubia* (Coleoptera, Scarabaeidae). Pri enaki kombinaciji privabilnih snovi se na vabo lahko ujame veliko število samcev obeh vrst. Vaba je ustrezna za detekcijo in oceno gostote populacije (npr. krivulje aktivnosti in pragov škode). Vaba *Anomala* je uporabna tudi za zatiranje, saj so bili preliminarni rezultati množičnega ulova v nasadih breskev ugodni. Vendar je pri tem ulovu bolj pomemben ulov samic.

Vrsto *Epicometis hirta*, syn.: *Tropinota hirta* (Coleoptera, Scarabaeidae), ki se hrani na cvetovih in lahko v letih, ko je njen pojav močan, povzroči resno škodo v cvetočih nasadih dreves, privabljata 2 sintetični rastlinski lahko hlapni sestavini, cinamilni alkohol in trans-anetol. Za ulov vrste *E. hirta* je najbolj učinkovita mešanica obeh, v primerjavi z učinkovitostjo posameznih komponent. V poskusih z vabami različnih barv, se je največ osebkov vrste *E. hirta* ujelo na svetlo modre in bele vabe, v primerjavi z rumenimi ali prozornimi. Na svetlo modre vabe, ki so vsebovale mešanico cinamilnega alkohola in trans-anetola, se je ujelo veliko število hroščev. Vaba je ustrezna za detekcijo in oceno gostote populacije. Možnost uporabe teh vab za množični ulov je obetavna, saj so bili ujeti osebki v največ primerih samice.

Veliki pesni rilčkar (*Bothynoderes punctiventris*) je pomemben škodljivec sladkorne pese v centralni, vzhodni in jugovzhodni Evropi. Vaba za detekcijo in monitoring bi bila dobrodošla za pridelovalce na teh območjih, ker je vizualno vzorčenje zelo odvisno od vremena, poleg tega pa zahteva veliko dela.

Odkrili smo tudi močan atraktant, ki privablja osebkove obeh spolov vrste *B. punctiventris* enako, v primerjavi z vabami brez atraktanta. Razvili smo novo vrsto vabe, v kateri je novo odkriti atraktant, TAL. Pri odkrivanju in spremljanju vrste *B. punctiventris*, smo s TAL vabami zaznali navzočnost vrste prej, kot z vizualnim pregledovanjem. Dalj časa in bolj podrobno smo s temi vabami spremljali tudi aktivnost letanja. Vabe TAL zadostujejo za detekcijo vrste *B. punctiventris*, ko se seli iz prezimovališč na nove posevke in za spremljanje nihanj populacije med rastno dobo. V preliminarnih poskusih se je pri številu 10 vab/ha ujel znaten del populacije škodljivca. Seveda so bili rezultati boljši pri številu 30 vab/ha. Ker odrasli hrošči spomladi v mladem posevku sladkorne pese lahko povzročijo zelo veliko škodo sklepamo, da bi zmanjšanje populacije škodljivca v podobnem obsegu zmanjšalo tudi škodo.

ABSTRACT

Novel pheromone traps for catching beetle pests (Coleoptera) developed by the Research Institute of Plant Protection, Budapest, Hungary

In the last decade the emphasis in pheromone research started to shift from Lepidoptera to non-Lepidopteran pests. This change in scientific interest was due to the fact that the pheromone compounds of many important lepidopteran pest species was successfully identified and the knowledge gained became available for practical application in plant protection technologies, while in other insect orders (e.g.: Coleoptera) our knowledge is insufficient, even in the case of key pests. Our scientific group works on plant protection problems of several important beetle pests from the chemical ecology point of view. In the present lecture some recent results are discussed.

Recently a sex attractant, (*E*)-2-nonenol has been discovered for two leaf-feeding scarab pests, the vine chafer (*Anomala vitis*) and the margined vine chafer (*A. dubia*) (Coleoptera, Scarabaeidae). Large numbers of males of the two species can be trapped by the same trap bait combination. The trap is suitable for detection and density estimations (e. g.: thresholds and flight curves). The *Anomala* trap might be useful in control, as well, since preliminary mass trapping results in a peach orchard were positive. However, for mass trapping efforts, the capture of females would be much more promising.

Another scarab species the blossom feeder (*Epicometis hirta*, syn.: *Tropinota hirta*) (Coleoptera, Scarabaeidae), which feeds on flowers and can cause severe damage to blossoming orchard trees in outbreak years was attracted to two of the synthetic plant volatile compounds, cinnamyl alcohol and *trans*-anethol. The mixtures of cinnamyl alcohol and *trans*-anethol proved to be superior in catching *E. hirta* as compared to the single components alone. In tests with traps of different colour, light blue and white traps captured the highest numbers of *E. hirta* as compared to yellow or transparent ones. Light blue traps baited with the mixture of cinnamyl alcohol and *trans*-anethol were capable of attracting and catching large numbers of beetles. The

trap is suitable for detection and density estimations and the application of such traps for mass trapping is promising since the majority of the specimens captured were females.

The sugar-beet weevil (*Bothynoderes punctiventris*) is an important pest of sugar-beet in the central, eastern and southeastern parts of Europe. A trap for detection and monitoring would be sought for by farmers in these areas, since visual sampling is highly weather dependent and fairly labour intensive.

A strong aggregation attractant was found, which attracts both sexes of the sugar-beet weevil equally, according to comparisons with unbaited traps throughout the flight season. The new bait was applied in a modified pitfall trap, the TAL. In trials for detection and monitoring, TAL traps baited with the newly discovered attractant detected the presence of the sugar-beet weevil earlier, than conventional visual sampling. The flight pattern was also monitored longer and in more detail by the baited traps. TAL trap is sufficient for detection of immigrating beetles from overwintering sites to the new crop and in monitoring population changes all through the season. In preliminary trials a density of 10 traps/ha could already "trap out" a significant portion of the pest population. Results were clearly better when applying 30 traps/ha. Since highly significant damages are caused by the adult beetles in the young sugar-beet fields in the spring, reduction in the beetle population should reduce damages by similar extent.



Razširjenost vrst rodu *Globodera* in postopki za njihovo identifikacijo v Sloveniji

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Prve najdbe ogorčic iz rodu *Globodera* v Sloveniji segajo v leto 1970. Od takrat smo naleteli na tri vrste iz tega rodu in sicer: rumeno krompirjevo ogorčico *G. rostochiensis* pri rednem zdravstvenem pregledu njiv v letih 1971, 1975, 1999 in 2001 ter leta 2002 pri uvoznih pošiljkah krompirja iz Hrvaške; belo krompirjevo ogorčico *G. pallida* leta 2001 in 2002 pri uvozu krompirja iz Italije; rmanova ogorčica *G. achilleae* pa je pogostejša, večkrat najdena vrsta v različnih območjih Slovenije. Zaradi pomembnosti krompirjevih ogorčic je nujna pravilna diagnostika in identifikacija vrst znotraj tega rodu. Osnova za identifikacijo so morfološki parametri, ki so podlaga v ključih za identifikacijo *Globodera* vrst. V novejšem času se za namene potrjevanja morfometrijskih metod razvijajo modernejše molekularne in biokemijske metode, katere smo vpeljali na Kmetijskem inštitutu. Z molekularno metodo PCR-RFLP uspešno ločujemo omenjene vrste. S PCR reakcijo se pomnoži fragment rDNA, razreže z petimi različnimi restrikcijskimi encimi in analizira število in dolžine restrikcijskih fragmentov (RFLP) po ločitvi na agaroznem gelu. Za ločevanje omenjenih vrst smo vpeljali tudi biokemijsko metodo proteinske elektroforeze IEF (izoelektrično fokusiranje), kjer s poliakrilamidno gelsko elektroforezo ločimo celične proteine na podlagi izoelektrične točke PI.

ABSTRACT

Geographical distribution of *Globodera* species and methods used for their identification in Slovenia

The first findings of *Globodera* species in Slovenia date back to 1970. Three *Globodera* species have been found in Slovenia since then: yellow potato cyst nematode *G. rostochiensis*, in frame of the annual sanitary field inspection in 1970, 1975, 1999 and 2001, which was also

intercepted in soil samples taken from the imported potatoes from Croatia in 2002; white potato cyst nematode *G. pallida* was intercepted in the imported potatoes from Italy in 2001 and 2002; yarrow cyst nematode *G. achilleae* is more frequent, often found species in different areas of Slovenia. Due to the importance of potato cyst nematodes a correct diagnostic and identification of *Globodera* species is required. *Globodera* species identification is based on specific morphological characteristics which are included in the majority of keys used for *Globodera* identification. To verify the morphometrical method, other methods have been developed. At Agricultural Institute of Slovenia molecular and biochemical methods are applied. With the use of PCR-RFLP method we try to distinguish between all three species mentioned. Patterns of nematode rDNA digested with restriction endonucleases and subjected to agarose gel electrophoresis are analysed. Differences in DNA sequence result in the number and size of fragments produced (RFLPs). For the differentiation of all three nematodes we have introduced a method for protein electrophoresis IEF (isoelectric focusing). The isoelectric point PI is determined after the separation by polyacrilamide slab gel electrophoresis.

Posterji

Določevanje ostankov pesticidov v sadju in zelenjavi - predstavitev postopka za multirezidualno metodo

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Z namenom ugotavljanja onesnaženosti kmetijskih pridelkov z ostanki pesticidov smo razvili hitro in učinkovito multirezidualno metodo, ki nam omogoča določitev 43 aktivnih spojin hkrati, kar pomeni skupno pripravo vzorca in analizo s plinskim kromatografom z masno selektivnim detektorjem.

V skladu s priporočili EU smo vpeljali določanje vsebnosti aktivnih snovi iz naslednjih kemijskih skupin: acilalanini (metalaksil), benzimidazoli (tiabendazol), dikarboksimidi (iprodition, prosimidon, vinklozolin), fenilpiroli (fludioksonil), ftalimidi (folpet, kaptan), imidazoli (imazalil), karbamati (karbofuran), klorirani ogljikovodiki (α -HCH, lindan, heptaklor, endosulfan, endrin, aldrin, p,p-DDE, o,p-DDD, p,p-DDD, o,p-DDT, p,p-DDT), organofosforjevi estri (acefat, azinfos-metil, diazinon, dimetoat, fenitrotion, fention, fosalon, heptenofos, klorpirifos, klorpirifos-metil, kvinalfos, malation, mekarbam, metamidofos, metidation, paration, piridafention, pirimifos-metil, triazofos) in piretroidi (deltametrin, lambda-cihalotrin, permetrin). Vzorce smo ekstrahirali z mešanico topil: acetona, diklorometana in petroletra, z namenom, da bi ekstrahirali spojine od zelo polarnih (npr. aceton, metamidofos) do nepolarnih (npr. DDT). Vzorce smo nato čistili z gelsko permeacijsko kromatografijo. Spojine smo analizirali s plinskim kromatografom z masno selektivnim detektorjem, ki je z načinom monitoringa selektivnih ionov (selective ion monitoring) omogočil simultano kvalitativno in kvantitativno ovrednotenje rezultatov. Vpliv matriksa smo izključili tako, da smo instrument kalibrirali s standardi, ki smo jih dodali končnemu ekstraktu praznih vzorcev (matriks match standardi). Vzorce smo kvalitativno ovrednotili s primerjavo retenzijskih časov in razmerij med ciljnim ionom (target ion), ter ostalimi ioni (qualifiers) standarda v ekstraktu matriksa (matriks match standard). Uporabljali smo dva ali tri ione za posamezno spojino, odvisno od selektivnosti metode za specifično spojino v različnih vzorcih (solati, krompirju). Rezultate smo kvantitativno ovrednotili z integracijo ciljnega iona (target ion).

Pri validaciji, v vzorcih krompirja in solate, smo testirali naslednje parametre: selektivnost, stabilnost spojin v ekstraktih vzorca, linearnost, mejo detekcije in mejo kvantitativne določitve, točnost in natančnost. Metoda se je izkazala za zanesljivo in je ustrezna za določevanje širokega območja pesticidov.

Metodo smo uporabili za preverjanje ostankov pesticidov v sadju in zelenjavi, v sklopu programa za nacionalni monitoring v Sloveniji v letih 2001 in 2002 na številnih matriksih: solati, krompirju, jabolkih, hruškah, jagodah, stročjem fižolu in paradižniku.

ABSTRACT

Determination of pesticide residues in fruit and vegetables - presentation of the procedure for a multiresidual method

Fast and efficient multiresidual method enabling a simultaneous determination of 43 active substances was developed to control the pollution of agricultural products. The method implies the common preparation of a sample and its analysis with gas chromatograph coupled with mass selective detector.

Following the EU recommendations we developed a method for the determination of active substances from the following chemical groups: acylalanines (metalaxyl), benzimidazoles

(thiabendazole), dicarboximides (iprodione, procymidone, vinclozolin), phenylpyrroles (fludioxonil), phthalimides (folpet, captan), imidazoles (imazalil), carbamates (carbofuran), chlorinated hydrocarbons (alpha-HCH, lindane, heptachlor, endosulfan, endrin, aldrin, p,p-DDE, o,p-DDD, p,p-DDD, o,p-DDT, p,p-DDT), organophosphorus esters (acephate, azinphos-methyl, diazinon, dimethoate, fenitrothion, fenthion, phosalone, heptenophos, chlorpyrifos, chlorpyrifos-methyl, quinalphos, malathion, mecarbam, methamidophos, methidathion, parathion, pyridafenthion, pirimiphos-methyl, triazophos) and pyrethroids (deltamethrin, lambda-cyhalothrin, permethrin).

The samples were extracted with the mixture of solvents: acetone, dichloromethane and petroleum ether, with the purpose of extracting substances from very polar (e.g. acephate, methamidophos) to non-polar ones (e.g. DDT). The clean-up of samples was performed by gel permeation chromatography. The samples were analysed by gas chromatograph coupled with mass selective detector which enabled a simultaneous qualitative and quantitative determination using the selective ion monitoring mode. The matrix effect was excluded by calibrating the instrument with matrix match standards. The samples were qualitatively evaluated by the comparison of retention times and ratios between the target ion and the qualifiers in the matrix match standard. Two or three ions were used for a single substance depending on the selectivity of method for a specific substance in different matrices (lettuce, potato). The results were quantitatively evaluated by integrating the target ion.

During the validation process the parameters: selectivity, analyte stability in sample extracts, linearity, limit of detection and limit of quantification, accuracy and precision, were tested on two sample matrices: potato and salad. The method proved to be suitable for the determination of a wide range of pesticides.

The method was used to verify the presence of pesticide residues in fruit and vegetables as part of the national monitoring programme in Slovenia in the years 2001 and 2002 on a number of the following matrices: salad, potato, apples, pears, strawberries, string beans and tomato.



Vpliv bršljanovega vodnega izvlečka na zmanjšanje okužbe z bakterijo *Xanthomonas campestris* pv. *pelargonii*

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Izvečki iz bršljana (*Hedera helix*) lahko povečajo odpornost rastlin na nekatere povzročitelje bolezni. V poskusu smo ugotavljali, ali zalivanje pelargonij (*Pelargonium peltatum*) z bršljanovim vodnim izvlečkom zmanjša okužbo z bakterijo *Xanthomonas campestris* pv. *pelargonii* pri pridelavi sadik. Pelargonije smo 3 tedne zalivali z izvlečki bršljanovih listov. Izvlečke smo pripravili tako, da smo liste namakali 8 (A), 16 (B) in 24 ur (C) v vodi iz javnega vodovoda. 24 rastlin smo razdelili v 4 skupine in jih zalivali z enim od izvlečkov, kontrolo (K) pa z vodo. Po 3 tednih smo iz rastlin pripravili potaknjence, ki smo jih pred sajenjem umetno okužili z bakterijo *X. campestris* pv. *pelargonii*. Opazovali smo razvoj bolezenskih znamenj na potaknjencih. Po 2 tednih smo iz potaknjencev, na katerih so se razvila bolezenska znamenja, reisolirali bakterijo. Bakterijo *X. campestris* pv. *pelargonii* smo potrdili z reisolacijo na selektivnem gojišču. Učinkovitost izvlečkov je bila različna. Bolezenska znamenja so se najprej razvila na rastlinah iz kontrolne skupine (K). Najbolj krepilno je na rastline deloval izvleček A, medtem ko sta izvlečka B in C na rastline delovala toksično.

ABSTRACT

Study on reduced infection with bacterium *Xanthomonas campestris* pv. *pelargonii* induced by *Hedera helix* watery extract

Ivy extracts (*Hedera helix*) are known to have positive effects on plant resistance against some diseases. The purpose of the experiment was to explore if watering the plants (*Pelargonium peltatum*) with watery ivy extract can reduce the infection with bacterium *Xanthomonas campestris* pv. *pelargonii* in production of seedlings. Pelargonium plants have been watered with ivy extracts for 3 weeks. Extracts were prepared by soaking the ivy leaves in a tap water for 8 (A), 16 (B) and 24 (C) hours. 24 plants were separated into 4 groups, each group having been watered with one of the extracts and control group (K) with water. After 3 weeks cuttings were prepared and infected with bacterium *X. campestris* pv. *pelargonii* before planting. Development of the disease was recorded. After 2 weeks bacterium has been reisolated from the cuttings which have shown the symptoms of the disease. The presence of the bacterium was confirmed by reisolation on selective medium. The effects of the extracts on plants were different. The symptoms of the disease first developed on cuttings from the control group (K). The extract A had the most invigorating effect on plants, whereas extracts B and C affected plants toxically.



Izolacija in identifikacija glive *Phoma exigua* var. *foveata* (Foister) Boerema, povzročiteljice gangrene krompirjevih gomoljev v Sloveniji

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Gangrena krompirjevih gomoljev je ena najnevarnejših skladiščnih bolezn krompirja. Razširjena je v številnih evropskih državah. Njen gospodarski pomen je večji v severnih deželah, kjer povzroči velike izgube pridelka zaradi gnitja uskladiščenih gomoljev. Poglavitna povzročiteljica bolezn je gliva *Phoma exigua* var. *foveata*. Gliva okuži predvsem krompir, le redko tudi druge gostitelje. Na lupini okuženih gomoljev se pojavijo uglobljene nekrotične pege, najpogosteje okrog oči, lenticel in na poškodovanih mestih. V hladnih in suhih razmerah gomolji v notranjosti zgrijejo. Podobna bolezenska znamenja povzroča tudi gliva *Phoma exigua* var. *exigua*. Slednja je zelo razširjena talna saprofitska gliva, ima številne gostitelje in je manj patogena kot var. *foveata*. Obe varieteti sta si po morfologiji zelo podobni in ju ne moremo zanesljivo razlikovati po značilnostih piknidijev in piknospor. Za njuno identifikacijo so poleg analize morfoloških značilnosti potrebne še različne biokemične in molekularne tehnike. V prispevku predstavljamo metode, ki smo jih uporabili za izolacijo in identifikacijo povzročitelja gnagrene krompirjevih gomoljev ter opisujemo bolezenska znamenja in epidemiologijo bolezn.

ABSTRACT

Isolation and identification of *Phoma exigua* var. *foveata* (Foister) Boerema - the causative agent of potato gangrene in Slovenia

Gangrene is an important storage disease of potato tubers. It causes significant losses due to the internal decay of the tissue. Gangrene has been reported from many European countries, being of the greatest economic importance in northern temperate countries. The disease is primarily caused by *Phoma exigua* var. *foveata*, although it can be caused by either of the two varieties of *Phoma exigua* Desm., i.e. var. *foveata* or var. *exigua* respectively. *P. exigua* var. *exigua* is a common soil inhabitant. It has a wide host range and is less pathogenic than var.

foveata. *P. exigua* var. *foveata* affects mainly potato and causes sunken lesions in tuber skin which typically develop at wound sites, eyes or lenticels. Internal rotting of tubers can be extensive and rapid, especially in cool and dry environment. The two varieties of *P. exigua* causing potato gangrene have similar morphology and can not be readily distinguished by morphological characteristics of pycnidia and pycnidiospores. Different techniques: morphological, biochemical and molecular, are used to differentiate between them. The poster presents methods used for isolation and identification of the causative agent of gangrene of potato tubers in Slovenia and describes the symptoms and epidemiology of the disease.



Pojav glive *Didymella ligulicola* (Baker, Dimock et Davis) von Arx v Sloveniji v letu 2002

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V letu 2002 smo v mikološkem laboratoriju pregledali 31 vzorcev bolnih krizantem, od tega 22 s sumom na okužbo z glivo *Didymella ligulicola*. Pojavljala so se različna bolezenska znamenja: nekroze na steblih, venenje, rumenenje in sušenje listja. Pri krizantemah v loncih so bila bolezenska znamenja najbolj izrazita na spodnjem delu stebela, tik nad korenino. Ponekod so nekroze objele celo steblo, posamezni potaknjenci so veneli in se sušili. Krizanteme za rezano cvetje so propadale v majhnih skupinah. Spodnji del stebela je potemnel, vršički so bili rahlo deformirani. Iz prizadetih rastlin smo izolirali glive iz rodov *Fusarium*, *Phoma*, *Verticillium* in *Didymella*. Med temi je pritegnila največjo pozornost gliva *Didymella ligulicola*, ki je uvrščena med karantenske škodljive organizme. Gliva se razširja z okuženimi potaknjenci, sadikami in cvetovi in se zlahka prilagaja različnim rastnim razmeram. Pri vse intenzivnejšem pridelovanju krizantem se pojavlja v čedalje večjem obsegu. Domnevamo, da je bila k nam zanesena z okuženimi potaknjenci, na katerih ob uvozu bolezenska znamenja še niso bila razvita. Spremljali smo njen pojav vse do konca rastne dobe. Zaradi skrbnih higienskih ukrepov in redne uporabe fitofarmaceutskih sredstev se gliva ni razširila in ni povzročila večje gospodarske škode. V prispevku opisujemo razvojni krog glive, bolezenska znamenja, epidemiologijo bolezni in možnosti njenega omejevanja ter razpravljamo o pomenu glive *D. ligulicola* glede na druge povzročitelje propadanja krizantem v naših razmerah.

ABSTRACT

Occurrence of *Didymella ligulicola* (Baker, Dimock et Davis) von Arx in Slovenia in 2002

In the year 2002 our mycological laboratory received 31 samples of diseased chrysanthemums, among which 22 were suspected to be infected with the fungus *Didymella ligulicola*. Various symptoms were observed on diseased plants: stem necroses, wilting, yellow and necrotic leaves. Plants grown in pots had the most conspicuous symptoms on basal portion of the stem. Black girdling lesions occurred, individual plants wilted and decayed. The infection in patches was sometimes observed among the chrysanthemums used as cut flowers, the plants had dark lesions on stems and were slightly deformed. The fungi belonging to the genus *Fusarium*, *Phoma*, *Verticillium* and *Didymella* were isolated from the symptomatic plants. Among them, the quarantine fungus *Didymella ligulicola* attracted the most attention. The fungus can be transmitted by cuttings, plants and flowers and it is tolerant to a wide range of growing conditions. Intensive chrysanthemum production favours its occurrence and spread. It was most probably introduced to our country via infected cuttings showing no symptoms of the disease at

the time of import. Occurrence of the fungus was monitored throughout the growing season. Careful sanitation and application of fungicides has successfully prevented epiphytotic development of the disease and has reduced the economical damage. In the poster the symptoms, disease cycle and epidemiology are presented, the control measures are described and the significance of *D. ligulicula* with other causative agents of chrysanthemum decay in our growing conditions is compared.



Gliva *Colletotrichum graminicola* (Ces.) G.W. Wills.- povzročiteljica propadanja trate

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Pridelovanje travne ruše se je razširilo tudi v Sloveniji saj je s polaganjem ruše možno hitro ozelenjevanje okrasnih vrtov in rekreacijskih zemljišč. V letu 2002 se je pri pridelovalcu travne ruše na Gorenjskem poleti pojavilo močno propadanje trate v rumeno-rjavih zaplatah nepravilnih oblik. Prevladovala so bolezenska znamenja: odmiranje celih rastlin, črne lise na okuženih delih rastlin, ki so bile posebej izrazite na stolonih, rjave pege na še zelenih listih, številni črni acervuli s setami na odmrlem tkivu. Iz vzorca smo izolirali glivo *Colletotrichum graminicola* (Ces.) G. W. Wills., teleomorf *Glomerella graminicola* Politis. Pozneje smo istega povzročitelja našli tudi na odmrlih delih trate na igrišču za golf in na zelenicah. Najbolj izrazita je bila okužba na travni vrsti *Poa annua* L., okužene so bile tudi vrste iz rodov *Agrostis* in *Festuca*. Gliva *Colletotrichum graminicola* je patogen številnih vrst trav, tudi pravih žit in koruze. V Sloveniji je že znana predvsem kot povzročiteljica koruznega ožiga. V zahodni Evropi in ZDA je *C. graminicola* pomembna povzročiteljica odmiranja travne ruše na igriščih za golf. Okužbi so bolj podvržene rastline oslABLJENE zaradi suše, visokih temperatur, zbitosti in slabe odcednosti tal, slabe ali neuravnotežene preskrbe s hranili. V prispevku obravnavamo dejavnike, ki so vplivali na propadanje travne ruše v opisanem primeru. Gojenje trate je najbolj intenzivno pri pridelovanju travne ruše in na igriščih za golf in vključuje tudi uporabo fitofarmaceutskih sredstev. Pravočasno in pravilno diagnosticiranje *C. graminicola* omogoča vzdrževalcem trat izvajanje tistih ukrepov, ki zavirajo razvoj boleznin in preprečujejo neustrezno uporabo fungicidov.

ABSTRACT

Turf damage caused by *Colletotrichum graminicola* (Ces.) G. W. Wills

Turf production has increased also in Slovenia because laying turf-rolls is the quickest way of making gardens and recreation grounds green. In summer 2002, the producer of turf in the Gorenjska region had serious problems with turf which appeared as yellow-brown irregularly shaped patches. The prevailing symptoms were the following: death of the plants, the blackening of infected tissue, especially on the stolons, brown spots on green leaves, numerous black acervuli with setae on dead leaves. The fungus *Colletotrichum graminicola* (Ces.) G. W. Wills., teleomorf *Glomerella graminicola* Politis, was isolated from the diseased plants. The same fungus was also found on the grasses from the damaged turf located on a golf course and greens. The highest intensity of infection was observed on *Poa annua* L. species but grasses from genera *Agrostis* and *Festuca* were infected as well. *Colletotrichum graminicola* is a pathogen on grasses and also on cereals and maize. In Slovenia it is known as a cause of corn anthracnose. It is an important causal organism of turfgrass disease occurring on golf courses in U.S.A. and western Europe. Plants growing under unfavourable conditions caused by

draught, high temperatures, overcompaction, poor drainage, nutrient deficiency or unbalanced nutrition are more prone to infection. The factors that influenced the turfgrass infection in Slovenia are discussed. The cultivation of turf is the most intensive on areas for turf production and on golf courses and includes also the use of pesticides. A correct diagnosis of *C. graminicola* is the basis for conducting the cultural practices which can limit the disease development and can also prevent the use of inadequate fungicides.



Proučevanje različnih ras glive *Exserohilum turcicum* na koruzi v Sloveniji

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V kmetijski pridelavi stalno prihaja do antagonizma med kmetijsko rastlino kot gostiteljem in rastlinskim patogenom, ki se z gostiteljem prehranjuje in ohranja. Z žlahtnjenjem novih odpornejših kultivarjev ima patogen vse manj možnosti za preživetje, zato le-ta neprestano razvija nove rase, na katere novi kultivarji niso več odporni. Za glivo *Exserohilum turcicum* (/Pass./ K. J. Leonard et E. G. Suggs) (*Et*), ki povzroča koruzno progavost, so v svetu do sedaj znane 4 rase. Kultivar, ki vsebuje gen za odpornost samo za eno od ras, postane neodporen na glivo, če se pojavi katerakoli druga rasa iste glive. Cilj raziskave je v kontroliranih razmerah v rastlinjaku proučiti zastopanost različnih ras glive *Et*. V ta namen smo v rastlinjaku posadili v 2 ponovitvah po 3 genotipe, občutljive na raso 1 obravnavane glive (Bc 262, L-ZN-5, Minnesota 706), 3 genotipe, odporne na raso 1 glive *Et* (Leon, L-108St, Jm02-66/4) ter 1 genotip poligeno odporen na raso 1 in 2 *Et* (Bc 278). Na vseh genotipih smo izvedli umetno okužbo v 4 kombinacijah in sicer: a) brez okužbe; b) okužba s prahom zmletih okuženih listov, nabranih v jeseni 2002; c) okužba z mešanico več izolatov na tekočem gojišču ter d) tekoča suspenzija pripravljena iz vzorca Jm02Ht2-13/2. Okužbo smo opravili ko je imela koruza 4-5 listov, ocenjevanje simptomov ter ugotavljanje pojava posameznih ras pa bomo opravili 10-14 dni po okužbi. Iz rezultatov predhodnih raziskav predvidevamo, da bodo tipična znamenja za glivo *Et* tudi na genotipih, ki so odporni na raso 1, kar bi potrdilo naše domneve o zastopanosti rase 2 glive *Et* tudi v Sloveniji.

ABSTRACT

Investigation of different races of *Exserohilum turcicum* on maize in Slovenia

In the agricultural practice permanent antagonism between the cultivated plants and pathogens are present. The new cultivars are more tolerant to the existing pathogens, so the pathogens constantly generate new races, which are virulent to the new cultivars. For the *Exserohilum turcicum* (/Pass./ K. J. Leonard et E. G. Suggs) (*Et*) 4 races are known, so the same maize genotype is differently tolerant to different races within the same pathogen. Three maize genotypes, susceptible to race 1 *Et* (Bc 262, L-ZN-5, Minnesota 706); 3 genotypes, resistant to race 1 *Et* (Leon, L-108St, Jm02-66/49) and 1 genotyp, resistant to both, race 1 and race 2 *Et* (Bc 278), in the greenhouse were investigated on the tolerance against *Exserohilum turcicum*. On the investigated genotypes artificial inoculations have been performed: a) the control (no

inoculation); b) with powder of dried leaves, naturally infected and collected in the previous year; c) the mixture suspension of several isolates and d) the spore suspension of Jm02Ht2-13/2 isolate. Inoculations were performed when the plants reached the stage of 4-5 leaves. Evaluations of symptoms of disease on seedlings will be carried out 11-14 days after the inoculation. On the base of the previous results we assume, that symptoms of diseases occur on genotypes, which are resistant to race 1 *Et*. Thus, our assumptions about presence of race 2 *Et* in Slovenia would be determined.



Določitev ras izolatov bakterije *Ralstonia solanacearum* povzročiteljice rjave gnilobe krompirja

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Ralstonia solanacearum (Smith 1896) Yabuuchi *et al.* 1996 je karantenska bakterija, ki povzroča rjavo gnilobo krompirja in bakterijsko venenje mnogih drugih rastlin. Uvrščena je na seznam IAII karantenskih organizmov.

Seve bakterije *Ralstonia solanacearum* lahko razdelimo na pet ras glede na primarno okuženega gostitelja ali pet biovarjev glede na uporabo določenih sladkorjev in sladkornih alkoholov.

V Evropi povzročajo rjavo gnilobo krompirja predvsem sevi rase 3. Rasa 3 ustreza biovarju II. Ta rasa okužuje krompir, paradižnik, jajčevac in nekatere razširjene plevele in je prilagojena nižjim temperaturam. Predvsem v rastlinjakih so možni tudi sevi rase 1 ki imajo širši krog gostiteljev in so prilagojeni višjim temperaturam. Sevi rase 1 ustrezajo sevom biovarjev 1, 3 ali 4.

Rasa izolata lahko vpliva na fitosanitarne ukrepe in je zato pomemben del določitve bakterije *Ralstonia solanacearum*.

Raso lahko določimo s testom hipersenzitivne reakcije na tobaku, določanjem uporabe nekaterih sladkorjev in sladkornih alkoholov (laktoze, maltoze, celobioze, manitola, sorbitola in dulcitol) ali analizo profila maščobnih kislin.

Za določanje rase izolatov bakterije *Ralstonia solanacearum* izoliranih iz krompirja različnega izvora med leti 1997 in 2002 smo uporabili test hipersenzitivne reakcije na tobaku in določanje uporabe nekaterih sladkorjev in sladkornih alkoholov. Vsi testirani izolati spadajo v raso 3, biovar II.

ABSTRACT

Determination of races of *Ralstonia solanacearum* isolates causing brown rot in potatoes

Ralstonia solanacearum (Smith 1896) Yabuuchi *et al.* 1996 is a quarantine bacterium causing brown rot of potatoes and bacterial wilt in many other hosts. It is listed on IA II quarantine list.

Strains of *Ralstonia solanacearum* have been informally grouped into five races on the basis of the host primarily affected or five biovars on the basis of the catabolism of certain sugars and sugar alcohols.

Strains most frequently isolated from potatoes in Europe correspond to race 3 which is equivalent to biovar II. This race infects potato, tomato, aubergine and some commonly present weeds and is adapted to lower temperatures. The presence of race 1 which has a wide host

range and is adapted to higher temperatures is also possible especially in green house facilities. Race 1 corresponds to biovars 1, 3 or 4.

Determination of race may influence phytosanitary measures taken and is therefore an important part of testing on *Ralstonia solanacearum*.

Races of *Ralstonia solanacearum* can be determined using hypersensitivity reaction test in tobacco, utilisation of hexose alcohols and sugars (lactose, maltose, cellobiose, mannitol, sorbitol and dulcitol) or analysis of fatty acids profile.

We have used hypersensitivity reaction test in tobacco and utilisation of hexose alcohols and sugars to determine races of *Ralstonia solanacearum* isolated from potatoes of different origine from 1997 to 2002. All tested isolates belonged to race 3, biovar II.



Določanje in identifikacija bakterije *Erwinia amylovora* (Burrill) Winslow *et al.* v okuženi hruški

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V okviru posebnega nadzora rastlin, ki ga vrši uradna služba za varstvo rastlin, izvajamo na Nacionalnem inštitutu za biologijo laboratorijsko diagnostiko povzročiteljice hruševega ožiga, bakterije *Erwinia amylovora* (Burrill) Winslow *et al.* Pogosto prispejo vzorci z značilnimi bolezenskimi znamenji, ki pa jih lahko povzročijo drugi povzročitelji bolezni, kot na primer bakterija *Pseudomonas syringae* pv. *syringae*, ki smo jo v preteklosti že nekajkrat identificirali.

V letu 2001 smo v vzorcu hruške z bolezenskimi znamenji, značilnimi za hrušev ožig, določili bakterijo *Erwinia amylovora*. To je bil prvi primer najdbe hruševega ožiga v Sloveniji. Na okuženem materialu smo preizkusili različne metode, ki jih je možno uporabljati za določanje bakterije *Erwinia amylovora* in sicer na poganjkih z bolezenskimi znamenji in na poganjkih brez njih.

Za določanje bakterije *Erwinia amylovora* smo uporabili uveljavljene metode določanja te bakterije: izolacija na gojišču (KB, NSA), test patogenosti na rezinah hrušk, od seroloških metod smo izvedli test indirektno imunofluorescence (IIF) in test aglutinacije, od molekularnih pa test PCR z različnimi pari začetnih oligonukleotidov. Izolirano bakterijo smo poslali na potrditev z analizo profila maščobnih kislin v Plant Protection Service v Wageningen na Nizozemskem.

Po pričakovanju smo s testom IIF določili bakterijo v vseh vzorcih, ki so imeli bolezenska znamenja in v katerih je koncentracija bakterij velika. Bakterijo smo s tem testom dokazali tudi v poganjkih nabranih na okuženem drevesu, ki niso imeli znamenj bolezni. Ostali testi niso dajali tako zanesljivih rezultatov, še zlasti pri latentno okuženih vzorcih. Ugotovili smo, da izolacija DNA z DNeasyTM Tissue Kit-om zmanjša učinek inhibitorjev PCR reakcije v vzorcu v primerjavi z ekstraktom pripravljenim s kuhanjem, kar je zlasti pomembno pri nizki koncentraciji bakterij. Potrdili smo pravilnost uporabe kombinacije različnih metod za določanje bakterije *Erwinia amylovora*.

ABSTRACT

Detection and identification of *Erwinia amylovora* (Burrill) Winslow *et al.* in infected pear tree

In the frame of monitoring of plants, conducted by official plant protection service, National Institute of Biology performs laboratory diagnosis of bacteria *Erwinia amylovora* (Burrill) Winslow *et al.*, the causal agent of fire blight. Frequently, samples with characteristic symptoms arrived to the laboratory. However, similar symptoms can also be caused by other plant pathogens such as *Pseudomonas syringae* pv. *syringae* which has already been demonstrated in the past. In 2001, *Erwinia amylovora* was detected in a pear sample with symptoms of fire blight for the first time in Slovenia. Different methods that can be used for detection of *Erwinia amylovora* were tested on infected material with and without symptoms.

Isolation on media (KB, NSA), pathogenicity test on pear slices, indirect immunofluorescence (IIF), agglutination test and PCR with different sets of primers were tested. Isolated bacteria were sent for confirmation with analysis of fatty acids profile to Plant Protection Service in Wageningen, the Netherlands.

As expected, *Erwinia amylovora* was detected with IIF test in all samples with symptoms where concentration of bacteria is high, but also in asymptomatic samples, with lower concentration of bacteria that have been collected from the same pear tree. Other tests were less reliable especially in case of latent infection. We established, that the DNA extraction using the DNeasy™ Tissue Kit reduces inhibition in PCR reaction compared to extraction by boiling of the sample which is essential when the concentration of bacteria in sample is low.

For reliable and accurate laboratory determination of *Erwinia amylovora* we recommend the use of several properly combined detection.



Pojav virusa, ki povzroča rumeno pritlikavost ječmena (Barley yellow dwarf virus, BYDV) na Hrvaškem v letu 2002

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Spomladi 2002 smo na več lokacijah na Hrvaškem opazili slabšo rast ječmena (Belje, Daruvar, Đakovo, Kutjevo, Nova Gradiška, Tovarnik, Valpovo in Zagreb). Na osnovi simptomov smo določili, da gre za virusno okužbo. Ječmenovi listi so bili zlato rumeni in so zaostajali v rasti. Sprememba barve listov se je širila od konice in robov lista proti listni bazi. Na porumenelih listih so bile vidne vodene pege. Listi na okuženih rastlinah so bili pokončni in debelejši od zdravih listov. Okužene rastline so bile vidne v obliki večjih ali manjših otokov na polju. Glede zaostalosti v rasti so bile velike razlike. Nekatere rastline so ostale majhne, le 10 – 15 cm visoke, klasi so bili manjši in pogosto prazni. Simptomi na pšenici so bili podobni kot na ječmenu in pri nekaterih sortah se je rumena barva listov spremenila v rdečkasto. Pri pšenici nismo opazili zaostajanja v razvoju. Z naraščanjem temperatur v maju in juniju so listi postopoma izgubili rumeno barvo. Zbrali smo vzorce okuženih rastlin in z metodo ELISA smo ugotavljali raso PAV virusa rumene pritlikavosti ječmena (BYDV). Virus je bil določen na naslednjih lokacijah:

Brestovac (ječmen Lord, pšenica Barbara in Super žitarka), Kneževo (ječmen Zlatko) in Kutjevo (ječmen Gaelic), Zagreb (pšenica Dukat, Rennan, Banica, Marija, Kuna, Soisson, Super žitarka, Žitarka, Patria). Na lokaciji Belje so strokovnjaki Oddelka za kmetijsko zoologijo Agronomske fakultete v Zagrebu, določili varieteto listnih uši, ki so znane prenašalke virusa rumene pritikavosti ječmena (BYDV-PAV). Simptomi so bili na Hrvaškem opisani v preteklosti, kar vodi k domnevi, da je šlo za BYDV (Panjan 1964 in Šarić 1986). To je prva zanesljiva determinacija virusa BYDV na ječmenu in pšenici na Hrvaškem.

ABSTRACT

Occurrence of barley yellow dwarf virus in 2002 in Croatia

In the spring of 2002 increased reduced growth of barley was observed at many locations in Croatia (Belje, Daruvar, Đakovo, Kutjevo, Nova Gradiška, Tovarnik, Valpovo and Zagreb). Based on the symptoms we concluded this was due to a virus infection. The barley leaves were golden yellow and lagged in growth. The change in leaf colour began from the tip and edges of the leaf and spread to the lower parts. Watery spots could be observed on the yellowed leaves. The leaves of infected plants stood upright (bristled) and were thicker than those on healthy plants. The symptoms on barley appeared on a group of several plants in a circle and included greater or smaller areas. Regarding dwarfing there were great differences. Some plants remained short - only 10-15 cm high and the ears were smaller and often empty. The symptoms on wheat were similar to those on barley and on some varieties the yellow colour on the leaves turned to a reddish colour. There was no marked underdevelopment on wheat. With increased temperatures in May and June the leaves gradually lost their yellow colour. Samples of plants with symptoms were collected from the fields and the ELISA-test was performed for the presence of the PAV strain of the BYD virus. The virus was determined at the following locations: Brestovac (barley Lord; wheat Barbara and Super Žitarka), Kneževo (barley Zlatko) and Kutjevo (barley Gaelic), Zagreb (wheat Dukat, Rennan, Banica, Marija, Kuna, Soisson, Super Žitarka, Žitarka, Patria). In the region of Belje experts from the Department for Agricultural Zoology of the Faculty of Agricultural Sciences in Zagreb determined a variety of leaf lice which are known vectors of BYDV-PAV. Symptoms had been described in Croatia previously and lead to the presumption that this was barley yellow dwarf virus (Panjan 1964 g. and Šarić 1986). This is the first definite determination of Barley yellow dwarf virus in Croatia - on barley and on wheat.



Detekcija virusov v selekcioniranih linijah nizkega fižola (*Phaseolus vulgaris* var. *nanus* Martens) z ELISA testom

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Rastline iz roda *Phaseolus*, vključno z navadnim fižolom (*Phaseolus vulgaris*), okužujejo virusi, ki lahko povzročijo znatno gospodarsko škodo (zmanjšanje pridelka in kakovosti). Nekateri najpomembnejši virusi fižola so Bean Common Mosaic (BCMV), Bean Common Mosaic Necrosis (BCMNV) in Bean Yellow Mosaic Virus (BYMV). Pri žlahtnenju fižola je zelo

pomembno, da ugotovimo viruse pri novih linijah, zlasti viruse, ki se prenašajo s semenom. V programih žlahtnenja je uporaben zlasti rastlinski material, ki je tolerant na virusne okužbe. V 4-letnih raziskavah smo z vizualnim pregledovanjem znamenj okuženosti novo vzgojenih linij *P. vulgaris* L. var. *nanus* Martens na polju, v biotičnih testih in z ELISA testom, spremljali pogostnost virusnih okužb naštetih virusov. Rezultati teh analiz omogočajo, da ustvarimo fond novih linij dwarf dry bean, ki so manj dovzetne za virusne okužbe. Zdravstveno stanje teh linij nizkega fižola bo, poleg ugodnih agronomskih lastnosti, odločilno pri nadaljnjem žlahtnjenju za pridobivanje novih kultivarjev.

ABSTRACT

Detection of the viruses on selected lines of dwarf dry bean (*Phaseolus vulgaris* L. var. *nanus* Martens) using ELISA-test

Plants from the genus *Phaseolus*, including *Phaseolus vulgaris*, can be infected by viruses that can cause significant economic damage (reduction of yield and quality). Some of the most important viruses of beans are Bean Common Mosaic (BCMV), Bean Common Mosaic Necrosis (BCMNV) and Bean Yellow Mosaic Virus (BYMV). In breeding it is very important to determine presence of viruses in newly bred lines, especially viruses which are transmitted through bean seed. Plant material tolerant to viral infection is favoured in breeding programs. During four years of study through visual examinations of the symptoms on newly bred lines of the bush dry beans, *Phaseolus vulgaris* L. var. *nanus* Martens, in the field, in biotests and in ELISA test frequency of viral infections of above mentioned viruses were monitored. Results of these analysis enable us to form pool of newly bred lines of the dwarf dry bean which were less susceptible to viral infections. Determined health conditions of these lines of dwarf dry bean would be, in presence of the satisfactory agronomic characteristics, decisive for further breeding in order to produce new cultivars.



Negativna zdravstvena selekcija na trsne rumenice v vinorodnem okolišu Ljutomersko-Ormoške gorice

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V letih 1999 in 2000 smo v Ljutomersko-Ormoških goricah v dveh vinogradih (Strežetina in Granda), kjer je bila selekcija že opravljena v letu 1993-94, opravili revizijo negativne zdravstvene selekcije vinske trte (*Vitis vinifera* L.) cv. 'Chardonnay', da bi ugotovili stanje in širjenje bolezni trsnih rumenic. Leta 1994 je bilo pregledanih 7040 trsov, od katerih je 314 ali 5 % imelo znamenja okužb s trsnimi rumenicami. V letu 1999 smo pri istem številu pregledanih trsov ugotovili znamenja rumenic na 1014 trsah ali 14 %, leta 2000 pa na 1509 trsah ali 21 %. Po ugotovljenih rezultatih vizualne selekcije na trsne rumenice bo potrebno opraviti revizijo selekcije tudi v drugih vinorodnih okoliših.

ABSTRACT

Yellows disease negative sanitary selection in Ljutomersko-Ormoške gorice winegrowing region

In 1999 and 2000, a revision of the grapevine selection (*Vitis vinifera* L.) cv. 'Chardonnay' was made in two vineyards (Strežetina in Granda) in Ljutomersko-Ormoške gorice winegrowing region. Although the negative sanitary selection was already made in 1993/94, it was repeated in order to establish the condition of the grapevine and the degree to which the yellows disease had spread. In 1994, 7040 grapevines were revised and 314 of them (5%) have shown signs of yellows disease infection. In 1999 the same grapevines has been examined again and 1014 grapevines (14%) showed signs of yellows infection. In 2000, 1509 grapevines (21%) were infected with yellows disease. Suggest the results of visual selection on yellows disease and expanded, a new revision of the selection in the future.



Fitoparazitske ogorčice nadzemnih delov rastlin v Sloveniji

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V nematološkem laboratoriju Kmetijskega inštituta Slovenije že vrsto let sistematično spremljamo razširjenost pomembnejših rastlinsko parazitskih ogorčic. Od leta 1998 dalje smo posebno pozornost namenili med drugim tudi ogorčicam nadzemnih delov rastlin. Podrobneje smo začeli spremljati razširjenost stebelne ogorčice, *Ditylenchus dipsaci* (Kühn, 1857) Filipjev, 1936 (A2 karantenska vrsta) na Primorskem (Goriško in Koprsko območje). Opazili smo večjo škodo na posameznih njivah radiča in solate v okolici Branika v Vipavski dolini in Šempetra pri Novi Gorici. Simptome napada smo ugotovili na radiču, cikoriji, špinači in endiviji. Na to vrsto smo naleteli tudi v okolici Ljubljane in Maribora. Na Grobeljskem polju blizu Mengša na Gorenjskem smo leta 1999 v klasih pšenice ugotovili navzočnost pšenične ogorčice, *Anguina tritici* (Steinbuch, 1799) Chitwood, 1935, listne ogorčice, *Aphelenchoides ritzemabosi* (Schwartz, 1912) Steiner, 1932, pa smo izolirali iz krizantem v Ljubljani. V sklopu preučevanja razširjenosti vrst rodu *Bursaphelenchus*, kamor spada tudi izredno nevarna borova ogorčica; *B. xylophilus* Steiner & Buhner, 1970, smo pri nas prvič doslej ugotovili vrsto *B. hoffmani* Braasch, 1998, ki smo jo izolirali iz podrtega borovca blizu Sežane na Primorskem. To je do sedaj edina znana vrsta tega rodu najdena na slovenskem ozemlju. Identifikacija obravnavanih vrst temelji na morfolologiji, na Kmetijskem inštitutu Slovenije pa uvajamo tudi molekularne identifikacijske tehnike (PCR). V preteklem letu smo preskusili molekularno metodo (PCR-RFLP) za ločevanje biotičnih ras *Ditylenchus dipsaci*, s katero smo uspeli ločiti česnovo in lucernino raso, razlike med česnovo raso in raso izolirano iz radiča pa nismo zaznali.

ABSTRACT

Plant parasitic nematodes affecting the above ground plant parts in Slovenia

A systematic study of spreading of the economically important plant parasitic nematodes has been conducted by the nematological laboratory of Agricultural Institute of Slovenia for many years. Among other studies, special attention has been focused on the plant parasitic nematodes of the above ground plant parts since 1998. Stem nematode, *Ditylenchus dipsaci*

(Kühn, 1857) Filipjev, 1936, is a quarantine pest (EU-IIA2a/4, SI-A2/6.2). In the year 1998 we started monitoring in detail its spread in Primorska (Gorica and Koper areas). We noticed greater damage on individual chicory and lettuce fields in the surroundings of Branik in the Vipava Valley and Šempeter near Nova Gorica. The symptoms of the attack were stated on chicory, succory, spinach and endive. *D. dipsaci* was also found in the outskirts of Ljubljana and Maribor. In 1999, the wheat nematode, *Anguina tritici* (Steinbuch, 1799) Chitwood, 1935, was determined in wheat plants in Grobeljsko polje near Mengeš in Gorenjska. In 2002, the chrysanthemum foliar nematode, *Aphelenchoides ritzemabosi* (Schwartz, 1912) Steiner, 1932, was extracted from chrysanthemum leaves collected from a greenhouse in Ljubljana. In frame of the study dealing with the spreading of the species belonging to *Bursaphelenchus* genus, to which a very dangerous pine wood nematode, *B. xylophilus* Steiner & Buhner, 1970, belongs, the nematode *Bursaphelenchus hoffmani* Braasch, 1998, was identified for the first time in Slovenia. It was extracted from the decayed pine tree in the forest near Sežana in Primorska. It is the only representative of the genus *Bursaphelenchus* known in Slovenia until now. The identification of the nematodes studied was based on morphology, but molecular identification techniques were also started in our nematological laboratory. The molecular method (PCR-RFLP) used for the identification of different pathotypes of *D. dipsaci* was tested last year. While the differences between garlic and alfa-alfa pathotypes of *D. dipsaci* were established, no differences.



Tipi tal in razširjenost ogorčic iz roda *Xiphinema* v istrskih vinogradih

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Vinogradništvo v Istri ima dolgo tradicijo in je gospodarsko pomembna panoga. L. 2000 je bilo v Istri 6.420 ha vinogradov, kar je 11,6 % od skupne površine vinogradov na Hrvaškem. Ogorčice so v vinogradih vedno bolj problematične, zato smo v vseh 3 vinogradnih rajonih, v zahodni, centralni in vzhodni Istri, proučevali razširjenost nematod (*Xiphinema* spp.) na različnih antropogenih tleh – vitisolih.

V zahodni Istri so vitisoli nastali pretežno iz srednje globokih, globokih ali lesiviranih rdečih tal (Terra rossa), pretežno na območjih z majhnim naklonom. V centralni Istri vinogradi rastejo na vitisolih, ki so nastali iz fliša, na terenih z večjim naklonom in terasami. Na osrednjem delu centralno-istrskega rajona in v vzhodno-istrskem rajonu se izmenjujejo vitisoli, ki so nastali iz fliša ali rdeče zemlje, na različnih nagibih. Vsem vitisolom Istre je skupno, da so to težja tla (vsebujejo več kot 30 % gline). Zaradi rigolanja se sklopi profila izmenjujejo, medtem, ko se kemične lastnosti bistveno ne spremenijo (razen na posameznih območjih, kjer je znatno povečana vsebnost kalija). Vitisoli, nastali iz fliša vsebujejo več karbonatov.

V 2-letni raziskavi (1999 – 2000) smo odvzeli vzorce iz 25 vinogradov v 3 navedenih rajonih. Ličinke ali samice ogorčic iz roda *Xiphinema* smo našli v 12 vzorcih, kar pomeni, da so ogorčice v 48 % proučevanih vinogradov in sicer 44 % na vitisolih, nastalih iz rdečih tal in 4 % v vitisolih na flišni osnovi.

Rezultati kažejo na zelo značilno okužbo vitisolov, ki so nastali iz rdečih tal, na katerih je skoncentrirana večina vinogradne pridelave (zahodno-istrski rajon) v Istrski županiji. Raziskave

fitoparazitskih ogorčic je potrebno nadaljevati, da se izdela karta razširjenosti vrst ogorčic, ki so nevarne za vinsko trto.

ABSTRACT

***Xiphinema* ssp. extension in different soil types of Istrian vineyards**

Viticulture in Istra, Croatia has a long tradition and great economical importance. Istra County had 6.420 hectares of vineyards in 2000, that was 11,6 percent total acreage of Croatian vineyards.

The problem of nematodes was increasing steadily, therefore a research on *Xiphinema* ssp. was put in three wine growing areas (West, Central, East Istria) on different anthropological soil types – aric anthrosols.

In West Istria wine growing areas aric anthrosols were middle deep or deep and loess red soils with slight inclination. Central areas had aric anthrosols on flysch, with higher inclination and terraced terrains. Central and East wine growing areas had in certain areas mixed soil types (red and flysch soil). All aric anthrosols had similar mechanical structure (over 30 percent clay), soil profile's changed by deep ploughing, and stable chemical structure (some locations had increased potassium share). Aric anthrosols on flysch had more carbonates.

During biannual research (1999, 2000) samples from 25 locations in 3 wine growing areas were collected and analysed. The larvae and adult females of genus *Xiphinema* were detected on 12 locations what implies that 48 percent researched vineyards were contaminated (44% red and 4% flysch aric anthrosols).

Results showed high contamination on red aric anthrosols, which are the most important for Istra's viticulture (West area). Therefore a systematic research should be continued resulting with a map of nematodes *Xiphinema* extension.



Paradižnikova rjasta pršica (*Aculops lycopersici*) (Tryon, 1917) (Eriophyidae) v Sloveniji

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V letu 2001 se je paradižnikova rjasta pršica (*Aculops lycopersici*) v poskusnih rastlinjakih na Laboratorijskem polju BF močno prerezumnožila. Pršica se največkrat navaja kot škodljivec paradižnika (*Lycopersicon esculentum*), poleg rodu *Solanum* pa napada še druge rodove iz družine razhudnikov (*Ipomoea*, *Nicotiana*, *Capsicum*). Pršice naselijo rastline kmalu po presajanju, populacije pršic zelo hitro naraščajo, rastline pa zaradi poškodb hitro propadajo. Pršice prezimijo na alternativnih gostiteljih. Samice začnejo odlagati jajčeca kmalu potem, ko naselijo gostitelja. Razvoj od jajčeca do odraslih osebkov traja v optimalnih razmerah 6 – 7 dni. V eni rastni dobi imajo do 7 rodov. Hranijo se na listih, cvetovih in mladih plodovih paradižnika, posledica so nekroze na listih, odpadanje cvetov in rjavost plodov ter odmiranje rastlin. Na napadenih rastlinah je zmanjšan nastavek plodov, pridelek paradižnika je celo do 65 % manjši. Pršice zatiramo s kemičnimi pripravki - akaricidi (dikofol), med pomembne preventivne ukrepe pa sodi tudi odstranjevanje zeli in drugih gostiteljev pršice iz rastlinjakov ter uničenje rastlinskih ostankov. Naravni sovražniki škodljivca pri nas še niso znani zato možnosti biotičnega zatiranja zazdaj niso raziskane.

ABSTRACT

Tomato russet mite (*Aculops lycopersici*) (Tryon, 1917) (Eriophyidae) in Slovenia

In the year 2001 tomato russet mite (*Aculops lycopersici*) had increased to devastating number in experimental greenhouses of Biotechnical Faculty. The mite is most often reported as a pest of tomato (*Lycopersicon esculentum*), though it can attack plants from other genera beside *Solanum* from Solanaceae (*Ipomoea*, *Nicotiana*, *Capsicum*). The infestation of the mites occurs soon after the plants are transplanted. Populations of the mites increase to a large number in a short time. As a consequence the plants die. Mites overwinter on alternative hosts. Females begin to oviposit soon after the infestation of the plant. The development from egg to adult lasts 7 days under optimum conditions. They give rise up to 7 generations per growing season. The mites feed on leaves, flowers and young fruits of tomato plants, thus causing necroses of leaves, dropping of flowering, russetting of fruit and death of the plants. Fruit setting on infested plants is reduced and heavy attack may seriously reduce tomato yield, i. e. up to 65 %. Chemical control is possible with acaricides (dicofol). Weeds and other hosts of the mites as well as plant remnants should be removed from greenhouses. Natural enemies of tomato russet mite have not been found in Slovenia yet. Therefore, biotical control has not been explored yet.



Rezultati monitoringa tobakovega ščitkarja *Bemisia tabaci* (Gennadius, 1889), (Homoptera: Aleyrodidae) na Hrvaškem v letih 2001 in 2002

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Tobakov ščitkar, *Bemisia tabaci* (Gennadius, 1889) je bil na Hrvaškem prvič najden na božičnih zvezdah (*Euphorbia pulcherrima*) in na potaknjencih vrste *Thunbergia grandiflora* v Splitsko – Dalmatinski županiji v letu 2000. V letu 2001 smo začeli izvajati monitoring tega karantenskega škodljivca v vseh 21 županijah Hrvaške. V projekt so bili vključeni najpomembnejši pridelovalci zelenjave in okrasnih rastlin v rastlinjakih in uvozniki lončnic in rezanega cvetja.

Morebitno zastopanost odraslih osebkov tobakovega ščitkarja na rastlinah v rastlinjakih smo ugotavljali s pomočjo rumenih lepljivih plošč. Pregledovali smo tudi spodnjo stran listov gostiteljskih rastlin, da bi našli ličinke in puparije škodljivca. Božične zvezde, ki so bile popolnoma brez škodljivcev, smo uporabili za vabo, ko je bila naseljenost gostiteljskih rastlin z odraslimi osebki tobakovega ščitkarja manjša.

Rezultati monitoringa z opisanimi metodami v letu 2001 so pokazali, da je bila vrsta *Bemisia tabaci* razširjena na 28 lokacijah v 8 županijah Hrvaške in na uvoženih ladijskih pošiljkah božičnih zvezd na 2 mejnih prehodih. Najdenih je bilo 32 gostiteljskih rastlin v rastlinjakih in na prostem.

Monitoring tobakovega ščitkarja v letu 2002 smo izvajali na enak način kot v letu 2001. Poleg monitoringa škodljivca smo zbirali še liste paradižnika z rastlin, ki so kazale znamenja, podobna okužbi z virusom. Listi so bili testirani na okužbo z TYLCV (Tomato yellow leaf curl virus), ki ga prenaša tobakov ščitkar.

Poster na kratko prikazuje biologijo vrste in opis poškodb, ki jih povzroča tobakov ščitkar in širjenje škodljivca v 2 letih monitoringa ter seznam najdenih gostiteljskih rastlin tobakovega ščitkarja na Hrvaškem.

ABSTRACT

The results of the monitoring of tobacco whitefly *Bemisia tabaci* (Gennadius, 1889), (Homoptera: Aleyrodidae) during 2001. and 2002. in Croatia

The tobacco whitefly, *Bemisia tabaci* (Gennadius, 1889) has been reported for the first time in Croatia on plants of *Euphorbia pulcherrima* and cuttings of *Thunbergia grandiflora* in the county of Splitsko-Dalmatinska in 2000.

In 2001 we started with monitoring of this quarantine pest in all 21 counties of Croatia. In this project were involved the most important producers of vegetables and flowers in glasshouses and the importers of potted plants and cut flowers.

Eventual presence of tobacco whitefly adults on the plants in glasshouses was established by the hanging of yellow sticky traps. In the course of monitoring the undersides of leaves on host plants were inspected for the purpose of discovering pest nymphal and pupal stages. The plants of poinsettia produced as pest free plants have been used as catch plants in the conditions of lower infestation of host plants by tobacco whitefly adults.

During the monitoring in year 2001 by using the listed methods the species *Bemisia tabaci* was reported on 28 localities in 8 counties of Croatia and in imported shipments of poinsettia on 2 border-transits. Thirtytwo host plants were recorded in the glasshouses and in open field.

The monitoring of tobacco whitefly in 2002 was carried out by the same methods as in year 2001. Besides the monitoring of pest, the samples of tomato leaves from the plants with visual symptoms similar to virus were collected for the analysis on *Tomato yellow leaf curl virus* (TYLCV) which is transmitted by *Bemisia tabaci*.

The poster presentation gives short biological characteristics and damage descriptions of tobacco whitefly, than detailed distribution of pest through two years monitoring and the list of *Bemisia tabaci* recorded host plants in Croatia.



Vpliv štirih insekticidov na vrsto *Thrips tabaci* Lindeman (Thysanoptera, Thripidae) iz dveh geografsko ločenih naravnih populacij

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Tobakov resar (*Thrips tabaci* Lindeman), ki ga uvrščamo v red Thysanoptera (resarji), podred Terebrantia in družino Thripidae, je v zadnjem desetletju v Sloveniji gospodarsko pomemben škodljivec pora (*Allium porrum* L.), čebule (*Allium cepa* L.) in zelja (*Brassica oleracea* L. convar. *capitata* (L.) Alef. var. *capitata* (L.)). Razmnožuje se partenogenetsko s telitokijo. Je polifagna in kozmopolitska vrsta, saj napada prek 200 različnih vrst rastlin. Z uporabo za Slovenijo nove laboratorijske metode za ugotavljanje učinkovitosti insekticidov, ki smo jo razvili v entomološkem laboratoriju na Inštitutu za fitomedicino na Biotehniški fakulteti v Ljubljani, smo v letih 1999-2001 ugotavljali vpliv nekaterih registriranih pripravkov z različnim načinom delovanja na vrsto *Thrips tabaci* Lindeman. Uporabili smo pripravke Match 050 EC z aktivno snovjo lufenuron kot inhibitorjem razvoja žuželk, Decis-2,5 EC z aktivno snovjo deltametrin kot sintetičnim piretroidom, Perfekthion z aktivno snovjo dimetoat kot sistemskim organskim fosforom in Kenyatox verde z aktivnima snovema piretrin in piperonil butoksid kot

zmesjo naravnih snovi. V gojitveno posodico smo vstavili 20 odraslih osebkov resarjev na fižolov list, ki smo ga predhodno omočili v insekticidni pripravek, in po 24 urah ugotavljali preživelost osebkov pri temperaturi 22 ± 2 °C in dolžini osvetlitve v razmerju 14:10 med dnevom in nočjo. Osebkki resarjev so bili nabrani na dveh klimatsko različnih in geografsko ločenih lokacijah (Bilje in Ljubljana). Testirani insekticidi so pokazali različno učinkovitost za zatiranje tobakovega resarja. Škodljivčeva populacija iz Ljubljane je bila bolj dovzetna (manj odporna) za insekticide kot populacija v Biljah. Ugotavljamo visoko učinkovitost pripravka Kenyatox verde, nekoliko manjšo učinkovitost pripravka Decis-2,5 EC in Perfekthion in slabo delovanje pripravka Match 050 EC.

ABSTRACT

Influence of four insecticides on *Thrips tabaci* Lindeman (Thysanoptera, Thripidae) from two geographically separated natural populations

Onion thrips (*Thrips tabaci* Lindeman) is classified in order Thysanoptera, suborder Terebrantia, and family Thripidae. In last decade it present economically important harmful pest on leek (*Allium porrum* L.), onion (*Allium cepa* L.) and cabbage (*Brassica Oleracea* L. convar. *capitata* (L.) alef. var. *capitata* (L.) cultivars in Slovenia. *Thrips tabaci* Lindeman propagates partenogenetically with thelitoky. It is a very poliphagous and cosmopolitan species and attacks more than 200 plant species. A new laboratory method for assessment of efficiency of different insecticides for control of thrips was developed in entomological laboratory in the Institute for Phytomedicine on the Biotechnical Faculty in Ljubljana. In 1999-2001 we estimated efficacy on thrips treated with four insecticides with different modes of action. We applied insecticide Match 050 EC with active substance lufenuron as a developing inhibitor for insects, Decis 2,5 EC with active substance deltametrin as a sintetic pyrethroid, Perfekthion with active substance dimetoat as a sistemic organo-phosphate ester and Kenyatox verde with active substances pyretrin in piperonil butoksid as a mixture of natural compounds. Thrips (20 imagines) were put in growing vessels on bean leaf treated with insecticides. The vessels were put in a growing chamber at temperature 22 ± 2 °C and lighting in relation 14:10 (day/night). Samples of thrips were collected in two climatically and geographically different areas (Bilje, Ljubljana). The insecticides showed different efficacy. The populations of *Thrips tabaci* Lindeman from Ljubljana showed higher susceptibility to different insecticides than those from Bilje. Kenyatox verde was the most efficient insecticide analysed, while Decis-2,5 EC and Perfekthion showed smaller efficiency. Match 050 EC was the least efficient insecticide in our research.



Analiza proizvodnje solate (*Lactuca sativa* L.) s primerjavo konvencionalne, integrirane in organske pridelave

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Raziskave Bulluck *et al.* (2002) in Elliot in Mumford (2002) kažejo, da je poleg konvencionalne pridelave zelenjave mogoča tudi pridelava v alternativnih sistemih, ki so za okolje manj tvegani, hkrati pa dajejo zadovoljive gospodarske rezultate. Namen te raziskave je bil, določiti vpliv alternativnih sistemov pridelave (organski in integrirani) ter vpliv endomikorize na vegetativno

rast in pridelek solate. V letu 2002 smo v Puli izvedli dvofaktorski poskus, s 3 ponovitvami in split-plot metodo. Glavni faktor (način pridelave) je imel 3 ravni (organski, integrirani, konvencionalni), podfaktor mikoriza je imel 2 ravni (sadike solate inokulirane z endomikorizno glivo *Glomus mossae* in neinokulirane sadike). Na parcelah določenih za organsko pridelavo, je pred solato rasel grah, rastline so bile pokošene in uporabljene za zastor. Druge parcele so bile pokrite s črno polietilensko folijo. Sadike solate cv. Vanity so bile posajene s koreninsko grudo, gnojenje in obdelovanje je potekalo v skladu s temeljnimi načeli organske, integrirane in konvencionalne pridelave. Način pridelave in mikoriza nista vplivala na gostoto rastlin. Največji premer glav solate je bil v integrirani pridelavi (17 % večje kot v organski pridelavi). Inokulirane sadike so imele za 6 % večji premer glav kakor neinokulirane. Tržni pridelek glav solate v integrirani pridelavi je dosegel 13 % večjo maso kot v konvencionalni pridelavi in 30 % večjo kot v organski pridelavi. Mikoriza ni vplivala na povprečno maso tržnega pridelka. Največji pridelek solate je bil v integrirani pridelavi (35,51 t/ha) in se ni statistično značilno razlikoval od pridelka v konvencionalni pridelavi (31,05 t/ha). V obeh sistemih je bil tržni pridelek statistično značilno večji od pridelka v organski pridelavi (21,65 t/ha). Mikoriza ni vplivala na pridelek. Način pridelave in mikoriza nista vplivala na odstotek netržnih rastlin.

ABSTRACT

Analyses of lettuce (*Lactuca sativa* L.) production, comparing conventional, integrated and organic crop management

Along with conventional vegetable production, research of Bulluck *et al.* (2002) and Elliot & Mumford (2002) show the possibility of vegetable production by alternative systems less risky for environment and with the satisfactory economical result. The goal of this research was to determine the influence of alternative systems of crop management (organic and integrated) and endomycorrhiza on vegetative growth and yield of lattice.

During 2002 two-factor trial with three repetitions and split-plot design was set up in Pula. Main factor "crop management" had three levels (organic, integrated and conventional) while the subfactor "mycorrhiza" had two levels (lettuce seedlings inoculated with endomycorrhizal fungus *Glomus mossae* and non-inoculated seedlings). On plots assigned for organic crop management, pea plants grown on the plots before the lettuce were mowed and used as mulch. Other plots were mulched with black polyethylene film. Lettuce seedlings, cv. Vanity were planted with root ball; fertilization and cultivation measures were performed according to basic principles of organic, integrated and conventional crop management system. Systems of crop management and mycorrhiza did not have effect on plant density. The biggest diameter of heads had lettuce from integrated crop management system (17% bigger than lettuce from organic system). Inoculated plants also had 6% bigger diameter than non-inoculated. Marketable heads from integrated system achieved 13% bigger mass than lettuce from conventional system and 30% bigger than plants from organic system. Mycorrhiza did not influence the average mass of marketable heads. The biggest yield of lettuce was achieved with integrated crop management (35.51 t/ha) and it did not statistically differ from the yield from conventional crop management (31.05 t/ha). Both systems had significantly bigger marketable yield compared with organic crop management (21.65 t/ha). Mycorrhiza did not influence the yield. System of crop management and mycorrhiza did not have influence on percentage of non-marketable plants.



Uporaba pare kot okolju prijazen ukrep za zatiranje plevelov

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Pleveli so kljub številnim herbicidom še vedno eden od najbolj omejujočih dejavnikov pridelovanja gojenih rastlin. To še posebej velja za številne tako imenovane male kulture, kjer nimamo na voljo dovolj ustreznih herbicidov. Kot ena izmed možnosti za zatiranje plevelov je tudi uporaba vroče vodne pare, ki ima v ekotoksikološkem smislu precejšnje prednosti pred uporabo herbicidov. V ta namen je bila izdelana naprava za zatiranje plevelov z vodno paro. Najpomembnejši sestavni del naprave je kotel, ki sprejme 140 l vode. V njem lahko pridobivamo paro do temperature 250 °C pri tlaku 50 barov. Kotel ogrevamo s kurilnim oljem. Vročo paro nato s posebnimi šobami, ki so oblikovane v odvisnosti od vrste plevela, ki ga želimo zatreti, vbrizgavamo na plevele. Naprava se lahko namesti na sprednji ali zadnji del traktorja v odvisnosti od priključkov traktorja ali terena po katerem vozimo. Naprava ima tudi rezervoar z vodo, katero črpalka tlači v kotel. Voda mora nadomestiti porabljeno paro. Pomemben sestavni del naprave je tudi elektronika, ki skrbi za napajanje gorilnika in s pomočjo termostata varuje kotel pred pregrevanjem, s presostatom pa pred prevelikim tlakom.

V prispevku so prikazani tudi prvi rezultati preizkušanja naprave v nasadih različnih gojenih rastlin. Napravo smo doslej preizkušali največ v vinogradih in v hmeljiščih. Glede na prve rezultate vroča para odlično zatira enoletne širokolistne rastline različnih velikosti, medtem ko je nekoliko slabši učinek na ozkolistne rastline ter večletne plevelne vrste. V nadaljevanju želimo napravo preizkusiti tudi pri pridelovanju številnih drugih gojenih rastlin, kjer nimamo na voljo drugih primernih ukrepov.

ABSTRACT

The use of steam as an environment-friendly measure for weed control

Despite of numerous herbicides the weeds still present one of the most serious threats to crop cultivation. This is especially true for various so-called small cultures for which there are not enough suitable herbicides at our disposal. One option for controlling weeds now presents hot water steam, which has from the ecotoxicological aspect quite a few advantages compared to herbicides. For this purpose a special device for controlling weeds with the help of steam was made. The most important component of the device is a kettle-drum with the capacity of 140 litres. In it we can obtain steam of the temperature of up to 250 C, at the pressure of 50 bars. The kettle-drum is oil-fired. Hot steam is then directed on weeds through special slots which are designed to suit weeds we want to eradicate. This device can be attached to the front or the back of a tractor, depending on the tractor's attachments and the terrain we drive on. This device also has a water tank from which the water is pumped into the kettle-drum. The used steam has to be replaced by water. Another important component is electronics which is responsible for burner charging and which with the help of the thermostat protects the kettle-drum from overheating and with the manometer from too high pressure.

This article also presents first results of the device testing on different crops. The device has so far been tested mostly in vineyards and hop gardens. The first results have shown that hot steam is an excellent deterrent for broad-leaved weeds of different sizes, while its effect on grass weeds and perennial weed species is slightly worse. In our further tests we would also like to test this device on other crops where other suitable measures are limited or not available.



Vpliv načina pridelave in gnojenja z dušikom na pojav solatne plesni (*Bremia lactucae*) ter solatne bele gnilobe (*Sclerotinia minor*)

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V večfaktorsko zasnovanem poljskem poskusu smo ugotavljali vplive različnega gnojenja z dušikom ter pridelavo solate - kultivar Vanity, z uporabo črne polietilenske folije (PE) in brez nje, na pridelek in zdravstveno stanje. Solato smo posadili 4. aprila 2002 v štirih vrstah na greben z vrstno in medvrstno razdaljo 25 cm.

V poskusu smo primerjali klasičen način gnojenja z načinom dodajanja dušika z vodo za namakanje (fertigacijo). V obeh poskusnih kombinacijah s klasičnim gnojenjem smo dušik dodali v dveh enakih obrokih. Skupne dodane količine dušika so bile 60 in 120 kg N/ha, hkrati pa je bila v poskus vključena kontrola brez gnojenja z dušikom. V poskusnih kombinacijah fertigacije pa so bile dodane količine 60, 90 in 120 kg N/ha v več obrokih. V poskusu nismo uporabljali sredstev za varstvo rastlin in smo vpliv načina in količine gnojenja na zdravstveno stanje solate ocenjevali ob spravi pridelka vizualno s sočasno laboratorijsko določitvijo patogenov. Statistična analiza vpliva količine in načina gnojenja na pojav solatne plesni je pokazala, da obstaja statistično značilna razlika v številu s solatno plesnijo obolelih rastlin le med kontrolo brez gnojenja ter poskusnima kombinacijama s klasičnim gnojenjem 60 in 120 kg N/ha ter poskusno kombinacijo, kjer smo s fertigacijo dodali 90 kg N/ha. Očiten pa je trend naraščanja števila obolelih rastlin v odvisnosti od načina in količine gnojenja. Poleg kontrolne variante je bilo najmanjše število obolelih rastlin v poskusni kombinaciji fertigacije s skupno količino 60 kg N/ha. Uporaba PE folije ni imela vpliva na pojav solatne plesni. Statistično značilno manjši je bil pojav solatne bele gnilobe v poskusni kombinaciji brez gnojenja ter v poskusnih kombinacijah fertigacije s 60 in 120 kg N/ha. Uporaba folije je imela pozitiven vpliv na manjši pojav bele solatne gnilobe, a je statistična analiza pokazala, da so rezultati le malenkostno zgrešili statistično značilno razliko ($p=0,0562$).

ABSTRACT

Occurrence of lettuce downy mildew (*Bremia lactucae*) and *Sclerotinia* leaf drop (*Sclerotinia minor*) influenced by different way and amount of applied nitrogen and by different growing practice

In multifactorial field trial design an influence of different methods and amounts of applied nitrogen was evaluated on lettuce growth (cv. Vanity) and plant health in combination with and without polyethylene plastic mulch. Lettuce was planted on beds in four rows with row and interrow space of 25 cm on 4 April 2002.

In field trial we compared conventional way of nitrogen application with fertigation were nitrogen was applied together with irrigation water. In the trial the following combinations were included: zero control without nitrogen application, two trial combinations were we applied 60 and 120 kg N/ha by conventional way and three combinations with fertigation were 60, 90 and 120 kg N/ha were applied. In trial combinations were N was added by conventional way nitrogen was added in two equal rates while in fertigation combinations nitrogen was applied in several applications. No fungicides were used during the trial. Plant health was evaluated at the end of the trial by visual observation which was supported by prior laboratory determination of pathogens. Statistical analyze of trial results showed statistically significant higher occurrence of downy

mildew in both combinations with conventionally applied nitrogen and also in combination with 90 kg N/ha applied by fertigation. However trend is obvious among the way and levels of applied nitrogen where beside the zero control, the lowest number of downy mildew affected plants was in fertigation combination with 60 kg N/ha. Use of PE mulch had no effect on downy mildew occurrence. There was statistically significant lower number of sclerotinia leaf drop in control combination and combinations by fertigation applied N with 60 and 120 kg N/ha. Use of PE mulch showed a positive effect. However statistical analyze proved that data merely missed statistical significance ($p=0,0562$).



Alelopatski vpliv vodnih izvlečkov pšenice (*Triticum aestivum* L.) na kalivost in rast radikule solate (*Lactuca sativa* L.)

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Alelopacija je delovanje ene rastlinske vrste na drugo z izločanjem kemičnih snovi – alelokemikalij. Alelopatski vpliv na rastline je lahko stimulativen ali zaviralen, kar se kaže v povečani ali zmanjšani kalivosti semen, pospeševanju ali zaviranju rasti in razvoja rastlin. Pri šestih različnih sortah pšenice (*Triticum aestivum* L.), treh jarih ('Leguan', 'Munk', 'Nandu') ter treh ozimnih ('Justus', 'Profit', 'Soissons'), smo proučevali vpliv njihovih vodnih izvlečkov na kalivost in rast testnih rastline solate (*Lactuca sativa* L.). Vsebnost skupnih fenolov v izvlečkih smo določili spektrofotometrično po metodi Folin-Ciocalteu. Ločeno smo proučevali vpliv vodnih izvlečkov podzemnih oziroma nadzemnih delov pšenice na skupno kalivost in energijo kalivosti semen solate ter na rast radikule. Vpliv izvlečkov, tako nadzemnih kot tudi podzemnih delov različnih sort pšenice na končno kalivost je bil neznaten. Izvlečki nekaterih sort so v primerjavi s kontrolo (voda) statistično značilno zmanjšali energijo kalivosti solate. Zmanjšanje energije kalivosti se razlikuje tudi med posameznimi sortami. Pokazalo se je, da izvlečki nadzemnih delov večine sort pšenice statistično značilno zavirajo rast radikule solate. Pri ugotavljanju povezave med rastjo radikule solate in skupno vsebnostjo fenolov v vodnih izvlečkih pšenice nismo ugotovili statistično značilne korelacije.

ABSTRACT

Wheat (*Triticum aestivum*) allelopathic effect of their aqueous extracts on germination and radicle growth of lettuce (*Lactuca sativa* L.)

Allelopathy refers to biochemical interactions between plants. Chemicals released from plants are termed as allelochemicals. Allelopathic effect can be both, stimulatory or inhibitory resulting in stimulated or inhibited germination, growth and development of plants. Six different wheat cultivars (*Triticum aestivum* L.), three summer ('Leguan', 'Munk', 'Nandu') and three winter ('Justus', 'Profit', 'Soissons'), were used to evaluate allelopathic effect of their aqueous extracts on germination and radicle elongation of lettuce (*Lactuca sativa* L.) used as a test plant. The total phenolic contents in wheat extracts were determined spectrophotometrically by the Folin-Ciocalteu method. Effects of aqueous shoot and root extracts respectively on the total germination, the speed of germination and radicle elongation of lettuce seeds were studied independently. Total germination was insignificantly inhibited by both, shoot and root aqueous

extracts. Speed of germination was significantly inhibited by some cultivars comparing to water control. The inhibition of speed of germination depends also on wheat cultivars. Shoot extracts of most wheat cultivars significantly inhibited lettuce radicle growth. No statistically significant correlation was obtained between lettuce radicle elongation and total phenolic contents in each wheat extract.



ISIP - Informacijski sistem za integrirano pridelavo v Nemčiji

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V sodobni kmetijski pridelavi zahteva po rešitvah kompleksnih problemov, npr. optimizacije odločanja v integriranem sistemu pridelovanja, vse bolj narašča. Pridelovalci ali svetovalci potrebujejo za pridobivanje pomembnih informacij za odločanje dostop do številnih baz podatkov. Nemška ustanova za okolje (German Foundation of Environment) je v l. 2001 financirala projekt izdelave informacijskega sistema na medmrežju (ISIP), za enostavnejši in hitrejši dostop do podatkov za integrirano pridelavo.

Prva verzija ISIP sistema daje informacije o varstvu rastlin, saj pridelovalci temu dajejo najvišjo prioriteto - v okviru pojedelstva za najbolj pomembne poljščine, žita, krompir in sladkorno peso. Te temeljijo na rezultatih prognostičnih ali simulacijskih modelov za pomembne škodljivce in bolezni; na podatkih iz monitoringov, ki jih izvaja osebje vladnih služb za varstvo rastlin in na priporočilih, ki jih dajejo svetovalci. V l. 2002 je bilo preko ISIP-a praksi posredovanih več deset tisoč izračunov z vremenskimi podatki iz 220 meteoroloških postaj, okoli 10.000 podatkov iz okoli 1.200 parcel na poljih pridelovalcev in nekaj 100 priporočil od skupno 90 svetovalcev. Internetne strani v l. 2002 so bile med rastno dobo žit obiskane 500 – 600 krat/dan, za sladkorno peso 600 – 700 krat/dan in za krompir 1000 – 1200 krat/dan.

V drugi verziji ISIP-a se bo število modelov za škodljivce in bolezni povečalo. Največji napredek pa pomeni vključitev interaktivnih komponent.

- Svetovalci lahko od 2003 dalje svoje podatke in priporočila vnašajo direktno v sistem, tako so aktualne informacije dostopne brez zamud.
- Uporabniki ISIP sistema bodo lahko v iskanju optimalnih rešitev kombinirali svoje podatke s sistemom za podporo odločanja (DSS) na medmrežju. Podatki se lahko tudi shranijo v sistem ISIP, tako da ponovno vnašanje ni potrebno.
- Pridelovalci lahko definirajo svoj uporabniški profil in tako »filtrirajo« nepotrebne informacije.
- Za uporabnike bodo dostopne baze podatkov z vremenskimi podatki, podatki o sorti in vsi podatki o sredstvih za varstvo rastlin (vključno z omejitvami rabe).
- Ustanovljena bo služba, ki z SMS sporočili ali po faksu obvešča kmetovalce, da so bili preseženi pragovi, ko je potrebno ukrepati ali v nujnih primerih, ko je potrebno ali priporočljivo škropljenje.

Nadaljnje informacije o sistemu lahko najdete na: www.isip.de

ABSTRACT

ISIP – A Web – based Information System on Integrated Crop Production in Germany

In modern agriculture the demand for solutions for complex problems, e.g. the optimisation of decision – making in integrated crop production, is strongly increasing. To obtain all relevant information for decision – making farmers or extension officers up to now need access to a multitude of databanks offered by different providers. In 2001 a project, funded by the German Foundation of Environment, was started to elaborate an internet – based information system (ISIP) which facilitates a simple and rapid access to integrated crop production data.

The first version of ISIP provides information on crop protection as they are given the highest priority within arable crop production by the farmers. Thus for the most important crops, cereals, potatoes and sugar beet, comprehensive warning services were made available. They are based on three pillars: results of forecasting or simulation models for the relevant pests and diseases, data from monitorings conducted by staff of governmental crop protection services and recommendations given by extension officers. In 2002 results of several ten thousands of model runs with weather data from 220 meteorological stations, about 10,000 records from about 1,200 plots on farmers` fields and some hundred recommendations by a total of ninety extension officers were presented to agricultural practice via ISIP. In 2002 the internet pages have been visited during the vegetation periods of cereals 500-600 times/day, of sugar beet 600-700 times/day and of potatoes 1000-1200 times/day.

In the second version of ISIP the number of included pest and disease models will be increased. But greatest progress will be made by including interactive components.

- Extension officers can insert their data and recommendations directly into the system from 2003 on, so that there is no delay in the availability of actual information.
- On the other hand the user of ISIP will be able to combine his own farm or plot data with decision support systems provided by the internet platform in order to obtain optimised plot-specific decisions. His data also may be stored within ISIP so that a repeated data insertion is no longer necessary.
- Farmers can define their own user profile and filter the non-necessary from the needed information.
- Databanks with weather data, cultivar information and all information on plant protection products (incl. the restrictions in use) will be made available to the users.
- A service will be established which by automatically sending SMS or faxes informs the farmers that action thresholds are overridden or an emergency case is present and pesticide applications are required or recommended.

Further information on the internet – based system can be obtained from: www.isip.de



Vpliv temperature na razvoj rdečega žitnega strgača *Oulema melanopus* L. (Coleoptera, Chrysomelidae)

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Temperatura kot ekološki dejavnik ima odločilno vlogo v razvoju vseh živih organizmov, vključno škodljivcev in med njimi rdečega žitnega strgača (*Oulema melanopus* L.), ki ga obravnavamo v prispevku. V raziskavah, ki so potekale med rastnima dobama v letu 2000 in 2001, smo opazovali vpliv temperatur na vse razvojne stadije rdečega žitnega strgača. Poljski poskusi so bili del raziskave o odpornosti nekaterih sort pšenice na rdečega žitnega strgača.

Beležili smo začetek ovipozicije, število odloženih jajčec, embrionalni razvoj, pojav ličink, razvoj ličink, stadij bube in pojav odraslih osebkov. Meteorološke podatke (temperature) smo dobili iz bližnje meteorološke postaje. Rezultati raziskave kažejo, da temperatura vpliva na vse razvojne stadije, zlasti pa na stadij jajčeca. Temperature imajo velik vpliv na delež preživelih ličink prvega stadija, medtem ko so poznejši stadiji ličinke bolj odporni. Zimske temperature nižje od 10° C zmanjšajo delež preživelih bub rdečega žitnega strgača. Pojav prvih odraslih osebkov spomladi je neposredno odvisen od zimskih temperatur. Višje temperature ugodno vplivajo na razvoj vseh stadijev rdečega žitnega strgača.

ABSTRACT

Effects of temperature on the development of *Oulema melanopus* L. (Coleoptera, Chrysomelidae)

Temperature as an ecological factor has a resolving role in the development of all living organisms, also including insects and among them Cereal Leaf Beetle (CLB) tested in this paper. In the researches done during the vegetation seasons 2000 and 2001, the effect of temperature on all stages of the development of *O. melanopus* has been observed. The experiments have been done in the fields, as a part of a research in resistance of some sorts of wheat to CLB. We observed the beginning of oviposition, number of laid eggs, embryo development, the appearance of larvae, the development of larvae, chrysalis stage and the coming out of imago. Meteorological information (temperature) has been taken from meteorological station nearby the place of research. As a result of this research, it can be said that temperature affects all stages of *O. melanopus*, and especially the egg stage. Also, temperature has a great effect on the survival of first stage larvae, whereas higher stages larvae are more resistant. We can also say that temperatures during the winter (lower than -10°C) effect the survival of CLB chrysalises. The appearance of first imagoes in the spring depends directly on the temperature during the winter. Higher temperatures favour and help the development of all stages of CLB.



Tolerantnost OS hibridov koruze na ličinke koruzne vešče (*Ostrinia nubilalis* Hübner)

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Koruzna vešča (*Ostrinia nubilalis* Hubner) je eden od poglavitnih škodljivcev koruze na Hrvaškem. Selekcija OS hibridov ima tradicijo, daljšo od 120 let. Pridobili smo veliko dragocenega materiala, ki ga danes sejejo širom Hrvaške. Namen raziskave je bil, da ocenimo toleranco nekaterih OS hibridov proti temu škodljivcu. Poljski poskusi so trajali 3 leta (1999 – 2001) na dveh lokacijah. Ocenili smo 5 OS koruznih hibridov: OSSK 247, OSSK 332, OSSK 444, OSSK 552 in OSSK 644. Med spravilom koruze smo opravili pregled stebela. Določili smo intenzivnost napada koruzne vešče v odstotkih, lego in dolžino rovov (cm/rastlino) in pridelek zrnja (t/ha). Povprečna intenzivnost napada koruzne vešče v 3 poskusnih letih je bila 34,2 %. Najnižja intenzivnost napada je bila ugotovljena v letu 2000, s povprečjem 9,6 %, najvišja pa v letu 2001, s povprečjem 60,9 %. Najkrajši rovi v koruznem stebelu so bili v letu 2000, s povprečjem 0,48 cm/rastlino, v letu 2001 pa 5,46 cm/rastlino. V letu 1999, z intenzivnostjo napada 34,2 %, je bila dolžina rovov povprečno 0,95 cm/rastlino. Najdaljši rovi so bili zabeleženi v letu 2001, in sicer pri hibridu OSSK 444 16,62 cm/rastlino, OSSK 552 13,54

cm/rastlino, OSSK 644 10,68 cm/rastlino, intenzivnost napada pa je bila na teh hibridih prek 90 %. Triletni poskusi so pokazali, da je pri intenzivnosti napada pod 40 %, največja dolžina rovov v povprečju 1,58 cm. Če je intenzivnost napada prek 50 %, je povprečna dolžina rovov 5,78 cm/rastlino. Med intenzivnostjo napada in dolžino rovov je statistično značilna pozitivna korelacija ($r=0,80 - 0,99$). Nekateri hibridi so pokazali toleranco na koruzno veščo in so dali zadovoljive rezultate.

ABSTRACT

Larval tunneling of European corn borer (*Ostrinia nubilalis* Hübner) on OS corn hybrids

European Corn Borer (*Ostrinia nubilalis* Hübner) is one of the major pests of corn in Croatia. Selection of OS corn hybrids has tradition of more than 120 years. Many valuable material has been created and today is sown on wide areas in Croatia. The aim of this study was to evaluate the tolerance of some OS hybrids against this pest. Field trials were conducted during three years (1999-2001) on two localities. Five OS corn hybrids were evaluated: OSSK 247; OSSK 332; OSSK 444; OSSK 552 and OSSK 644. Dissection of corn stalk was done during harvest period. Intensity of attack of ECB (%) was determined, as well as position and length of damage (cm/plant), and grain yield (t/ha). Average intensity of attack caused by ECB during three years of investigation was 34,2%. The lowest attack intensity were determined in 2000 with the average of 9,6%, and the greatest was in 2001 with the average value of 60,9%. Length of damages on corn stalk was least in 2000 when average damage was 0,48 cm/plant, while in 2001 year, 5,46 cm/plant were damaged. In 1999 when attack intensity was 34,2%, the length of damage on the stalk was 0,95 cm/plant. The greatest length of damage on hybrids were recorded in 2001, when hybrid OSSK 444 has damage of 16,62 cm/plant, OSSK 552 has 13,54 cm/plant, and OSSK 644 has 10,68 cm/plant, and the attack intensity was in the same time over 90% in those hybrids. Three years trials showed that if attack intensity was under 40%, the greatest length of damage on corn stalk was in average 1,58 cm. If the intensity of attack was over 50%, the average length of damage on the corn stalk was 5,78 cm/plant. Significant positive correlation occurred between intensity of attack and length of damage ($r=0,80-0,99$). Some of the hybrids showed tolerance to ECB and reached satisfying results.



Možnosti varstva determinantnega paradižnika (*Lycopersicon lycopersicum* [L.] Karsten) v deževnem letu v odvisnosti od tehnik gojenja

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Raziskava je bila opravljena na Laboratorijskem polju Biotehniške fakultete v Ljubljani v letu 1999 z namenom preprečevati okužbo paradižnika (*Lycopersicon lycopersicum* [L.] Karsten) s paradižnikovo plesnijo (*Phytophthora infestans* [Mont.] de Bary). V poskusu, v katerem sta bila testirana dva kultivarja nizkega paradižnika ('Go-101' in 'Pick rite'), smo primerjali učinkovitost črne folije in dveh insekticidov z netretirano kontrolo. Rastline smo varovali pred glivičnimi boleznimi z ekološko sprejemljivimi fungicidi, kot sta dithane M-45 (mankozeb) in cuprablau-Z

(Cu-hidroksid). Ugotovili smo, da v ekstremnih deževnih razmerah nobena od izbranih tehnik ne zagotavlja ustreznega varstva rastlin. Najvišji pridelek zdravih plodov smo dobili pri trikratnem škropljenju s pripravkom dithane M-45, najvišji odstotek neokuženih plodov pa pri dvakratnem škropljenju s pripravkom cuprablau-Z.

ABSTRACT

The possibilities of protection of determinate tomato (*Lycopersicon lycopersicum* [L.] Karsten) in wet season, dependent upon the growing techniques

The experiment was conducted at the Experimental Station of the Biotechnical Faculty in Ljubljana during 1999, which aimed to prevent determinate tomato's infection (*Lycopersicon lycopersicum* [L.] Karsten) from tomato late blight (*Phytophthora infestans* [Mont.] de Bary). Two cultivars ('Go-101' and 'Pick rite') were tested. Black mulch and two insecticide programmes were compared with an untreated control. The plants were mycosis protected by ecologically compliant chemical means, with use of dithane M-45 (mancozeb), and cuprablau-Z (Cu-hydroxide). It was established that in an extremely wet growing season none of the selected techniques guaranteed successful protection of the plants. The highest yield was achieved with dithane M-45 which was applied three times, though the highest percentage of healthy (non-infected) tomatoes was accomplished with cuprablau-Z applied twice.



Varstvo pora (*Allium porrum* L.) pred škodljivci in boleznimi

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Poskus v posevku pora smo postavili na dveh različnih lokacijah v Ljubljani: v Sostrem in na Laboratorijskem polju Biotehniške fakultete. Preučevali smo škodljivce: tobakovega resarja (*Thrips tabaci* L.), čebulno muho (*Hylemya antiqua* Meig.) in porovo zavrtalko (*Napomyza gymnostoma* (Loew)) ter bolezni: porovo škrlatno pegavost (*Alternaria porri*/Ell./Neerg.) in porovo rjo (*Puccinia porri* (Sow.) Winter) na poru. Pri tehnologijah gojenja z neposredno setvijo, preko sadik in s PP prekrivko smo primerjali pojav škodljivcev in dveh bolezni. Škropili smo z dursbanom E-48, basudinom 40 WP in dithanom M-45. Med potekom poskusa smo dvakrat tedensko menjali lepljive rumene plošče, jih pregledovali in opazovali nalet škodljivcev, bolezni pa ustrezno ocenjevali. Napad tobakovega resarja je bil največji na parcelah, ki niso bile škropljene (15 %), sledijo parcele, ki so bile pokrite s PP prekrivko (11%) in tiste, ki so bile škropljene (10%). Napad tobakovega resarja (*Thrips tabaci* L.) je bil močnejši na Laboratorijskem polju BF, škrlatna pegavost pora (*Alternaria porri*/Ell./Neerg.) pa v Sostrem. Ostale bolezni in škodljivci so bili dokaj izenačeni po zastopanosti na obeh lokacijah.

ABSTRACT

Control of pests and diseases of leek (*Allium porrum* L.)

The experiment was carried out on two different locations in the vicinity of Ljubljana (Sostro and Laboratory field of the Biotechnical Faculty). The research was focused on the observation of onion thrips (*Thrips tabaci* L.), onion fly (*Hylemya antiqua* Meig.) and leek miner fly (*Napomyza gymnostoma* (Loew)), purple leek spottedness (*Alternaria porri*/Ell./Neerg.) and leek rust (*Puccinia porri* (Sow.) Winter). Those diseases have been observed through the use of different production techniques. So we observed direct sowing, growing with seedlings and covering the plants with PP cover. So we have checked the pests and diseases on two experimental fields with different technologies. We have sprayed the leek with different insecticides: dursban E-48, basudin 40 WP and dithane M-45. During experiment we changed the yellow sticky traps twice a week and evaluated the quantity of harmful insects on them. The diseases were also checked twice a week. Onion thrips were most numerous in the field where no insecticide were used (15% of the plants were damaged by thrips). The lesser extent of damage caused by feeding of *Thrips tabaci* were found in the treatments 'PP cover' (11%) and 'sprayed' (10%). In general the attack of onion thrips (*Thrips tabaci* L.) was stronger on the Laboratory field of the Biotechnical Faculty, while the occurrence of purple leek spottedness (*Alternaria porri*/Ell./Neerg.) was higher in Sostro. No significant differences among other diseases and pests in our research were recorded.



Vpliv herbicidov, ki se aplicirajo pred vznikom na kalitev in rast čebule

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Zatiranje plevela v posevku čebule je pomembno, ker ima čebula proti plevelom slabo tekmovalno sposobnost. V posevku čebule lahko najdemo vse plevelne vrste, ki so značilne za pokrajino. Med herbicidi, ki se aplicirajo pred vznikom lahko uporabimo tiste, ki za čebulo niso nevarni ali se močno vežejo na talne delce in se ne izperejo do semena. Namen poskusa je bil, ugotoviti vpliv 3 herbicidov, ki se aplicirajo pred vznikom: stomp 330 (pendimetalin), satecid 65 WP (propaklor) in reglone (dikvat-dibromid) na sejance in rast različnih sort čebule. Izbrane sorte so bile: Braunschweig, Barletta, Stuttgart giant in Silver white. Lončni poskus smo izvedli v rastlinjaku. Uporabili smo priporočene hektarske odmerke herbicidov. Spremljali smo kalitev in rast rastlin ter vpliv herbicidov na spremembo vsebnosti sveže in suhe snovi pri različnih sortah čebule. Ugotovili smo, da preizkušani herbicidi lahko vplivajo na te parametre v različnem obsegu. Stomp je močno zaviral kalitev in je povzročil poškodbe čebulnih sejancev.

ABSTRACT

Effect of preemergent herbicides on germination and growth of onion

Weed control of onion is very important because of this plant has a bad weed competition. All landscape weeds can be found in an onion culture. Among preemergent herbicides we can use which not dangerous for onion or strongly adsorb at the soil, so couldn't leach to the seeds result of a heavy rain.

The aim of our experiment was to study the effect three pre-emergent applicable herbicides: Stomp 330 (pendimethalin), Satecid 65 WP (propachlor) and Reglon (diquat-dibromide) on seedling and growth of different varieties of onion. Chosen varieties were Braunschweig, Barletta, Stuttgart giant, and Silver white.

Pot experiment was carried out under green house conditions. Herbicides were applied at landscape suggested doses.

We followed germination and growth of plants, changing of fresh matter production and dry matter production of onion varieties influenced by applying herbicides.

We established, that examined pre-emergent herbicides could influence these parameters in different extent. Stomp strongly hindered germination and damaged seedling of onion seeds.