GROWTH OF COMMON RAGWEED (*Ambrosia artemisiifolia*) ON DIFFERENT SOIL TYPES WITH VARIOUS NITROGEN SUPPLIES

Erzsébet NÁDASY[1], Gabriella KAZINCZI[2]

[1] University of Pannonia, Georgikon Faculty, Institute for Plant Protection
[2]Kaposvár university, Department of Botany and Plant Production

ABSTRACT

Common ragweed is one of the most dangerous and allergen weed species in Europe and Hungary. The reason of its wide spreading is very good adaptability to environmental factors.
Ambrosia artemisiifolia can be found on all soil types, but it multitudinous on brown forest soil and loose sandy soil. Biomass production and seed yield of plants are influenced by nutrient supply, first of all by nitrogen nutrition. Common ragweed is known as a nitrofill plant. Plant species can utilize nitrogen as nitrate or ammonium form. According to early researches there are differences between species according to utilization of nitrogen forms. We had no data's about that how can influence nitrogen forms of growth and biomass production of common ragweed. The aim of our pot experiment was to study the effect of soil type and different nitrogen fertilizers - péti-salt (ammonium-nitrate + calcium-carbonate), ammonium-nitrate and carbamide - on early growth of *Ambrosia artemisiifolia.* The experiment was set up on meadow soil, sandy soil with acidic pH and Ramann-brown forest soil. We also had control pots without fertilization on all three soil types. Plants grew poorly on settled meadow soil, fresh mass of ten plants was 5,06 g without fertilizers, while on sandy soil was 13,17 g, and on Ramann-brown forest soil was 10,39 g. Height, leaf area and dry mass of plants also staid behind plants grown on other type of soil. Nitrogen treatments increased fresh mass, it was significant in ammonium-nitrate (15,36 g) and carbamide (16,6 g) treatments on sandy soil. Nitrogen forms influenced the examined parameters differently on all three examined soil types.

Key words: *Ambrosia artemisiifolia*, fresh mass, leaf area, nitrogen fertilizer, soil type

1 INTRODUCTION

Ambrosia artemisiifolia is multitudinous on brown forest soils and on loose sandy soils. Nutrient supply of the soil influences the biomass production of common ragweed and hereby the seed production, but plants able to live and generates seeds between wide limit of nutrient supply (Lehoczky, 2004; Kőmíves ***et al***., 2006).
Several examinations studied the effect of nitrate and ammonium nitrogen forms on plant development. Different plant species react contrary to two nitrogen forms (Kirkby, 1981). The most of the plants species prefer nitrate and growth better on soil supply with nitrate that ammonium. Researches established that the plants love acidic soil fitted to ammonium nutrition. Ammonium has an advantage over nitrate in a lot of species of young plants.
On the base of former results the dry matter production less with ammonium nutrition that nitrate, lose of dry mass may be 15-60%. Plants supply with booth nitrogen forms increase nitrogen uptake, the growth will be quicker and more crop will develops, dry mass and

[1] PhD, H-8360, Keszthely, Deák F. Str. 57, nadasyne@georgikon.hu
[2] DSc, H-7400 Kaposvár, Guba S: str. 40, kazinczi.gabriella@ke.hu

protein content will be rise. This effect was proved a lot of cultures as winter wheat, maize, soya bean, flex or lettuce (Mengel-Kirkby 1982, Nádasyné 1999).
Béres and Sárdi (1994) examined the effect of nitrogen fertilizers on germination of wheat and its weeds. They established that péti-salt (ammonium-nitrate + calcium-carbonate) did not influenced germination of wheat at 100 mg N kg^{-1} doses in soil, but decreased the germination of catchweed bedstraw (*Galium aparine*) and increased of *Matricaria inodora*. The same doses of ammonium-nitrate increased germination of wheat with 2%, decreased of *Galium aparine* with 54%, but increased of *Matricaria inodora* with 34%. Carbamide decreased germination of wheat also with 2%, contrary rose of catchweed bedstraw with 54 and *Matricaria inodora* with 6%.

2 MATERIALS AND METHODS

We made a pot experiment in greenhouse of Plant Protection Institute in May of 2009 to study how can influence the soil type and different nitrogen fertilizers the early development of common ragweed.
Experiment was set up on meadow soil from Bonyhád, sandy soil with acidic pH from Tarany and Ramann-brown forest soil from Keszthely in Hungary. Pots contained 2 kg air dried soil (Table 1).

Table 1: Parameters of experimental soils

Soil type	**K_A**	**Humus %**	**pH $_{H2O}$**	**P_2O_5 mg kg^{-1}**	**K_2O mg kg^{-1}**
meadow soil	52	2,11	6,2	128	122
sandy soil	31	1,46	5,87	134	266
Ramann-brown forest soil	39	2,28	7,26	210	334

Applied fertilizers were péti-salt (ammonium-nitrate + calcium-carbonate, 27% N), ammonium-nitrate (34% N) and carbamide (46% N) with 100 mg N kg^{-1} soil in each treatment, except of unfertilized control pots on every three soils. We worked with four replications so we had 48 pots altogether.
In every pot were planted 20 pieces common ragweed plants with 1-2 leaves. Plants were collected from the edge of corn field in Keszthely. After three weeks we took samples moving out 10-10 plant from all pots. Leaf areas, length of shoots, fresh mass and after air drying the dry mass were measured. Results were statistically analyzed with SPSS program.

3 RESULTS AND DISCUSSION

Growth of plants and length of shoots were influenced first of all by soil type (Table 2.). Shoot length differed from each other significantly grown on all three soils. Plants developed the most slender on meadow soil. Much smaller differences were found between shoot length of plants grown on sandy soil and Ramann-brown forest soil, benefit of sandy soil. This result similar to establishment of Kőműves *et al.* (2006) that *Ambrosia artemisiifolia* likes brown forest soils and sandy soils too. Though common ragweed does not choosy considering the soil type but doesn't like the strongly fixed, bad water permeable, cracking soils.
Nitrogen fertilization promoted growth of shoots, except of carbamide treatment on meadow soil, where length of plants decreased not significantly. It can possible explain with ammonium accumulation in badly breathing soil, which is toxic for sensitive young plants. Since carbamide during decomposition converts into ammonium the first, this suddenly

increases the pH, and after converts into nitrate during processes of nitrification, when the pH considerable decreases.

Table 2: Length of shoots, leaf area, fresh and dry mass of common ragweed on different soils influenced by nitrogen treatments

Soil	Treatment	Length of shoots (mm plant^{-1})	Leaf area (cm^2 plant^{-1})	Fresh mass (g 10 plant^{-1})	Dry mass (g 10 plant^{-1})
meadow soil	Control	70,73	14,91	5,06	0,94
	Péti-salt	91,87	18,68	5,86	1,24
	Ammonium-nitrate	81,07	16,19	5,34	1,05
	Carbamide	65,7	11,69	4,06	0,73
sandy soil	Control	159,88	42,51	13,17	2,24
	Péti-salt	166,48	44,13	12,98	1,78
	Ammonium-nitrate	170,38	52,92	15,36	1,89
	Carbamide	175,25	56,87	16,6	2,1
Ramann-brown forest soil	Control	128,08	32,32	10,39	1,55
	Péti-salt	128,45	34,08	10,63	1,31
	Ammonium-nitrate	127,25	33,38	9,86	1,36
	Carbamide	131,9	38,83	10,74	1,34
	$LSD_{5\%}$	15,39	6,86	1,91	0,38

The highest plants were developed on sandy soil fallowed by Ramann-brown forest soil. We measured significant increase of shoot length by the effect of fertilization treated with péti-salt on meadow soil, and in carbamide treatment on sandy soil. We established that the leaf area of plants differed significantly on every three soils. The leaf area on meadow soil was almost half of plants' growth on Ramann-brown forest soil. The biggest area was measured on sandy soil. Nitrogen fertilization increased the leaf area except on meadow soil treated with carbamide, but this stimulating effect was significant only on sandy soil with carbamide and ammonium- nitrate.

Fresh mass of ten plants showed strong differences on three soils. Fresh mass of common ragweed was threefold on sandy soil, and twofold on brown forest soil than on meadow soil.

The fresh mass of plants on meadow soil also decreased similarly to shoot length and leaf area treated with carbamide compared to unfertilized control. Nitrogen treatments usually increased the fresh mass in small extent; it was significantly justified on sandy soil in ammonium-nitrate and carbamide treatments.

The tendency of dry mass changing looks like the fresh mass. Dry mass of plants differed significantly growing on different soils; it was maximal on sandy soil and minimal on meadow soil. Nitrogen treatments a little bit decreased the dry mass on sandy soil and brown forest soil.

4 CONCLUSIONS

Studying the development of *Ambrosia artemisiifolia* we found strong differences among plants growth on three experimental soils. Common ragweed grew conspicuously poorly on meadow soil, the length of shoot, leaf area and biomass production were behind compared to

plants grew on Ramann-brown forest soil and on sandy soil. ***Ambrosia*** liked sandy soil the best, examined parameters of plants were the biggest on this soil.
We established that effect of 100 mg kg^{-1} nitrogen fertilization promoted the growth of plants in a little extent. Lehoczky (2004) experienced that the optimal nitrogen dose for growth of common ragweed was the 200 mg nitrogen kg^{-1} soil. So the nitrogen dose we used in present experiment proved to be limited to good development of this nitrofil weed species.
Nitrogen fertilizer forms influenced leaf area, shoot length and biomass production differently on three examined soils. On meadow soil the péti-salt (ammonium-nitrate + calcium-carbonate), but on sandy soil and on brown forest soil the carbamide helped the development of ragweed, contrary hindered on meadow soil. This effect resulted probably ammonium storage in soil, in consequence of bad water regime.

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