

**EFFECT OF SHOOT RESIDUES OF SOME PERENNIAL PLANTS ON THE
GERMINATION AND DEVELOPMENT OF COMMON RAGWEED (*Ambrosia
artemisiifolia* L.)**

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ABSTRACT

Common ragweed (*Ambrosia artemisiifolia* L.) is considered to be the most dangerous invasive alien weed species in Europe. In Hungary, *A. artemisiifolia* infests many arable crops. Besides its harmful effects in agriculture it is believed to be the most important pollen-allergic plant. The aim of our investigations was to study the effect of shoot residues of some perennial species (*Ailanthus altissima*, *Juglans regia*, *Solidago gigantea*, *Robinia pseudo-acacia*) on the germination and aboveground biomass production of *A. artemisiifolia* in pot experiments under field conditions. It was stated that donor plants - known earlier about their inhibitory effects - rather promoted than retarded germination and early growth of *A. artemisiifolia*. Probably *A. artemisiifolia* could utilize shoot residues incorporated into the pot's soil, as nutrient sources via its roots, as it was already proved in earlier experiments. The observed stimulatory effects on common ragweed offer the possibility to help the dominance of this weed under field conditions.

Key words: invasive plants, allelopathy, growth, germination

1 INTRODUCTION

Common ragweed (*Ambrosia artemisiifolia* L.) is considered to be the most important invasive alien weed species in Hungary and Europe (Novák *et al.* 2009). In Hungary, common ragweed infests mainly arable cultures (Kazinczi – Novák, 2014), particularly sunflower and stubble fields (Pinke *et al.* 2013). Besides its harmful effects on agriculture, common ragweed (*Ambrosia artemisiifolia* L.) became the most important pollen-allergenic plant in the last years (Smith *et al.* 2013). Recently this weed species is in the centre of interest of other European countries (Fenesi *et al.*, 2014; Milakovic *et al.*, 2014; Müller-Schärer *et al.* 2014). Database of more decades is available about its spreading, biological, ecological characteristics, economic and human health injuries (Szigetvári – Benk 2004). Some review papers were also published in the last years. In spite of our large knowledge some aspects of its biology is not yet well known, and this fact makes more difficult the adaptation of effective control techniques (Kazinczi *et al.* 2008 a,b; Kazinczi – Novák 2014).

It is well known that *A. artemisiifolia* – as a donor plant in allelopathic research - can release allelochemicals which inhibit the germination and development of some recipient (test)

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species (Béres *et al.* 2002). In spite of that no plant species – except in bioassay experiments – are known so far which could inhibit the development of *A. artemisiifolia* (Kazinczi *et al.* 2012).

Therefore the aim of our investigations was to study the role of *A. artemisiifolia* as an recipient (test) species under glasshouse conditions.

2 MATERIALS AND METHODS

Aboveground plant parts of the donor plant species (*Ailanthus altissima*, *Juglans regia*, *Solidago gigantea*, *Robinia pseudo-acacia*) were collected in summer of 2014 year. They were left to dry under glasshouse conditions for a week, then chopped shoot parts were mixed into the soil of the pots (800 g dried shoots into 10 kg of a soil mixture). 50-50 ragweed seeds were sown on the top of each plastic pots and germination was evaluated daily until no further emergence occurred. Ragweed seedlings were removed after counting except 4-4 seedlings for each pot. Fresh and dry shoot weight of ragweed was recorded 42 days after sowing (DAS). Analysis of variance was used to evaluate the results statistically with an error of 5 %.

3 RESULTS AND DISCUSSION

It was stated that donor plants - known earlier about their inhibitory effects - rather promoted than retarded germination and early growth of *A. artemisiifolia*. (Table 1). Probably *A. artemisiifolia* could utilize shoot residues incorporated into the pot's soil, as nutrient sources via its roots, as it was already proved in earlier experiments (Kazinczi *et al.*, 2008c, 2013a). The most intensive stimulatory effects on ragweed germination, fresh and dry shoot weight were the followings: 146 % (*S. gigantea* shoot residues), 164 % (*R. pseudo-acacia* shoot residues), 164 % (*R. pseudo-acacia* shoot residues), respectively (Table 1).

Table 1: The effect of shoot residues of the donor plant species on the germination and shoot weight of common ragweed

Treatments*				
1	2	3	4	5
Germination (%)				
45 ^a	57.5 ^a	65.5 ^a	52.75 ^a	55.5 ^a
LSD _{5%} = 24.29013; std error = 11.3984				
Fresh shoot weight (g/pot)				
6.775 ^a	11.075 ^b	7.925 ^a	11.1 ^b	7.425 ^a
LSD _{5%} = 2.18951; std error = 1.0275				
Dry shoot weight (g/pot)				
1.25 ^{ad}	1.9 ^{bc}	1.5 ^{ab}	2.05 ^c	1.00 ^d
LSD _{5%} = 0.492133; std error = 0.2309				

*1: Control, 2: *Juglans regia* shoot residues, 3: *Solidago gigantea* shoot residues, 4: *Robinia pseudo-acacia* shoot residues, 5: *Ailanthus altissima* shoot residues

Based on our results - in comparison with previous work – it was stated that the effects of allelochemicals greatly depend on donor, recipient (test) species, plant parts, the age of plants (living, dead), concentration and type of the dissolvents (water, organic ones) and the physiological target process observed (e.g. germination, growth) (Kazinczi *et al.*, 2013b). In an earlier study water root extract of *Solidago gigantea* had the strongest inhibitory effect, causing over 90 % reduction in aboveground biomass production of velvetleaf (*Abutilon*

theophrasti) (Horváth *et al.*, 2006), while inhibitory effect of *S. gigantea* root residues was significant only on the germination of common ragweed. Both shoot and root residues of *S. gigantea* significantly promoted ragweed's development (Kazinczi *et al.*, 2013a).

Ailanthus altissima stimulated germination of ragweed in present experiment, in opposite Kovács - Nádasyné (2014) detected significant inhibitory effect of shoot extracts on germination and early growth of maize.

4 CONCLUSIONS

The observed stimulatory effects of the donor plant species on common ragweed offer the possibility to help the dominance of this weed under field conditions. Our results underpin the previous statements that common ragweed can utilize the residues of some allelopathic plants, perhaps as nutrient sources. This phenomenon – among others – can be one reason for its rapid expansion under field conditions.

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