



Mini Review

Root Exudation in Common Ragweed (*Ambrosia Artemisiifolia* L.)

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ABSTRACT

Common ragweed is herbaceous annual plant of Asteraceae family, originating from North America. Ragweed is an important agricultural weed in Europe; its pollen grains are noxious aeroallergens and cause summer hay fever. Regarding the climate change it seems beneficial to assess the invasive potential of ragweed and its ability to influence the native plant associations in area of its potential expansion. We assume that competing ability of ragweed is promoted by allelochemicals released into the soil by intact roots, which affect the germination, growth and propagation of neighbouring plants. This paper presents knowledge on ragweed root exudates.

Keywords: *Ambrosia artemisiifolia*, Root exudates, Amino acids, Aliphatic organic acids, Allelopathy.

INTRODUCTION

Invasive plant *Ambrosia artemisiifolia* (Asteraceae) of North American origin is an important agricultural weed in Europe and also occupies large non-crop areas with a range that is likely to accelerate under climate change. It produces a large amount of highly allergenic pollen.

Ambrosia artemisiifolia was first recorded in the Czech Republic in 1883. This species prefers open dry habitats on sandy or gravel substrata with low vegetation cover; most records are from around railway stations, river harbours, and transit sheds, agricultural and industrial areas dealing now or in the past with soya beans, and neighbouring referral areas [1].

Allelopathy of *Ambrosia artemisiifolia*: Genus *Ambrosia* produces many secondary metabolites, including phenolics, thiarubrines, thiophenes etc. [2]. Thiarubrine A is a biologically active compound synthesized by *Ambrosia artemisiifolia* with antifungal, antibacterial and antiviral properties [2]. Four

polyacetylenes, a mixture of sesquiterpene hydrocarbons, methyl caffeate and a mixture of β -sitosterol and stigmasterol were obtained from the roots of *Ambrosia artemisiifolia* [3].

The bioassay performed by Jackson and Willemsen [4] showed that *A. artemisiifolia* plants are successful pioneer plants on newly ploughed fields and in disturbed habitats; competing ability of *A. artemisiifolia* peaks in first year of succession and is facilitated by phenolic acids, namely caffeic and chlorogenic acids. The presence of *A. artemisiifolia* on exposed sites also shows a positive shift in soil fertility, namely in soil organic matter, available phosphorus, nitrate, ammonium nitrogen and potassium [5].

Allelopathic potential of *A. artemisiifolia* could be described using the juglone index; reported values for *A. artemisiifolia* are measured for 1% and 5% (w/v) extracts of plant material in distilled water and could reach up to 0.86 and 0.93 respectively [6]. *Ambrosia trifida* L. was tested for allelopathic effects on wheat [7]. Allelopathic effects were confirmed for two sesquiterpenes of carotane group, namely 1α -angeloyloxy-carotol and 1α -(2-methylbutyroyloxy)-carotol, which showed inhibition thresholds at concentrations 11.5 $\mu\text{g/g}$ and 16.3 $\mu\text{g/g}$ soil, respectively [7].

Root exudates of *Ambrosia artemisiifolia*: Knowledge on allelopathic effect of root exudates of *Ambrosia artemisiifolia* on germination of plant species is described in work by Kašparová [8]. Cultivation of plant species (*Plantago lanceolata* L., *Lotus corniculatus* L., *Festuca rubra* L., *Phleum pratense* L. and *Arrhenatherum elatius* L.) in variant with root exudates of *Ambrosia artemisiifolia* and in control variant was performed [9, 10, 11, 12]; root exudates of *Ambrosia artemisiifolia* cultivated to different growth stages were collected and analysed [11, 12, 13]. Root exudates of *Ambrosia artemisiifolia* showed an inhibitory effect on growth of cereals (*Hordeum vulgare* L. and *Triticum aestivum* L.) and *Lycopersicon esculentum* Mill. etc.[10, 11, 12, 14].

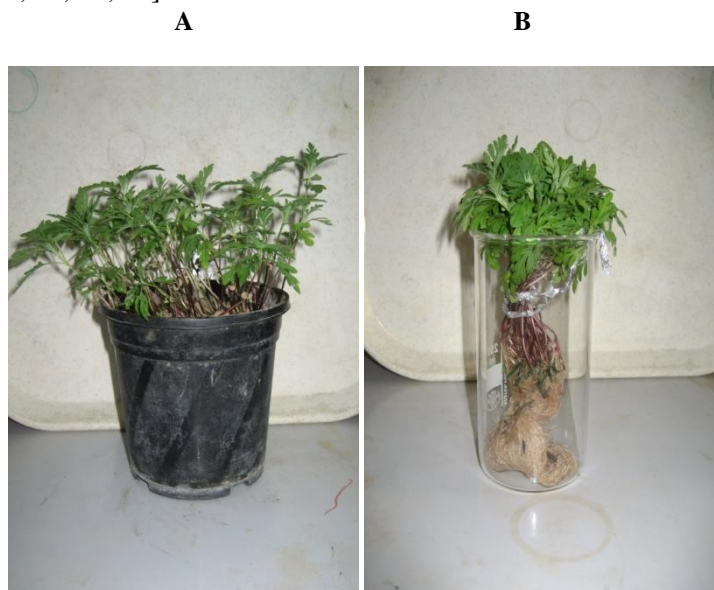


Figure 1: *Ambrosia artemisiifolia* cultivated in flowerpots filled with mineral soil (A) and the *A. Artemisiifolia* plants with washed roots(B)

APPLICATIONS

Root exudates of *Ambrosia artemisiifolia* cultivated to different growth stages were collected and analysed; the use of given methods is described in work by Hohnová et al. [13].

CONCLUSIONS

Knowledge on the effect of root exudates of *Ambrosia artemisiifolia* on growth of plant species and on the composition of root exudates of *Ambrosia artemisiifolia* cultivated in mineral soil (**Figure 1**) were obtained.

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