



EFFECT OF ESSENTIAL OILS ON GERMINATED SEEDS OF RAGWEED



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Introduction

Ragweed (*Ambrosia artemisiifolia*) is problematic invasive plant widespread all around Serbia. Chemical and mechanical weed control methods have been developed to control invasive weeds, such as ragweed. They are already partially implemented in the South and East Europe, although sustainable control strategies to mitigate its spread into these areas have not yet been established. Some biological measures like using natural products with no negative impacts on human health and the environment (“Green Pesticides”) take a great attention for use of herbal essential oils.

Materials and methods

In the present study we have tested efficiency of several essential oils extracted from medical plant species (*Anethum graveolens* L., *Origanum vulgare* L., *Juniperus communis* L., *Salvia officinalis* L., *Satureja montana* L.) for ragweed control. Effect of essential oils on seed germination and seedling growth (length) were tested using *in vitro* method in Petri dishes. Petri dishes containing seeds and diluted oils (500µl in 100ml of distilled water) were sealed with parafilm and left for a week in the dark, at 27°C. Following that period, impacts of essential oils’ solutions on seed germination were observed. For testing effect of oils on seedling growth seed were germinated in water and at the moment of radicle emergence transferred to diluted oils. This effect was observed based on seedling length after 7 days. Statistical analysis of results obtained from both experiments was performed using t-test.

Results

Table 1. Effects of essential oils on germination of ragweed seeds

Measured parameters	Treatments					
	C	U1	U2	U3	U4	U5
Number of germinated seeds	7.22 ± 1.86	0 ± 0	0 ± 0	1 ± 1	0.22 ± 0.67	0 ± 0
Inhibition of germination (%)		100	100	86.15	96.95	100

Table 2. Effects of essential oils on ragweed seedlings growth

Measured parameters	Treatments					
	C	U1	U2	U3	U4	U5
Seedlings lenght (cm)	3.2059	0.0529	0.0882	3.6353	0.0882	0.0706
Seedling lenght reduction (%)	5.8824	5.8778	5.8800	5.8824	5.8800	5.8833

C – control, U1 – *A. graveolens*, U2 – *O. vulgare*, U3 – *J. communis*, U4 – *S. officinalis*, U5 – *S. montana*

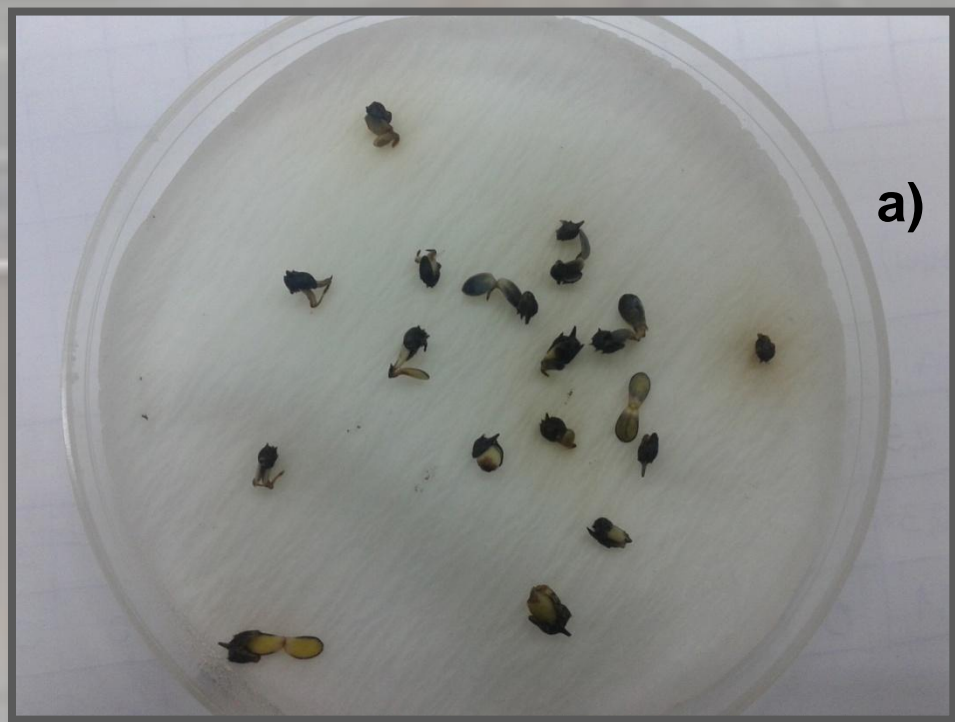
Table 3. Results of t-test for percentage of ragweed

	C	U1	U2	U3	U4
U1	0.000000**				
U2	0.000000**	ns			
U3	0.000000**	0.008479**	0.008479**		
U4	0.000000**	0.332195ns	0.332195ns	0.070026ns	
U5	0.000000**	ns	ns	0.008479**	0.332195ns

p> 0.05 ns (not significant difference), 0.01<p<0.05 * (statistically significant difference), p<0.01 ** (statistically highly significant difference)

Table 4. Results of t-test for ragweed seedlings growth

	C	U1	U2	U3	U4
U1	0.002779**				
U2	0.001475**	0.259382ns			
U3	0.586750nr	0.007803**	0.004513**		
U4	0.001479**	0.348574ns	1.000000ns	0.004519**	
U5	0.003260**	0.460856ns	0.900026ns	0.008770**	0.911303ns



Picture 3. Effects of essential oils from a) *S. montana*; b) *J. communis*; c) *S. officinalis* on the ragweed seedlings growth



Picture 4. Ragweed seeds

Conclusion

Generally, all essential oils affected seed germination and seedlings growth. Therefore, our results confirmed that the tested five oils possess inhibitory effect on *A. artemisiifolia* seeds germination. With exception of oil from *S. montana*, tested oils from *A. graveolens*, *O. vulgare*, *J. communis*, *S. officinalis* also had inhibitory effect on seedling growth. The obtained results show that all tested oils, due to their *in vitro* herbicidal activity have potential for use as pre-emergence weed seed germination inhibitors, and as a part of integrated weed management practices.