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INFLUENCE OF THE APPLICATION OF SELECTED ESSENTIAL OILS ON THE GERMINATION OF SOYBEAN (GLYCINE MAX) SEEDS

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Abstract: The present scientific paper presents the results of the effects of treatments with essential oils of crimson beebalm and wild thyme, at different concentrations (25 µl/ml and 50 µl/ml), on the germination of soybean seeds, considering the antifungal and antibacterial properties of the essential oils mentioned above. To evaluate the phytotoxicity of essential oils on the seed germination process, two experiments were realized: one *in vitro* and one *in vivo*. It was observed that the application of *Monarda didyma* and *Thymus pulegioides* essential oil treatments, at different concentrations, did not negatively influence the germination percentage of soybean seeds, but caused a reduction/inhibition of root size development. The *in vivo* experiment showed an inhibitory effect of the tested oils on the development of vegetative organs of soybean plants compared to plants in the control group not treated with essential oils.

Introduction

Today, there is a growing interest in ecofriendly products such as essential oils. These are able to fight pathogens and control the growth of plants that are harmful to agricultural crops. Thus the use of essential oils is arousing great interest for their bactericidal, virucidal, fungicidal, antiparasitic, insecticidal and herbicidal applications. The aim of the present work is to evaluate the effects of essential oils of *Monarda didyma* and *Thymus pulegioides*, at different concentrations, on the germination of soybean seeds, taking into account the antifungal and antibacterial properties of the essential oils mentioned above.

Material and method

The first experiment, *in vitro*, was carried out in sterile Petri dishes of size 90x15mm. Ten soybean seeds were placed on top of the filter paper in each Petri boxes, selected beforehand. The second experiment, *in vivo*, involved the evaluation of the effects of the two essential oils, previously studied, at concentrations of 25 and 50 µl/ml respectively, on the germination of soybean seeds (belonging to the same variety, previously used in the first experiment) in soil.



In vitro and *in vivo* testing of the phytotoxicity of essential oils of *Monarda didyma* and *Thymus pulegioides*

Results and discussions

In the control lot the germination percentage was 90%. In the experimental groups treated with *Thymus* essential oil (25 µL/ml respectively 50 µL/ml) and *Monarda* essential oil 50 µL/ml, no changes in germination percentage were observed. The experimental lot subjected for eight days to *Monarda* essential oil vapour at a concentration of 25 µL/ml showed a germination percentage of 90%, compared to the control lot where a percentage of 100% was obtained. Wild thyme oil applied at a concentration of 50 µL/ml, resulted in a stimulation of root (radicle) growth, compared to the mean root growth of the control group.

After evaluation of soybean plants from the lot treated with essential oil of spontaneous thyme at a concentration of 25 µl/ml, compared to the control lot we observe a significant reduction in the size of germinated plants, but also of each vegetative organ. Percentage of 50% of the plants, although they germinated (the appearance of the radicle could be observed), could not continue their development. An inhibition of growth/development of soybean plants after germination was also observed in soybean samples treated with monarda essential oil at a concentration of 50 µl/ml (Figure 1).

Conclusions

Considering the antifungal and antibacterial properties of the oils analysed, as reported in the literature, as well as the results obtained in the first *in vitro* experiment following the application of essential oil treatments on soybean seeds, the use of the oils studied, can be taken into account as possible ecofriendly fungicides in grain storage. It is necessary to continue the *in vitro* and *in vivo* tests regarding the essential oils influence on seed germination, for other crops and also on some weed species, due to the inhibitory effect observed.

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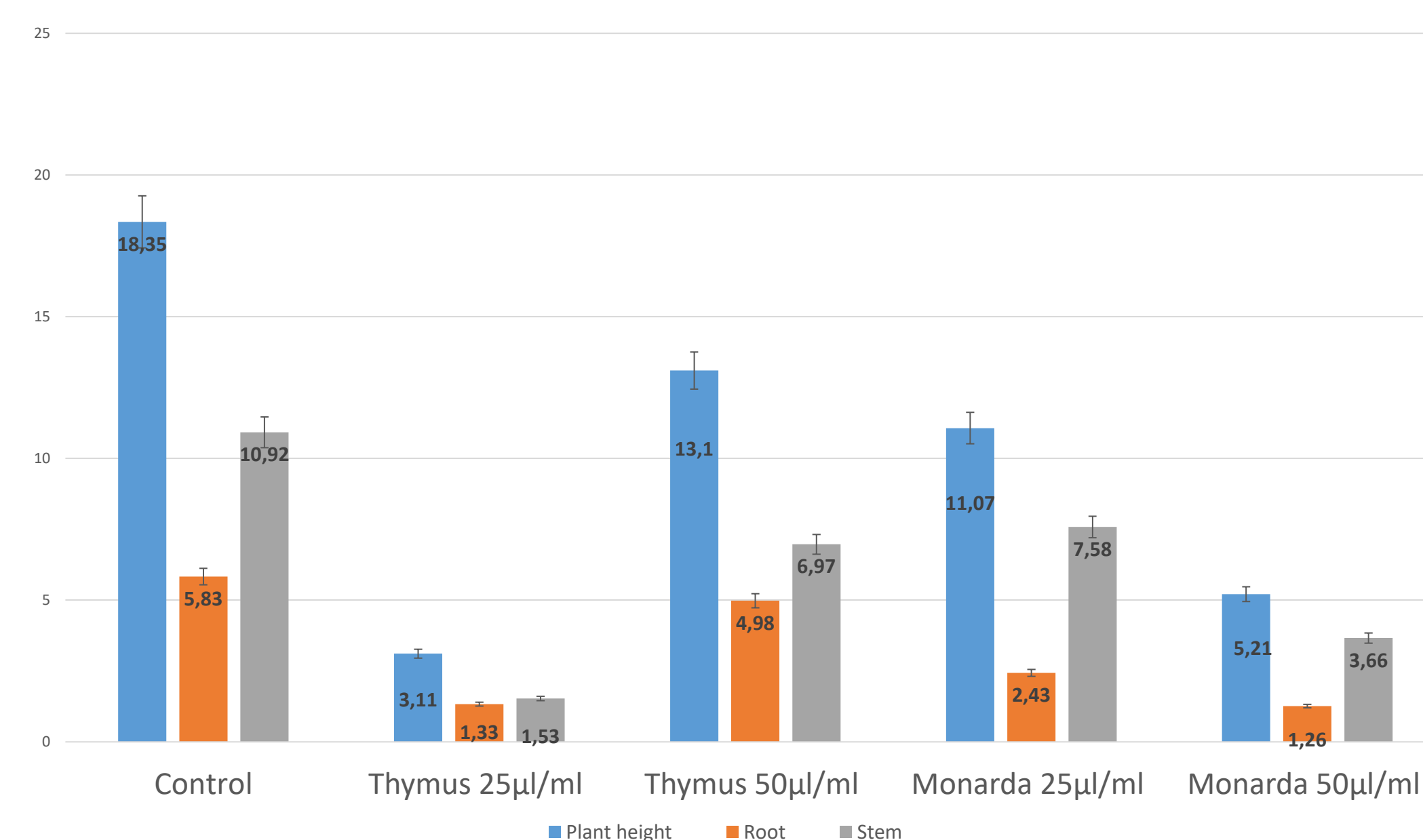


Figure 1. Graphical representation of the average size of the vegetative organs, compared to the control group