

ALLELOPATHIC EFFECT OF *Cannabis sativa* L. ESSENTIAL OIL ON INITIAL GROWTH OF *Chenopodium album* L.

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Abstract

Allelopathy is increasingly gaining importance due to the tendency to avoid the use of synthetic herbicides. Research is increasingly focused on the finding of plant compounds that have allelopathic properties to weed species. The aim of the study is to examine the allelopathic potential of *Cannabis sativa* L. essential oil in relation to the initial growth of the weed species of *Chenopodium album* L. The essential oil was obtained by the process of distillation of dry plant material collected during the ripening phase. The concentrations of essential oil were 200, 400, 600 and 800 ml/l, while distilled water was used in the control. The parameters that were studied were the length of the hypocotyl and the length of the epicotyl *C. album* L. All investigated concentrations of essential oil exhibited an inhibitory effect. The average length of hypocotyl *C. album* L. in control was 2.67 cm while in the smallest concentration it was 1.9 cm. The average length of epicotyl *C. album* L. in control was 2.7 cm and in the lowest applied concentration of 1.67 cm. Increasing concentrations of essential oil increased the inhibitory effect. The obtained results indicate that it is possible to use *C. sativa* L. essential oil as bioherbicides for the control of *C. album* L.

Introduction

The potential damage to human health and the environment from herbicides is regarded as a real problem today. This problem has resulted in an increase in interest in alternative methods that lead to the discovery of biodegradable compounds [1]. The properties of certain compounds to inhibit the germination of weed seeds and suppress their growth are attributed to allelopathy, which is very important and can be considered an alternative, non-chemical measure of weed control [2]. Interfering the normal functioning and suppressing growth of cultivated plants, weeds lead to yield reductions of up to 34% [3]. The exploitation of allelopathic properties in plants may give promising results [4]. Certain compounds derived from plants are used as repellents and pesticides, and the best known examples are compounds obtained from the following plant species: *Allium sativum* L., *Ricinus communis* L., *Tagetes patula* L., *Tanacetum vulgare* L., *Azadirachta indica* L., *Chrysanthemum cinerariifolium* (Trevir.) Vis., *Nicotiana tabacum* L., *Strychnos nux-vomica* L. [5]. Aromatic and medicinal plants are investigated as crops with pronounced allelopathic properties [2]. *Cannabis* also has the potential to be used as a repellent and pesticide [5]. The aim of the study is to determine

the allelopathic effect of *Cannabis sativa* L. essential oil on the initial development of the weed species *Chenopodium album* L.

Experimental

Cannabis sativa L. essential oil was obtained in the process of distillation of dry plant material, which represents the above-ground part of the plant collected during the period of ripening. The essential oil was obtained by distilling 60g of dried plant material which was placed in a flask with 800 ml of distilled water. The distillation process lasted 2.5 hours. *C. sativa* L. essntial oil was used in concentrations of 200, 400, 600 and 800ml/l.

The experiment was set up in 2017 in laboratory conditions. The biotest consisted of placing the *C. album* L. in Petri dishes with filter-paper. It was set in 15 seeds in two repetitions for each concentration of essential oil, while distilled water was used in the control. The Petri dishes were placed in an air-conditioned chamber for conditions of 24 °C during a fourteen-hour period ($400 \text{ micrometer photons m}^{-1} \text{ s}^{-1}$) and then a temperature of 22 °C over a ten-hour dark period. After 5 days of follow-up, the length of the hypocotyl and the length of the epicotyl in each Petri dish were measured.

Results and discussion

Effect of essential oil on the length of hypocotyl

By examining the effect of *Cannabis sativa* L. essential oil on the initial development of the *Chenopodium album* L. species, allelopathic effect was established. Increasing the concentration of essential oil increased the inhibitory effect. Unlike the control in which the average length of the hypocotyl was 2.67cm in the lowest applied concentration of essential oil, the average length of the hypocotyl was 1.9cm. A concentration of 400ml/l gave an average length of the hypocotyl of 1.6cm, a concentration of 600ml/l length of 0.77cm while a concentration of 800ml/l showed the strongest inhibitory effect with the average length of the hypocotyl was 0, 67cm (Figure 1).

Effect of essential oil on the length of the epicotyl

The *C. sativa* L. essential oil exhibited an inhibitory effect on the length of the epicotyl of the test species *C. album* L. The highest inhibitory effect exhibited concentrations of essential oil of 600 and 800ml/l, with the average length of the epicotyl being 0.63cm in difference from a control in which the average length was 2.7cm. The inhibitory effect also exhibits the smallest applied concentration of 200ml/l with an average length of epicotyl *C. album* L. of 1.67cm, while the concentration of 400ml/l gives an average length of 1.2cm (Figure 1).

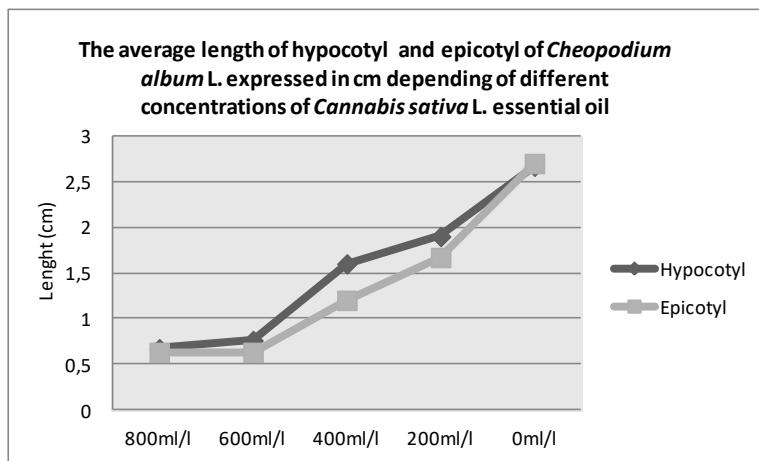


Figure 1. The average length of hypocotyl and epicotyl *Chenopodium album* L. expressed in cm depending on the application of different concentrations of *Cannabis sativa* L. essential oil.

Conclusion

The obtained results in the conducted research clearly indicate the allelopathic inhibitory effect of *C. sativa* L. essential oil on the initial development of the weed species of *C. album* L. All investigated concentrations of essential oil inhibit the increase in *C. album* L., which is observed through the observed parameter of the average length of the hypocotyl, but also through average length of the epicotyl. The obtained results indicate the possibility of the use of *C. sativa* L. essential oil for the control of weed species *C. album* L. Due to increasing public pressure due to the harmful effects of synthetic herbicides on the environment, the application of biological measures to control weed species is gaining in importance makes it remarkable.

References

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