

## بررسی پتانسیل آلوپاتیک برخی از اسانسهای مهم گیاهی

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### چکیده

به منظور بررسی پتانسیل آلوپاتیک اسانس میوه های زنیان (*Carum copticum*) و زیره سبز (*Cuminum cyminum*) و بخشهای هوایی مربوط به گیاهان رزماری (*Rosmarinus officinalis* L) و آویشن شیرازی (*Zataria multiflora* Boiss)، آزمایشی به صورت درون شیشه ای انجام شد. در این پژوهش اثر بازدارندگی اسانسهای مورد آزمایش در غلظتهای ۰، ۱۰۰، ۲۰۰، ۳۰۰ و ۴۰۰ میکرولیتر بر لیتر ( $\mu\text{l. L}^{-1}$ ) بر جوانه زنی و رشد گیاهچه های مرغ (*Cynodon dactylon* L.)، فستوکا (*Festuca arundinacea* Schreb.) و لولیوم (*Lolium perenne* L.) که از تیره Poaceae میباشند، موردآزمون قرار گرفت. نتایج نشان داد که جوانه زنی بذور و رشد گیاهچه ها به طور معنی داری ( $P \leq 0.05$ ) توسط تمام اسانسها بکار برده شده تحت تاثیر قرار گرفته و کاهش یافت. در بین غلظتهای بکار رفته، بیشترین تاثیر مربوط به غلظتهای ۳۰۰ و ۴۰۰ میکرولیتر بر لیتر بود. بعلاوه نتایج حاکی از آن بود که اسانس آویشن شیرازی در مقایسه با سایر اسانسها دارای بیشترین تاثیر (۱۰۰٪ اثر بازدارندگی) بر جوانه زنی و رشد گیاهچه های مورد آزمایش است.

**کلمات کلیدی:** آلوکمیخالها، اثرات آلوپاتیک، اسانس، تیره Poaceae، جوانه زنی، رشد گیاهچه

### Introduction

Inhibition of growth of plants by other plants in their vicinity has been known for a long time. The chemical interaction between plants, which can cause enhancement or inhibition of growth, has been termed 'allelopathy' and has been extensively studied (Macias et al., 2007; Azirak and Karaman, 2008). Tworokski (2002) observed phytotoxicity effects of some essential oils as post emergence growth inhibitors. Singh et al., (2005) reported the phytotoxicity activity of volatile oils from *Eucalyptus citriodora* against *Parthenium hysterophorus*. Ramezani et al., 2008, showed the allelopathic effects of four essential oils against three weed species as pre-emergence.

This study was initiated to determine the allelopathic effects of some important Iranian essential oil plants against three genera of Poaceae family and exploring their possible allelopathic potential.

### Materials and Methods

#### Plant material

To determine the allelopathic effects of essential oils, common Bermudagrass (*Cynodon dactylon* L.), Tall fescue (*Festuca arundinacea* Schreb.), and Perennial ryegrass (*Lolium perenne* L.) were selected as plants exposed to the selected essential oils.

#### Essential oils isolation

Essential oils of examined plants were extracted by hydrodistillation for 2.5 hr, using an all glass Clevenger-type apparatus.

#### Bioassay of Inhibition Induced by Essential Oils

In order to detect the allelopathic effects of the studied EOs, four concentrations (100, 200, 300, and 400  $\mu\text{l.L}^{-1}$ ) and a control (0  $\mu\text{l.L}^{-1}$ ) were used. Four replications of 100 weed seeds were also used for each essential oil concentration. After 20 days, all germinated and non-germinated seeds were counted. The seeds showing radicle emergence were recorded as germinated. Total lengths of seedlings (root plus shoot) were also measured in all treatments.

## Results and Discussion

The essential oils resulted in decreasing seed germination and seedling length in all studied plants. *Z. multiflora* essential oil showed the greatest inhibition effect on seed germination and seedling length of all tested plant genera. Germination significantly ( $P \leq 0.05$ ) suppressed (0-0.25 %) by application of *Z. multiflora* oil at the rate of 400  $\mu\text{L.L}^{-1}$  and reached between 1-11% at 300  $\mu\text{L.L}^{-1}$ . The results also demonstrate that in except of Bermudagrass seedling length, the 100  $\mu\text{L}$  of *Z. multiflora* oil is significantly ( $P \leq 0.05$ ) effective in seed germination and seedling length of all tested plants.

In the present study, which is a basic work regarding the allelopathic potential of some important Iranian aromatic plants, all tested EOs, particularly of *Z. multiflora*, exhibited a significant inhibitory effect on the seed germination and seedling lengths of examined plants and showed allelopathic effects. The concentration of the EOs was an important factor which changed the degree of allelopathic effects. With an increase in EO concentration, germination capacity and seedling lengths markedly decreased.

## Conclusion

The results obtained in this study suggest the use of *Zataria multiflora*, *Rosmarinus officinalis*, *Carum copticum*, and *Cuminum cyminum* EOs at 300 and/or 400  $\mu\text{L.L}^{-1}$  to control seed germination and seedling growth of the examined plants belonging to the Poaceae family. The findings of this work may be extended to other noxious weeds in this family. The results reported here can be considered the first steps towards a possible practical application of EOs as potentially natural allelochemicals. Further studies on the phytotoxicity and especially on formulation of EOs, are still required before this technique could be used for weed control in agriculture.

## References

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## Abstract

Essential oils (EOs) obtained from dried fruits of *Carum copticum* L. and *Cuminum cyminum* L., and aerial parts of *Rosmarinus officinalis* L. and *Zataria multiflora* Boiss. were evaluated *in vitro* to examine their potential allelopathic effects. The inhibitory effects of oils at concentrations of 0, 100, 200, 300 and 400  $\mu\text{L.L}^{-1}$  on seed germination and seedling growth of common bermudagrass (*Cynodon dactylon* L.), tall fescue (*Festuca arundinacea* Schreb.) and perennial ryegrass (*Lolium perenne* L.) from the Poaceae family were tested. Germination rate and seedling length were significantly ( $P \leq 0.05$ ) reduced by all EOs, however, the highest effect was observed at 300 and 400  $\mu\text{L.L}^{-1}$ . Moreover, the allelopathic impact of *Z. multiflora* oil on the seed germination and seedling growth was most effective (100% germination and growth inhibition) when compared with other tested oils.

**Key words:** Allelochemicals, Growth Inhibition, Poaceae, Volatile oils.