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Allelopathic effects of some essential plant oils on germination of some weed species

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Abstract

Weeds are problem in many crops and they cause important yield and quality loss. To control weeds herbicides are used commonly. But the herbicides cause serious problems for human health and environment. Because of this, alternative weed control methods to chemical control are investigated. One of these methods is using natural allelochemicals instead of synthetic herbicides. In this study, allelopathic effects of essential plant oils belonging to different plant species on seed germination of Vicia sativa (common vetch), Amaranthus retroflexus (redroot pigweed), Portulaca oleracea (purslane) and Lolium perenne (perennial rye grass) were investigated. For this purpose, four different plant species Pelargonium graveolens (rose geranium), Melaleuca alternifolia (tea-tree), Vitex agnus-castus (vitex) and Lavandula stoechas (topped lavender)'s oils obtained by steam distillation methods were applied at various doses on seeds of these four weed species. Twenty-five seeds for common vetch and a hundred seeds for others put into each nine cm diameter sterile petri dishes. Three different doses (0, 5µℓ, 10µℓ and 15µℓ) of plant oils were mixed with ten ml pure water and applied to petri dishes. Seeds of V. sativa and L. perenne left to germinate at 22 °C and seeds of A. retroflexus and P. oleracea left to germinate at 30 °C. The seeds were counted on 3rd, 5th, 7th, 10th, 14th and 19th days from the beginning of the experiment and when their radicula length reached to 0,5 cm, accepted as germinated. The all essential oils used in the experiment effectively reduced germination ratio of A. retroflexus and L. perenne. The effect of plant oils on V. sativa and P. oleracea was found very low. L. perenne was determined to be more sensitive to plant oils than others. The most effective plant oil was found tea-tree oil. The essential oil of M. alternifolia reduced seed germination of L. perenne by 34%, 84% and 87% at the rate of 5µℓ, 10µℓ and 15µℓ, respectively. The second most effective plant oil was found rose geranium oil. This essential oil more reduced seed germination of L. perenne than others and inhibition of germination occurred by 36%, %74 and 85% at the rate of 5µℓ, 10µℓ and 15µℓ, respectively. The inhibition effects of topped lavender and vitex's oil were found lower. Although vitex oil reduced germination ratio of A. retroflexus by 41% at the highest dose (15µℓ). When all the results are evaluated in general, tea-tree and rose geranium oils were found the most effective essential oils among the tested plants for redroot pigweed and perennial rye grass. The essential oils of these species can be used in practice. The results should be supported by field study.

Keywords: Allelopathy, alternative control, essential oil, germination