



Effects of Allelopathic three Medicinal Plants on Germination and Seeding Growth of *Cynodon dactylon* (L.) Pers.

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ABSTRACT: The use of plants allelopathic properties is one of the methods of weeds control against each other which nowadays is performed vast research about that. As regards being weeds in stable agriculture is caused destruction of soil and pollution of underground waters. As one of the biological control methods, allelopathy could have considerable effect in agriculture ecosystem. In this research, the effect of essential oils as medical plants *Artemisia annua* L., *Rosmarinus officinalis* L. and *Lavandula vera* L. with 5 level (0, 250, 500, 750, 1000ppm) was evaluated on weeds of *Cynodon dactylon* L. Result indicated different concentration essential oils plants *Artemisia annua* L., *Rosmarinus officinalis* L. and *Lavandula vera* L. had strong reduce in germination rate, Radicle length and plumule length weed. The highest concentration (1000ppm) essential oil of *Artemisia annua* L., *Rosmarinus officinalis* L. and *Lavandula vera* L. lead to germination deterrence, with 100, 94, 88 respectively. The low concentration essential oil *Artemisia annua* with 32 respectively reduce germination. It was concluded that *Artemisia annua* has strong allelopathic to control germination and seeding weed it can be used as an herbicide in organic culture of the agricultural crops.

Key words: *Cynodon dactylon*, essential oil, allelopathic, germination, weed

INTRODUCTION

Weeds are unwanted plants in a variety of human activities interact with the environment, agriculture and human habitats, have adapted And the most important threats to the cultivation and development of crops that fight weeds, was one of the most important steps in Agriculture(Qasem and Foy, 2001).

The use of chemical pesticides to combat weeds is the most widespread method. But reduced crop quality, high cost of weed control, environmental risks and increased weed resistance to herbicides Show the need for alternative methods such as the use of biological and chemical methods is the next crop (Hejazi, 1379).

Allelopathy (allelopathic) was first raised in 1973 by Hans Mulish plant physiologist. Rice allelopathy define the effects of microorganisms on other plants that occur through the release of allelo-chemical substances into the environment (Rice, 1984).

Allelochemical combination of physiological and biochemical processes such as transitive and germination inhibition, inhibition of cell division and elongation, Gibberellin and auxin-induced growth inhibition, inhibition of respiration and photosynthesis,

stomatal inhibition, inhibition of protein synthesis and hemoglobin, changes in membrane permeability and inhibition of enzyme activity takes (Narval, 1996).

Bermuda grass weeds scientific name *Cynodon dactylon* (L.) Pers of millet family (Graminaceae) and African origin (Hanson and Juksa, 1969) is the deep grass roots. And generally require little maintenance (Naderi & Kaffi, 2005). It is a perennial plant with long internodes which rapidly expands. Plant resistant thermophilic and ecological conditions by seed, stolons and rhizomes multiply. Even after being dried rhizome of the weeds growing between 10 and 20 percent more likely to have (Christians, 2004). Several reports show that many species of *Artemisia* Rosemary are allelopathic properties (Duke *et al.*, 1987; Groves and Anderson, 1981; Halligan, 1976; Rice, 1995). Alipur *et al.* (2010) in a study of allelopathic effects on germination and growth of medicinal plant extracts sagebrush-grass weeds were maize. The results showed that the allelopathic effect of plant extracts on germination and seedling growth and weed Sorghum halepense low osmotic pressure was evaluated.

Research (Daneshmandi and Azizi, 2009) allelopathic effect of *Eucalyptus* (*Eucalyptus globulus* Labill.) on germination and growth of Bermuda grass weed extracts were examined at various concentrations. The results of this study showed that the effect of different concentrations of essential oils reduce plant growth and plant height and germination and seedling emergence decreased with increasing concentration of essential oils.

The results (Ramezani *et al.*, 2008) show that rosemary oil has a significant effect on the germination of crap (*Acroptilon repens*), pigweed (*Amaranthus retroflexus*) and PO (*Portulaca oleracea*).

In the reviews (Rassaeifar *et al.*, 2013) eucalyptus oil effect on the germination and growth of two species of pigweed (*Amaranthus retroflexus*) and (*Cynodon dactylon*) were evaluated. The results showed that the germination percentage, root length and shoot length was reduced greatly.

The purpose of this study was to evaluate the allelopathic effect of essential oils of rosemary, lavender and Artemisia on germination and growth of weeds to control damage and reduce the use of chemical pesticides.

MATERIALS AND METHODS

To extract the essential oil, leaves were dried and then by using powder electric crusher grounded. In the each essential oil, 50 g of leaves of each plant individually along with 1200 ml of distilled water with help the glass mat (Clevenger) was at 100°C extracted. Essence making time for each sample was 3 hours. Essential oils collected from each plant were measured using sodium sulfate watered. And the time of use, the volume of 7 ml glass container with aluminum gowns were kept in a refrigerator at 4°C (Sahaf & Moharrmipour, 2009).

To perform this test, for each group, four Petri dish was used which in each, 50 weed seeds were placed and

each Petri dish was considered to be a repeat. Planting seeds in petridishes with a diameter of 180 and a thickness of 15 ml were collected. After adding Essential oils glass Petri dishes closed and in a growth chamber with dark, temperature 25-20°C and humidity of 70% were placed. Traits such as germination, the mean time to germination and root length and shoot and weeds. The experiment was conducted in a completely randomized design with 3 replications. Data were analyzed by software MATAT-C.

RESULT

The effect of the herb Artemisia Essential oils on germination and growth of *Cynodon dactylon*

Analysis of variance showed that the percentage of seed germination and emergence of chickens affected by different concentrations of the herb Artemisia Essential oils significantly decreased (Table 1 and 2). Comparison of the mean showed that the germination of seeds *Cynodon dactylon* under Essential oils with high concentration ppm500 stopped. The results showed that the concentration of ppm250 essential oil Artemisia seed germination to 32 percent reduced. The results showed that the mean time to germination *Cynodon dactylon* using different concentrations Artemisia significantly decreased (Tables 1 and 2). Therefore, mean concentrations *Artemisia sieberi* showed significant decreases in shoot and rootlet length. Ppm250 concentration of Essential oils reduced rootlet length and shoot of *Cynodon dactylon* with amount of 36 and 41% compared to control (Table 1 and 2). The results of the weight of the *Cynodon dactylon* with the use of *Artemisia sieberi* significantly decreased (Table 1 and 2). Different concentrations of Essential oils were significantly decreased in plant height. Concentration of one percent of the essential oil of *Artemisia sieberi* plant on *Cynodon dactylon*, 49% reduction compared to control levels showed (Table 1 and 2).

Table 1: Mean squared weed traits in *Cynodon dactylon* weed under different concentrations of essential oil of Artemisia plant.

Sources of variation	Degrees of freedom	Mean-square of measured traits						
		Germination percentage	Average days of germination (days)	Rootlet length (mm)	Shoot length (mm)	Plant fresh weight (g)	Plant dry weight (g)	Plant height (mm)
Treatment control	4	981.23**	101.31**	45.78**	108.12**	27.24**	4.8**	63.78**
	14	142.2	6.12	11.72	8.18	4.31	0.12	14.2

* and ** indicating significant differences in the five and one percentlevels.

Table 2: Comparison of mean square measured traits in *Cynodon dactylon* weed under different concentrations of essential oil of Artemisia.

Treatment	Germination percentage	Average days of germination (days)	Rootlet length (mm)	Shoot length (mm)	Plant fresh weight (g)	Plant dry weight (g)	Plant height (mm)
Control	82 ^a	19.22 ^a	7.45 ^a	17.46 ^a	7.81 ^a	1.21 ^a	29.24 ^a
Concentration 250 ppm	32 ^b	16.56 ^a	4.36 ^b	11.95 ^b	4.53 ^{ab}	0.92 ^a	25.73 ^b
Concentration 500 ppm	18 ^b	14.32 ^a	4.43 ^b	8.2 ^c	3.71 ^{ab}	0.71 ^{ab}	17.67 ^b
Concentration 750 ppm	0 ^c	0 ^b	0 ^c	0 ^d	2.29 ^b	0.41 ^b	10.43 ^c
Concentration 1000 ppm	0 ^c	0 ^b	0 ^c	0 ^d	0.87 ^c	0.12 ^c	1.18 ^d

The effect of the herb rosemary Essential oils on germination and growth of *Cynodon dactylon*

The results showed that the percentage of seed germination and seed growth of *Cynodon dactylon* affected by different concentrations of rosemary essential oil significantly decreased (Tables 3 and 4). ppm 1000 concentration of essential oil Rosemary decreased germination percentage of *Cynodon dactylon* to 88% (Table 4). Comparison of the mean showed that the germination time of seeds *Cynodon dactylon* with rosemary essential oil is significantly reduced. Although this reduction was not significant at some concentrations.

The results showed that root length and shoot of *Cynodon dactylon* affected by essential oil of Rosemary with various concentrations significantly decreased (Tables 3 and 4) 750 ppm and ppm500 concentrations decrease root length, respectively, 42% and 61% compared to the control. Different concentrations of Rosemary Essential Oil significant decreases *Cynodon dactylon* in dry weight compared to control plants. As the concentration of 250 ppm wet weight and dry Essential oils of *Cynodon dactylon* to the rate of 29% reduced (Table 3 and 4). Different concentrations of Essential oils provides a significant reduction in plant height.

Table 3: Comparison of the mean-square measured traits in *Cynodon dactylon* weed under different concentrations of essential oil of rosemary.

Sources of variation	Degrees of freedom	Mean-square of measured traits						
		Germination percentage	Average days of germination (days)	Rootlet length (mm)	Shoot length (mm)	Plant fresh weight (g)	Plant dry weight (g)	Plant height (mm)
Treatment control	4	1241.77 ^{**}	211.56 ^{**}	61.82 ^{**}	132.23 ^{**}	32.11 ^{**}	5.4 ^{**}	91.78 ^{**}
	14	98.04	10.94	6.61	12.91	7.55	0.82	15.29

* and ** indicating significant differences in the five and one percent levels.

Table 4: Comparison of mean square measured traits in *Cynodon dactylon* weed under different concentrations of essential oil of Rosemary.

Treatment	Germination percentage	Average days of germination (days)	Rootlet length (mm)	Shoot length (mm)	Plant fresh weight (g)	Plant dry weight (g)	Plant height (mm)
Control	90 ^a	21.08 ^a	6.54 ^a	14.76 ^a	9.43 ^a	2.54 ^a	28.01 ^a
Concentration 250 ppm	43 ^b	14.35 ^b	3.82 ^b	12.95 ^b	7.41 ^b	1.86 ^a	27.53 ^a
Concentration 500 ppm	24 ^b	14.78 ^b	5.21 ^a	11.42 ^b	7.11 ^b	2.01 ^a	21.42 ^b
Concentration 750 ppm	15 ^c	16.82 ^c	3.52 ^b	7.64 ^c	6.34 ^b	1.77 ^a	14.54 ^c
Concentration 1000 ppm	12 ^c	9.68 ^c	2.26 ^b	6.69 ^c	4.31 ^c	1.20 ^b	9.23 ^d

Herb lavender Essential oils influence on germination and vegetative growth of *Cynodon dactylon*

The results showed that the percentage of seed germination and seed growth of *Cynodon dactylon* affected by different concentrations of lavender essential oil significantly decreased (Tables 5 and 6). Comparison of the mean showed that the concentrations of 250, 500, 750 and 1000 ppm Essential oils, seed germination *Cynodon dactylon* decreases 3, 34, 60 and 75% compared to the control (Table 6). The results showed that the average *Cynodon dactylon* seed germination was significantly reduced by the use of

Artemisia Essential oils. Although this reduction was not significant in some of certain concentrations (Tables 5 and 6). Different concentrations of lavender herb, rootlet and shoot length was significantly reduced compared to control. Concentration of 500 and 700 ppm of Lavender Essential oils, respectively, root length and shoot as much as 44% and 71% decrease compared to the control. The results showed that the different concentrations of Essential oils significant decrease dry weight, plant height and weight of the *Cynodon dactylon* compared to Control, although the decrease in some of concentration was not significant (Table 5 and 6).

Table 5: Comparison of the mean-square weed measured traits in *Cynodon dactylon* under different concentrations of essential oil of *Lavandula spp*

Sources of variation	Degrees of freedom	Mean-square of measured traits						
		Germination percentage	Average days of germination (days)	Rootlet length (mm)	Shoot length (mm)	Plant fresh weight (g)	Plant dry weight (g)	Plant height (mm)
Treatment control	4	1092.12**	181.42**	79.57**	124.9**	29.74**	7.51**	71.26**
	14	102.21	8.23	9.25	11.43	9.24	4.52	17.37

* and ** indicating significant differences in the five and one percent levels.

Table 6: Comparison of mean square weed measured traits in *Cynodon dactylon* under different concentrations of essential oil of *Lavandula spp*.

Treatment	Germination percentage	Average days of germination (days)	Rootlet length (mm)	Shoot length (mm)	Plant fresh weight (g)	Plant dry weight (g)	Plant height (mm)
Control	81 ^a	21.46 ^a	5.85 ^a	14.76 ^a	8.91 ^a	2.27 ^a	28.49 ^a
Concentration 250 ppm	78 ^b	15.72 ^b	4.21 ^a	11.37 ^a	6.34 ^b	2.09 ^a	24.04 ^a
Concentration 500 ppm	47 ^b	12.45 ^b	3.63 ^{ab}	8.58 ^b	5.09 ^b	1.54 ^b	22.42 ^b
Concentration 750 ppm	21 ^c	13.64 ^b	3.38 ^b	6.11 ^b	5.58 ^b	1.48 ^b	18.79 ^c
Concentration 1000 ppm	6 ^c	12.49 ^c	3.04 ^b	2.79 ^c	3.74 ^c	1.39 ^b	11.44 ^d

DISCUSSION

Plant allelopathic potential of a variety of factors is depend on species, varieties, plant seed growth stage and the type of plant (Rashed Mohasel *et al.*, 2009). The results of a recent survey showed that Artemisia, rosemary and lavender have strong allelopathic on *Cynodon dactylon*. Artemisia and lavender essential oils decreases dry and fresh weight of aerial organs of *Cynodon dactylon*, but this effect for Rosemary compared to two plants severely were lower. This result could be explained by the phenomenon of allelopathy depend on allele-chemicals type, alleo-chemical concentration and sensitivity of target plant (Regosa

and Pedrol, 2002). It also reduced root elongation suggests that lengthen cells, thought allele-chemicals compounds and inhibition of act of gibberellin and indole acetic acid, is impressed (Qasem, 1992).

The results showed that with increasing concentrations of Essential oils Artemisia herbs, lavender and rosemary, the percent inhibition of germination reduced and the growth rate decreases, which this issue by (Meissner *et al.*, 1989) has been approved allelopathic effects of Artemisia essential oils, rosemary and lavender and compared the eucalyptus effects on the *Cynodon dactylon*.

(Rassaeifar *et al.*, 2013) investigated further. In the present study, Germination percentage, root length and Shoot length was reduced to a greater extent than individuals researches. This is due to the strong allelopathic of plant compounds that affect the physiological processes. Considering the above results can be exuding allelochemicals composition, physiological and biochemical processes, such as the germination inhibition and germination, inhibition of cell division and growth inhibition induced by auxin or gibberellin, inhibition of respiration and photosynthesis, stomatal inhibition, inhibition protein and hemoglobin synthesis, membrane permeability changes and inhibition of enzyme activity (McCarty *et al.*, 2010). Broadly speaking, Artemisia and lavender essential oils have strong allelopathic effects and prevent weed germination and *Cynodon dactylon* growth. That it would be promising results in the organic cultivation of crops to be followed and in the production of natural origin herbicides used.

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