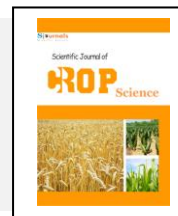


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**CROP** ScienceJournal homepage: [www.Sjournals.com](http://www.Sjournals.com)**Original article****The allelopathic potential of brassicaceae family weeds species on germination and early growth of barley, sunflower, clover and cotton****H. Dehghanzadeh***Department of Agricultural Sciences, Payame Noor University, I. R. Of IRAN.*

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## ABSTRACT

This study was conducted to evaluate the allelopathic effect of family Brassicaceae weed species on germination and early growth of barley, sunflower, clover and cotton. Experiment design study was according to factorial and randomized complete in four replications. The first factor includes four species of plants (a1) clover, (a2) cotton, (a3) barley, (a4) sunflower and the second factor weed species at five levels (b1) hairy vetch, (b2) *Lepidium vesicarium*, (b3) kochia, (b4) stock, (b5) flaxweed and the third factor concentration of residual weeds that levels (c0) 0%, (c1) 5%, (c2) 10%, (c3) 20% concentration of the weed residue extract. Results showed that weed species had a significant effect on plant germination, so that kochia (*Kochia scoparia*) and stock (*Mathiola* Spp.) extract effect in reducing germination were highest and lowest, respectively. The crop of clover and barley, respectively, the lowest and highest average germination rate of 7.11 and 16.50 percent, respectively. The results showed that with increasing concentrations of weeds, crop germination decreased significantly. kochia (*Kochia scoparia*) extraction (20%) and the lowest percentage of germination of clover and much 3.54 percent, respectively. Finally, kochia weed control generally in agricultural crops in general and for the study of clover cultivation particularly is of utmost importance because their effect on the reducing germination and initial establishment.

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## 1. Introduction

Weeds damage agricultural and non farming activities. It contains a variety of damaging to human activities such as farming activities which directly or indirectly have a negative effect on agricultural productivity, it is measurable. Quality damage includes different effects; such as poor value in agricultural land and allelopathic which are not measurable with tools (Rice, 1984). The visible effects of allelopathic activity often are observed in delay or preventing of seed germination and seedling growth, due to the initial effects on metabolic processes. Allelochemical material have no the same effect because of chemical structure variations. (Yazdani et al., 2010). Reaction and vital processes such as cell division, hormone production, stability and membrane permeability, pollen germination, mineral absorption, stomata movement, pigment synthesis, photosynthesis, respiration, synthesis of amino acids, nitrogen fixation, enzyme activity, thermal conductivity tissues and organs, have been proposed as the aim and point of effect for allelochemical ( Putnam and Tang, 1989).

Except the direct effects of allelochemicals on other plants, these compounds can also affect the availability of nutrients in the soil and thus indirectly inhibits the growth of other plants. This was observed that soil surrounding the *Pluchea lanceolata* is also affected by high content of phenolics, Ph, electrical conductivity, potassium and chloride in soil solution (Yazdani et al., 2010). Gavahi and Shaji (2006) reported the effect of allelopathic commonlambs quarters (*Chenopodium album* L.) on germination and primary growth factors in Jiroft bean. Shoot extract has significant effect on seed germination, root growth, shoot and seedling dry weight. Germination and growth decreased by increasing in concentrations of aqueous extract of bean shoots. Samdani and Baghestani (2004) evaluated the allelopathic effect of aqueous extracts of four-seeded vetch (*Vicia tetrasperma*) foliage on corn and soybean. They reported that germination and growth of soybean and corn crops were not affected by four-seeded vetch extract. However, Shafagh et al., (2009) reported a significant reduction in percent germination of Soybean Williams cultivar, simultaneously with increasing extract concentration of artichoke, redroot pigweed and creeping jenny. They expressed that creeping jenny has the highest impact on the reduction in germination. Rezai et al., (2009) investigated allelopathic effects *Scariola orientalis* and *Agropyron elongatum*. They showed that the germination rate *Onobrychis* in *A. elongatum* extract was reduced about 18-fold compared to control. Benias et al., (2010) reported that aqueous extracts of different organs of *Chenopodium album* and *Xantium strumarium* reduced the percentage of germination in savory (*Satureja hortensis* L).

Saeidipour et al., (2012) investigated allelopathic effects Johnson grass, slender foxtail and pigweed on seed germination and seedling growth of corn; they reported that the slender foxtail have highest inhibitory effects on corn against pigweed which have minimum effect. Mojab and Mahmoudi (2009) also reported the germination and primary growth significantly reduced in sorghum by shoot and underground application of water extract of heary cress (*Cardaria draba*). Mohammadi et al (2005) reported that the extract of shoot Johnson grass, Common lambs, and creeping jenny significantly decreased germination and seedling growth of chickpea as compared to the control, whereas licorice (*Glycyrrhiza glabra*) and knot grass were not significant.

Considering that there is not complete information about allelopathic effect of Brassicaceae family on germination in barley, clover, cotton and sunflower in Isfahan; this study was to investigate the percentage of seed germination and crop species affected by the different concentration of extract some weeds in Brassicaceae family.

## 2. Materials and methods

Experiment design study was according to factorial and randomized complete in four replications in Tiran Payame Noor University. The first factor consisted of four levels of plants (a1) Clover, (a2) Cotton, (a3) Barley, (a4) Sunflower. The second factor was weed species in five levels (b1) heary cress (*Cardaria draba* L.), (b2) (*lepidium vesicarinum*), (b3) kochia (*Kochia scoporia*), (b4) stock (*Mathiola* Spp.), (b5) flixweld (*Descorainia sophia*). The third factor concentration of residual weeds includes four levels (c0) 0%, (c1) 5%, (c2) 10 %, and (c3) 20 % concentration of the extract of weeds. Petri dishes (9 cm in diameter) were disinfection and two layers of Whatman paper placed on that. Plenty of weeds with bloom and roots were dried. The amount of forty grams of powder was poured into 100 ml of distilled water for 24 hours was on Shaker. After this time the extract was filtered. Other concentrations were prepared by dilution. After disinfection 50 seeds were placed on in each Petri dish. Four ml of the extract solution was poured in Petri dish. Three ml of extract was added in Petri dishes daily until the end of the test period. After adding weed extract door closed with paraffin tape. Petri placed on germinator at 25 ° C, 12 h

photoperiod, and 60% relative humidity. In order to determine the percentage and rate of germination, seeds with visible cotyledons were counted per 24 hours. Statistical calculations were performed using ANOVA appropriate with SAS ver. 9.1. It should be pointed out for means comparison we applied DunCan's multiple range test at 0.05 probability levels when the F values were significant.

### 3. Results

Results showed that species and concentration organs weed extract had significant effects on the cotton seed germination (Table 1). The highest cotton seed germination was observed in heary cress extract and lowest was in the stock and kochia extract (Table 2). Stock and kochia are two perennial weeds, both of which are C4 photosynthetic system with similar allelopathic effects on germination of cotton. However, these weeds have the power competes with cotton, but the results of this study showed not only losses resulting from the presence of weed competition with cotton, but they also have allelopathic effect on Cotton yield loss. The result is according to Gavahi and Shaji (2006), who found that germination of bean reduced by common lambsquarters extract.

By increasing weed concentration, Cotton germination rates declined (Table 2). The lowest germination rate was observed at 20 % concentration of the kochia and heary cress extract (Table 2). Gavahi and Shaji (2006) also reported the germination of bean plant significantly reduced in line with the increasing concentration of Chenopodium. Increasing concentrations of weed extract can increase the allelopathic effects of weeds on crop. Extract concentration is the direct effect of weed density. So we can be deduced that due to the increased density of weed growth, increased concentration extraction on the environment which can reduce germination of cotton.

Seed germination percentages in clover significantly as affected by weed species and weed extract concentration (Table 1). Mean comparison showed the highest percentage of clover germination in the presence of flixweld and heary cress extraction. The lowest germination was observed in the kochia extraction (Table 2). These results indicate that allelopathic effect is not a general phenomenon. Whereas cotton germination strongly reduced in stock extract (Table 2), clover seed had the lowest effect on stock. Kochia is still had a great influence on the germination of clover. Minimum clover seed germination was obtained in kochia extraction (Table 2). Shafagh et al., (2009) also shown that the soybean germination reduced significantly, in variety concentration of weeds extraction.

Also the results showed that the extract concentration of organs weeds had significant effect on germination of seed clover (Table 1). In all weed species by increasing extract concentration, germination was reduced (Table 2). Alazami and Ghorbani (2011) also reported that in their experiments the concentration redroot pigweed extract, decreased significantly summer savoury (*Satureja hortensis*) seed germination. The lowest percentage of germination was observed at concentrations of 20 % heary cress, and kochia extract (Table 2). These results indicate that kochia in the competition with clover not only use physiological (photosynthesis, C4) and morphological (more height and asexual reproduction), but also with allelopathic compounds can resistance vs. clover.

Sunflower seed germination percentages significantly as affected by weed species and weed extract concentration (Table1). Mean comparison data demonstrated that the highest germination of sunflower seeds observed in the presence lepidium vesicarium and stock and the lowest was observed in the presence kochia extraction (Table 2). The similar result is corresponded with the results of the seed germination of cotton and clover (Table 2).

**Table 1**

Variance analysis of seed germination percent of crop under weed species and weed extract concentration.

S. O .V	df	Ms			
		Cotton	Clover	Sunflower	Barley
Pep	3	27.37	33.72	48.61	86.33
Weed spices	4	137.58 **	30.26 **	90.67 **	23.03 **
Extract concentration	3	657.43 **	158.90 **	192.46 **	80.68 **
Weed spices × Extract concentration	12	2.06 ns	0.58 ns	6.34 ns	5.68 **
E	57	11.98	2.54	9.38	20.10
C.V (%)	-	11.72	18.23	6.95	12.78

\*, \*\*: Significant at 1 % and 5 % probability level; ns: not significant.

**Table 2**

Seed germination percent of crop under weed species and weed extract concentration.

Weed spices	Extract concentration (%)	Cotton	Clover	Sunflower	Barley
Flixweld	0	21.59 a	10.98 a	15.83 a	22.83 a
Flixweld	5	18.29 b	8.58 b	12.00 b	19.50 b
Flixweld	10	14.34 bc	6.86 b	10.00 c	15.50 c
Flixweld	20	10.04 c	6.12 b	8.33 d	10.50 d
Stock	0	21.46 a	11.58 a	15.00 a	22.83 a
Stock	5	19.54 b	7.21 b	13.50 b	20.33 a
Stock	10	16.34 b	5.49 c	11.66 c	17.16 b
Stock	20	10.99 c	9.61 a	8.00 d	11.16 c
lepidium vesicarium	0	21.33 a	8.24 b	16.61 a	21.16 a
lepidium vesicarium	5	19.09 b	6.52 c	14.00 b	19.33 b
lepidium vesicarium	10	16.23 b	5.15 c	10.50 c	16.66 c
lepidium vesicarium	20	12.04 c	5.1 c	9.83 c	12.00 d
Heary cress	0	20.11 a	8.92 a	13.83 a	22.50 a
Heary cress	5	17.70 b	4.29 c	9.00 b	17.83 b
Heary cress	10	13.36 c	6.40 b	6.84 c	14.00 c
Heary cress	20	8.72 d	6.27 b	6.16 c	8.50 d
Kochia	0	20.05 a	9.69 a	11.33 a	22.83 a
Kochia	5	15.97 b	4.80 b	9.50 b	13.00 b
Kochia	10	12.95 c	3.60 b	9.16 b	13.83 b
Kochia	20	8.49 d	3.54 c	6.70 c	9.6 c

\*Treatments with at least one similar letter are in same group.

Mohsen Zad (2001) also reported that kochia weed significantly reduced germination and primary growth of wheat. Allelopathic compounds are extremely volatile and their structure rapidly changes in the soil environment. These compounds are not possible to identify simply. This test can only show the existence, nature and type of kochia plant. Combinations allelopathic compounds still remain undiagnosed. Results also showed that with increasing concentration of the extract, sunflower seed germination rates dropped (Table 2). The lowest percentage of sunflower seed germination was at 20 % of heary cress extracts (Table 2). Zia Hosseini (2003) also indicated that germination percentage, plant height, dry weight, yield of cotton under different ages and various levels hoary cress remains had a significant decrease compared to control.

The results showed that the effects of weed species and weed extract were statistically significant on barley seed germination percentages (Table 1). Comparison mean revealed that the highest rate of barley seed germination was at stock extract and the lowest germination was in the presence of kochia extraction (Table 2). Comparisons of means showed that by increasing concentrations of extract seed, barley germination rates have also plummeted. The lowest germination of weeds extraction was observed at 20 % (Table 2). Ismail and Chong (2002) believe allelopathic material in low concentrations may have positive or negative effects on target plants but high concentrations have been inhibitors. Also Mojab and Mahmoudi (2009) reported that by increasing heary cress concentrations, germination percentage and germination rate of sorghum decreased significantly, which is coordinated with the results of this study.

Generally results indicated that the extract of kochia and stock had highest and lowest effect in reducing germination, respectively. Among the crops, the lowest and highest average germination rate was observed in clover and barley, 7.11 and 16.50 percent respectively. Also results showed with increase in concentrations of weed extraction, crops seed germination significantly decreased. Lowest percentage of germination was at the 20 ppm kochia extract in clover and 3.54 percent. On the other hand, stock extracts had the least effect on germination. Maximum germination was obtained in the barely by the seed extract of stock and 13.86 percent. Therefore kochia weed control generally in agricultural crops for this study and for of clover cultivation particularly is of utmost importance because their effect on the reducing germination and initial establishment.

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