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Effect of allelopathic activity of annual wormwood on seed germination and seedling growth of *Brassica napus* L.

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ABSTRACT

Allelopathic had been applied by Molisch at the first time in 1937. He also used this word for chemical interaction of live creatures, and chemical compounds which involve in this process named allelochemical. In order to consider the allelopathic effect of aqueous extracts of annual wormwood (*Artemisia annua* L.) on germination and early growth of *Brassica napus* L, an experiment was conducted using a completely randomized design with five treatments (control, 25%, 50%, 75% and 100% concentration of aqueous extracts) and four replications in the laboratory. Results analyzed by SAS software with means subjected to Duncan test at 5% probability level showed that effect of different concentrations of *Artemisia annua* extract was significant on germination percentage and rate, plumule and radicle lengths and fresh and dried weights of seedlings.

Key words: Allelopathic, *Artemisia annua*, *Brassica napus* L, Germination

INTRODUCTION

One of the biochemical interactions between 2 or more plants and their microorganisms is allelopathy in which natural chemical materials (allelopathins) release by a plants and have effects on physiological process of plants and other creatures [1, 2]. During the time that extracts, roots and other rests of *Cardaria draba* added to soil, Qasem [3], avoids from growth and germination of two plants such as barley and wheat.

Kiemnec and Mcinnis [4] studied the effects of aqueous extract of *Cardaria draba*'s root on germination of winter wheat, *Medicago sativa*, *Agropyrum repens* and *Pseudoroegneria spicata* which resulted that by enhancing the level of *Cardaria draba* root's extract, germination and radicle's length of all spices will decrease in comparison with distilled water, but wheat had more tolerance than other spices.

Artemisia annua L. from Asteraceae family is an annual plant which involves many kinds of extracts and glycoside and alkaloid components are using as an herbal plant [1]. Poisonous plants' allelopathins have phenolic, glycoside and alkaloid components [5, 6]. Allelopathic characteristics of weeds and their effects on germination and early growth of crops in each zone have importance.

The aim of this experiment is studying the potential of *Artemisia annua* L. allelopathic on germination and greenness of *Brassica napus* L. seedlings.

MATERIALS AND METHODS

This research was done to consider the effect of *Artemisia annua* L. extracts on germination and early growth of *Brassica napus* L. It was done in complete accidental plot with 4 times repetitions in Tehran's laboratory in 2011. To provide aqueous extract, *Artemisia annua* L. was harvested from Golestan research center and was wash off with water then under shadow and normal temperature was dried and then was grilled. Each experimental unit includes a Petri dish with 9cm diameter. For each level of treatment 20 healthy *Brassica napus* L. seeds considered and were put on wattman paper homogeneously, then 6 ml aqueous extract of *Artemisia annua* L. was added to each of them, then Petri dished were put in a room.

Counting germinated seeds to determine germination's race was done daily. This was continued till 7 days. At the end 10 bushes were selected from each Petri dish and radicle separated from plumule then the length of each was areseawred.

After this stage, each repetition was put on wattman papers separately and put them in oven to measure dry weight; analysis of raw numbers was done by SAS.

Following characteristics were considered:

Germination Percentage (GP):

Counting germinated seeds started from the 2nd day. Those seeds were germinated that the length of their radicle was more than 3 mm.

$$Gp = Ni / N \times 100$$

N=Total number of seeds

Ni= Number of germinated seed in ith day.

Germination Race (GR)

In order that, from the second day to 8th once a 24 hours we counted germinated seeds and its race was determined by Maguire equation [7]:

$$GR = \sum_{i=1}^n \frac{Si}{Di}$$

GR: Germination Race (number of germinated seed in each day)

Si: number of germination seeds in each numeration

Di: number of days till nth numeration.

n: number of numeration times.

At the end of experiment we chose 10 plants from each Petri dish, separated their radicle and plumule and measure each plat's radicle and plumule length separately. Then we put each repetition on the filter separately. In order to make them dry and measure its dry weight, we put them in oven with 75°C temperature for 24 hours, after we achieved pure numbers; we used SAS software for analyzing them.

RESULTS

Table 1: Result of variance analysis on germination and growth of seedling *Brassica napus* L under different extract concentration of *Artemiasia annua* L.

Mean Square							
S.O.V	df	GP (%)	GR	RL (cm)	PL (cm)	FW (g)	DW (g)
Treatment	4	1270.62**	41.81**	8.01**	0.61**	0.000094**	0.00002**
Error	15	30.4	1.95	0.41	0.129	0.000005	0.0000012
C.V (%)		11.34	13.9	8.1	9.43	12.4	20.08

Note: ** indicate significant difference at 1% probability level.

GP: Germination percentage, GR: Germination rate, PL: plumule length, RL: Radicle length, FW: Fresh weight, DW: Dry weight.

Results of data statistical analysis had been shown in table 1 and results of comparison between characteristics mean had been shown in table 2. These results showed that *Artemisia annua L.* extracts have deterrence effect potential on germination and early growth of *Brassica napus L.*

Table 2: Effect of different extracts concentration of <i>Artemisia annua L.</i> on germination and growth of seedling characteristics in <i>Brassica napus L.</i>						
Extract concentration (%)	GP (%)	GR	RL (cm)	PL (cm)	FW (g)	DW (g)
0	86.25a	10.76a	6.3a	3.17a	0.023a	0.008a
25	73.75b	8.42a	6.12a	2.95ab	0.021a	0.007ab
50	62.5c	5.1b	5.1b	2.75bc	0.017b	0.0063b
75	53.75c	3.9c	3.9c	2.42cd	0.013c	0.0043c
100	40d	3.02d	3.02d	2.2d	0.011c	0.0028c

Note: Similar letters in each column hadn't any significant statistical difference.

GP: Germination percentage, GR: Germination rate, PL: Plumule length, RL: Radicle length, WW: Fresh weight, DW: Dry weight.

Germination and race percentage:

Results of analysis in 1% of probable levels showed that there is significant difference between different concentration of *Artemisia annua L.* for percentage and race of germination in *Brassica napus L.* (Table 1). Comparison between means of different concentration effects percentage and race of germination had been showed in table 2. As you see in different extract concentration, the most germination percentage is related to control with 86.25%, and the least is related to 100% of extract with 40%.

Also, in germination race the most races were related to control treatment (10.76), and the least was related to 100% of extract (3.02) (Table 2).

Resulted of researcher's studies show that extract of *Artemisia annua L.* plant, leads to reduction in race and percentage of germination in *Avena lodoviciana* and *Amaranthus retroflexus* [8].

Radicle and pumule length:

Results of variance analysis showed that in 1% of probable level, was significant difference about pumule and radical length (Table 1). Comparison between radicle and pumule length means in different extract concentration (0%, 25%, 50%, 75% and 100%) showed that by increasing extract concentration pumule and radicle length will decrease. The most reduction in pumule and radicle length had been observed in 100% of extract concentration.

Fresh and dry weight of seedling:

Impact of different extract concentration on fresh and dry weight of all spices was significant (Table 1). Effects of extract concentration on seedling dry and fresh weight had been shown in table 2. As have being seen, by increasing extract concentration, wet weight of *Brassica napus L.* decreased; in this case, the minimum fresh weight was related to 100% of extract concentration (0.011 g). Also, about seedlings dry weight, results were the same by increasing extract concentration till 100% dry weight amount had been decreased.

Discussion and Conclusion

Physiological process of plants and creatures is under effect existing compounds in *Artemisia annua L.* extract. It also plays deterrence role on germination and growth of *Brassica napus L.* This effect on germination growth of radicle and pumule's length and dry and fresh weigh was related to different range of active biological compounds [9].

Lydon et al. [10] found that extract of chloride methylene in *Artemisia annua L.* includes artemisinin. The effects of this extract on growth and germination of *Amaranthus retroflexus* was similar to that time when leaves of *Artemisia annua L.* mixed with soil.

Hartman et al. [2] suggested that *Artemisia annua L.* extract has impact on radicle and pumules length. Extract has more impact on radicle length, because it has direct contact with radicle. High concentration makes radicle's growth to have more reduced than pumule, and it is because of extract features, plants spices and chemical features of all allelochemicals.

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