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The Allopathic Effects of *Cyperus Rotundus* Extract on the Germination of *Lycopersicon esculentum* L. var *Chef Flat*

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ABSTRACT

This experiment was conducted to determine allopathic effects of *Cyperus rotundus* extracts on the tomato germination. It was a completely randomized design (CRD) with four replications, carried out in the laboratory of the Agricultural College of University Jiroft during 2011. The various test treatments were extracts of *Cyperus rotundus* taken from aerial organs, root, and combinations of both plant parts, at densities of 0, 25, 50, 75 and 100 percent. Experimental units were Petri dishes in depths and diameters of 3 and 9 cm, respectively. The shoot and root length, shoot and root fresh weight, germination percentage and rate was measured. The use of the *cyperus* extract reduced the germination, and it significantly decreased by increasing its in density, such that at the 75% and 100% densities, germination was terminated. Based on the test results, it could be said that the *cyperus* extract has a severe inhibitory effect on the tomato germination. With time passing, the germination speed decreased over the measurement period, and reached its minimum at day 14. The maximum fresh weight of the root and shoot were achieved from the control treatment (no extract).

Key words: Allopathy, Tomato, Germination, Weed.

INTRODUCTION

Tomato is a widely distributed annual vegetable crop which is consumed fresh, cooked or after processing by canning, making into juice, pulp, paste, or as a variety of sauces; being a rich source of phytochemicals such as lycopene, β-carotene, flavonoids, vitamin C and essential nutrients (Beutner et al., 2001). Abiotic stresses are major constraints for global crop production. Among various abiotic stresses, salinity has become a severe threat to ensure food security by affecting about one-third of the irrigated land on earth (Mengel et al., 2001).Today, in most integrated weed management systems,

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herbicides are used extensively therefore severe dependence on them, poses a serious risk to the environment, causes public health concerns and raises agricultural production expenses (Burgos et al., 1999). Allopathy is a harmful effect generated as a result of the secretion of biochemical substances by a given plant on a receiver plant (Rice, 1984). In specific conditions allochemical substances are exuded into the environment; they can effect germination, root and stem growth, numbers of soil micro organisms and other reactions (Putnam, *et al.,* 1988). The active harmful matter of plant residue exists in the chaff and has an effect on subsequent planting. Substances produced from chaff, are the cause of poisoning in some plants (Bohrani, 1994). At all times, agricultural plants are exposed to weeds thereby a significant part of their potential annual yield is decreased as a result of existing weed debris (Pratly and Haig, 1998). The study also showed that leaves and rhizomes of wild sorghum contain allochemical substances including the phenol compounds; chlorogenic, P- and p-hidroxy Banzaldeid (Kohli et al., 2001).The allelopathy is result of production biologically active molecules by growing plants or remains of them, which might do a direct or indirect effect after change the shape and enter to environment, on the growth and developmentof the same species or any other species (Seigler, 1996). The allelochemical materials, includes those chemicals materials in plant that apply the physiological activities on plants or microorganisms (Kiemnec and Mcinnis, 2002). Use of the allopathic attribute of the plants can play an important role in the management of weed and control them. These plants produce secondary metabolites that through to its surroundings apply the negative effect on germination and growth of adjacent plants and limit their growth and density. Therefore, the use of these types of plants or remains can decrease the consumption of herbicides (Leather, 1993).Environmental effects of chemical herbicides and the limitations of their implementation have led to the increasing importance of non-chemical alternatives in the management of weeds (Challa and Ravindra, 1998). Allelopathy is a biochemical reaction between two or more plants or cultivars in which the release of natural chemical materials (Allelopathins) by a herb affects the physiological processes of neighboring plants or organisms (Challa and Ravindra, 1998). Using this phenomenon, one might be able to control the weeds in farms without implementing chemical herbicides. For example, the inhibitor effect of walnut leaves on neighboring herbs is an instance of allelopathic effects (Kocacaliskan, 2001). Jung et al., (2004) reported that various types of rice have different inhibitor effects on the emersion of Barnyardgrass seedlings.The *Cyperus rotundus* is one of the most important and common weeds in the world, troubling everyone (Holm et al., 1977). The allopathic capabilities of this plant have been proven. The growth of grain, cucumber, cabbage, and sorghum significantly decrease when cultivated in the soil, including the remains of this weed. The cyperus allochemicals include catechol, which are plenty in the ripe glands and Rhizomes. The yellow cyperus has an inhibitor effect on the other plants (Sanchez et al., 1973).

In Iran, the allopathic researchers have started for some time now, and many works has been done regarding this matter. The goal from this test is to analyze the allopathic effects of the cyperus, on the tomato plant.

METHODS AND MATERIALS

This test was performed at the agricultural unit of the horticulture Laboratory of university of Jiroft. To obtain *Cyperus rotundus* extracts, plants were collected at harvest time. The aerial and root parts of the plants were separated and compounded at equal rates. They were then dried at a temperature of 75^0C. Extracts were made as follows: the selected parts of each plant were milled into smaller particles, and then 100 cc of condensed water was add to 5 g plant remains they were put in a mixer for 24 hours at 200 rpm at ambient temperature. Weed extract was centrifuged by four layers of watman filter paper n1, during 30 minutes at speed 300 round/min and then placed in the refrigerator. To achieve the various densities of 0, 25, 50, 75, 100 percent, weed extract was diluted with condensed water. tomato types, *Chef Flat* were used as plant indicators, as well as, completely random design (CRD) with four repetitions and five treatments. Experimental treatments consisted of *Cyperus rotundus* extract (aerial organ, underground organ and a mixture of both) at densities of 0, 25, 50, 75, 100 percent of their extracts. The test units were petri dishes (diameter 9cm and depth 3cm). To prevent growth and activity of variant microbes, both seeds and dishes were disinfected, then 10 grains were placed on two layers and 15 cc was added to each dish. Petri dishes were placed in the growth room in completely darkness both day and night at 25^0C. In order to neutralize evaporation and changes to the various extracts the caps of the Petri dishes were closed firmly. In final counting of shoot and root length, shoot and root fresh weight, seed vigor, mean germination time, germination percentage and rate was measured. Seeds were considered germinated when the emergent root reached 2 mm length. Rate of germination, germination percentage and mean germination time were calculated using the following formulas (Mostafavi, 2011):

$GP = SNG/SNO \times 100\%$

Where: GC is germination percentage, SNG is the number of germinated seeds, and SNO is the number of experimental seeds with viability (Close and Wilson 2002; Danthu et al. 2003).

$GR=\Sigma N/\Sigma(n\times g)$

Where: GR: Germination race; n: number of germinated seed on gth day and g: Number of total germinated

Seed Vigor = [seedling length (cm) × germination percentage]

Analysis of variance was performed using standard techniques and differences between the means were compared through Duncan's multiple Significant Difference test ($P < 0.05$) using SAS release 9.1 (SAS, 2002) software package.

RESULTS AND DISCUSSION

The use of the cyperus extract reduced the germination, and it significantly decreased by increasing its density, such that at the 75% and 100% densities, germination was terminated. Based on the test results, it could be said that the cyperus extract has a severe inhibitory effect on the tomato germination (table 1). The Ghiazdowsk et al., (2007) results showed that the effect of cyperus allelopathy on seed germination of mustard were like to this results.

Table 1- The allelopatic effect of different concentrations aqueous extracts of *cyperus* aerial organs on the seed germination and Germination Percentage of *Lycopersicon esculentum* L. var *Chef Flat*

concentrations extracts	Germination Percentage

(volumetric percentage)	(day)				
	6	8	10	12	14
control	49.39a	72.12a	79.79a	82.14a	87.69a
aerial organs 25%	7.77b	23.31b	26.74b	49.95a	49.95b
aerial organs 50%	2.22b	3.33b	3.33b	3.33b	4.44c
aerial organs 75%	0b	0b	0b	2.22b	3.33c
aerial organs 100%	0b	0b	0b	0b	0c

The results of comparing the means from (table 2) indicate that the cyperus extract reduced the germination speed. By increasing its density, the growth speed decreases, such that no germination speed was observed at the 75% and 100% densities. With time passing, the germination speed decreased over the measurement period and reached its minimum at day 14. Also by adding the eucalyptus extract, the eggplant's germination speed decreased significantly. According to (table 3) it indicates the root length was also affected by the cyperus aqueous extract densities. The maximum root length was owned by the observer treatment (no extract). The decrease of radicle length may indicate this point that cells by preventing the action of gibberelin and indole acetic acid by allelopathy are under the impact of this factors (Qasem, 1992). Some studies indicate that in most conditions, after the chemicals are placed within the soil, they are subjected to chemical, physical, and biological decomposition, which causes a stimulating state in the soil environment (Gonzalez et al., 1977).

Table 2- The allelopatic effect of different concentrations aqueous extracts of *cyperus* aerial organs on the seed germination and Germination rate of *Lycopersicon esculentum* L. var *Chef Flat*

concentrations extracts (volumetric percentage)	Germination rate (day)				
	6	8	10	12	14
control	2.55a	3.02a	2.40a	2.05a	1.88a
aerial organs 25%	0.38b	0.87b	0.80b	1.24a	1.07b
aerial organs 50%	0.10b	0.12b	0.10b	0.80b	0.09c
aerial organs 75%	0b	0b	0b	0.05b	0.07c
aerial organs 100%	0b	0b	0b	0b	0c

Table 3- The allelopatic effect of different concentrations aqueous extracts of *cyperus* aerial organs on the seed germination and Root length of *Lycopersicon esculentum* L. var *Chef Flat*

concentrations extracts (volumetric percentage)	Root length (cm)				
	6	8	10	12	14
control	0.55a	14.45a	19.16a	20.15a	22.13a
aerial organs 25%	0.18b	7.83ab	10.29ab	11.99ab	19.44a
aerial organs 50%	0.21b	0.40b	0.44b	0.76b	1.45a
aerial organs 75%	0b	0b	1b	0.30b	0.18a
aerial organs 100%	0b	0b	0b	0b	0a

But the test indicated a less root length at day 14. With the increased density from the cyperus shoot's aqueous extract, the bud's root length reduced in comparison to the observer treatment. Based on the results from (table 4), it indicates that the shoot length was affected by the cyperus aqueous extract densities. The maximum root length was achieved from the observer treatment (without extract). Results indicate that from a statistical point of view, there was no significant difference between day 10 for the observer treatment (without aqueous extract) and the 25% and 50% densities, but over days 12 and 14 of the test, the observer treatment indicates a significant difference with the 50% density. The maximum wet weight of the root and shoot were achieved from the observer treatment (no extract). Leather (1993) also reported about the more inhibitory effects of mixtured extracts of air and underground organs effects rather than each alone extracts.

Table 4- The allelopatic effect of different concentrations aqueous extracts of *cyperus* aerial organs on the seed germination and Shoot length, shoot and root Fresh weight of *Lycopersicon esculentum* L. var *Chef Flat*

concentrations extracts (volumetric percentage)	Shoot length (cm)			shoot Fresh weight (g)	root Fresh weight (g)
	10	12	14		
control	0.93a	14.02a	1.90a	0.17a	0.05a
aerial organs 25%	0.48a	12.12a	1.77a	0.12ab	0.04a
aerial organs 50%	0.46a	0.60b	0.66ab	0b	0b
aerial organs 75%	0a	0b	0b	0b	0b
aerial organs 100%	0a	0b	0b	0b	0b

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