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Effect of aqueous extract of sun – dried neem (*azadirachta indica* a) leaves on wheat and wheat weeds (wild oat and dumbi sitti) in Vitro

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A study was conducted to evaluate the effects of aqueous extract of sun-dried neem (Azadirachta indica) leaves on the wheat and wheat weeds (Phalaris minor and Avena fatua). The effect of aqueous leaf extract of neem on the germination of wheat and wheat weeds were not significant while it had the significant effect on shoot and root growth of wild oat seedlings, fresh weight of root/ shoot growth of Dumbi sitti seedlings. The root and shoot growth of wheat seedlings showed significant results. Non-significant effect on the root, shoot length and dry weight of wheat weeds at different concentrations (0%,25% 50%,75% and 100%) of aqueous extracts of sun dried neem leaves.

Keywords: Wild oat, Dumbi sitti, leaves Extract of Neem leaves, Root shoot fresh and dry weight.

INTRODUCTION

The world scene is changing, globalization and market integrations are opening up a new era of challenges, growth and development. The farmers in the under-developed world, once the market modalities comes into force as WTO would be face to face with their counterparts in the developed world and competing with them on the level field. The stiff competition occurring among the nations and the farmers within a nation requires maximization of yield with minimum inputs in an environmentally sound national and local production to maintain natural resources for obtaining good health.

Wheat (Triticum aestivum L) is the most important world grain staple food for the people of Pakistan. Wheat production has expanded both vertically and horizontally. The production has increased from 3.35 metric tons in 1947 to 19.18 metric tons in 2003-04. The area meanwhile increased from 9.05 million hectares with 24.032 million tons yield in Pakistan. (Annon; 2009).

Although a number of factors are responsible for low yield but weed infestation in wheat fields in recent years has created alarming situation. Introduction of high yielding fertilizer, responsive varieties of wheat has increased weed infestation tremendously causing considerable losses in wheat yield. Losses in wheat yield due to weeds are as high as 26.76% (Nayyar et al;1991).

Herbicides are very useful and efficient in controlling weeds but often they have health hazards. This necessitates the search for some other methods of weed control which are effective, environment friendly and practicable under farmer's condition.

Allelopathy – an active area of weed science research has emerged recently with promising results. It provides a natural alternative of weed management strategy. The presence of allelochemicals in the crop residues and their effect on subsequent crop and weed growth are recognized (Putnam et al; 1983, Cheema, 1988). The allelochemicals once released are short lived in the environment and therefore do not disastrously upset the balance as the applied chemicals would.

Allelopathy is the direct influence of a chemical released from one living plant on the development and growth of another. Many researchers have spectulated

Table 1. effect of aqueous leaf extracts of neem on the germination % of wheat, wild oat and dumbi sitti and percent increase over control

Treatments	**Wheat % increase**		**Wild Oat** (*Avena fatua*) **% increase**		**Dumbisitti**(*Phalaris minor*) **% increase**	
Control (distilled water)	92.5	-	94.0	-	90.1 NS	-
25% v/v aqueous leaf extract	85.0	-	92.5	-	94.0	+3.9
50% v/v aqueous leaf extract	92.5	0	90.0	-	92.5	+2.4
75% v/v aqueous leaf extract	85.0	-	85.0	-	90.0	-
100% v/v aqueous leaf extract	94.0	+1.5	85.0	-	85.0	-

NS=Non significant - =decrease+ = increase

that allelopathy might prove useful in controlling weeds and increasing grain yields (Duke et. al., 2001). Recently Alkhail (2005) showed the aqueous extracts of plants had strong antifungal activity against fungi.

Azadirachta indica, commonly known is neem is a versatile tree having many good and useful qualities belong to order Rutale and family Meliaceae. It was described by A. Juss in 1830. Neem (Azadirachta indica A) has engaged as an important source and has insecticidial, antifungal, antiviral and nematical properties (Parmar, 1978). Present study was therefore conducted to investigate the suppressive effect of allelopathic substance of sun dried neem leaves on the growth and yield performance of wheat in germination and growth of wheat weeds.

MATERIALS AND METHODS

The field experiment was conducted to evaluate the effect of aqueous leaf extract of sun dried neem leaves on germination and growth of wheat weeds invitro. The experiment was conducted in Weed Science Lab Department of Agronomy University of Agriculture Faisalabad. The study was laid out in randomized complete block design (RCBD) during 2004-05 with three replications.

The aqueous extract was prepared by soaking 1kg of ground sun dried neem leaves in 20 litres of distilled water for 24 hours and then filtered through a filter paper. Petri diehes (9cm diameter) were filled with 110gm of soil.

The treatments are control (No extract but distilled water only),25% V/V aqueous leaf extract,50% V/V aqueous leaf extract,75% V/V aqueous leaf extract and100% V/V aqueous leaf extract

20ml aqueous extract of the respective treatment was added to petri dishes while in case of control only 20ml of distilled water was applied to the soil.50 seeds of Wheat (*Triticium aestivum* L), Wild oat (*Avena fatua*) and Dumbi siiti (*Phalaris minor*) were sown in petri dishes. The seeds were kept moist with the extracts of respective concentration to facilitate germination and seedling establishment. The observations recorded during the course of study are daily rate of seed germination for eight days (percentage),root shoot length of individual plants were recorded to get average root shoot length (cm), fresh weight of seedlings were recorded after 20 days of sowing (gm) and dry weight of seedlings were recorded after drying it in oven at 80 C for 48 hours (gm).The data obtained from these parameters was subjected to analysis of various techniques using the last significant difference test at 5 percent level of probability to compare the differences among treatment means (Steel and Torrie, 1980).

RESULTS AND DISCUSSIONS

The allelopathic effects of neem leaves on some rabi weeds and on Wheat variety, Pasban- 90 were investigated invitro. Germination percentage reflects prospective crop stand which is an important yield parameter for a crop. Germination of Wheat, Wild oat(*Avena fatua*) and Dumbi sitti (*Phalaris minor*) was not significantly affected by aqueous leaf extract of neem. In case of wheat, decrease of 7.5 % was found by the application of 25% and 75% aqueous leaf extract of neem. Table-2 in case of Dumbii sitti, the effect was also non significant. Overall the application of these treatments showed negative impact on weed seed germination. Similar trend was also observed in case of wild oat. These findings are non-significant as shown in Table-1. These results confirm the observations of Alam (1990) who revealed that the *Azadirachta indica* leaf extract has no effect on the germination of wheat. Joshi and Parakash (1992) reports supported these results. They proved that decomposed litter extract of *Azadirachta indica* was less inhibitory to seed germination of wheat and maize than peas and mustard.

Table 2 showed that shoot length, shoot fresh weight and dry weight of wild oat were significantly affected in different treatments of aqueous leaf extract of neem. Application of 5% and 50% of aqueous extract resulted in 37.8% increase in shoot length of wild oat over control, while the 28.7% increase on 100% aqueous leaf extract and there was no inhibitory effect at the application of 75% neem leaf aqueous extract. It is also evident from

Table 2. effect of aqueous leaf extracts of neem on the shoot growth of wild oat seedlings and percent increase over control

atments % v/v	Length(cm)		Fresh Weight (g)		Dry Weight (g)	
0	7.67c*	-	0.361c*	-	0.00b*	-
25	12.35a	37.8%	0.60a	66	0.07a	17
50	12.12ab	37.8%	0.55ab	53	0.017a	17
75	8.07c	+5.1	0.51c	42	0.05c	-
100	10.75 b	28.7%	0.47b	30	0.06b	-

*Any two means sharing not a letter in common differ significantly at 5% probability level + = increase - = decrease

Table 3. Effect of aqueous leaf extracts of neem on the growth of root of wild oat seedlings and percent increase over control

atments % v/v	Length(cm)	Percent increase over control	Fresh Weight (g)	Percent increase over control	Dry Weight (g)	Percent increase over control
0	5.26b	-	0.05c	-	0.02c*	-
25	8.76a	66	0.08	60	0.04	100
50	10.01a	99	0.04	-	0.03	50
75	8.32a	58	0.07	40	0.03	50
100	7.91a	50	0.671	40	0.03	50

*Any two means sharing not a letter in common differ significant at 5% probability level.

Table 2 that fresh shoot weight of wild oat was affected significantly by the application of aqueous leaf extract of neem @ 25%. ,50% and 100% aqueous leaf extract exhibited significantly increase over control whereas 75% leaf extract concentration remained statistically similar with control. These results don't confirm the findings of Alam (1990) who reported that shoot growth was significantly increased by increasing extract concentration

It is cleared from Table 2 that there was stimulating effect of various concentration of leaf extract of neem on shoot dry weight but did not exhibit any particular pattern. @25% and 50 % had 17 percent increase over control. A minute decrease was also noted @75 % aqueous leaf extract.

Table 3 showed that neem leaf extract had significant stimulating effect on root growth of Wild oat seedlings. The root length effect was mentioned in Table 3 was significant with the application of various concentrations of neem leaf aqueous extract (Table). 25% neem leaf extract showed maximum increase over control. Remaining concentration also attained significantly increase in the root length of wild oat seedlings over control but remained statistically at par.

It is evident in the Table 3 that various concentrations of aqueous extract of neem leaves had stimulating effect on the root fresh weight of wild oat seedlings. Maximum significant increase over control was observed by 25% followed by 100% and 75% aqueous extract. While a decrease was also noted at 50% concentration aqueous leaf extract but remained statistically equal to control. Dry weight of root showed the stimulating effect with the application of aqueous leaf neem extract(Table 3). Maximum increase was found @25% aqueous leaf extract while the rest have almost same difference in stimulating effect over control. These results are contrary to the findings of Hussain (1985) who reported that *Azadirachta indica* leaf extract reduced radical growth fresh and dry biomass and productivity of wheat, millet, maize, lettuce and mustard.

Table 4 revealed that shoot length of Dumbi sitti had statistically non significant effect with these treatments. However a small decrease was observed at 100% aqueous leaf extract over control. Similar trend was also noted in the remaining treatments of this study.

It is obvious from table 4 that fresh shoot weight had significant effect showing maximum increase at 75% but 100% and 25% aqueous leaves extract showed significant decrease. No significant effect (Table 4) was

Table 4. Effect of aqueous leaf extracts of neem on the shoot growth of dumbi sitti seedlings

atments % v/v	Length(cm)	Fresh Weight (g)	Dry Weight (g)
0	9.477 NS	0.089b*	0.006NS
25	9.477	0.060c	0.006
50	8.987	0.086b	0.006
75	9.032	0.113a	0.006
100	8.760	0.048c	0.005

N.S = Non significant
*Any two means sharing not a letter in common differ significantly at 5% probability level.

Table 5. Effect of aqueous leaf extracts of neem on the shoot growth of dumbi sitti seedlings and percent increase over control

atments % v/v	Length(cm)	Fresh Weight (g)	Percent increase over control	Dry Weight (g)
0	3.962 NS	0.003bc*	-	0.001NS
25	4.475	0.002c	-33	0.001
50	4.142	0.003bc	-	0.001
75	4.305	0.006a	+100	0.002
100	4.830	0.004b	+33	0.001

N.S = Non significant
*Any two means sharing not a letter in common differ significantly at 5% probability level.

observed in the regard of dry shoot weight.These results were not in line with the findings of Hussain (1985) who reported that neem exhibited phytotoxicity against the associated species. Leaf aqueous extracts reduced radical growth, fresh weight and dry weight and productivety of wheat, millet, maize and lettuce. No significant effect of root length of Dumbi sitti was observed with these treatments (Table 5).

Table 5 showed that 100 % and 33% increase with the concentration of 75% and 100% respectively. At 25% aqueous leaf extract produced 33% over control reduction was noted. No effect was evident at 50% leaf extract over control.

Incase of dry root weight of Dumbi sitti a statistical non significant increase was found at 75% aqueous leaf extract over control. Remaining treatments showed statistical equivalence to control. These findings are contrary to the findings of Hussain (1985) who reported that neem exhibitd phytotoxity effect against the associated species. Leaf aqueous extracts reduced radical growth fresh weight and dry weight and productivity of wheat, millet, maize and lettuces.

It is evident from Table 6 that the shoot length of wheat was affected significantly with the application of various treatments of aqueous extract of neem leaves. No significant stimulation / inhibition was observed with the concentration of 50% and 75% while a decrease was observed with the application of 25% and 75% aqueous leaf extract over control. The fresh weight of shoot of wheat seedlings was affected significantly with these treatments (Table 6). 100% leaf extract application showed 15% increase over control and 25% treatment showed reduction. In general lowest diluted concentration and highest concentration of extract showed more significant effect on wheat shoot fresh weight as compared to moderately diluted concentrations.

Dry weight of wheat seedlings, treatments at 50% and 100% were at par with control and 100% concentration produced dry weight while it was the lowest at 25% concentration. It showed at a lower concentration it had some suppressive effect which may be due to the presence of allelochemicals.

The results were against the findings of Hussain (1985) who reported that the leaf and fruit pericarp aqueous extract leaf mulch reduced germination, radical growth, fresh and dry biomass and productivity of wheat, millet, maize, lettuce and mustard.

Table 7 showed that there was a significant effect of all the concentration of aqueous leaf extract of neem leaves

Table 6. Effect of aqueous leaf extracts of neem on the shoot growth of wheat seedlings

Treatments % v/v	Length(cm)	Fresh Weight (g)	Dry Weight (g)
0	13.360 b	0.895 b	0.114 a*
25	11.193 a	0.650 c	0.079 c
50	13.162 b	0.960 b	0.097 b
75	13.695 b	0.915 b	0.105 b
100	11.172 a	1.015 a	0.111 a

*Any two means sharing not a letter in common differ significantly at 5% probability level.

Table 7. Effect of aqueous leaf extracts of neem on the root growth of wheat seedlings

Treatments % v/v	Length(cm)	Fresh Weight (g)	Dry Weight (g)
0	15.945 a	0.268 c	0.073 c*
25	9.773 b	0.387 b	0.086 b
50	11.355 b	0.480 ab	0.087 b
75	15.445 a	0.610 a	0.116 a
100	17.217 a	0.625 a	0.128 a

*Any two means sharing not a letter in common differ significantly at 5% probability level.

on root length of wheat seedlings. Application of 75% and 100% aqueous leaf extract remained equal to control while a decrease was observed with the application 25% and 100% aqueous leaf extract.

Table 7 indicated a stimulating effect of aqueous leaf extract of neem on fresh weight of wheat seedlings. Application of 100% and 75% aqueous leaf extract had an increasing trend over control.

Data presented in Table 7 also revealed a stimulating effect of various concentration of extract on the root dry weight of wheat seedlings. Application of 100% and 75% aqueous neem leaf extract significantly promoted the dry weight. 25% and 50% aqueous leaf extract also gave significant increase. These results are in line with the work of Alam (1990) who reported that *Azadirachta indica* leaf extracts significantly increased shoot growth of wheat by increasing extract concentrations and root growth of wheat was decreased as extract concentration increased.

CONCLUSION

The effect of aqueous leaf extract of neem on the germination of wheat and wheat weeds was not significant while it had the significant effect on shoot and root growth of wild oat seedlings, fresh weight of root/ shoot growth of Dumbi sitti seedlings. The root and shoot growth of wheat seedlings showed significant results. Non significant effect on the root, shoot length and dry weight of wheat weeds at different concentrations (0%,25% 50%,75% and 100%) of aqueous extracts of sun dried neem leaves were noted

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