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ALLELOPATHIC EFFECT OF LEAVES ON GERMINATION OF WHEAT (*TRITICUM AESTIVUM* L.)

MUHAMMMAD AZHAR KHAN, ZAFAR IQBAL, MANZOOR HUSSAIN AND INAYAT UR RAHMAN*

Department of Botany, Hazara University, Mansehra-21300, Pakistan

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Abstract

An experiment was conducted to determine the allelopathic potential of leaves of seven different plant species on germination of wheat variety Pir Sabaq 2005. The experiment was laid out in completely randomized design (CRD) with seven treatments replicated three times. The aqueous solution of leaves of seven plant species including *Dodonaea viscosa* (L.) Jacq., *Eucalyptus camaldulensis* Dehnh., *Fumaria indica* (Hausskn.) Pugsley, *Juglans regia* L., *Olea ferruginea* Wall. ex Aitch., *Tamarix indica* Willd. and *Taraxicum officinale* aggr F.H.Wigg. was applied for germination of wheat. Significant variation was observed among the treatments for germination attributes. Maximum (4.54 cm) radical length was observed in extract of *T. officinale* while minimum (1.20 cm) radical length in extract of *E. camaldulensis.* The highest (3.21 cm) plumule length of wheat was recorded in control, followed in extract of *J. regia* (2.85 cm) and the lowest (1.12 cm) in extract of *E. camaldulensis.* It may be concluded that leaves extracts of *J. regia* and *T. officinale* can be used for plumule and radical, respectively due to its growth enhancing effect while leaves of *E. camaldulensis* can be used as herbicide.

Wheat (*Triticum aestivum* L.) is the main source of food all over the world. In Pakistan, it is also known as “king of cereal crops” (Rahman *et al.* 2014a). It is originated from the Levant region of the Near East and Ethiopian Highlands, but now cultivated worldwide. In 2010, world production of wheat was 651 million tons, making it the third most-produced cereal after maize (844 million tons) and rice (672 million tons). Pakistan is the eighth largest wheat producer, contributing about 3.17% of the world wheat production from 3.72% of the wheat producing area. According to agricultural researchers weeds cause 17 - 25% losses in wheat annually due to their competitive and allelopathic nature (Shah *et al.* 2006).

Various crops have allelopathic potential or weed-suppressing activity, including oat, wheat and rice (Wu *et al*. 1999). Khan *et al*. (2008) reported the allelopathic effects of *E. camaldulensis* on germination and seedling growth of wheat (*T. aestivum*). Kocacë and Terzi (2001) had explained the allelopathic effects of walnut leaf extracts on seedling growth. Jankowska *et al.* (2012) investigated the allelopathic effect of *T. officinale* on the seed germination and initial growth of *Lolium westerwoldicum.*

By keeping these considerations and facts in mind, this study was planned to investigate the allelopathic effects of weeds and some tree leaves on wheat germination.

Fresh leaves of *D. viscosa*, *E. camaldulensis, F. indica*, *J. regia*, *O. ferruginea, T. indica* and *T. officinale* were collected in April, 2013 from the vicinity of Department of Botany, Hazara University Mansehra, Khyber Pakhtunkhwa, Pakistan. The dried leaves were grinded separately in a grinder and after sieving, stored in air tight glass bottles. Aqueous extracts of leaf were prepared by adding 5 and 10 g of air dried weeds and trees plant material in 100 ml of distilled water kept for 24 hrs at room temperature. It was filtered through Whatman filter paper No. 1 and the volume of the filtrate made to 100 ml (Khan *et al.* 2016).

*Author for correspondence: <hajibotanist@outlook.com>.

The seeds of *T. aestivum* were soaked in distilled water overnight. Next day the surface of the seeds was sterilized with 0.1 percent mercuric chloride solution for two minutes and washed twice with distilled water. Ten seeds were placed in each glass Petri dish (9.0 × 1.5 cm) containing Whatman filter paper. Each set of treatment (extract) and a control were replicated thrice in completely randomized design (CRD). Each filter paper was moistened with approximately 10 ml of respective treatment (extract) and the Petri dishes were then kept in an incubator at 28ºC. Experimental traits; radicle and plumule length were noted after an interval of 10 days with the help of measuring scale (cm)**.**

Analysis of variance (ANOVA) was evaluated to find the level of significance (Khan *et al.* 2016). For calculating mean values comparison, least significant difference (LSD) test at 5% level was done (Rahman *et al.* 2014b, Rahman *et al.* 2014c, Rahman *et al.* 2014d). The recorded data was statistically analyzed using computer programs SPSS 16.0 (Rahman *et al.* 2015) and Statistix 8.1 (Rahman *et al.* 2017).

Analysis of variance of the recorded data for radical length trait of wheat showed highly significant ($p \leq 0.01$) differences among the allelopathic plants applications (Table 1). The mean values of seedling length of treated applications showed that *T. officinale* attained maximum radical length (4.54 cm), followed by control (3.80 cm) and *J. regia* (3.50 cm), respectively. *D. viscosa, F. indica, O. ferruginea* and *T. indica* applications achieved similar radical length (2.97 cm) while the minimum radicle length (1.20 cm) was observed in application of *E. camaldulensis*.

Analysis of variance for plumule length trait revealed that among allelopathic plants applications highly significant ($p \leq 0.01$) differences were observed (Table 1). The mean values of plumule length of applied applications showed that control had highest plumule length (3.21 cm), followed by *J. regia* (2.85 cm) and minimum plumule length (1.12 cm) was observed in application of *E. camaldulensis*.

Table 1. Analysis of variance for leaf aqueous extract for plumule- and radicle length.

Source of variance	df	Plumule length		Radicle length	
		MS	P	MS	P
Treatment (T)	6	2.55	0.00	431.43	0.000
Aqueous percentage (AQ)	1	5.53	0.00	1.700	0.002
T × AQ	6	1.13	0.00	903	0.000
Error	33	0.03			
Total	48				

Highly significant at $p \leq 0.01$, significant at $p \leq 0.05$ and non-significant at $p > 0.05$.

The least significant data for radical length revealed that control (3.80 b) showed significant differences with *D. viscosa* (2.97de)*, E. camaldulensis* (1.20 f)*, F. indica* (2.97 f)*, O. ferruginea* (2.97 e) and *T. officinale* (4.54a) while showed non-significant differences with *J. regia* (3.50bc) and *T. indica* (2.97 bc) (Table 2). The least significant data for plumule length revealed that control (3.21 a) has significant differences with *D. viscosa* (2.15 bc), *E. camaldulensis* (1.1283 d), *F. indica* (1.57 cd), *O. ferruginea* (1.50 cd) and *T. indica* (2.10 bc). Whereas, control application showed non-significant differences with *J. regia* (2.85 a) (Table 2).

Maximum radical length was observed due to aqueous leaf extract of *T. officinale*. Similar results were reported by Jankowska *et al.* (2012). Minimum radical length was noticed due to aqueous leaf extract of *E. camaldulensis* which agreed with the results observed by Khan *et al.* (2008). Leaf of *E. camaldulensis* has tannins, saponins, cardiac glycosides that might decrease the length of radical (Adeniyi and Ayepola 2008).

Table 2. Least significant data (LSD) of leaf aqueous extract.

Treatment	Plumule length (cm)	Radical length (cm)
Control (T0)	3.21a	3.80b
Dodonea viscosa	2.15bc	2.97de
Eucalyptus camaldulensis	1.12d	1.20f
Fumaria indica	1.57cd	2.97de
Juglan regia	2.85a	3.50bc
Olea ferruginea	1.50cd	2.97de
Tamarix indica	2.10bc	2.97bc
Taraxacum officinale	2.77ab	4.54a

Means followed by similar letters in each column do not differ significantly at $p \leq 0.05$.

Maximum length of plumule of wheat was observed due to aqueous leaf extract of *J. regia*, where minimum plumule length was observed by extract of *E. camaldulensis* This finding is not in agreement with results reported by Kocacë and Terzi (2001).

It may be concluded that leaves of *J. regia* and *T. officinale* can be used as biological fertilizer due to its growth enhancing effect while leaves of *E. camaldulensis* can be used as herbicide.

References

Adeniyi BA and Ayepola OO 2008. The phytochemical screening and antimicrobial activity of leaf extracts of *Eucalyptus camaldulensis* and *Eucalyptus torelliana* (Myrtaceae). Res. J. Med. Plant **2**: 34-38.

Jankowska J, Ciepiela GA, Sosnowski J, Kolczarek R and Jankowski K 2012. The allelopathic effect of *Taraxacum officinale* FG Wigg on the seeds germination and initial growth of *Lolium westerwoldicum* R. Br. Acta Agrobotanic. **62**: 207-212.

Khan MA, Hussain I and Khan EA 2008. Allelopathic effects of *Eucalyptus* (*Eucalyptus camaldulensis* L.) on germination and seedling growth of wheat (*Triticum aestivum* L.). Pak. J. Weed Sci. Res. **14**: 9-18.

Khan MA, Iqbal Z, Hussain M and Rahman IU 2016. Allelopathic effect of some tree fruits on wheat (*Triticum aestivum* L.). Int. J. Biosci. **9:** 120-125.

Kocacë AI and Terzi I 2001. Allelopathic effects of walnut leaf extracts and juglone on seed germination and seedling growth. The J. Hort. Sci. & Biotech. **76**: 436-440.

Rahman IU, Afzal A, Iqbal Z and Manan S 2014a. Foliar application of plant mineral nutrients on wheat: A review. Res. Rev: J. Agric. & Allied Sci. **3**: 19-22.

Rahman IU, Afzal A, Iqbal Z, Ijaz F, Khan SM, Khan SA, Shah AH, Khan K and Ali N 2015. Influence of foliar nutrients application on growth and yield of onion grown in nutrient deficient soil. Bangladesh J. Bot. **44**: 613-619.

Rahman IU, Afzal A, Iqbal Z, Ijaz F, Manan S, Sohail, Ali A, Khan K, Karim S and Qadir G 2014b. Growth and yield of *Phaseolus vulgaris* as influenced by different nutrients treatment in Mansehra. Int. J. Agron. Agric. Res. **4**: 20-26.

Rahman IU, Afzal A, Iqbal Z, Ijaz F, Sohail, Shad S, Manan S and Afzal M 2014c. Response of common bean (*Phaseolus vulgaris*) to basal applied and foliar feeding of different nutrients application. American-Eurasian J. Agric. Environ. Sci. **14**: 851-854.

Rahman IU, Afzal A, Iqbal Z, Sohail, Ijaz F, Manan S, Niaz S, Shah AH, Ullah A and Waheed A 2014d. Response of cauliflower (*Brassica oleraceae* var. *botrytis* L.) to N, Mo and Mg fertilization under poultry manure condition. Int. J. Biosci**.** **4**: 215-221.

Rahman IU, Ijaz F, Afzal A and Iqbal Z 2017. Effect of foliar application of plant mineral nutrients on the growth and yield attributes of chickpea (*Cicer arietinum* L.) Under nutrient deficient soil conditions. Bangladesh J. Bot. **46**: 111-118.

Shah SR, Ijaz AK and Shah SA 2006. Study of medicinal plants among weeds of wheat and maize in Peshawar region. Pak. J. Weed Sci. Res. **12**: 191-197.

Wu H, Pratley J, Lemerle D and Haig T 1999. Crop cultivars with allelopathic capability. Weed. Res. **39**: 171-180.

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