EXOGENOUS APPLICATION OF DIFFERENT PLANT EXTRACTS ON THE GROWTH AND PERFORMANCE OF WHEAT (*TRITICUM AESTIVUM* L.)

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Abstract

The decomposed leaves of forest trees may affect the growth and yield of crops planted around them. The present study on the exogenous application of plant extracts on wheat seed was conducted at Farm area of Agronomy Department, Agriculture Faculty, Gomal University during the year 2020-21 with the objective of evaluating the stimulating or inhibitory effect of forest plants water extracts on the germination, growth and grain yield of spring wheat. Experiment was done in RCBD fashion with three replicates. The 7 unit of treatments comprised of T_1 (only water), T_2 (*Conocarpus lancifolius*), T_3 (*Acacia arabica* L.), T_4 (*Moringa oleifera* L.), T_5 (*Dalbergia sissoo*), T_6 (*Eucalyptus globulus*), and T_7 (*Cordia myxa* L.) phyto extracts were utilized @5 % (w/v) for seed priming of wheat seed cultivar AZRIC- Dera Ismail Khan. All the germination physiology, morphological, yield contributing and grain yield parameters depicted significantly differed among the treatments. The *M. oleifera* and *D. sissoo* showed 8% and 4% more grain yield compared to control and 16% more yield than E. globulus extracts. So, it is concluded that the planting of *M. oleifera* and *D. sissoo* should be encouraged around the cropping area for having positive impacts on the grain yield of wheat crop while cultivation of *C. lancifolius and E. globulus* should be avoided near the wheat growing area as they have negative impacts on the wheat growth physiology, grain yield and its components.

Key words: Different phyto-chemicals, seed priming, grain yield, component of yield, wheat.

Introduction

Pakistan's population has been increasing at alarming rate with limited resources. Physical resources like soil, water etc. are utilized rapidly due to expansion of urban areas, industrialization and climate change. Food security is the key is not only in Pakistan but all over the world as well. In Pakistan, the wheat crop is considered as the main source of human food and animal feed, so, it has a vital importance among other crops grown in the country. It was cultivated on an area of 9.04 million hectares producing 27.64 million tones during rabi season 2022-23 (Anonymous 2023).

The record of wheat is as aged as the history of agriculture profession. It is believed that wheat crop was grown in this area since ten thousand BC years ago and it was cultivated long ago in the Indian sub-continent. The cross between *Triticum*

spelta L. and *Triticum dicoccum* Sehubl produced today's hexaploid wheat. Wheat grain yield production is very important for our country economy. Agronomist, breeders and farmers play a suitable role in stability of its production.

Wheat is the main food item of peoples of Pakistan. Several abiotic and biotic stresses may influence the germination physiology, growth and grain yield of wheat. The one main problem among other are phyto-chemicals released by some trees like (*Conocarpus lancifolius*), *(Eucalyptus globulus*), (*Cordia myxa*.) and weeds like (*Chenopodium alba* L.). (Khan *et al*., 2012). Death of seedling and late germination of wheat results in lower economic yield and it is mainly due to these phyto-chemicals which adversely affect crops (Herro and Callaway, 2003).

Agro-forestry is a voice of day for food security and environment conservation. Pakistan is going to establish ten billion trees in Khyber Pakhtunkhwa province. (Khan *et al*., 2019). Introduction of trees that enhance the germination physiology and gain of wheat crop is our priority. Enhancing the yield of wheat crop under agro-forestry ecology by the application of different leaf extracts will enhance the germination physiology, growth and will lead to improved grain yield. The production of proper plant population per hectare is very essential for getting more grain yield.

The moringa Leaf Extract (MLE) exogenously applied to wheat crop enhance the leaf area index of wheat crop and thus positive impacts on the photosynthesis and grain yield and also reduced abiotic stresses like drought, heat and salinity effect. (Yasmeen *et al*., 2013b). This is due to the presence of growth regulators like auxins, and cytokinin (Makkar *et al*., 2007). MLE application improved the germination potential of sorghum crop (Phiri, 2010) and seed priming significantly improved the yield of sunflower and maize crops (Basra *et al*., 2009) (Iftikhar, 2009). Therefore, these studies were conducted aiming to find out the response of wheat seeds by phyto-priming.

The eucalyptus aqueous extracts have been reported to carry negative effects on the germination of wheat seeds, seedling growth and production of the crop (Khan *et al*., 2009). The *D. sissoo* trees grown in the fields carry negative impacts on the germination of seeds and growth of different crops by releasing phyto-chemicals. (Akhtar *et al*., 2010). The eucalyptus, lichi and guava aqueous leaf extracts were sprayed on the seeds of wheat and maize crops and all the tested extracts negatively affected the germination of seeds, shoot and root development of both the tested crops (Khan *et al*. 2014). The fresh leaves extract of two eucalyptus species (*Camaldulensis* and *globulus*) was exogenously applied to the seed of four cereal crops. The entire four crops were negatively influenced by the application of water extracts.

1. To determine the effect of aqueous seed priming on germination physiology, growth and grain yield of wheat crop.
2. To find out the best priming source as plant growth regulator.

Materials and Methods

An exogenous application of different aqueous extracts prepared from plants leaves were applied to check the growth of wheat "AZRC-Dera" cultivar at Farm area of Agronomy Department, Agriculture Faculty, Gomal University during the year 2020-21.

The research trial was conducted in Randomized Complete Block Design (RCBD) with three replications. Each replication was divided into 7 sub-units having a plot size of 2×5 m^2 (10 m^2). The seed rate was kept 150 kg per hectare and the seeds were sown by single hand drill. All the other including manuring, irrigation, weeds and pests

management and other cultural practices were kept uniform. The leaves from the selected six forest trees were collected, washed, dried under shade conditions and were finally used for making aqueous extracts. All the six selected aqueous leaf extracts were used at 5% concentration. The seeds were then soaked for 48 hours in the aqueous extracts. The grains and solution ratio had been established to 1:5.

Treatments studied

T_1 Control / Tape water
T_2 *Conocarpu slancifolius extracts*
T_3 *Acacia arabica* (Kikar) *extracts*
T_4 *Moringa oleifera* (Sohanjna) *extracts*
T_5 *Dalbergia sissoo* (Shisham) *extracts*
T_6 *Eucalyptus globulus* (Sufaida) *extracts*
T_7 *Cordia myxa* (Lasoda) *extracts*

The following parameters were studied and statistically analyzed by using the "Analysis of Variance Techniques" (Steel *et al*., 1997). The treatment means were separated by $LSD_{0.05}$. The data were statistically analyzed using computer software "Statistix version 8.1".

Parameters/variables studied

The parameters studied were

1. Time start to emergence (days)
2. Times taken to 50% emergence (days)
3. Mean emergence time (days)
4. Roots length (cm)
5. Roots fresh weight (g)
6. Roots dry weight (g)
7. Leaf area index LAI
8. Leaf area duration LAD
9. Crop growth rate g m^{-2} day^{-1}
10. Total number of tillers m^{-2}
11. Plant height cm
12. Grains $spike^{-1}$
13. Number of $spikelet\ spike^{-1}$
14. 1000seed weight g
15. Grain yield kg ha^{-1}
16. Biological yields kg ha^{-1}
17. Harvest index %

Results and Discussion

Time to emergence (days)

The speedy germination observed in different treatments is attributed to the presence of plant growth regulators present in phyto chemical solution that enhanced the germination process. The data revealed that T_4 and T_5 took minimum days to germinate while the T_6 and T_2 attained more days to germinate which is attributed to the presence of suppressing chemicals that inhibit and increased the process of germination. The results reported by Ashraf *et al*. (2008) are in line with the present findings. They observed that seed germination of wheat crop significantly improved when moringa leaf extracts were applied. Khan *et al*., (2009) explained the presence of phyto-chemicals in eucalyptus extract like flavonoids, terpenoids, steroids and glycosides whose are responsible for delay or inhibition in germination.

Time taken to 50% emergence $days^{-1}$

Germination of any crop is the fundamental process which estimates the plant population per unit area and economic yield. Some phyto-chemicals like moringa leaves extract proved as germination regulator. The resulted presented in (Table 1) regarding days to 50% emergence indicated significant variations among the tested treatments. The maximum duration for 50% emergence (15.00, and 14.60) were noted in T_2 and T_6. In contrast to this, the minimum duration of 11.68 days for 50% emergence was noted in T_4. The minimum duration for 50% emergence observed in T_4 is due to the presence of some substances in moringa extracts which

accelerated the germination process. These findings are in complete conformity with the results of Rehman *et al*. (2014) who observed that minimum duration to 50% emergence was documented was noted in plants treated with moringa leaf extracts. While Khan *et al.*, (2009) advocated that eucalyptus extract might delay the germination process.

Mean emergence time (days)

Mean emergence time is the symbol of timely and fast germination facilitated by the presence of food reserves in cotyledon or PGRs found in the seed. The seed priming had significant effects on the duration of germination (Table 1). The maximum duration (15.40 and 14.40 days) to emergence was observed in T_2 and T_6. In comparison to this, the minimum germination duration of 11.90 days was documented in control (T_1). The maximum duration to seed emergence noted in T_2 and T_6 is attributed to the presence of some inhibitors that deaccelerate the process of seed development. These results are supported by the findings of Iftikhar, (2009) who documented that the application of leaf extracts prepared from moringa decreased the mean emergence time of wheat crop.

Root length (cm)

The seed priming altered the root length of the wheat crop as shown in Table 2. The root length between the primed and unprimed seeds differed significantly among different treatments. The maximum root length of 22.38 and 21.68 cm were observed in T_4 and T_5 respectively. In comparison to this, the minimum root length of 19.0, 19.33 and 19.66 cm were observed in T_2, T_6 and T_7 respectively. In control plots, comparatively more (20.33cm) root length was observed compared to T_2, T_6 and T_7 showing negative impacts of mentioned treatments on the length of roots. Similar findings were also reported by Khan *et al*. (1999). They reported that the application of eucalyptus extracts carried negative effects on root length. Most of phyto-chemicals recorded in extracts of trees near the crop having allele-chemicals which negatively influenced the development process of roots. Previous literature depicted that the release of phenolic acids and alkaloids from the decomposed residues of trees impacted badly the roots system of wheat (Chang *et al*., 2015).

Roots fresh weight plant^{-1} (g)

The collection attending roots fresh weight indicated significant deviation among the treatments (Table 2). The maximum roots fresh weight (1.70 and 1.59 g) was obtained in T_4 and T_5 (1.59 g) followed by T_3 and T_1 which produced the root fresh weight of 1.37 and (1.34 g) respectively, while the lowest fresh root weight of 1.13 and 1.18 g was noted in T_2 and T_6. The lower root fresh weight of the control might be the effect of allele-chemical present in these plant extracts. This result is in correspondence with finding of Yang *et al*. (2002) who found too the lower root fresh weight. Sirohi and Bangarwa (2017) have similar findings in wheat crop. Chang *et al*., (2015) found suppressing influence of forest trees on roots of cereals.

Root dry weight plant^{-1}(g)

The dry weight of roots per plant indicated that significant variation was observed among the treatment means (Table 2). The maximum root dry weight per plant (0.25 g) was noted in T_4 preceded by T_5 which gave root dry weight of (0.22 g). The next lower root dry weight of 0.19, 0.20 and 0.21 was calculated in T_7, T_1 and T_3 respectively, while the lowest root dry weight of 0.17 and 0.18 was observed in T_2 and T_7 indicating negative effect on root development. These outcome are endorsed by the finding of Patel *et al*. (2002) who claimed that *Eucalyptus globulus* Dehnh. reduces the root dry

weight. Xaxa *et al*. (2018) found reduction in dry biomass of wheat grown under the different trees.

Leaf area index (LAI)

The maximum leaf area index is the reflection of better vegetative production which ultimately leads to improved photosynthetic activities. Significant variations were documented among different treatments regarding leaf area index. The maximum (0.88, 0.85 and 0.83) leaf area index were observed in T_4, T_5, and T_3. It was followed by 0.80 in control plants. The more leaf area index observed in these treatments is attributed to the presence of some growth accelerating phytochemicals that promote the development of leaf area leading to longer and wider leaves having better light capturing properties. The results reported by Fuglie, (2000) are in complete conformity with these results who observed longer leaves when the plants were treated with moringa leaf extracts. Hussain *et al*. (2019) also depicted the negative impact on leaves development in maize by application of phyto-chemicals extract.

Leaf area duration (LAD)

It is evident from the results that the active green biomass of the crop drier matter. Significant variations were observed among various treatments regarding leaf area duration (Table 3). The maximum (8.65, 8.28 and 8.10) leaf area indexes were observed in T_4, T_5 and T_3. It was followed by 7.70 leaf area index documented in control treatment. In comparison to this, the least (4.03, 4.14 and 4.18) leaf area index was observed in T_2, T_6 and T_7 having no-significant variations between each other. The leaf area index observed in T_2, T_6 and T_7 was comparatively low which may be due to the presence of some chemicals having suppressing effect on the leaf area index. Fuglie, (2000) also documented same trends regarding leaf area duration and reported that the moringa leaf extract enhance the Leaf Area Duration.

Plant growth rate (g m^{-2} day^{-1})

Maximum plant growth rate (PGR) is clear proof of enhanced vegetative plant growth in a specified time period. Significant variations were observed among the tested treatments regarding the plant growth rate (Table 3).

The maximal PGR (2.77 g m^{-2} day^{-1} was observed in T_4 followed by T_5 2.70 g m^{-2} day^{-1}. The control treatment T_1 and T_3 recorded PGR of 2.03 and 2.02 g m^{-2} day^{-1} while the maximum PGR of 2.77 and 2.70 g m^{-2} day^{-1} was recorded in T_2 and T_6. The maximum PGR as compared to control T_1 is attributed the presence of different growth regulators in the mentioned plant extracts which promoted the vegetative growth of wheat crop during the growing phases. Similar findings were also reported by Fuglie (2000), and documented that the application of moringa leaf extracts accelerated the plant growth rate. Khan *et al*. (2014) revealed that aqueous extract of (eucalyptus, guava and litchi) three different species was found to have an inhibitory effect on growth of maize, wheat and sorghum. They determined reduction in crop growth rate of tested species by applying above mentioned water extract in early stages of growth as compared to control.

Total number of tillers (m^{-2})

The data regarding yield component of wheat viz, no. of tillers per m^2, plant height (cm), grains per spike and thousand (g) were presented in Table 4. Productive tillers of wheat contributed significantly to grain and biological yield. The results obtained from our research on the number of tiller (m^{-2}) showed significant differences among the tested treatments (Table 4). The maximum number of tillers (327.33 m^{-2}) were observed in T_4. It was followed by T_5 producing 288 tillers (m^{-2}). All the other treatments, resulted the minimum tillers (m^{-2}).

The maximum tillers production in T_4 (327.33 m^{-2}) might be due to utilization of available nutrients both micro and macro along with growth regulating material (auxin and cytokinin) which have increased the amount of tillers (m^{-2}) in wheat crop. These findings are fully supported by Yang and Zhang, (2010). They reported that the application of moringa leaf extracts increased the number of tillers per unit area. Singh and Sharma (2007) determined in their experiment that forest trees like popular and eucalyptus affected the growth negatively by declining the utilization of soil nutrition and releasing allele-chemicals which resulted in decline in tillering.

Plant tallness (cm)

Plant canopy is the result of luxurious vegetative development either by nutrients or plant hormones. The maximum height of wheat plants were noted in T_4 (112.29 cm). The dwarf wheat plants were 98.18 and 97.33 cm in height, were observed in T_2 and T_6 respectively. The tallest plants observed in T_4 (112.29 cm) is attributed to the presence of strong growth regulating hormones and also due to the presence of macro and micro nutrients that enhanced its vegetative growth. The results reported by Culver *et al*. (2012) fully support these results, they noted maximum height of wheat plants when the crop was sprayed with moringa leaves extracts. While Khan *et al*. (2014) noted suppressive impact to tallness of wheat when grown under or eucalyptus, guava and litchi. This might be due to release of allelo-chemicals found in their residue water extract.

Grains spike^{-1}

Numbers of grains spike^{-1} is considered as major yield contributing parameter as far as the grain yield is concerned. The obtained data presented significant variations among the tested treatments (Table-4). The maximum number of 4.33 grains per spike were observed in T4. In contrast to this, the minimum number of 38.66 and 39.66 grains per spike were recorded in T_2 and T_6. The increased number of grains per spike noted in different treatments compared to control is attributed to the application of plant growth promoting regulators which improved the number of grains per spike. These findings are supported by Taiz and Zeiger, (2002), they reported maximum numbers of grains per spike when the crop was sprayed with moringa leaf extract. The minimum count of grains was noted in conocarpus and eucalyptus seed priming respectively. Singh and Sharma (2017) described the reason by declining the availability and utilization of nutrients due to physiological disorder in the plant.

1000-seed weight (g)

Grain weight of wheat, as the yield component was highly correlated with grain yield potential and could be affected by multiple things consisting of irrigation, nutrient uptake, biotic and abiotic stresses. The 1000 grains weight is the net result of photosynthates as well as the presence of growth nutrients. The maximum thousand seed weight of (50.30 and 47.15 g) was noted in T_4 and T_5. The minimum thousand seed weight of 38.44 and 39.63 was documented in T2 and T6. The more thousand seed weight recorded in different treatments compared to control is attributed to the more photosynthetic efficiency of wheat plants treated with plant extracts. These findings are supported by the results reported by Taiz and Zeiger, (2006), they documented maximum thousand seed weight when the plants were treated with moringa extracts. Hussain *et al*. (2019) stated in their research report that nutrient uptake and metabolism of plant is badly disturbed by application of eucalyptus, conocarpus and neem aqueous extract respectively which resulted low grain weight in wheat.

Grains yield (kg ha^{-1})

Grain yield is the integrative contribution of no. of tillers, no. of grains and grains weight. Sharma *et al*., (2019) concluded from their trials that increment in no. of tillers and 1000 grains weight lead to maximum grain yield. The main goal of any research project is to increase economic yield or grain yield for better financial output. The grain yield as affected by the soaking of wheat seeds in various phyto extracts showed clear differences (Table 5). The maximum grains yield (4506.3 kg ha^{-1}) was observed in T_4. In contrast to this, the minimum grain yield of 3816.4 kg ha^{-1} was calculated in T_2. The maximum grain yield than control might be due to presence of growth promoting phyto-chemicals which enhanced photosynthetic efficiency from vegetative part of wheat to the spike (source to sink movement) and improved the tillers (m^{-2}), number of spikelets per spike, and thousand grain weight, the lower grain yield compared to control showed negative impacts of phyto-chemical found in these extracts that suppressed the growth-related parameters and ultimately lead to lower grain yield. These results are supported by Rehman *et al*. (2017) they obtained maximum grain yield when crop was sprayed with moringa extracts. It increases the grain yield component and physiological activities, due to increase in leaf area index, vegetative growth and biological yield in wheat. Eucalyptus and Conocarpus badly influenced the above stated factors in wheat resulted in low grain yield.

Biological yields (kg ha^{-1})

Higher photosynthetic efficiency results in boosted biomass productions per unit area. Table 5 pertaining to biological yield (kg ha^{-1}) depicted important variation among the treatment means. The supreme biomass yield of 9175.3 kg ha^{-1} was recorded in T_4 proceeded by T_5 which produced biological yield of 9018.3 kg ha^{-1}. Next to these the treatment T_1 (8585.3 kg ha^{-1}) and T_3 (3967 kg ha^{-1}) followed by T_2 (7736.7 kg ha^{-1}), however T_6 and T_7 gave the lowest biological yield by producing 7982.0 and 8056.3 kg ha^{-1}. The more numbers of grains per spike contributing is attributed to the presence of plant hormones which increased the number of grains per spike. These results are fully supported by the findings of Rehman *et al*. (2017) who found higher biological yield when crop was treated with moringa extracts. Xaxa *et al*. (2018) reported reduction in photosynthesis, nutrient uptake resulted low biological yield in wheat due to presence of eucalyptus leave litter in field. So it resulted that productivity of wheat was declined in the land sheltered by eucalyptus trees.

Harvest index %

Harvest index is quantitative relation between grains outputs to total biomass produced. The data in Table 5, regarding harvest index % showed significant response to the seed priming extracts applied to wheat seed. The highest harvest index % (49.11, 48.22, 48.93 and 48.85 %) was recorded in T_4, T_3, T_1 and T_7 respectively, followed by T_5 which produced harvest index of 48.22 % while the lowest harvest index % was obtained in T_6 and T_2 which produced 47.90 and 48.05 %. The lower harvest index % than control treatment (T_1) might be due to negative effect of these treatments by hindering the translocation of photosynthates from leaves to the grains. These outcomes are backed up by the results.

Table 1 Germination physiology of wheat as affected by different phyto-extracts.

Treatments	Plant extracts	Time start to emergence (days)	Time taken to 50% emergence (days)	Mean emergence time (days)
T1	Control	10.05^{ab}	13.00^{b}	13.00^{c}
T2	*Conocarpus lancifolius*	10.67^{a}	15.03^{a}	15.40^{a}
T3	*Acacia arabica* L.	9.03^{bc}	13.60^{b}	12.60^{c}
T4	*Moringa oleifera*.	7.60^{d}	12.50^{c}	11.90^{c}
T5	*Dalbergia sisso*	8.30^{cd}	14.68^{bc}	12.60^{c}
T6	*Eucalyptus globulus*	10.70^{ab}	13.00^{a}	14.40^{ab}
T7	*Cordia myxa* L.	9.60^{ab}	13.00^{b}	13.00^{bc}

Table 2 Growth analysis of wheat as affected by different phyto-extracts.

Treatments	Plant extracts	Root length (cm)	Fresh root weight (g) plant^{-1}	Dry root weight (g) plant^{-1}
T1	Control	20.35^{cd}	1.34^{bc}	0.20^{bcd}
T2	*Conocarpus lancifolius*	19.00^{e}	1.13^{c}	0.17^{d}
T3	*Acacia nilotica* L.	20.67^{bc}	1.37^{bc}	0.21^{bc}
T4	*Moringa oleifera*	22.30^{a}	1.70^{a}	0.25 ^{a}
T5	*Dalbergia sisso*	21.68^{ab}	1.59^{ab}	0.22^{b}
T6	*Eucalyptus globulus*	19.30^{de}	1.18^{c}	0.18^{d}
T7	*Cordia myxa* L.	19.68^{cde}	1.25^{c}	0.19^{cd}

Table 3 Physiological traits of wheat as affected by different phyto-extracts.

Treatments	Plant extracts	Leaf area index (LAI)	Leaf area duration (LAD)	Plant growth rate (g m^{-2} day^{-1})
T1	Control	0.80^{b}	7.70^{b}	2.12^{d}
T2	*Conocarpus lancifolius* Engl.	0.46^{c}	4.03^{c}	2.00^{f}
T3	*Acacia arabica* L.	0.83^{ab}	8.10^{ab}	2.02^{e}
T4	*Moringa oleifera* Lam.	0.85^{a}	8.65^{a}	2.77^{a}
T5	*Dalbergia sisso* Roxb.	0.85^{ab}	8.28^{ab}	2.70^{b}
T6	*Eucalyptus globulus* Dehnh.	0.40^{c}	4.14^{c}	2.17^{c}
T7	*Cordia myxa* L.	0.41^{c}	4.18^{c}	2.12^{d}

Table 4 Grain yield components of wheat as affected by different phyto-extracts.

Treatments	Plant extracts	Total number of tillers (m^{-2})	Plant height (cm)	Grains ($spike^{-1}$)	1000-seed weight (g)
T1	Control	225.6^{c}	105.66^{bc}	44.00^{cd}	44.56^{c}
T2	*Conocarpus lancifolius*	206.6^{c}	98.18^{d}	38.66^{e}	38.43^{e}
T3	*Acacia arabica*	236.0^{c}	106.19^{bc}	45.66^{bc}	45.70^{bc}
T4	*Moringa oleifera* Lam.	327.3^{a}	112.29^{a}	49.33^{a}	50.30^{a}
T5	*Dalbergia sisso*	280.0^{b}	108.57^{b}	47.00^{b}	47.15^{ab}
T6	*Eucalyptus globulus*	216.0^{c}	97.30^{d}	39.66^{e}	39.63^{e}
T7	*Cordia myxa*	215.0^{c}	102.59^{c}	43.33^{d}	41.81^{d}

Table 5 Economic traits of wheat as affected by different phyto-extracts.

Treatments	Plant extracts	Grain yield ($Kg\ ha^{-1}$)	Biological yield ($Kg\ ha^{-1}$)	Harvest index (%)
T1	Control	4200.0^{c}	8585.3^{c}	48.85^{ab}
T2	*Conocarpus lancifolius*.	3816.4^{f}	7736.7^{e}	48.40^{c}
T3	*Acacia arabica*	4324.8^{c}	8633.7^{c}	48.93^{a}
T4	*Moringa oleifera*	4606.3^{a}	9175.3^{a}	49.11^{a}
T5	*Dalbergia sisso*	4438.7^{b}	9018.3^{b}	48.22^{bc}
T6	*Eucalyptus globulus*	3923.8^{e}	7982.0^{d}	47.90^{c}
T7	*Cordia myxa*	4010.3^{d}	8056.3^{d}	48.71^{ab}

Conclusion

It is concluded from the existing research conducted on "exogenous application of different plant extracts on the growth and performance of wheat (*Triticum aestivum* L.) that seed priming of wheat with extract of *Moringa oleifera*., *Dalbergia sissoo*. and *Acacia arabica* promoted the growth parameters and consequently the yields of wheat was increased by harmonic effect of allelo-chemicals. The effects of plant extract of (*Cordia myxa* L.), (*Eucalyptus globulus*.), and (*Conocarpus lancifolius*) on wheat was negative. These plants decreased the growth parameters and overall the wheat grain yield compared with treatment control. The plantation of *Moringa oleifera*., *Dalbergia sissoo*, and *Acacia arabica* L. may not be discouraged around the wheat field. To avoid wheat yield loss by allelo-chemicals, the planting of *Eucalyptus globulus*. and *Conocarpus lancifolious* trees should be discouraged. From the above cited

results it is recommended for the farming communities to encourage plantation of *Moringa oleifera*, and *Dalbergia sissoo* around the wheat field as growth promoting substances while *Eucalyptus globulus* and *Conocarpus lancifolius* plantation should be discourage to avoid economic/grain yield losses in wheat due to the presence of harmful allelo-chemical in their extracts.

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