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Effect of varietal cum sowing methods trait on growth and yield of wheat (*Triticum aestivum* l.)

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Abstract
The present study was conducted at the Agronomy Section, Agriculture Research Institute, Tandojam during Rabi, 2016-17. The results are statistically significant effect on growth traits. The results for varieties observed the maximum (94.24 cm) plant height, tillers m^{-2} (408.83), spike length (10.22 cm), grain weight $plant^{-1}$ (24.63 g), seed index (1000-grain weight, g) (52.27 g), biological yield (11903 kg ha^{-1}) and grain yield (5519.0 kg ha^{-1}) were observed in TD-1. Benazir ranked second with plant height (91.38 cm), tillers $plant^{-1}$ (401.22), spike length (9.63 cm), grain weight $plant^{-1}$ (23.03 g), seed index (51.41 g), biological yield (11749 kg ha^{-1}) and grain yield (5230 kg ha^{-1}). Whereas Moomal had minimum plant height (86.61 cm), tillers $plant^{-1}$ (386.0), spike length (9.16 cm), grain weight $plant^{-1}$ (22.59 g), seed index (48.71), biological yield (11074 kg ha^{-1}) and grain yield (9771 kg ha^{-1}). Drilling planting method recorded maximum plant height (93.14 cm), tillers m^{-2} (406.0), spike length (10.69 cm), grain weight $plant^{-1}$ (24.86 g), seed index (53.30 g), biological yield (12227 kg ha^{-1}) and grain yield (5602 kg ha^{-1}). Whereas the broadcasting sowing method had ranked second with plant height of 89.76 cm, tillers m^{-2} (400.17), spike length (9.45 cm), grain weight $plant^{-1}$ (24.21 g), seed index (50.63 g), biological yield 11608 kg ha^{-1} and grain yield 5245 kg ha^{-1}. The results further indicated that the lowest plant height (89.33 cm), tillers m^{-2} (389.89), spike length (8.86 cm), grain weight $plant^{-1}$ (21.19 g), seed index (48.46 g), biological yield (10891 kg ha^{-1}) and grain yield (4873 kg ha^{-1}) was observed where crop was planted under Gurbi sowing methods. It is concluded that all the yield traits, varieties, sowing methods and their interaction (varieties x sowing methods) were significant. The results further revealed that the TD-1 and Benazir were best varieties for obtaining higher yield. The results for sowing methods could be concluded that drilling was most suitable method for getting higher wheat yield.

Keywords: sowing methods, growth, yield, *Triticum aestivum*

1. Introduction
Agriculture accounted for 20.9 percent of the Gross Domestic Product (GDP) in 2014-15 and is a source of livelihood of 43.5 percent of rural population. Increased agricultural production and high crops yield is essential for food security which make the farming systems less vulnerable to climate change [1]. Wheat is the leading food grain of Pakistan occupying the largest area under single crop. Wheat contributes 10.0 percent to the value added in agriculture and 2.1 percent to GDP. Area under wheat has decreased to 9180 thousand hectares in 2014-15 from last year's area of 9199 thousand hectares which shows a decrease of 0.2 percent. The production of wheat stood at 25.478 million tons during 2014-15, showing a decrease of 1.9 percent over the last year's production of 25.979 million tons [1]. In Pakistan it was grown on an area of about 8.805 million hectares, with an average yield of (2750 kg ha^{-1}) [2], followed by wheat growing countries of the world such as U.K. (7890 kg ha^{-1}), Germany (7190 kg ha^{-1}) and France (7091 kg ha^{-1}) etc, [3]. The wheat crop planted under different sowing methods has great role for increasing the yield [4]. Sowing method is a major factor that determines crop vigor and yield [5] and [6].

In Pakistan, wheat is mostly cultivated by broadcasting method after rice and cotton. Seed broadcast methods, whether in proper moist soil or in standing water not only require higher seed rates but also results in lower plant population. Besides that, seed broadcast in standing water provides the conditions more favorable to disease attack and low osmotic pressure [7]. Drilling method is considered suitable because of its uniform seed distribution and sowing at desired depth and resulted higher germination and uniform stand. Therefore, planting with drill is recommended for better crop production [8]. Row planting has many advantages over broadcasting, as it need less seed and facilitate field inspection and weed control [9]. Wheat lodging is reported more in flat planting with flood irrigation, which is the most common cultivation system of farmers [10]. Conventional and bed sowing methods at 100 to 150 kg ha^{-1} seed rates increased grain and straw yield with optimum N rates [11]. [8] Recommended an automatic drill for planting but not essential. However, they suggested row planting due to its advantages over broadcasting because it needs less seed and

facilitates mechanical weed control, field inspection and rouging [9].
[12] Observed higher grain yield when crop was sown through drilling method. Direct drilling recorded lower straw yields and nutrient uptake compared to conventional broadcast of seeds, and thus, direct drilling was effective and recommended for wheat cultivation [13].

2. Materials and methods
The present study was conducted at the Agronomy Section, Agriculture Research Institute, Tandojam during Rabi, 2016-17. The experiment was carried out in randomized complete block design (RCBD) with three replication having net plot size 3 m x 4 m = (12 m^2).

2.1 Replications = Three
2.2 Treatments= (Two factors A and B**)**
2.3 Factor-A: Varieties (V) = 3
V_1 = TD-1
V_2 = Benazir
V3 = Momal

2.4 Factor-B
Sowing method = (03)
I_1 = Drill
I_2 = Broadcast
I_3 = Gurbi

2.5 Treatment Combination
$T_1 = V_1 M_1$, $T_2 = V_1 M_2$, $T_3 = V_1 M_3$,
$T_4 = V_2 M_1$, $T_5 = V_2 M_2$, $T_6 = V_2 M_3$,
$T_7 = V_3 M_1$, $T_8 = V_3 M_2$, $T_9 = V_3 M_3$

2.6 Observations to be recorded
1. Plant height (cm)
2. Tillers m^{-2}
3. Spike length (cm).
4. Grain weight $plant^{-1}$ (g)
5. Seed index (1000-grain weight, g)
6. Biological yield (kg ha^{-1})
7. Grain yield (kg ha^{-1})

2.7 Procedure for recording observations
2.7.1 Plant height (cm)
Plant height was recorded at maturity of crop using measurement tape from bottom to tip of the each plot and was averaged.

2.7.2 Tillers (m^{-2})
Tillers in each randomly selected plant were counted and accordingly average m^{-2} was worked out in each treatment.

2.7.3 Spike length (cm)
Spike length was recorded in centimeters at maturity of crop using measurement tape from initiation to tip of the spike from randomly selected plants in each plot and was averaged.

2.7.4 Grains $spike^{-1}$
The total number of grains in five randomly selected plants was counted in each plot and total number of grains was divided with total number of spikes.

2.7.5 Seed index (1000 grains weight, g)
After threshing the experimental crop for each plot separately, the 1000 grains from each was taken and weighed by electronic top loading balance in grams.

2.7.6 Biological yield (kg ha^{-1})
At maturity, the wheat crop in each plot was harvested and the total biomass was weighed. The $plot^{-1}$ biological yield was converted to biological yield ha^{-1} in using following formula.

$$\frac{\text{Biol. yield (kg ha}^{-1})}{\text{Plot size (m}^{-2})} \text{ X } 10{,}000$$

2.7.7 Grain yield (kg ha^{-1})
At maturity, the wheat crop in each plot was harvested and threshed, and yield ha^{-1} was calculated by the following formula.

$$\frac{\text{Grain yield (plot}^{-1})}{\text{Plot size (m}^{-2})} \text{ X } 10{,}000$$

2.7.8 Statistical analysis:
The collected data was subjected to statistical analysis by using Statistix 8.1 computer software [14] (Statistix, 2006). The least significant difference (LSD) test was applied through Duncan's Multiple Range Test (DMRT) to compare treatments superiority.

3. Layout plan of the experiment
3.1 Title: Effect of varietal cum sowing methods trait on growth and yield of wheat (*Triticum aestivum* L.)

3.2 Experimental design: Randomized Complete Block Design (RCBD)

3.3 Replications = Three

3.4 Net plot size = 3 m x 4 m (12 m^2)

3.5 Treatments= (Two factors A and B**)**

3.5.1 Factor-A:
Varieties (V) = 3
V_1 = TD-1, V_2 = Benazir, V3 = Momal

3.5.2 Factor-B
Sowing Method = (03)
M_1 = Drilling
M_2 = Broadcasting
M_3 = Gurbi

3.6 Treatment Combination

$T_1= V_1 M_1$, $T_2= V_1 M_2$, $T_3= V_1 M_3$,
$T_4= V_2 M_1$, $T_5= V_2 M_2$, $T_6= V_2 M_3$,
$T_7= V_3 M_1$, $T_8= V_3 M_2$, $T_9= V_3 M_3$

RI 4Cm	N	RII	N	RIII
T_1	Sub-Chennel	T_9	Sub-Chennel	T_5
T_2		T_8		T_3
T_3		T_7		T_9
T_4		T_6		T_2
T_5		T_4		T_6
T_6		T_5		T_1
T_7		T_3		T_8
T_8		T_2		T_7
T_9		T_1		T_4
Main Water Channel				

4. Results

The experiment was conducted to investigate the effect of different planting methods on the yield of wheat varieties during 2016-17. Three wheat varieties viz; TD-1, Benazir and Moomal and three sowing methods viz; drilling method, broad casting and Gurbi method were used. The experiment was laid out in Randomized Complete Block Design having four replications. The results are described are as under:

4.1 Plant height (cm)

The results revealed that wheat varieties Benazir and Moomal produced taller plants than wheat variety TD-1 with plant height of 78.7 and 77.9 (cm). Whereas the smallest plants 62.5 (cm) in height were recorded in variety TD-1. There were statistically significant differences in plant height among the different varieties.

The results further indicated that the sowing method had statistically significant effects on plant height. Drilling sowing method had maximum (78.5 cm) plant height as compared to Broadcast sowing method with 73.4 cm, whereas the lowest (67.2 cm) plant height was observed in gurbi sowing method.

The interactive effect of varieties x planting methods for plant height (cm) was also significant. The highest plant height of 85.0 (cm) was observed from interaction of variety Benazir in drilling sowing method whereas, the lowest plant height of 58.3 (cm) was recorded from variety TD-1 under gurbi sowing method.

It is clear from the results that variety Benazir had more plant height under drilling method.

4.2 Number of tillers m^{-2}

The results revealed that wheat varieties TD-1 and Benazir produced significantly highest number of tillers m^{-2} than wheat variety Moomal. The highest 408.3 and 401.2 number of tillers m^{-2} were recorded in TD-1 and Benazir, whereas the lowest 386.00 number of tillers m^{-2} were recorded in variety Moomal. There are statistically significant differences in number of tillers m^{-2} of TD-1 and Benazir.

The results also indicated that sowing method had statistically significant effect on number of tillers m^{-2}. Drilling sowing method had maximum (406.0) number of tillers m^{-2} as compared to Broadcast sowing method with 400.1, however, the crop was planted under gurbi sowing mehtods was observed minimum (389.8) number of tillers m^{-2}.

The interactive effect of varieties x sowing methods for the number of tillers $plant^{-2}$ was also significant. The maximum (415.6) number of tillers m^{-2} was observed from variety Moomal in drill sowing method. Whereas, the minimum (397.0) number of tillers m^{-2} were recorded from variety Benazir under broadcast sowing method.

It is clear from the results that variety TD-1 had more number of tillers $plant^{-1}$ under drilling sowing method.

4.3 Spike length (cm)

The results revealed that maximum spike length of 10.2 (cm) was recorded in wheat variety TD-1 where as spike length was slightly reduced to 9.1 (cm) in variety Moomal. The wheat variety Benazir ranked second in producing spike length of 9.6 (cm) in all sowing methods.

The results for sowing method had statistically significant effect on spike length (cm). Drilling sowing methods had maximum (10.6 cm) spike length as compared to broadcast sowing method with 9.4 cm, whereas the minimum (8.8 cm) spike length was observed in gurbi sowing methods.

The interactive effect of varieties x sowing methods for the spike length (cm) was also significant. The maximum (12.3 cm) spike length was observed from variety TD-1 under drilling sowing methods, whereas, the minimum (8.5 cm) spike length was recorded from variety Moomal in Gurbi sowing method.

It is clear from the results that variety TD-1 had highest spike length (cm) under drilling sowing method.

4.4 Grain weight $plant^{-1}$ (g)

The results revealed that maximum grain weight $plant^{-1}$ of 24.6 (g) was recorded in wheat variety TD-1 where as grain weight $plant^{-1}$ was slightly reduced to 22.5 (g) in variety Moomal. The wheat variety Benazir ranked second in producing grain weight $plant^{-1}$ of 23.0 (g) in all sowing methods.

The results for sowing method had statistically significant effect on grain weight $plant^{-1}$. Drilling sowing methods had maximum (24.8 g) grain weight $plant^{-1}$ as compared to broadcast sowing method with 24.2 g, whereas the minimum (21.1 g) grain weight $plant^{-1}$ was observed in gurbi sowing methods.

The interactive effect of varieties x sowing methods for the spike length (cm) was also significant. The maximum (26.4 g) grain weight $plant^{-1}$ was observed from variety TD-1 under drilling, whereas, the minimum (20.7 g) grain weight $plant^{-1}$ was recorded from variety TD-1 in Gurbi sowing method.

It is clear from the results that variety TD-1 had highest grain weight $plant^{-1}$ (g) under drilling sowing method.

4.5 Seed index (1000-grain weight, g)

The results revealed that maximum (52.2 g) seed index were recorded in wheat variety TD-1 followed by variety Benazir which was recorded 51.4 g seed index whereas, the lowest (48.7 g) seed index was observed from the wheat variety Moomal.

The results for sowing methods had statistically significant effect on seed index (1000 grain weight, g). Drilling sowing methods had maximum (53.3 g) seed index (1000 grain

weight, g) as compared to broadcast sowing method with 50.6 g seed index. However the minimum seed index (48.4 g) was observed from Gurbi sowing methods.
The interactive effect of varieties x sowing methods for seed index was also significant. The maximum (57.6 g) seed index was observed under drilling sowing method in variety TD-1 whereas, minimum (46.1 g) seed index was observed from Gurbi sowing method in variety Moomal.
It is clear from the results that variety TD-1 had more seed index under Drilling sowing method.

4.6 Biological yield (kg ha^{-1})
The results revealed that maximum (12284 kg ha^{-1}) biological yield was noted from wheat variety TD-1 followed by variety Benazir which recorded (11362 kg ha^{-1}) biological yield whereas, the minimum (11079 kg ha^{-1}) biological yield were recorded from the wheat variety Moomal.
The sowing methods had statistically significant effects on biological yield (kg ha^{-1}). Drilling sowing method had maximum (12226) biological yield (kg ha^{-1}) as compared to broadcast sowing method with 11337 kg ha^{-1} biological yield, whereas, the minimum (11162 kg ha^{-1}) biological yield was observed in Gurbi sowing methods.
The interactive effect of varieties x sowing methods for biological yield (kg ha^{-1}) was also significant. The maximum (12897 kg ha^{-1}) biological yield was recorded from drilling sowing method in variety TD-1 whereas, minimum (10029) biological yield (kg ha^{-1}) was recorded from Broadcast sowing method in wheat variety Moomal.
It is clear from the results that variety TD-1 had more biological yield under drilling sowing method.

4.7 Grain yield (kg ha^{-1})
The results revealed that maximum (5519 kg ha^{-1}) grain yield was noted from wheat variety TD-1 followed by variety Benazir which recorded 5230 grain yield (kg ha^{-1}) whereas, the minimum (4971 kg ha^{-1}) grain yield were recorded from the wheat variety Moomal.
The sowing methods had statistically significant effects on grain yield (kg ha^{-1}). Drilling sowing method had maximum (5602 kg ha^{-1}) grain yield as compared to broadcast sowing method with 5245 kg ha^{-1} grain yield. Whereas, the minimum (4873 kg ha^{-1}) grain yield was observed from Gurbi sowing methods.
The interactive effect of varieties x sowing methods for grain yield (kg ha^{-1}) was also significant. The maximum (5900 kg ha^{-1}) grain yield was recorded from Drilling sowing method in variety TD-1 whereas, minimum (4445 kg ha^{-1}) grain yield was recorded from Gurbi sowing method in variety Moomal.
It is clear from the results that variety TD-1 had more grain yield under Drilling sowing method.

5. discussion
Wheat varieties and planting methods are an important tool for boostingup the per acre production of wheat grains. To evaluate the effect of planting methods that can help in the placement of seed at proper depth, which ultimately affects crop growth. The selection of suitable planting method for wheat is dependent upon the time of planting, availability of soil water at planting time, amount of residue in the field and availability of planting machine [15]. The results revealed that the wheat variety Benazir produced taller plants of 78.7 cm in drilling sowing method than other wheat varieties. This increase in plant height of wheat variety Moomal is due to its genetic effects. As TD-1 having the characteristics of dwarfing nature therefore, it has produced lowest plant height of 62.5cm under broadcast sowing method. The wheat varieties under drilling sowing method have produced taller plant than other sowing methods. These results are in agreement with the findings of [16] who reported that the sowing methods greatly affected the number of tillers, grain yield and harvest index value whereas grains spike^{-1} and 1000-grain weight were no significant. Many researchers have conducted experiments to test the suitability of wheat varieties planted under different planting methods. As [17] had investigated that response of tall and dwarf wheat varieties to methods of sowing. Drilling, broadcast and Gurbi were evaluated for yield and six yield-related traits.
As for as number of tillers m^{-2} are concerned the wheat variety TD-1 significantly resulted in producing more number of tillers of 408.8 than other wheat varieties. In drilling sowing method it also produce more number of tillers of 406.00 than other wheat varieties. Whereas, the lowest number of tillers of 350.0 were recorded in wheat variety Moomal under Gurbi sowing method. The increase in number of tillers in wheat variety TD-1 is due to superiority in genetics characteristics and increase in sowing method drilling. The results also coincided with the findings of [15] as well as [18] who reported that the sowing methods greatly affected the number of tillers plant^{-1} of wheat varieties.
The response of wheat varieties to spike length planted under different sowing methods are significant. However, the maximum spike length was observed in wheat variety TD-1 sowing under drilling method. Similarly, it also produced bigger spikes in length than Grubi sowing method. This increase in spike length is the effect in increase in plant height and uniform distribution of more and nutrients. Similar results were reported by [19] who conducted a field experiment to find out the effect of planting method on the yield and yield attributes of wheat. Two planting methods viz. bed planting and conventional planting were studied on wheat. Sowing methods exhibited significant variation in respect to all the characters studied. The maximum (3.60 t ha^{-1}) grain yield was obtained from bed planting.
The results for seed index (1000-grain weight, g) indicated that wheat variety TD-1 had maximum seed index (1000-grain weight, g) than other wheat varieties in drilling sowing method. Due to superior varietal characters of wheat variety TD-1 which has also produced more number of grains and maximum grain weight spike^{-1} has resulted in producing maximum seed index (1000-grain weight, g) in sowing method drilling. Similarly these results are in agreement with findings of [20] whereas [21] they reported that maximum grain yield in drilling method of sowing can be described to higher number of spikelet's spike^{-1}, number of grains spike^{-1} and 1000-grain weight g, which was favored because of better growing condition in drilling method. [22] evaluated that planted-wheat at 30 cm apart produced significantly the highest (164) number of spikes m^{-2}, thousand-grain weight (39.85 g) and grain yield (5164 kg ha^{-1}), while broadcast

method produced the least number of spikes m^{-2} (104), number of grains $spike^{-1}$ (57), thousand-grain weight (32.09 g) and grain yield (4088 kg ha^{-1}).

The results regarding biological yield (kg ha^{-1}) of wheat varieties indicated that variety-TD-1 recorded highest biological yield (kg ha^{-1}) under drilling sowing method than other wheat varieties. Similarly, [16] studied that the sowing methods greatly affected the biological yield (kg ha^{-1}). The results pertaining to grain yield (kg ha^{-1}) revealed that wheat variety TD-1 had highest grain yield of 5900 kg ha^{-1} than other wheat varieties in drilling sowing method. The interactive effect of varieties x sowing methods for grain yield kg ha^{-1} was significant. The maximum grain yield kg ha^{-1} of wheat variety TD-1 is due to performing superior in yield contributing characters, such as, plant height, number of tillers, spike length, grain weight $spike^{-1}$, seed index, grain yield and harvest index than other wheat varieties. The drilling sowing method proved superior to in producing maximum grain yield ha^{-1} than bed planting method. Similarly these results are fully in agreement with findings of [23] and [24], similarly [25, 26, 15] and [27] they reported that yield of wheat varieties responded well in producing higher grain yield in different planting methods tested.

6. Tables

Table 1: Plant height (cm) of wheat varieties as affected by different sowing methods

Sowing methods	Varieties			Mean
	TD-1	Benazir	Momal	
Drill	68.1	85.0	82.4	78.5 A
Broadcast	61.2	80.1	78.9	73.4 B
Gurbi	58.3	70.8	72.5	67.2 C
Mean	62.5 C	78.7 A	77.9 B	
	Varieties	**Sowing methods**		**V X SM**
SE=	1.0155	1.0155		1.7589
LSD @ 5%=	2.1528	2.1528		3.7288

Table 2: Tillers m^{-2} of wheat varieties as affected by different sowing methods

Sowing methods	Varieties			Mean
	TD-1	Benazir	Momal	
Drill	415.6	400.0	402.3	406.0 A
Broadcast	398.5	397.0	405.0	400.1 B
Gurbi	412.3	406.6	350.6	389.8 C
Mean	408.8 A	401.2 B	386.0 C	
	Varieties	**Sowing methods**		**V X SM**
SE=	2.6008	2.6008		4.5048
LSD @ 5%=	5.5135	5.5135		9.5497

Table 3: Spike length (cm) of wheat varieties as affected by different sowing methods

Sowing methods	Varieties			Mean
	TD-1	Benazir	Momal	
Drill	12.3	9.9	9.7	10.6 A
Broadcast	8.9	10.2	9.1	9.4 B
Gurbi	9.3	8.6	8.5	8.8 C
Mean	10.2 A	9.6 A	9.1 B	
	Varieties	**Sowing methods**		**V X SM**
SE=	0.3224	0.3224		0.5584
LSD @ 5%=	0.6835	0.6835		1.1838

Table 4: Grain weight $plant^{-1}$ of wheat varieties as affected by different sowing methods

Sowing methods	Varieties			Mean
	TD-1	Benazir	Momal	
Drill	26.4	26.1	22.0	24.8 A
Broadcast	25.7	21.8	25.0	24.2 B
Gurbi	21.7	21.7	20.7	21.1 C
Mean	24.6	23.0	22.5	
	Varieties	**Sowing methods**		**V X SM**
SE=	0.6189	0.6189		1.0720
LSD @ 5%=	-	1.3220		2.2725

Table 5: Seed index (1000 grain weight, g) of wheat varieties as affected by different sowing methods

Sowing methods	Varieties			Mean
	TD-1	Benazir	Momal	
Drill	57.6	51.8	50.3	53.3 A
Broadcast	49.4	52.8	49.6	50.6 B
Gurbi	49.7	49.5	46.1	48.4 C
Mean	52.2 A	51.4 A	48.7 B	
	Varieties	**Sowing methods**		**V X SM**
SE=	0.6078	0.6078		1.0528
LSD @ 5%=	1.2885	1.2885		2.2318

Table 6: Biological yield (kg ha^{-1}) of wheat varieties as affected by different sowing methods

Sowing methods	Varieties			Mean
	TD-1	Benazir	Momal	
Drill	12897	11736	12047	12226 A
Broadcast	12500	11482	10029	11337 B
Gurbi	11457	10868	11163	11162 C
Mean	12284 A	11362 B	11079 C	
	Varieties	**Sowing methods**		**V X SM**
SE=	314.14	314.14		544.11
LSD @ 5%=	665.95	665.95		1153.5

Table 7: Grain yield (kg ha^{-1}) of wheat varieties as affected by different sowing methods

Sowing methods	Varieties			Mean
	TD-1	Benazir	Momal	
Drill	5900	5533	5373	5602 A
Broadcast	5695	4945	5095	5245 B
Gurbi	4962	5212	4445	4873 C
Mean	5519 A	5230 B	4971 B	
	Varieties	**Sowing methods**		**V X SM**
SE=	80.415	80.415		139.28
LSD @ 5%=	170.47	170.47		295.27

6. Conclusions

It is concluded that all the yield traits, varieties, sowing methods and their interaction (varieties x sowing methods) were significant. The results further revealed that the TD-1 and Benazir were best varieties for obtaining higher yield. The results for sowing methods concluded that drilling was most suitable method for getting higher wheat yield.

7. Acknowledgements

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6. References

1. GOP. Economics survey of Pakistan 2014-2015. Ministry of Food, Agriculture and Livestock, Govt. Of Pakistan, Statistics Division (Economics Wing), Islamabad, 2015.
2. MINFAL. Ministry of Food Agricultural and Livestock, Agricultural Statics of Pakistan, Economic wing Islamabad, 2011.
3. Deho ZA, Arain MA, Sial MA, Nizamani NA. Agronomic performance of exotic wheat (*Triticum aestivum* L.) genotypes evaluated at different sowing dates. Pak. J. Seed Tech. 2006; 1(89):35-42.
4. Shah A, Hidayatullah I, Khan M, Amanullah A. Foliar nitrogen management for improving growth and yield of dry land wheat, Cercetări Agro. Moldova. 2013; 3(163):273-288.
5. Korres, Froud F. The influence of different establishment methods on performance of early drilled winter wheat. HGCA- Project Report. 2002; 375:24.
6. Yongqing MA. Allelopathic studies of common wheat (*Triticum aestivum* L.). Weed Biol. Manag. 2005; 5(3):93.
7. Blankkenau, Olfs HW. Effect of different crop densities of wheat on recovery of Nitrogen in crop and soil within the growth period. J. Agro. Crop Sci. 2001; 186(3):151.
8. Easson DL, White EM, Pickles SJ. The effects of weather, seed rate and cultivar on lodging and yield in winter wheat. J. Agric. Sci. 1993; 121(2):145-156.
9. Galanopoulou S, Facinelli M, Lorenzetti F. General agronomic aspects of seed production. In A.J.G. van Gastec, M.A. Panetta and E. Procedure, eds. Seed Science and Technology. Proc. Train-the-Trainers Workshop Sponsored by Med campus Program (EEC), 24 April 9, Amman. Aleppo, Syria, ICARDA, 1996.
10. Tripathi SC, Sayre KD, Kaul JN. Planting systems on lodging behavior, yield components and yield of irrigated spring bread wheat. Crop Sci. 2005; 45(4):1448-1455.
11. Kumar R, Agarwal SK, Nanwal RK. Biomass study in bread wheat (*Triticum aestivum* L.) under different planting systems, seed rates and nitrogen levels in sandy loam soils. Haryana Agric. Uni. J. Res. 2002; 32(2):73-76.
12. Oztürk A, Calar O. The effect of seeding methods on yield and some agronomic characteristics of wheat in Erzurum dry farming conditions. Ziraat Fakültesi Dergisi, Atatürk Üniversitesi. 2001; 32(1):17-24.
13. Hagras AM. Effect of seeding methods on yield and yield components of some wheat cultivars. Annals Agri. Sci., Ain Shams Univ. 2001; 30(1):113-130.
14. Statistix. Statistix 8 user guide, Version 1.0. Analytical Software, PO. BOX 12185, Tallahassee FL 32317 USA. Copyright @2006 by Analytical Software, 2006.
15. Sikandar KT, Hussain IM, Sohail NS, Abbas SG. Effects of different planting methods on yield and yield components of Wheat. Asian J. of Plant Sci. 2003; 2(10):811-813.
16. Khan H, Khan MA, Hussain I, Khan MZ, Khattak MK. Effect of sowing methods on grain yield and yield components of wheat variety Pak-81, P. J. Biol. Sci. 2000; 3(7):1177-1179.
17. Chourasia SK, Pandey RP, Namdeo KN. Response of tall and dwarf wheat to methods of sowing. Madras Agri. J. 1999; 69(8):553-554.
18. Gogoi AK, Kalita H. Effect of seeding method and herbicide on weeds and growth and yield of wheat (*Triticum aestivum* L.). Indian J. Agro. 1995; 40(2):209-211.
19. Hossain I, Islam K, Sufian A, Cracg AM, Islam S. Effect of planting method on the yield and yield attributes of wheat, J. Bio-Sci. 2004; 14:127-130.
20. Ahuja KN, Lal RB, Kumar A. Effect of seed rate, date and method of sowing on growth and yield of wheat. Ann. Agri. Res. 1996; 17(2):190-192.
21. Raj S, Singh D, Rao VU. Effect of date of sowing and row spacing on the yield of wheat (*Triticum aestivum* L.). Crop Res. 1992; 5(2):199-206.
22. Khan A, Muhammad A, Shah A, Ali S, Hussain Z, Khan S. Evaluation of planting methods for grain yield and yield components of wheat. Sarhad J. Agri. 2007; 23(3):561-564.
23. Wang F, Kong L, Sayre K, Li S, Feng SJ, Zhang B. Morphological and yield responses of winter wheat (*Triticum aestivum* L.) to raised bed planting in Northern China, African J. Agri. Res. 2011; 6(13):2991-2997.
24. Hassan K. The effect of planting methods on yield and yield components of irrigated spring durum wheat varieties. Sci. Res. and Es. 2010; 5(20):3063-3069.
25. Ashrafi ZY, Rahnavard A, Sedigheh S. Analogy potential effects of planting methods and tank mixed herbicides on wheat yield. J. Agri. Tech. 2009; 5(2):391-403.
26. Abbas G, Ali MA, Abbas G, Azam M, Hussain I. Impact of planting methods on wheat grain yield and yield contributing parameters. J. Ani. & Plant Sci. 2009; 19(1):30-33.
27. Khaleque MA, Paul NK, Craig AM. Yield of wheat as influenced by bed planting, Bangladesh J. Agri. Res. 2008; 33(3):439-448.