

Evaluation of Advance Bread Wheat Lines in Preliminary Wheat Yield Trial

^{1,2}Fahim Ullah Khan, ¹Muhammad Khan, ¹Sabir Gul Khattak,
¹Zahid Iqbal, ¹Zahid Saleem, ¹Javed Iqbal and ¹Niaz Muhammad

¹Barani Agricultural Research Station, Kohat, Pakistan

²Department of Plant Breeding and Genetics, The University of Agriculture, Peshawar, Pakistan

Abstract: Development of superior crop varieties is the prime objectives of all plant breeding programs. Fourteen bread wheat lines selected from 20th Semi Arid Wheat Yield Trials received from CIMMYT-Mexico. The experiment was planted in randomized complete block design with three replications at Barani Agricultural Research Station, Kohat during 2013-14. Data were recorded on days to heading, days to maturity, plant height, tillers m⁻² and grain yield. Analysis of variance revealed highly significant differences among genotypes for all the traits studied. Seven entries viz. E-304, E-311, E-314, E-325, E-360, E-384 and E-388 out yielded check cultivar KT-2010 and will forwarded for multi-location testing to be released as new variety for rainfed areas.

Key words: Wheat • Drought • Advance lines • Preliminary wheat yield trial

INTRODUCTION

Wheat is the major food grain crop of the world and is the staple food of millions people around the globe. Wheat is widely adaptable to wide range of climatic conditions. About 70% of the world wheat is cultivated under rainfed conditions [1]. Generally, wheat crop is affected from both heat and drought which usually occur simultaneously to cause significant reduction in yield [2]. In Pakistan, wheat is grown cultivated under rainfed condition is more than 20% of the total wheat area mainly in Khyber Pakhtunkhwa. Due to this, the average farmer yield in Khyber Pakhtunkhwa is about 1500 kg ha⁻¹, which is about half of the national yield. Low yield under rainfed conditions is generally due to low soil moisture at sowing and heat stress at reproductive stage.

Development of resistant variety better suited to rainfed/stress condition is the prime objective of many wheat breeding program across the globe. However, the success achieved so far is not up to the mark and need due consideration in current and future breeding schemes.

Therefore, the present study was undertaken to select early maturing, high yielding and disease resistant wheat line for rainfed areas of Khyber Pakhtunkhwa.

MATERIALS AND METHODS

This study was conducted in Barani Agricultural Research Station (BARS) Kohat, during 2013-2014 cropping season. The material comprised of 14 elite wheat lines selected from fifty entries received as 20th SAWYT from CIMMYT Mexico and were screened during 2012-13 cropping season. Thirteen promising lines were selected on the basis of high yield potential and disease resistances. These lines were included in preliminary wheat yield trial 2013-14 for testing against local check cultivar KT-2010. Randomized Complete Block Design with 3 replications was used. Each entry consisted of six rows with row length of 5 meters and row to row distance of 0.3 m. Standard agronomic practices was carried out throughout the growing season. Normal dose of fertilizers i.e. N: P₂O₅ @ 80:58 kg/ha were applied at the time of sowing. Data were recorded on days to heading, days to maturity, plant height (cm), tillers m⁻² and grain yield (kg/ha). List of entries included in the trials are given in Table 1.

Statistical Analysis: The data collected were subjected to analysis of variance technique appropriate for randomized complete block design using computer software Statix ver 8.1. Upon significant differences means were separated using LSD test at 5% level of probability.

Table 1: List of entries with their parentage included in the trials

Entry Code	Parentage	Source
E-304	W15.92/4/PASTOR//HXL7573/2*BAU/3/WBLL1	20-SAWYT-CIMMYT Mexico
E-302	DHARWAR DRY	20-SAWYT-CIMMYT Mexico
E-310	H45/4/KRICCHAUFF/FINSI/3/URES/PRL//BAV92	20-SAWYT-CIMMYT Mexico
E-311	VORB/SOKOLL	20-SAWYT-CIMMYT Mexico
E-313	VORB/SOKOLL	20-SAWYT-CIMMYT Mexico
E-314	DUCKLA/GUNDOO//SOKOLL	20-SAWYT-CIMMYT Mexico
E-315	VORB/3/T.DICCOCCON PI94625/AE.SQUAROROSA (372)//3*PASTOR	20-SAWYT-CIMMYT Mexico
E-323	BABAX/KS93U76//BABAX/3/2*SOKOLL	20-SAWYT-CIMMYT Mexico
E-324	BABAX/KS93U76//BABAX/3/2*SOKOLL	20-SAWYT-CIMMYT Mexico
E-325	MILAN/KAUZ//PRINIA/3/BAV92/4/2*SOKOLL	20-SAWYT-CIMMYT Mexico
E-360	W15.92/4/PASTOR//HXL7573/2*BAU/3/WBLL1	20-SAWYT-CIMMYT Mexico
E-384	MILAN/KAUZ//PRINIA/3/BAV92/4/2*SOKOLL	20-SAWYT-CIMMYT Mexico
E-388	GK ARON/AG SECO 7846/2180/4/2*MILAN/KAUZ/PRINIA/3/....	20-SAWYT-CIMMYT Mexico
KT-2010	Local Check	--

RESULTS AND DISCUSSION

Days to Heading: Mean values of 14 wheat lines for days to heading are presented in Table 2. Days to heading of fourteen wheat lines ranged from 121 to 126 with the mean value of 123 days. Entry E-314 and E-310 (126 days) took maximum days to heading, which is statistically at par with entry E-311(125 days) and entry E-313(124 days).

Furthermore, the minimum days to heading were recorded for check cultivar KT-2010 (121 days). The present findings are in line with the earlier research work of Wardlaw [3].

Days to Maturity: Mean values for days to maturity of 14 wheat lines are presented in Table 2. Days to maturity ranges from 158 to 165 with the mean value of 163 days.

Table 2: Mean squares for various morpho-physiological and yield traits of 14 bread wheat lines evaluated at BARS, Kohat during 2013-14

Traits	Replication (df=2)	Genotype (df=13)	Error (df=26)	CV(%)
Days to heading	16.6667	8.07**	2.3590	1.25
Days to maturity	0.4524	11.40**	1.5037	0.75
Plant height	6.6429	46.21**	0.5659	0.70
Tillers m ⁻²	13.50	2502.65**	235.96	9.88
Grain yield	3875	2781956**	72540	7.50

CV= Coefficient of variation and df= degree of freedom

**, * = significant at 1% and 5 % level of probability, respectively

Table 3: Mean performance of 14 bread wheat lines evaluated under Preliminary wheat yield trial (PWYT) at BARS, Kohat during 2013-14

Entry	Days to heading (days)	Days to maturity (days)	Plant height (cm)	Tillers m ²	Grain yield (kg ha ⁻¹)
E-304	121 CD	161 D	104.0 G	169 B-E	4033 CDE
E-302	122 CD	164 A-C	105.3 F	134 FG	2944 I
E-310	126 A	163 A-C	106.7 E	126 G	3111 HI
E-311	125 AB	165 AB	106.7 E	199 A	4844 A
E-313	124 A-C	163 A-C	104.7 FG	149 D-G	3533 F-H
E-314	126 A	165 AB	101.0 H	188 AB	4222 B-D
E-315	123 B-D	165 A	113.3 A	130 G	3634 E-G
E-323	122 CD	163 B-D	108.0 D	146 E-G	3289 G-I
E-324	122 CD	162 CD	111.0 B	99 H	2056 J
E-325	123 CD	162 CD	105.7 EF	135 FG	3889 D-F
E-360	122 CD	161 D	109.7 C	184 A-C	4456 A-C
E-384	122 CD	162 CD	111.0 B	185 A-C	4533 AB
E-388	122 CD	164 AB	110.3 BC	173 B-D	4300 B-D
KT-2010	121 D	158 E	99.7 I	160 C-F	1455 K
Mean	123	163	106.9	156	3593
LSD(0.05)	2.58	2.06	1.26	25.78	452.03

Entry 311, 314 and 315 (165 days) took maximum days to maturity, whereas minimum days to maturity were recorded for check cultivar KT-2010(158 days). High temperature stress induced forced maturity and thus reduces number of days to maturity. Nahar *et al.* [4] reported 15% reduction in maturity duration in wheat genotype due to stress condition.

Plant Height (cm): Mean values for plant height of 14 wheat lines are given in Table 2. Plant height ranged from 99.7 cm to 113.3 with the mean value of 106.9 cm. Entry 315 produced tallest plants (113.3 cm), followed by entry 324 and 384 (111.0 cm) which is statistically similar with entry 388 (110.3 cm). Furthermore, check cultivars KT-2010 produced shortest plants measuring 99.7 cm. Similar results regarding plant height was also reported in spring wheat by Hossain *et al.* [5].

Tillers m⁻²: Data pertaining tillers m⁻² of 14 advance wheat lines are presented in Table 2. Tillers m⁻² ranged from 99 to 199 with the mean value of 156. Entry 311 produced maximum tillers m⁻² (199), which is statistically similar with entry 314 (188), entry 384 (185) and 360 (184). Furthermore, the minimum values for tillers m⁻² were recorded for entry 324 (99). Khan *et al.* and Mahboob *et al.* [6, 7] also reported variations in fertile tillers.

Grain Yield (kg ha⁻¹): Data regarding grain yield of 14 advance wheat lines are given in Table 2. Grain yield ranged from 1455 to 4844 kg ha⁻¹ with the mean value of 3593 kg ha⁻¹. Entry 311 produced maximum grain yield (4844 kg ha⁻¹), which is statistically at par with entry 384 (4533 kg ha⁻¹) and entry 360 (4456 kg ha⁻¹), whereas, the minimum value for grain yield were recorded for check cultivar KT-2010 (1455 kg ha⁻¹). Reduction in grain yield under stress condition was reported by Mahboob *et al.* and Okuyama *et al.* [7,8].

CONCLUSION AND RECOMMENDATIONS

Seven entries viz. E-304, E-311, E-314, E-325, E-360, E-384 and E-388 were found high yielding and out yielded check cultivar KT-2010. These entries will be further tested in Advance yield trial and better performing, rust resistant lines will be sent for multi location testing to be released as new variety for rainfed areas.

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