

## Performance of Newly Released Dry Land Wheat Varieties under Barani and Minor Irrigated Conditions

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**Abstract.** Among the three newly released dry land wheat varieties viz; Marwat J-01, Lucky J-03 and Raj 2000 and the local race “Khattakwal wheat” sowed in district Karak during, November, 2004-05, significant difference was found between the grain yields both under barani and minor irrigated environment. Marwat J-01 out yielded significantly all the varieties with one irrigation (4120 kg/ha) followed by Raj-2000 (3993 kg/ha). Under barani conditions as well, the two varieties produced statistically equal but highest grain yield of 1718 and 1773 kg/ha, respectively.

**Keywords.** wheat, arid lands, grain yield, Pakistan, *Triticum aestivum*

### Introduction

Being staple diet of the people, wheat occupies a central position in agricultural policies, of Pakistan. It is grown on 92 percent of the total cropped area in rabi (spring).

About 80 percent of the total land area of 79.61 million hectares (m. ha) or about 25 percent of the cultivated area of 20.43 m. ha in Pakistan is barani (rain fed), bulk of which consists of arid and semi arid lands. These lands contribute 12.5 percent of the national wheat produce. Wheat (*Triticum aestivum*) is the main rabi crop of barani areas of Pakistan (Hobbs *et al.*, 1983). However, wheat yield is sharply low in our country as compared to that of France (6.23 tons/ha), Britain (7.78 tons/ha), Egypt (6.25 tons/ha) and East Punjab, India (4.5 tons/ha) (Aqil, 2006).

Wheat genotypes differ in yield in response to environment and yield is a highly variable trait. Hence, extensive research is required to find suitable wheat lines across different locations (Baisakh and Nayak, 1991; More *et al.*, 1990).

Various researchers have studied a number of varieties of wheat including Pirsabak-85, Pak-81, Sarhad-82, Haider 2000, Saleem-2000 etc. in search of the best yielding variety for particular climatic conditions of specific areas of Pakistan.

Din (2004) reported no significant increase in the grain yield of any of the 19 selected wheat genotypes from CIMMYT material which were planted against Raj variety (Standard Check) in a preliminary yield trial at Agricultural Research Institute, D. I. Khan. Jamal (2003) selected 94 high yielding

dry land wheat genotypes from international wheat nurseries received from CIMMYT/ICARDA which were evaluated for grain yield against Marwat J-01 in preliminary yield trials during 2002-03; however none of these genotypes exhibited significant increase in yield over Marwat J-01 (Kissana, 2001). Similarly under irrigated conditions, there was non-significant difference in the grain yield of Marwat J-10, Fakhre Sarhad, Inqiliab-91, Salim-2000, Raj, Bakhtawar-92, Dera-98, Nasir-2000 and Lakki J-03.

The variety complex undergoes changes in response to biotic and abiotic stresses as well. Wheat rust causes more variety changes than other factors (Khan *et al.*, 2002). To this effect Agricultural Research Department in Pakistan is actively involved in developing varieties that are high yielding, resistant to rust(s) and have acceptable bread quality. Every year, hundreds of new lines are tested for all or either of these attributes so that country food and farm sector welfare needs are met with.

The total land area of the North West Frontier Province (NWFP) of Pakistan is 10.2 m. ha, of which nearly 19 percent or 1.93 m. ha is cultivated while 60 percent of the cultivated area is again rain fed (Khan, 1986).

In regard to the particular climatic conditions of NWFP, Jamal (2001) conducted multi location trials on wheat genotypes in district Lakki Marwat of NWFP and reported that the variety Marwat J-01 out yielded other varieties by 12-40%, producing the highest grain yield of 2183 kg/ha among the 14 dry land genotypes. Ilyas *et al.* (2006) tested seven wheat

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varieties in Malakand farm of NWFP Agricultural University and concluded that Haider-2000 and Saleem-2000 showed better performance than others.

On account of availability of insufficient data in respect of the best variety producing higher yield in the particular environment of the district Karak of NWFP, the present study was conducted on farmers' fields of district Karak so as to select the most suitable wheat variety for the barani and minor irrigated (using tube well) tract of Karak district.

Karak lies to the south of Kohat and to the north of Bannu and Lakki Marwat districts of NWFP on the main Indus Highway between the cities of Peshawar and Karachi, 123 km from the former. Agriculture is the main source of living of the people, with 39% of the population being agricultural workers. It is very hot during the summer, with temperature sometimes touching 45-50°C and sand storms are common. Meteorological data of Karak for the year 2004-2005 is given in Table 1.

### Materials and Methods

Three wheat varieties viz; Marwat J-01, Lucky J-03 [released by Agriculture Research Station, Serai Naurang, Bannu] and Raj-2000 [released by Agriculture Research Institute, D. I. Khan] were planted at three locations of district Karak (Wagi Banda, Gudi Khel and Hada Banda) under barani (rain fed) conditions. The same varieties were planted under minor irrigated conditions (using tube wells) on the farmers fields in village Khamidan, Hari Banda and Kot Banda in Teri area. Local race which is called "Khattakwal" in district Karak was

included as a check variety. At each location, the test varieties were cultivated on a gross plot size of one acre. All the four varieties were replicated four times. Sowing, was completed in the 1<sup>st</sup> week of November 2004. At the time of sowing, basic fertilizer dose of 50-50 and 90-60 kg NP/ha were applied to barani and irrigated plots, respectively. Irrigated plots were provided with only two waterings, one before sowing and the other at tillering stage because of severe drought stress. Grain yield data were recorded and statistically analyzed combined over locations using LSD test at 0.05 P.

### Results and Discussion

**Performance of newly released dry land wheat varieties under barani conditions.** Grain yield data for barani plots are presented in Table 2 and 3. Significant differences were revealed between locations, varieties and interaction between locations and varieties. Highest grain yield of 1773 kg/ha was produced by Raj-2000 which, in turn, was statistically at par with that of Marwat J-01 (1718 kg/ha). This was followed by Lucky J-03 with produce of 1636 kg/ha. All the three improved varieties produced statistically higher grain yield by 55%, 50% and 43% respectively, over local variety (1146 kg/ha). The data further showed that wheat yield was the highest in Gudi Khel area (1666 kg/ha) where Raj-2000 and Marwat J-01 produced maximum but statistically equal grain yield of 1950 and 1875 kg/ha, respectively. The low grain yield in Khada Banda (1431 kg/ha) may be due to poor moisture at the time of sowing. These findings are in conformity with those reported by Jamal (2001), Kissana (2001) and Khan *et al.* (2002).

**Table 1.** Meteorological data of District Karak for 2004-05

Month	Mean temp (°C)		Mean humidity (%)		Rainfall (mm)	Wind speed (km/h)	Pan evaporation (mm/day)
	Max	Min	Max	Min			
Jul 2004	40	25	66	36	131	4.8	9.50
Aug 2004	37	25	74	37	158	3.8	8.00
Sep 2004	36	24	71	34	70	3.2	7.20
Oct 2004	30	16.2	71	31	16	4.2	5.13
Nov 2004	28	12	64	31	13	3.0	3.40
Dec 2004	22	8	76	30	22	3.1	2.10
Jan 2005	17	4	83	37	65	2.4	1.70
Feb 2005	17	7	82	43	95	2.7	1.90
Mar 2005	24	13	85	39	81	3.3	6.70
Apr 2005	32	16	65	24	15	3.4	6.70
May 2005	33	21	59	28	35	6.2	9.10
Jun 2005	42	26	47	22	20	5.3	12.80

source: Agricultural Research Station, Ahmadwala, District Karak

**Table 2.** Performance of newly released dry land wheat varieties under barani conditions

Locations	Grain yield (kg/ha)				Mean
	Marwat J-01*	Lucky J-03*	Raj-2000*	Local*	
Wagi Banda	1750 bc	1680 cd	1800 bc	1200 f	1608 a
Gudi Khel	1875 ab	1740 c	1950 a	1100 f	1666 a
Khada Banda	1530 e	1487 e	1569 de	1137 f	1431 b
Mean	1718 a	1636 b	1773 a	1146 c	-
Increase over local variety	55 %	50 %	43 %	-	-

\* = variety; LSD (0.05 P) for: locations = 64.1 kg/ha; varieties = 73.8kg/ha; L x V = 127.8kg/ha

**Table 3.** Performance of wheat varieties under minor irrigated conditions

Locations	Grain yield (kg/ha)				Mean
	Marwat J-01*	Lucky J-03*	Raj-2000*	Local*	
Khamidan	4000 abc	3500 d	3800 c	2700 e	3500 b
Hari Banda	4200 a	3920 bc	4080 ab	2670 e	3718 a
Kot Banda	4160 a	4000 abc	4100 ab	2498 e	3689 a
Mean	4120 a	3807 c	3993 b	2623 d	-
Increase over local variety	57 %	45 %	50 %	-	-

\* = variety; LSD, (0.05 P) for: locations = 164.7 kg/ha; varieties = 118.6 kg/ha; L x V = 205.4 kg/ha

**Performance of newly released dry land wheat varieties under minor irrigated conditions.** A perusal of the data (Table 3) reveals that locations, varieties and interaction between locations and varieties significantly affected the grain yield. The highest grain yield of 4120 kg/ha was produced by Marwat J-01 which is 57 % higher than that of local variety (2623 kg/ha). This was followed by Raj-2000 which produced a grain yield of 3933 kg/ha (50 % higher than local race). Grain yield of Lucky J-03 (3807 kg/ha) was 45 % higher than the local variety. The data further revealed that on an average, wheat yield was statistically the highest in Hari Banda (3718 kg/ha) and Kot Banda (3689 kg/ha). In the latter village, grain yield of all the three varieties was statistically non-significant. However numerically, Marwat J-01 (4160 kg/ha) was observed as the leading variety followed by Raj-2000 (4100 kg/ha) and Lucky J-03 (4000 kg/ha). In Hari Banda too, Marwat J-01 (4200 kg/ha) and Raj-2000 (4080 kg/ha) were the leading varieties, having significant edge over the local race. The superiority of Raj-2000 has already been confirmed by Din (2004).

The results of the study show that Marwat J-01 and Lucky J-03 are the most suitable wheat varieties for the dry areas of Karak district. However, provided availability of some source

of irrigation, Marwat J-01 can be successfully planted followed by Raj-2000.

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