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Pirsabak Barani-05, A New Wheat Variety for Cultivation in Rainfed Areas of NWFP, Pakistan

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Abstract: The wheat variety Pirsabak Barani-05, having the parentage MUNIA/CHTO/ / AMSEL, was first tested at CCRI Pirsabak during 2001-02 in HRWYT (High Rainfall Wheat Yield Trial) trial received from CIMMYT (Centro Internacional de Mejoramiento de Maiz y Trigo) Mexico. The line was selected on the basis of high yield and disease resistance and was included in the advance yield trials B-VI for further testing at CCRI (Cereal Crops Research Institute) Pirsabak and at ARI (Agricultural Research Institute) Tarnab during 2002-03. This line was again selected on the basis of high yield and disease resistance and was included in microplot or regional wheat yield trials for testing at different locations i.e., CCRI Pirsabak, ARS (Agricultural Research Station) Serai Naurang and at ARS Buffa in the North-West Frontier Province during 2003-04. This line was included in the Rainfed National Uniform Wheat Yield Trial (NUWYT) during 2004-05 where it showed excellent yield disease resistance performance. The results of HRWYT, advance yield trials (B trial), regional yield trial (MPT) and the NUWYT from 2001-02 to 2004-05 confirmed its superiority in higher yield and resistance to yellow and leaf rusts because of which this line was approved by the Provincial Seed Council as a new wheat variety for cultivation in the rainfed areas of NWFP. It has been named as Pirsabak Barani-05 and is recommended for sowing from November 1st to December 15th in NWFP.

Key words: Wheat (*Triticum aestivum* L.), variety, yield, disease resistance, rainfed areas

INTRODUCTION

The North-West Frontier Province (NWFP) of Pakistan comprises of several agro-ecological zones having different climates. In mountainous areas such as upper Swat, Hazara, Aurakzai and Chitral, neither true spring wheat nor winter or facultative types of wheat give high yield. In plain areas such as Swabi, Mardan and Peshawar, spring wheat is grown but popular wheat cultivars are susceptible to most common wheat diseases, particularly the yellow and leaf rust. Furthermore, in NWFP more than 60% of the area where wheat is grown is rainfed. The success or failure of the crop depends on sufficient and well-timed precipitation. Due to these constraints, the average grain yield of wheat is the lowest in NWFP among all four provinces of the country (Agricultural Statistics of Pakistan, 2004) and the province where the staple food is wheat has always to import it from other parts of the country.

Cereal Crops Research Institute (CCRI) Pirsabak has the mandate to produce wheat varieties suitable for the irrigated and rainfed areas of the province through indigenous hybridization and national and international nurseries obtained from international non-profit research

organizations like the CIMMYT (Centro Internacional de Mejoramiento de Maiz y Trigo) Mexico and ICARDA (International Center for Agricultural Research in Dry Areas) Syria etc. The broad genetic make-up of the CIMMYT/ICARDA material has made it possible for researchers to select lines adapted to the climatic and edaphic conditions of different countries (Anonymous, 1979, 1980). Penjano-62, Lermarajo-64, Mexipak-65, Pak-81, Sarhad-82, Pirsabak-85 and Khyber-87 were selected from the genetic material obtained from CIMMYT for general cultivation in NWFP (Mohammad *et al.*, 1990a, b; 1992a, b). These varieties revolutionized the wheat cultivation not only in NWFP but also in the neighboring countries Afghanistan and Iran as well. Recently Saleem-2000 and Haider-2000, also selected from CIMMYT material, have proved superior cultivars in the NWFP (Subhan *et al.*, 2004a,b). The present variety, named as Pirsabak Barani-05 was also selected from the genetic material obtained from CIMMYT Mexico. The variety gave high yield and showed resistance to yellow and leaf rusts in various tests. We hope that it will increase the grain yield of wheat at farmer's field and will bridge the gap between the wheat consumption and production in the irrigated areas of NWFP generally and its rainfed areas particularly.

Table 1: Grain yield of wheat lines in High Rainfall Wheat Yield Trial (HRWYT) conducted at CCRI, Pirsabak during 2001-02

Ent. No.	Cross	Grain yield (kg ha ⁻¹)
1	Bakhtawar-92 (Local check variety)	4900
2	IMBABURA	4000
3	PROINTA GUAZU	3900
4	ROMOGA F 96	4700
5	MILAN	4200
6	LIRA/CEP80111	3700
7	KVZ/K4500/KAUZ	4800
8	ORL8285	4600
9	YANGMAI 5	4800
10	ESTANZUELA DAKURU	3900
11	ESTANZUELA TARARIRAS	4300
12	EMBRAPA 16	4600
13	NING9421	4700
14	ALUCAN/DUCULA	5000
15	TNMU/6/CEP80111/.....	4600
16	TNMU/MILAN	5400
17	-DO-	4300
18	-DO-	4400
19	TNMU/3/JUP/BJY/ /SARA	5000
20	TNMU/ /CEP 7891/LE805/3/PF8215	5400
21	DUCULA/TNMU	4400
22	DUCULA/TNMU	4800
23	LD*6KVZ/LD*6/AGE/3/LD*6/KVZ// LD*6/WTP/4/	4400
24	BAU/3/GLEN/MAYA/NAC/4/NL 456/VEE#5	5600
25	TRAP#1/BOW/ / VEE#5/SARA	6600
26	MILAN/PSN/BOW/3/ATTILA/4/MUNIA	4600
27	PASTOR/ /MUNIA/ALTAR 84	5600
28	-DO-	5600
29	OR 791432/ VEE#3.2/ /MILAN	5200
30	MUNIA/ALTAR84/ / AMSEL	4800
31	-DO-	5400
32	MUNIA/CHTO/ /AMSEL	4900
33	TNMU/MUNIA	3700
34	PNLU/MUNIA	5200
35	KAUZ/TNMU	6200
36	MILAN/DUCULA	4700
37	MILAN/DUCULA	5000
38	CBRD//VEE#10/2*PVN	4500
39	TNMU/ATTILA	4400
40	-DO-	6000
41	-DO-	5800
42	MUNIA/ /NL456/ VEE#5	4600
43	BAU/TNMU	6400
44	-DO-	4800
45	-DO-	5400
46	HXL8088/DUCULA	4000
47	-DO-	5100
48	EMB27/CEP8825/MILAN	4800
49	-DO-	5100
50	-DO-	4000
	LSD 5 %	1245
	CV	12.7%

MATERIALS AND METHODS

The first cross was made at CIMMYT Mexico among MUNIA/CHTO/ /AMSEL and the line was received at CCRI for testing in the High Rainfall Wheat Yield Trial (HRWYT) during 2001-02. The HRWYT comprised of 50 white grain high yielding lines including check was planted at CCRI Pirsabak in a Randomized Complete Block design (Gomez and Gomez, 1983) with four replications during 2001-02 for yield and disease resistance. Each plot consisted of six rows 25 cm apart and 5 m long. Out of the

Table 2: Grain yield response of selected entries from B-VI Trials (normal) planted at CCRI, Pirsabak and ARI, Tarnab during 2002-2003

Ent. No.	Cross	Grain yield (kg ha ⁻¹)	
		CCRI	Tarnab
2	CHUM 18/5*BCN	5207	1947
5	KAUZ *2/ HAHN//KAUZ 5760	5760	2653
14	OR791432/VEE# 3.2/MILAN	5227	2293
17	MUNIA / CHTO // AMSEL	5767	2813
18	MILAN / DUCULA	5640	2640
19	CHECK -1 (FAKHRE SARHAD)	4527	2733
	LSD 5%	1358	940
	CV%	16.66	24.02

50 entries received from CIMMYT Mexico, 20 were selected for further testing (Table 1). Data on grain yield, disease reaction and other desirable characteristics were recorded. Disease reaction, plant type and other characteristics of these lines were in acceptable range.

On the basis of high yielding performance and disease resistance, the line (MUNIA/CHTO/ /AMSEL, CMSS93B00729S-23Y-010M-010Y-010M-7Y-1M-0Y) along with other selected lines was advanced to B-VI test (Advance Screening trial) to compare it with other high yielding lines in 2002-03 (Table 2). This test had 20 lines and was planted in a Randomized Complete Block design with 3 replications at two different locations, i.e., CCRI Pirsabak and Agricultural Research Institute, Tarnab. The line was further advanced and was put in regional testing program (Microplot trial or MPT) on the basis of its performance during the year 2003-04. In MPT, it was planted at three locations i.e., CCRI Pirsabak, ARS, Serai Naurang and ARS, Buffa (Mansehra) in a Randomized Complete Block design having three replications. Each entry was sown in plots having six rows 5 m long and 25 cm apart. Fertilizer was applied at the rate of 120-90 NP in all the trials through out the testing of the line from 2001-02 to 2003-04. The line, which was now named as PR-83, was sent to NARC Islamabad for inclusion in the rainfed National Uniform Wheat Yield Trial (NUWYT Rainfed) in 2004-05. Its performance was tested throughout Pakistan including 8 different locations of NWFP in the NUWYT Rainfed during 2004-05.

For yield determinations four rows of 5 m lengths were harvested in all tests conducted for the selection of this line. All cultural practices were kept the same during the study period of this line in all trials and locations. Statistical analyses were conducted according to the standard procedures using MSTAT-C computer program.

RESULTS AND DISCUSSION

The results of HRWYT conducted at CCRI Pirsabak during 2001-02, demonstrated that the yield of this line (entry No. 32) was equal to that of the local check variety, Bakhtawar-92 (Table 1). Both of them produced

grain yield of 4900 kg ha⁻¹. Entry No. 32 was selected on the basis of high yield in HRWYT and was included in the Advance Yield Trial (B-trial) as entry No. 17 during 2002-03. In B-VI test, this line (entry No. 17) produced grain yield of 5767 kg ha⁻¹, while the local check varieties Fakhre Sarhad and Saleem-2000 produced grain yields of 4527 and 5547 kg ha⁻¹ grain yield at CCRI, Pirsabak, respectively. Thus the grain yield of this line was 27 and 4% higher than the checks Fakhre Sarhad and Saleem 2000, respectively, at CCRI Pirsabak during 2002-03 (Table 2). The yield of this line (entry No. 17) was 3 and 48% higher than the checks Fakhre Sarhad and Saleem-2000 i.e., 2813 versus 2733 and 1907 kg ha⁻¹, respectively during the same year in B-VI test at ARI Tarnab (Peshawar) (Table 2). Due to its excellent grain yield performance, this line (entry No. 32) was selected in B-trials and was included in regional yield trial, which is

also called the microplot or MPT during 2003-04. In MPT, it was sown at three different locations i.e., CCRI Pirsabak, ARS Serai Naurang and ARS Buffa in NWFP. The data shows that grain yield (4333 kg ha⁻¹) of this line (entry No. 11 in Table 3) was significantly higher than the grain yields of all other entries including the local check variety Haider-2000 which produced a grain yield of 4000 kg ha⁻¹ (Table 3). The disease reaction recorded at CCRI, Pirsabak indicated that this line is resistant to yellow and leaf rust.

During 2004-05, the line was included in NUWYT Rainfed as PR-83. In NWFP, the average grain yield of 8 locations showed that PR-83 produced 4372 kg ha⁻¹ grain yield which was only 4 kg ha⁻¹ smaller than the grain yield of DN-44, which produced the highest grain yield of 4376 kg ha⁻¹ (Table 4). Local check variety produced average grain yield of 3486 kg ha⁻¹. Similarly, PR-83 produced average grain yield of 3531 kg ha⁻¹ and ranked 5th among 12 lines throughout Pakistan (average of 19 locations). The highest grain yield of 3620 kg ha⁻¹ was produced by NRL-2017 while the local check produced an average grain yield of 3186 kg ha⁻¹ (Table 4).

Disease reaction data (Relative Resistance Index RRI) (Hussain, 1997; Loegering, 1959) recorded on PR-83 at 12 different locations in Pakistan (Sindh 3, Punjab 4, NWFP 3, Baluchistan 1 and Islamabad 1) (Anonymous, 2005) are given in Table 5. PR-83 recorded a desirable RRI of 8 for leaf rust and 9 for yellow rust (Anonymous, 2005).

Because of its yield performance and resistance to the most killing diseases of yellow and leaf rusts, the line PR-83 having the parentage and pedigree of MUNIA/CHTO//AMSEL, CMSS 93B00729S-23Y-010M-010Y-010M-7Y-1M-0Y was approved by the Provincial Seed Council for cultivation in the rainfed

Table 3: Grain yield performance of advance line PR-83 in MPT (Rainfed) trial conducted at CCRI, Pirsabak during 2003-04

Ent. No.	Cross	Grain yield (kg ha ⁻¹)
1	TRAP#1 ACO/3/KAVZ*2/TRAP//KAUZ	3379
2	CIMMYT ADVANCE LINE---	3095
3	CIMMYT ADVANCE LINE---	3484
4	CIMMYT ADVANCE LINE---	4147
5	CIMMYT ADVANCE LINE---	3407
6	CIMMYT ADVANCE LINE---	3936
7	CIMMYT ADVANCE LINE---	3707
8	UP 2338	3268
9	NL 750	2867
10	OR791432/VEE # 3.2/MILAN	3518
11	MUNIA / CHTO // AMSEL (PR-83)	4333
12	MILAN / DUCULA	3741
13	BAU / TNMU	3262
14	EMB27/CEP8825/MILAN	3329
15	KAUZ / BAU	3596
16	Haider-2000 (Local Check Variety)	4000
	LSD %	31.9%
	CV %	18.3%

Table 4: Average grain yield (kg ha⁻¹) of PR-83 in Rainfed National Uniform Wheat Yield Trial (NUWYT Rainfed) at various locations of NWFP and Pakistan (including NWFP) during 2004-05

NUWYT No.	Line/Variety	Source	NWFP (8) location)	Pakistan (19 location)
1	PR-84	CCRI-Pirsabak	4004	3606
2	NR-241	NARC-Islamabad	3896	3533
3	SN-128	ARS-S.Naurang	4165	3524
4	V-00BT004	AARI-Faisalabad	3543	3169
5	V-00055	AARI-Faisalabad	3593	3353
6	V-5	ARI-Sariab	3791	3475
7	NRL-2017	NIFA-Peshawar	3945	3620
8	NR-234	NARC-Islamabad	4223	3486
9	V-002467	RARI-Bahawalpur	3827	3304
10	DN-44	ARI-D.I.Khan	4376	3538
11	PR-83	CCRI-Pirsabak	4372	3531
12	Local Check		3468	3186
		CV %	15	14.2
		LSD value (0.05)		
		Variety	290**	156**

Table 5: Response of PR-83 as compared with other lines showing desirable and acceptable Relative and Resistance Index (RRI) in National Uniform Wheat Yield Trial (NUWYT Rainfed) conducted at various locations in Pakistan during 2004-05*

S. No.	Candidate line	Yellow rust	Leaf rust
1	DN-44	9	6
2	V-002467	7	8
3	PR-83	9	8

*Table 5 adopted from Anonymous *et al.* (2005)

areas of NWFP. It has been named as Pirsabak Barani-05. It is recommended for sowing throughout NWFP from 1st November to 15th December.

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