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Dera 98: An Outstanding Heat Tolerant Wheat Cultivar for Warmer Areas of N.W.F.P.

Nasir Uddin, Abdul Aziz Khakwani, Saifullah Khan and Abdul Wahab
Agriculture Research Institute D.I. Khan, Pakistan

Abstract: The wheat cultivar, Dera 98, coded as DW-2, was first tested at Agricultural Research Institute, D.I.Khan in 1991-92 in 5th Warmer Areas Wheat Screening Nursery along with some others. Selected entries were advanced to preliminary yield trials and advanced yield trial because of their high yield potential, disease and heat resistance and acceptable stature as compared to three check varieties Pirsabak 85, Pirsabak 91 and Inqilab 91. Best performing entry, DW-2 was promoted to micro plot yield trial in 1995-96. DW-2 produced grain yield of 3799 kg ha⁻¹ versus 3382 Kg ha⁻¹ of Bakhtawar 92. This selection was further evaluated for yield, disease and heat resistance and other agronomic traits in National Uniform Wheat Yield Trials coordinated by National Agricultural Research Center, Islamabad on more than 22 sites during 1996-97 and on 30 sites during 1997-98 in Pakistan. Because of higher grain yield, disease and heat resistance and better grain quality, this entry was named as DERA 98 and was approved for general cultivation in southern N.W.F.P.

Key words: Dera-98, heat tolerant, grain yield, cultivar

Introduction

Wheat is the most important food crop of NWFP and is the central theme of self-sufficiency program in the country. The wheat requirements are progressively increasing every year due to population explosion and stagnant per hectare yields. Therefore, new high yielding varieties with tolerance to biotic and abiotic stresses are desperately needed for cultivation in the wheat growing areas of the province and Pakistan to enhance and stabilize wheat production.

The NWFP has different ecological zones with varying climates and soil types. The southern parts of NWFP are particularly prone to heat stress at the time of wheat flowering and grain filling. In Karak, Lakki Marwat, Bannu, D.I.Khan and Tank, the temperatures are usually very high during the anthesis period. In this zone varieties with a considerable heat tolerance is required for reducing losses due to heat stress. Therefore, wheat research program at A.R.I., D.I.Khan developed a strategy to develop a heat tolerant wheat cultivar. To develop a wheat variety which is resistant to heat and diseases like rust etc the wheat programme at ARI, D.I. Khan screened wheat material from international and local germplasm with particular emphasis on heat tolerance and resistant to diseases. Many varieties like Pak 81, Pirsabak 85 and Khyber-87 have been developed in the past out of which the above mentioned varieties became very popular in NWFP (Khan *et al.*, 1990 and 1992a,b). Prior to that Mexipak-65, WL-711 and Sonalika were successfully introduced from Mexico and India, respectively, (Bourlaug, 1965).

The objective of the present study was to develop a high yielding, heat tolerant and disease resistant variety with acceptable chapatti making quality.

Materials and Methods

The present variety with pedigree, F12.71/COC//CNO79 CM76688-9Y-03M-02Y-2B-0Y was received from CIMMYT in the 5th Warmer Areas Wheat Screening Nursery during 1991-92. The line at S.No. 41 in the said nursery performed well and was selected for further testing after its critical examination for agronomic, disease and yield characteristics. The line was selected for regular trials in 1992-93 and was tested in preliminary yield trials from

1992-94. It was further evaluated in Advanced Yield Trial 1994-95 and in Microplot trial in 1995-96. It was tested in the National Uniform Wheat Yield Trials coordinated by National Agricultural Research Center, Islamabad (NUWYT) from 1996-1998.

Results and Discussion

From the very beginning DW-2 showed very good performance and was among the top three genotypes throughout its testing period. After selection from the 5th WAWSN, it was tested in preliminary yield trial where it gave maximum grain yield of 4338 Kg ha⁻¹ as compared to 4008 kg ha⁻¹ of Pirsabak-85 (Table 2). The variety was tested in B-1 test and Advanced Yield Trial in 1993-94 and 1994-95, respectively at ARI, D.I. Khan. In B-1 test, DW-2 yielded 4258 kg ha⁻¹ as compared to check variety PS-91, which produced the grain yield of 4091 kg ha⁻¹. Yield data of Advanced yield trial (1994-95), also showed the most satisfactory performance of DW-2 where it produced grain yield of 4217 kg ha⁻¹ as compared to 3466 kg ha⁻¹ of check variety Inqilab 91. Yield data of Micro Plot Yield Trial in 1995-96, again confirmed the yield advantage of Dera 98 against the check variety Bakhtawar 92. Dera 98 produced the highest yield of 3799 kg ha⁻¹ against a yield of 3382 kg ha⁻¹ for Bakhtawar 92, the check variety. (Table 2).

Dera 98 was evaluated for grain yield, disease and heat resistance and other agronomic traits in National Uniform Wheat Yield Trials coordinated by National Agricultural Research Center, Islamabad on more than 22 sites during 1996-97 and on 30 sites during 1997-98, in Pakistan and Afghanistan, respectively. The variety produced higher grain yield than the Local checks on most of the sites in both the years (Table 3 and 4). At last after several years of hectic efforts the wheat section at ARI, D.I. Khan succeeded in developing a variety which is not only high yielding and resistant to diseases but of high Chapatti quality also.

D-98 showed very good performance at Kalat station and exceeded in yield then local check variety Zarghoon by 250kg ha⁻¹. Sixteen percent increase in grain yield of D-98 was recorded as compared to newly released variety.

Table 1: History of Development of DERA-98

S.No	Type of trial	Year	Remarks
1	5th Warmer Areas Wheat Screening Nursery	1991-92	Entry No.41 (Dera 98) was selected on the basis of good performance.
2	A-1 Test	1992-93	Dera 98 was selected (entry at S.No.14) on the basis of high yield at ARI, D.I. Khan.
3	B-1 Test	1993-94	Dera 98 (at S.No.9) topped the yield test.
4	Advanced yield trial	1994-95	Dera 98 (at S.No.6) out yielded all the entries included in the trial.
5	Micro Plot Trial	1995-96	Dera 98 (at S.No.2) produced the maximum yield as compared to rest of the genotypes.
6	NUWYT (Normal) irrigated, ARI, D.I. Khan.	1996-97 & 1997-98	Dera 98 and V-7002 were the highest yielders producing 4708 Kg ha ⁻¹ and 4792 Kg ha ⁻¹ , respectively in comparison to 18 candidate varieties and 2 checks during 1997-98.
7	NYWYT (Normal) Pakistan	1996-97 & 1997-98	Dera 98 stood on top for grain yield in the whole province of SIND, Plains of BALOCHISTAN, Southern PUNJAB and Southern NWFP during 1997-98. In combined analysis of data from 30 sites of Pakistan and Afghanistan Dera 98 ranked third in grain yield but was equal to V-4 which ranked second. Inquilab 91 used as common check ranked 4th throughout the country.

NOTE:- Dera 98 was approved for general cultivation by the Provincial Seed Council on July 14, 1998.

Table 2: Zonal grain yield (Kg ha⁻¹) of DERA-98 in comparison to local checks in various yield tests conducted from 1991-92 to 1997-98

S.No	Nursery /Test	Year	Yield Dera 98	Yield local check	Reference
1	5th WAWSN	1991-92	4333	3000 (Ps85)	Ent. No.41
2	A-1 Test	1992-93	4338	4008 (Ps85)	Tab. 14.4 Ann.Report
3	B-1 Test	1993-94	4258	4091 (Ps91)	Tab. 13.2 Ann.Report
4	Advanced Yield Trial	1994-95	4217	3466 (Inq 91)	Tab. 13.3 Ann. Report
5	Micro plot Trial	1995-96	3799	3382 Bakht.92	Tab. 13.4 Ann. Report
6	NUWYT, DIK.	1997-98	4708	3708 (Bakht.92)	NUWYT (Tab. 53)

Table 3: National and International Comparison of Grain Yield of DERA-98 and Local checks during 1996-97

S.No	Location	Dera 98 Kg ha ⁻¹	Local Check Yield Kg ha ⁻¹	LSD
1	ARI, SARIAB, QUETTA	2438	1958(Zarghoon)	NS
2	KALAT	3188	2938(Zarghoon)	895
3	LORALAI	2124	2037(Zardana)	503
4	AEARC, TANDOJAM, HAIDERABAD	5313	4958(Sarsabz)	701
5	FEROZE, FARM, MIRPURKHAS	6917	7833(Sarsabz)	1181
6	SANGHAR	1521	1125(Anmol-93)	508
7	WRI, SAKRAND, NAWABSHAH	2738	2208(Abadgr-93)	622
8	RRI, Dokri, LARKANA	1292	917(Abadgr-93)	366
9	RARI, BAHAWALPUR	5500	4621(Punjab 96)	NS
10	ARF, KAROR, LAYYAH	3917	3938(Inq 91)	303
11	ARF, VEhari	4188	4729(Inq 91)	316
12	ARF, R.Y.KHAN	4279	4404(Punj 96)	785
13	NARC, ISLAMABAD	3750	3350(Chak 86)	686
14	ARI, D.I.KHAN	4250	4750(Bk 92)	842
15	ARS, SARAI NAURANG, LAKKI MARWAT	4448	4511(Bk 92)	800
16	NIFA, TARNAB, PESHAWAR	3208	3217(Bk 92)	652
17	CCRI, PIRSABAK,	3025	3088(Khy 87)	NS
18	KARINA, JUGLAOTE, GILGIT	2628	1765(Karina 87)	760
19	RF, GARI DUPATTA, MUZAFFAR ABAD	2479	2167(Pak 81)	NS
20	RF, KURTI, KOTLI	2531	1990(Pak 81)	NS
21	ARF, SHESHAM BAGH, JALALABAD	5073	4901(Pamir 94)	946

At ARI, D.I.Khan, the D-98 also out yielded Bakhtawar-92 by 1000 kg ha⁻¹, which shows its wide adaptability throughout PAK.

Results of 17 locations in various climates of PAK and Kashmir indicate that D-98 produced higher grain yields than the local checks. Hence D-98 is a very excellent, high yielding, disease and drought resistant for irrigated areas of PAK.

In NWFP, among the commercially grown wheat varieties, Inquilab 91 is dominant mainly due to abundant seed availability but unfortunately, it is losing resistance to yellow rust and is also prone to high shattering. Therefore, its planting on a larger area may cause yellow rust epidemics and increase harvesting losses. High temperature

is also a serious limiting factor for wheat production in southern NWFP and other warmer areas of Pakistan. It reduces yield by 20-25% depending upon temperatures at anthesis. Heat stress is particularly detrimental to normal grain filling and grain size. Dera 98 has out yielded Inquilab 91 and Bakhtawar 92 in warmer irrigated areas of the province. It is thus superior to all the other recommended varieties. It has diversified the genetic base and also strengthened the varietal structure to enhance and stabilize wheat production in the province in particular and in the country in general.

High yield potential, heat tolerance and disease resistance of Dera 98 has not only helped in boosting the wheat production but has also been helpful in averting the danger

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Table 4: Comparison of Grain Yield of DERA-98 and Local check on National Level (NUWYT) during 1997-98

S.No	Location	Dera 98 Kg ha ⁻¹	Check Yield Kg ha ⁻¹	Rank among 20 Var.
	BALUCHISTAN			
1	USTA MOHD., NASIRABAD	3563	2313(Zarghoon)	1
	SIND			
2	AEARC TANDO JAM, HYDERABAD	5896	5250(Sarsabz)	2 = 1
3	SANGHAR, JHOL	7375	6680(Sarsabz)	1
4	SANGHAR, KHIPRO	2750	2417(Anmol 91)	2 = 1
5	WRI, SAKRAND, NAWAB SHAH	4125	3813(Abdg 93)	2 = 1
6	KIANI FARM, SUKKUR	4125	4000(Sarsabz)	4
7	WRI, SAKRAND (LATE)	3708	3229(Anmol 91)	
	PUNJAB			
8	ADAPTIVE RES. FARM, RY. KHAN	5679	4608(Bhpur 95)	1
9	REG. A. R. I., BAHAWALPUR	4288	4004(Bhpur 95)	1
10	ADAPTIVE RES. FARM, VEHARI	4515	4104(Bhpur 95)	3 = 1
11	PINDI BHATTIAN, HAFIZ ABAD	3333	2556(Inq 91)	2 = 1
	NWFP			
12	A. R. I., D. I. KHAN	4708	3708(Bakht 92)	2 = 1
13	A. R. S., SARAI NAURANG	2890	2740(Bakht 92)	1
14	AGRI. UNIV. PESHAWAR	3205	3214(Bk 92)	7 NS
15	C. C. R. I., PIRSABAK	5212	4500(Bk 92)	2
	AZAD KASHMIR			
16	A. R. FARM, GARHI DUPADDA	2563	2349(Inq 91)	2 = 1
17	A. R. F., PADDAR, BAGH	3188	2750(Pak 81)	4 = 1

High yield potential, heat tolerance and disease resistance of Dera 98 has not only helped in boosting the wheat production but has also been helpful in averting the danger of rust epidemic by diversifying the genetic base of the crop in the province/country. It will avert yield losses due to sudden rise in temperatures at flowering and grain filling stages.

Because of its outstanding performance with respect to its yield potential, disease resistant, heat tolerance and better quality, DERA 98 was approved for normal sowing in the southern NWFP and is also suitable for warmer areas of Pakistan.

Dera 98 is a normal duration variety and may be sown between October 25 to November 15. The new variety, DERA-98, has a genetic constitution different from the varieties already released in the province. It has attractive plant type with a plant height ranging from 90-100 cm. It has medium bold grain with acceptable amber white color. It has an erect growth habit with green leaves. Dera 98 has a high tillering capacity coupled with more number of grains per spike. The spikes are long, plump and slightly tapering and creamy white in color. The variety is superior in grain yield as compared to Inquilab 91 and other varieties. Its yield potential is 6000 to 7000 kg ha⁻¹.

It is completely resistant to stripe rust which is a very serious disease of wheat in NWFP. It is also resistant to all natural races of leaf rust. It is the most heat tolerant variety

and its planting can avert losses due to heat stress.

Suggested seeding rates is 100 kg ha⁻¹. Fertilizer (NP) at 100 and 67 kg ha⁻¹, respectively be applied for optimum yield. All phosphorus and half of the nitrogen be applied before or at the time of planting and remaining half of nitrogen with first irrigation.

Four to five irrigations should be applied to the crop depending upon the amount and distribution of rainfall during the season.

Reference

- Bourlaige N.E., 1965. Wheat improvement and its impact on world food supply. Proceed, 3rd wheat Genetics symp, Canberra.
- Khan, M., A.A. Abadi, and K. Gul, 1990. Khyber-87: A short duration wheat variety to replace sonalica under late sowing situation. Sarhad J. Agric., VIII: 301-309.
- Khan, M., A. A. Abadi, A. Hadir, K. Gul and F. Subhan, 1992. Khyber-87: A short duration wheat variety to replace Sonalica under late sowing situation. Sarhad J. Agric., VIII: 301-309.
- Khan, M., A. A. Abadi, A. Hadir, K. Gul and H. Khan, 1992. Pirsabak-85: An outstanding cultivar for N.W.F.P. Sarhad J. Agric., VIII: 311-319.