

CHAKWAL SARSON: A NEW HIGH YIELDING RAPESEED VARIETY

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ABSTRACT:- Barani Agricultural Research Institute (BARI), Chakwal has a strong breeding programme for oilseed research including Brassica crops. Long and consistent breeding efforts on Brassica improvement programme by the breeders has resulted in the development of a high yielding and drought tolerant elite line SPS-5, selected from the segregating progenies of a cross between Ganyou-4 x Westar. Breeding was carried out by the pedigree method and the elite line was evaluated for its yield potential in various yield trials conducted at BARI, Chakwal from 1994 to 1998. Based on the desirable phenotypic traits and superior seed yield, SPS-5 was approved as a rapeseed variety "Chakwal Sarson" by the Punjab Seed Council in 2002 for general cultivation in the Punjab *barani* tract.

Key Words: Rapeseed; Cultivar; High Yielding; Bold Seeded; Drought Tolerant; Pakistan.

INTRODUCTION

Rapeseed and mustard are traditional oilseed crops in Pakistan and an important oilseed crop grown in different parts of the world. The oil contents range is 37-45 %. It contributes about 16-20 % towards domestic edible oils production. Rapeseed and mustard are grown on 128900ha with production of 127600t annually in the Punjab province of Pakistan. Out of which Punjab *barani* tract covered 24300 ha (18.56 %) and contributed 17300t (13.56 %) towards total production in the province (Anonymous, 2009). An ever increasing population pressure warrants a proportionate increase in the local edible oils production. The local edible oils production can be increased by exploiting the maximum production potential of existing varieties through modern production technology and evolving new varieties with high yield potential and better adapted to local agro-climatic conditions.

Development of new varieties has significantly increased the ultimate production of different field crops (Sadiq et al. 1999; Haq et al., 2002; Tariq and Mahmood, 2008; Naeem-ud-Din et al., 2009 and Hussain et al., 2009). Varieties of rapeseed and mustard have been developed in Pakistan (Khan, 1978) as well as in other countries (Bengtsson, 1995; Dhillon et al. 1994;

Okuyama et al. 1994; McVetty et al. 1996 a,b; Rife et al., 2000; Scarth et al. 1995 a,b) according to their specific requirements. However, there is a constant need to develop new high yielding cultivars; to meet the local oil demands, to avoid vulnerability to diseases, to broaden genetic base and to enhance productivity per unit area. The major objective of plant breeder is to reduce ever increasing gap between domestic production and import of edible oil by developing oilseed cultivars that possess higher yield potential per unit area to increase the overall production. The present paper describes the development of a high yielding and drought tolerant rapeseed variety "Chakwal Sarson" which was approved by Punjab Seed Council in its 33rd meeting held on November 21, 2002 for general cultivation in the Punjab *barani* tract.

MATERIALS AND METHODS

Chakwal Sarson was evaluated in yield trials conducted at BARI, Chakwal, from 1993-94 to 1997-98 under the name SPS-5. Later on, the elite line was tested in Zonal Yield trials in different ecologies during 1998-99 followed by testing in National Uniform Rapeseed Yield Trials during 1999-2000 and 2000-01 at various lo-

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cations in the country. All the experiments were sown during *rabi* season under rainfed conditions (Table 1) following Randomized Complete Block Design. Initially the cross was attempted between Ganyou-4 x Westar during 1985-86 and F_1 was raised in the following year. The elite line was selected from the F_2 segregating progenies during 1988-89. It was further evaluated for different parameters in different yield trials and later on in the National Uniform Rapeseed Yield Trials. The experiments were conducted following Randomized Complete Block Design with four replications maintaining a net plot size of 5m x 1.8m. The row-to-row and plant-to-plant spacings were maintained at 45 cm and 10 cm, respectively. All the agronomic / cultural practices were kept uniform for all the treatments in all experiments. Data regarding days to flowering, days to maturity, plant height, seed yield and yield related traits were recorded and analyzed statistically on the basis of mean values (Singh and Chaudhry, 2004).

RESULTS AND DISCUSSION

The breeding history of rapeseed variety "Chakwal Sarson" tested under code SPS-5 is illustrated (Table 2). SPS-5 is an elite high yielding line selected from the segregating generation of a cross between Ganyou-4 and Westar and other promising lines on the basis of plant shape, leaf size, pod shape, seed size and seed coat color. It showed excellent adaptability under local environmental conditions. It was evaluated in a series of different yield trials from 1993-94 to 2000-01 (Table 3).

In preliminary yield trials conducted during 1993-94 and 1994-95 at BARI, Chakwal, 11 promising lines were evaluated against two check varieties for their yield performance wherein SPS-5 produced the highest seed yield of 2917 kg ha^{-1} compared to Westar which gave 2257 kg ha^{-1} and showed 29.24 % higher seed yield over the check variety. The line was again evaluated for its yield performance against two check varieties. The elite line recorded a yield increase of 7.64 % over the check variety Westar.

SPS-5 showed a yield increase of 11.82% over the check variety Westar in Micro Yield trials conducted at BARI, Chakwal and Barani Agricultural Research Station (BARS), Fateh Jang during 1997-98. The line SPS-5 was further evaluated in Zonal Yield Trials conducted at five locations (BARI, Chakwal, Oilseeds Research Station, Khanpur, Regional Agricultural Research Institute, Bhawalpur, Ayub Agricultural Research Institute, Faisalabad and BARS, Fateh Jang) in the Punjab province to study its adaptability under a wide range of climatic conditions during 1998-99. It showed an increase of 9.01% over the check variety Westar.

The elite line SPS-5 was further evaluated in National Uniform Yield Trials at nine locations throughout the country (conducted by the National Coordinator Oilseeds, National Agricultural Research Centre, Islamabad) during 1999-2000 wherein it produced an average seed yield of 1614 kg ha^{-1} against the check variety Shiralee (1419 kg ha^{-1}) and showed an increase of 13.74 % over the check variety. SPS-5 was

Table 1. Monthly rainfall data of Chakwal for *rabi* growing season (1993-1999)

Year	Jan	Feb	Mar	Apr	Sep	Oct	Nov	Dec	Total (mm)
1993	10.1	15.3	60.4	37.1	157.0	0	0	0	279.9
1994	22.6	25.0	8.9	48.3	15.5	12.0	0	24.0	156.3
1995	1.8	39.3	108.0	72.5	7.0	15.3	0	3.5	247.4
1996	51.9	62.1	81.8	5.5	27.0	60.0	0	0	288.3
1997	28.0	03.0	25.4	130.0	96.9	115.0	19.0	4.0	421.3
1998	21.9	159.3	20.0	96.0	35.7	44.0	0	0	376.9
1999	129.7	18.6	22.3	5.0	87.6	9.3	18.0	0	290.5
Avg	38.0	46.1	46.7	56.3	61.0	36.5	5.3	4.5	294.4

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Table 2. Breeding history of the rapeseed variety “Chakwal Sarson”

Year	Filial Generation /Trial	Remarks
1985-86	Hybridization	Cross “Ganyou-4 x Westar” was attempted
1986-1987	F ₁	The F ₀ seed was planted to raise F ₁
1987-1988	F ₂	Seed was space planted and selections were made
1988-1989 to 1992-1993	F ₃ to F ₆	Generations were advanced and selection on the basis of desirable traits were made till uniformity was achieved in the progeny lines
1993-1994 to 1994-1995	Evaluation in trials	Evaluated SPS-5 in preliminary yield trials at BARI, Chakwal
1995-1996 to 1996-1997	Evaluation in trials	Evaluated SPS-5 in Advanced Lines Yield trials at BARI, Chakwal
1997-1998	Evaluation in trials	Evaluated SPS-5 in Micro Yield Trials
1998-1999	Evaluation in trials	Evaluated SPS-5 in sowing date, plant spacing and multi-location yield trials
1999-2000 to 2000-2001	Evaluation in trials	Evaluated SPS-5 in National Uniform Yield trials at different locations in the country
2002	Approval as variety	Approved as commercial variety “Chakwal Sarson” by Punjab Seed Council for general cultivation in Punjab <i>barani</i> tract

Table 3. Mean seed yield performance of SPS-5 compared to recommended varieties of rapeseed in various yield trials

Year	Trial	No. of trials	(kgha ⁻¹)		
			SPS-5	Westar	Shiralee
1993-94 & 1994-95	Preliminary Yield Trial	2	2917	2257	-
1994-95 & 1996-97	Regular Yield Trial	2	2213	2056	-
1997-98	Micro Yield Trial	2	1864	1667	-
1998-99	Sowing Date	1	1541	1273	-
1998-99	Row Spacing	1	1884	1492	-
1998-99	Zonal Yield Trial	5	1307	1199	-
1999-2000	National Uniform Yield Trial	9	1614	-	1419
2000-01	National Uniform Yield Trial	7	1475	-	1343
Total/ Mean		29	1852	1657	1381
% Increase over check varieties			-	+ 11.8	+34.1

Table 4. Average seed yield as affected by various sowing dates and genotypes during 1998-99 (kgha⁻¹)

Sr.No.	Cultivar	Sep.15	Oct.1	Oct.15	Nov.1	Nov15	Mean
1	SPS-5	1674	1852	1778	1259	1141	1541
2	6008	1630	1744	1659	1178	1133	1469
3	Westar	1407	1484	1474	1007	983	1273
Mean		1570	1693	1637	1148	1086	
Cd1		18.48					
Cd2		26.89					
CV (%)		1.98					

again tested in National Uniform Yield Trials at seven locations during 2000-01 wherein it produced an average yield of 1475 kgha⁻¹ against check variety Shiralee (1343 kgha⁻¹) and showed a yield increase of 9.83% over the check variety. On an average of two years of NUYT results, SPS-5 produced higher seed yield (1545 kgha⁻¹) against check variety Shiralee (1381 kgha⁻¹) thus recording a yield increase of 11.88% which showed its inherent capability to produce higher seed yield over the check variety Shiralee. On an average of 29 yield trials conducted from 1993-94 to 2000-01, SPS-5 gave 11.8% and 34.1% higher seed yield than commercial varieties viz., Westar and Shiralee, respectively.

Agronomic trials conducted to find out the best sowing time for the elite line, revealed that SPS-5 produced the maximum mean seed yield (1693 kgha⁻¹) when planted on October 1 followed by sowing on October 15 (Table 4). Hence the most appropriate planting time of Chakwal Sarson to get higher yield was October 1-15. Another trial conducted to find out the best row spac-

ing showed that the elite line gave maximum mean yield (1803 kgha⁻¹) when the crop was planted at a row spacing of 45 cm followed by a row spacing of 30 cm (Table 5)

The rapeseed genotype was developed through conventional breeding following pedigree method. Various cultivars already developed through conventional breeding in field crops have significantly contributed towards the overall productivity of respective crop in the country both in rainfed and irrigated areas.

Keeping in view the inherent capability of the elite line 'SPS-5' a proposal for the approval of SPS-5 as "Chakwal Sarson" was prepared and submitted to the Punjab Seed Council. The PSC approved the elite line SPS-5 as a rapeseed variety "Chakwal Sarson" in its 33rd meeting held on November 21, 2002 for general cultivation in the Punjab *barani* tract. Its cultivation on large scale will not only increase the overall profit of the grower but also increased productivity will help to enhance domestic edible oil production in the country.

Table 5. Seed yield as influenced by various genotypes and row spacings (1998-99) (kgha⁻¹)

Row	SPS-5	6008	Westar	Mean
	spacing (cm)			
30	1870	1804	1476	1717
45	1985	1859	1634	1803
60	1798	1670	1434	1634
Mean	1884	1778	1492	
Cd	126.19			
Cd2	36.19			
CV (%)	2.49			

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