https://doi.org/10.29321/MAJ.10.A02284

Madras Agric. J. 73 (7) : 370—374 July, 1986

COMBINING ABILITY STUDIES IN DURUM WHEAT

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Combining ability study was carried out for grain yield, its component traits, harvest index and grain protein content in a diallel set of six diverse varieties of durum wheat (*Triticum durum* Desf.) in F_1 and F_2 generations. General and specific combining ability were highly significant for all the seven traits in both the generations. However, the magnitude of GCA variances was much high than that of SCA variances for all the characters reflecting the predominance of additive gene effects in their genetic control. The *per se* performance of the parents was associated with their GCA effects. The varieties Raj 1721, Raj 2070 and Raj 1521 were the best general combiners. Superior crosses involved atleast one good general combiner.

Investigation was carried-out to elicit information on the nature of gene action and to identify desirable parents for grain yield, its components, harvest index and grain protein content by combining ability analysis in F_1 and F_2 generations. In durum wheat (*Triticum durum* Desf.) The information so derived will be helpful in formulating an efficient breeding methodology in this important group of wheat.

METERIALS AND METHODS

Six durum wheat cultivars viz, Raj 1919, Raj 2070, Raj 1721, Valsacco, Raj 911 and Raj 1521 of diverse genetic origin were crossed in all possible combinations excluding reciprocals. Six parents along with their 15 F_1s and F_2 progenies were planted during *rabi* 1983 - 84. The experiment was conducted in randomised block design with three replications. The parents and F_1s were grown in single row while F_2s in two rows. Each row was 3 m long with spacing of 25 cm between rows and 15 cm between plants. The experiment was undertaken under high fertility condition (120 N : 60 P_2O_5 : 40 K_2O kg/ha) with five irrigations

Observations were recorded on ten randomly selected plants in parents and F_1s and 20 plants in F_2 families for days to flower, plant height, number of effective tillers per plant, 1000-kernel weight, grain yield per plant and harvest intex. The nitrogen content of grains was estimated by the standard micro-Kjeldahl method. Protein content was determined by multiplying Kjeldahl nitrogen by the factor 5.7. Combining ability analysis was carried out for seven characters in F_1 and F_2 generations separately using Method II and Model I of Griffing (1956).

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Table: 1 Analysis of variance for combining ability in durum wheats

Source	Generation	df	Days to flower	Plant height	Number of effective tillers	1000-kernal weight	Grain yield	Harvest index	Protein content
GCA	F_1	5	23.34**	25.58**	7.83**	1.07**	23 55**	45.70**	3.99**
	F_2	5	25.45**	39.92**	5.14**	1.48**	45.18**	29.10**	2 29**
SCA	F_1	15	9.16**	7.80**	1.78**	0.12**	9.98**	27.60**	0.22**
	F_2	15	4.93**	38.52**	2.38**	0.27**	6.33**	39.84**	0.32**
Error	F_1	40	0.29	0 61	0.13	0.08	0.68	0.74	0.04
	F_2	40	0.30	0.25	0.03	0.08	0.83	0.60	0.02
GCA/SCA	F_1		2.55	3.29	4.40	8.92	2.36	1.66	18.14
	F_2		5.17	1.03	2.16	5.48	7.14	0.73	7.16

** Significant at 1% level.

Table : 2 General combining ability effects in durum wheat

Parents	Generation	Days to flower	Plant height	Number of effective tillers	1000-Kernel weight	Grain yield	Harvest index	Protein content
Raj 1919	F_1	0.08	-1.67**	0.63**	-0.14**	-0.69**	0.36	0.29**
	F_2	0.56**	-1.97**	0.04	-0.22**	-1.21**	-0.67**	-0.07**
Raj 2070	F_1	-2.38**	-1.10**	0.76**	-0.07**	2.88**	2.01**	-1.02**
	F_2	-2.45**	-2.23**	0.32	-0.15**	2.51**	1.09**	-0.50**
Raj 1721	F_1	1.69**	0.45	1.16**	0.28**	0.21	1.32**	0.30**
	F_2	1.58**	-0.95**	1.41**	0.54**	-0 72**	0.07	0.18**
Valsacco	F_1	-0.55**	2.32**	-0.38**	0.59**	-1.36**	-4.65**	0.48**
	F_2	-1.18**	1.61**	-0.34**	0.41**	-0.19*	-2.63**	0.50**
Raj 911	F_1	2.18**	-1.79**	-1.27**	0.31**	-1.83**	1.02**	0.75**
	F_2	2.26**	0.39	-1.05**	0.39**	-3.34**	-0.85**	0.64**
Raj 1521	F_1	-1.02**	1.79**	-0 89**	-0.35**	0.80**	-0.06	-0.73**
	F_2	-0.76**	3.15**	-0.09**	-0.50**	2.96**	2.99**	-0.70**
S. E. (gi)	F_1	0.17	0.25	0.11	0.03	0.28	0.28	0.02
	F_2	0.18	0.16	0.06	0.03	0.08	0 25	0.02

Significant at 5% level ** Significant at 1% level

RESULTS AND DISCUSSION

The analysis of variance for combining ability (Table 1) showed that both general (GCA) and specific (SCA) combining ability variances were highly significant for all the traits to both the filial generations. However, magnitude of GCA variances was much higher than SCA variances for all the seven characters in both the generations except harvest index in F_2 generation. This indicated preponderance of additive (fixable) gene effects in the genetic control of these characters. Widner & Lebsock (1973) and Quick (1978) also indicated that most of the total genetic variation for yield attributes was due to additive gene effects in durum wheat. Sharma *et al.* (1980) reported that harvest intex was predominantly controlled by additive gene action in bread wheat Maloo and Mehrotra (1984) and Mihaljev and Kovacev-Djolai (1978) reported the importance of additive gene effects in the inheritance of grain protein content in durum and bread wheat.

The estimates of GCA effects are presented in Table-2. Raj 2070, Valsacco and Raj 1521 showed negative and significant GCA effects for days to flower. For tallness, Valsacco and Raj 1521 and for number of effective tillers per plant, Raj 2070 and Raj 1721 were the good combiners. For 1000-kernel weight and grain protein content, Raj 1721, Valsacco & Raj 911 exhibited positive and significant GCA effects in both the generations. Raj 2070 and Raj 1521 contributed towards high grain yield per plant and harvest index. In general, all the parents expressed high *per se* performance in accordance with their GCA effects. Varieties Raj 1712, Raj 2070 and Raj 1521 appeared to be promosing for breeding durums with high grain yield, harvest index and protein content.

Estimates of SCA effects of these seven characters in F_1 and F_2 generations revealed that two cross combinations Raj 2070 x Raj 1721 and Raj 2070 x Raj 1521 had significant positive SCA effects for grain yield and harvest index. Other crosses Valsacco x Raj 1521 and Raj 2070 x Raj 911 exhibited high positive SCA effects in both the generations. In most of the cases superior crosses involved one good and one poor or even negative general combiners. Therefore, desirable transgressive segregates may be expected which can be utilized in the selection of superior pure-line varieties. For higher grain protein percentage, five crosses exhibited positive signficant SCA effects in both F_1 and F_2 Raj 1919XRaj 1721, Raj 1919XRaj 911 and Raj 2070XRaj 1521 involved atleast one superior parent for grain protein content.

In general, the estimates of SCA effects were lower in magnitude in F_2 than F_1 populations. This is expected due to reduction in the percentage of heterozygosity in the segregating populations.

ACKNOWLEDGEMENT

Authors are grateful to Dr H. G. Singh, Director (Research), Sukhadia University for providing necessary facilities and to Dr. H. N. Mehrotra, Professor and Head, Department of Genetics and Plant Breeding, Rajasthan College of Agriculture, Udaipur for valuable suggestions.

REFERENCES

GRIFFING, B. 1956 Concent of general and specific combining ability in relation at diallel crossing system. *Aust. J Biol. Sci.*, 9 : 463-493

MALOO, S. R. and H. N. MEHROTRA. 1984. Combining ability for grain protein content in durum wheat under normal and late plantings. *India J. Genet.* 44 : 266-269.

MIHALJEV, I. and KOVACEV-DJOLAI. 1978. Inheritance of grain protein content in diallel wheat cross. *Proc. 5th Int. Wheat Genet. Symposium*, 2 : 755-671.

QUICK, J. S. 1978. Combining ability and interrelationships among an international array of durum wheats. *Proc. 5th Int. Wheat Genet. Symposium*, 2 : 635-647.

SHARMA, S. K., R. K. SINGH, M. SINGH and I. D. TIWARI. 1980. Genetic studies of harvest index (HI) and its components in wheat (*Triticum aestivum* L.) *II National Seminar on Genetics and Wheat Improvement* Abstract. 2. 12. Hissar.

WIDNER, J. and K. L. LEBSOCK. 1973 Combining ability in durum wheat : I Agronomic characteristics. *Crop. Sci.*, 13: 164-167.

Madras Agric. J. 73 [7] : 374 — 377 July, 1986

RESIDUES OF PHORATE IN RICE

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Studies on residues of phorate on rice plant and subsequent on soil were under taken. Two doses of phorate at 1.0 Kg ai/ha and 2.0 Kg ai/ha were applied in the soil in the granular from. The samples both soil and plant were taken after 0, 5, 10, 15, 20, 30 and 45 days of application and residue levels were analysed spectrophotometrically. The pesticide reaches non - detectable level within 20 days of application in soil and in case of plant maximum residue was obtained at 5th day of sampling and becomes safe after 30 and 45 days of application for both doses.

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