HETEROTIC STUDIES FOR YIELD AND YIELD ATTRIBUTING CHARACTERS IN FINGER MILLET (*Eleusine coracana* L. Gaertn)

ABSTRACT

An experiment was conducted to estimate the heterosis for yield and yield attributing characters in finger millet. In the present study, seven parents and twelve crosses were used for studying the extent of heterosis. The experimental trial was conducted at Agricultural Research Station, Perumallapalle, Tirupati. The parent Tirumala was used as a standard check. The relative heterosis for grain yield ranged from -45.01 (Hima × VL 400) to 55.64 (PPR 1216 × VL 400) per cent. The heterobeltiosis for grain yield ranged from -61.61 (Hima ×VL 400) to 30.41 (PPR 1216 × VL 400) per cent and standard heterosis for grain yield ranged from -30.34 (Hima × VL 400) to 46.07 (Vakula × VL 400) per cent. Among the crosses, PPR1216 × VL 400 was identified as superior cross as it recorded high magnitude of *per se* performance and all three types of heterosis for days to 50% flowering, number of productive tillers per plant, number of fingers per ear and grain yield per plant. The heterosis will be exploited through selection of superior and character specific genotypes in the segregating generations for the evolution of high yielding varieties.

Key words: *per se* performance, relative heterosis, heterobeltiosis, standard heterosis, finger millet.

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INTRODUCTION

Finger millet is one of the most important crop grown in eastern Africa and southern India and it serves as a subsistent food and a nutritional security crop. It is a hardy food crop grown in traditional low input millet-based farming. In India the productivity level of finger millet is 1497 Kg ha^{-1}. To improve the productivity level in any crop can be exploited by using of heterosis during crop improvement programme. To get maximum grain yield associated with best grain quality is the aim of the breeding programs in any crop. The use of heterosis for getting high yield with improved quality has been largely used in cross-pollinated crops. In self-pollinated crops evidences are available to confirm the potential use of heterosis, suggesting the easiest ways of commercial exploitation of genetic potential of wheat crops. Though *per se* performance of parental lines provides clues, reliable information on magnitude of heterosis for yield and yield attributing characters are of more helpful in selecting appropriate parents and desirable cross combinations for the exploitation of hybrid vigour. The present study was, therefore, undertaken to determine the extent of relative heterosis, heterobeltiosis and standard heterosis in finger millet and to identify the most heterotic hybrids

MATERIALS AND METHODS

In the present investigation, three lines were crossed with four testers in a Line × Tester mating design (Kempthorne 1957) to generate 12 F_1 crosses**.** The 12 F_1 crosses along with seven parents and a standard check Tirumala were raised in Randomised block design with two replications at Agricultural Research Station, Perumallapalle, Tirupathi during *rabi*, 2023-24. For emasculation, hot water method was followed and crossing was done through contact method. Each entry was grown in two rows with a spacing of 22.5 cm between rows and 10 cm between plants**.**The following quantitative characters like days to 50% flowering, days to maturity, plant height, number of productive tillers per plant, ear head length, number of fingers per ear, grain yield per plant, fodder yield per plant, 1000 grain weight and harvest index were recorded in five randomly selected plants. Proper crop management practices were followed in order to raise good crop. The magnitude of heterosis was estimated over mid parent, better parent and standard check. The mean values were subjected to statistical analysis as suggested by Snedecor and Cochran (1967) and mid parent, better parent and economic heterosis was estimated.

RESULTS AND DISCUSSION

The analysis of variance for various yield and yield attributing characters were exhibited significant differences indicated the availability of the variability (Table1).

Table 1 Analysis of variance for grain yield and yield attributing characters in finger millet genotypes (*Eleusine coracana* L.)

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Source of variation	D.f	Days to 50% flowering	Days to maturity	Plant height (cm)	No of productive tillers plant^{1}	Ear head length (cm)	No of fingers ear head^{-1}	Grain yield plant^{-1} (g)	Fodder yield plant^{-1} (g)	Test weight (g)	Harvest index (%)
		Mean sum of squares									
Replications	1	1.60	32.40	34.2250	0.121	0.0120	0.1960	0.0050	1.4710	0.1820	1.3070
Treatments	19	132.6**	34.611**	360.137**	0.365**	2.223**	0.295**	13.601**	134.311**	0.526**	43.385**
Error	19	10.284	9.979	21.08	0.083	0.199	0.074	0.701	12.367	0.058	2.722

** Significant at 1% level

The range of heterosis for ten characters expressed by twelve crosses was estimated and represented in Table 2. Efficient crosses are the one which exhibits significant values for all three types of heterosis studied. For days to 50% flowering the crosses *viz.,* PPR 1216 ×VL 400, PPR 1216 x Indravathi, PPR 1216 × VL 376, PPR 1216 × ER 41, Vakula × VL 400, Vakula × Indravathi, Vakula × VL 376 and Vakula × ER 41 recorded significant negative values for all three types of heterosis suggesting the contribution of dominant gene action with negative effects. The early reports clarified that early maturing types can be obtained from crosses with negative heterosis. None of the crosses recorded significant negative values for days to maturity for all three types of heterosis. For plant height most of the crosses recorded significant positive values for standard heterosis. Significant positive heterosis was observed in PPR 1216 × VL 400 and PPR 1216 × ER 41 for productive tillers per plant, PPR 1216 × Indravathi for ear head length, PPR1216 × VL 400 for number of fingers per ear and PPR1216 × VL 400 for grain yield per plant. Values In the present study, the cross PPR 1216 × VL 400 exhibited significant positive values for all three types of heterosis for grain yield per plant. Similar results previously reported by Suresh (1988), Ravi kumar *et al.* (1986), Mahadevaiah (2002), Sivagurunathan (2004), Priyadarshini *et al.* (2010) Parashuram *et al.* (2011), Savitha *et al.* (2013) and Divya *et al.* (2022) in finger millet. Among 12 crosses, PPR1216 × VL 400 was considered as best performing cross for grain yield and its attributing characters.

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Table 2 Estimates of heterosis for yield and yield attributing characters in finger millet (*Eleusine coracana* L. Gaertn)

Crosses	Days to 50% flowering			Days to maturity			Plant height (cm)			Productive tillers per plant (No.)			Ear head length (cm)		
	MP	BP	SH	MP	BP	SH	MP	BP	SH	MP	BP	SH	MP	BP	SH
PPR1216 × VL400	-8.43 *	-9.52 *	-13.14 **	28.30 **	21.43 *	-5.36	5.44	2.13	54.84 **	28.30 **	21.43 *	47.83 **	3.61	-8.51	-4.44
PPR1216 × Indravathi	-10.91 **	-12.50 **	-16.00 **	22.81 **	9.38	-0.89	11.97 *	8.02	65.16 **	22.81 **	9.38	52.17 **	-14.89**	-14.89**	-11.11*
PPR1216 ×VL376	-9.55 **	-15.48 **	-18.86 **	-8.2	-22.22 *	-9.38 **	13.55 *	10.27	66.29 **	-8.2	-22.22 *	21.74	-1.08	-2.13	2.22
PPR1216 × ER41	-13.02 **	-13.53 **	-16.00 **	34.69 **	32.00 **	-3.13	1.4	-9.60 *	64.03 **	34.69 **	32.00 **	43.48 **	2.92	-6.38	-2.22
Vakula ×VL400	-14.74 **	-18.90 **	-24.00 **	8.47	3.23	-7.14 *	11.20 *	6.7	61.77 **	8.47	3.23	39.13 **	25.33**	20.51**	4.44**
Vakula × Indravathi	-12.26 **	-16.05 **	-22.29 **	-11.11	-12.5	-8.04 **	-5.08	-9.28	38.71 **	-11.11	-12.5	21.74	0.00	-8.51	-4.44
Vakula × VL376	-14.97 **	-15.54 **	-28.57 **	-22.39 **	-27.78 **	-10.27 **	-16.40 **	-19.57 **	21.29 *	-22.39 **	-27.78 **	13.04	8.24	0.00	2.22
Vakula × ER41	-16.35 **	-21.76 **	-24.00 **	-12.73	-22.58 *	-8.93 **	6.69	-5.69	71.13 **	-12.73	-22.58 *	4.35	21.29	20.51**	4.44
Hima × VL400	14.10 **	8.54 *	1.71	-8.47	-12.9	-0.89	-12.25 *	-16.91 **	25.97 **	-8.47	-12.9	17.39	-20.00**	-30.61**	-24.44**
Hima × Indravathi	12.26 **	7.41	-0.57	-33.33 **	-34.37 **	-0.45	-17.23 **	-21.94 **	19.35 *	-33.33 **	-34.37 **	-8.7	-27.08**	-28.57**	-22.22**
Hima × VL376	-2.04	-2.7	-17.71 **	-4.48	-11.11	-2.68	-19.10 **	-23.21 **	15.81	-4.48	-11.11	39.13 **	-7.37	-10.20*	-2.22
Hima × ER41	10.69 *	3.53	0.57	-1.82	-12.9	0.89	-23.16 **	-32.89 **	21.77 *	-1.82	-12.9	17.39	-26.86**	-34.69**	-28.89**
SE	2.74	3.16	3.16	0.23	0.27	3.22	4.08	4.72	4.72	0.23	0.27	0.27	0.36	0.46	0.46

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Crosses	Fingers per ear (No.)			Grain yield per plant (g)			Fodder yield per plant (g)			1000 grain weight (g)			Harvest index (%)		
	MP	BP	SH	MP	BP	SH	MP	BP	SH	MP	BP	SH	MP	BP	SH
PPR1216 × VL400	40.00 **	40.00 **	20.69*	55.64 **	30.41 **	38.76 **	14.43	6.01	-32.35 **	19.73 *	2.13	-11.65	29.41 **	18.02	81.42 **
PPR1216 × Indravathi	25.49 *	23.08*	10.34	8.41	3.48	10.11	-10.92	-18.69 **	-37.15 **	8.43	0.33	-13.21	16.67	4.24	60.22 **
PPR1216 ×VL376	-9.68	-24.32 **	-3.45	-9.04	-11.3	-5.62	39.44 **	38.41 **	-10.35*	27.05 **	21.84 *	5.4	-30.45 **	-32.25 **	4.15
PPR1216 × ER41	30.77 **	25.93 *	17.24	19.63 *	8.76	15.73	-12.34	-18.55 **	-39.44 **	16.16	10.34	-4.55	28.17 **	11.71	71.71 **
Vakula ×VL400	5.66	0	-3.45	33.33 **	-0.76	46.07 **	17.02 *	8.29	-30.74 **	42.18 **	23.79 **	1.99	14.81	-5.94	86.60 **
Vakula × Indravathi	-3.7	-7.14	-10.34	4.1	-13.74*	26.97 **	-18.75 **	-25.76 **	-42.62 **	14.39	8.28	-10.8	20.48 *	-3.03	92.37 **
Vakula × VL376	-23.08 **	-32.43 **	-13.79	-17.65 *	-30.53 **	2.25	14.63*	13.92	-26.22 **	11.33	9.31	-9.94	-24.08 **	-34.14 **	30.65*
Vakula × ER41	-12.73	-14.29	-17.24	-34.77 **	-48.09 **	-23.60 *	-7.08	-13.57	-35.74 **	16.84 *	13.62	-6.39	-25.99 **	-41.69 **	15.68
Hima × VL400	-1.89	-7.14	-10.34	-45.01 **	-61.61 **	-30.34 **	40.87 **	27.20 **	-14.11 **	-12.02	-21.18 *	-39.20 **	-49.60 **	-58.94 **	-17.34
Hima × Indravathi	-14.81	-17.86	-20.69*	-41.44 **	-55.11 **	-18.54	27.35 **	19.30 **	-7.79	-10.65	-12.71	-32.67 **	-44.56 **	-55.62 **	-10.66
Hima × VL376	-13.85	-24.32 **	-3.45	-33.20 **	-47.99 **	-5.62	-9.18	-11.03	-39.92 **	42.29 **	40.25 **	11.36	-15.12*	-26.82**	47.32**
Hima × ER41	-12.73	-14.29	-17.24	-43.93 **	-58.51 **	-24.72 *	15.48 *	10.19	-18.08 **	-16.59	-16.97	-35.37 **	-41.40**	-54.08*	-7.55
SE	0.24	0.28	0.28	0.74	0.86	0.86	2.86	3.30	3.30	0.22	0.25	0.25	1.45	1.68	1.68

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

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