Short Communication

Heterosis for ear parameters, crop duration and prolificacy in varietal crosses of maize (*Zea mays* L.)

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During evaluation of *jhum* maize landraces from Tripura [1], it was argued that they were similar to Sikkim primitive type as revealed from the descriptions made earlier by Sachan and Sarkar [2]. Tribal communities of Tripura generally consume the small cobs of these prolific varieties as vegetables. With the increasing market demand of baby corn and sweet corn in India, they might have some commercial prospects in near future. But in the course of competition with the new world maize varieties, they are gradually becoming endangered due to their long duration, small cob size and low yielding ability. One of the approaches of their improvement in respect of these characters is to develop inter-varietal hybrids. Beal [3] was the first to report the inter-varietal hybrid in maize and with the understanding of the theoretical background of recurrent selection, this approach is becoming more popular. Present investigation was aimed at analyzing the heterotic responses of inter-varietal crosses.

The experimental materials comprised of three lines, namely, Navin, Tarun (composites) and Prakash (hybrid) and two testers, namely, *Jhum* black (black seeded) and *Jhum* yellow (yellow seeded) and crosses were generated in line × tester design. All F_1s and parents were evaluated in RBD in three replications in 20m^2 plot with 60cm × 20cm spacing during autumn season of 2002 at ICAR Research Complex for NEH Region, Tripura center, Lembucherra following the recommended cultural practices. Data were recorded for crop duration, plant height, ear length, ear girth, seeds/cob, 100 seed weight, seed weight/ear and ears/plant from 100 randomly selected plants from each plot. Heterotic responses were calculated using standard procedure relative to mid parent (Standard heterosis) and better parent (Heterobeltiosis).

All the F_1s and the parents significantly differed from each other in respect of all the traits under consideration (Table 1). Line vs. tester variance was highly significant for all the traits, indicating that the testers were highly divergent from lines, which satisfy the choice of testers. From the parent vs. crosses component of variance, it was observed that significant heterosis (average) was exhibited by all the characters except ear length and seeds/cob. Contribution of line × tester interaction to the heterosis was almost absent in case of ear number/plant and it was very low for duration and plant height. Also narrow sense heritability was very high in such cases which indicated that these characters were mainly governed by additive gene action. For other characters this interaction had a definite contribution to the observable heterosis. This result was little bit contradictory to the observation made earlier by Singh and Singh [4], where ear length, plant height and ear weight did not show any variability due to line × tester interaction. For the traits like, duration, height, ear girth, 100 seed weight, seed weight/ear and number of ears/plant, the range of heterobeltiosis was from −35.62 to −21.49, from −12.48 to 14.59, from 0.0 to 17.12, from −4.65 to 32.20, from −28.48 to 31.60 and from −53.73 to −44.09, respectively. Similarly, range of standard heterosis was from −21.92 to −12.74, from 6.1 to 22.64, from 6.7 to 21.89, from 10.23 to 54.0, from 5.04 to 80.75 and from −36.48 to −26.44, respectively (Table 2). Negative heterosis was desirable for crop duration and all the crosses showed significant negative heterosis. Nagda *et al.* [5] also found significant negative heterosis for days to silking in most of the crosses. Highest negative heterobeltiosis was found for duration in Tarun × *Jhum* black (−35.62). For plant height, highest positive significant heterobeltiosis was observed in Navin × *Jhum* black (14.49). Highest significant positive heterobeltiosis was recorded for the cross Prakash *Jhum* black in respect of ear girth (17.12) and 100 seed weight (32.2). Only significant positive heterobeltiosis was observed in Navin × *Jhum* yellow for seed weight/cob. But in all the crosses, number of

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Table 1. Mean, heritability, variances and contribution of line and tester interaction for different traits in maize

Characters	General mean	Heritability (Narrow sense) (%)	Contribution of line × tester (%)	Variances (MSS)		
				Treatments	Line vs. tester	Parents vs. crosses
Duration (days)	92.61	77.17	10.54	675.3**	4636.8**	1423.2**
Height (cm)	196.26	73.88	18.93	2513.4**	13554.67**	3285.47**
Ear length (cm)	13.65	1.22	74.93	16.4**	118.13**	9.16
Ear girth (cm)	3.92	30.83	32.09	0.27**	0.51*	1.78**
Seeds/cob	391.66	5.37	75.89	199.11**	91855.6**	10124.9
100 seed weight (g)	22.95	33.49	38.85	95.8**	303.9**	299.8**
Seed weight/ear (g)	87.9	2.54	94.08	2215.8**	11485.3**	5004.7**
Number of ear/plant (100 plants)	1.24	89.41	2.87	0.55**	4.26**	1.21**

** significant at 1% level, * significant at 5% level

Table 2. Estimation of heterobeltiosis and standard heterosis for different traits in maize

Characters	H1/H2	Navin × Jhum yellow	Navin × Jhum black	Tarun × Jhum yellow	Tarun × Jhum black	Prakash × Jhum yellow	Prakash × Jhum black
Duration (days)	H1	−28.08**	−30.87**	−27.79**	−35.62**	−21.49**	−27.18**
	H2	−15.35**	−15.89**	−15.29**	−21.92**	−12.74**	−16.11**
Height (cm)	H1	−3.28	14.59**	−7.17	−4.88	−12.48**	2.17
	H2	15.33**	22.64**	14.72**	6.10	11.26**	17.77**
Ear length (cm)	H1	3.01	−17.20	−11.95	0.69	−17.60	1.24
	H2	23.06*	−0.68	8.96	17.54	5.99	23.28*
Ear girth (cm)	H1	6.52	11.30*	3.85	0.00	11.71*	17.12**
	H2	11.87**	17.81**	9.95*	6.70	15.35**	21.89**
Seeds/cob	H1	18.21	−0.25	8.53	−9.51	−43.55**	−6.18
	H2	37.51**	18.12	31.77*	11.71	−28.96*	19.94
100 seed weight (g)	H1	22.29	−4.95	−3.34	7.26	5.63	32.20*
	H2	54.00**	10.23	24.60	27.74*	41.08**	63.96**
Seed weight/ear (g)	H1	31.60*	−0.23	4.21	−3.79	−28.48*	14.94
	H2	80.75**	35.29	46.63*	33.74	5.04	67.00**
Number of ears/plant (100 plants)	H1	−46.79**	−51.34**	−48.65**	−53.73**	−44.09**	−50.30**
	H2	−29.37**	−32.78**	−32.29**	−36.48**	−26.44**	−31.90**

H1 = Heterobeltiosis, H2 = Standard Heterosis

ears/plant showed significant negative heterosis. Moreover, high narrow sense heritability indicated its additive nature pointing towards the fact that the prolificacy can only be maintained through crossing between prolific parents. Similar observation was made earlier by Zieger [6] in respect of prolificacy in maize.

The cross combinations like, Prakash × Jhum black and Navin × Jhum yellow were found promising as they exhibited heterosis for certain important characteristics of maize ear in addition to early maturity.

References

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