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Estimates of variability, heritability and genetic advance in baby corn

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ABSTRACT

A set of 20 bay corn cultivars was evaluated for variability and genetic advance for 20 quantitative characters. Five traits *viz*., days to first and last cob picking interval, husked cob yield/plant, husked yield/plant, harvest index and tassel weight/plant exhibited high values of phenotypic coefficient of variation (PCV) and genotypic coefficient of variation (GCV). Stalk weight, biological yield, husked cob yield/plant, husk yield/plant, fodder yield/plant and plant height expressed high heritability accompanied with high genetic advance indicating that additive gene action governed the expression of these traits. Two traits viz., days to first and last cob picking interval and single de-husked cob weight showed lower values for both heritability and genetic advance. Two maize genotypes, *viz*., HM 4 and HQPM 1 were found suitable for baby corn cultivation.

Key words: Genetic advance, genetic variability, baby corn.

INTRODUCTION

Maize is unique among the cereals on account of its amenability to diverse uses. In India maize has huge potential in the present era of crop diversification. Maize is cultivated in almost all the states with an annual production of 19.77 m tonnes from 8.12 m ha in India. The major maize producing states in India are Andhra Pradesh, Karnataka, Rajasthan, Bihar, Maharashtra, Madhya Pradesh, Uttar Pradesh, Himachal Pradesh, Jammu & Kashmir. India is emerging as one of the potential baby corn producing countries due to low cost of production and high demand within the country. Baby corn is a young finger like unfertilized cob of maize harvested early within 1-3 days of silk emergence depending upon the growing season. Baby corn is a good option for crop diversification (Dass *et al.*, 1) and it suits to peri-urban agriculture. Further, there is a great potential to earn foreign exchange through export of fresh/canned baby corn and its processed products. Another important feature of baby corn is safe vegetable to eat as it is almost free from residual effects of pesticides as the young cob is rapped with husk and well protected from insect and diseases. Despite manifold uses of baby corn, very little information is so far available on variability, heritability and genetic advance on baby corn (Tiwari and Verma, 2; Verma and Sarma, 3; Viola *et al.,* 4 and Satyanarayana *et al.,* 5).Hence, the present investigations on the variability, heritability and genetic advance on baby corn were undertaken for 20 quantitative characters.

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MATERIAL AND METHODS

The material for the present study consisted of a set of 20 maize cultivars comprising six single cross hybrids, four double cross hybrids, one three-way cross hybrids and nine composites. These genotypes were obtained from the Directorate of Maize Research, Pusa Campus, New Delhi, and evaluated in *kharif* season of 2007. The experiment was laid in a randomized block design with three replications at the experimental farm of Janta Vedic College, Baraut, Baghpat (Uttar Pradesh). Each plot consisted of two rows of three-meter length with row spacing and plant spacing of 60 cm and 15 cm, respectively. Recommended agronomic practices and plant-protection measures were adopted to raise a healthy crop. Ten plant were randomly selected in each genotype and observations were recorded on days to tasseling, days to first cob silking, days to last cob silking, days to first cob picking, days to last cob picking, days to first and last cob picking interval, number of cobs picked/plant, single husked cob weight (g), single de-husked cob weight (g), husked cob yield/plant (g), de-husked cob yield/plant (g), de-husked to husked cob yield ratio/plant, plant height (cm), tassel weight/plant (g), husk (green sheath) weight/cob (g), husk (green sheath) yield/plant (g), stalk (picked plant) weight/plant (g), fodder yield/plant (g), biological yield/plant (g) and harvest Index. The heritability estimates were computed as the ratio of genotypic variance to phenotypic variance (Singh and Choudhary, 6&9).Genetic advance was estimated as per the procedure outlined by Johnson *et al*. (7).

RESULTS AND DISCUSSION

Analysis of variance was carried out to partition the variances into its components. The results of the analysis revealed highly significant differences among the mean values for all traits i.e. days to tasseling, days to first cob silking, days to last cob silking, days to first cob picking, days to last cob picking, days to first and last cob picking interval, number of cobs picked/plant, single husked cob weight (g), single de-husked cob weight (g), husked cob yield/plant (g), de-husked cob yield/plant (g), de-husked to husked cob yield ratio/plant, plant height (cm), tassel weight/plant (g), husk (green sheath) weight/cob (g), husk (green sheath) yield/plant (g), stalk (picked plant) weight/plant (g), fodder yield/plant (g), biological yield/plant (g) and harvest Index (Table 1), indicating existence of genetic variability for these traits among the genotypes used in the present study.

Considerable genetic variability existed in all the characters. The characters (Table 1). *viz*., days to first and last cob picking interval (43.96 and 35.90%), husked cob yield/plant (23.26 and 22.92%), husked yield/plant (27.13 and 26.58%), harvest index (19.77 and 19.30%) and tassel weight (17.29 and 17.22%) were observed to possess high phenotypic coefficient of variation(PCV) and genotypic coefficient of variation (GCV) estimates (Table 2), indicating that, selection based on these characters would lead to isolation of desirable genotypes. The GCV alone is not sufficient for determination of an amount of heritable variation. The estimates of GCV together with the heritability estimates provide the best picture of the extent of advance to be expected by selection (Burton, 8). In present investigation, high values of heritability were observed for stalk weight, biological yield, fodder yield, plant height, tassel weight/plant, husked cob yield and husk yield per plant (Table 2) and low for days to first and last cob picking interval.

The heritability estimates indicate only the effectiveness with which selection of genotype can be based on phenotypic performance but fail to indicate the real progress and on the other hand high heritability could be also due to lower influence of environment on genotypes. Therefore, high heritability estimates need not always be accompanied by genetic progress. However, high heritability estimates along with high genetic gain render the selection effective (Johnoson *et al*., 8). In this study, the genetic advance as per cent of mean was maximum for husk yield per plant (53.63%) followed by husked cob yield per plant (46.53%) and harvest index (38.86%) along with high heritability estimates. This situation indicates that the genotypic variance for these characters is probably due to high additive gene effects. Hence, simple selection for

Table 1. ANOVA for 20 characters in baby corn genotype during *kharif.*

Character	Treatment M.S.S.	C.D. at 5%	C.V. (%)
Days to tasseling	68.37**	2.04	2.59
Days to first cob silking	73.18**	1.86	2.20
Days to last cob silking	39.11**	1.58	1.70
Days to first cob picking	74.49**	1.64	1.88
Days to last cob picking	39.21**	1.56	1.63
Days to first and last cob picking interval	10.41**	1.98	2.53
Number of cobs picked/plant	0.33**	0.16	4.23
Single husked cob weight (g)	83.11**	1.92	2.83
Single de-husked cob weight (g)	1.24**	0.46	2.96
Husked cob yield/plant (g)	1430.23**	6.14	3.96
De-husked cob yield/plant (g)	29.98**	1.66	4.76
De-husked to husked cob yield ratio/plant	32.87**	1.38	3.70
Plant height (cm)	467.02**	2.56	1.25
Tassel weight/plant (g)	28.60**	0.46	1.55
Husk (green sheath) weight/cob (g)	72.29**	2.08	4.19
Husk (green sheath) yield/plant (g)	1152.72**	6.50	5.45
Stalk (picked plant) weight/plant (g)	8922.62**	6.84	1.24
Fodder yield/plant (g)	11486.63**	8.42	1.20
Biological yield/plant (g)	11489.05**	7.96	1.08
Harvest Index	2.63**	0.34	4.28

** Significant at 1% level

Table 2. Estimates of genetic parameters for 20 characters in baby corn genotype during *kharif.*

Character	Mean	Range	PCV (%)	GCV (%)	Heritability (%)	G.A.	G.A. as % of mean
Days to tasseling	48.33	41.43-59.45	10.15	9.81	93.5	9.40	19.45
Days to first cob silking	52.11	45.34-64.31	9.65	9.39	94.8	9.82	18.85
Days to last cob silking	57.40	52.91-66.49	6.44	6.21	93.0	7.09	12.35
Days to first cob picking	53.70	47.26-65.73	9.41	9.22	96.0	9.99	18.60
Days to last cob picking	58.50	54.07-67.51	6.32	6.11	93.3	7.11	12.15
Days to first and last cob picking interval	4.40	1.12-7.33	43.96	35.90	66.8	2.90	60.37
No. of cobs picked/plant	2.26	1.83-3.10	15.14	14.54	92.2	0.65	28.72
Single husked cob weight (g)	41.62	34.65-49.17	12.84	12.54	95.1	10.49	25.20
Single de-husked cob weight (g)	9.43	8.41-11.19	7.21	6.60	83.2	1.17	12.41
Husked cob yield/plant (g)	94.78	67.02-143.79	23.26	22.92	97.1	44.10	46.53
De-husked cob yield/plant (g)	21.31	17.36-29.53	15.34	14.58	90.4	6.08	28.54
De-husked to husked cob yield ratio/plant	23.02	18.58-29.25	14.69	14.22	93.7	6.53	28.36
Plant height (cm)	125.63	103.20-144.40	9.98	9.90	98.4	25.43	20.24
Tassel weight/plant (g)	17.91	13.33-26.40	17.29	17.22	99.2	6.33	35.35
Husk (green sheath) weight/cob (g)	30.44	22.36-38.98	16.49	15.94	93.5	9.67	31.77
Husk (green sheath) yield/plant (g)	73.24	49.07-113.96	27.13	26.58	96.0	39.28	53.63
Stalk (picked plant) weight/plant (g)	337.03	229.97-437.73	16.21	16.17	99.4	111.90	33.20
Fodder yield/plant (g)	428.18	328.30-552.01	14.49	14.43	99.3	126.88	29.63
Biological yield/plant (g)	449.72	349.33-573.41	13.79	13.75	99.4	126.95	28.23
Harvest Index	4.81	3.57-7.27	19.77	19.30	95.3	1.87	38.86

improvement of these traits would be most effective in the maize genotypes for developing elite lines for specific usage as baby corn. High heritability combined with lowest genetic advance as per cent of mean was noted for number of days to last cob silking, number of days to first cob picking, number of days to last cob picking and plant height revealing little scope for improving these characters through selection and this may be attributed to the non-additive gene action and for their improvement the strategy of heterosis breeding could be more appropriate on these traits. The high value of heritability by these characters may be attributed to favourable influence of environment. These findings are in accordance with those of earlier workers (Verma and Sharma, 3; Viola *et al.*, 4; Satyanarayana *et al.* ,5). For days to first and last cob picking interval, the estimate of both heritability and genetic advance were low which indicated that this trait is highly influenced by environmental effects and therefore simple selection for improvement of such trait would be ineffective.

In the present investigations, two maize cultivars *viz*., HM 4 and HQPM 1 with desirable characters namely husked cob yield/plant, de-husked cob yield/plant, number of cobs picked/plant, fodder yield/plant, days to first cob picking, days to last cob picking were identified (Table 3) which can be used for baby corn cultivation.

Table 3. Mean data of two superior most genotypes for six characters for baby corn yield during *kharif*.

Character	HM 4	HQPM 1
Husked cob yield/plant (g)	143.79	133.19
De-husked cob yield/plant (g)	29.53	25.98
Number of cobs picked/ plant	3.10	2.72
Fodder yield/plant (g)	488.96	523.19
Days to first cob picking	55.40	58.66
Days to last cob picking	60.28	61.50

REFERENCES

1. Dass, Sain, Yadav, V.K., Kwatra A., Jat, M.L., Rakshit, S., Kaul, J., Prakash, O., Singh, I., Singh, K.P. and Sekhar, J.C. 2008. *Baby Corn in India*. Directorate of Maize Research, Pusa Campus, New Delhi, Technical Bulletin **6**, pp. 1-45.
2. Tiwari, V.K. and Verma, S.S. 1999. Correlation and path coefficient analysis in

   baby corn (*Zea mays* L.). *Agric, Sci. Digest* **19**: 230-34.
3. Verma, D.K. and Sarma, B.K. 2001. Studies on genetic parameters in baby corn in the mid hills of Meghalaya. *Indian J. Hill Farm.* **14**: 123-25.

4. Viola, G., Ganesh, M., Reddy, S.S. and Kumar, C.V.S. 2003. Study on heritability and genetic advances in elite baby corn (*Zea mays* L.) lines. *Progr. Agric*. **3**: 127-28.

5. Satyanarayana E., Shanthi P. and Kumar R.S., 2005. Genetic variability in babycorn (*Zea mays* L.) genotypes. *J. Res. Acharya N.G. Ranga Agric. Univ*. **33**: 83-86.

6. Singh, R.K. and Choudhary, B.D.1985. *Biometrical methods in Quantitative Genetics Analysis*, Kalyani Pub., New Delhi, pp. 38-54.

7. Johnson H.W., Robinson, H. F. and Comstock, R.E. 1955. Genotypic and phenotypic correlations in soybean and their implications in selection. *Agron. J*. **47**: 477-83.

8. Burton, G.M. 1952. Quantitative inheritance in grasses. *Proc. 6th Int. Grassland Cong.*, **1**: 277-83.

9. Singh, P. and Narayanan, S.S. 2010. *Biometrical Techniques in Plant Breeding*, (4th Edn.), Kalyani Publishers, New Delhi.

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