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Character Association and Path Coefficient Analysis in Baby Corn (*Zea mays* L.)

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ABSTRACT

One hundred selected baby corn genotypes were studied for character association and path coefficient analysis for yield and twelve yield characters. Significant positive association of baby corn yield with the cheracters *viz.,* days to 50% fasselling, days to 50% silking, plant height, number of shoots per plant, shoot weight with husk, shoot weight without husk, shoot length, shoot girth and number of pickings was observed. In the study of partition of correlation coefficients into direct and indirect effects throguh path coefficient analysis, days to 50% tasselling, plant height, shot weight with husk and shoot length showed positive direct effect on baby corn yields.

Key words : Baby corn, Chracter association and Path analysis.

Baby corn is a small maize ear harvested before or just at the silk emergence stage. This dehusked young ear may be eaten raw as salad or used as ingredient in various preparations *viz.,* soups, vegetables, pickles etc. Many varieties of specialized corn plants are used to produce baby corn which is gaining importance in the Indian sub continent. Baby corn ears are typically 4.5 cm to 10 cm in length and 7 mm to 17 mm in diameter.The green nutritious plants after picking ears may be used as fodder for cattle.

There are several constraints responsible for lower yields of grain maize crop. Of these, cultivation of maize in rainy season itself makes it risky due to various seasonal vagaries like floods, droughts, windstorms etc. oftenly occurring in the season. Some of late maturing hybrids and composites are, therefore, not appropriate for intensive crop rotations followed by maize farmers in most of the areas. Post flowering stalk and ear rots also cause severe losses to the crop. On the contrary, maize for baby corn may be grown as a best substitute to grain maize cultivation to get better economic returns because it is harvested only 50-60 days after planting. This small duration of the crop enables it to escape from all climatic hazards expected to occur in the later part of the season (Verma *et al.,* 1998).

Moreover, 2-3 crops of baby corn may be taken up through staggered planting within the same season. Early maturing and prolific maize cultivars particularly hybrids with wider adaptability are preferred over open pollinated varieties as they produce high yield and more uniform size of baby corn ears. Yield is a complex, polygenic and highly variable character determined by cumulative effects of its component characters. Therefore, direct selection for yield may not be very effective and efficient. In this study, the inter-relationship of a number of yield contributing characters has been investigated and further different factors were separated into direct and indirect correlation coefficients through path coefficient analysis (Dewey and Lu, 1959).

MATERIAL AND METHODS

Hundred selected baby corn genotypes were grown during *kharif* 1998-99 in a simple lattice design with two replications at the college farm, College of Agriculture, Rajendranagar. The crop was sown with 75 cm inter row spacing and 30 cm intra row spacing to have a desired plant density. The recommended package of practices and plant protection measures were adapted to raise a good healthy crop.

Observations were recorded on the whole plant basis for yield of cobs, days to 50 percent silking, days to 50 per cent tasselling and the data on other characters like plant height, ear height, ear length, ear girth, ear weight with husk, ear weight without husk and number of ears per plant were taken on five competitive plants. The harvested ears were analysed in laboratory for sugar content and protein per cent by using standard methods.

Table 1.Genotypic and phenotypic correlations for yield and yield characters in Baby corn genotypes

Character	Days to 50% tasselling	Days to 50% silking	Plant height	Ear height	Number of shoots per plant	Shoot weight with husk	Shoot weight without husk	Shoot length	Shoot girth	Number of pickings	Protein %	Sugar content	Babycorn yield
Days to 50 percent tasseling		G 0.9764** P 0.9405**	G 0.0884 P 0.0907	G 0.1428 P 0.1382	G 0.7962** P 0.7048**	G 0.2618** P 0.2490*	G 0.2185* P 0.1998*	G 0.2288* P 0.2173*	G 0.1215 P 0.1213	G 0.8057** P 0.7093**	G 0.1752 P 0.1700	G 0.1582 P 0.1635	G 0.7575** P 0.7191**
Days to 50 per cent silking			G 0.1211 P 0.0898	G 0.1544 P 0.1456	G 0.8549** P 0.7541**	G 0.2468* P 0.2381*	G 0.1713 P 0.1661	G 0.2163* P 0.2044*	G 0.0503 P 0.0538	G 0.8619** P 0.7573**	G 0.1767 P 0.1699	G 0.2315* P 0.2210*	G 0.7788** P 0.7374**
Plant height				G 0.1320 P 0.1237	G 0.2089* P 0.1746	G 0.2797** P 0.2518*	G 0.2523* P 0.2259*	G 0.2585** P 0.2385*	G 0.1312 P 0.1143	G 0.2045* P 0.1742	G -0.0343 P -0.0320	G 0.1472 P 0.1176	G 0.2831** P 0.2536*
Ear height					G 0.0726 P 0.0650	G 0.2444* P 0.2362*	G 0.3050** P 0.2923**	G 0.2393* P 0.2350*	G 0.1938 P 0.1906	G 0.0819 P 0.0733	G 0.1626 P 0.1583	G 0.3282** P 0.3166**	G 0.1690 P 0.1674
Number of shoots per plant						G 0.2463* P 0. 2073*	G 0.1054 P 0.0984	G 0.1512 P 0.1228	G -0.0118 P -0.0097	G 1.0000** P 0.9967**	G 0.1539 P 0.1471	G 0.2099* P 0.1725	G 0.8662** P 0.7801**
Shoot weight with husk							G 0.8481** P 0.8163**	G 0.7800** P 0.7468**	G 0.7348** P 0.7114**	G 0.2439* P 0.2058*	G 0.1970 P 0.1853	G 0.1203 P 0.1206	G 0.6803** P 0.6607**
Shoot weight without husk								G 0.9314** P 0.8855**	G 0.8597** P 0.8340**	G 0.1092 P 0.1025	G 0.2197* P 0.2146*	G 0.2461* P 0.2331*	G 0.5034** P 0.4864**
Shoot length									G 0.8261** P 0.7998**	G 0.1583 P 0.1304	G 0.1753 P 0.1691	G 0.2615** P 0.2497*	G 0.5038** P 0.4916**
Shoot girth										G -0.0071 P -0.0052	G 0.1736 P 0.1695	G 0.0448 P 0.0455	G 0.3672** P 0.3630**
Number of pickings											G 0.1535 P 0.1458	G 0.2132* P 0.1736	G 0.8657** P 0.7783**
Protein per cent												G 0.0016 P -0.0006	G 0.1862 P 0.1871
Sugar content													G 0.1956 P 0.1890

**: significant at 1 per cent level; * : significant at 5 per cent level G-Genotypic correlation coefficients P- Phenotypic correlation

Table 2.Path coefficient analysis (phenotypic and genotypic) showing the direct and indirect effect of characters on yield in Baby corn genotypes

Character	Days to 50% tasselling	Days to 50% silking	Plant height	Ear height	Number of shoots per plant	Shoot weight with husk	Shoot weight without husk	Shoot length	Shoot girth	Number of pickings	Protein %	Sugar content	Baby Corn yield
Days to 50 per cent tasselling	P 0.1536	P 0.1029	P 0.0017	P -0.0017	P 0.3960	P 0.1308	P -0.0209	P 0.0188	P -0.0012	P -0.0585	P -0.0023	P -0.0002	P 0.7191
	G 0.3771	G -0.3540	G 0.0002	G -0.0012	G -0.4380	G 0.1432	G -0.0192	G 0.0115	G -0.0025	G 1.0435	G -0.0039	G 0.0008	G 0.7575
Days to 50 per cent silking	P 0.1445	P 0.1095	P 0.0017	P -0.0018	P 0.4237	P 0.1250	P -0.0174	P 0.0177	P -0.0005	P -0.0624	P -0.0023	P -0.0003	P 0.7374
	G 0.3682	G -0.3626	G 0.0003	G -0.013	G -0.4702	G 0.1360	G -0.0150	G 0.0109	G -0.0010	G 1.1163	G -0.0039	G 0.0012	G 0.7788
Plant height	P 0.0139	P 0.0098	P 0.0192	P -0.0015	P 0.0981	P 0.1322	P -0.0236	P 0.0207	P -0.0011	P -0.0144	P 0.0004	P -0.0002	P 0.2536
	G 0.0333	G -0.0439	G 0.0022	G -0.0011	G -0.1149	G 0.1530	G -0.0221	G 0.0130	G -0.0027	G 0.2648	G 0.0008	G 0.0007	G 0.2831
Ear height	P 0.0212	P 0.0159	P 0.0024	P -0.0120	P 0.0365	P 0.1240	P -0.0306	P 0.0204	P -0.0018	P -0.0060	P -0.0022	P -0.0005	P 0.1674
	G 0.0538	G -0.0560	G 0.0003	G -0.0082	G -0.0400	G 0.1336	G -0.0268	G 0.0120	G -0.0040	G 0.1060	G -0.0036	G 0.0017	G 0.1690
Number of shoots per plant	P 0.1083	P 0.0825	P 0.0033	P -0.0008	P 0.5618	P 0.1088	P -0.0103	P 0.0107	P 0.0001	P -0.0822	P -0.0020	P -0.0003	P 0.7801
	G 0.3003	G -0.3099	G 0.0005	G -0.0006	G -0.5500	G 0.1347	G -0.0092	G 0.0076	G 0.0002	G 1.2952	G -0.0034	G 0.0011	G 0.8662
Shoot weight with husk	P 0.0382	P 0.0261	P 0.0048	P -0.0028	P 0.1164	P 0.5251	P -0.0854	P 0.0648	P -0.0069	P -0.0170	P -0.0025	P -0.0002	P 0.6607
	G 0.0987	G–0.0901	G 0.0006	G -0.0020	G -0.1355	G 0.5469	G -0.0744	G 0.0393	G -0.0152	G 0.3159	G -0.0044	G 0.0006	G 0.6803
Shoot weight without husk	P 0.0307	P 0.0182	P 0.0043	P -0.0035	P 0.0553	P 0.4287	P -0.1047	P 0.0768	P -0.0081	P -0.0084	P -0.0029	P -0.0004	P 0.4860
	G 0.0824	G -0.0621	G 0.0006	G -0.0025	G -0.0580	G 0.4638	G -0.0877	G 0.0469	G -0.0178	G 0.1414	G -0.0049	G 0.0012	G 0.5034
Shoot length	P 0.0334	P 0.0224	P 0.0046	P -0.0028	P 0.0690	P 0.3922	P -0.0927	P 0.0867	P -0.0077	P -0.0107	P -0.0023	P -0.0004	P 0.4916
	G 0.0863	G -0.0784	G 0.0006	G -0.0020	G -0.0832	G 0.4266	G -0.0817	G 0.0503	G -0.0171	G 0.2050	G -0.0039	G 0.0013	G 0.5038
Shoot girth	P 0.0186	P 0.0059	P .0022	P -0.0023	P -0.0055	P 0.3736	P -0.0873	P 0.0694	P -0.0097	P 0.0004	P -0.0023	P -0.0001	P 0.3630
	G 0.0458	G -0.0182	G 0.0003	G -0.0016	G 0.0065	G 0.4018	G -0.0754	G 0.0416	G -0.0207	G -0.0092	G -0.0039	G 0.0002	G 0.3672
Number of pickings	P 0.1090	P 0.0829	P 0.0033	P -0.0009	P 0.5600	P 0.1081	P -0.0107	P 0.0113	P 0.0001	P -0.0824	P -0.0020	P -0.0003	P 0.7783
	G 0.3038	G -0.3125	G 0.005	G -0.0007	G -0.5500	G 0.1334	G -0.0096	G 0.0080	G 0.0001	G 1.2952	G -0.0034	G 0.0011	G 0.8657
Protein per cent	P 0.0261	P 0.0186	P -0.0006	P -0.0019	P 0.0827	P 0.0973	P -0.0225	P 0.0147	P -0.0016	P -0.0120	P -0.0136	P 0.0000	P 0.1877
	G 0.0661	G -0.0641	G -0.0001	G -0.0013	G -0.0847	G 0.1077	G -0.0193	G 0.0088	G -0.0036	G 0.1988	G -0.0222	G 0.0000	G 0.1862
Sugar content	P 0.0251	P 0.0242	P 0.0023	P -0.0038	P 0.0969	P 0.0633	P -0.0244	P 0.0217	P -0.0004	P -0.1413	P 0.0000	P -0.0015	P 0.1890
	G 0.0597	G -0.0839	G 0.0003	G -0.0027	G -0.1154	G 0.0658	G -0.0216	G 0.0132	G -0.0009	G 0.2762	G 0.0000	G 0.0051	G 0.1956

Note : underlined values are direct effects
Residual effect (phenotypic) : 0.18906
Residual effect (genotypic) : 0.02005

Phenotypic and genotypic correlations coefficients for all possible combinations were completed according to the method given by Johnson *et al.* (1955). Path coefficients were worked out following the procedure elaborated by Dewey and Lu (1959).

RESULTS AND DISCUSSION

Genotypic and phenotypic correlations coefficients between different pairs of characters are presented in Table 1. Genotypic correlations were higher than phenotypic correlations for most of the characters. The genotypic and phenotypic correlations coefficients indicated that baby corn yield were significant and positively correlated with days to 50 per cent tasseling, days to 50 per cent silking, plant height, number of shoots per plant, shoot weight with husk, shoot weight without husk, shoot length, shoot girth and number of pickings. Similar results were reported by Kumar and Mishra (1995). Similarly positive and significant coefficient between grain yield and ear length were reported by Dwivedi and Godawat (1994) and Reddy and sharma (1996). Umakanth and Khan (2001) reported grain yield showed significant and positive association with ear girth, ear length and plant height. Malhotra and Khehra (1986) reported positive and significant correlations of grain yield with plant height and ear height.

Days to 50 per cent tasselling showed highly significant and positive association with days to 50 per cent silking, number of shoots per plant, shoot weight with husk, shoot weight without husk, shoot length and number of pickings at both genotypic and phenotypic level. Days to 50 per cent silking had significant and positive correlations both at genotypic and phenotypic level with number of shoots per plant, shoot weight with husk, shoot length, number of pickings and sugar content. Plant height showed significant and positive relation with shoot weight with husk, shoot weight without husk, and shoot length. Ear height had showed positive correlations with shoot weight with husk, shoot weight without husk, shoot length and sugar content. Number of shoots per plant showed significant positive association with shoot weight with husk, and number of pickings. Shoot weight with husk showed highly significant positive relationship with shoot weight without husk, shoot length, number of pickings, shoot girth. Shoot weight without husk showed significant and positive correlation with shoot length, shoot girth, protein content and sugar content. Shoot length had significant positive association with shoot girth and sugar content.

At genotypic level, plant height showed significant and positive association with number of pickings, number of shoots per plant and number of pickings with sugar content. Earlier, Vijay and Sitar Singh Verma (1999) reported significant and positive association of baby corn yield with cob yield with husk at both genotypic and phenotypic level. Dwivedi and Godawat (1994) reported significant and positive association of grain yield with shoot length and ear diameter in maize. Zheng *et al* (1994) reported that plant height and ear height were significantly correlated with yield in grain maize.

In general, genotypic correlation coefficient were higher than their corresponding phenotypic correlation coefficient. These results revealed that selection for genotypes with number of shoots per plant, shoot weight with husk, shoot weight without husk, shoot length, shoot girth and more number of pickings could be expected to result in higher baby corn yield.

Partitioning the correlation coefficients of yield components with yield into direct and indirect effects will help to estimate the actual contribution of an attribute and its influence through other characters. In the present investigation, among twelve characters, days to 50 per cent tasselling, plant height, shoot weight with husk, and shoot length showed positive direct effect on baby corn yield at both genotypic and phenotypic levels. Earlier Satyanarayana *et al.* (1990) reported similar findings in maize for ear length which exhibited positive direct effects on grain maize yield. Vijay Kumar Tiwari and Sitar Singh Verma (1999) reported positive direct effect of ear length and plant height on baby corn yield. The residual effact (genotypic) was found to be very low (0.02) which indicated that almost all the yield contributing characters were included. The results of path coefficient analysis emphasized the need for direct selection based on plant type with greater number of shoots per plant, shoot weight with husk, days to 50% silking, shoot length and days to 50% tasseling for improvement of baby corn yield as they directly contributed towards high yield.

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