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CORRELATION AND PATH COEFFICIENT ANALYSIS FOR THE YIELD AND ITS TRAITS IN CABBAGE

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ABSTRACT

The correlation and path coefficient analysis in nine hybrids of cabbage revealed that all the characters under study, viz., core length, stalk length, gross and net head weights, number of non wrapper leaves, leaf length and breadth, days to maturity, longitudinal and equatorial head lengths, contributed up to 83 percent towards the variation in yield. This indicated the adequacy of the characters while resorting to the selection of hybrids. The analysis also indicated that the genotypic correlation coefficients were higher than phenotypic correlation coefficients for all the pairs of characters studied. The yield had positive and significant correlation with all the yield components except stalk length. The yield components mostly exhibited significant interrelationship among themselves, which indicated the need of their simultaneous selection for improvement of desirable characters. The leaf breadth had the highest direct effect on yield followed by longitudinal head length and leaf length.

INTRODUCTION

Among the cole crops, cabbage (*Brassica oleracea* L. var. capitates) is one of the most important vegetable being grown in more than ninety countries throughout the world (Kanwar, 1998). Yield is a complex variable and depends upon a large number of factors and their interactions. Hence, the assessment of yield contributing characters is an important pre-requisite in the formulation of effective breeding programme. The criteria formulated for selection of genotypes would be effective in improvement of vegetable crops including cabbage, by using the knowledge of correlation among the yield contributing characters is available. And it is further effective if accompanied by the understanding of the magnitude of contribution (direct and indirect) of the each of the yield component to the final make up of yield. The information regarding the correlation and path coefficient analysis in cabbage is quite inadequate. Therefore, the present investigations were undertaken with a view to workout the association between important yield traits and their path analysis in cabbage, so as to make effective selection for the improvement of the crop.

MATERIALS AND METHODS

Eight hybrids of cabbage, viz., Cabbage No. 8, Nath 501, BSS-50, Quisto, Sri Ganesh Gol, BSS-32, H-44 and Pusa Muketa were grown at the Horticultural Research Farm of Indira Gandhi Agricultural University, Raipur, in four environments (1994 and 1996-98) using a randomized block design with four replications. Twenty-five days old seedlings were plated at spacing 60×45 cm in a plot (3×2.7 m) consisting of 30 plants. The NPK was applied in the ratio of 120:80:60 respectively. All the agronomic practices were followed to raise a good crop. All the observations except yield were

recorded on ten randomly selected plants in each plot namely, core length (cm), stalk length (cm), gross and net head weight (g), number of non-wrapper leaves, leaf length and breadth (cm), days to maturity, longitudinal and equatorial head length (cm). The yield was recorded on plot basis and finally converted into quintal per hactare. Phenotypic and genotypic correlations were computed by followed Al-Jibouri et al. (1958), and the path analysis following Dewey and Lu (1959).

RESULTS AND DISCUSSION

Genotypic correlation coefficients were higher than phenotypic correlation coefficients for all the pairs of characters (Table 1). This might be due to the masking effect of environment in the total expression of the genotypes resulting in reduced phenotypic association. Almost all the genotypic correlations were statistically significant at 1% level with certain exceptions in case of corielation of core length and stalk length with other characters respectively. The statistical significance of phenotypic correlation coefficients was also almost similar to that of genotypic correlations. The y yield displayed positive and significant correlation with all the characters except stalk length, viz., core length, gross and net head weights, number of non-wrapper leaves, leaf length and breadth, days to maturity, longitudinal and equatorial head lengths. These results indicated that the aforesaid traits had certain inherent relationships with the yield. Thus, it may be deducted that the selection based on these characters either in combination or alone will result in identifying the hybrids having high yield potential. The present findings are in consonance with that of Prasad et al. (1989) and Jamwal et al. (1996) who have also reported positive and significant association of yield with grow and net head weight per plant. The yield components mostly exhibited significant interrelationship among themselves, which indicated the need of their simultaneous selection for improvement of desirable characters. Similar inter se associations of yield contributing traits in cabbage was also reported earlier by Sharma and Swarup (1954), Gill et al. (1977), Prasad et al. (1989) and Jamwal et al. (1996). The character stalk length showed a negative association with yield but it was not significant.

In the path coefficient analysis the total genotypic correlation coefficient of a given character with yield has been split into direct and indirect effects. In other words, the sum of the direct effect of a given component character on yield and al possible indirect effects of the same character via other characters, is equal to the total genotypic correlation between that character and yield. For all the characters having significant correlation with yield (has row, Table 2), the underlined data along the diagonal of Table 2) reveled that the leaf breadth had the highest direct effect on yield followed by longitudinal head length and leaf length. The net head weight, the number of non-wrapper leaves, equatoial head length, gross head weight, days to maturity and core length had negative direct effects.

The direct effect of longitudinal head length (0.881) on yield was quite close to its correlation with yield (0.771**), which was significant at 1% level. It indicated that this correlation explained the true relationship and direct selection through this trait would be effective while formulating selection indices for improvement of yield in cabbage.

The positive direct effect of leaf breadth (1.569) on yield was higher than its correlation with yield (0.709**). However, the positive direct effect of leaf length (0.41) was lower than its correlation with yield (0.816**) Similarly, the negative direct effects of other characters on yield, viz., net head weight (-1.346), number of non-wrapper leaves (-0.066) were not equal to their respective correlations with yield, each of which was significant at 1% level. These observations confirm that the characters leaf breadth, leaf length, net head weight, number of non-wrapper leaves, equatorial head length, core length, gross head weight and days to maturity were indirect causes of correlation with yield. In other words, for example, the significant correlation of leaf breadth with yield was through the indirect factors leaf length, net head weight, number of non-wrapper leaves, equatorial head length, core

length, gross head weight and days to maturity acting simultaneously. Similarly, other significant correlations through indirect effects may be explained. Thus, in such situations all these characters should be considered simultaneously for effective selection of hybrids.

Lastly, the residual effect 0.175 revealed that all the characters under study contributed 83 percent of variation in yield. This indicated the adequacy of the characters in accounting for the variation in yield, and hence the adequacy of these characters while resorting to the selection of hybrids.

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REFERENCES

Al-Jibourie, H.A. Miller, P.A. Miller and Robinson, H.F (1958). Genotypic and environmental variations and co-variances in an upland cotton cross of inte specific origin. *Agron. J.* **50 :** 633-36.

Dewey, D. and Lu, K.H. (1959). A correlation and path coefficient analysis in crested wheat grass see production. *Agron. J.*; **54 :** 515-8.

Gill, H.S.; J.P. Singh and Swarup, V. (1997). Correlation and path coefficient analysis in cabbage (Brassica oleracea L var. capitates). *Veg. Sci.*; **41 :** 102-6.

Jamwal, R.S.; P. Kumar and Kumar, J. (1996). Correlationa and path coefficient studies in cabbage (*Brassica oleracea* L. var. capitata). *South Indian Hort.* **44 :** 19-22.

Kanwar, H.S. (1998). Development of hybrid seed production through self-incompatibility. Compendium of improvement and production temperate vegetable. Center of Advance Studies in Horticulture-Vegetable (ICAR), Dr. V.S. Parmar University of Horticulture and Forestry, Solan, pp. 37-39.

Prasad, V.S.R.K.; Prasad M.V.N.V. and Singh, D.P..(1989). Character association and path coefficient analysis in cabbage (*Brassica oleracea* L. var. capitates). *Indian J. Hort;* 21:213-30.

Table 1. Estimates of correlation coefficients at genotypic (G) and phenotypic (p) Levels

Traits		Stalk Length (cm) (gm)	Gross head weight leaves	Net head weight (gm)	No. of non-wrapper	Leaf length (cm)	Leaf breadth (cm)	Days to maturity length (cm)	Longi-tudinal head length (cm)	Equa-torial head	Yield (q/ha)
Core	G	-0.149	0.126	0.290**	-0.349	0.347**	0.194**	0.237**	0.462**	0.158	0.294**
Length (cm)	P	-0.075	0.089	0.122	-0.164	0.236**	0.187	0.182	0.357**	0.126	0.208**
Stalk	G		0.805**	0.605**	0.756**	0.392**	0.478**	0.132	0.097	0.227**	-0.005
Length (cm)	P		0.574**	0.439**	0.515**	0.241**	0.349**	0.111	0.086	0.120	-0.005
Gross head	G			0.932**	0.525**	0.706**	0.933**	0.328**	0.349**	0.527**	0.517**
Weight (gm)	P			0.658**	0.352**	0.537**	0.711**	0.240**	0.280**	0.407**	0.379**
Net head	G				0.476**	0.851**	0.964**	0.318**	0.625**	0.773**	0.698**
Weight (gm)	P				0.319**	0.598**	0.699**	0.272**	0.500**	0.597**	0.517**
No.of non-	G					0.460**	0.491**	0.107	0.394**	0.236**	0.458**
Wrapper leaves	P					0.323**	0.368**	0.081	0.221**	0.155**	0.340**
Leaf	G						0.879	0.655**	0.609**	0.603**	0.816**
Length (cm)	P						0.748	0.515**	0.430**	0.424**	0.653**
Leaf	G							0.279**	0.509**	0.788**	0.709**
Breadth (cm)	P							0.233**	0.379**	0.566**	0.591**
Days to	G								0.414**	-0.216	0.528**
Maturity	P								0.323**	-0.172	0.448**
Longitudinal	G									0.436**	0.771**
Head length	P									0.363**	0.545**
Equatorial	G										0.533**
Head length	P										0.423**
(cm)											

** Significant at 1% level

Table 2. Genotypic path coefficient showing direct and indirect effects of different hybrids on yield

	Core Length	Stalk length	Gross head Weight	Net head weight	No. of non-wrapper Leaves	Leaf length	Leaf breadth	Days to maturity	Longi-tudinal head length	Equa-utrial head length
Core length	-0.179	0.027	-0.023	-0.052	0.063	-0.062	0.035	-0.042	-0.083	-0.028
Stalk length	-0.017	0.113	0.091	0.068	0.085	0.044	0.054	0.015	0.011	0.025
Gross head Weight	-0.013	-0.086	-0.107	-0.099	-0.056	-0.075	-0.100	-0.035	-0.037	-0.056
Net head Weight	-0.390	-0.814	-1.254	-1.346	-0.641	-1.145	-1.298	-0.428	-0.842	-1.040
No. of non Wrapper Leaves	-0.086	-0.187	-0.130	-0.118	-0.247	-0.114	-0.122	-0.026	-0.097	-0.058
Leaf length	0.142	0.161	0.290	0.349	0.189	0.410	0.361	0.269	0.250	0.247
Leaf Breadth	0.304	0.749	1.464	1.513	0.771	1.378	1.569	0.438	0.799	1.236
Days to Maturity	-0.016	-0.009	-0.022	-0.021	-0.007	-0.043	-0.018	-0.066	-0.027	0.014
Longitudina I head Length	0.407	0.085	0.307	0.551	0.347	0.537	0.448	0.364	0.881	0.384
Equatorial Head length	-0.030	-0.043	-0.100	-0.147	-0.045	-0.115	-0.150	0.041	-0.083	0.190
Total direct and indirect effects	0.294	-0.005	0.517	0.698	0.458	0.816	0.709	0.528	0.771	0.533
Genotypic Correlation With yield	0.294	-0.005	0.517	0.698	0.458	0.816	0.709	0.528	0.771	0.533

1. The underlined diagonal values are direct effects of column-character on yield, while the non-diagonal values are the indirect effects of row- characters through which the column-character, combined with direct effect, is correlated with yield as shown in last two rows.
2. Residual effect: 0.171, i.e. R-square value: 0.829