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Correlation and Path-Coefficient Analysis in Onion (*Allium cepa* L. Var. *aggregatum Don*)*

I. R. SUTHANTHIRAPANDIAN[1] AND C. R. MUTHUKRISHNAN[2]

A study on the association of metric traits involving ten aggregatum onion lines (*Allium cepa* L. Var. *aggregatum* Don), with three testers and their 30 crosses revealed that the yield components like number of bulbs, weight of plants, T. S. S, shape index of bulb and bulb density exhibited significant positive association with yield. These components were also highly and positively inter-correlated among themselves. The path-coefficient analysis indicated that plant height, number of bulbs, weight of plant and days to maturity had direct positive effects on yield; while number of leaves, T. S. S, shape index and bulb density had negative direct effects. Weight of plant and number of bulbs are dependable indices of selection in identifying the yield potential of individual lines.

Onion (*Allium cepa* L. Var. *aggregatum* Don.) is an important bulb vegetable of Tamil Nadu grown in an area of 16,500 hectares with an annual production of 2,02,370 tonnes (Anon. 1978.) Information on the association among economic traits of a crop is of great value to plant breeders. It will not only help to understand the desirable and undesirable relationships of economic traits but help in assessing the scope of simultaneous improvement of two or three attributes. It aids in the selection of high yielding individuals on the basis of certain yield components, Path-coefficient analysis permits the understanding of the cause and effect of related characters (Wright, 1921). Such information on the inter-relationship of different traits in aggregatum onion is limited. It was reported in common onion that the seed yield per plant was highly and positively correlated with number of flower stalks, number of leaves and number of tillers. (Jones and Emsweller, 1939; Arakeri and Patil, 1956; Solomon and Patil, 1959; Patil, 1969; Mital and Srivastava, 1964; Dadlani and Bhagchandani 1978.) Correlation among yield contributing characters showed that number of leaves and number of tillers had highly significant positive correlation with number of flowering stalks as well as between themselves. An investigation was undertaken at the Faculty of Horticulture, Tamil Nadu Agricultural University, Coimbatore, to assess the magnitude and direction of association of different traits and their cause and effect relationships.

MATERIAL AND METHODS

The data were collected from ten aggregatum onion clones crossed with three testers in a line × tester method.

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1 and 2 Faculty of Horticulture, Tamil Nadu Agricultural University, Coimbatore.

The lines were CS.856-8, CS.675-3, CS.872, CS.463, CS.396, CS.856-13, CS.1094-34, CS.421, CS.854, CS. 665-51 and the testers were Co.1, CS.522 and F_1 of Co.1 x CS.522. Line x tester analysis is one of the simplest biometrical tools and relatively this method gives a precise estimation of combining ability which helps in the selection of potential parents for breeding programme. The parents and hybrids were raised in a randomised block design with five replications. The characters studied were plant height, number of leaves, number of bulbs, weight of plant, weight of bulbs shape index, bulb density, days to maturity and total soluble solids. Shape index was arrived at by dividing the length by circumference of individual bulbs. Density of bulbs was arrived at by dividing the weight of bulbs by volume of bulbs per plant. The genotypic correlation coefficients of yield and yield components and their intercorrelation among various components were calculated using the formula suggested by Panse and Sukhatme (1967) for bulb to bulb generation only. The path-coefficient analysis was done as suggested by Deway and Lu(1959).

RESULTS AND DISCUSSION

The genotypic correlation coefficients worked out for the eight characters are furnished in Teble I. Among the yield components, number of bulbs, weight of plant, T.S.S, shape index and bulb density exhibited significant positive association with yield. Interestingly each component were also highly and positively inter-correlated among themselves. Hence, it can be inferred that selection based on any one of these traits either alone or in combination, will result in identifying lines with high yield. There was absence of association between yield and days to maturity indicating that they are independantly inherited. Such a situation is favourable to choose lines with high yield and earliness. Further significant negative inter-correlations were observed between days to maturity on the one hand and number of bulbs, shape index and T. S. S. on the other. Hence when selections are made for the higher number of bulbs or high shape index it may possibly lead to earliness also. The T.S.S. was also found to be positively associated with yield as well as its components like number of bulbs and shape index. This again is a favourable situation in the pedigree breeding programme, which facilitates a simultaneous selection for yield and T.S.S. in aggretatum onion.

The estimate of correlation coefficients mostly indicated the interrelationships of the characters but did not furnish information on the cause and effect. That is one of the reasons for the failures met with in the utility of selection indices. Under such a situation, path analaysis helps the breeder in identifying the ideal index of selection. In the present investigation the number of bulbs per plant, weight of plant, shape index and bulb density exhibited a high association with yield Table-II but a study of path analysis revealed that the weight

of plant and number of bulbs per plant had direct contribution to the yield, while the other two had negative influences. It was also indicated that shape index and bulb density showed high association with yield, mainly due to indirect influences of number of bulbs and weight of plant. Hence it is appropriate to decide that the ideal index of selection for yield in onion could be number of bulbs per plant and weight of plant. Even in the case of other yield components, the indirect influence of these two traits are very marked. The effect of the residual factors over yield was 0.2841. This suggests that there might be few more components other than the eight studied in this investigation which might have been responsible to influence the yield.

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TABLE I Genotypic correlation coefficients (r) (bulb to bulb)

Characters	Number of leaves	Plant height	Number of bulbs	Weight of plant	Days to maturity	T. S. S.	Shape index	Bulb density	Weight of bulbs/plant
	1	2	3	4	5	6	7	8	9
1.		0.0250	0.1721	0.1198	−0.2868	0.2204	−0.1552	−0.0027	0.0284
2.			−0.3987**	0.2670	0.3612*	0.7797**	−0.1038	−0.6972**	0.2333
3.				0.3135*	−0.5078**	0.1176	0.6638**	0.7386**	0.3903**
4.					−0.1787	0.4202**	0.4290**	0.2675	0.9439**
5.						−0.3926**	−0.2969*	−0.0788	−0.1762
6.							−0.0565	−0.2186	0.4083**
7.								0.4593**	0.4562**
8.									0.3053*

** Significant at 1% level

* Significant at 5% level

TABLE II Path Coefficient analysis in onion

Characters	Number of leaves per plant	Plant hight (cm)	Number of bulbs per plant	Weight of plant	Days to maturity	T. S. S.	Shape index	Bulb density	Weight of bulbs/plant
	1	2	3	4	5	6	7	8	9
1.	−0.1407	0.0008	0.0655	0.1153	−0.0124	−0.0098	0.0194	0.0003	0.0284
2.	−0.0035	0.0335	−0.1288	0.2568	0.0156	−0.0347	0 0130	0.0812	0.2333
3.	−0 0242	−0.0134	0.3226	0.3016	0.0220	−0.0052	−0.0831	−0.0960	0.3903**
4.	−0.0169	0.0089	0.0011	0.9620	−0.0077	−0.0187	−0.0537	−0.0311	0.9439**
5.	0.0404	0.0121	−0.1638	−0.1719	0.0432	0.0175	0.0371	0.0092	−0.1762
6.	−0.0310	0.0261	0.0379	0.4042	−0.0170	−0 0445	0.0071	0.0255	0·4083**
7.	0.0218	−0.0034	0.2141	0.4127	−0.0128	0.0025	−0.1252	−0.0535	0.4562**
8.	0.0003	−0.0234	0.2383	0.2574	−0 0034	0.0097	−0.0575	−0.1164	0.3050*

Residual : 0.2841

Figures underlined indicate direct effects

**Significant at 1% level

*Significant at 5% level