



E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2019; 8(3): 318-320
Received: 04-03-2019
Accepted: 06-04-2019

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Path analysis studies of yield and yield components in brinjal (*Solanum melongena* L.)

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Abstract

Fourty one genotypes including one check were sown in a randomized block design with two replications during *Kharif* 2017 at experimental farm, Department of Agricultural Botany, V.N.M.K.V, Parbhani. Path analysis revealed that maximum positive direct effect on fruit yield per plant was exhibited through number of fruits per plant, number of branches per plant, fruit weight per plant, shoot borer infestation and number of flower per plant. Present results indicate the importance of these traits in selection for fruit yield per plant. Direct selection based on these traits would result in simultaneous improvement of aforesaid traits and yield in brinjal.

Keywords: Path analysis, character association

Introduction

Brinjal is one of the most important and popular vegetable crop grown round the year all over the country. It is believed that eggplant may have originated in Indo-Burma and China may be the secondary centre of origin. Brinjal fruits are a fairly good source of calcium, phosphorus, iron and vitamins, particularly 'B' group. Yield is a complex entity which depends upon many contributing characters. Knowledge of the magnitude and type of association between yield and its components greatly helps in evaluating the contribution of different traits. Yield and its components have been of an immense value in selecting suitable plant type.

The knowledge of direct and indirect influence of these characters on yield and its components is of prime importance to select the desirable genotypes. While evaluating the yield potential of any variety, it is necessary to give attention to all the yield contributing characters. Under such circumstances, knowledge of interrelationship among different traits is also necessary. It is essential to assess the degree of association of various quantitative characters in order to initiate effective selection programme. As there are number of factors involved in a correlation study, their indirect association become more complex and confusing but path coefficient analysis helps to avoid this complication by measuring the direct influence of one variable upon the other as well as permit the separation of the correlation coefficients into its components of direct and indirect effects. This is also advantageous to point out the true yield determinant in plant breeding programme.

Material and Methods

The present investigation on "path analysis for fruit yield components in brinjal (*Solanum melongena* L.)" was carried out during *kharif* 2017 at experimental farm, Department of Agril. Botany VNMKV, Parbhani. The experimental material consist of fourty one genotypes of (*Solanum melongena* L.) including one check.

Observations were recorded on five randomly selected plants from each line for twelve quantitative characters *viz.*, days to 50% flowering, number of fruits per plant, number of branches per plant, fruit weight per plant (kg), fruit length per plant (cm), number of leaves per plant, plant height (cm), fruit per cluster, shoot borer infestation (%), fruit borer infestation(%), number of flowers per plant and fruit yield per plant(kg)

The experiment was laid out in a randomized block design with 40 genotypes of brinjal and one check variety with two replications. Thirty days old seedling raised in the nursery beds were transplanted on the ridges adopting a spacing of 60 × 45 cm. The genotypic correlation coefficient between yield and its components were further partitioned into direct and indirect effects with the help of path coefficient analysis given by Dewey and Lu (1959) ^[1].

Results and Discussion

The association of different component characters among themselves and with yield is quite important for devising an efficient selection criterion for yield. The total correlation between

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yield and component characters may sometimes be misleading, as it might be an over-estimate or under-estimate because of its association with other characters are also associated with economic yield.

The analysis of variance showed significant differences among treatments for all the characters studied (Table 1.).

Indirect selection by correlated response may sometimes be not fruitful. When many characters are affecting a given character, splitting the correlation into direct and indirect effects of cause by Wright (1921) [5] such study give more meaningful interpretation to the causes of association between the dependent variable like pod yield and independent variables like yield components. Path co-efficient analysis was carried out in order to obtain cause and effect relationship between yield per se and 12 yield contributing components in brinjal and the results are discussed below (Table 2).

The days to 50 per cent flowering had negative direct effect on yield per plant (kg). However, it exhibited positive correlation with yield because of its positive indirect effects via fruit per cluster and number of flowers per plant, remaining character show negative indirect effect. Similar result were obtained by Yadav Neha *et al.* (2017) [6] for negative indirect effect on number of branches per plant and fruit weight, positive on number of flowers per plant, fruit per cluster. Path analysis revealed that number of fruits per plant had positive direct effects on yield per plant (kg), however, its association with yield per plant was positive. This is because of positive indirect effects via number of leaves per plant, number of flowers per plant, fruits per cluster, fruit length per plant and indirect effect on fruit per cluster, fruit length, number of flowers per plant. Shekhar *et al.* (2014) [2].

Though the direct effects of fruit length per plant, plant height, fruit per cluster and number of leaves per plant were negative but their association with fruit yield was found to be

positive because of indirect influence of these characters through number of fruits per plant through, days to 50 per cent flowering, fruit length per plant and number of branches per plant. In this situation the indirect causal factors are to be considered simultaneously for selection. Shende *et al.* (2014) [4].

The number of branches per plant had direct effect on yield per plant was positive while it had positive indirect effect through plant height, number of fruits per plant and negative effect on fruits per cluster. Fruit borer infestation had direct effect on yield per plant was positive. It had negative indirect effect through number of flowers per plant, number of branches per plant, number of fruits per plant and fruit length per plant. Shende *et al.* (2014) [4].

Path analysis studies of the present investigation revealed that days to 50 per cent flowering, fruit weight per plant and number of fruit per plant were the important yield components having direct bearing on the improvement of fruit yield. Hence, selection of genotypes based on these characters as selection criterion would be helpful in improving fruit yield potential of genotypes.

Further, it was observed that traits viz., fruit length per plant and fruit per cluster exhibited negative direct effect on yield and were negatively associated with fruit yield. Hence, it is difficult to combine simultaneous selection of quality with fruit yield in selection of elite genotypes with the present set of experimental material, There for selection could be limited for accomplishing improvement in fruit yield potential.

The estimated residual effect was (0.332), which indicates that major per cent of variability was contributed by different plant characters studied. These residual effect towards fruit yield in present study might be due to other characters environmental factors or sampling error. Lakshmi *et al.* (2000) [3].

Table 1: Analysis of variance for different characters in brinjal genotypes

S. No	Character	Mean sum of squares		
		Replications (d.f=1)	Treatment (d.f=40)	Error (d.f=40)
1	Days to50% flowering	62.48	250.02**	25.77
2	No. of fruits per plant	0.46	54.57**	1.75
3	No. of branches per plant	0.06	2.401**	0.16
4	Fruit weight per plant(kg)	0.0088	0.289**	0.0068
5	Fruit length per plant(cm)	0.67	23.3305**	0.68
6	No. of leaves per plant	5.90	1126.78**	45.62
7	Plant height(cm)	18.93	246.45**	8.15
8	Fruit per cluster	0.03	1.53**	0.06
9	Shoot borer infestation (%)	0.37	75.69**	1.26
10	Fruit borer infestation (%)	0.44	80.05**	1.29
11	No. of flowers per plant	1.68	200.90**	7.50
12	Fruit yield per plant	0.19	4.51**	0.13

Table 2: Direct (diagonal) and indirect (above and below diagonal) path effect of different characters towards yield in brinjal

Characters		Days to 50% flowering	No. of fruit /plant	No. of branches/ plant	Fruit weight /plant (kg)	Fruit length/ Plant (cm)	No. of leaf/ plant	Plant height (cm)	Fruit/ cluster	Shoot Borer infestation	Fruit Borer infestation	No. of flower / plant
Days to50% flowering	G	-0.0868	-0.0138	-0.0131	-0.0048	-0.0104	-0.0053	-0.0190	0.0024	-0.0080	-0.0063	0.0102
	P	-0.0076	-0.0008	-0.0010	-0.0002	-0.0009	-0.0004	-0.0014	0.0000	-0.0007	-0.0005	-0.0006
No. of fruits per plant	G	0.1398	0.8797	0.0360	-0.3618	0.4033	0.8263	0.0582	0.4660	0.0545	-0.1722	0.6702
	P	0.0498	0.4567	0.0239	-0.1769	0.2034	0.3950	0.0394	0.2197	0.0208	-0.0914	0.3206
No. of branches per plant	G	0.0095	0.0026	0.0628	0.0074	-0.0087	0.0066	0.0153	-0.0080	0.0199	-0.0149	0.0010
	P	0.0005	0.0002	0.0035	0.0004	-0.0004	0.0004	0.0009	-0.0004	0.0010	-0.0008	0.0000
Fruit weight per plant(kg)	G	0.0595	-0.4416	0.1261	1.0737	-0.2528	-0.3877	0.0900	-0.4968	-0.2335	-0.0808	-0.3572
	P	0.0218	-0.3895	0.1078	1.0059	-0.2483	-0.3446	0.0793	-0.4456	-0.2079	-0.0763	-0.3008
Fruit length per plant(cm)	G	-0.0010	-0.0040	0.0012	0.0020	-0.0086	-0.0035	-0.0014	-0.0037	0.0011	0.0014	-0.0018
	P	-0.0001	-0.0003	0.0001	0.0002	-0.0008	-0.0003	-0.0001	-0.0003	0.0001	0.0001	-0.0001
No. of leaves per	G	-0.0164	-0.2536	-0.0286	0.0975	-0.1107	-0.2700	0.0068	-0.1236	-0.0043	0.0237	-0.1769

plant	P	0.0042	0.0634	0.0089	-0.0251	0.0280	0.0733	-0.0019	0.0315	0.0009	-0.0059	0.0452
Plant height(cm)	G	-0.0210	-0.0064	-0.0233	-0.0080	-0.0151	0.0024	-0.0960	0.0217	-0.0154	0.0122	-0.0071
	P	-0.0096	-0.0045	-0.0133	-0.0041	-0.0081	0.0013	-0.0517	0.0101	-0.0074	0.0068	-0.0029
Fruit per cluster	G	0.0015	-0.0281	0.0067	0.0245	-0.0227	-0.0243	0.0120	-0.0530	0.0011	0.0048	-0.0266
	P	-0.0001	-0.0134	0.0032	0.0123	-0.0111	-0.0120	0.0054	-0.0279	0.0004	0.0023	-0.0131
Shoot borer infestation	G	0.0024	0.0016	0.0083	-0.0057	-0.0034	0.0004	0.0042	-0.0005	0.0261	0.0037	-0.0021
	P	0.0049	0.0023	0.0138	-0.0104	-0.0065	0.0006	0.0072	-0.0007	0.0503	0.0071	-0.0036
Fruit borer infestation	G	0.0012	-0.0032	-0.0039	-0.0012	-0.0026	-0.0014	-0.0021	-0.0015	0.0023	0.0164	-0.0047
	P	-0.0023	0.0078	0.0092	0.0029	0.0061	0.0031	0.0051	0.0032	-0.0054	-0.0388	0.0103
No. of flowers per plant	G	-0.0029	0.0190	0.0004	-0.0083	0.0053	0.0164	0.0019	0.0126	-0.0020	-0.0071	0.0250
	P	-0.0057	0.0510	0.0006	-0.0217	0.0133	0.0448	0.0040	0.0342	-0.0051	-0.0194	0.0727
Fruit yield per plant(kg)	G	0.0857	0.1523	0.1726	0.8152	-0.0265	0.1599	0.0699	-0.1844	-0.1581	-0.2191	0.1299
	P	0.0558	0.1729	0.1567	0.7834	-0.0253	0.1614	0.0862	-0.1763	-0.1532	-0.2168	0.1290

Residual effect = 0.332, underlined figure indicate direct effect

Conclusion

From path analysis studies it is observed that, the characters like fruits weight per plant, number of fruits per plant, number of branches per plant, number of leaves per plant, number of flowers per plant, plant height and days to 50 per cent flowering, showed positive direct effect on fruit yield per plant due to its direct contribution, there by indicating a true correlation and could be taken as a major component for the improvement of yield. Hence, selection of genotypes based on these characters as selection criterion would be helpful in improving fruit yield potential of genotypes.

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