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Path analysis studies in brinjal (*Solanum melongena* L.)

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Abstract
Path analysis in 180 genotypically diverse indigenous genotypes of brinjal was carried out at Vegetable Research Station, Junagadh Agricultural University, Junagadh during late *kharif* 2017-18. The results revealed that the number of fruits per plant is the most important yield determinant, because of its very high direct effect and indirectly influence the yield through plant height and fruit length are the another most important yield determinant. Thus, these characters should be given importance in selection programme for yield improvement in brinjal.

Keywords: Path analysis, Brinjal

Introduction

Brinjal (*Solanum melongena* L, 2n = 24) belonging to family Solanaceae is one of the most important and popular vegetable crop grown round the year all over the country. The fruit is employed as cure for toothache and recommended as remedy for liver complaints. In Unani roots are used to alleviate pain. Fruits are used as cardio tonic, laxative and reliever of inflammation. There is an increasing demand for its varieties, which are used for different preparations. Yield is a complex character influenced by several genetic factors interacting with environment. Success of any breeding programme for its improvement depends on the existing genetic variability in the base population and on the efficiency of selection.

Path co-efficient analysis are the important biometrical technique to determine the yield components. The characters that are positively correlated with yield are of considerably important to plant breeder for selection purpose. Path analysis splits the correlation coefficients into measure of direct and indirect effects thus providing understanding of the direct and indirect contribution of each characters towards yield. The characters contributing significantly to yield can be identified and could be used as selection criteria in fruit yield improvement in brinjal. Hence, the present study was planned to find out the direct and indirect effect through path analysis using 180 genotypically diverse indigenous genotypes of brinjal.

Materials and Methods

To assess the performance of 180 genotypes, Augmented Randomized Block Design (ARBD) followed with nine blocks during late *kharif* 2017-18 at Vegetable Research Station, Junagadh Agricultural University, Junagadh. Each block contain 20 genotypes with 3 checks, in each treatment ten plants were accommodated in a single row. Thirty days old seedlings were transplanted on the ridges adopting a spacing of 90 x 60 cm². Standard package of practices were adopted to raise healthy crop. Observation were recorded on five randomly selected plants for thirteen characters considered *viz.* days to days to 50% flowering, plant height (cm), plant spread EW (cm), plant spread NS (cm), days to first picking, days to last picking, number of branches per plant, fruit length (cm), fruit girth (cm), fruit weight (g), number of fruits per plant, total soluble solids (%) and fruit yield per plant (kg). The path coefficient analysis was carried out as per the method suggested by Dewey and Lu (1959) [3].

Results and Discussion

Path coefficient is simply standardized partial regression coefficient which splits the correlation coefficient into the measures of the direct and indirect effects of a set of independent variables on the dependent variable. This analysis provides a method for separating out the direct and indirect effect of causal factors which affect the yield.

The present study on path coefficient analysis revealed that the highest magnitude of positive direct affect on yield per plant was exerted by number of fruits per plant followed by fruit

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weight, days to first picking, days to last picking, plant spread (NS) and fruit girth at phenotypic level (Table 1 and Fig. 1). This indicates that direct selection based on number of fruits per plant and fruit weight would result in an appreciable improvement of yield per plant. Maximum direct effect of number of fruits per plant was reported by Parneetha (2006), Bansal and Mehta (2008) [2], Ahmed *et al.* (2013) [1], Thangamani and Jansirani (2012) [8] and Ravali *et al.* (2017) [6], while Shinde *et al.* (2012) [7] reported that length of fruit, number of fruits per cluster, plant height, days to last picking, average fruit weight and number of fruits per plant would be selection criteria for fruit yield improvement in brinjal. Similarly, Kushwah and Bandhopadhya (2007) [4] also reported that number of fruits per plant and fruit girth had positive direct effect on fruit yield. Direct effect of plant height on fruit yield was noted by Parneetha (2006) and fruit length on fruit yield was noted by Ravali *et al.* (2017) [6].

The negative direct effect on yield was shown by number of branches per plant, total soluble solid, fruit length, days to 50% flowering, plant spread (EW) and plant height but were substantially low. The results are in accordance with the findings of Ahmed *et al.* (2013) [1] and Tripathy *et al.* (2018) [9]. The negative direct effect of plant height and fruit length was nullified by considerable and positive indirect effects of these characters *via* number of fruits per plant.

Number of fruits per plant was not only found to have maximum direct effect on total fruit yield per plant, but it also contributed substantial positive indirect effect for plant height (0.1557), fruit length (0.1071), plant spread – NS (0.0548), days to last picking (0.0414), fruit girth (0.0128) and total soluble solids (0.0124) towards fruit yield per plant. Therefore, during selection, these characters should also be taken into consideration. Similar results had also been reported by Parneetha (2006), Ahmed *et al.* (2013) [1], Thangamani and Jansirani (2012) [8] and Ravali *et al.* (2017) [6].

Table 1: Phenotypic path coefficient analysis showing direct (diagonal and bold) and indirect effects of different characters on fruit yield in brinjal

Characters	Days to 50% flowering	Plant Height (cm)	Plant Spread – EW (cm)	Plant Spread - NS (cm)	Days to First Picking	Days to Last Picking	Number of branches per plant	Fruit length (cm)	Fruit girth (cm)	Fruit weight (g)	Number of fruits per plant	Total Soluble Solids (⁰Brix)	Phenotypic correlation with fruit yield per plant (kg)
Days to 50% flowering	-0.0052	0.0001	0.0002	-0.0001	0.0040	-0.0015	0.0039	-0.0001	-0.0001	0.0021	-0.0414	0.0001	-0.0381
Plant Height (cm)	0.0001	-0.0029	-0.0013	0.0010	-0.0006	0.0013	-0.0014	-0.0022	0.0001	0.0187	0.1557	-0.0006	0.1679*
Plant Spread (EW)	0.0002	-0.0009	-0.0043	0.0012	-0.0003	0.0007	-0.0030	-0.0015	0.0002	0.0519	-0.1454	-0.0008	-0.1019
Plant Spread (NS)	0.0002	-0.0009	-0.0015	0.0033	-0.0005	0.0018	-0.0008	-0.0022	0.0002	0.0440	0.0548	-0.0016	0.0966
Days to First Picking	-0.0026	0.0002	0.0002	-0.0002	0.0079	-0.0012	0.0002	0.0001	-0.0003	-0.0206	-0.0550	0.0021	-0.0693
Days to Last Picking	0.0012	-0.0005	-0.0004	0.0009	-0.0015	0.0067	0.0009	-0.0005	0.0001	-0.0068	0.0414	-0.0024	0.0390
Number of branches per plant	0.0012	-0.0003	-0.0008	0.0002	-0.0001	-0.0004	-0.0160	-0.0010	0.0004	0.0711	-0.0585	-0.0007	-0.0048
Fruit length (cm)	-0.0001	-0.0008	-0.0008	0.0010	0.0001	0.0004	-0.0020	-0.0074	0.0002	0.0863	0.1071	-0.0021	0.1815*
Fruit girth (cm)	0.0003	-0.0003	-0.0006	0.0004	-0.0014	0.0003	-0.0047	-0.0010	0.0014	0.1055	0.0198	-0.0032	0.1165
Fruit weight (g)	0.0001	-0.0002	-0.0006	0.0004	-0.0005	-0.0001	-0.0032	-0.0018	0.0004	0.3548	-0.3672	-0.0017	-0.0197
Number of fruits per plant	0.0002	-0.0004	0.0006	0.0002	-0.0004	0.0003	0.0009	-0.0008	0.0001	-0.1227	1.0619	-0.0001	0.9397**
Total soluble solids (⁰Brix)	0.0001	-0.0002	-0.0003	0.0005	-0.0017	0.0017	-0.0011	-0.0016	0.0005	0.0627	0.0124	-0.0096	0.0631

*, ** Significant at 5% and 1% levels, respectively
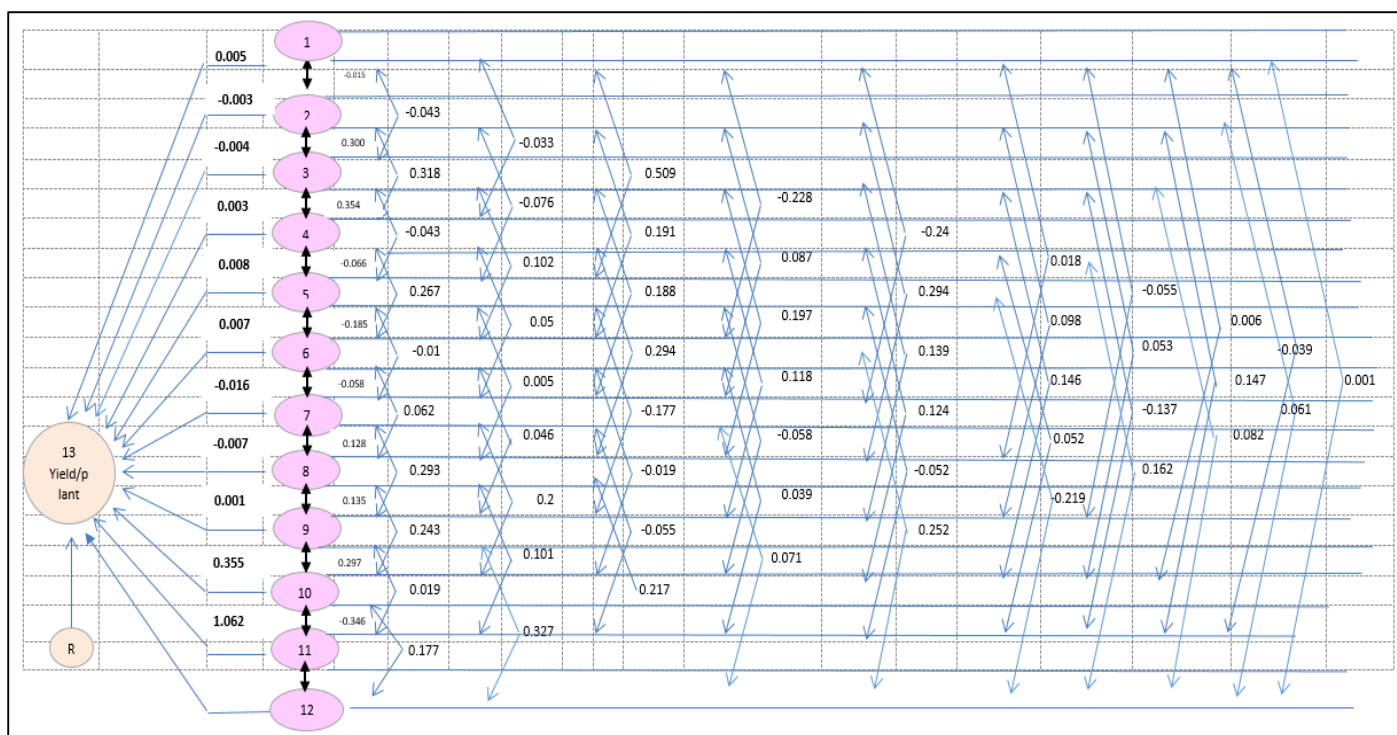Residual effect = 0.1034

Fig 1: Diagrammatic representation of phenotypic path analysis in brinjal

Conclusion
It can be concluded that number of fruits per plant, fruit weight and days to first picking were the major contributing characters towards marketable yield and selection based on these characters can be effective for developing high yielding brinjal varieties.

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