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# Direct and indirect effect of yield components on yield of eggplant (*Solanum melongena* L.) by path co-efficient analysis

**Satrughan Pandey, Sudhanshu Mishra, Navin Kumar, GC Yadav and VP Pandey**

**Abstract**
The analysis of variance for the design of experiment indicated highly significant differences among the genotypes for all the traits. Based on mean performance of genotypes NDB-5 followed by NDB-5 followed by NDB-15, NDB-6, NDB-4, NDB-7 and NDB-16 were yield per plant, fruit weight and yield per plant indicating opportunity for selection response. Yield per plant had exhibited highly significant and positive association with fruits per plant and early yield while primary branches showed negative and significant association with yield per plant. Fruits per plant, fruit weight and plant height were identified as most important traits which has direct effect on yield per plant while negative direct effect on yield showed by fruit circumference followed by plant height and days to 50% flowering on yield. Path coefficient provide an effective means of entangling direct and indirect causes of association are measure and measure the relative importance of each caused factor.

**Keywords:** Eggplant, *Solanum melongena* L.

## Introduction
Brinjal or eggplant (*Solanum melongena* L.) is one of the most important solanaceous vegetable crop having diploid chromosome number 2n=2x=24. It is grown in the tropics and subtropics of India and other parts of the world. It is called Brinjal in India and Aubergine in Europe. It is extensively grown in India, Japan, Indonesia, China, Bulgaria, Italy, France, USA, Pakistan, Bangladesh, Philippines and several African countries. Due to high productivity and wife adoptability, usually finds its place as the poor man's crop.

Brinjal being most important to growers and consumer, there is pressing need to increase its productivity to fulfill the increasing demands throughout the year. The information usually needed for developing high yield varieties in a particular species pertains to the extent of genetic variability for desirable train in the available germplasm. Evaluation of germplasm is the basic tool for identification of important genotypes. The great extent of natural variation present in various characters among the genotypes suggests good scope of improvement in economic. Degree of association between the various characters and direct effect of yield contributing characters on total yield, is of paramount significance in formulating an appropriate breeding strategy aimed at exploiting the inherent variability of the original population.

## Materials and Methods
The present investigation entitled "Variability, character association and genetic divergence in egg plant (*Solanum melongena* L.)" was executed at Main Experiment, Station of Department of Vegetable Science, Narendra Deva University of Agriculture and Technology, Narendra Nagar (Kumarganj), Faizabad, during *Kharif* 2010, to find out the direct and indirect effect of yield components on yield by path coefficient analysis. The experimental field had sandy loam soil, low in organic carbon, nitrogen, medium in phosphorus, potash, and slightly alkaline in nature with pH 8.5.The mechanical composition of soil was 60.9 per cent, 27.8 per cent silt and 11.3 per cent clay. Experimental material for the study consisted of 30 genotypes including six checks (Arka Nidhi, NDB-2, SM 6-6, Pant Rituraj, KS-224 and S. Mani). The experiment was conducted in Randomized Complete Block Design with three replications. Each treatment consisted 20 plant in two row, having spacing of 60 × 45 cm with net plot size of 4.5 × 1.2 $m^2$. Observations were recorded on 9 quantitative characters *viz.,* days to 50% flowering, primary branches per plant, plant height (cm), Fruit weight (g), fruit circumference (cm), polar length of fruit (cm), fruits per plant, early yield per plant (g) and yield per plant.

## Results and Discussion

In order to evaluate the listed genotypes the mean of thirty genotypes including check for nine characters has been presented in table 1. A very wide range of variation in mean performance of genotypes was observed for all the character under study. The comparison of performance of 30 genotypes for nine traits using critical differences revealed existence of very high level of variability in the used genotypes. The genotype NDB-5 (1.40kg) significantly out yielded in respect of all genotype as well as check in case of long purple and long green groups and also showed high mean performance for fruits per plant. The other high yielder's genotypes were NDB-4 (1.20kg), NDB-7(1.15kg), NDB-16(1.09kg), NDB-14(0.95kg) and NDB-12(0.87kg). These genotypes also showed high mean performance for some other characters. None of the genotypes produced higher yield per plant than the best check Pant Rituraj (1.09kg) in case of round purple and round green groups Only three genotypes NDB-15 (1.35kg), NDB-6 (1.24kg) and NDB-11(1.04kg) produced satisfactory yield per plant.

## Path coefficient analysis

Path coefficient is simply standardized particle regression coefficient which splits the correlation coefficient in to the measure of the direct and indirect effects of a set of independent variables on the dependent variable. This analysis provided a method for separating out 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 effect on yield per plant was exerted by fruits per plant followed by fruit weight and plant height at both phenotypic and genotypic level (table 1 and 2.) This indicates that direct selection based on fruits per plant and fruit weight would result on an appreciable improvement of yield per plant.

The negative direct effect on yield was showed by fruit circumference and polar length of fruit. Fruit weight showed highest indirect positive effect via fruit circumference followed by fruits per plant via plant height and days to 50% flowering, plant height and primary branches per plant on fruit yield per plant. The negative indirect effect of fruits per plant on yield per plant via fruit circumference observed height followed by fruit weight, days to 50% flowering plant height and primary branches per plant exhibited negative indirect effect on yield per plant. Therefore during selection these characters should also be taken into consideration. Similar results were also reported by Vadivel and Bapu (1989), Randhawa *et al.* (1989) [26], Mishra and Mishra (1990), Nair *et al.* (1990), Vikram and Kohli (1998).

**Table 1:** Direct and indirect effect of nine characters on fruit yield per plant (kg) at phenotypic level in brinjal

| S. No. | Characters | Days to 50% flowering | No. of primary branches per plant | Plant Height (cm) | Fruit Weight (cm) | Fruit Circumference (cm) | Polar length of fruit (cm) | Fruits per plant | Early yield Per plant (kg) | Yield per plant (kg) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. | Days to 50% flowering | 0.0275 | -0.002 | 0.0015 | 0.0060 | 0.0047 | -0.0041 | -0.0086 | -0.0074 | -0.1465 |
| 2. | Days to first fruit harvest | -0.0005 | 0.0764 | -0.0488 | -0.0024 | 0.0061 | 0.0048 | -0.0128 | -0.0026 | -0.2363 |
| 3. | Plant height (cm) | 0.0127 | 0.1470 | 0.2304 | 0.0865 | 0.0600 | -0.004 | -0.0622 | 0.0224 | 0.1226 |
| 4. | Fruit weight (cm) | 0.1101 | -0.0156 | 0.1898 | 0.5057 | 0.4441 | -0.1539 | -0.2814 | 0.1285 | 0.04956 |
| 5. | Fruit circumference (cm) | 0.0204 | -0.0096 | -0.0312 | -0.1050 | -0.1195 | 0.0543 | 0.0720 | -0.0261 | -0.0826 |
| 6. | Polar length of fruit (cm) | 0.0037 | 0.0016 | 0.0000 | 0.0076 | 0.0113 | -0.0249 | -0.0042 | 0.0015 | 0.0043 |
| 7. | Fruits per plant | -0.2625 | -0.1398 | -0.2255 | -0.4651 | -0.503 | 0.1418 | 0.357 | 0.260 | 0.5566 |
| 8. | Early yield per plant (kg) | -0.0172 | -0.0022 | 0.0062 | 0.0163 | 10.140 | -0.0038 | 0.0181 | 0.0641 | 0.4163 |

$R^2 = 0.6835$, Residual effect = 0.5328

**Table 2:** Direct and indirect effect of nine characters on fruit yield per plant (kg) at genotypic level in brinjal

| S. No. | Characters | Days to 50% flowering | No. of primary branches per plant | Plant height (cm) | Fruit weight (cm) | Fruit circumference (cm) | Polar length of fruit (cm) | Fruits per plant | Early yield per plant (kg) | Yield per plant (kg) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. | Days to 50% flowering | 0.0395 | -0.0016 | 0.0208 | 0.1989 | -0.0695 | 0.0141 | -0.3646 | -0.0457 | -0.2082 |
| 2. | Days to first fruit harvest | -0.00078 | 0.0734 | 0.1631 | -0.0236 | -0.0289 | 0.0043 | -0.1812 | -0.0023 | -0.3223 |
| 3. | Plant height (cm) | 0.0034 | -0.0491 | 0.2438 | 0.2956 | -0.0920 | -0.004 | -0.2768 | 0.0163 | 0.1407 |
| 4. | Fruit weight (cm) | 0.0102 | -0.0022 | 0.0938 | 0.7681 | -0.3033 | 0.0259 | -0.5696 | 0.0394 | 0.0623 |
| 5. | Fruit circumference (cm) | 0.0083 | 0.0064 | 0.0673 | 0.6995 | -0.3331 | 0.0399 | -0.6240 | 0.0366 | -0.0991 |
| 6. | Polar length of fruit (cm) | -00.0069 | -0.0039 | 0.0011 | -0.2451 | 0.1641 | -0.0811 | 0.1778 | -0.0100 | 0.0039 |
| 7. | Fruits per plant | -0.0145 | -0.0133 | -0.0677 | -0.4388 | 0.2084 | -0.0145 | 0.9972 | 0.0441 | 0.7010 |
| 8. | Early yield per plant (kg) | -0.0128 | -0.0012 | 0.0281 | 0.2148 | 0.0866 | 0.008 | 0.3116 | 0.1410 | 0.6007 |

## Conclusion

Large amount of variability exixted in the population for the selection. Genotype superior for yield per plant, some of them were superior for fruits per plant and other are superior for fruit weight. These have appears plenty of scope for the selection of yield per plant, fruits per plant and fruit weight. Among the character under study, fruits per plant, plant height, priimary branches per plant, fruit circumference, fruit weight, polar length and early yield per plant had high heritability coupled with high genetic advance which is important for further breeding programme. Since yield is a complex trait and governed by polygenes. The knowledge of correlation between yield and its components ius very useful for developing efficient breesing strategy for evolving high yielding varieties.

Direct selection for fruits per plant and fruit weight will be more effective for enchancing the fruit yield per plant.

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