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Influence of Physicomorphic and Biochemical Resistance Attributing Characters of Shoot and Fruit on Yield in Brinjal Genotypes

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ABSTRACT: Influence of physicomorphic and biochemical resistance attributing characters on brinjal fruit yield was investigated in sixty genotypes and three check cultivars during kharif 2017-18 at college of Horticulture, Venkataramannagudem to select the elite genotypes for crop improvement programme towards higher yield. The fruit yield in brinjal genotypes showed negative and highly significant correlation with shoot thickness (r = -0.8100), significantly high positive correlation with trichomes on leaf lamina (r = 0.8520), significantly high positive correlation with trichomes on shoot (r = 0.7530), non-significant negative correlation with plant height (r = -0.1730), number of branches (r = -0.1760) and plant spread (r =0.0530), fruit length (r = -0.0940), fruit diameter (-0.0700), non-significant positive correlation with pedicel length (r = 0.0600), highly significant positive correlation with calyx length (r = 0.5790) whereas phenol in shoot (r = 0.7870), fruit (r=0.8190), peroxidase in shoot (r = 0.7820), fruit (r = 0.7850), PAL content in shoot (0.8310), fruit (r=0.7990) showed highly significant positive correlation with fruit yield in brinjal genotypes.The path coefficient analysis in the present study revealed that the highest magnitude of negative direct effect on fruit yield was exerted by peroxidase in fruit followed by PAL and phenol in shoot followed by Phenol in fruit, peroxidase in shoot, PAL in in fruit and trichomes on leaf. This indicated that the phenol, peroxidase and PAL in shoot and fruit, trichomes on leaf should be considered as important parameters during selection of a genotype towards crop improvement programme to enhance the yield in brinjal.

Keywords: Brinjal genotypes, yield, correlation, path analysis.

INTRODUCTION

Brinjal (*Solanum melongena* L., 2n = 24) belongs to the family Solanaceae, is an important and popular vegetable crop in both subtropical and tropical regions of India. It is being grown extensively in India, Bangladesh, Pakistan, China, Philippines. India is the second major producer of brinjal in the world.

Brinjal is grown in India, over an area of 669 thousand hectares with an annual production of 12400 thousand metric tonnes with a productivity of 18.54 metric tonnes per ha which is quite low (Anonymous, 2017).

More than 70 insect pests were reported on brinjal (Kalawate and Dethe 2012) of which, shoot and fruit borer, *Leucinodes orbonalis* (Guenee) was considered as main constraint in production. The yield loss in India ranges from 30 to 70 per cent and up to 70 per cent in Andhra Pradesh in particular (Sasikala *et al*., 1999). Development of high yielding brinjal varieties with good plant type, resistant to pests and diseases still remained as a research gap even in 2020.

Different management approaches like cultural, host plant resistance, biological, chemical etc. are integrated to minimize the damage of the pest on the crop. The most important and effective way to manage an insect pest is the use of host plant resistance mechanism. IPM system along with host plant resistance is yielding promising and encouraging results and hence, development of insect resistant varieties is a potential objective of the crop scientists.

Physicomorphic and biochemical factors of the host plant have been reported to play a vital role on resistance to various insect and disease pests (Panda and Khush, 1995) and relatively resistant varieties contained higher amount of secondary metabolites inherently (Dhaliwal and Dilawari 1993). On the other

hand, susceptibility of a host plant might be due to enrichment of essential and necessary food materials, especially carbohydrate and proteins have been reported by Sadasivam and Manickam (1992) and Dhaliwal and Dilawari (1993).

Development of high yielding as well as shoot and fruit borer tolerance cultivar of brinjal requires knowledge of existing genetic variation and also the extent of association among yield contributing characters. These are the rationale approaches to understand the nature and magnitude of their relationship on yield in brinjal (Senapati and Senapati 2006).

Correlation and path co-efficient analysis are the important biometrical technique to determine the characters contributing in host plant resistance. The characters that are positively correlated with levels of infestation are of considerably important to plant breeder for selection purpose.

Correlation coefficient analysis assesses the mutual relationship between physicomorphic - biochemical constituents of the plant and establishes the components upon which selection is to be done for improvement in development of resistant/tolerant variety. Path co-efficient analysis reveals the direct and indirect effect of various components thus providing understanding of the direct and indirect contribution of each character towards yield.

As the development of high yielding brinjal varieties with good plant type, resistant to pests still remained as a research gap, the present investigation was undertaken to identify the elite genotype with desirable plant characters and high yield.

The earlier studies focused to investigate on the influence of either morphological or biochemical factors on the yield of the brinjal genotypes independently. The present study was undertaken to investigate the combined effect of 16 component characters (Both physicomorphic and biochemical) on yield of 60 brinjal genotypes and three check cultivars.

MATERIAL AND METHODS

The present experiment was conducted at college of Horticulture, venkataramannagudem during kharif 2017-18. The experimental material comprised of sixty genotypes collected from IIVR-Varanasi, NBPGR, Hyderabad, Dr. YSRHU, Venkataramannagudem. The seedlings were transplanted in the main field n augmented design at 35-40 DAS in a single row of 5m length with a spacing of 70 cm × 60 cm. The checks were planted in a randomized manner after every eight test genotypes in each block. Recommended agronomic package of practices were adopted for raising the crop excluding the plant protection measures.

Five plants were tagged in each genotype and checks at random. Observations were recorded on physicomorphic characters such as shoot thickness (cm), trichome density on leaf lamina, trichome density on shoot, length of pedicel (cm), length of calyx (cm), length of fruit (cm), diameter of fruit (cm), plant height (cm), number of branches per plant, plant spread (cm). Yield on weight basis (kg/plant) from tagged plants of each genotype was recorded starting from first harvest to final harvest. Only healthy fruits were considered for recording the yield data.

For the estimation of biochemical constituents, shoot samples from the apical shoots of selected plants of each genotype were collected when the plants are at 45 days age. The leaves were clipped off and remaining shoot portion was taken for the estimation of biochemical constituents. Similarly samples of edible size healthy brinjal fruits of the same physiological age were picked when the plants were at 90 days age. Phenol was estimated from shoot and fruit samples by Bray and Thorpe (1954) method, Peroxidase activity by Hammer Schimidt *et al.*, (1982) method and Phenylalanine Ammonialyase was determined according to the procedure laid down by (Dickerson *et al.*, 1984).

Genotypic and phenotypic correlation coefficients were estimated according to the formula given by (Johnson *et al.*, 1955). The significance of the phenotypic and genotypic correlation coefficients was tested as given by Snedecor and Cochran (1967). Path coefficient analysis suggested by Wright (1921) was used to calculate the direct and indirect contribution of various traits responsible to shoot and fruit infestation.

RESULTS AND DISCUSSION

Correlation coefficient between physicomorphic, biochemical characters of shoot and fruit with yield:

In the present study, correlation coefficient computed among eighteen characters in all possible combinations at phenotypic and genotypic levels has been presented in Table 1. In general, the magnitude of genotypic correlation coefficient was higher than the corresponding values of the phenotypic correlation coefficient suggesting a strong inherent relationship in different pairs of characters in brinjal genotypes.

Yield per plant showed negative and highly significant correlation with shoot thickness (r =-0.8100), significantly high positive correlation with trichomes on leaf lamina (r = 0.8520), significantly high positive correlation with trichomes on shoot (r = 0.7530), non-significant negative correlation with plant height (r = -0.1730),number of branches (r = -0.1760) and plant spread (r =0.0530), fruit length (r= -0.0940), fruit diameter (-0.0700), non-significant positive correlation with pedicel length (r= 0.0600), highly significant positive correlation with calyx length (r= 0.5790) whereas phenol in shoot (r= 0.7870), fruit (r=0.8190), peroxidase in shoot (r= 0.7820), fruit (r=0.7850), PAL content in shoot (0.8310), fruit (r=0.7990) showed highly significant positive correlation with fruit yield in brinjal genotypes.

Table 1: Phenotypic and Genotypic correlation matrix between physicomorphic, biochemical factors of shoot and fruit on yield.

Character	Shoot damage	Fruit damage	Shoot thickness	Trichomes on leaf	Trichomes on shoot	Fruit length	Fruit diameter	Pedicel length	Calyx length	Plant height	No. of branches	Plant spread	Phenol shoot	Phenol fruit	Peroxidase shoot	Peroxidase fruit	PAL shoot	PAL fruit	Yield
Shoot damage	**1.0000**	0.9560**	0.9403 **	-0.9755**	-0.9484**	0.1147	0.2308	-0.0523	-0.3790**	0.1899	0.2395	0.0557	-0.9587**	-0.9672**	-0.9645**	-0.9654**	-0.9692**	-0.9650**	-0.8440**
Fruit damage		**1.0000**	0.9592**	-0.9659**	-0.9650**	0.1268	0.2151	0.0009	-0.3298**	0.1966	0.2395	0.0557	-0.9587**	-0.9672**	-0.9645**	-0.9654**	-0.9692**	-0.9650**	-0.8440**
Shoot thickness			**1.0000**	-0.9650**	-0.9383**	0.1264	0.1579	-0.0806	-0.3419**	0.2633*	0.2363	0.0382	-0.9771**	-0.9630**	-0.9754**	-0.9772**	-0.9625**	-0.9532**	-0.8100**
Trichomes on leaf				**1.0000**	0.9508**	0.124	-0.1904	0.058	0.3620**	-0.2105	-0.202	-0.038	0.9749**	0.9828**	0.9848**	0.9814**	0.9860**	0.9818**	0.8520**
Trichomes on shoot					**1.0000**	-0.1777	-0.1923	0.0227	0.3064*	-0.1839	-0.2045	-0.0249	0.9655**	0.9602**	0.9643**	0.9716**	0.9625**	0.9756**	0.7530**
Fruit length						**1.0000**	0.1494	0.2006	-0.0044	-0.1669	-0.0424	-0.1343	-0.1356	-0.1043	-0.1086	-0.1347	-0.1015	-0.1019	-0.094
Fruit diameter							**1.0000**	-0.1394	0.0362	-0.1394	-0.1081	-0.0112	-0.1655	-0.1853	-0.1832	-0.1757	-0.2049	-0.21	-0.07
Pedicel length								**1.0000**	0.2196	0.132	0.3093**	0.2516*	0.0643	0.0553	0.0841	0.0729	0.0822	0.0841	0.06
Calyx length									**1.0000**	-0.2234	0.0052	-0.0738	0.3839**	0.3503**	0.3713**	0.3626 **	0.3703**	0.3574**	0.5790**
Plant height										**1.0000**	0.5562**	0.5693**	-0.2527	-0.2254	-0.2254	-0.2467	-0.2427	-0.2404	-0.173
Number of branches											**1.0000**	0.5421**	-0.2215	-0.204	-0.2174	-0.223	-0.2107	-0.2054	-0.176
Plant spread												**1.0000**	-0.0348	-0.0253	-0.0281	-0.0354	-0.0311	-0.0292	-0.053
Phenol shoot													**1.0000**	0.9807**	0.9937**	0.9976**	0.9776**	0.9690**	0.7870**
Phenol fruit														**1.0000**	0.9871**	0.9848**	0.9890**	0.9877**	0.8190**
Peroxidase shoot															**1.0000**	0.9956**	0.9911**	0.9842**	0.7820**
Peroxidase fruit																**1.0000**	0.9830**	0.9752**	0.7850**
PAL shoot																	**1.0000**	0.9981**	0.8310**
PAL fruit																		**1.0000**	0.7990**
Yield	**-0.8440****	**-0.7870****	**-0.8100****	**0.8520****	**0.7530****	**-0.094**	**-0.07**	**0.06**	**0.5790****	**-0.173**	**-0.176**	**-0.053**	**0.7870****	**0.8190***	**0.7820****	**0.7850****	**0.8310****	**0.7990****	**1.0000**

**1% level of significance, * 5% level of significance

The correlation between different yield attributes among themselves showed that shoot thickness and plant height are significantly and positively correlated whereas on significant positive correlation was observed with fruit length, fruit diameter, number of branches number of branches and plant spread. Shoot thickness and trichomes on leaf lamina, trichomes on shoot, phenol in shoot-fruit, peroxidase in shoot-fruit, PAL in shoot-fruit showed highly significant negative correlation.

Trichomes on leaf lamina showed highly significant positive correlation with trichomes on shoot, calyx length, phenol in shoot-fruit, peroxidase in shoot-fruit, PAL in shoot-fruit whereas non significant negative correlation was observed with fruit diameter, plant height, number of branches and plant spread. Trichomeson shoot showed highly significant positive correlation with phenol in shoot-fruit, peroxidase in shoot-fruit, PAL in shoot-fruit significant positive correlation with calyx length, non significant negative correlation with fruit length, fruit diameter, plant height, number of branches and plant spread.

Fruit length showed non significant positive correlation with fruit diameter, pedicel length whereas non significant negative correlation was observed with calyx length, plant height, number of branches, plant spread, phenol in shoot-fruit, peroxidase in shoot-fruit, PAL in shoot-fruit. Fruit diameter showed non significant negative correlation with pedicel length, calyx length, plant height, number of branches, plant spread, phenol in shoot-fruit, peroxidase in shoot-fruit, PAL in shoot-fruit

Pedicel length showed highly significant positive correlation with number of branches, significant positive correlation with plant spread, non significant positive correlation with calyx length, plant height, phenol in shoot-fruit, peroxidase in shoot-fruit, PAL in shoot-fruit. Calyx length showed highly significant positive correlation with phenol in shoot-fruit, peroxidase in shoot-fruit, PAL in shoot-fruit whereas non significant negative correlation was observed with plant height and plant spread.

Plantheight showed positive and highly significant correlation with number of branches and plant spread whereas non significant negative correlation was observed with phenol in shoot-fruit, peroxidase in shoot-fruit, PAL in shoot-fruit. Number of branches showed highly significant positive correlation with plant spread whereas non significant negative correlation with phenol in shoot-fruit, peroxidase in shoot-fruit, PAL in shoot-fruit. Plant spread showed non significant negative correlation with phenol in shoot-fruit, peroxidase in shoot-fruit, PAL in shoot-fruit.

Phenol in shoot showed highly significant positive correlation with phenol in fruit, peroxidase in shoot-fruit, PAL in shoot-fruit. Phenol in fruit showed highly significant positive correlation with peroxidase in shoot-fruit, PAL in shoot-fruit. Peroxidase in shoot showed highly significant positive correlation with peroxidase in fruit, PAL in shoot-fruit. Peroxidase in fruit showed highly significant positive correlation with PAL in shoot and fruit. PAL in shoot showed highly significant positive correlation with PAL in fruit.

Path coefficient analysis between physicomorphic and biochemical characters of shoot and fruit on yield:

The total correlation between yield and a component trait may sometimes be misleading as it might be an over-estimate or under-estimate. Hence, direct selection based on character association may not be fruitful. Therefore, it is necessary to partition the total correlation coefficients into direct and indirect effect of cause as devised by Wright (1921).

Based on the above, the characters subjected to correlations were also subjected to path coefficient analysis for estimating the direct and indirect effects (Table 2), so as to formulate more authentic criteria for selection in brinjal.

The results showed that, the character shoot thickness had negative direct effect (-0.0128) on fruit yield. Its indirect effects via trichomes on leaf lamina, fruit length, calyx length, number of branches, phenol in shoot-fruit, PAL in shoot were negative, while its indirect effect via trichomes on shoot, fruit diameter. Pedicel length, plant height, peroxidase in shoot-fruit and PAL in fruit were positive.

Trichomes on leaf lamina had positive direct effect (-0.8744) on fruit yield. Its indirect effects via shoot thickness, fruit length, calyx length, number of branches, plant spread, phenol in shoot-fruit, PAL in shoot were positive while indirect effects via trichomes on shoot, fruit diameter, pedicel length, plant height, peroxidase in shoot-fruit, PAL in fruit are negative.

Trichomes on shoot had negative direct effect (-0.3701) on yield. Its indirect effects via shoot thickness, trichomes on leaf, fruit length, calyx length, pedicel length, plant height, number of branches and plant spread, phenol in shoot-fruit, PAL in shoot were positive while indirect effects via fruit diameter, plant height, peroxidase in shoot-fruit, PAL in fruit were negative.

Fruit length exerted negative direct effect (-0.0509) on fruit yield. Its indirect effects via shoot thickness, trichomes on leaf, calyx length, pedicel length, plant height, phenol in shoot-fruit, PAL in fruit were negative while indirect effects via trichomes on shoot, fruit diameter, number of branches, plant spread, peroxidase in shoot-fruit, PAL in shoot were positive.

Fruit diameter showed direct positive effect (0.1174) on yield. Its indirect effects via trichomes on shoot, calyx length, pedicel length, number of branches, plant spread, peroxidase in shoot-fruit, PAL in shoot were positive while indirect effects via shoot thickness, trichomes on leaf, fruit length, plant height, phenol in shoot-fruit, PAL in shoot were negative.

Table 2: Genotypic and phenotypic path coefficient analysis between physico-morphic, biochemical factors of shoot and fruition yield.

Character	Shoot damage	Fruit damage	Shoot thickness	Trichomes on leaf	Trichomes on shoot	Fruit length	Fruit diameter	Pedicel length	Calyx length	Plant height	Number of branches	Plant spread	Phenol shoot	Phenol fruit	Peroxidase shoot	Peroxidase fruit	PAL shoot	PAL fruit
Shoot damage	**-0.5290**	-0.5057	-0.4974	0.5161	0.5017	-0.0607	-0.1221	0.0277	0.2005	-0.1005	-0.1267	-0.0295	0.5072	0.5117	0.5102	0.5107	0.5127	0.5105
Fruit damage	-0.1073	**-0.1122**	-0.1077	0.1084	0.1083	-0.0142	-0.0241	-0.0001	0.037	-0.0221	-0.0216	-0.0043	0.11	0.1094	0.1097	0.1102	0.1081	0.1071
Shoot thickness	-0.012	-0.0123	**-0.0128**	0.0123	0.012	-0.0016	-0.002	0.001	0.0044	-0.0034	-0.003	-0.0005	0.0125	0.0123	0.0125	0.0125	0.0123	0.0122
Trichomes on leaf	-0.853	-0.8445	-0.8438	**0.8744**	0.8313	-0.1084	-0.1664	0.0507	0.3165	-0.1841	-0.1766	-0.0332	0.8524	0.8593	0.861	0.8581	0.8621	0.8584
Trichomes on shoot	0.3511	0.3572	0.3473	-0.3519	**-0.3701**	0.0658	0.0712	-0.0084	-0.1134	0.0681	0.0757	0.0092	-0.3574	-0.3554	-0.3569	-0.3596	-0.3563	-0.3545
Fruit length	-0.0058	-0.0065	-0.0064	0.0063	0.009	**-0.0509**	-0.0076	-0.0102	0.0002	0.0085	0.0022	0.0068	0.0069	0.0053	0.0055	0.0069	0.0052	0.0052
Fruit diameter	0.0271	0.0252	0.0185	-0.0223	-0.0226	0.0175	**0.1174**	-0.0164	0.0042	-0.0164	-0.0127	-0.0013	-0.0194	-0.0217	-0.0215	-0.0206	-0.0241	-0.0246
Pedicel length	0.0001	0.0001	0.0002	-0.0001	0.0001	-0.0004	0.0003	**-0.0021**	-0.0005	-0.0003	-0.0007	-0.0005	-0.0001	-0.0001	-0.0002	-0.0002	-0.0002	-0.0002
Calyx length	-0.0771	-0.0671	-0.0695	0.0736	0.0623	-0.0009	0.0074	0.0447	**0.2033**	-0.0454	0.0011	-0.015	0.0781	0.0712	0.0755	0.0737	0.0753	0.0727
Plant height	0.0139	0.0144	0.0193	-0.0154	-0.0135	-0.0122	-0.0102	0.0097	-0.0164	**0.0732**	0.0407	0.0417	-0.0185	-0.0165	-0.0178	-0.0181	-0.0178	-0.0176
No. of branches	-0.0188	-0.0151	-0.0186	0.0159	0.0161	0.0033	0.0085	-0.0243	-0.0004	-0.0437	**-0.0786**	-0.0426	0.0174	0.016	0.0171	0.0175	0.0166	0.0161
Plant spread	-0.0007	-0.0004	-0.0005	0.0005	0.0003	0.0016	0.0001	-0.003	0.0009	-0.0068	-0.0064	**-0.0119**	0.0004	0.0003	0.0003	0.0004	0.0004	0.0003
Phenol shoot	-1.274	-1.3028	-1.2984	1.2955	1.283	-0.1802	-0.2199	0.0854	0.5102	-0.3357	-0.2943	-0.0462	**1.3289**	1.3033	1.3205	1.3257	1.2992	1.2877
Phenol fruit	-0.095	-0.0957	-0.0945	0.0965	0.0943	-0.0102	-0.0182	0.0054	0.0344	-0.0221	-0.02	-0.0025	0.0963	**0.9082**	0.0969	0.0967	0.0971	0.097
Peroxidase shoot	0.7943	0.8047	0.8033	-0.811	-0.7941	0.0895	0.1508	-0.0693	-0.3058	0.1996	0.179	0.0231	-0.8183	-0.8129	**-0.8235**	-0.8199	-0.8162	-0.8105
Peroxidase fruit	1.9113	1.9445	1.9347	-1.9431	-1.9237	0.2666	0.3479	-0.1443	-0.7179	0.4884	0.4415	0.0701	-1.9751	-1.9497	-1.9712	**-1.9799**	-1.9462	-1.9307
PAL shoot	-1.8008	-1.79	-1.7885	1.8321	1.7885	-0.1887	-0.3808	0.1527	0.688	-0.4509	-0.3915	-0.0578	1.8166	1.8376	1.8416	1.8266	**1.8581**	1.8545
PAL fruit	0.7977	0.7889	0.7879	-0.8115	-0.7916	0.0842	0.1736	-0.0695	-0.2954	0.1987	0.1698	0.0242	-0.801	-0.8164	-0.8136	-0.8061	-0.825	**-0.8266**
Total correlation of yield	**-0.878**	**-0.8174**	**-0.827**	**0.8761**	**0.7912**	**-0.0999**	**-0.0743**	**0.0297**	**0.5499**	**-0.1947**	**-0.176**	**-0.053**	**0.7870****	**0.8190****	**0.7820****	**0.7850****	**0.8310****	**0.7990****

Pedicel length exerted direct negative effect (-0.0021) on yield. Its indirect effects via trichomes on shoot, fruit length, fruit diameter, number of branches, plant spread, peroxidase in shoot-fruit, PAL in fruit were negative while indirect effects via shoot thickness, trichomes on leaf, calyx length, plant height, phenol in shoot-fruit, PAL in shoot were positive.

Calyx length showed direct positive effect (0.2033) on yield. Its indirect effects via shoot thickness, trichomes on leaf, fruit length, fruit diameter, plant spread, phenol in shoot-fruit, PAL in shoot were positive while indirect effects via shoot thickness, trichomes on shoot, pedicel length, plant height, number of branches, peroxidase in shoot-fruit, PAL in fruit were negative.

Plant height showed direct positive effect (0.0732) on yield. Its indirect effects via trichomes on shoot, fruit length, peroxidase in shoot-fruit, PAL in shoot were positive while indirect effects via shoot thickness, trichomes on leaf, fruit diameter, pedicel length, calyx length, number of branches, plant spread, plant height, phenol in shoot-fruit, PAL in shoot were negative.

Phenol in shoot showed positive direct effect (1.3289) on yield. Its indirect effects via shoot thickness, trichomes on leaf, fruit length, calyx length, number of branches, plant spread, phenol in fruit, PAL in shoot were positive while indirect effects via trichomes on shoot, fruit diameter, pedicel length, plant height, peroxidase in shoot-fruit, PAL in fruit were negative.

Phenol in fruit showed positive direct effect (0.9082) on yield. Its indirect effects via shoot thickness, trichomes on leaf, fruit length, calyx length, number of branches, plant spread, phenol in shoot, PAL in shoot were positive while indirect effects via trichomes on shoot, fruit diameter, pedicel length, plant height, peroxidase in shoot-fruit, PAL in fruit were negative.

Peroxidase content in shoot showed direct negative effect (-0.8235) on yield. Its indirect effects via shoot thickness, trichomes on leaf, fruit length, calyx length, number of branches, plant spread, phenol in shoot-fruit, PAL in shoot were positive while indirect effects via trichomes on shoot, fruit diameter, pedicel length, plant height, peroxidase in fruit, PAL in fruit were negative.

Peroxidase content in fruit showed direct negative effect (-1.9799) on yield. Its indirect effects via shoot thickness, trichomes on leaf, fruit length, calyx length, number of branches, plant spread, phenol in shoot-fruit, PAL in shoot were positive while indirect effects via trichomes on shoot, fruit diameter, pedicel length, plant height, peroxidase in shoot, PAL in fruit were negative.

PAL content in shoot showed direct positive effect (1.8581) on yield. Its indirect effects via shoot thickness, trichomes on leaf, fruit length, calyx length, number of branches, plant spread, phenol in shoot-fruit were positive while indirect effects via trichomes on shoot, fruit diameter, pedicel length, plant height, peroxidase in shoot-fruit, PAL in fruit were negative.

PAL content in fruit showed direct negative effect (-0.8266) on yield. Its indirect effects via shoot thickness, trichomes on leaf, fruit length, calyx length, number of branches, plant spread, phenol in shoot-fruit, PAL in shoot were positive while indirect effects via trichomes on shoot, fruit diameter, pedicel length, plant height, peroxidase in shoot-fruit were negative.

The path coefficient analysis in the present study revealed that the highest magnitude of negative direct effect on fruit yield was exerted by peroxidase in fruit followed by PAL and phenol in shoot followed by Phenol in fruit, peroxidase in shoot, PAL in in fruit and trichomes on leaf. It indicates that selection of a genotype based on biochemical factors of fruit and shoot such as phenol, peroxidise and PAL would result in an appreciable improvement in reduction of per cent shoot and fruit infestation. This indicated that the phenol, peroxidase and PAL in shoot –fruit, trichomes on leaf should be considered as important parameters during the selection of a resistant or tolerant genotype.

Eighty one brinjal genotypes (nine parents and 72 hybrids) evaluated for 14 yield attributed characters showed that marketable yield per plant had significant positive association for both at genotypic and phenotypic level with all the characters studied *viz.*, plant height, number of branches per plant, fruit girth, calyx length, number of fruits per plant, single fruit weight, protein content and total phenol content (Praneetha *et al.*, 2011).

Correlation studies with twenty five F1 hybrids in brinjal revealed that yield per plant showed positive correlation with number of branches per plant, percentage of long styled flowers, number of fruits per plant, fruit dry matter content and ascorbic acid content. The quality characters like dry matter content and ascorbic acid content were indirectly influenced the yield by the number of fruits per plant (Thangamani and Jansirani, 2012).

According to Nirmala and Vethomani (2016) brinjal genotypes, ABSR-2 was found least attacked by the borer recorded minimum percentage of fruit infestation (14.51 percent) with maximum marketable yield of 2.29 kg per plant. Lowest pedicel and calyx length, low sugar, high polyphenol oxidase and high phenol content contributed to record maximum fruit yield in ABSR-2 hence used as resistant cultivar for further shoot and fruit borer resistance breeding programme.

Out of nineteen characters, plant height exhibited a positive significant correlation with fruit yield per plant indicating that the association between yield and this character was positive and high. Similar significant and positive association with fruit yield per plant was reported for number of branches per plant and number of fruits per plant, while negatively correlated with ascorbic acid (Srivastava *et al.*, 2018).

Out of fourteen characters, plant spread exhibited a positive significant correlation at genotypic levels with fruit yield per plant indicating that the association between yield and this character was positive and high. The positive correlation between the desirable

characters is favourable to the plant breeder because it helps in simultaneous improvement of all the characters (Tripathy *et al*., 2018). The fruit length, number of fruits per plant, fruit girth, fruit weight, pericarp thickness, TSS, number of fruits per cluster, plant spread, fruit stalk length, number of primary branches per plant and plant height exerted a high positive direct effect on fruit yield per plant.

According to Patil *et al.,* (2020) days to first flowering at phenotypic levels, fruit girth, fruit length, plant height, number of flowers per plant, number of fruits per plant, plant height showed highly significant correlation with fruit yield per plant indicating, the direct effect of all above mentioned traits on fruit yield per plant favour yield improvement through selection that these characters can be used as surrogate characters for selecting high yielding genotypes. Individual fruit weight contributed the highest direct positive effect on the fruit yield. It acted majorly through plant height, number of branches, number of leaves and number of days to first fruit set as revealed in the path coefficient result. Individual fruit weight, number of fruits per plant, plant height, number of days to 50% flowering, number of branches, number of days to first flowering and 50% fruit set had positive direct effect on yield (Onyia *et al.,* 2020).

Sivasankarreddy *et al.,* (2020) observed that plant characters such as number of fruits per plant, plant height, fruit weight, number of branches per plant recorded positive and significant association with yield per plant in the genotypes. Path coefficient analysis revealed that number of fruits per plant is important yield attributing trait because of their high direct effect and indirectly influencing number of branches per plant is another most important yield attributing trait.

Similar significant relationships of between physicomorphic and biochemical characters of plant with fruit yield were reported by Doshi *et al*., (1998) for total phenol content; Mohanty (1999) for plant height and number of fruits per plant; Jansirani (2000) for plant height, number of branches per plant, number of fruits per plant, fruit weight, calyx length and fruit girth; Ananthalakshmi (2001) for plant height, number of branches per plant, fruit weight, and fruits per plant; Singh and Singh (2001) for fruit number per plant; Asati *et al.,* (2002) for number of primary branches per plant, percentage of long-styled flowers, number of fruits per plant, number of secondary branches per plant, percentage of medium-styled flowers and plant spread; Sarnaik *et al.,* (2010) for number of fruits per plant, fruit length, plant height, plant spread and number of primary branches.

The present findings are more or less corroborating with the above reports. However, the set of genotypes used were different from that used in the study. It was found in the present study that among the sixty genotypes of brinjal, IC 136061 recorded with higher fruit yield per plan towing to the characters like high trichome density on shoot and leaf, calyx length, high quantity of phenol, peroxidase, PAL in shoot and fruit which contributed to show moderately resistance response against shoot and fruit borer.

Identification of elite brinjal genotypes enables the plant breeder to develop improved varieties which perform well against shoot and fruit borer with promised yield. Hence the brinjal geno type IC 136061 identified as an elite brinjal genotype can be incorporated in crop improvement programme in future investigations on nutritional and cooking quality aspects to transform the genotype as an improved variety for commercial cultivation.

Conflict of Interest. Nil.

REFERENCES

Ananthalakshmi, A. (2001). Genetic studies of yield and quality parameters in eggplant (*Solanum melongena*). M. Sc. (Hort) thesis. Tamil Nadu Agricultural University, Coimbatore.

Anonymous (2017). Annual report of National Horticulture Board, New Delhi.

Asati, B. S., Sarnaik, D. A., Thakur, B. S., & Guhey, A. (2002). Shoot and fruit borer incidence as influenced by total phenol and total chlorophyll content in round fruited brinjal varieties. *Orissa Journal of Horticulture*, *30*(2):100-104.

Bray, H. G., & Thorpe, W.V. (1954). Estimation of total phenol from plant tissues. *Methods of Biochemical Analysis*, *1*: 27-52.

Dhaliwal, G. S., & Dilawari, V. K. (1993). Advances in Host Resistance to Insects. Kalyani Publishers, India, 443p.

Dickerson, D. P., Pascholati, S. F., Hagerman, A. E., Butler, L. G., & Nicholson, R. L. (1984). Phenylalanine ammonia lyase and hydroxycinnamate: CoA ligase in maize mesocotyls inoculated with *Helminthosporium maydis* or *Helminthosporium carbonum*. *Physiological Plant Pathology*, *25*:111-123.

Doshi, K. M., Bhalala, K. B., & Kathiria (1998). Correlation and path analysis for yield, fruit borer infestation, little leaf incidence and quality traits in Brinjal (*Solanum melongena* L.). *Capsicum and Eggplant News letter*, *17*: 84-87.

Jansirani, P. (2000). Studies on heterosis and combining ability in brinjal (*Solanum melongena* L.) Ph. D (Hort.) thesis. TNAU, Coimbatore.

Johnson, W. W., Robinson, H. F., & Comstock, R. E. (1955).Genotypic and phenotypic correlation in soybeans and their implications in selection. *Agronomy Journal*, *47*: 477-482.

Kalawate, A., & Dethe, M. D. (2012). Bioefficacy study of biorational insecticide on brinjal. *Journal of Biopesticides*, *5*(1): 75-80.

Mohanty, B. K. (1999). Genetic variability and character association and path analysis in brinjal. *Progressive. Horticulture*, *31*: 59-63.

Nirmala, N., & Vethamoni, P. (2016). Biophysical and biochemical characteristics of green fruited brinjal genotypes for resistance to shoot and fruit borer (*Leucinodes orbonalis* Guenee). *Electronic Journal of Plant Breeding*, *7*(2): 325-331.

Onyia, V. N., Chukwudi, U. P., Ezea, A. C., Atugwu, A. I., & Ene, C. O. (2020). Correlation and path coefficient analyses of yieldand yield components of eggplant (*Solanum melongena*) in a coarse-textured ultisol. *Information Processing in Agriculture, 7*: 173-181.

Panda, N., & Khush, G. S. (1995). Host plant Resistance to Insects IRRI-CABI, 431p.

Patil, S. V., Gangaprasad, S., & Dushyantha Kumar, B. M. (2020). Correlation studies and path analysis for yield and attributing characters in brinjal (*Solanum melongena* L.). *International Journal of Current Microbiology and Applied Sciences*, *9*(2): 619-625.

Praneetha, S., Rajashree, V., & Pugalendhi, L. (2011). Association of characters on yield and shoot and fruit borer resistance in brinjal (*Solanum melongena* L.). *Electronic Journal of Plant Breeding*, *2*(4): 574-577.

Sadasivam, S., & Macickam, A. (1992). Biochemical methods (Second edition). New Age International (P) Limited Publishers, New Delhi and TNAU, Coimbatore, India, 256p.

Sasikala, K., Rao P. A., & Krishnayya P. V. (1999). Comparative efficacy of eco-friendly methods involving egg parasitoid, *Trichogramma japonicum*, mechanical control and safe chemicals against *Leucinodes orbonalis* Guenee infesting brinjal. *Journal of Entomological Research*, *23*(4): 369-372.

Sarnaik, D. A., Verma, S. K., & Verma, D.P. (2010). Correlation studies in brinjal (*Solanum melongena* L.). *Advances in Horticulture and Forestry*, *7*: 91-94.

Schimidt, H. R., Nuckles, E. M., & Kuc, J. (1982). Association of enhanced peroxidase activity with induced systemic resistance of cucumber to *Colletotrichum lagenarium*. *Physiological Plant Pathology*, *20*(1): 73-82.

Senapati, A. K., & Senapati, B. K. (2006). Character association in relation to infestation by shoot and fruit borer (*Leucinodes orbonalis* Guenee) in brinjal (*Solanum melongena* L.). *Indian Journal of Agricultural Research*, *40*(1): 68-71.

Singh, A. K., & Singh, A. (2001). Correlation and path coefficient analysis of some quantitative traits in brinjal (*Solanum melongena* L.). *Crop Research*, *22*: 499-502.

Sivasankarreddy, K., Sarmah, P., Sarma, D., Barua, P., & Gogoi, S. (2020). Correlation and path coefficient analysis of yield related traits in F3 populations of brinjal from Intra-specific hybridization. *Current Journal of Applied Science and Technology*, *39*(10): 58-67.

Snedecor, G. W., & Cochran, C. W. G. (1967). Statistical methods. The Iowa State University Press, IOWA, U.S.A.

Srivastava, S., Saidaiah, P., Shivraj, N., & Ravinder Reddy, K. (2018). Correlation and path analysis studies of yield and yield components in brinjal (*Solanum melongena* L.). *Journal of Pharmacognosy and Phytochemistry*, *7*(6): 1910-1914.

Thangamani, C., & Jansirani, P. (2012). Correlation and path coefficient analysis studies on yield and attributing characters in brinjal (*Solanum melongena* L.). *Electronic Journal of Plant Breeding*, *3*(3): 939-944.

Tripathy, B., Dhananjay, S., Jitendra Singh, & Sunil Kumar, N. (2018). Correlation and path analysis studies of yield and yield components in brinjal (*Solanum melongena* L.). *Indian Journal of Pure and Applied Biosciences*, *6* (1): 1266-1270.

Wright, S. (1921). Correlation and causation. *Journal of Agricultural Research*, *20*: 557-585.

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