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Correlation studies in brinjal (*Solanum melongena* L.)

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ABSTRACT

Brinjal is the most important vegetable crop in India, which is mostly suffered due to heavy damage of shoot and fruit borer infestation. An attempt was made to investigate correlation between physical and chemical characters with percentage infestation of shoot and fruit borer in brinjal. The correlation studies with various physical character revealed that the per cent infested fruits had significant positive correlation with per cent infested fruit weight, total fruit weight, fruit length, calyx length and fruit grith. The per cent infested shoots had significant positive correlation with shoot thickness. The per cent fruit infestation had significant positive correlation with total sugars, potassium whereas significant negative correlation with total phenols, copper, manganese, calcium and ash. The per cent shoot infestation had significant positive correlation with phosphorus, iron, copper, magnesium, calcium, crude fibre, ash and silica.

Key words : Brinjal, Correlation, Shoot and fruit borer

INTRODUCTION

Brinjal (*Solanum melongena* L.) is one of the most popular vegetable crop cultivated throughout the warmer regions of the world. A breeding programme to be initiated for yield and other characters requires information on the nature and magnitude of variation in available material and knowledge for association of the various plant characters with yield and among themselves so that a rational choice of characters for selection can be exercised. An exclusively self-pollinated vegetable is improved by selection. Efficiency of selection in any breeding programme mainly depends on the knowledge for association of characters. The correlations among the various characters are important for three reasons, first, in connection with the changes brought about the selection which is important to know how the improvement of one character causes simultaneous changes in other characters. Second, in connection with natural selection and third in connection with the genetic cause of correlation (Falconer, 1960).

MATERIALS AND METHODS

The field experiment was conducted during *kharif* season of 2003 in the Department of Horticulture, Mahatma Phule Krishi Vidyapeeth, Rahuri. The experimental material comprised of a cross Ruchira x *Solanum incanum*, having six generations (P_1, P_2, F_1, F_2, BC_1 and BC_2). The experiment was laid out in a randomized block design with three replications. All recommended cultural practices were followed to ensure good crop stand. Five competitive plants from each parent and F_1, 20 plants from F_2 and 10 plants from BC_1 and BC_2 in each of the replication were selected randomly for recording observations for 13 physical characters on shoot and fruit borer infestation, and different quantitative characters (Table 1). The chemical parameters *viz.*, total sugars, total phenols, N, P, K, Fe, Cu, Zn, Mn, calcium, crude fibre, ash and silica of fruits (Table 2) and except sugars and phenols, all other parameters of shoots (Table 3) were determined according to the standard by A.O.A.C. (1975) procedures. The estimates of correlation was done according to the method given by Panse (1957).

Physical and biochemical constituents of the plants are known to impart resistance against pest and diseases. An attempt was made to investigate the correlation between the physical characters of plants and chemical characters of fruits and shoots with percentage infestation of shoot and fruit borer in brinjal.

RESULTS AND DISCUSSION

Correlation analysis of infested fruits with physical characters of cross Ruchira x *Solanum incanum* was depicted in Table 1. The correlation analysis of infested fruits with chemical characters was shown in Table 2 and that of infested shoots with chemical characters in Table 3.

The per cent infested fruits had significant positive correlation with per cent infested fruit weight, total fruit weight, fruit length, calyx length and fruit girth whereas negative but non-significant correlation with fruit skin thickness. The per cent infested shoots had significant positive correlation with shoot thickness and non-significant positive correlation with total shoots (Table 1).

Thickness of fruit skin played an important role in resistance reaction. Thick peel restricts the entry of caterpillar in the resistant genotypes as has been reported

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Table 1 : Correlation analysis of infested fruits with physical characters of cross C_3 (Ruchira x *S. incanum*)

Character	% infested fruits	% infested shoots	% infested fruit weight	Total shoots	Total fruits	Total fruit weight	Fruit length	Pedicel length	Calyx length	Fruit girth	Shoot thickness	Fruit skin thick-ness	Seeds per fruit
% infested fruits	1.000	0.493*	0.924**	0.174	-0.041	0.728**	0.629**	0.344	0.685**	0.426*	0.519**	-0.148	0.325
% infested shoots		1.000	0.498*	0.319	-0.694**	0.415*	0.674**	0.732**	0.621**	0.753**	0.700**	-0.627**	0.597**
% infested fruit weight			1.000	0.231	-0.027	0.642**	0.609**	0.258	0.727**	0.378	0.536**	-0.148	0.340
Total shoots				1.000	0.225	0.528**	0.598**	0.493*	0.666**	0.697**	0.706**	-0.387	0.765**
Total fruits					1.000	0.043	-0.467*	-0.473*	-0.304	-0.561**	-0.561**	0.349	-0.597**
Total fruit weight						1.000	0.656**	0.501*	0.735**	0.661**	0.534**	-0.320	0.568**
Fruit length							1.000	0.671**	0.833**	0.864**	0.834**	-0.537**	0.795**
Pedicel length								1.000	0.604**	0.822**	0.593**	-0.764**	0.672**
Calyx length									1.000	0.806**	0.806**	-0.378	0.790**
Fruit girth										1.000	0.825**	-0.611**	0.899**
Shoot thickness											1.000	-0.424*	0.836**
Fruit skin thickness												1.000	-0.478*
Seeds / fruit													1.000

* and ** indicates significant of values at P=0.05 and 0.10, respectively.

Table 2 : Correlation analysis of infested fruits with chemical characters of fruits of cross C_3 (Ruchira x *S. incanum*)

Character	% infested fruits	Total sugars	Total phenols	Nitrogen	Phosphorus	Potassium	Fe	Cu	Zn	Mn	Calcium	Crude fibre	Ash	Silica
% infested fruit	1.000	0.560**	-0.543**	0.151	-0.259	0.470*	-0.399	-0.601**	0.394	-0.651**	-0.435*	-0.336	-0.611**	-0.312
Total sugars		1.000	-0.848**	0.754**	-0.670**	0.835**	-0.815**	-0.905**	0.886**	-0.877**	-0.863**	-0.694**	-0.837**	-0.702**
Total phenols			1.000	-0.609**	0.817**	-0.722**	0.815**	0.902**	-0.867**	0.803**	0.825**	0.743**	0.768**	0.706**
Nitrogen				1.000	-0.451*	0.714**	-0.595**	-0.620**	0.694**	-0.547**	-0.627**	-0.368	-0.510**	-0.601**
Phosphorus					1.000	-0.452**	0.664**	0.790**	-0.708**	0.483*	0.636**	0.598**	0.568**	0.677**
Potassium						1.000	-0.791**	-0.763**	0.885**	-0.823**	-0.846**	-0.481*	-0.858**	-0.728**
Fe							1.000	0.870**	-0.898**	0.789**	0.893**	0.657**	0.841**	0.692**
Cu								1.000	-0.914**	0.815**	0.850**	0.666**	0.847**	0.807**
Zn									1.000	-0.817**	-0.915**	-0.707**	-0.845**	-0.871**
Mn										1.000	0.853**	0.743**	0.855**	0.586**
Calcium											1.000	0.779**	0.940**	0.713**
Crude fibre												1.000	0.637**	0.489*
Ash													1.000	0.654**
Silica														1.000

* and ** indicates significant of values at P=0.05 and 0.01, respectively.

by Darekar *et al*. (1991), similar to the present study.

The per cent fruit infestation had significant positive correlation with total sugars, potassium whereas significant negative correlation with total phenols, copper, manganese, calcium and ash (Table 2) whereas non-significant but positive correlation with nitrogen and zinc; negative correlation with phosphorus, iron, crude fibre and silica. The per cent shoot infestation had significant positive correlation with potassium, zinc whereas significant negative correlation with phosphorus, iron, copper, manganese, calcium, crude fibre, ash and silica (Table 3).

Higher total sugars contributed significantly to higher shoot and fruit borer infestation. Panda and Das (1975), Darekar *et al*. (1991) reported lower content of total sugars in resistant varieties. In resistant parents higher ash, crude fibre and silica was observed was also reported by Panda and Das (1975). High amount of phenols was observed in resistant parents and their backcrosses were also reported by Raju *et al.* (1987) and phenols may be responsible for resistance was also

Table 3 : Correlation analysis of infested shoots with chemical characters of shoots of cross C_3 (Ruchira x *S. incanum*)

Character	% infested shoots	Nitrogen	Phosphorus	Potassium	Fe	Cu	Zn	Mn	Calcium	Crude fibre	Ash	Silica
% infested shoots	1.000	0.155	-0.726**	0.771**	-0.818**	-0.872**	0.893**	-0.729**	-0.834**	-0.699**	-0.847**	-0.802**
Nitrogen		1.000	0.207	-0.121	-0.195	-0.013	0.346	0.284	-0.171	-0.062	-0.025	-0.031
Phosphorus			1.000	-0.925**	0.815**	0.777**	-0.774**	0.958**	0.808**	0.677**	0.771**	0.861**
Potassium				1.000	-0.820**	-0.838**	0.825**	-0.939**	-0.908**	-0.756**	-0.851**	-0.915**
Fe					1.000	0.910**	-0.932**	0.758**	0.928**	0.745**	0.878**	0.938**
Cu						1.000	-0.883**	0.753**	0.903**	0.729**	0.900**	0.919**
Zn							1.000	-0.728**	-0.921**	-0.796**	-0.881**	-0.915**
Mn								1.000	0.785**	0.744**	0.768**	0.853**
Calcium									1.000	0.752**	0.909**	0.930**
Crude fibre										1.000	0.959**	0.879**
Ash											1.000	0.932**
Silica												1.000

* and ** indicates significant of values at P=0.05 and 0.01, respectively

reported by Bajaj *et al*. (1989).

Breeding for pest resistance contributing to the maintenance and stability of yield and quality of brinjal. The shoot and fruit borer was a major pest causing heavy losses in brinjal cultivation. For this purpose, the resistant/ tolerant genotypes should be identified and would be incorporated in breeding programme. The resistant genotypes had more number of fruits per plant, thicker fruit skin, small fruit shape, less fruit girth, late fruiting and less shoot thickness as compared to susceptible genotypes. The resistant genotypes had lower total sugars, nitrogen, potassium and zinc while higher total phenols, iron, calcium, crude fibre, ash and silica in their fruits and shoots. These parameters should be considered while implementing resistant breeding programme in brinjal for shoot and fruit borer, as these parameters may be responsible for resistance in brinjal for shoot and fruit borer infestation.

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