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Correlation study of shoot and fruit borer infestation with morphologiocal traits of okra genotypes

Remi Kumari and Anshuman Tiwari

Abstract
The correlation study was carried out in fifteen diverse genotypes of okra for shoot and fruit borer infestation and its component traits. The study revealed that shoot infestation showed positive significant correlation with fruit diameter and significant negative correlation with number of fruits per plant and fruit length. The fruit infestation based on number showed positive significant correlation with fruit diameter and significant negative correlation with number of fruits per plant and fruit length. The fruit infestation based on weight showed positive significant correlation with fruit diameter and significant negative correlation with number of fruits per plant and fruit length. Hence selection of genotypes with more fruit diameter and short fruit length will help to minimize the shoot and fruit borer infestation.

Keywords: Correlation, fruit, infestation, okra and shoot

Introduction
Okra (*Abelmoschus esculentus* L. Moench), also known as lady's finger or bhindi, belongs to family Malvaceae and is an important crop grown throughout the year. Besides India, it is grown in many tropical and subtropical parts of the world. The tender fruits are used as vegetables or in culinary preparations as sliced and dried pieces. The roots and stems of okra are used for cleaning cane juice [3]. Matured fruits and stems containing crude fiber are used in paper industry. It contains proteins, carbohydrates and vitamin-C [4].

One of the important limiting factors in the cultivation of okra is its insect pests. The crop is attacked by a variety of pests throughout its growth stages. Amongst them, okra shoot and fruit borer is of much significance and causes extensive damage to fruits. Shoot and fruit borer, *Earias vitella* is a major pest of okra. In *Earias* there are two major species *viz.*, *Earias insulana* Boisd and *Earias vitella* (Fabricius) and both occur in Karnataka, South India [8]. The fruit borers cause severe damage to the crop leading to yield losses to an extent of 3.5-90% in Andhra Pradesh [7] and upto 69% in Madhya Pradesh [9]. Most of the present day okra hybrids/cultivars are susceptible to the fruit borers [5].

Yield enhancement is the major breeding objective in breeding programmes and knowledge on the nature and magnitude of the genetic variation governing the inheritance of quantitative characters like yield and its components is essential for effective genetic improvement. Ultimately, study of association between shoot and fruit infestation with morphological traits could help the breeder to design his selection strategies to improve yield. So the present study was undertaken to understand the association among pest infestation and its component characters through correlation analysis in some okra varieties.

Materials and Methods
The present investigations comprises 15 okra varieties viz. 326-10-1, 633-7-1, IC – 140206, IC-282280, 303- 10- 1, 461-10-1, IC- 43742, 419-10-1, 599-8-1, IPM-20-16-39, VRO – 22, IC- 288892, 304-10-1,100-10-1 and 231- 10-1 against shoot and fruit borer *Earias vitella* (Guen.).

The experiment were conducted during the *kharif* season of 2016-2017 in the experimental field of Department of Entomology, College of Agriculture, Gwalior (M.P.) in RBD with 3 replications and recommended fertilizer dose applied. The experimental area is having uniform topography, gentle slope and adequate drainage.

The observations were recorded for pest infestation (both shoot and fruit) with seven morphological traits viz. plant height, number of branches per plant, number of fruit per plant, number of leaves per plant, leaf length, fruit length and fruit diameter. The data were used for statistical analysis following appropriate computer based statistical software (OPSTAT) for the estimation of correlation. The correlation coefficients were estimated as suggested by Al-Jibouri [1].

Results

Association of shoot infestation (60 DAS) with morphological characters (60 DAS and 90 DAS):

The shoot infestation at 60 DAS showed positive significant correlation with fruit diameter at 60 DAS (0.956) and there was significant negative correlation with number of fruits per plant (-0.927) and fruit length (-0.969). The shoot infestation at 60 DAS showed positive significant correlation with fruit diameter at 90 DAS (0.912) and significant negative correlation with number of fruits per plant (-0.861) and fruit length (-0.976) as shown in table.1.

Association of shoot infestation (90 DAS) with morphological characters (60 DAS and 90 DAS)

The shoot infestation at 90 DAS showed positive significant correlation with fruit diameter at 60DAS (0.985) and significant negative correlation with number of fruits per plant (-0.970) and fruit length (-0.992). The shoot infestation at 90 DAS showed positive significant correlation with fruit diameter at 90DAS (0.954) and significant negative correlation with number of fruits per plant (-0.913) and fruit length (-0.997) as shown in table.1.

Association of fruit infestation (47 DAS) with morphological characters (60 DAS and 90 DAS)

The fruit infestation at 47 DAS showed positive significant correlation with fruit diameter at 60 DAS (0.957) and significant negative correlation with number of fruits per plant (-0.928) and fruit length (-0.974). The fruit infestation at 47 DAS showed positive significant correlation with fruit diameter at 90DAS (0.914) and significant negative correlation with number of fruits per plant (-0.859) and fruit length (-0.985) as shown in table.2.

Association of fruit infestation (54 DAS) with morphological characters (60 DAS and 90 DAS)

The fruit infestation at 54 DAS showed positive significant correlation with fruit diameter at 60 DAS (0.967) however it showed significant negative correlation with number of fruits per plant (-0.982) and fruit length (-0.940). The fruit infestation at 54 DAS showed positive significant correlation with fruit diameter at 90DAS (0.958) and significant negative correlation with number of fruits per plant (-0.991) and fruit length (-0.942) as shown in table.2.

Table 1: Correlation coefficient of morphological characters in different genotypes of okra with shoot infestation

S. No.	Morphological Characters	DAS	Correlation coefficient	
			Shoot infestation	
			60 DAS	90 DAS
1	Plant height (cm)	60	-0.428	-0.393
		90	-0.454	-0.423
2	Number of branches / plant	60	0.032	-0.011
		90	0.085	0.037
3	Number of leaves/plant	60	0.180	0.135
		90	0.008	-0.037
4	Leaf length (cm)	60	-0.317	-0.303
		90	-0.266	-0.247
5	Number of fruits/plant	60	-0.927**	-0.970**
		90	-0.861**	-0.913**
6	Fruit length (cm)	60	-0.969**	-0.992**
		90	-0.976**	-0.997**
7	Fruit diameter (cm)	60	0.956**	0.985**
		90	0.912**	0.954**

Association of fruit infestation (61 DAS) with morphological characters (60DAS and 90 DAS)

The fruit infestation at 61 DAS showed positive significant correlation with fruit diameter at 60 DAS (0.974) and significant negative correlation with number of fruits per plant (-0.989) and fruit length (-0.961). The fruit infestation at 61 DAS showed positive significant correlation with fruit diameter at 90DAS (0.981) and significant negative correlation with number of fruits per plant (-0.978) and fruit length (-0.956).

Association of fruit infestation (68 DAS) with morphological characters (60 DAS and 90 DAS

The fruit infestation at 68 DAS showed positive significant correlation with fruit diameter at 60 DAS (0.980) and significant negative correlation with number of fruits per plant (-0.974) and fruit length (-0.983). The fruit infestation at 68 DAS showed positive significant correlation with fruit diameter at 90 DAS (0.959) and significant negative correlation with number of fruits per plant (-0.931) and fruit length (-0.981).

Association of fruit infestation based on weight (47 DAS, 54 DAS, 61 DAS and 68 DAS) with morphological characters (60 DAS and 90 DAS)

The fruit infestation based on weight of different date showed positive significant correlation with fruit diameter at 60 DAS (0.970) and significant negative correlation with number of fruits per plant (-0.972) and fruit length (-0.964). The fruit infestation based on weight of different date showed positive significant correlation with fruit diameter at 90 DAS (0.937) and significant negative correlation with number of fruits per plant (-0.945) and fruit length (-0.977).

Table 2: Correlation coefficient of morphological characters in different genotypes of okra with fruit infestation on number & weight basis

Morphological Characters	DAS	Correlation coefficient				
		Fruit infestation at 47 DAS	Fruit infestation at 54 DAS	Fruit infestation at 61 DAS	Fruit infestation at 68 DAS	Fruit infestation (average)
Plant height (cm)	60	-0.388	-0.420	-0.436	-0.432	-0.334
	90	-0.414	-0.473	-0.491	-0.466	-0.368
No of branches /plant	60	0.045	-0.112	-0.107	-0.019	-0.080
	90	0.093	-0.084	-0.071	0.015	-0.042
Number of leaves/plant	60	0.194	0.013	0.021	0.114	0.057
	90	0.023	-0.148	-0.146	-0.052	0.111
Leaf length (cm)	60	-0.294	-0.313	-0.298	-0.333	-0.239

	90	-0.240	-0.256	-0.245	-0.295	-0.175
Number of fruits/plant	60	-0.928**	-0.982**	-0.989**	-0.974**	-0.972**
	90	-0.859**	-0.991**	-0.978**	-0.931**	-0.945**
Fruit length (cm)	60	-0.974**	-0.940**	-0.961**	-0.983**	-0.964**
	90	-0.985**	-0.942**	-0.956**	-0.981**	-0.977**
Fruit diameter (cm)	60	0.957**	0.967**	0.974**	0.980**	0.970**
	90	0.914**	0.958**	0.981**	0.959**	0.937**

Discussion

Data revealed that shoot infestation showed positive significant correlation with fruit diameter and significant negative correlation with number of fruits per plant and fruit length. The present findings corroborate with [2] who revealed that fruit length and fruit infestation had negative correlation with shoot infestation and suggested that selection of genotypes with reduced growth habit and minimum fruit length will help to minimize the shoot and fruit borer infestation. Therefore, it can be concluded that selecting genotypes with less fruit diameter, more number of fruit per plants and more fruits length are preferable to reduce shoot borer infestation.

The fruit infestation based on number showed positive significant correlation with fruit diameter and significant negative correlation with number of fruits per plant and fruit length. Thus, it can be concluded that selecting genotypes with less fruit diameter, more number of fruit per plants and more fruits length are preferable to reduce fruit borer infestation on number basis. The fruit infestation based on weight showed positive significant correlation with fruit diameter and significant negative correlation with number of fruits per plant and fruit length. During present investigation with borer incidence showed positive significant correlation with fruit diameter and significant negative correlation with number of fruits per plant and fruit length. Halder *et al.* 2015 [6] also reported fruit length, diameter and fruit weight showed positive correlation with borer incidence which collaboration present findings. Thus, in order to minimize fruit infestation the genotype should possess less fruit diameter and more number of fruit per plant and fruit length.

Conclusion

It is concluded from the present findings that shoot infestation showed positive significant correlation with fruit diameter and significant negative correlation with number of fruits per plant and fruit length. Therefore, selecting genotypes with greater number of fruit per plants and short fruits are preferable to reduce shoot borer infestation. The fruit infestation based on number showed positive significant correlation with fruit diameter and significant negative correlation with number of fruits per plant and fruit length. The fruit infestation based on weight showed positive significant correlation with fruit diameter and significant negative correlation with number of fruits per plant and fruit length. Thus, the genotype possesses less fruit diameter and more fruit length must be selected to minimize fruit infestation.

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