Screening of Different Varieties of Okra (*Abelmoschus esculentus* L.) against Sucking Insect Pests

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Abstract: The screening of different varieties is one of the key strategies used in Integrated Pest Management to control the insect population and to escape the use of synthetic insecticides. This study was aimed to screen different okra varieties against sucking insect pest complex such as thrip, jassid, aphid, whitefly and mealybug. The experiment was conducted at Agriculture Research Institute Tandojam. The varieties such as Rama Krishna, Silky-460 and Bharat Kawairi were cultivated in RCBD layout and each treatment was replicated five times. The results revealed that the most infested variety was Bharat Kaiwari followed by Silky-460 and Rama Krishna throughout the experimental period. The highest mean population of the sucking insect pests (thrip, jassid, aphid, whitefly and mealybug) was 9.61±0.35, 3.22±0.13, 18.33±0.50, 3.25±0.15 and 3.75±0.19 respectively was observed on Bharat Kaiwari and the lowered on Rama Krishna. However, the attack of aphid was prominent on all okra varieties and overall pest attack was higher in the month of June. Similarly, the co-efficient correlation analysis showed a positive relationship of temperature and humidity (r= 0.012; r = 0.128) with thrip population whereas there was a negative relationship between temperature and humidity with remaining sucking pests. Both jassid and mealybug population indicated a significant difference with temperature. Similarly, relative humidity displayed a significant impact on population of mealybug (r = 0.365) and aphid (r = -0.096). Thus, it could be concluded based on the results that Rama Krishna is the most resistance against sucking insect pests as compared to Silky-460 and Bharat Kaiwairi.

Keywords: Okra, Sucking pests, Varieties, Population.

INTRODUCTION

The fruit of *Abelmoschus esculentus* (L.) Moench in its immature stage is known as okra and commonly named as lady finger. The crop is widely used as a food vegetable in Asia, Africa and South-America [1]. Similarly, it is an important vegetable and one of the favourites dish eaten in daily life in Pakistan. The fruit of okra comprises of water, calcium, iron, protein and starch. It is a great source of vitamin A and B, Calcium and also contains minerals, phosphorus, iodine and salts [2]. Besides, use of okra is also helpful to cure some acute diseases like genito-urinary disorders, hemorrhoids, spermatorrhoea and chronic dysentery [3].

The okra plant is infested by a large number of insect pests and particularly in sucking complex whitefly *Bemisia tabaci*, thrip *Thrips tabaci,* jassid *Amrasca devastans*, aphid *Aphis gossypii* and leaf hopper *Amrasca biguttula biguttula* are more deleterious insect pests [4,5]. These insect pests are involved in creating multiple problems for the crop by direct sucking the sap from the leaves and indirectly involving in transmission of yellow vein mosaic virus [6]. Both nymphal and adult stages are equally responsible for severe damage [7].

These insect pests of okra are generally managed by using different synthetic insecticides and the continuous use of these pesticides at large scale created problems like pest resistance, resurgence, pesticides residues, destruction of beneficial fauna and environmental pollution [8]. Therefore, an alternative method by introducing or determining the use of resistant varieties that may contain different chemical substances to detoxify these insect's attack will be one of main component to be added in IPM as an environmental friendly pest management approaches.

MATERIALS AND METHODS

The experiment was conducted at Entomology Section, Agriculture Research Institute Tandojam in 2016. Three varieties including Silky-460, Rama Krishna and Bharat Kawairi were sown in Plot of 20x20 square meters. The seeds were sown on ridges at the distance of 8"- 10" between plants and 1.0' between rows. The agronomical practices such as irrigation, fertilizer, hoeing, weeding and thinning were applied as

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ISSN: 1814-8085 / E-ISSN: 1927-5129/17

Table 1: Mean Weekly Population of Sucking Pests (Thrips, Jassid, Whitefly, Aphid and Mealybug) on Different Varieties of Okra

Months	Weeks	Thrips			Jassid			Aphid			Whitefly				Mealyug			
		Silky-460	R. Kirshana	B. Kaiwari	Silky-460	R. Kirshana	B. Kaiwari	Silky-460	R. Kirshana	B. Kaiwari	Silky-460	R. Kirshana	B. Kaiwari	Silky-460	R. Kirshana	B. Kaiwari	Temperature ^{0}C	Relative Humidity %
May	1	2.67	1.47	3.13	0.93	0.73	1.47	5.47	4.40	6.07	0.93	0.67	0.93	0.87	0.40	0.73	35.50	50
	2	4.33	1.80	5.07	1.53	1.33	2.80	13.27	11.13	15.33	1.40	0.93	2.13	1.53	1.00	1.93	33.50	52
	3	6.87	2.07	8.07	2.47	2.20	2.47	15.60	13.60	21.87	2.87	1.73	4.13	2.6	1.67	3.47	32.50	53
	4	8.93	3.80	9.33	3.33	2.33	3.13	15.60	17.67	21.53	2.40	1.87	2.73	3.53	2.07	3.53	34.50	55
June	5	12.47	4.13	14.80	3.40	2.93	4.33	24.40	20.87	28.20	3.27	2.53	5.07	4.07	2.60	5.20	32.25	60
	6	12.4	4.07	15.07	3.60	3.13	5.33	23.87	21.67	26.60	3.47	2.87	4.87	4.93	2.93	6.60	32.75	51
	7	14.33	4.40	18.13	4.13	3.60	6.47	19.87	17.67	23.33	4.00	3.40	6.20	6.00	3.80	7.40	33.50	56
	8	13.07	4.13	16.87	2.47	2.07	3.80	14.33	13.07	17.53	2.80	2.20	3.47	7.20	5.93	10.67	32.75	63
July	9	7.60	3.47	10.53	1.53	0.93	2.20	13.87	11.60	17.20	1.73	1.13	2.87	6.13	4.20	7.07	31.75	66
	10	4.67	2.80	5.80	1.07	0.80	2.53	13.00	8.67	15.20	1.53	0.87	2.80	3.13	2.60	4.33	31.00	63
	11	3.53	2.27	4.93	0.93	0.67	2.07	11.73	6.53	13.87	0.93	0.60	2.60	2.93	2.20	3.87	32.00	60
	12	2.20	1.87	3.53	0.60	0.40	2.07	12.00	4.67	13.20	0.87	0.33	1.20	2.13	1.40	2.80	31.75	61
		7.76± 0.37^a	3.02± 0.39^b	9.61± 0.35^c	2.17± 0.13^a	1.76± 0.13^a	3.22± 0.13^b	15.25± 0.45^a	12.63± 0.47^b	18.33± 0.50^c	2.18± 0.11^a	1.59± 0.09^b	3.25± 0.15^c	3.76± 0.19^a	2.57± 0.14^b	3.75± 0.19^a		

per standard. The experiment was designed in Randomized Complete Block Design (RCBD) with three treatments. However, the numbers of 15 plants were observed randomly in each replication to know the possible population of these sucking insect pests on different selected okra varieties. These plants were observed from June to July at weekly intervals. The collected data were subjected to statistical analysis by doing analysis of variance (ANOVA) and least significant difference (LSD) at 0.05 probabilities was used to separate the means with significant differences. Furthermore, the population of insect pests were correlated with temperature and relative humidity. All the analysis was done using statistical analysis software STATX 8.1.

RESULTS

The population of sucking insect pests in all selected varieties was observed varied with significant difference (p<0.05) as mentioned in Table **1**. The highest mean population of thrips (9.61 ± 0.35), jassid (3.22 ± 0.13), aphid (18.33 ± 0.50), whitefly (3.25 ± 0.15) and mealybug (3.76 ± 0.19) was recorded on Bharat Kaiwari. Such findings showed the susceptible characters of Bharat Kaiwari variety against all sucking insect pests of okra.

However, the most abundant population of aphid as compared to other sucking insect pests was observed on all three selected varieties of okra (Figure **1**). It indicated that among pests, aphid was much overwhelming sucking pest that even attacked on most resistant variety (Bharat Kaiwari) of okra. Furthermore, the overall population of insect pests was significant different (Figure **2**) in all observed months but the higher (9.03 ± 3.2) in the month of June as compared to May (5.0 ± 2.17) and July (4.5 ± 1.9) was recorded, respectively.

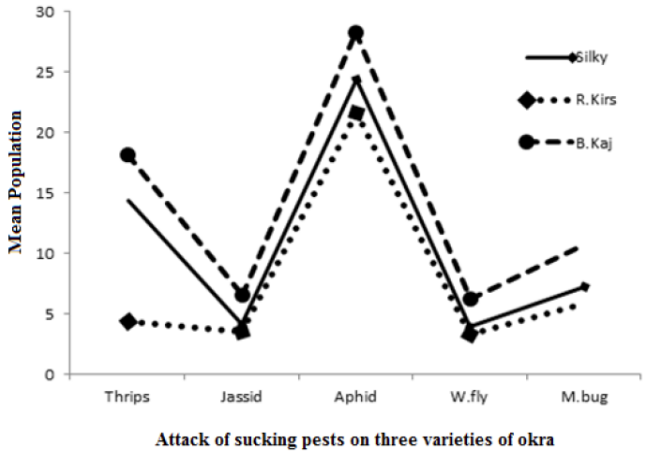

Figure 1: The mean population of sucking pests of okra on three selected varieties.

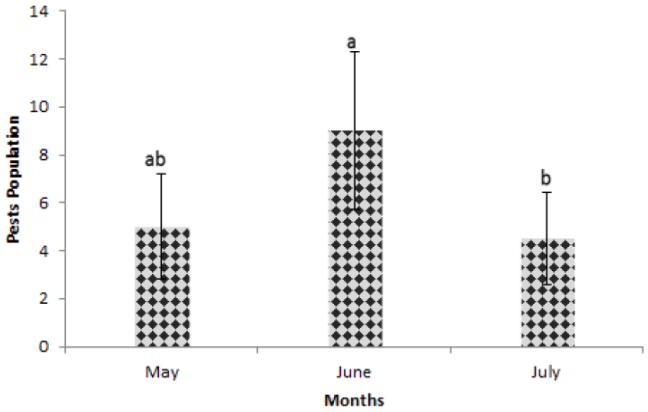

Figure 2: The monthly mean population of overall sucking insect pests of okra.

In addition, the correlation coefficient was computed to assess the relationship between temperatures recorded during period of study with different varieties of okra. In Table **2**, the results demonstrated that the only relationship between temperature and thrip was linear and positive with r value of 0.012 but with non-significant difference (p>0.05). Similarly, non-significant results of correlation coefficient were observed when correlated temperature with population of aphid and whitefly.

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However, jassid (r= - 0.09) and mealybug (r= - 0.26) population were observed significantly different (p<0.05) with negative linear relationship with temperature. Likewise, relative humidity also showed positive linear relationship with thrip and mealybug population and displayed significant (p < 0.05) effect on population of all insect pests except jassid and whitefly. Thus, all these findings indicated the effect of temperature and relative humidity on sucking insect pests of okra on different varieties illustrated number of different relationship among them.

Table 2: Correlation Coefficient (r) of Sucking Insect Pest Population with Temperature and Relative Humidity

	Thrip	Whitefly	Jassid	Mealybug	Aphid
Temp	0.012	-0.054	-0.095	-0.265	-0.032
	0.776^{NS}	0.207^{NS}	0.026^{S}	$<0.0001^{HS}$	0.449^{NS}
RH	0.128	-0.052	-0.08	0.365	-0.096
	0.002^{HS}	0.226^{NS}	0.062^{NS}	$<.0001^{HS}$	0.0242^{S}

S=Significant, HS=Highly Significant, NS=Non-Significant.

DISCUSSION

Screening of different plant varieties against insect pests is one of the popular strategies to encounter the pest attack. Moreover, the varietal resistance is an important tool to combat with different species of insect pests as each variety has a unique physiological mechanism to resists against pest infestation. Screening techniques vary in different crops and pests attacking them. Through the knowledge regarding the pest life cycle and screening techniques, the breeder can breed crop to resist against particular insect pest. This instrument of varietal resistance can minimize the use of insecticides thus decrease the chance of insecticide residues and reduce the cost of inputs for cultivation of crops.

The results of present study verify the hypothesis of the planned work that the different varieties have different resistance capacity against sucking insect pests. However, no any variety showed 100% resistance against the sucking insect pests. Throughout the study, the most susceptible variety was Bharat Kaiwari followed by Silky-460; whereas, Rama Krishna showed more resistance against sucking insect complex as compared to the other varieties tested.

This study was conducted to screen the varieties locally sown in upper Sindh. The study demonstrated that the maximum population of thirps was observed on Bharat Kaiwari followed by Silky-460 and Rama Krishna. Furthermore, the most attack was observed in the month of June however the attack of aphid was prominent on each variety. The results of present study are in accordance with Raina [9] study who concluded that okra variety Rama Krishna found to be significantly better than other varieties in being least preferred for oviposition by seed-beetles as it had a rough seed coat that is almost spiny. Furthermore, the present study also agrees with those of Sarwar and co-workers [10] who checked response of 10 okra genotypes to fruit borer *H. armigera* and sucking pests at the farm conditions. Results indicated that Rama Krishana behaved the best for holding the least borer's population and damage while Noori-786 proved sensitive and the least productive. A marked feeding behaviour of *Helicoverpa* on growing okra crop was recorded.

The present study partially agree with those of Sharma and colleagues [11] who reported that the major insect pests of okra are aphids (*Aphis gossypii*), jassid, *A. devastans* and thrip, *T. tabaci* and their management options (cultural, biological and chemical controls) are discussed. Low to moderate levels of resistance have been identified in the germplasm, and a few improved cultivars with resistance to pod borer and high grain yield have been developed. Atta ur Rehman along with associates [12] tested the Host Plant Susceptibility Indices (HPSIs) of various genotypes of okra and recorded maximum HPSI,s of Sabzpari (32%) toward leaf hopper followed by Green star and Arkaanamika (25% each) and minimum in Pusasawani (18%).

Present study demonstrated that the population of sucking insect pests is influenced by change in temperature which is in agreement with Panikar and Patel [13]. Results are also in same trend with Wahlaand co-workers [14] who stated that sometimes there in negative correlation of sucking complex with relative humidity.

CONCLUSION

It can be concluded from the results of trial that the resistance is different in each variety. The population of insect pests can be reduced with the cultivation of resistant varieties. The abiotic factors such as temperature and relative humidity can influence the incidence of pests.

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Received on 09-03-2017 Accepted on 20-03-2017 Published on 28-04-2017

https://doi.org/10.6000/1927-5129.2017.13.27