

## ROLE OF PHYSICO-MORPHIC CHARACTERS OF DIFFERENT OKRA GENOTYPES IN RELATION TO POPULATION OF JASSID, *AMRASCA BIGUTTULA* ISHIDA

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### ABSTRACT

This study was conducted in Department of Horticulture, PMAS-Arid Agriculture University, Rawalpindi, Pakistan during the year 2010 to evaluate the role of physico-morphic characters of five okra genotypes (Sharmeeli, Pusa Green, Anokhi, Arka Anamika and Sabz Pari) against jassid, *Amrasca biguttula biguttula* Ishida. The results indicated that all tested genotypes differed significantly in relation to leaf hopper population density. Same pattern was observed for morphological attributes except hair density on leaf veins. Genotype Arka Anamika had minimum population ( $1.61 \pm 0.31$  hoppers/leaf) and found comparatively more resistant to jassid's attack. In contrast, genotype Anokhi proved as highly susceptible with maximum jassid population ( $3.07 \pm 0.56$  hoppers/leaf). The leaf hopper population continuously increased from third week of June to 2<sup>nd</sup> week of July. Correlation co-efficients between population of *A. biguttula biguttula* and different physico-morphic characters of okra revealed highly significant, strong and negative correlation for hair density on lamina and fruit yield per plant while non-significant, weak and negative correlation for hair density on midrib, leaf area and dry shoot weight. The output implies the identification of resistant source against *A. biguttula biguttula* which can be exploited for plant genetic improvement and cultivation of okra crop where pest causes substantial yield losses.

KEYWORDS: *Hibiscus esculentus*; genotypes; morphological characters; Amrasca; population dynamics; Pakistan.

### INTRODUCTION

Okra (*Abelmoschus esculentus* L. Moench) is an important vegetable crop of tropics and subtropics. It is very delicious food and its immature fruit is eaten eagerly in sub-continent especially in Pakistan (1). It is an important source of vitamin A, B, C and is also rich in protein, carbohydrates, fats, minerals, iron and iodine (16). Okra is cultivated to produce edible seed pods that are differently used in particular regions of the world. These can be

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boiled and served as a salad or cut into pieces and served with soups (12). The ripe seeds of okra are some time roasted and ground as substitute of coffee (10). It is an important vegetable crop from medicinal point of view as the mucilage from its fruit and seed is used as demulcent, emollient, laxative and diuretic (22). In Pakistan, area under okra cultivation is 14996 hectares with a production of 103659 tons (4).

This crop is attacked by a large number of fungi, bacteria, viruses, nematodes, mycoplasma and insects which are responsible for tremendous reduction in its yield and quality. Ewete (7) found 72 and Hill (8) reported 48 insect pest species, that attack and damage okra which include sapsuckers, leaf eaters, fruit borers, leaf rollers, flower feeders and leaf miners. *A. biguttula biguttula* (Ishida) has attained the status of a harmful pest of many crop and ornamental plants including vegetables, from the last few years (6). It is considered as a key pest of cotton in both Punjab and Sindh provinces of Pakistan (13, 15) and also in India (11) and Bangladesh (2). The damage potential of *A. biguttula biguttula* depends on its oviposition preference and subsequent population build-up on different host plants (18). According to Sharma and Singh (17) okra was the most suitable host in terms of oviposition, nymph survival and feeding of leafhopper. The leafhopper can cause damage right from early seedling stage to fruit setting stage of the crop; resulting in 40-50 percent yield reduction (5). The main symptom of leafhopper attack is phytotoxemia (hopper burn), caused due to desapping of leaves by its nymphs and adults (9).

Chemical control of the pest has not now been desirable due to its role in destabilization of ecosystem, breaking the delicate balance between insect pests and their natural enemies and development of insecticide resistance in insect pests. Villegas *et al.* (21) suggested a clear need for alternative control measures to promote sustainable agriculture for coming generations. Host plant resistance is a major part of IPM programme that saves the crop from pest by making it less vulnerable or making the crop opposing to the pest. Hence identification of resistant and high yielding varieties of okra will be useful as resistant source for genetic improvement to get sustainable control of the pest in a convenient, economical and eco-friendly manner.

In view of these aspects five different okra varieties were evaluated against *A. biguttula biguttula* in field, to find out the role of different physico-morphic plant characters in building up jassid population.

## **MATERIALS AND METHODS**

This study was conducted in Department of Horticulture, PMAS-Arid Agriculture University, Rawalpindi, Pakistan during the year 2010. Five okra varieties (Sharmeeli, Pusa Green, Anokhi, Arka Anamika and Sabz Pari) were sown in a RCBD with three replications. Plot size was kept as 3.6 x 3m. The seeds were sown on parallel ridges. In each experimental plot, plant to plant and row to row distance was kept as 30 and 75cm, respectively. Uniform agronomic practices were adopted in all the plots.

Data regarding jassid population per leaf was recorded early in the morning from randomly selected 12 plants in each plot at weekly interval. For this purpose 12 leaves were selected from each plot in a sequence i.e first leaf from upper portion of first plant, second leaf from middle portion of second plant, third leaf from lower portion of third plant and so on. The leafhopper population per plot was calculated on per leaf basis i.e. total number of leaf hoppers dividing by the total number of leaves.

For physico-morphic characters, six leaves were selected from upper, middle and lower part of different plants from each plot and hair density on lamina (cm<sup>2</sup>), midrib (cm) and veins (cm) was counted under Labomed 6, CZ 4X Microscope. From each experimental plot, six leaves were selected from lower, middle and upper part of different plants and the leaf area was measured by using digital leaf area meter. Three fresh shoots were taken from each plot, dried in oven at 70°C for two days and their weight was measured on a digital electrical balance to see the effect of insect population on okra plants. Five plants were tagged randomly in each plot to record fruit yield and fruit was picked at three days interval and the data were recorded in grams per plant.

The data were subjected to analysis of variance using MSTATC package and the means were separated by LSD test at 5 percent level of probability. The data regarding physico-morphic plant characters were correlated with jassid population to find out their relation with leaf hopper incidence (19).

## **RESULTS AND DISCUSSION**

The data (Fig.1) revealed highly significant differences ( $F_{4, 239} = 235.36$ ;  $P = 0.000$ ) in jassid population among okra varieties. Maximum population of leaf hoppers was observed on Anokhi and minimum on Arka Anamika followed by Sabz Pari.

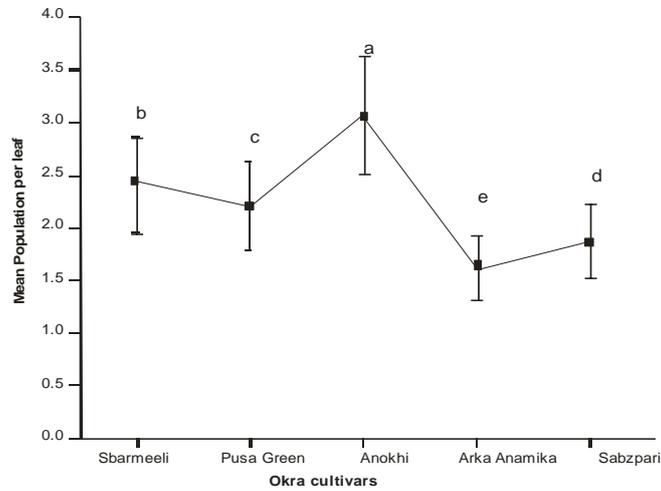


Fig. 1. Means comparison of the data regarding physico-morphic character of different cultivars of okra.

These results confirm the findings of Kumar and Singh (11) who reported minimum leafhopper population and leaf injury in variety Arka Anamika. Similarly Anitha and Nandihalli (3) evaluated seven okra hybrids and found Arka Anamika as the least preferred for insect to establish its population.

Highly significant differences were also found in jassid population on different dates ( $F_{15, 239} = 2022.91$ ;  $P = 0.000$ ). Jassid population was  $0.43 \pm 0.05$  per leaf on 10.04.2010 which slightly decreased next week and then it started to increase and reached to first peak on 29.05.2010 (Fig. 2).

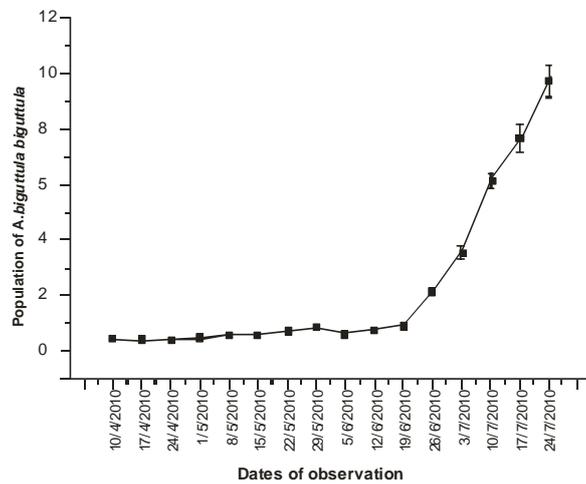


Fig. 2 Mean population of *A. biguttula biguttula* on okra on different dates of observation during 2010.

This population decreased to 0.60±0.53 on 05.06.2010 and then it showed increasing trend till 24.07.2010 and reached to 9.71±0.58 hoppers per leaf.

The data regarding physico-morphic plant characters (Table 1) revealed highly significant difference among okra genotypes for hair density on leaf

**Table 1. Means comparison of data regarding physico-morphic characters of different cultivars of okra.**

Varieties	Hair density on lamina (cm <sup>2</sup> )	Hair density on midrib (cm)	Hair density on vein (cm)	Leaf area (cm <sup>2</sup> )	Yield/plant (g)	Dry shoot weight (g)
Sharmeeli	30.33±0.33b	11.33±0.38b	22.33±1.07ab	33.01±2.52b	20.31±0.57c	71.7±2.18a
Pusa Green	35.11±0.22a	18.44±0.48a	19.78±0.80b	41.87±1.21a	14.44±0.71d	50.7±2.09cd
Anokhi	26.22±1.16c	11.67±0.00b	23.33±0.19ab	44.02±1.69a	11.26±0.24e	49.30±1.86d
Arka Anamika	35.33±1.68a	11.22±1.06b	18.89±4.64b	40.80±0.97a	26.57±0.32a	60.53±2.32b
Sabz Pari	34.78±0.78a	12.33±0.19b	28.44±1.82a	44.96±3.24a	24.17±0.42b	56.30±2.50bc

Means sharing similar letters are not statistically different at P> 0.05

lamina ( $F_{4,14} = 16.25$ ;  $P = 0.000$ ), hair density on leaf midrib ( $F_{4,14} = 30.62$ ;  $P = 0.000$ ), plant yield ( $F_{4,14} = 179.32$ ;  $P = 0.000$ ) and dry shoot weight ( $F_{4,14} = 16.82$ ;  $P = 0.000$ ). The data showed significant differences for leaf area ( $F_{4,14} = 5.05$ ;  $14 P = 0.017$ ) and non-significant differences for hair density on leaf lamina on Arka Anamika (35.33±1.68 cm<sup>2</sup>) which was statistically at par with Pusa Green (35.11±0.22) and Sabz Pari (34.78±0.78) while minimum was observed on Anokhi (26.22±1.16 cm<sup>2</sup>). In case of midrib, maximum hair density was recorded on Pusa Green (18.44±0.48 cm<sup>2</sup>) which differed statistically from other varieties that were similar with each other (Table 1). There was no statistical difference for hair density on veins among different varieties. Minimum leaf area was observed on Sharmeeli (33.01±2.52 cm<sup>2</sup>) which statistically differed to all other varieties. Maximum leaf area was recorded in Anokhi (44.02±1.69 cm<sup>2</sup>) which was statistically at par with Sabz Pari, Pusa Green and Arka Anamika (Table 1). Maximum fruit yield per plant was recorded in Arka Anamika (26.57±0.32g) followed by Sabz Pari (24.17±0.42g) and minimum in Anokhi (11.26±0.24g). Dry shoot weight was maximum in Sharmeeli (71.7±2.18g) followed by Arka Anamika (60.53±2.32g), whereas minimum dry shoot weight was observed in Anokhi (49.30±1.86g) which was at par with Pusa Green.

Correlation co-efficient (r-values) between population of *A. biguttula bigullula* and different physico-morphic characters of okra revealed highly significant, strong and negative correlation for hair density on lamina and fruit yield per plant while it was weak, negative and non-significant for hair density on

midrib, leaf area and dry shoot weight (Table 2). The pubescent character in varieties tested seems to confer resistance against jassids which may be due

**Table 2. Correlation between population of *A. biguttula biguttula* and different physico-morphic characters of okra.**

Plant characters	Correlation (r-values)
Lamina (cm <sup>2</sup> )	-0.831 <sup>**</sup>
Midrib(cm)	-0.045 <sup>ns</sup>
Vein(cm)	0.003 <sup>ns</sup>
Leaf area(cm <sup>2</sup> )	-0.044 <sup>ns</sup>
Yield (g)	-0.871 <sup>**</sup>
Dry shoot weight (g)	-0.264 <sup>ns</sup>

\*\* Significant at P<0.01, NS= Non-significant

to difficulty in feeding and less suitability for oviposition. Less preference of Arka Anamika also implies that this variety had more hairiness on leaf lamina and midrib which are less preferred for oviposition by jassid. Earlier report of Mahal and Singh (14) also established an inverse relationship between emergence of nymphs and density of trichomes on mid-vein of leaves, while Taylo and Bernardo (20) observed that emergence of *A. biguttula biguttula* had significant and negative correlation with density of trichomes. The jassids cause phytotoxemia (hopper burn) by desapping the leaves of okra plants which affects the fruit bearing of plant. In present study the same fact may be attributed to less fruit yield per plant in varieties with more hopper population.

## CONCLUSION

Cultivar Arka Anamika was found comparatively less preferred while Anokhi showed higher susceptibility to jassid. The population of leaf hoppers continuously increased from third week of June upto 2<sup>nd</sup> week of July. Among physico-morphic characters, hair density on lamina and fruit yield per plant can be considered as prominent attributes affecting hopper's population with highly significant, strong and negative correlations. These results further suggest that genotypes Arka Anamika and Sabz Pari were comparatively better to cultivate in Pothwar region because of their better yield performance and non-preference by leaf hoppers.

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