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Screening of Okra Genotypes for Resistance against *Amrasca biguttula biguttula*

J.G. Dose[1*], N.S. Satpute[2], S.V. Annala[1] and S.K. Bhalkare[3]
[1]PG Scholar, Department of Agricultural Entomology,
Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Krishinagar Akola (Maharashtra), India.
[2]Associate Professor, Department of Agricultural Entomology,
Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Krishinagar Akola (Maharashtra), India.
[3]Assistant Professor, Department of Agricultural Entomology,
Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Krishinagar Akola (Maharashtra), India.

(Corresponding author: J.G. Dose)*
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ABSTRACT: The okra leafhopper *Amrasca biguttula biguttula* (Ishida) has emerged as a major threat, triggering significant yield losses. To address this, we aimed to screened okra genotypes for resistance or susceptibility against *Amrasca biguttula biguttula* was conducted at Centre for Organic Agriculture Research and Training, Department of Agronomy, Dr. PDKV, Akola during *Kharif* 2022-23. The trial consisted of 20 genotypes replicated twice in Randomized Block Design. The studies on field screening of okra genotypes revealed that none of the genotypes were completely free from the leafhopper infestation, although they differ significantly in their percentage of damage and number of populations. Among these PDKV Pragati, Arka Anamika, Parbhani Kranti and Akola Bahar were found with least average population < 3.346 leafhoppers per 3 leaves per 5 plants and graded under resistant category. However, the maximum mean population > 4.654 leafhoppers per 3 leaves per 5 plants was observed on the genotypes Korchi × Phule and Vijayalaxmi were categorized as susceptible.

Keywords: Okra, genotypes, leafhopper, screening, categorization.

INTRODUCTION

Okra (*Abelmoschus esculentus*) is well known, edible and utilized species of the family Malvaceae (Ijoyah and Usman 2013). It is a rich source of essential nutrients, like protein, vitamins (Vitamin C), carbohydrate, fat and plays a pivotal role in human diet (Afzal *et al.,* 2015). It is suitable to cultivate in kitchen garden as well as on large farms including high-tech commercial farms. However, the incidence of insect pests is a major constrain attributed for lower production of okra. Many of these pests occurring on major crop like, cotton is found to scourge okra crop. As many as 72 species of insects have been reported (Chatterjee *et al.,* 2019). The productivity of okra is severely affected by leafhopper (*Amrasca biguttula biguttula*) is prominent amongst them (Sharma *et al.,* 2018). It is a serious pest as heavy infestation of the pest leads to both nymph and adults de-sap the plant tissues which results in curling and crinkling of leaves, stunted growth, hopper burn symptom and ultimate death of plants (David and Ramamurthy 2016). In case of severe attack, it results in the loss of crop vigor and reduce the yield up to 54.04% (Ghosal *et al.,* 2013). To prevent this pest infestation and produce quality crops it is necessary to manage the pest population with appropriate control measures. Insect resistant cultivar/genotypes provide a source of resistance against insect pest damage, involve minimal cost of production, conserve natural enemies and are environmentally friendly. The use of resistant varieties is one of the most economical and effective control measure among all. Keeping this in sight, current studies have been undertaken to screen out some genotypes of okra against leafhopper.

MATERIAL AND METHODS

The experiment was conducted at the Centre for Organic Agriculture Research and Training, Department of Agronomy, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola during *Kharif* 2022-23. This research Centre located in the subtropical region at 77′′30′ to 77′′35′′ E Longitude, 21′′18′ to 21′′30′ N latitude and 1297 feet above mean sea level on black cotton soil. The research trial on screening of twenty okra genotypes was laid out in a Randomized Block Design and two replications with a plot size of 4.5m × 1.2m each. Seeds of twenty genotypes of okra viz., IC42451, IC 42456, Akola-Bahar, EC 329386, Ankur-40, Arka Abhay, EC 329384, Parbhani Kranti, Arka Anamika, PDKV Pragati, Varsha Uphar, Kokan Bhendi, Korchi, Phule Vimukta, EC 329395, Akola-1, Korchi × Phule, Akola-2 and Akola-3 were sown at spacing 60cm × 45cm. The crop was grown under unprotected condition. All the recommended agronomical package of practices were implemented for raising the crop. The okra genotypes were sown after receiving sufficient rainfall i.e., 1250 mm. The plots were unsprayed throughout the experimental period.

The observations on leafhopper nymphs and adults on five randomly selected plants from each treatment and each replication were initiated at 3 weeks after emergence i.e. 21 days after emergence. The population

count was taken as soon as leafhopper (nymph and adult) appeared on plants. Subsequent observations at an interval of 7 days were continued till last picking of the crop. The data was recorded for leafhoppers as number of nymphs and adults per leaf (Prithiva *et al.,* 2019). The Average population of leafhopper (nymph and adult) per leaf for each genotype was calculated by simple arithmetic means by using formula, X= X1+ X2+ X3+ X4+ X5 /N. (Where X is average population per leaf, N is the total number of plants observed and X1 + X2 + X3 + X4 + X5 are the number of observed plants (Iqbal *et al.*, 2008).

Mean leafhopper population and infestation were calculated and categorized based on the scale adopted by Nagar *et al.,* (2017).

Modified Scale:

Resistant	Xi < X - sd
Moderately resistant	Xi > X – sd< X
Moderately susceptible	Xi > X < (X + sd)
Susceptible	Xi > (X+ sd) < (X + 2sd)

where,

Xi=Mean value of individual genotypes.

X = Mean value of infestation of all genotypes.

Sd = Standard deviation.

The transformed data were used for computation of X, Xi and sd for each parameter.

RESULTS AND DISCUSSION

The screening of twenty genotypes of okra against leafhopper, *A. biguttula biguttula* was carried out under field conditions. These data collected on population of leafhoppers on 3 leaves per 5 plants per plot was recorded at weekly interval. The data presented in Table 1 indicates the average leafhopper population per 3 leaves per 5 plants during *Kharif* 2022-23 on twenty selected genotypes of okra. The obtained data was analyzed statistically.

Cumulative Mean of leafhopper population on different okra genotypes: The cumulative mean leafhopper population per 3 leaves is presented in Table 1 and depicted in Fig. 1. The data revealed significant differences among the genotypes tested, PDKV Pragati was found significantly superior genotype recording 2.52 leafhoppers per 3 leaves. The next best set of genotypes Korchi × Phule (4.81 leafhoppers per 3 leaves) and it was at par with Vijayalaxmi (4.71), Akola-1 (4.60), Akola-3 (4.58), Phule Vimukta (4.56), EC 329395 (4.54) and Akola-2 (4.51 leafhoppers per 3 leaves), all being at par with each other and imparting susceptibility to leafhopper population. AS per the reports of Kadu *et al.,* (2018) concluded that, the okra genotypes Arka Anaika OK-7 and OK-9 recorded the lowest leafhopper population. Similar results have been quoted by Sultana *et al.* (2017); Nagar *et al.* (2017) which corroborates with present finding.

Categorization of okra genotypes for their resistance or susceptible to leafhoppers: To determine the relative susceptibility or resistance against leafhopper infestation, the okra germplasm was categorized based on the population count of leafhopper per 3 leaves on randomly selected five plants.

Table 1: Average population of leafhopper (*A. biguttula biguttula*) per 3 leaves per 5 plants on different genotypes of okra.

Treatments	Mean Leafhopper population (nymphs and adults) per 3 leaves per 5 plants							C.M. leafhopper/ 3 leaves/ 5 plants
	3 WAE	4 WAE	5 WAE	6 WAE	7 WAE	8 WAE	9 WAE	
IC 42451	1.77 (1.32)	2 (1.41)	2.83(1.68)	3.76 (1.93)	5.03 (2.24)	6.5(2.55)	6.1 (2.47)	4(2.00)
IC 42456	1.56 (1.25)	2 (1.41)	2.83 (1.68)	3.96 (1.99)	4.73 (2.17)	6.3 (2.51)	8.23 (2.87)	4.23(2.06)
Akola- Bahar	1.06 (1.02)	1.13 (1.05)	1.86 (1.36)	3.36 (1.83)	4.3 (2.07)	6.5 (2.55)	4.9 (2.20)	3.31(1.82)
EC 329386	1.46 (1.21)	1.73 (1.31)	2.16 (1.47)	3.43 (1.85)	4.9 (2.20)	7.3 (2.70)	6.23 (2.50)	3.89(1.97)
Ankur- 40	1.7 (1.28)	1.1 (1.04)	2.06 (1.43)	2.76 (1.66)	4.16 (2.04)	6.2 (2.48)	7.3 (2.70)	3.61(1.90)
Arka abhay	1.4 (1.13)	1.36 (1.16)	1.96 (1.40)	2.56 (1.59)	4.23 (2.05)	6.93 (2.63)	8.03 (2.83)	3.78(1.94)
EC 329384	2.53 (1.59)	1.9 (1.37)	2.36 (1.53)	3.23 (1.79)	4.46 (2.11)	6.8 (2.60)	8.43 (2.90)	4.25(2.06)
Parbhani kranti	0.85 (0.92)	1.1 (1.04)	1.83 (1.34)	2.43 (1.55)	3.26 (1.80)	4.73 (2.15)	7.46 (2.73)	3.03(1.74)
Arka Anamika	1.48 (1.21)	1.1 (1.04)	2.06 (1.43)	2.56 (1.60)	3.7 (1.92)	4.4 (2.09)	5.1 (2.26)	2.92(1.71)
PDKV Pragati	1.46 (1.20)	1.66 (1.28)	2.13 (1.46)	2.4 (1.54)	3.06 (1.75)	3.06 (1.75)	3.86 (1.97)	2.52(1.59)
Varsha uphar	0.93 (0.96)	1.93 (1.37)	2.9 (1.69)	3.53 (1.87)	4.33 (2.08)	5.03 (2.24)	5.93 (2.44)	3.51(1.87)
Kokan bhendi	1.16 (1.07)	2.06 (1.43)	2.93 (1.71)	3.9 (1.97)	5.13 (2.26)	6.39 (2.52)	7.93 (2.82)	4.21(2.05)
Korchi	2.16 (1.47)	1.76 (1.32)	2.56 (1.60)	4.13 (2.03)	4.63 (2.15)	7.46 (2.73)	8.03 (2.83)	4.39(2.10)
Phule Vimukta	0.76 (0.87)	1.96 (1.39)	2.9 (1.69)	4.23 (2.05)	5.53 (2.35)	8.16 (2.85)	8.36 (2.89)	4.56(2.14)
EC 329395	1.66 (1.28)	1.7 (1.29)	2.73 (1.65)	4.3 (2.07)	5.4 (2.32)	7.86 (2.80)	8.1 (2.84)	4.53(2.13)
Akola – 1	1.8 (1.33)	2.1 (1.44)	2.5 (1.58)	4.4 (2.09)	5.6 (2.36)	7.8 (2.79)	7.96 (2.82)	4.59(2.14)
Korchi x Phule	1.5 (1.22)	2.2 (1.47)	3 (1.73)	4.46 (2.11)	6.16 (2.47)	7.96 (2.82)	8.36 (2.89)	4.81(2.19)
Vijayalaxmi	1.8 (1.34)	2.16 (1.47)	2.63 (1.62)	4.4 (2.09)	5.4 (2.32)	8.06 (2.83)	8.5 (2.91)	4.71(2.17)
Akola – 2	1 (0.99)	2.06 (1.43)	2.9 (1.70)	4.2 (2.04)	5.26 (2.29)	7.63 (2.76)	8.53 (2.92)	4.51(2.12)
Akola – 3	1.73 (1.30)	2.36 (1.53)	3.2 (1.78)	4.36 (2.08)	5.5 (2.34)	7.23 (2.68)	7.66 (2.76)	4.58(2.14)
S.E.M	0.12	0.10	0.07	0.06	0.08	0.09	0.07	0.0281
CD @5%	0.34	0.30	0.21	0.18	0.22	0.12	0.20	0.083
C.V.	13.67	10.68	6.39	4.56	4.94	4.86	3.53	1.99

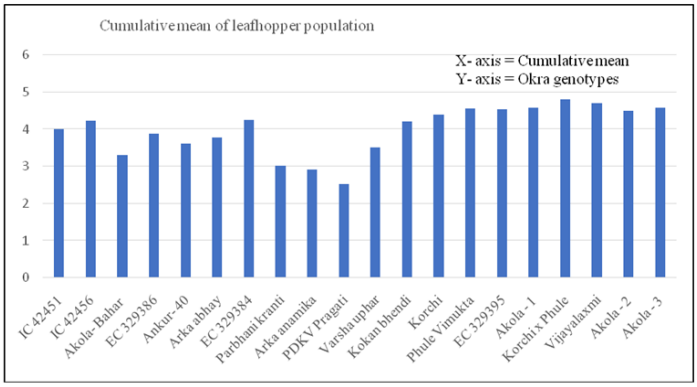

Fig. 1. Cumulative Mean of population of leafhopper per 3 leaves per 5 plants on various okra genotypes.

Table 2: Categorization of okra genotypes for their resistance or susceptible to leafhopper.

Category of resistant	Scale	(X = 4); (sd = 0.654)	
		Treatments	Mean leafhopper/ 3 leaves/ 5 plants
R	Xi < 3.346	PDKV Pragati Arka Anamika Parbhani Kranti Akola - Bahar	(2.52) (2.92) (3.03) (3.30)
MR	Xi > 3.346 < 4	Varsha Uphar Ankur – 40 Arka Abhay EC 329386	(3.51) (3.61) (3.79) (3.89)
MS	Xi > 4 < 4.654	IC 42451 Kokan Bhendi IC 42456 EC 329384 Korchi Akola-2 EC 329395 Phule Vimukta Akola- 3 Akola- 1	(4.00) (4.22) (4.23) (4.25) (4.40) (4.51) (4.54) (4.56) (4.58) (4.60)
S	Xi > 4.654 < 5.308	Vijayalakshmi Korchi x Phule	(4.71) (4.81)

Where,
Xi = Mean value of individual genotypes.
X = Mean value of infestation of all genotypes.
Sd = Standard deviation.

The data revealed that, PDKV Pragati, Arka Anamika, Parbhani Kranti and Akola Bahar recorded the leafhopper population below 3.35 leafhoppers per 3 leaves per 5 plants and were categorized as Resistant category. The genotypes IC 42451, Kokan Bhendi, IC 42456, EC329384, Korchi, Akola-2, EC 329395, Phule Vimukta, Akola-3 and Akola-1 had leafhopper population varying from 3.35 to 4 leafhoppers per 3 leaves per 5 plants and were categorized as moderately resistant genotypes.

The population of leafhopper on the genotypes Varsha Uphar, Ankur-40, Arka Abhay and EC 329386 ranged from 4 to 4.65 and were categorized as moderately susceptible genotypes. Vijayalaxmi and Korchi × Phule recorded the leafhopper population above 4.65 leafhoppers per 3 leaves per 5 plants and were graded under the susceptible category.

CONCLUSIONS

Study on screening of okra germplasm against leafhopper during 2022-23 concluded that PDKV Pragati, Arka Anamika, Parbhani Kranti and Akola Bahar were found to be resistant recording significantly less population of leafhopper. These genotypes are recognized as a source of resistance and could be used in breeding programme and development of IPM Strategies.

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