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Field screening of okra genotypes for resistance against leafhopper *Amrasca biguttula biguttula* (Ishida)

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Abstract

The present investigation entitled “Field screening of okra genotypes for resistance against leafhopper *Amrasca biguttula biguttula* (Ishida)*”* were conducted at Chilli and vegetables research unit, Dr. PDKV, Akola Dist. Akola 444 104 during *Kharif* 2022- 23. The trial consisted of 15 genotypes replicated twice in Randomized Block Design. The research was performed to check out the reaction of different okra genotypes against leafhopper. 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, Pusa A-4 and AKOV- 117 were found least average leafhoppers population <3.012 per 3 leaves per 5 plants and graded under resistant category. While, maximum mean leafhoppers population >5.068 leafhoppers per 3 leaves per 5 plants were observed on the genotypes *viz.*, AKOV- 145, AKOV- 118, AKOV- 154 and AKOV- 160 and categorized as susceptible.

Keywords: Screening, jassid, okra genotypes, categorization

1. Introduction

Okra (*Abelmoschus esculentus*), is a commercial vegetable crop locally known as bhindi and lady’s finger in English speaking country belong to family Malvaceae and is native of Ethiopia (north Africa). (Benchasri *et al.*, 2012) [1]. It has the highest genetic yield potential. It is a rich source of essential nutrients, like protein, carbohydrate, fat and plays a pivotal role in human diet (Afzal *et al.*, 2015) [2]. It is cultivated mainly for immature pods, which are consumed fresh or dried, and are added to soup, depending on where it is cultivated. India ranks second in terms of vegetable production in the world. In India, the total area under okra is 5.23 lakh hectares with an annual production of 64.16 lakh tons with productivity of 12.26 tons ha-1. In India, it is widely cultivated in Haryana, West Bengal, Orissa, Chhattisgarh, Madhya Pradesh, Gujarat, Uttar Pradesh, Tamil Nadu, Maharashtra, and Andhra Pradesh (NHB database Anonymous, 2021-22) [3]. Okra is suitable to cultivate in a 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 the pests occurring on major cash crop like, cotton is found to scourge okra crop. As many as 72 species of insects have been reported (Chatterjee *et al.*, 2019) [4]. Among which the leafhopper, *Amrasca biguttula biguttula* (Ishida) is most destructive insect pests registered (Mane *et al.*, 2010) [5]. *Amrasca biguttula biguttula* (Ishida) is considered as destructive one among the sucking pests. Both nymph and adult suck the cell sap from the lower surface of leaves. During feeding they inject saliva into plant tissues, as a result leaves of plant turn yellowish and curly and the photosynthetic activity of plant is disturbed (Singh *et al.*, 2008) [6]. 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) [7]. Chemical control is generally considered as the most effective and cheapest method to control pests. However, maximum use of insecticides creates numerous problems for non-target organisms (Malik *et al.*, 2015) [8]. Host plant resistance (HPR) and varietal control are the cost-effective and safe approaches which are integral part of integrated pest management (IPM), as they have compatibility with other control methods in order to suppress insect pest populations (Khan *et al.*, 2010) [9]. Growing of resistant varieties is the most operative, economic and environment friendly strategies which proves to be the most favorable method to boost okra production (Khan, 2011) [10]. Therefore, an experiment was planned to evaluate different genotypes of okra for their response to incidence of leafhopper, to assess their susceptibility under field condition and eventually to screen out more potent strains of okra.

2. Materials and Methods

The screening of fifteen okra genotypes was laid out in a Randomized Block Design and two replications with plot size of 4.5m x 1.2 m each at Chilli and vegetables research unit, Dr. PDKV, Akola Dist. Akola 444 104 during *Kharif* 2022-23. Experimental field of during *Kharif* season 2022-23. Seeds of fifteen different genotypes of okra *viz.,* AKOV- 160, AKOV- 154, AKOV- 118, AKOV- 145, AKOV- 155, AKOV- 102, AKOV- 111, PDKV Pragati, Parbhani Kranti, Arka Abhay, AKOV- 117, Phule Utkarsha, Phule Vimukta, Pusa A-4 and Arka Anamika were sown at 60 cm x 45 cm spacing in the *kharif* season. All the recommended package of practices were adopted for raising the crop. The plots were kept unsprayed through the experimental period. The okra genotypes were sown at 60 cm x 45 cm spacing after receiving sufficient rainfall i.e., 1250 mm. The crop was grown under unprotected condition by adopting all other agronomical practices recommended by the university. In each treatment, five plants were randomly selected for recording observations on leafhopper incidence. The first observations of leafhopper nymphs and adult on five selected plants from each replication were initiated 3 weeks after emergence i.e., 21 days after emergence (DAE) till 63 DAE at an interval of 7 days. 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) [11]. The average adult and nymph of leafhopper population 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) [12]. Mean leafhopper and infestation were calculated and categorized under the grades based on the scale adopted by (Nagar *et al.*, 2017) [13]. For the purpose, mean value of individual genotypes (Xi) was compared with mean value of infestation of all genotypes (X) and standard deviation (sd) following the modified scale [Resistant: Xi < X – sd for resistant; Xi > X – sd < X for moderately resistant; Xi > X < (X + sd) for moderately susceptible; and Xi > (X + sd) < (X + 2 sd) for susceptible]. The retransformed data were used for computation of X, Xi and sd for each parameter.

3. Results and Discussion

The screening of fifteen different okra genotypes against leafhopper, *A. biguttula biguttula* under field conditions of Akola. Data collected as per three Leaves population of leafhopper on okra was recorded with weekly interval from randomly selected five plants per plot. The data presented in Table 1 indicates the average population of leafhopper per three leaves per five plants during *Kharif* 2022 on fifteen different genotypes of okra and data obtained is analyzed statistically.

3.1 Cumulative Mean of leafhopper population on different okra genotypes

The cumulative mean data population per 3 leaves per 5 plants is presented in table. 1 and depicted in fig.1. indicated that all the genotypes in the present study were found more or less infested by jassid, amongst them PDKV Pragati showed minimum leafhoppers population per 3 leaves per 5 plants (2.52) followed by genotypes *viz*., Arka Anamika (2.82), Pusa A-4 (2.85), AKOV – 117 (2.98) and Parbhani Kranti (3.23) leafhoppers per 3 leaves per 5 plants and these were at par with each other. The next best set of genotypes Arka Abhay (3.43), AKOV- 102 (3.97) and AKOV- 155 (4.13). Medium leafhoppers population were observed on AKOV-111 (4.31), Phule Utkarsha (4.36), Phule Vimukta (4.56), AKOV- 145 (5.08) and AKOV- 118 (5.19). Whereas, the maximum leafhopper population per 3 leaves per 5 plants were reported on genotypes AKOV- 154 (5.45) and which was found statistically at par with AKOV- 160 (5.64) and these genotypes has significantly higher leafhoppers than rest of the genotypes studied. As per the reports of Srinivasa and Sugeetha (2001) [14] no okra cultivar was completely free from leafhopper infestation. According to Tripathy *et al.*, (2008) [15] okra variety Arka Anamika was resistant against leafhopper and recorded mean population of 5.02 leafhoppers/3 leaves. Patel *et al.*, (2012) [16] who revealed that Arka Anamika supported minimum leafhopper population (2.03 leafhoppers/leaf). Similar results have been quoted by Priyanka *et al.*, (2020) [17] and Sapkal *et al.*, (2022) [18] which corroborates with present findings.

3.2 Categorization of okra genotypes for their resistance or susceptible to leafhopper

The data revealed that, PDKV Pragati, Arka Anamika, Pusa A-4 and AKOV-117 observed the leafhoppers population less than 3.012 leafhoppers per 3 leaves per 5 plants and were categorized as resistant category. The genotypes Parbhani Kranti, Arka Abhay and AKOV-102 had leafhopper population varying from 3.012 to 4.04 leafhoppers per 3 leaves per 5 plants and these genotypes were categorized as moderately resistant genotypes. The population of leafhoppers on the genotypes AKOV-155, AKOV-111, Phule Utkarsha and Phule Vimukta ranged from 4.04 to 5.068 and were categorized as moderately susceptible genotypes. AKOV-145, AKOV-118, AKOV-154 and AKOV-160 recorded the leafhopper population above 5.068 leafhoppers per 3 leaves per 5 plants and were graded under the susceptible category.

Table 1: Shows the Treatments/ Genotypes and Mean Leafhopper population (nymphs and adults) per 3 leaves per 5 plants

Treatments/ Genotypes	Mean Leafhopper population (nymphs and adults) per 3 leaves per 5 plants														CE	
	3 WAE		4 WAE		5 WAE		6 WAE		7 WAE		8 WAE		9 WAE			
AKOV- 160	2.30	(1.51)	2.69	(1.63)	4.01	(2)	5.84	(2.42)	7.99	(2.81)	6.58	(2.56)	10.07	(3.17)	5.64	(2.38)
AKOV- 154	1.84	(1.36)	2.82	(1.66)	4.90	(2.21)	6.20	(2.48)	6.71	(2.56)	6.48	(2.55)	9.24	(3.04)	5.45	(2.33)
AKOV- 118	2.46	(1.57)	1.53	(1.23)	2.72	(1.62)	6.76	(2.60)	8.98	(3.00)	6.59	(2.57)	7.34	(2.71)	5.19	(2.28)
AKOV- 145	1.47	(1.21)	1.93	(1.39)	2.82	(1.67)	6.93	(2.62)	7.22	(2.69)	7.40	(2.72)	7.78	(2.78)	5.08	(2.25)
AKOV- 155	1.81	(1.33)	1.29	(1.13)	2.07	(1.44)	5.99	(2.44)	4.26	(2.06)	6.23	(2.5)	7.30	(2.7)	4.13	(2.03)
AKOV- 102	1.40	(1.14)	1.42	(1.19)	2.85	(1.67)	2.77	(1.66)	4.27	(2.06)	7.03	(2.65)	8.03	(2.83)	3.97	(1.99)
AKOV- 111	2.56	(1.60)	2.04	(1.43)	2.37	(1.54)	3.36	(1.83)	4.56	(2.14)	6.82	(2.61)	8.43	(2.9)	4.31	(2.07)
PDKV Pragati	0.86	(0.93)	0.83	(0.91)	1.30	(1.14)	2.03	(1.43)	3.27	(1.81)	4.63	(2.14)	4.73	(2.17)	2.52	(1.59)
Parbhani Kranti	1.74	(1.32)	1.12	(1.06)	2.07	(1.44)	2.75	(1.66)	3.77	(1.94)	6.08	(2.47)	5.10	(2.26)	3.23	(1.80)
Arka Abhay	1.52	(1.23)	1.73	(1.31)	2.13	(1.46)	2.54	(1.59)	5.00	(2.24)	5.63	(2.37)	5.42	(2.32)	3.43	(1.85)
AKOV- 117	0.93	(0.96)	1.47	(1.2)	1.83	(1.35)	1.97	(1.4)	3.07	(1.75)	5.65	(2.38)	5.93	(2.44)	2.98	(1.72)
Phule Utkarsha	1.27	(1.13)	2.75	(1.65)	3.62	(1.9)	3.99	(2)	5.16	(2.27)	5.83	(2.42)	7.93	(2.82)	4.36	(2.08)
Phule Vimukta	2.27	(1.51)	2.69	(1.64)	2.57	(1.6)	4.23	(2.06)	4.68	(2.16)	7.47	(2.73)	8.03	(2.83)	4.56	(2.13)
Pusa A-4	0.80	(0.89)	1.60	(1.26)	1.40	(1.18)	2.53	(1.59)	3.20	(1.79)	6.20	(2.49)	4.24	(2.05)	2.85	(1.69)
Arka Anamika	0.93	(0.97)	1.43	(1.19)	1.67	(1.29)	2.53	(1.59)	3.37	(1.83)	6.03	(2.45)	3.79	(1.95)	2.82	(1.68)
S.E.M	0.12		0.07		0.05		0.05		0.06		0.06		0.08		0.07	
CD @5%	0.36		0.20		0.15		0.15		0.17		0.19		0.25		0.21	
C.V.	14.07		7.36		5.06		4.05		3.91		4.78		4.57		6.26	

Figures in parentheses are square root transformed values.
WAE: Weak after Emergence

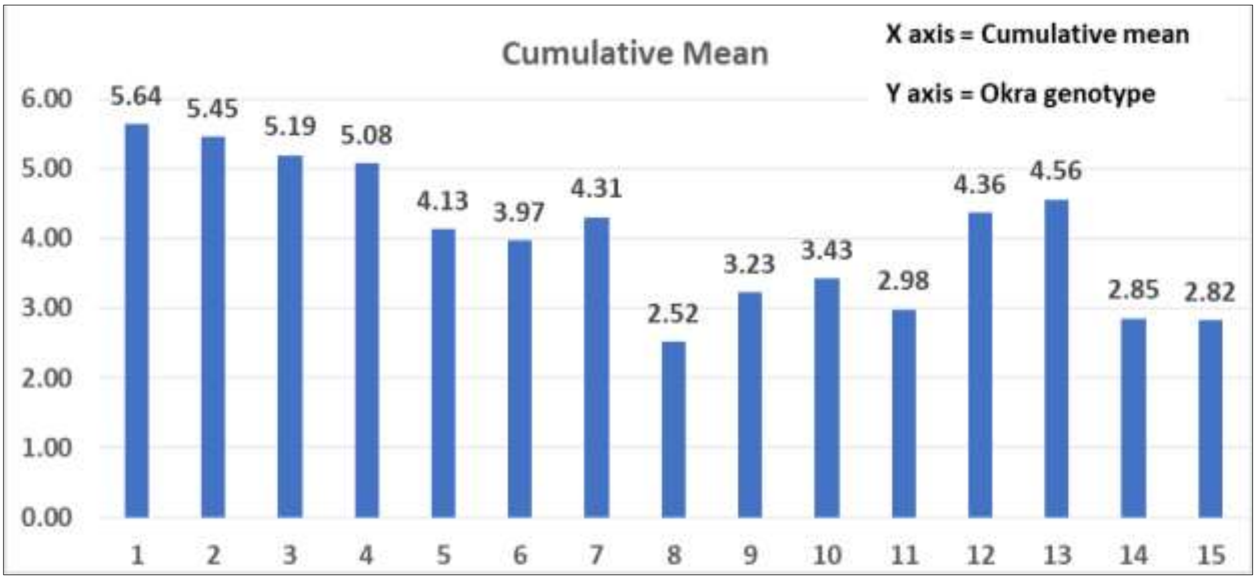

Fig 1: Cumulative Mean of population of leafhopper per 3 leaves per 5 plants on various okra genotypes

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

Category of resistant	Scale	(X = 4.04); (sd = 1.028)	
		Treatments	Mean leafhopper/ 3 leaves/ 5 plants
R	Xi < 3.012	PDKV Pragati	(2.52)
		Arka Anamika	(2.82)
		Pusa A-4	(2.85)
		AKOV- 117	(2.98)
MR	Xi > 3.012 < 4.04	Parbhani Kranti	(3.23)
		Arka Abhay	(3.43)
		AKOV- 102	(3.97)
MS	Xi > 4.04 < 5.068	AKOV- 155	(4.13)
		AKOV- 111	(4.31)
		Phule Utkarsha	(4.36)
		Phule Vimukta	(4.56)
S	Xi > 5.068 < 6.096	AKOV- 145	(5.08)
		AKOV- 118	(5.19)
		AKOV- 154	(5.45)
		AKOV- 160	(5.64)

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

4. Conclusions
Study on screening of okra germplasm against leafhopper during 2022- 23 concluded that PDKV Pragati, Arka Anamika, Pusa A-4 and AKOV-117 were found to be resistant recording significantly less population of leafhopper. These genotypes are identified as a source of resistance and could be used in breeding programme and development of IPM Strategies.

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