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RESEARCH ARTICLE

SCREENING OF BRINJAL GERMPLASM AGAINST WHITEFLY, *BEMISIA TABACI* GENN. AND APHID, *APHIS GOSSYPII* GLOVER IN ALLUVIAL ZONE OF WEST BENGAL

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ABSTRACT

A field experiment was carried out during kharif season of 2012 and 2013 to screen the brinjal genotypes against whitefly, *Bemisia tabaci* and aphid, *Aphis gossypii.* All the seven brinjal germplasms were infested by aleurodid with low to moderate damage to the crop. The peak incidence was recorded during August of both years of study. All the germplasms were more or less equally infested by this aleurodid, except chhuli makra and sada jhuri. In chhuli makra and sada jhuri, the infestation level of the aleurodid was quite lower than other germplasms and hence both the brinjal germplasm i.e. chhuli makra and sada jhuri can be termed as less susceptible / tolerant to this aleurodid. None of the brinjal germplasms showed complete resistance to aphid infestation. The germplasm chhuli makra and L-13 (sourava) were highly susceptible to aphid, while kalo jhuri, muktakeshi and sada jhuri were moderately susceptible but pata kanta and soyla were less susceptible or tolerant to aphid.

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INTRODUCTION

Brinjal is one of the important vegetable crop in west Bengal due to its high production potential. The crop occupies a significant position in this region due to favourable weather parameters and soil texture. Brinjals are cultivated in almost all the states in the country but the major producing states are West Bengal, Orissa, Bihar (Singhal, 2003). In West Bengal, it is grown all the year round in a vast area covering most of the districts, but the promising ones are North 24 Parganas, South 24 Parganas, Nadia, Howrah, Hooghly, Murshidabad, Malda, Jalpaiguri and Coochbehar. Brinjal is attacked by about 140 species of insect and non-insect pests belonging to 50 families. But in India, about 44 species of insect pests have been found to infest this crop (Lal, 1975). Among these, only 10 have been recognized to be major economic significance in West Bengal (Bandopadhyay, 1985). Owing to regular and widespread occurrence, the cotton aphid, *Aphis gossypii*, Glover (Aphididae: Hemiptera) and whitefly, *Bemisia tabaci* Genn. (Aleyrodidae: Hemiptera) are the most important pests of brinjal in West Bengal (Banerjee and Basu, 1955) and transmit various viral diseases beside their direct damage to the crop yield. Use of hazardous synthetic insecticides to reduce the incidence of these pests on brinjal develop resistance in insects and also pollute the environment. The present investigation were therefore undertaken on the screening of brinjal germplasms against these sucking pests i.e. aphid and whitefly in West Bengal.

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MATERIALS AND METHODS

The field experiment was carried out during kharif season from June to October of 2012 and 2013 at Adisaptagram Block Seed Farm, Department of Agriculture, Govt. of West Bengal, District Hooghly on screening various brinjal germplasms viz. chhuli makra, kalo jhuri, L-13, muktakeshi, pata kanta, sada jhuri and soyla were selected for this experiment. The seedlings of the germplasms were collected from the nursery at Chakdah of Nadia district, West Bengal. The seedlings were transplanted in the middle of June in the plots measuring 3.75 m x 4.50 m with 75 cm x 75 cm spacing. Each germplasm was replicated thrice in an RBD. All the standard agronomic practices recommended for this region were thoroughly followed without application of pesticides to this crop. Just after transplanting of seedlings, observation was recorded on the incidence pattern of aphid and whitefly on different germplasms at 10 days interval and it was continued upto full maturity of the crop i.e from

fourth week of June to third week of October. The population of aphid and whitefly was recorded from one upper, one middle and one lower leaves of 10 plants in each plot, selected at random. The yield of marketable fruits was also noted during respective harvesting periods in each plot. Thus the data obtained were categorically transformed (Gomez and Gomez, 1984) and subjected to statistical analysis.

RESULTS AND DISCUSSION

Incidence pattern of whitefly on different brinjal germplasms

In both the years of 2012 and 2013, the infestation of whitefly was started just after transplanting of seedling of all the brinjal germplasms, except sada jhuri and soyla during 2013, where the infestation was appeared in mid and early July, respectively (Table 1).

The pest remained active in the field throughout the entire period of investigation. Then the level of infestation was gradually increased and attained the peak during August in all cases, except kalo jhuri, where it was found in early September during 2013. During 2012, in muktakeshi, two peaks of population of the pest were found. The first one was during end July while the second one was in late August and the second peak was slightly higher than the first one. During 2012, maximum population of aleurodid was noted per 30 leaves in pata kanta (38.77) which was followed by soyla (38.55), muktakeshi (35.88), L-13 (29.11), kalo jhuri (28.99), chhuli makra (18.55) and sada jhuri (17.44). During 2013, the highest population was obtained in muktakeshi (46.66) which was followed by pata kanta (37.22), soyla (36.77), kalo jhuri (29.44), chhuli makra (22.99) and sada jhuri (15.99). The mean whitefly population per 30 leaves was found highest in soyla (28.99) succeded by muktakeshi (23.55), pata kanta (22.55), L-13 (18.49), kalo jhuri (16.69), sada jhuri (11.85) and chhuli makra (11.38) during 2012 while in 2013 it was recorded

Table 1. Population dynamics of whitefly on different brinjal germplasm during 2012 and 2013 at Adisaptagram Block Seed Farm, Hooghly, W.B. (Mean of three replications)

Different germplasm	Population of whitefly on different months of observation (mean of three observation/month)										Mean population	
	June		July		August		September		October			
	2012	2013	2012	2013	2012	2013	2012	2013	2012	2013	2012	2013
Chhuli makra	5.66 (13.25)	0.0 (0.0)	12.11 (19.88)	8.22 (15.96)	18.55 (25.11)	22.99 (28.42)	11.88 (19.64)	21.77 (27.55)	1.67 (2.81)	8.49 (16.23)	11.38	14.66
Kalo jhuri	4.66 (12.13)	3.66 (10.48)	17.11 (23.85)	14.22 (21.59)	28.99 (32.32)	29.44 (32.62)	15.88 (22.94)	30.22 (33.63)	4.83 (11.11)	13.50 (21.0)	16.69	21.02
L-13 (Sourava)	7.33 (15.26)	5.33 (13.11)	17.22 (23.78)	14.88 (21.96)	29.11 (31.71)	34.77 (35.87)	18.11 (24.87)	26.44 (30.61)	10.66 (18.47)	9.66 (17.52)	18.49	21.08
Muktakeshi	8.66 (16.51)	8.66 (16.65)	25.11 (29.61)	20.66 (26.67)	35.88 (35.56)	46.66 (42.97)	23.44 (28.45)	37.12 (37.31)	10.33 (18.22)	18.46 (24.89)	23.55	29.85
Pata Kanta	6.33 (13.97)	6.33 (14.20)	23.33 (28.51)	16.33 (23.29)	38.77 (38.18)	37.22 (37.40)	19.33 (25.68)	24.44 (29.21)	9.10 (18.01)	11.16 (18.94)	22.55	21.88
Sada jhuri	3.66 (10.48)	0.0 (0.0)	14.77 (21.86)	4.99 (10.18)	17.44 (24.28)	15.99 (23.21)	10.88 (18.72)	11.44 (19.20)	4.67 (11.01)	3.83 (10.43)	11.85	8.74
Soyla	12.66 (20.55)	0.0 (0.0)	38.11 (37.83)	11.55 (19.03)	38.55 (38.15)	36.77 (37.09)	28.11 (28.30)	33.33 (35.03)	10.50 (18.20)	13.49 (21.04)	28.99	22.66

Source of variation

	Date of observation		Variety		Date of observation x Variety	
	2012	2013	2012	2013	2012	2013
SEM (±)	1.30	1.27	1.00	0.97	3.45	3.36
CD (p=0.05)	3.03	2.96	2.32	2.26	NS	NS

*Figures in parenthesis are logarithmic transformed values

Table 2. Population dynamics of aphid on different brinjal germplasm during 2012 and 2013 at Adisaptagram Block Seed Farm, Hooghly, W.B. (Mean of three replications)

Different germplasm	Population of whitefly on different months of observation (mean of three observation/month)										Mean population	
	June		July		August		September		October			
	2012	2013	2012	2013	2012	2013	2012	2013	2012	2013	2012	2013
Chhuli makra	12.33 (1.09)	28.66 (1.43)	92.88 (1.88)	121.22 (2.04)	347.33 (2.52)	216.55 (2.32)	315.11 (23.49)	334.77 (2.51)	88.66 (1.96)	181.99 (2.19)	204.63	200.85
Kalo jhuri	7.66 (0.87)	0.0 (0.0)	93.22 (1.92)	62.32 (1.65)	331.22 (2.51)	239.88 (2.37)	197.55 (2.27)	352.11 (2.54)	26.99 (1.77)	124.67 (2.03)	167.38	184.33
L-13 (Sourava)	0.0 (0.0)	34.33 (1.52)	124.66 (1.98)	177.88 (79.78)	420.88 (2.61)	234.0 (2.36)	346.44 (2.53)	305.22 (2.48)	110.99 (2.01)	177.49 (2.21)	241.49	211.72
Muktakeshi	0.0 (0.0)	0.0 (0.0)	22.87 (0.61)	13.78 (0.53)	214.44 (2.31)	191.44 (2.25)	275.55 (2.42)	321.55 (2.50)	56.50 (1.67)	92.99 (1.89)	137.63	147.19
Pata Kanta	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	5.55 (0.41)	43.66 (1.17)	87.33 (1.90)	110.99 (2.01)	151.11 (2.17)	14.67 (0.73)	37.99 (1.43)	41.11	67.33
Sada jhuri	0.0 (0.0)	0.0 (0.0)	62.99 (1.68)	31.55 (1.07)	237.11 (2.36)	139.55 (2.12)	165.66 (2.25)	211.66 (2.44)	45.01 (1.53)	113.0 (1.98)	123.94	131.19
Soyla	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	105.22 (1.98)	103.66 (1.97)	197.44 (2.28)	218.88 (2.33)	71.98 (1.82)	57.16 (1.68)	90.02	90.16

Source of variation

	Date of observation		Variety		Date of observation x Variety	
	2012	2013	2012	2013	2012	2013
SEm (±)	0.03	0.02	0.02	0.02	0.08	0.06
CD (p=0.05)	0.07	0.06	0.05	0.04	0.18	0.15

*Figures in parenthesis are angular transformed values

Table 3. Yield of different brinjal germplasms during 2012 & 2013

Different germplasms	Number of fruits per plant				Percentage of marketable fruits		Percentage of unmarketable fruits		Total yield (t/ha)	
	Marketable		Unmarketable							
	2012	2013	2012	2013	2012	2013	2012	2013	2012	2013
Chhuli makra	294.33 (2.47)	319.33 (2.50)	187.66 (2.27)	204.66 (2.31)	56.97	57.63	43.03	42.37	14.60	13.95
Kalo jhuri	518.66 (2.71)	561.33 (2.75)	338.66 (2.53)	321.33 (2.50)	62.06	61.03	37.94	38.97	13.61	14.31
L-13 (Sourava)	553.33 (2.74)	510.66 (2.71)	217.0 (2.33)	231.66 (2.36)	69.12	66.53	30.88	33.47	24.49	26.03
Muktakeshi	256.66 (2.42)	235.66 (2.37)	208.33 (2.31)	182.33 (2.25)	53.71	54.54	46.29	45.46	15.91	15.75
Pata Kanta	331.33 (2.52)	357.00 (2.55)	146.33 (2.16)	172.33 (2.23)	67.61	69.04	32.39	30.96	17.03	17.35
Sada jhuri	543.33 (2.73)	517.33 (2.71)	452.66 (2.65)	416.66 (2.61)	54.56	58.83	45.44	41.17	8.78	9.06
Soyla	229.66 (2.36)	246.00 (2.39)	158.66 (2.19)	171.33 (2.22)	59.17	57.91	40.83	42.09	11.38	12.72
SEM (±)	0.04	0.01	0.06	0.02	-	-	-	-	-	-
CD (p=0.05)	0.09	0.02	0.14	0.05	-	-	-	-	-	-

maximum in muktakeshi (29.85) and then in soyla (22.66), pata kanta (21.88), L-13 (21.08), kalo jhuri (21.02), chhuli makra (14.66) and sada jhuri (8.74). The results of both years of study revealed infestation ability of white fly against all the seven germplasms throughout the entire period of study. The peak period of incidence of aleurodid was recorded during August. Chhuli makra and sada jhuri were recorded as less susceptible or tolerant; kalo jhuri, L-13 and pata kanta were moderately susceptible and muktakeshi and soyla were highly susceptible to this aleurodid. It may be concluded that in chhuli makra and sada jhuri, the infestation of the aleurodid was quite lower than other brinjal germplasms and hence both the germplasms were recorded as tolerant to whitefly. The findings of Balaji and Veeravel (1995), Ghosh and Senapati (2001) and Singh *et. al.* (2002) also more or less corroborated with the results of the present investigation.

Incidence pattern of aphid on different brinjal germplasm

During 2012, the infestation of aphid was first observed in chhuli makra and kalo jhuri during end June, while in pata kanta and soyla, it was appeared quite later, i.e. in between early to mid August (Table 2). The aphid infestation was initiated during early July in L-13 and sada jhuri while during end July in muktakeshi. Then population of aphid was gradually increased and reached its peak in between mid August and mid September. During 2012, the highest aphid infestation was recorded in L-13 (420.88 per 30 leaves), followed by chhuli makra (347.33), kalo jhuri (331.22), muktakeshi (275.55), sada jhuri (237.11), soyla (197.44) and pata kanta (110.99). Then the population of aphids started to decline. During 2013, the aphids was also first appeared in end June in Chhuli makra and L-13, while in others, it was observed within July, except soyla, where its infestation was initiated in early August (Table 2). Two peak population of aphid were recorded on brinjal germplasms except muktakeshi, pata kanta and soyla. The first one was during early August while the second one was in between mid to end September, which was quite higher than the first one. In muktakeshi, pata kanta and soyla, one peak population of aphid was noted during mid September. The highest population of the pest was observed in kalo jhuri (352.11), which was succeded by chhuli makra (334.77), muktakeshi (321.55), L-13 (305.22), soyla (218.88), sada jhuri (211.66) and pata kanta (151.11). During both years of study, the highest mean aphid population was recorded in L-13 (211.72-241.49/30 leaves), followed by chhuli makra (200.85-204.63), kalo jhuri (167.38-184.33), muktakeshi (137.63-147.19), sada jhuri (123.94-131.19), soyla (90.02-90.16) and pata kanta (41.11-67.33). It is evident from the results of both years of study that none of the brinjal germplasm showed complete resistance to aphid infestation. The population of aphid remained higher during August to September, irrespective of various germplasms, when temperature ranged from 24.40-34.70^0 C, RH- 70.30-99.10 %, rainfall 1.90-24.00 mm, sunshine duration 2.70-8.30 h and wind speed 0.50-1.90 km/h.

Chhuli makra and L-13 brinjal germplasms were highly preferred by aphid in both years and these two germplasms are highly susceptible to the pest. Ghosh and Senapati (2001) also recorded moderate to high aphid infestation in L-13 (sourava). It can be concluded that chhuli makra and L-13 (sourava) were highly susceptible while kalo jhuri, muktakeshi and sada jhuri were moderately susceptible, but pata kanta and soyla were less susceptible to aphid infestation. The least infestation of aphid in pata kanta & soyla was may be due to presence of dense

hairs on the lower surface of leaves. The present results were also in line with the findings of Reddy and Birader (1990), Jyani *et. al*. (1995) and Paul and Konar (2004) regarding aphid infestation in different brinjal germplasms.

Yield of different brinjal germplasms

Among seven brinjal germplasms L-13 (sourava) obtained the maximum fruit yield (24.49 – 26.03 t/ha) followed by pata kanta (17.03 – 17.35 t/ha), muktakeshi (15.75 – 15.91 t/ha), chhuli makra (13.95 – 14.60 t/ha), kalo jhuri (13.61 – 14.31 t/ha), soyla (11.38 – 12.72 t/ha) and sada jhuri (8.78 – 9.06 t/ha), respectively (Table 3). In the year 2012, L-13 (sourava) also gave highest percentage of marketable fruits (69.12 %), which was followed by pata kanta (67.61 %), kalo jhuri (62.06 %), soyla (59.17 %), chhuli makra (56.97 %), sada jhuri (54.56 %) and mukta keshi (53.71 %). While in 2013, the maximum percentage of marketable fruits was obtained from pata kanta (69.04) and then from L-13 (66.53), kalo jhuri (61.03), sada jhuri (58.83), soyla (57.91), chhuli makra (57.63) and muktakeshi (54.54), respectively (Table 3)

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