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Field evaluation of sunflower (*Helianthus annuus* L.) accessions for resistance against leaf hopper, *Amrasca biguttula biguttula* (Ishida)

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Abstract

One hundred and twelve accessions of sunflower (*Helianthus annuus* L.) were screened under field conditions in two seasons at Sambavar Vadakarai and Udappankulam villages of Tirunelveli district of Tamilnadu, India during January to April and June to September, 2009 respectively for their resistance against leaf hopper (*Amrasca biguttula biguttula* Ishida). Observations on the number of nymphs/adults per plant were recorded at weekly interval. In the first season, four accessions viz., KBSH 1, AHT 14, GK 2002 and GMU 698 harboured the least population whereas in the second season, the accession KBSH 1 proved to be promising.

Keywords: *Amrasca biguttula biguttula* – *Helianthus annuus* – Field screening – resistance evaluation

INTRODUCTION

Sunflower (*Helianthus annuus* L.) is an important edible oil seed crop in India, being cultivated in an area of 14 lakh hectares with a production of 8.23 lakh tonnes and productivity of 701 kg/ha in 2009-2010 (Anonymous, 2011). The productivity of this crop is affected by several biotic and abiotic constraints. Many insecticides are being used to control the pest complex of sunflower, which pose health hazards and environmental problems. Plant resistance is a potential alternate management strategy to reduce such pest damage, since it is eco-friendly, cost effective and can be integrated with cultural and biological control measures (Anitha Chirumamilla *et al*., 2010).

Leaf hoppers, *Amrasca biguttula biguttula* Ishida (Homoptera : Cicadellidae) are the important sucking pests of sunflower in India (Rana and Sheoran, 2004). Both nymphs and adults suck the plant sap and their severe infestation leads to curling of leaves and the characteristic "hopper burn" symptom. Leaf hopper infestation reduces the oil yield. Since host plant resistance can be effectively exploited and utilized against sucking pests (Saritha *et al*., 2008), the present investigation was undertaken to screen sunflower germplasm for resistance against leaf hopper under field conditions.

MATERIALS AND METHODS

One hundred and twelve accessions of sunflower obtained from various sources were screened for their resistance against leaf hopper (*A. biguttula biguttula*). Two field experiments were conducted during January to April and June to September, 2009 respectively at Sambavar Vadakarai and Udappankulam villages of Tirunelveli district of Tamilnadu, India. Sunflower seeds were sown on the ridges at a spacing of 45 X 30 cm. Ten plants were maintained per row. A known susceptible check 'Morden' was maintained @ one row for every five rows of the test accessions as infestor rows. Two rows of the susceptible check were also maintained around the experimental field as infestor crop. Three replications were maintained per accession. Recommended agronomic practices were followed except plant protection measures. Observations on the number of leaf hoppers was made at weekly interval by counting the number of nymphs and adults present in three leaves one each from top, middle and bottom portion of three plants in a row. Using these data, the mean population per plant was worked out.

Based on the mean number of insects present per plant, a mean scale index as furnished below was formulated to evaluate the level of resistance of the screened accessions.

Leaf hopper population/plant	Resistance grade	Resistance rating
0 - 1	I	R
1 - 2	II	MR
2 - 3	III	S
Above 3	IV	HS

RESULTS AND DISCUSSION

The data recorded revealed that the infestation started from 27 days after sowing (DAS) in the first season and from 34 DAS in the second season and continued upto 90 DAS. In the first season, the mean population of leaf hopper ranged from 0.42 to 4.65 per plant (Table 1), whereas in the second season, an increased level of leaf hopper population was observed which ranged from 0.89 to 5.31 (Table 1).

Morden, the susceptible check recorded the highest population in both seasons (4.65 and 5.31 per plant) respectively (Table 1).

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Suganthy and Uma (2010) reported a maximum of 28 hoppers per plant in Morden. Based on the mean scale index, in first season, four accessions *viz.,* KBSH 1, AHT 14, GK 2002 and GMU 698 had less leaf hopper population (< 1.0 hopper/plant) than other accessions and were grouped as resistant varieties (Table 2). Another six accessions *viz*., AHT 17, IHT 751, GMU 606, GMU 647, K 578 and GMU 621 recorded higher mean population (1.0 to 2.0 hoppers/plant) and based on the mean scale index, these were grouped as moderately resistant varieties. Among the remaining accessions, 95 accessions were rated as susceptible and seven accessions were rated as highly susceptible. Rana and Sheoran (2004) reported that the hopper population ranged from a minimum of 2 on HSFH 848 to a maximum of 4 per plant on KBSH 1. This result was in contradictory with the present findings whereas Bhat and Virupakshappa (1993) observed some hybrids such as KBSH 8 and KBSH 1 to record less damage.

In the second season, KBSH 1 recorded the least mean population and was rated as resistant (Table 2) while 7, 18 and 86 accessions were rated as moderately resistant, susceptible and highly susceptible respectively. Similarly, Saritha et al. (2008) also reported the least mean population of leaf hoppers in KBSH 1.

Based on this study, the accessions KBSH 1, AHT 14, GK 2002 and GMU 698 recorded the least hopper population and can be used for further genetic improvement programs.

Table 1. Rating of sunflower accessions for leaf hopper resistance in the first season

Sl.no	Resistance rating	Name of the accessions
1.	Resistant	KBSH 1,AHT 14, GK 2002 and GMU 698.
2.	Moderately resistant	AHT 17, IHT 751, GMU 606, GMU 647, K 578 and GMU 621.
3.	Susceptible	KBSH 44, SF 0701, GMU 610, AHT 03, GMU 602, GMU 691, AHT 04, GMU 699, K 678, SF 0703, GMU 636, GMU 683, K 642, SF 0704, COSF 5, MANISHA, K 693, TCSH 1, GMU 605, AHT 05, K 618, SF 0706 GMU 645, GMU 700, AHT 06, K 583, SF 0707, GMU 685, GMU 622, AHT 07, K 581, SF 0708, GMU 689, GMU 601, AHT 08, K 805, SF 0709, GMU 631, GMU 690, GMU 682, AHT 09, K 696, GMU 623, GMU 659, AHT 10, AGSUN 110, IHT 756, GMU 692, GMU 614, AHT 11, GMU 615, SUNBRED 275, IHT 747, GMU 687, GMU 604, AHT 13, JK CHITRA, IHT 755, GMU 638, GMU 693, AHT 15, RAVIKIRAN, IHT 752, GMU 608, GMU 684, AHT 16, AGSUN 95, IHT 758,GMU 613, GMU 635, AHT 18, AGSUN 75, IHT 757, GMU 642, GMU 624, AHT 19, AGSUN 618, IHT 759, GMU 641, GMU 617, AHT 20, IHT 753, GMU 612, GMU640, RUSSIAN GIANT, IHT 748, GMU 637, GMU 681, NSFH 145, IHT 754, GMU 686, GMU 688, IHT 749, GMU 628, GMU 680.
4.	Highly susceptible	MORDEN, SF 0710, SF 0705, GMU 629, CO 4, KBSH 41, SF 0702.

Table 2. Rating of sunflower accessions for leaf hopper resistance in the second season

Sl.no	Resistance rating	Name of the accessions
1.	Resistant	KBSH 1.
2.	Moderately resistant	GK 2002, GMU 606, GMU 698, AHT 17, AHT 14, IHT 751, GMU 647.
3.	Susceptible	GMU 602, GMU 691, AHT 04, CO 4, GMU 683, K 618, SF 0707, GMU 685, GMU 621, AHT 15, AHT 16, GMU 613, AHT 18, AHT 19, IHT 759, GMU 641, K 578, GMU 637.
4.	Highly susceptible	KBSH 44, SF 0701, GMU 610, AHT 03, KBSH 41, SF 0702, GMU 699, K 678, SF 0703, GMU 636, K 642, SF 0704, COSF 5, GMU 629, MANISHA, K 693, SF 0705, TCSH 1, GMU 605, AHT 05, SF 0706, GMU 645, GMU 700, AHT 06, K 583, GMU 622, AHT 07, K 581, SF 0708, GMU 689, GMU 601, AHT 08, K 805, SF 0709, GMU 631, GMU 690, GMU 682, AHT 09, K 696, SF 0710, GMU 623, GMU 659, AHT 10, AGSUN 110, IHT 756, GMU 692, GMU 614, AHT 11, GMU 615, SUNBRED 275, IHT 747, GMU 687, GMU 604, AHT 13, JK CHITRA, IHT 755, GMU 638, GMU 693, RAVIKIRAN, IHT 752, GMU 608, GMU 684, AGSUN 95, IHT 758, GMU 635, AGSUN 75, IHT 757, GMU 642, GMU 624, AGSUN 618, GMU 617, AHT 20, IHT 753, GMU 612, GMU 640, RUSSIAN GIANT, IHT 748, GMU 681, NSFH 145, IHT 754, GMU 686, GMU 688, IHT 749, GMU 628, GMU 680, MORDEN.

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