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# Field screening of sunflower (*Helianthus annuus* L.) accessions 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 (Rabi 2016 and Kharif 2017) at Sambavar vadakarai and Udappankulam villages of Tirunelveli district of Tamilnadu for their resistance against leaf hopper (*Amrasca biguttula biguttula* Ishida). Observations on the number of nymphs/adults per plant at weekly interval revealed promising accessions against the study insect. In the first season, four accessions *viz.*, KBSH 1, IHT 751, GK 2002, and AHT 14 harboured the least population whereas in the second season, KBSH 1, IHT 751 proved to be promising. In both seasons, the mean insect population showed significant difference with passage of time.

**Keywords:** *Amrasca biguttula biguttula*, *Helianthus annuus*, field screening, host plant resistance

## Introduction
Sunflower (*Helianthus annus* L.) is one of the most important edible oil seed crop of the world including India, being cultivated in an area of 0.33 million hectare with 0.23 million metric tonnes of production and 0.70 metric tonnes per hectare of productivity in 2015-2016 (Anonymous, 2017) [1]. 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. Considerable progress has been made in identification of sources of resistance to the insect pests in different crops. Resistance to insects should form one of the criteria to release varieties and hybrids. Plant resistance is a potentially viable management strategy to reduce such pest damage, since it is eco-friendly, cost effective and can be integrated with cultural and biological control measures. Sunflower could be protected from sucking pest during early growth stages of the plant. (Ravi *et al*., 2006) [5].
Leaf hopper, *Amrasca biguttula biguttula* Ishida (Homoptera: Cicadellidae) is an important sucking pest of sunflower in India (Ravi *et al*., 2006) [5]. 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 reduced the oil yield. Since host plant resistance can be effectively exploited and utilized against sucking pests (Saritha *et al*., 2008) [6], 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 (*Amrasca biguttula biguttula* Ishida). Two field experiments were conducted during Rabi 2016 and Kharif 2017 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. The selected sunflower genotypes were laid out in a randomized complete block design (RCBD) replicated thrice. 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. Recommended agronomic practices were followed except plant protection measures. Observations on the number of leaf hopper was made 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. 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 in the screened accessions

**Table 1**

| Leaf hopper population (No.'s) | Resistance grade | Resistance |
|---|---|---|
| 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 starts from 27 days after sowing in the first season and 34 days in the second season and continued up to 90 DAS. In the first season, the mean population of leaf hopper ranged from 0.42 to 4.65 per plant (Table 2), whereas in the second season an increased level of leaf hopper population was observed which ranged from 0.89 to 5.31 (Table 2).
The highest population was recorded at 62 DAS in the first season and 69 DAS in the second season, after that the population gradually decreased and was found to be minimum at 90 DAS. Significant difference was found in the population as time passed. Morden, the susceptible check recorded the highest population in both seasons (4.65 and 5.31 per plant) respectively (Table 2). Suganthy and Uma 2010 [7] reported a maximum of 28 hoppers per plant in Morden. Based on the mean scale index, in first season,

four accessions *viz.*, KBSH 1, IHT 751, GK 2002, and AHT 14 had less leaf hopper population (< 1.0 hopper/plant) than other accessions and were grouped as resistant varieties (Table 3). Other five accessions *viz.*, AHT 17, 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 were rated as susceptible and 6 varieties were rated a highly susceptible. Rana and Sheoran (2004) [4] reported 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 show less damage.

In the second season KBSH 1 and IHT 751 recorded the least mean population and was rated as resistant (Table 3) while 7, 18 and 85 accessions were rated as moderately resistant, susceptible and highly susceptible respectively. Saritha *et al.*, (2008) [6] also reported a least mean population of leaf hoppers in KBSH 1 whereas Suganthy and Uma (2010) [7] reported a maximum of 28.

Aslam and Misbah Ulhaq (2003) [2] reported a significant difference in the population of hoppers as days passed.

**Table 2:** Field screening of sunflower accessions against leaf hopper in Season I and II

| Accessions | Accessions name | Mean leaf hopper population/plant | | Accessions | Accessions name | Mean leaf hopper population/plant | |
|---|---|---|---|---|---|---|---|
| | | Season I | Season II | | | Season I | Season II |
| A1 | KBSH 44 | 2.58 | 3.06 | A22 | GMU 629 | 3.07 | 3.14 |
| A2 | SF 0711 | 2.82 | 3.11 | A23 | MANISHA | 2.80 | 3.33 |
| A3 | GMU 610 | 2.84 | 3.13 | A24 | K 693 | 2.81 | 3.28 |
| A4 | GK 2002 | 0.76 | 1.44 | A25 | SF 0705 | 3.03 | 3.15 |
| A5 | AHT 03 | 2.71 | 3.25 | A26 | TCSH 1 | 2.84 | 3.18 |
| A6 | GMU 602 | 2.94 | 2.86 | A27 | GMU 605 | 2.87 | 3.23 |
| A7 | KBSH 41 | 3.04 | 3.32 | A28 | AHT 05 | 2.69 | 3.22 |
| A8 | SF 0702 | 3.11 | 3.28 | A29 | K 618 | 2.81 | 2.94 |
| A9 | GMU 691 | 2.84 | 2.99 | A30 | SF 0706 | 2.76 | 3.30 |
| A10 | AHT 04 | 2.85 | 2.94 | A31 | GMU 645 | 2.73 | 3.16 |
| A11 | GMU 699 | 2.85 | 3.18 | A32 | GMU 700 | 2.71 | 3.05 |
| A12 | K 678 | 2.87 | 3.10 | A33 | AHT 06 | 2.98 | 3.10 |
| A13 | SF 0703 | 2.70 | 3.13 | A34 | K 583 | 2.86 | 3.27 |
| A14 | GMU 606 | 1.25 | 1.96 | A35 | SF 0707 | 2.83 | 2.93 |
| A15 | CO 4 | 3.09 | 2.95 | A36 | AHT 17 | 1.01 | 1.45 |
| A16 | SF 0701 | 0.82 | 1.04 | A37 | GMU 685 | 2.91 | 2.97 |
| A17 | GMU 636 | 2.65 | 3.35 | A38 | GMU 622 | 2.91 | 3.27 |
| A18 | GMU 683 | 2.86 | 2.98 | A39 | AHT 07 | 2.85 | 3.48 |
| A19 | K 642 | 2.89 | 3.42 | A40 | K 581 | 2.69 | 3.45 |
| A20 | SF 0704 | 2.79 | 3.22 | A41 | SF 0708 | 2.78 | 3.33 |
| A21 | COSF 5 | 2.95 | 3.38 | A42 | GMU 689 | 2.75 | 3.38 |
| Accessions | Accessions name | Mean leaf hopper population/plant | | Accessions | Accessions name | Mean leaf hopper population/plant | |
| | | Season I | Season II | | | Season I | **Season II** |
| A43 | GMU 601 | 2.97 | 3.37 | A64 | IHT 747 | 2.83 | 3.05 |
| A44 | AHT 08 | 2.86 | 3.51 | A65 | GMU 687 | 2.61 | 3.18 |
| A45 | K 805 | 2.92 | 3.39 | A66 | GMU 604 | 2.94 | 3.37 |
| A46 | SF 0709 | 2.75 | 3.32 | A67 | AHT 13 | 2.82 | 3.49 |
| A47 | GHU 631 | 2.77 | 3.58 | A68 | CHITRA | 2.46 | 3.15 |
| A48 | GMU 690 | 2.89 | 3.13 | A69 | IHT 755 | 2.67 | 3.17 |
| A49 | GMU 682 | 2.75 | 3.38 | A70 | GMU 638 | 2.72 | 3.36 |
| A50 | AHT 09 | 2.56 | 3.38 | A71 | GMU 693 | 2.89 | 3.19 |
| A51 | K 696 | 2.78 | 3.26 | A72 | AHT 15 | 2.61 | 2.94 |
| A52 | SF 0710 | 3.07 | 3.07 | A73 | AHT 14 | 0.54 | 1.01 |
| A53 | GMU 621 | 1.93 | 2.32 | A74 | RAVIIRAN | 2.77 | 3.19 |
| A54 | GMU 623 | 2.86 | 3.18 | A75 | IHT 752 | 2.71 | 3.05 |
| A55 | GMU 659 | 2.69 | 3.14 | A76 | GMU 608 | 2.59 | 3.37 |
| A56 | AHT 10 | 2.74 | 3.27 | A77 | GMU 684 | 2.81 | 3.21 |
| A57 | AGN 110 | 2.95 | 3.32 | A78 | AHT 16 | 2.95 | 2.94 |
| A58 | IHT 756 | 2.87 | 3.18 | A79 | AGSN 95 | 2.88 | 3.39 |
| A59 | GMU 692 | 2.97 | 3.18 | A80 | IHT 758 | 2.73 | 3.27 |
| A60 | GMU 614 | 2.48 | 3.48 | A81 | GMU 613 | 2.69 | 2.86 |
| A61 | AHT 11 | 2.93 | 3.28 | A82 | GMU 635 | 2.50 | 3.23 |
| A62 | GMU 615 | 2.92 | 3.18 | A83 | AHT 18 | 2.74 | 2.99 |
| A63 | SUNRED5 | 2.64 | 3.07 | A84 | AGN 75 | 2.69 | 3.22 |
| Accessions | Accessions name | Mean leaf hopper population/plant | | Accessions | Accessions name | Mean leaf hopper population/plant | |
| | | Season I | Season II | | | Season I | **Season II** |
| A85 | IHT 757 | 2.82 | 3.32 | A99 | RUSSIAN GIANT | 2.97 | 3.29 |
| A86 | GMU 642 | 2.68 | 3.29 | A100 | IHT 748 | 2.73 | 3.01 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| A87 | GMU 624 | 2.76 | 3.41 | A101 | GMU 637 | 2.63 | 2.86 |
| A88 | AHT 19 | 2.74 | 2.96 | A102 | KBSH 1 | 0.42 | 0.89 |
| A89 | AGSUN18 | 2.80 | 3.11 | A103 | GMU 681 | 2.85 | 3.06 |
| A90 | IHT 759 | 2.81 | 2.98 | A104 | NSFH 145 | 2.57 | 3.59 |
| A91 | GMU 641 | 2.77 | 2.84 | A105 | IHT 754 | 2.86 | 3.20 |
| A92 | IHT 751 | 0.68 | 0.96 | A106 | GMU 686 | 2.70 | 3.23 |
| A93 | GMU 617 | 2.78 | 3.04 | A107 | GMU 688 | 2.72 | 3.52 |
| A94 | AHT 02 | 2.71 | 3.25 | A108 | IHT 749 | 2.90 | 3.45 |
| A95 | K 578 | 1.66 | 2.09 | A109 | GMU 647 | 1.45 | 1.89 |
| A96 | IHT 753 | 2.75 | 3.17 | A110 | GMU 628 | 2.97 | 3.35 |
| A97 | GMU 612 | 2.80 | 3.67 | A111 | GMU 680 | 2.67 | 3.64 |
| A98 | GMU 640 | 2.69 | 3.41 | A112 | MORDEN(CHECK) | 4.65 | 5.31 |

**Table 2:** Rating of sunflower accessions for leaf hopper resistance

| S. No. | Resistance rating | Name of the accessions | |
|---|---|---|---|
| | | Season I | Season II |
| 1 | R | KBSH 1, IHT 751, GK 2002, AHT 14 | KBSH 1, IHT 751 |

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