Research Article
The J. Res. PJTSAU 49 (3) 45-52, 2021

EVALUATION OF SUNFLOWER, *Helianthus annus* L. GERMPLASM ACCESSIONS AGAINST LEAFHOPPER, *Amrasca biguttula biguttula* Ishida UNDER FIELD CONDITIONS

TABASSUM FATIMA[1], P. SATYA SRINIVAS[2], G. SRIDEVI[3], D. SHIVANI[4] and BHARATI BHAT[5]

[1]Department of Entomology, [2]ICAR - Indian Institute of Oilseeds Research, [3]AINP on Pesticide Residues, [4]Department of Genetics & Plant Breeding [5]Department of Plant Pathology, College of Agriculture
Professor Jayashankar Telangana State Agricultural University,
Rajendranagar, Hyderabad-500 030

Date of Receipt : 30-06-2021 Date of Acceptance : 15-07-2021

ABSTRACT

Field experiment was conducted during *Rabi* season 2016-17 and 2017-18 to screen 57 sunflower germplasm accessions along with commercial hybrid, Syngenta SB-275 and susceptible check, Morden to evaluate their reaction against sunflower leafhopper at ICAR-Indian Institute of Oilseeds Research (IIOR), Hyderabad, India. Based on mean scale index (MSI) the accessions were categorised as highly resistant, resistant, moderately resistant, susceptible and highly susceptible. During *Rabi* 2016-17, average leafhopper infestation ranged between 0.3 and 18.2 per three leaves per plant across the germplasm accessions. TSG- 349 recorded the lowest mean population of leafhoppers (0.3 per three leaves per plant) while highest number of leafhoppers were recorded on the susceptible check, Morden (18.2 per three leaves per plant), 22 accessions were found resistant, 25 were found moderately resistant and 10 were found susceptible. During *Rabi*, 2017-18, leafhopper infestation ranged between 2.2 and 32.4 per three leaves per plant. GMU-339 recorded the lowest mean population of leafhoppers (2.2 per three leaves per plant). Whereas, highest numbers of leafhoppers were recorded on the susceptible check, Morden (32.4 per three leaves per plant), 15 germplasm lines were categorized as resistant, 30 germplasm lines were identified as moderately resistant while to be 12 were susceptible. Considering both the years, consistently 15 accessions were identified as resistant and 23 accessions moderately resistant.

Sunflower (*Helianthus annuus* L.) is an important oilseed crop in India popularly known as "Surajmukhi". It is an important source of high quality edible oil with wide adaptability to seasons and soils. Sunflower was introduced into India in 1969 and now occupies an area of 0.25 lakh hectares and production of 0.22 million tonnes and productivity of 886 kg per hectare (DAC & FW, 2020). In Telangana state, the crop was grown with an area of 0.10 lakh acres during *Rabi,* 2019 with production of 0.07 million tonnes and productivity of 687 kg per acre (DES, 2020). In India there are more than fifty insect species (seedling pests, sucking pests, soil insects, defoliators and inflorescence pests) feeding on sunflower at different phenological stages (Basappa and Prasad, 2005). In Telangana state, leafhopper *Amrasca biguttula biguttula* (Ishida) is the major pest in sunflower.

A. biguttula biguttula has a broad host range including cotton, okra, brinjal, eggplant, jute and sunflower. This pest is more serious in the tropics and subtropics because of the favorable environmental conditions for its growth and development round the year (Ramandeep, 2016). In sunflower, leafhopper population is predominantly observed during *Rabi* season. Both nymphs and adults of leafhopper suck the cell sap from the leaves and shows symptoms like stunted growth, burning of leaf margins, cupped and crinkled leaves. In severe case if infestation occurs, characteristic "hopper burn" is noticed. Leafhopper caused 25.2 and 41.0 per cent yield reduction in sunflower hybrid, KBSH-53 and variety, Morden, respectively (DOR, 2014) whereas in okra it caused 32.06 to 40.84 per cent damage (Singh and Brar, 1994) and 16.3 per cent reduction in seed yield of cotton (Ramalakshmi, 2012).

Reducing the cost of production is one of the important crop technologies in sunflower to increase the profitability of the crop. Host plant resistance in crop plants is an important component of Integrated Pest Management (IPM) and it is considered as non-monetary input. Use of resistant or less susceptible cultivars is one of the most significant methods of

email:s.rahiftento@gmail.com

keeping insect populations below economic threshold levels. It is most helpful when carefully utilized with other components of pest management. Host plant resistance to leafhopper is being exploited in several research institutes and important sources of resistance have been identified. However, there are no durable resistant lines against leafhopper in sunflower. Keeping this in view few sunflower germplasm accessions were screened against leafhopper under natural field conditions to identify the sources of resistance that can be utilized in the breeding programmes.

MATERIAL AND METHODS

Screening and evaluation for leafhopper resistance was done in the field under unsprayed conditions taking advantage of the natural infestation.

A total of 57 germplasm accessions of sunflower collected from Germplasm Maintenance Unit (GMU), IIOR, Rajendranagar with different plant characters along with commercial hybrid, Syngenta SB-275 and susceptible check, Morden were screened during *Rabi*, 2016-17 and 2017-18 at IIOR farm, Rajendranagar. Each line was planted in single row of 3 m length at a spacing of 60 x 30 cm and 2 replications were maintained for each line. For every two rows of germplasm lines one row of Morden (susceptible check) was sown as infester row. Sowing was done on 08-12-2016 during *Rabi,* 2016-17 and on 17-1-2018 during *Rabi*, 2017-18. Crop was raised as per the IIOR recommended package of practices and no plant protection measures were taken up for leafhoppers, as the screening was done under natural infestation.

Observations on leafhopper population was recorded on five randomly selected plants per replication on 65 days old crop when peak leafhopper population was observed. The nymphs of leafhopper were counted on top, middle and lower leaves per plant.

Injury grade	Scoring of leafhopper injury
0	Free from leafhopper injury
1	Slight yellowish on the edges up to 30 per cent
2	Yellowing and curling up to 40 per cent leaves
3	Yellowing and curling up to 60 per cent leaves
4	Yellowing and curling up to 80 per cent leaves
5	Maximum, yellowing, cupping and curling up to 100 per cent

Leafhopper injury on five randomly selected plants was scored as per Ingale *et al.,* 2019 and grade was awarded as follows

On the basis of injury grade, Mean Scale Index (MSI) was determined as under;

$$MSI = \frac{(G0 \times P) + (G1 \times P) + (G2 \times P) + (G3 \times P) + (G4 \times P) + (G5 \times P)}{TP}$$

Where, G - Leafhopper Injury Grade (0 to 5)

P - The number of plants under the grade for each category

TP - Total number of plants taken for observation

MSI	Resistance category
0.0	Highly resistant
0.1-1.0	Resistant
1.1-2.5	Moderately resistant
2.6-3.5	Susceptible
3.6-5.0	Highly susceptible

Based on MSI, the accessions were grouped into five categories as given below (Ingale *et al.,* 2019).

The leafhopper susceptibility index (LHSI) for each accession was worked out by multiplying the average nymphal population per three leaves per plant with corresponding mean scale index (Mahal *et al.,* 1993).

RESULTS AND DISCUSSION

Rabi 2016-17

The average leafhopper infestation ranged between 0.3 and 18.2 per three leaves per plant across the germplasm accessions (Table 1). Among the germplasm lines, the accession TSG- 349 recorded the lowest mean population of leafhoppers (0.3 per three leaves per plant). Highest number of leafhoppers were recorded on the susceptible check Morden (18.2 per three leaves per plant) followed by PSECO-86 (15.6 per three leaves per plant) and PSMO-53-B-1 (15.0 per three leaves per plant). The population of leafhopper in the remaining 54 accessions ranged between 2.0 and 13.2 per three leaves per plant. Twenty two accessions were found resistant with an average MSI ranging from 0.6 and 1.0, while twenty five were found moderately resistant with an average MSI ranging from 1.1 and 2.2, ten germplasm lines were found susceptible with an average MSI ranging from 2.6 and 2.7. The commercial sunflower hybrid,

Table 1. Field screening of sunflower germplasm accessions against leafhopper, *Amrasca biguttula biguttula* (*Rabi*, 2016-17 and 2017-18)

S.no	Germplasm	2016 -17			2017-18		
		Average No. of leafhoppers/ three leaves/plant	MSI	LHSI	Average No. of leafhoppers/ three leaves/plant	MSI	LHSI
1	GMU-4	12.3	1.8	22.14	17.2	2.6	44.63
2	GMU-25	3.0	1.0	3.00	3.4	1.0	3.40
3	GMU-243	10.6	2.6	27.56	15.0	2.7	40.50
4	GMU-327	12.0	1.2	14.40	16.0	2.0	32.00
5	GMU-339	3.3	0.6	1.98	2.2	0.8	1.76
6	GMU-343	4.2	1.4	5.88	9.0	1.8	16.20
7	GMU-405	9.8	1.3	12.74	13.8	1.2	16.56
8	GMU-504	6.0	1.0	6.00	8.4	1.0	8.40
9	GMU-556	4.4	1.1	4.84	9.0	1.2	10.80
10	GMU-595	8.2	1.0	8.20	10.2	1.6	16.32
11	GMU-669	2.2	1.0	2.20	4.6	1.0	4.60
12	GMU-696	2.9	1.0	2.90	5.2	1.0	5.20
13	GMU-713	8.4	1.2	10.08	11.2	1.6	17.92
14	GMU-776	7.4	1.0	7.40	5.4	1.0	5.40
15	GMU-922	9.6	1.0	9.60	13.6	1.8	24.48
16	GMU-1029	4.2	1.0	4.20	10.4	1.2	12.48
17	GP-6-570	5.4	1.0	5.40	9.6	1.6	15.36
18	GP-9472-4-13	5.2	1.1	5.72	10.6	1.4	14.84
19	AKSFI-46-2	5.4	1.0	5.40	6.6	1.0	6.60
20	TSG-195	2.4	1.0	2.40	6.6	1.2	7.92
21	TSG-196	8.4	1.0	8.40	6.8	1.2	8.16

Table 1. (cont.)

S.no	Germplasm	2016 -17			2017-18		
		Average No. of leafhoppers/ three leaves/plant	MSI	LHSI	Average No. of leafhoppers/ three leaves/plant	MSI	LHSI
22	TSG-197	2.0	0.6	1.20	4.4	1.0	4.40
23	TSG-198	3.8	0.8	3.04	4.2	1.0	4.20
24	TSG-216	5.6	1.1	6.16	8.2	1.2	9.84
25	TSG-217	2.8	0.6	1.68	3.2	0.8	2.56
26	TSG-238	8.4	1.1	9.24	11.6	1.2	13.92
27	TSG-258	4.6	1.4	6.44	6.8	1.6	10.88
28	TSG-278	5.8	1.1	6.38	8.2	1.4	11.48
29	TSG-287	6.6	1.2	7.92	9.6	1.6	15.36
30	TSG-295	11.4	2.6	29.64	18.2	2.8	50.96
31	TSG-296	6.0	1.1	6.60	8.2	1.4	11.48
32	TSG-297	6.4	1.3	8.32	8.4	1.6	13.44
33	TSG-298	3.4	0.8	2.72	4.6	1.0	4.60
34	TSG-302	10.4	1.2	12.48	12.4	1.4	17.36
35	TSG-320	5.6	1.1	6.16	8.6	1.3	11.18
36	TSG-337	6.8	1.1	7.48	7.4	1.4	10.36
37	TSG-338	6.4	1.2	7.68	9.6	1.4	13.44
38	TSG-339	6.8	1.1	7.48	7.8	1.3	10.14
39	TSG-349	0.3	0.6	0.18	2.6	1.0	2.60
40	TSG-400	2.1	1.0	2.10	3.8	1.2	4.56
41	TSG-401	3.8	0.8	3.04	6.2	1.0	6.20
42	TSG-HA-430-B	4.6	1.0	4.60	7.8	1.0	7.80

Table 1. (cont.)

S.no	Germplasm	2016 -17			2017-18		
		Average No. of leafhoppers/ three L-leaves/plant	MSI	LHSI	Average No. of leafhoppers/ three leaves/plant	MSI	LHSI
43	TSG-HA-89-B	6.0	1.0	6.00	10.6	1.0	10.60
44	PSCIM-115	8.6	1.2	10.32	13.6	1.8	24.48
45	PSCIM-117	13.2	1.8	23.76	17.2	2.3	39.56
46	PSCIM-122	10.4	1.6	16.64	13.8	2.2	30.43
47	PSCIM-186	12.6	2.6	32.76	20.2	3.2	64.64
48	PSCIM-137	6.6	1.6	10.56	14.0	2.4	33.60
49	PSCRM-127	10.4	2.6	27.04	17.8	2.7	48.06
50	PSECO-70	12.0	2.2	26.40	16.4	2.8	45.92
51	PSECO-79	12.6	2.7	34.02	24.2	3.0	72.60
52	PSECO-81	7.8	2.6	20.28	15.0	2.8	42.00
53	PSECO-86	15.6	3.0	46.80	23.4	3.4	79.56
54	PSERM-138	8.4	2.6	21.84	14.6	2.8	40.88
55	PSMO-53-B-1	15.0	2.7	40.50	20.6	3.5	72.10
56	PSMO-53-D	9.6	2.7	25.92	13.2	2.8	36.86
57	OCRM	7.8	1.2	9.36	8.4	1.8	15.12
58	Syngenta-SB-275	10.4	2.6	27.04	15.8	3.0	47.40
59	Morden (SC)	18.2	3.2	58.24	32.4	3.4	110.16
	Mean	7.3	-	-	11.0	-	-

Syngenta-SB-275 and susceptible check, Morden were found 'susceptible' to leafhoppers with an average MSI of 2.6 and 3.2, respectively. LHSI ranged between 0.18 and 58.24 among the germplasm lines wherein TSG- 349 recorded the lowest LHSI of 0.18 followed by TSG-197 (1.20), TSG-217 (1.68), GMU-339 (1.98), TSG-400 (2.10), GMU-669 (2.20), TSG-195(2.40), TSG-298 (2.72), GMU-696 (2.90), GMU-25 (3.00), TSG-198 and TSG-401 (3.04). Highest LHSI was recorded in susceptible check, Morden (58.24) followed by PSECO-86 (46.80) and PSMO-53-B-1 (40.50). The LHSI of remaining 43 accessions ranged between 4.20 and 34.02.

***Rabi*, 2017-18**

The leafhopper infestation ranged between 2.2 and 32.4 per three leaves per plant (Table 1). The germplasm accession, GMU-339 recorded the lowest mean population of leafhoppers (2.2 per three leaves per plant). The highest numbers of leafhoppers were recorded on the susceptible check, Morden (32.4 per three leaves per plant) followed by PSECO-79 (24.2 per three leaves per plant) and PSECO-86 (23.4 per three leaves per plant). The population of leafhopper in the remaining 54 accessions ranged between 2.6 and 20.6 per three leaves per plant. Fifteen germplasm accessions were categorized as 'resistant' with an MSI of 0.8 and 1.0; thirty germplasm lines were categorized as 'moderately resistant' with an average MSI ranging from 1.2 and 2.4 and twelve as susceptible with an MSI ranging from 2.6 and 3.5. The commercial sunflower hybrid, Syngenta-SB-275 and susceptible check, Morden were found to be 'susceptible' to leafhoppers with an average MSI of 3.0 and 3.4. LHSI ranged between 1.76 to 110.16, among the germplasm accessions, GMU-339 recorded the lowest LHSI of 1.76 followed by TSG- 217 (2.56), TSG- 349 (2.60), GMU-25 (3.40), TSG-198 (4.20), TSG-197 (4.40), TSG-298 (4.60), TSG-400 (4.56), GMU-669 (4.60), GMU- 696 (5.20), GMU-776 (5.40) and TSG-401 (6.20). Highest LHSI was recorded in susceptible check, Morden (110.16) followed by PSECO-86 (79.56), PSECO-79 (72.60) and PSMO-53-B-1 (72.10). The LHSI of remaining 43 accessions ranged between 6.60 and 64.64.

A perusal of Table 2 revealed that among the 57 accessions evaluated, fifteen accessions were consistently found resistant to leafhopper for two years, *i.e.,* 2016-17 and 2017-18. Twenty three accessions were offered moderate resistance while eleven accessions were found susceptible. However, eight accessions did not exhibit any consistency in their reaction to leafhoppers. Screening and evaluation of different germplasm accessions of sunflower against leafhopper was done earlier based on 0-5 injury grades by different workers *viz*., Saleem *et al*. (2017) and Ingale *et al.* (2019). Host plant resistance to leafhopper is being exploited as several research centres and important sources of resistance have been identified. Previous studies reported GMU-339 and TSG-401 resistance to leafhopper infestation based upon

Table 2. Categorization of sunflower germplasm based on mean scale index

2016-17	2017-18	2016-17 and 2017-18	Reaction
GMU-25, GMU-339, GMU-504,GMU-595 GMU-669,GMU-696, GMU-776, GMU-922, GMU-1029, GP-6-570, AKSFI-46-2, TSG-195, TSG-196, TSG-197, TSG-198, TSG-217, TSG-298, TSG-349, TSG-400, TSG-401, TSG-HA-430-B and TSG-HA-89-B	GMU-25, GMU-339, GMU-504, GMU-669, GMU-696, GMU-776, AKSFI-46-2, TSG-197, TSG-198, TSG-217, TSG-298, TSG-349, TSG-401, TSG-HA-430-B and TSG-HA-89-B	GMU-25, GMU-339, GMU-504, GMU-669, GMU-696, GMU-776, AKSFI-46-2, TSG-197, TSG-198, TSG-217, TSG-298, TSG-349, TSG-401, TSG-HA-430-B and TSG-HA-89-B	Resistant
GMU-4, GMU-327, GMU-343, GMU-405, GMU-556, GMU-713, GP-9472-4-13, TSG-216, TSG-238, TSG-258, TSG-278, TSG-287, TSG-296, TSG-297, TSG-302, TSG-320, TSG-337, TSG-338, TSG-339, PSCIM-	GMU-327, GMU-343, GMU-405, GMU-556, GMU-595, GMU-713, GMU-922, GMU-1029, GP-6-570, GP-9472-4-13, TSG-195, TSG-196, TSG-216, TSG-238, TSG-258,	GMU-327, GMU-343, GMU-405, GMU-556, GMU-713, GP-9472-4-13, TSG-216, TSG-238, TSG-258, TSG-278, TSG-287, TSG-296, TSG-297, TSG-302, TSG-320, TSG-337, TSG-338, TSG-339, PSCIM-115,	Moderately Resistant

2016-17	2017-18	2016-17 and 2017-18	Reaction
115, PSCIM-117, PSCIM-122, PSCIM-137, PSECO-70 and OCRM	TSG-278, TSG-287, TSG-296, TSG-297, TSG-302, TSG-320, TSG-337, TSG-338, TSG-339, TSG-400, PSCIM-115, PSCIM-117, PSCIM-122, PSCIM-137 and OCRM	PSCIM-117, PSCIM-122, PSCIM-137 and OCRM	
GMU-243, TSG-295, PSCIM-186, PSCRM-127, PSECO-79, PSECO-81, PSECO-86, PSERM-138, PSMO-53-B-1, PSMO-53-D, Syngenta-SB-275 and Morden (Susceptible check)	GMU-4, GMU-243, TSG-295, PSCIM-186, PSCRM-127, PSECO-70, PSECO-79, PSECO-81, PSECO-86, PSERM-138, PSMO-53-B-1, PSMO-53-D, Syngenta – SB-275 and Morden (Susceptible check)	GMU-243, TSG-295, PSCIM-186, PSCRM-127, PSECO-70, PSECO-79, PSECO-81, PSECO-86, PSERM-138, PSMO-53-B-1, PSMO-53-D, Syngenta-SB-275 and Morden (Susceptible check)	Susceptible

hoppers injury grade (DOR, 2006 and IIOR, 2017 and 2019). Morden was categorised as the most susceptible variety to leafhopper and recorded highest number of leafhopper nymphs per leaf and maximum injury grade of 5.0 (DOR, 1999 and 2008, Jagadish *et al*., 2004, Saritha *et al*., 2008 and Suganthy and Uma, 2010). Vijay kumar *et al.* (2019) reported six accessions as resistant (GMU-25, GMU-339, GMU-504, GMU-922, GMU-570 and GP-9-472-4-13), 16 germplasms as moderately resistant *i.e.,* GMU-1, GMU-4, GMU-116, GMU-405, GMU-595, GMU-669, GMU-703, GMU-782, GMU-914, GMU-1029, GMU-243, GMU-327, GMU-556, GMU-696, GMU-776 and AKSFI-46-2.

CONCLUSION

The results of the present study showed that fifteen germplasm accessions *viz*., GMU-25, GMU-339, GMU-504, GMU-669, GMU-696, GMU-776, AKSFI-46-2, TSG-197, TSG-198, TSG-217, TSG-298, TSG-349, TSG-401, TSG-HA-430-B and TSG-HA-89-B were found consistently resistant during *Rabi*, 2016-17 and 2017-18. These identified sources of resistance can be utilized in the resistance breeding programme for the development of resistant cultivars against *A.biguttula biguttula*.

REFERENCES

Basappa, H and Prasad, S.L. 2005. Insect pests and diseases of sunflower and their management (ed. D.M. Hegde), Directorate of Oilseeds Research. Hyderabad. 80.

DAC & FW. 2020. Sunflower all India area, production and yield. Available at *https://eands.dacnet.nic.in/PDF/At%20a%20 Glance %202019%20Eng.pdf*

DES, 2020. Crop scenario 2018-19 and 2019-20. Available at *https://agri.telangana.gov.in/open_record_view.php?ID=803*

DOR, 1999. Annual report of AICRP on Oilseeds (sunflower). Directorate of Oilseeds Research, ICAR, Hyderabad, India. 128.

DOR, 2006. Annual report of AICRP on Oilseeds (sunflower), 2005-06. Directorate of Oilseeds Research, ICAR, Hyderabad, India. 149.

DOR, 2008. Annual report of AICRP on Oilseeds (sunflower), 2007-08. Directorate of Oilseeds Research, ICAR, Hyderabad, India.169-171.

DOR, 2014. Annual Report 2013-14. Directorate of Oilseeds Research, Hyderabad, India. 21

IIOR, 2017. Annual report 2016-17. ICAR, Indian Institute of Oilseeds Research, ICAR, Hyderabad, India. 33.

IIOR, 2019. Annual report of AICRP on Oilseeds (sunflower) 2018-19. Directorate of Oilseeds Research, ICAR, Hyderabad, India. 187.

Ingale, A. S., Mutkule, D.S., Deshmukh, K.V., Kumbhar, S. C Bharadwaj and Gollanapalli. S. 2019. Screening of sunflower germplasm lines for resistance/tolerance to leafhopper and whitefly. Journal of Entomology and Zoology Studies. 7(5): 803-805.

Jagadish, K.S., Shadakshari, Y.G., Puttarangaswamy, K.T and Jagannatha, D.P. 2004. Impact of sowing dates and genotypes on the incidence of major insect pests and their predatory fauna in sunflower. Insect Environment.10(3): 99-100.

Mahal, M.S., Lal, H., Singh, R and Singh, B. 1993. Field resistance in okra to cotton jassid, *Amrasca biguttula biguttula* (Ishida) in relation to crop age. Journal of Insect Science. 6(1): 60-63.

Ramandeep, K. S. 2016. Evaluation of okra germplasm for their resistance to jassid, *Amrasca biguttula biguttu*la (Ishida). M.Sc. Thesis. Punjab Agricultural University. Ludhiana. India.

Ramalakshmi, V. 2012. Studies on Yield Loss and Management of Sucking pests on Transgenic Cotton. MSc. Thesis, ANGR Agricultural University, Rajendra Nagar, Hyderabad.

Saleem Muhammed., Waqar Hassan Muhammed and Jamil Moazzam. 2017. Screening of sunflower (*Helianthus annuus* L.) varieties against sucking insect pests, predators populations and their yield comparison under semiarid climatic conditions. Journal of Entomology and Zoology Studies. 5(3):1219-1225.

Saritha, R., Dharma Reddy, K and Basappa, H. 2008. Screening of sunflower varieties for the resistance against sucking pests. Indian Journal of Plant Protection. 36(1): 144-147.

Singh, G and Brar, K. S. 1994. Effect of dates of sowing on the incidence of *Amarsca biguttula biguttula* (Ishida) and *Earias* species on Okra. Indian Journal of Entomology. 21: 41-48.

Suganthy, M and Uma, D. 2010. Screening of promising germplasm entries of sunflower against major pests. National Workshop on "Paradigm Shifts in Research on Crop Resistance to pests", Department of Entomology, Faculty of Agriculture, Annamalai University. 61.

Vijaykumar, N.G., Arunkumar, C.H and Vikas Kulkarni. 2019. Biochemical constituents *vis-à-vis* leafhopper, *Amrasca biguttula biguttula* (Ishida) tolerance in sunflower germplasms. Journal of Entomology and Zoology Studies. 7(4): 235-238.