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FIELD SCREENING OF SUNFLOWER (*HELIANTHUS ANNUUS* L.) ACCESSIONS AGAINST HEAD BORER (*HELICOVERPA ARMIGERA* HUBNER)

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Abstract

Sunflower (*Helianthus annus* L.) is one of the important oil seed crop in India, contributing to the edible oil industry of the country. In India it is cultivated in an area of 14 lakh ha with a production of 8.23 lakh tones. The field screening was carried out at Sambavar vadakarai and Udappankulam villages of Tirunelveli district of Tamilnadu during January to April and June to September, 2016 in two seasons to evaluate the resistance of one hundred and twelve accessions of sunflower against head borer (*Helicoverpa armigera* Hubner) under field conditions. Observations were made on the number of larvae/head at weekly interval starting from 55th day of sowing till harvest. During both seasons, four varieties KBSH 1, IHT 751, GHU 631 and GMU 615 recorded the least mean larval population. In the first season, the population ranged from 0.39 to 4.99 larva/plant whereas in the second season, it ranged between 0.35 and 2.78 larva per plant and a significant difference in the population was noticed.

Key words : *Helicoverpa armigera, Helianthus annus,* ield screening, host plant resistance.

Introduction

Sunflower (*Helianthus annus* L.) is one of the important oil seed crop in India, contributing to the edible oil industry of the country. In India, it is cultivated in an area of 1.48 M. ha. with a production of 0.09 M. metric tonnes (Anonymous, 2017). Average recorded yield of sunflower is 0.6 MT/acre and is the lowest in the world due to several biotic and abiotic production constraints. Among the biotic stresses, insects cause regular yield loss. In the recent past, insect pest outbreaks pose serious threat to profitable production of sunflower (Jayewar and Sonkamble, 2015). Out of the very many insect pests recorded in India, capitulum borer (*Helicoverpa armigera* Hubner), leaf hopper, (*Amrasca biguttula biguttula* Ishida), thrips (*Thrips palmi* Karny) and defoliators (*Spilasoma obliqua* Walker are the major pests (Jagadish *et al*., 2006) recorded on sunflower crop.

Head or capitulum borer is a polyphagous pest and severe pest of sunflower causing 20-25 percent loss in yield under normal conditions. However, sometimes the damage is so severe and loss goes up to 40-70 percent. Newly hatched larvae feed on leaves, buds and flowers for a short period of time and after making a hole in the disc may enter in it to feed the developing seed. After devouring the seed in one head, the larvae move to the next head resulting in heavy loss of the crop.

Studies on sunflower insects in the past have focused on the use of chemical control, but screening and evaluating for host plant resistance for the major insect pests has become a current research priority (Anitha Chirumamilla *et al*., 2010). Hence, an investigation was undertaken to evaluate the available sunflower accessions under field conditions for their resistance to head borer during January to September, 2016 at Tirunelveli district of Tamilnadu.

Materials and Methods

Two preliminary field trials were conducted during January to April and June to September, 2016 at Sambavar vadakarai and Udappankulam villages of Tirunelveli district of Tamilnadu, India to screen the resistance of 112 accessions of sunflower against head borer (*Helicoverpa armigera* Hubner). Sunflower seeds were sown on the ridges of the prepared field at a spacing of 45 × 30 cm.

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Table 1: Mean scale index.

Head borer population (nos.)	Resistance grade	Resistance
0.0 -0.50	I	R
0.51 -1.50	II	MR
1.51 -2.50	III	S
Above 2.50	IV	HS

Ten plants were maintained per accession. 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 larval population on three randomly selected heads per row was recorded from 55th day of sowing on weekly intervals till harvest.

A mean scale index was formulated to evaluate the level of resistance in the screened accessions against head borer based on the mean number of larvae present per head. The mean scale index is as follows.

Results and Discussion

In both seasons, the infestation was recorded from 55 days after sowing. In the first season, the mean larval population ranged from a minimum of 0.39 to a maximum of 4.18 larvae/plant (Table 2), whereas in the second season, a decreased level of larval population was noticed which ranged from 0.35 to 2.78 larvae per plant (Table 3). The highest population was recorded on the susceptible check at 76 DAS (3.66 larvae/head) (Table 3), in the second season, after that the population gradually decreased and was found to be the minimum at 90 DAS. In all other accessions, the larval population was significantly less compared to the susceptible check and it is similar to the observation of variability in wild sunflower in their reaction to *Spodoptera litura* from immune to highly susceptible (Sujatha and Lakshiminarayana, 2007).

Among the 112 accessions tested in the first season, four accessions *viz*., KBSH 1, IHT 751, GHU 631 and GMU 615 averaged less than 0.50 larvae per head (Table 2) indicating resistance to attack by head borer. Another six accessions *viz*., K 578, GMU 612, GMU 698, GK 2002, AHT 02 and Ravi harbored 0.51 to 1.50 larvae/ head (Table 2) and based on the mean scale index, these accessions were rated as moderately resistant. Similarly Rana and Sheron, 2004 evaluated sunflower hybrids against head borer and reported a minimum of one larva/ head on accessions like HSFH 848 followed by Jwala Mukhi, KBSH 1 and Krishidhan 13.

Among the remaining accessions, 25 were rated as susceptible and the final 77 accessions averaged maximum of more than 2.5 larvae/head and were grouped as highly susceptible as per mean scale index (Table 1).

In the second trial also four accessions *viz*., KBSH 1, IHT 751, GMU 615 and K 528 had the lowest mean larval density per plant which indicate resistance to head borer. Eighty nine other accessions show a higher level of population and were rated as moderately resistant (Table 3). The remaining 18 accessions were listed as susceptible and the susceptible check, Morden alone rated as highly susceptible accession in the second trial.

Tariq Mustafa *et al*., 2003 reported non-significance on the mean population of semilooper among the different varieties of Sunflower with F value 1.11.

Table 2: Preliminary field screening of sunflower accessions against head borer in season I.

Accessions	Mean head borer larva/plant						Mean
	55 DAS	62 DAS	69 DAS	76 DAS	83 DAS	90 DAS	
GK 2002	0.00	0.66	1.00	1.33	0.99	0.22	**0.70**
KBSH 41	1.99	2.33	3.99	4.99	4.66	3.22	**3.53**
GMU 699	2.99	2.66	3.33	4.77	3.99	1.88	**3.27**
CO 4	1.99	2.99	3.99	3.77	4.55	3.44	**3.46**
GMU 698	0.00	0.66	0.99	1.33	0.88	0.22	**0.68**
GMU 636	2.33	3.33	3.99	4.33	3.99	1.55	**3.25**
K 693	0.00	0.77	1.00	1.55	0.99	0.33	**0.77**
AHT 06	1.99	2.99	3.99	3.77	4.33	2.66	**3.29**
AHT 07	0.00	0.44	0.88	1.22	0.77	0.22	**0.59**
GMU 631	0.00	0.22	0.77	1.00	0.66	0.00	**0.44**
GMU 615	0.00	0.33	0.88	1.00	0.66	0.11	**0.50**
AHT 15	0.00	0.77	1.00	1.55	1.00	0.33	**0.78**
IHT 751	0.00	0.22	0.77	0.99	0.55	0.00	**0.42**
K 578	0.00	0.44	0.88	1.00	0.77	0.22	**0.55**
KBSH 1	0.00	0.22	0.66	0.99	0.44	0.00	**0.39**
GMU 681	2.33	1.99	4.55	4.99	4.33	1.33	**3.25**
IHT 754	1.66	3.33	3.66	4.77	3.99	2.22	**3.27**
MORDEN	2.44	3.99	5.22	5.55	4.44	3.44	**4.18**
SEd	**0.0897**	**0.1064**	**0.0713**	**0.0686**	**0.0817**	**0.1448**	
CD (p=0.05)	**0.1770**	**0.2099**	**0.1406**	**0.1353**	**0.1612**	**0.2856**	
Each value is an average of three replicates							

Table 3: Preliminary field screening of sunflower accessions against head borer in season II.

Accessions	Mean head borer larva/plant						Mean
	55 DAS	62 DAS	69 DAS	76 DAS	83 DAS	90 DAS	
GK 2002	0.00	0.66	1.22	1.33	0.22	0.00	0.57
KBSH 41	1.33	2.66	3.44	1.88	1.44	0.00	**1.79**
K 678	0.77	1.21	1.66	1.33	0.44	0.00	**0.90**
GMU 606	0.66	0.99	1.33	1.44	0.55	0.00	**0.83**
CO 4	1.88	2.44	1.99	1.88	1.33	0.00	**1.59**
GMU 698	0.00	0.66	1.11	1.22	0.22	0.00	**0.54**
GMU 636	1.55	2.88	2.33	1.88	0.99	0.00	**1.61**
K 642	1.66	2.88	2.11	2.22	0.88	0.00	**1.63**
GMU 629	0.33	1.66	1.44	1.44	0.44	0.00	**0.89**
K 693	0.00	0.88	1.33	1.33	0.33	0.00	**0.65**
SF 0706	0.77	1.22	1.21	1.33	0.55	0.00	**0.85**
GMU 645	2.10	1.88	2.66	1.99	0.66	0.00	**1.55**
GMU 700	0.99	1.11	1.44	1.66	0.55	0.00	**0.96**
AHT 06	1.99	2.77	1.99	2.44	0.99	0.00	**1.70**
SF 0707	1.66	3.10	2.77	2.22	0.44	0.00	**1.70**
AHT 17	1.44	2.33	2.33	2.22	0.66	0.00	**1.50**
GMU 685	2.10	3.22	2.44	1.66	0.44	0.00	**1.64**
AHT 07	0.00	0.55	1.11	1.22	0.22	0.00	**0.52**
GMU 601	1.99	2.11	2.10	2.33	0.66	0.00	**1.53**
K 805	1.44	2.55	2.55	1.66	0.99	0.00	**1.53**
GMU 631	0.00	1.22	1.33	1.00	0.44	0.00	**0.67**
GMU 690	1.33	1.22	1.33	1.22	0.66	0.00	**0.96**
GMU 621	1.21	2.33	2.88	2.33	0.55	0.00	**1.55**
GMU 623	2.33	1.66	2.44	1.77	0.99	0.00	**1.53**
GMU 615	0.00	0.33	1.00	1.11	0.11	0.00	**0.43**
SUNBRED 275	2.33	2.22	2.66	2.44	0.44	0.00	**1.68**
IHT 747	2.77	1.99	1.99	2.66	0.77	0.00	**1.70**
GMU 638	1.99	3.55	1.88	1.99	0.55	0.00	**1.66**
AHT 15	0.00	0.88	1.33	1.33	0.33	0.00	**0.65**
IHT 752	2.55	1.55	1.66	2.88	0.66	0.00	**1.55**
GMU 684	1.21	1.88	3.21	1.99	0.88	0.00	**1.53**
IHT 751	0.00	0.22	1.00	1.00	0.00	0.00	**0.37**
K 578	0.00	0.33	1.11	1.22	0.11	0.00	**0.46**
KBSH 1	0.00	0.22	0.88	1.00	0.00	0.00	**0.35**
GMU 681	1.88	2.10	2.66	2.33	0.55	0.00	**1.59**
MORDEN	2.77	3.55	3.66	3.50	3.22	0.00	**2.78**
SEd	**0.1258**	**0.1229**	**0.1162**	**0.1261**	**0.1743**		
CD (p=0.05)	**0.2483**	**0.2424**	**0.2293**	**0.2487**	**0.3439**		
Each value is an average of three replicates							

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