

POPULATION BUILD UP STUDIES OF SUNFLOWER SUCKING PESTS WITH CHOICE AND NO-CHOICE TESTS ON PROMISING SUNFLOWER LINES

Amala Hyacinth A.M. and Chand Asaf

Department of Entomology

Faculty of Agriculture

Annamalai University

Tamilnadu – 608 002

e-mail: chandmuba@gmail.com

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, India. Investigations were made to study the population build-up of sucking pests viz., whiteflies (*Bemisia tabaci*), leaf hoppers (*Amrasca biguttula biguttula*) and thrips (*Thrips palmi*) on sunflower. Results of field screening indicated six accessions (KBSH-1, K 578, AHT 02, IHT 751, GMU 615, GHU 631) to be comparatively resistant to the sucking pests. The check variety 'Morden' proved to be the most susceptible sustaining highest populations of sucking pests throughout the experimental period. Population build-up studies (Choice-test) on the six promising accessions in comparison to Morden as 'check', revealed that AHT 02 harboured least population of whiteflies followed by IHT 751 and KBSH-I. The population of leaf hoppers was minimum on K 578 followed by KBSH-1 and AHT 02. The accessions KBSH-1, IHT 751 and AHT 02 recorded least mean thrips population. Under No-choice test, KBSH-1 and IHT 751 recorded least whitefly population and the accessions K 578 and KBSH-1 sustained minimum leaf hopper population. The least number of thrips was observed on IHT 751 followed by AHT 02 and KBSH-1.

Keywords: *Helianthus annuus* - Field Screening - Sucking Pests - Population Build-up

INTRODUCTION

Sunflower (*Helianthus annuus* 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). 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. Plant resistance is a potentially viable 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). Resistance to insects should form one of the criteria to

release varieties and hybrids. Sunflower could be protected from sucking pests during early growth stages of the plant. (Ravi *et al.*, 2006).

Whiteflies (*Bemisia tabaci*), leaf hoppers (*Amrasca biguttula biguttula*) and thrips (*Thrips palmi*) 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. Sucking pest 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 study the population build-up of sucking pests 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.

After field screening, population build-up (choice test and no-choice test) of thrips, whiteflies and leaf hoppers were studied on six promising accessions (KBSH-1, IHT 751, K 578, AHT 02, GMU 615, and GHU 631) and check variety (Morden). These studies were taken-up in the field and glass house of Faculty of Agriculture, Annamalai University. Sunflower (variety Morden) was raised in a 100m² plot, which was left unsprayed in growth period. The adults of whiteflies, leaf hoppers, and thrips were collected from this plot and immobilised by refrigerating them for five minutes. The immobilised insects were sexed by observing under compound microscope and later utilized for population build-up studies (Hoodie, 2002).

CHOICE TEST

A. Whiteflies

Each of the seven lines was raised in a pot with one plant in it and all the seven pots placed in a wire mesh cage. This arrangement was replicated thrice. At 30 DAS, 30 whitefly adults (15 pairs) were released per replication. Whiteflies (No.) per plant was counted at 5 days interval, starting from 35 DAS up to 60 DAS.

B. Leaf hoppers

Each of the seven accessions was raised in a pot with one plant in it and all the seven

pots placed in a wire mesh cage. The entire arrangement was replicated thrice. Thirty leaf hoppers adults (15 pairs) were released per replication at 30 DAS. Leaf hoppers (No.) per plant was counted, starting from 35 DAS up to 60 DAS, at five days interval.

C. Thrips

Each of the seven accessions was raised in a pot with one plant in it and all the seven pots placed in a wire mesh cage. This arrangement was replicated thrice. At 30 DAS, 30 thrips adults (15 pairs) were released per replication. Thrips (No.) per plant was counted at 5 days interval, starting from 35 DAS up to 60 DAS.

NO-CHOICE TEST

A. Whiteflies

Each of the seven accessions was raised in three pots (replications) with one plant per pot. The pots of each line were kept in separate wire mesh cages. At 30 DAS, 10 whitefly adults (5 pairs) were released per plant. Whiteflies (No.) per plant were counted at 5 days interval, starting from 35 DAS up to 60 DAS.

B. Leaf hoppers

Each of the seven accessions was raised in three pots (replications) with one plant per pot. The pots of each line were kept in separate wire mesh cages. At 30 DAS, 10 leaf hopper adults (5 pairs) were released per plant. Leaf hoppers (No.) per plant was counted at 5 days interval, starting from 35 DAS up to 60 DAS.

C. Thrips

Each of the seven accessions was raised in three pots (replications) with one plant per pot. The pots of each line were kept in separate wire mesh cages. At 30 DAS, 10 thrips adults (5 pairs) were released per plant. Thrips (No.) per plant was counted at 5 days interval, starting from 35 DAS up to 60 DAS.

RESULTS

The 6 promising accessions identified (KBSH-1, K 578, IHT 751, AHT 02, GMU 615, and GHU 631) along with Morden as check were studied for their population buildup and for further confirmation under choice test and no choice test.

CHOICE TEST

White flies

The results of population buildup studies under choice test for whiteflies are tabulated in Table 1.

At 35 DAS, whiteflies population was least on KBSH-I (2.30/ plant), however, it was on par with IHT 751 (2.30/ plant), AHT 02 (2.30/ plant) and GHU 631 (3.30/ plant). The whitefly population showed no significant difference between the accessions K 578 (6.70/ plant), GMU 615 (6.70/ plant) and Morden, which harboured highest population (7.30/ plant). The data

recorded at 40 DAS revealed that KBSH-1, IHT 751, AHT 02, and GHU 631 sustained the least whitefly population (2.30 to 3.70/ plant) and these accessions were on par with each other. The next best accession were GMU 615 (6.00/ plant) followed by K 578 (6.30/ plant). Morden recorded significantly highest population of whitefly (8.00/ plant).

At 45 DAS, AHT 02 showed the least whitefly population (1.30/ plant). IHT 751 (2.70/ plant) and KBSH-1 (3.30/ plant) were the next best accessions. The check Morden (5.70/ per plant) was on par with GMU 615 which recorded highest number of whiteflies (6.30/ plant).

At 50 DAS, the accessions KBSH-1, IHT 751, AHT 02 recorded significantly low level of whitefly population *i.e.*, 1.30, 1.30 and 1.70/ plant respectively. The next least pest load was recorded on GHU 631 (4.30/ per plant) followed by K 578 (5.30/ per plant) and GMU 615 (5.30/ plant). Morden showed significantly highest number of white flies (6.70/ plant). As per the observations taken at 55 DAS, the least number of whitefly were present on AHT 02 (1.30/ plant) and it was on par with that on IHT 751 (1.70/ plant), KBSH-1 (2.00/ plant) and GHU 631 (2.30/ plant). The whitefly populations on GMU 615 (4.30/ plant) and K 578 (5.30/ plant) were statistically on par with each other. The highest population of whitefly was observed on Morden (7.30/ plant).

At 60 DAS, IHT 751 (1.30/ plant) showed significantly least whitefly population. The accessions AHT 02 (2.00/ plant), KBSH-1 (2.30/ plant) & GHU 631 (2.70/ plant) were the next best accessions and were on par with each other. K 578 and GMU 615 both sustained 4.00 whiteflies per plant and were statistically superior to Morden (6.30/ plant). The overall mean populations showed that AHT 02 harboured least number of whiteflies (1.77/ plant) but it was on par with IHT 751 (2.00/ plant) and KBSH-1 (2.28/ plant). GHU 631 recorded 3.5 whiteflies per plant and proved to be the next superior accession. K 578 (5.39/ plant) and GMU 615 (5.44/ plant) were statistically on par with each other. Morden showed significantly highest number of white flies (6.88/ plant).

Leaf hoppers

The results of population buildup studies under choice-test for leaf hoppers are presented in Table 2.

At 35 DAS, AHT 02 (4.33/ plant) recorded least number of leaf hoppers, however, it was on par with KBSH-1 (4.67/ plant) and K 578 (5.00/ plant). The highest population of leaf hopper was observed on Morden (10.00/ plant).

At 40 DAS, leaf hopper population was least on K 578 (4.33/ plant) but it was on par with KBSH-1 (5.67/ plant) and AHT 02 (5.33/ plant). The next best accession was GMU 615 (6.67/ plant). The highest number of leaf hoppers was observed on IHT 751 (9.00/ plant), GHU 631 (8.67/ plant) and check variety Morden (9.33/ plant).

At 45 DAS, the number of leaf hoppers was significantly least (5.33/ plant) on KBSH-1, K 578 and AHT 02. The next superior accession was GMU 615 (7.33/ plant). The highest number of leaf hoppers was recorded on Morden (10.33/ plant) which was on par with IHT 751

and GHU 631.

At 50 DAS, the same trend was observed with the least number of leaf hoppers on KBSH-1, K 578 and AHT 02 which sustained per plant populations of 6.33, 5.67 and 5.67, respectively. The next least population of leaf hoppers was recorded on GMU 615 (8.00/ plant). The accessions GHU 631 and IHT 751 both recorded 9.33 leaf hoppers per plant. The check variety Morden sustained the highest number of leaf hoppers (10.67/ plant).

At 55 DAS, again, K 578 (6.00/ plant), KBSH-1(6.67 / plant), and AHT 02 (7.33/ plant) harboured least number of leaf hoppers and these accessions were on par with each other. GMU 615 was the next best accession recording 7.67 leaf hoppers per plant. GHU 631 (11.00/ plant), IHT 751 (10.33/ plant) and Morden (13.00/ plant) sustained highest population of leaf hoppers, statistically.

At 60 DAS, leaf hoppers population was found to be least on K 578 (6.33/ plant) but this was on par with KBSH-1 (7.33/ plant). The leaf hopper population on AHT 02 (8.33/ plant) and GMU 615 (9.33/ plant) were next least and on par with each other. Morden and IHT 751 recorded the highest leaf hopper population of 11.33 per plant.

The overall mean population of leaf hoppers was least on K 578 (5.39/ plant) and it was on par with KBSH 1

Thrips

The results of population buildup studies under choice-test for thrips are tabulated in Table 3.

At 35 DAS, AHT 02 recorded the least number of thrips (4.33/ plant). The next best accessions were IHT 751 (6.67/ plant) and KBSH -1(8.33/ plant). The check variety Morden along with GMU 615 and GHU 631 recorded the highest population of thrips (10.67 to 11.67/ plant).

At 40 DAS again, AHT 02 proved to be the best, harbouring least number of thrips (4.67/ plant). The accession IHT 751 recorded 6.67 thrips per plant followed by KBSH-1 (7.67/ plant). The thrips population was highest on Morden(12.00/ plant), which was on par with K 578 (10.67/ plant),GMU 615 (11.00/ plant) and GHU 631 (11.33/ plant).

At 45 DAS, AHT 02 showed least thrips population (6.00/ plant), which was on par with KBSH-1 (6.33/ plant). The accession IHT 751 recorded 8.33 thrips per plant. The highest number of thrips was recorded on GHU 631 (11.00/ plant) and it was on par with K 578 (10.33/ plant), GMU 631 (10.67/ plant) and check variety Morden (10.67/ plant).

At 50 DAS, the data revealed that KBSH-1, AHT 02 and IHT 751 recorded statistically least number of thrips (5.66 to 7.00/ plant). All the remaining accessions along with check variety Morden were on par with each other (9.66 to 11.00/ plant). At 55 DAS, KBSH-1 and IHT 751 showed statistically least load of thrips, 5.00 and 6.33 per plant, respectively. AHT 02 recorded 8.00 thrips per plant followed by K 578 (9.33/ plant). The check variety Morden

recorded the highest number of thrips (10.67/ plant) and was on par with GMU 631 (10.33/ plant).

At 60 DAS, the thrips population was least on KBSH-1, IHT 751 and AHT 02 (4.00 to 5.33/ plant) and these accessions were on par with each other. There were no significant difference between Morden (10.33/ plant) and GHU 631 (9.00/ plant) and GMU 615 (9.33/ plant). The mean pest load was found to be least on AHT 02 (5.78/ plant) and it was on par with KBSH-1 (6.16/ plant). IHT 751 showed next least number of thrips (6.55/ plant). The accessions GMU 615 (10.38/ plant) and GHU 631 (10.61/ plant) sustained statistically equal and highest number of thrips along with check variety Morden (10.94/ plant).

NO CHOICE TEST

Whiteflies

The results of population buildup studies under no choice test for whiteflies are tabulated in Table 4.

There was no significant difference regarding the population of whiteflies among different accessions from 35 DAS to 50 DAS.

At 55 DAS, the least whitefly population was recorded on KBSH-1 (6.67/ plant), which was on par with AHT 02 (7.67/ plant), IHT 751 (8.00/ plant) and GHU 631 (8.00/ plant). The next least population was recorded on K 578 (9.00/ plant) followed by GMU 615 (9.33/ plant). Modern recorded the highest number of whiteflies (10.00/ plant). The mean population of whiteflies was least on KBSH-1 (7.33/ plant) and it was on par with IHT 751 (8.22/ plant). The rest of the accessions were statistically on par with check variety Morden, which sustained highest number of whiteflies (9.83/ plant).

Leaf hoppers

The results of population buildup studies under no choice test for leaf hoppers are given in Table 5.

No significant difference was observed regarding leaf hopper population among different accessions from release up to 50 DAS.

The observations at 55 DAS indicated that KBSH-1 recorded least load of leaf hoppers (7.67/ plant), which was on par with K 578 (8.33/ plant) and GMU 615 (8.67/ plant). The check variety Morden recorded highest number of leaf hoppers (11.67/ plant), which was statistically no different from the accessions AHT 02 (10.33/ plant), GHU 631 (10.33/ plant) and IHT 751 (12.33/ plant).

The overall averages indicated that KBSH-1 (8.00/ plant) and K 578 (8.50/ plant) sustained least leaf hopper population followed by GMU 615 and GHU 631. The check variety Morden along with AHT 02 and IHT 751 had highest number of leaf hoppers (10.83 to 11.22/ plant).

Thrips

The results of population buildup studies under no choice test for thrips are presented in

Table 6.

KBSH-1 (7.33/ plant) recorded the least number of thrips at 35 DAS. All the remaining accessions were statistically on par having in between 9.00 and 10.00 thrips per plant.

At 40 DAS too, KBSH-1 sustained least load of thrips (8.33/ plant), however, it was on par with IHT 751 (8.67/ plant), AHT 02 (8.67/ plant), GMU 615 (8.67/ plant) and K 578 (9.00/ plant). The highest number of thrips was recorded on GHU 631 (9.67/ plant) and Morden (10.33/ plant).

Observations at 45 DAS indicated that KBSH-1 and AHT 02 recorded least number of thrips per plant on them, 7.33 and 7.67 respectively. The accessions IHT 751, K 578 and GMU 615 were statistically on par recording 8.00 to 8.33 thrips per plant. The highest thrips population was observed on GHU 631 (9.00/ plant) and Morden (9.67/ plant).

At 50 DAS, AHT 02 recorded least thrips population (6.67/ plant), however it was on par with KBSH-1 (7.33/ plant), IHT 751 (7.67/ plant) and GMU 615 (7.67/ plant). Morden recorded highest number of thrips (9.67/ plant), which was statistically no different from GHU 631 (8.33/ plant).

Data taken at 55 DAS showed that AHT 02 had significantly least number of thrips population (5.33/ plant). The accessions KBSH-1 and K 578, IHT 751, GMU 615 and GHU 631 were statistically on par and showed thrips population in range of 6.67 to 7.67 per plant. The check variety Morden recorded highest number of thrips (9.67/ plant).

At 60 DAS, the accessions AHT 02 (4.67/ plant) and IHT 751 (5.33/ plant) showed significantly least number of thrips. The next best accessions were KBSH-1 (5.67/ plant) and K 578 (6.67/ plant). The accessions GMU 615, GHU 631 and Morden showed highest number of thrips population (8.33 to 8.67/ plant).

The overall mean population of thrips indicates that AHT 02 (7.00/ plant), KBSH-1 (7.55/ plant) and IHT 751 (7.61/ plant) sustained statistically least of thrips. The next best accessions were K 578 (8.22/ plant), GMU 615 (8.39/ plant) and GHU 631 (8.88/ plant). The check variety Morden recorded significantly highest number of thrips (9.61/ plant).

DISCUSSION

Significant difference in populations of whiteflies, leaf hoppers and thrips among the selected promising accessions and the check variety Morden were noticed. Studies on population build up of whitefly, leaf hopper and thrips in choice-test indicated that the population of the sucking pests was more on, comparatively susceptible accessions and less on comparatively resistant lines within few days after release (30 days after sowing) and remained as such till the end of vegetative phase of crop. The pests had the choice to shift to the different accessions but still the difference in population indicates that some morphological characters of the plants might have exhibited antixenosis.

In no-choice test, the pest populations did not have any choice to move over to another accession. As such, populations were more or less equal on the accessions even up to 15 -20

days after release (45-50 days after sowing). Later, significant differences in pest populations arose among different genotypes that indicated the population build-up was hindered in comparatively resistant accessions. The results of Bhat and Virupakshappa (1993) are in tune with the present findings that hybrids such as KBSH 8 and KBSH 1 recorded less sucking pest population.

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Table 1. Population Build-up Studies of Whiteflies under Choice-test

Genotypes	Crop Age (DAS)						
	35	40	45	50	55	60	Overall Mean
KBSH-1	2.30 ^a	2.30 ^a	3.30 ^b	1.30 ^a	2.00 ^a	2.30 ^{ab}	2.28 ^a
K 578	6.70 ^b	6.30 ^b	4.70 ^c	5.30 ^b	5.30 ^b	4.00 ^b	5.39 ^c
IHT 751	2.30 ^a	3.00 ^a	2.70 ^b	1.30 ^a	1.70 ^a	1.30 ^a	2.00 ^a
AHT 02	2.30 ^a	2.30 ^a	1.30 ^a	1.70 ^a	1.30 ^a	2.00 ^{ab}	1.77 ^a
GMU 615	6.70 ^b	6.00 ^b	6.30 ^b	5.30 ^b	4.30 ^a	4.00 ^c	5.44 ^c
GHU 631	3.30 ^a	3.70 ^a	3.70 ^a	4.30 ^b	2.30 ^a	2.70 ^b	3.50 ^b
Morden check	7.30 ^b	8.00 ^c	8.00 ^c	6.70 ^c	7.30 ^c	6.30 ^b	6.88 ^d
C.D (5%)	1.00	1.50	1.30	1.20	1.40	1.20	0.72

Table 2. Population Build-up Studies of Leaf Hoppers under Choice-test

GENOTYPES	CROP AGE (DAS)						
	35	40	45	50	55	60	Overall Mean
KBSH-1	4.67 ^a	5.67 ^{ab}	5.33 ^a	6.33 ^a	6.67 ^a	7.33 ^{ab}	6.00 ^a
K 578	5.00 ^a	4.33 ^a	5.33 ^a	5.67 ^a	6.00 ^a	6.33 ^a	5.39 ^a
IHT 751	8.67 ^c	9.00 ^c	9.33 ^c	9.67 ^c	10.33 ^c	11.67 ^b	9.77 ^c
AHT 02	4.33 ^a	5.33 ^{ab}	5.33 ^a	5.67 ^a	7.33 ^{ab}	8.33 ^{bc}	6.05 ^a
GMU 615	6.33 ^b	6.67 ^b	7.33 ^b	8.00 ^b	8.67 ^b	9.33 ^c	7.72 ^b
GHU 631	8.33 ^c	8.67 ^c	9.67 ^c	9.33 ^{bc}	11.00 ^c	11.33 ^d	9.55 ^c
Morden check	10.00 ^d	9.33 ^c	10.33 ^c	10.67 ^c	13.00 ^d	11.67 ^d	10.77 ^d
C.D (5%)	1.10	1.55	1.10	1.36	1.44	1.49	0.94

Table 3. Population Build-up Studies of Thrips under Choice-test

GENOTYPES	CROP AGE (DAS)						
	35	40	45	50	55	60	Overall Mean
KBSH-1	8.33 ^c	7.67 ^b	6.33 ^a	5.66 ^a	5.00 ^a	4.00 ^a	6.16 ^{ab}
K 578	10.33 ^d	10.67 ^c	1.033 ^c	10.00 ^b	9.33 ^{bc}	8.33 ^b	9.83 ^c
IHT 751	6.67 ^b	6.67 ^b	8.33 ^b	7.00 ^a	6.33 ^a	4.33 ^a	6.55 ^b
AHT 02	4.33 ^a	4.67 ^a	6.00 ^a	6.33 ^a	8.00 ^b	5.33 ^a	5.78 ^a
GMU 615	11.33 ^{dc}	11.00 ^c	10.67 ^c	9.66 ^b	10.33 ^{cd}	9.33 ^{bc}	10.38 ^{cd}
GHU 631	10.67 ^{dc}	11.33 ^c	11.00 ^c	11.00 ^b	10.67 ^d	9.00 ^{bc}	10.61 ^d
Morden check	11.67 ^c	12.00 ^c	10.67 ^c	10.33 ^b	10.67 ^d	10.33 ^c	10.94 ^d
C.D (5%)	1.26	1.62	1.38	1.40	1.33	1.30	0.57

Table 4. Population Build-up Studies of Whiteflies under No Choice Test

GENOTYPES	CROP AGE (DAS)						
	35	40	45	50	55	60	Overall Mean
KBSH-1	8.67	8.33	7.33	7.33	6.67 ^a	5.67 ^a	7.33 ^a
K 578	9.67	9.33	9.67	9.00	9.00 ^a	8.00 ^{cd}	9.11 ^{bc}
IHT 751	8.67	8.33	8.67	8.67	8.00 ^c	7.00 ^{bc}	8.22 ^{ab}
AHT 02	8.33	8.67	8.33	8.33	7.67 ^{ab}	6.67 ^{ab}	9.36 ^{bc}
GMU 615	9.67	10.80	10.00	8.67	9.33 ^b	8.33 ^{dc}	9.33 ^{bc}
GHU 631	9.67	9.33	9.00	8.67	8.00 ^c	8.00 ^{ab c}	9.05 ^{bc}
Morden check	9.33	9.67	10.33	10.33	10.00 ^d	9.33 ^c	9.83 ^c
C.D (5%)	NS	NS	NS	NS	1.50	1.21	1.29

NS-Non Significant

Table 5. Population Build-up Studies of Leaf Hoppers under No Choice Test

GENOTYPES	CROP AGE (DAS)						
	35	40	45	50	55	60	Overall Mean
KBSH-1	9.33	9.00	8.67	7.00	7.67 ^a	6.33 ^a	8.00 ^a
K 578	9.67	9.00	9.00	8.00	8.33 ^{ab}	7.00 ^a	8.50 ^a
IHT 751	9.67	9.66	11.00	11.00	12.33 ^c	12.33 ^c	11.16 ^c
AHT 02	10.00	10.67	10.33	10.33	10.33 ^{bc}	11.33 ^{bc}	10.83 ^c
GMU 615	9.67	9.67	8.67	9.33	8.67 ^{ab}	9.67 ^b	9.28 ^{ab}
GHU 631	9.67	9.67	9.67	11.00	10.33 ^{bc}	11.33 ^{bc}	10.27 ^{bc}
Morden (Check)	9.67	9.67	11.33	8.67	11.67 ^c	13.00 ^c	11.22 ^c
C.D (5%)	NS	NS	NS	NS	2.38	2.08	1.39

NS-Non Significant

Table 6. Population Build-up Studies of Thrips under No Choice Test

GENOTYPES	CROP AGE (DAS)						Overall Mean
	35	40	45	50	55	60	
KBSH-1	7.33	8.33	7.33	7.33	6.67	5.67	7.55
K 578	9.33	9.00	8.33	8.33	7.67	6.67	8.22
IHT 751	9.00	8.67	8.00	7.67	7.00	5.33	7.61
AHT 02	9.00	8.67	7.67	6.67	5.33	4.67	7.00
GMU 615	9.67	8.67	8.33	7.67	7.67	8.33	8.39
GHU 631	10.00	9.67	9.00	8.33	7.33	8.67	8.88
Morden (Check)	9.67	10.33	9.67	9.67	9.67	8.67	9.61
C.D (5%)	1.33	1.19	1.35	1.34	1.25	1.00	0.68