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Screening of different genotypes against major insect pests of chilli (*Capsicum annum* L.)

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Abstract
A field experiment was conducted during *kharif* 2016-17 at Horticulture Instructional Farm of Chamanbhai Patel College of Agriculture, Sardarkrushinagar Dantiwada Agricultural University Sardarkrushinagar, Randomized Block Design (RBD) with three replications and twelve genotypes JCh 722, JCh 725, JCh 740, JCh 754, JCh 756, JCh 759, JCh 784, JCh 788, JCh 800, GCh 1, GCh 2, GCh 3 is local cultivar of chilli. Out of twelve different genotypes of chilli, genotype GCh 3 and GCh 2 were resistant against aphid and yellow mite. The genotype GCh 3 and GCh 1 showed resistant against whitefly and fruit borer. The genotype viz., GCh 1, GCh 2, and GCh 3 were found to be resistant against leafhopper. The genotype GCh 3 was found resistant against thrips, while eleven genotypes were grouped under susceptible category.

Keywords: Chilli, Incidence, Population, Peak, Seasonal, Correlation, Significant

1. Introduction
Chilli is an important vegetable and condiment crop in India. The two cultivated species (*Capsicum annum* L. and *Capsicum frutescens* L.; family Solanaceae) are raised in the tropics and sub-tropics with a temperature range of 20-25 °C considered as ideal. The medicinal value of chilli is much realized because of its vitamin 'C' and capsaicin (C_{18} H_{27} O_3 N) [10]. It is widely used throughout the tropics as major ingredient of curry powder in the culinary production. Besides essential alkaloid, red colouring matter, which is non-pungent [9]. India is the largest consumer and exporter of chilli in the world with a production of 3292 MT from an area of 238 thousand ha and productivity 10 MT per ha during 2016 [6]. The major chilli growing states are Andhra Pradesh, Maharashtra, Karnataka, Tamil Nadu and Rajasthan. In Gujarat, it is cultivated in an area of 6500 ha with the production of 6600 MT [1]. The major chilli growing districts of Gujarat include Anand, Banaskantha, Kheda, Vadodara, Navsari, Patan, Mehsana and Surat. A number of factors responsible for low yield include adverse climate, poor quality seeds, diseases, insect and mites significantly affect both the quality as well as production of chilli. The yield losses range between 50 to 90 per cent due to insect pests of chilli [7, 5]. Thrips (*Scirthothrips dorsalis* Hood), whiteflies (*Bemisia tabaci* Genn), aphids (*Aphis gossypii* Glover) and yellow mites (*Polyphagotarsonemus latus* Banks) are the important sucking pests which contributed to reduce the crop yield [3]. The damage due to mites and thrips together had been estimated to the tune of 50 per cent [4].

2. Materials and methods
The present field experiment was conducted during *kharif* 2016-17 at Horticulture Instructional Farm of Chamanbhai Patel College of Agriculture, Sardarkrushinagar Dantiwada Agricultural University Sardarkrushinagar, Randomized Block Design (RBD) with three replications and twelve genotypes JCh 722, JCh 725, JCh 740, JCh 754, JCh 756, JCh 759, JCh 784, JCh 788, JCh 800, GCh 1, GCh 2, GCh 3 is local cultivar of chilli. The plot size (Gross plot size 1.20 m x 6 m and Net plot size 1.20 m x 4.80 m) with 60 cm x 60 cm spacing.

2.1 Sucking pests
The incidence of selected pests was recorded from sowing to harvesting of the crop. Five plants were randomly selected and tagged to record the population of insect pests of chilli. Observations were recorded on these tagged plants after 15 days of transplanting at weekly interval during morning between 7.00 AM to 8.00 AM. The chilli crop was kept insecticide free throughout the crop season. Number of sucking pests *viz.*, leafhopper, thrips, whitefly and

aphid were counted separately from three leaves one each from top, middle and bottom region per plant at weekly interval with the help of magnifying lens.

2.2 Yellow mite

Weekly observations on the population of *P. latus* were recorded starting one month after transplanting. Three leaves representing top, middle and bottom canopy were plucked randomly from each of the five plants and one cm^2 area of each selected leaf from each plant were observed with the help of 10x eye glass.

2.3 Fruit borer

The observations of number of fruit borer larvae per plant were recorded from five randomly selected plants. Observations were recorded during early morning hrs at weekly interval.

2.4 Statistical analysis

Cut - off value for each genotype was calculated applying formula proposed by [8]. Cut - off value = Mean – S.D. On the basis of the formula, the genotype was categorized into Resistant and Susceptible designated as 'R' and 'S', respectively.

3. Results

3.1 Thrips (*Scirtothrips dorsalis* Hood)

Among 12 genotypes of chilli (Table 5) minimum population of thrips was found in genotype GCh 3 (2.97 thrips/ 3 leaves) and maximum population of thrips was found in genotype GCh 1 (4.36 thrips/ 3 leaves).

Out of 12 genotypes, GCh 3 was found resistant against thrips, which exhibited less than 3.37 thrips/ 3leaves, while, remaining all genotypes *viz*., GCh 1, GCh 2, JCh 722, JCh 725, JCh 740, JCh 754, JCh 756, JCh 759, JCh 782, JCh 788 and JCh 800 showed more than 3.37 thrips/ 3 leaves were grouped into susceptible against leafhopper.

3.2 Whitefly (*Bemisia tabcai* Genn.)

The genotype GCh 3 recorded the lowest number of whitefly population (3.50 whitefly/ 3 leaves), whereas, highest whitefly population observed in genotype JCh 740 (4.63 whitefly/ 3 leaves) (Table 5 & Fig. 2).

Among twelve genotypes, GCh 3 and GCh 1 were found resistant against whitefly, which exhibited less than 3.88 whitefly/ 3 leaves. However, remaining genotypes *viz*., GCh 2, JCh 722, JCh 725, JCh 740, JCh 754, JCh 756, JCh 759, JCh 782, JCh 788 and JCh 800 showed more than 3.88 whitefly/ 3 leaves were categorized susceptible against whitefly population.

3.3 Leafhopper (*Amrasca biguttula biguttula* Ishida)

The results presented in table 5 and indicated that among various genotypes screened, GCh 1 showed the lowest leafhopper incidence (3.20 leafhopper/ 3 leaves), whereas, highest leafhopper population observed in Jch 725 (4.61 leafhopper / 3 leaves).

Out of 12 genotypes, GCh 1, GCh 3 and GCh 2 were found categorized as resistant genotypes against leafhopper, which exhibited less than 3.64 leafhopper/ 3 leaves. While, remaining genotypes *viz.*, JCh 722, JCh 725, JCh 740, JCh 754, JCh 756, JCh 759, JCh 782, JCh 788 and JCh 800 showed more than 3.64 leafhopper/ 3 leaves were susceptible ones against leafhopper.

3.4 Aphid (*Aphis gossypii* Glover)

The results presented in table 1 indicated that among various chilli genotypes screened, GCh 3 Showed the lowest aphid incidence (3.39 aphid/ 3 leaves) and highest aphid population observed in JCh 725 (4.82 aphid / 3 leaves).According to this formula, the cut-off value was 3.80 aphid/ 3 leaves. The genotypes which supported less aphid population than the cut off value were considered as 'resistant' and designated by the alphabet 'R'. Similarity, the genotypes that supported greater population than the cut-off value were considered as 'susceptible' and designated by the alphabet 'S'. The resistant genotypes with the least value of incidence of aphid were assigned a numerical rank 1 and remaining genotypes were ranked in ascending order of aphid population.

Out of 12 genotypes, GCh 3 and GCh 2 were found resistant against aphid, which exhibited less than 3.80 aphid/ 3leaves. While, remaining genotypes *viz*., Gch 1, JCh 722, JCh 725, JCh 740, JCh 754, JCh 756, JCh 759, JCh 782, JCh 788 and JCh 800 showed more than 3.80 aphid/ 3 leaves were susceptible against aphid.

3.5 Yellow mite (*Polyphagotarsonemus latus* Banks)

The results presented in table 5 and indicated that among various chilli genotypes screened, GCh 3 showed the lowest yellow mite incidence (1.83 yellow mite/ 3 leaves), whereas, highest yellow mite population observed in the genotype GCh 1 (3.33 yellow mite / 3 leaves).

Among 12 genotypes, GCh 3 and GCh 2 were found resistant against yellow mite, which exhibited less than 2.28 yellow mite/ 3 leaves. While, remaining genotypes *viz*., GCh 1, JCh 722, JCh 725, JCh 740, JCh 754, JCh 756, JCh 759, JCh 782, JCh 788 and JCh 800 showed more than 2.28 mite/ 3 leaves were proved as susceptible against yellow mite.

3.6 Fruit borer (*Helicoverpa armigera* Hubner)

Among 12 genotypes of chilli (Table 5), the lowest population of fruit borer was observed in the genotype GCh 3 (0.88 fruit borer/ plant), whereas, highest population found in genotype Jch 800 (2.11 fruit borer/ plant).

Out of 12 genotypes, GCh 3 and GCh 1 were found to be resistant against fruit borer, which exhibited less than 1.18 fruit borer/ plant. While, remaining genotypes *viz*., GCh 2, JCh 722, JCh 725, JCh 740, JCh 754, JCh 756, JCh 759, JCh 782, JCh 788 and JCh 800 showed more than 1.18 fruit borer/ plant were considered as susceptible ones against fruit borer.

3.7 Fruit yield of chilli

The descending order of yield levels of different genotype was GCh 3 (3231 kg/ ha) > GCh 2 (3104 kg/ ha) > GCh 1 (2539 kg/ ha) > JCh 800 (2080 kg/ ha) > JCh 754 (2051 kg/ ha) > JCh 782 (1969 kg/ ha) > JCh 722 (1952 kg/ ha) > JCh 740 (1928 kg/ ha) > JCh756 (1919 kg/ ha) > JCh 725 (1884 kg/ ha) > JCh 759 (1859 kg/ ha) > JCh 788 (1318 kg/ ha).

4. Discussion

Arka *et al.* (2017) [2] reported that chilli hybrid lines 2012/CHYB-11 and 2011/CHYB-4 against yellow mite; BSS-453 against thrips and 2013/CHYB-1 and 2012/CHYB-5 were found less affected or tolerant against both mites and thrips. Who observed differential reaction of chilli germplasm against mites and thrips may be due to the factors like plant morphological or bio-chemical traits and some environmental factors. Thus, the present findings are more or less similar to the reported by earlier workers.

5. Conclusion

Out of twelve different genotypes of chilli were screened under field condition against major insect pests of chilli. genotype GCh 3 and GCh 2 were resistant against aphid and yellow mite remaining ten genotypes were found susceptible. The genotype GCh 3 and GCh 1 showed resistant against whitefly and fruit borer, while remaining ten genotypes were susceptible to whitefly and fruit borer. The genotype GCh 1, GCh 2, and GCh 3 were found resistant against leafhopper while nine genotypes were susceptible to leafhopper. The genotype GCh 3 was found resistant against thrips while eleven genotypes were susceptible to thrips.

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Table 1: Screening of different genotypes against major insect pests of chilli

Sr. No.	Genotype	Sucking pests/ 3 leaves					Fruit borer/ plant
		Aphid	Whitefly	Leafhopper	Thrips	Yellow mite	
1	GCh 1	3.97S	3.73R	3.2R	4.36S	3.33S	0.94R
2	GCh 2	3.5R	3.89S	3.59R	3.39S	2.26R	1.2S
3	GCh 3	3.39R	3.5R	3.39R	2.97R	1.83R	0.88R
4	JCh 722	4.35S	4.27S	4.19S	3.63S	2.5S	1.57S
5	JCh 725	4.82S	4.42S	4.61S	3.8S	3.06S	1.84S
6	JCh 740	4.7S	4.63S	4.48S	3.82S	3.03S	1.65S
7	JCh 754	4.31S	4.56S	4.17S	3.7S	2.71S	1.46S
8	JCh 756	4.33S	4.36S	4.46S	3.78S	2.84S	1.79S
9	JCh 759	4.6S	4.39S	4.57S	3.92S	2.66S	2.1S
10	JCh 782	4.3S	4.23S	4.52S	3.57S	2.9S	1.44S
11	JCh 788	4.6S	4.22S	4.58S	3.73S	2.68S	1.73S
12	JCh 800	4.34S	4.51S	4.21S	3.8S	2.48S	2.11S
Mean		4.27	4.23	4.16	3.71	2.69	1.56
S. D.		0.47	0.35	0.52	0.34	0.41	0.38
Cut-off value= Mean-S. D.		3.80	3.88	3.64	3.37	2.28	1.18

Resistant genotypes considered as 'R' and remaining were designated as susceptible 'S'

Table 2: Fruit yield of chilli in different genotypes

Sr. No.	Genotype	Fruit yield (kg/ ha)
1.	GCh 1	2539[b]
2.	GCh 2	3104[a]
3.	GCh 3	3231[a]
4.	JCh 722	1952[c]
5.	JCh 725	1884[c]
6.	JCh 740	1928[c]
7.	JCh 754	2051[bc]
8.	JCh 756	1919[c]
9.	JCh 759	1859[c]
10.	JCh 782	1969[c]
11.	JCh 788	1318[d]
12.	JCh 800	2080[bc]
S.Em.±		153
C. V.%		12.27

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