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INCIDENCE OF CHILLI MITE ON CHILLI VARIETIES UNDER FIELD CONDITIONS

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ABSTRACT

The current experiment was carried out to evaluate the occurrence of mites on chilli (*Capsicum* spp.) leaves. The trial was conducted in the experimental field and laboratory of RSRC, BARI, from December 2020 to April 2021. Three released varieties (viz. BARI Morich 1, BARI Morich 2, and BARI Morich 3) and six genotypes (Viz. G10, G13, G25, G27, G30, and G31) were used as the test crops of the experiment. The findings showed a considerable amount of variation among the treatments. Regarding the number of mites/leaf, the G25 had the highest mean number (7.24) whereas the G31 had the lowest (0.69). The G30 was the most productive in terms of yield (512.27 g/plant). The weight of each fruit and the number of fruits per plant were directly related to yield. On the contrary, the G10 and the G13 supplied an optimum yield per plant, whereas the G25 produced the least yield (21.02/plant). The correlation between yield and mite infestation was negative, and the results revealed that the BARI Morich-1, the G27, and the G31 were highly resistant to chilli mite infestation, and the G13, the BARI Morich-3, and the G30 were resistant, while the BARI Morich-2 was only moderately resistant. The G10 was tolerant and the G25 was susceptible to chilli mite infestation. The results concluded that the tested genotypes G13, G27, G30 and G31 showed remarkable resistance to mite infestation.

Key words: Chilli, Chilli mite, Infestation, Yield, Resistant.

Introduction

Nowadays, Chilli (*Capsicum* spp.) has become a major economic crop in the world. It is widely cultivated in the warm temperate, tropical, and subtropical parts of the world. It has a great potential demand with versatile uses, such as spice and vegetables. The use of

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chilli has expanded in culinary, medicinal, and many food and beverage industries worldwide (Tatagar *et al*., 2011, Jangra *et al.*, 2017). As an essential spice, chilli is rich in vitamins C, A, and B, oleoresins, and red pigment and is used to add color and spiciness to dishes (Tatagar *et al*., 2011). The most serious pest of chilli is *Polyphagotarsonemus latus* (Banks), commonly recognized as a broad mite, or yellow mite or chilli mite (de Coss-Romero and Peña, 1998) and caused severe yield loss (Keerthana *et al*., 2022). Mites are a significant issue in growing chillies. They mainly occur on the young shoots at the tips of the chilli plant. Adults and nymphs appear especially on the underside of leaves to suck cells (Kumar *et al*., 2019).

Downward curling along with the brittleness of leaves, extension of petioles of elder mature leaves, and bunching of young leaves at the tip of the branches are common symptoms of mite infestation in plants. Flowers are distorted and do not open properly. During a heavy infestation, shortened internodes and premature fruit drops may occur in most infested hosts (Aarwe *et al*., 2019). In severe conditions, defoliation, shedding of buds and drying of growing points may occur. Toxic mite saliva is responsible for stunted or dead shoot growth (Kumar *et al*., 2019).

The plants of the genus *Capsicum* are extremely vulnerable to injuries triggered by these mites, and 10 individuals per plant are enough to cause significant damage and reduce crop yields (de Coss-Romero and Peña, 1998, Rodrı´guez-Cruz, 2014). It can cause about 96.39% yield loss in chilli (Borah, 1987). The prevalence of leaf curl disease complex up to 80.23% has been reported in Karnataka (Venkatesh *et al*., 1998). About 21.29% of crop damage was reported due to mite invasion (Jeyarani and Chandrasekaran, 2006).

Due to the minute size of chilli mites, farmers need help understanding the incidence of chilli mites on the crop. They use different insecticides in their field to prevent other insects, and the wide exposure to them helps chilli mites become resistant to insecticides. And that makes such pests challenging to control chemically, and eventually, growing costs have increased so much that chilli cultivation has become less profitable. Moreover, the repeated application of insecticides results in increased pesticide residues on produce and the environment. It poses a threat to the ecosystem, apart from destroying natural predators and resurgence of chilli mites, the main threat to chilli production (David, 1987).

Considering the beneficial role of chilli discovered in the new scientific research emphasizing its adaptation in many areas of the world is increasing. To meet the demand, chilli production needs to be increased, and the selection of a desirable mite-tolerant or resistant line for commercial cultivation in Bangladesh is imperative. The main purpose of this work is to screen advanced chilli lines with registered varieties, aiming for tolerance to chilli mites, and high-yielding varietal development in mind. Given the information mentioned above, studies were conducted with the following goals in mind:

(i) to reveal the occurrence of mites on the leaf of chilli varieties/advanced lines and
(ii) to evaluate the chilli varieties/advanced lines in terms of resistance to chilli mites.

Materials and Methods

The research trial was conducted in the experimental field and laboratory of the Regional Spices Research Centre (RSRC), Bangladesh Agricultural Research Institute (BARI), Joydebpur, Gazipur, during the period from December 2020 to April 2021. The experiment was executed with three replications in a randomized complete block design (RCBD). The total land area was divided into small plots at the experimental site. Each plot area was 3 m × 1 m with a spacing of 60 cm × 45 cm. Three released varieties (BARI Morich-1, BARI Morich-2, and BARI Morich-3), and six genotypes (G10, G13, G25, G27, G30, and G31) were used as the test crop of the experiments. Data on plant height, canopy diameter, number of branches, number of leaves, leaf surface area, fruit number, fruit diameter, fruit length, and yield (g/plant) were recorded.

The incidence of chilli mite was recorded at an interval of seven days and randomly five top leaves (third leaf) were collected for each of the three replications of each treatment to observe the incidence of mite in the plant following (Naituku *et al*., 2017). The leaves thus collected from the field were put in separate zip lock polypropylene bags according to replication of each treatment for observation of the mite population under a stereo-zoom binocular microscope (Olympus SZ2-ILST) following Samanta et al. (2017). From both surfaces (dorsal and ventral), the number of mites per leaf was counted and recorded for each replicate. The study was continuous till the termination of the crop. The Selected varieties and genotypes of chilli were classified based on the number of mites, as Girish et al. (2019) suggested.

For statistical analysis, recorded data were collated and organized. Analysis of variance (ANOVA) was performed using the computer package STATISTIX 10 program. The mean differences of the treatments were observed by Tukey's Highest Significant Difference (HSD) test at a 5% level of probability for the explanation of the findings.

Results and Discussion

Effects of chilli mite infestation on the growth parameters: Table 1 represents the effect of chilli mite infestation on the selected varieties and genotypes of chilli. The number of mites per leaf was ranked 7.24, 4.54, 2.89, 1.76, 1.40, 1.21, 0.98, 0.85, and 0.69 in G25, G10, BARI Morich-2, G30, G13, BARI Morich-3, BARI Morich-1, G27, and G31, respectively.

The growth and yield parameters of particular chilli varieties and genotypes differed significantly ($p \leq 0.05$) (Table 1). The plant's maximum height (55.11 cm/plant) was noted in the G10. The BARI Morich-2 had the second tall height (43.00 cm/plant), followed by the G30 (42.44 cm/plant) and the G27 (37.67 cm/plant). On the contrary, the G31 had the least plant height (16.22 cm/plant), followed by the BARI Morich-3 (23.33 cm/plant) and the G13 (27.67 cm/plant).

Accounting for the development of the chilli plant, Genotype G10 has the highest canopy diameter (46.22 cm/plant) followed by the G30 (42.06 cm/plant), the G27 (41.39 cm/plant), and the G13 (31.56 cm/plant). The lowest canopy diameter (17.61 cm/plant) occurred in the BARI Morich-3. Among the screened genotypes, the G25 had the highest number of branches (9.33), followed by the G30 (8.67) and the G13 (8.00). The least number of branches (5.33) was recorded in the BARI Morich-3. The distribution of the number of other treatments' branches was more or less similar.

Although the frequency of mite attacks did not correlate with plant height in several studies (Borah,1987; Hosamani, 2007; Nasrin, *et al.* 2021), current results showed a positive and significant correlation between plant height and mite attack. Pest attacks can affect the plant height in different crops. Zeeshan and Kudada (2019) reported significant variations in chilli plant height in response to different management treatments to control pest infestation. Jangra *et al.* (2017) reported the stunted growth of hybrid chilli. The decrease in plant height depends on the pest’s severity and the infestation stage. The infestation of bell paper by mites has been reported to reduce plant height by 50 percent (Vichitbandha and Chandrapatya, 2011). Manjunatha (1982) reported that plant height decreased with the severity of the mite infestation at the seedling stage. Toxins injected by the mites in the chilli plant resulted in shorter internodes, producing a restricted or tufted presence (Pal and Karmakar, 2017)

The G30 had 1256.0 leaves per plant, which was the highest number. The second highest (1222 leaves/plant), which was statistically comparable to the G30, was found in the G10. The BARI Morich-2 (742.3 leaves/plant), the G25 (654.3 leaves/plant), and the BARI

Table 1. Growth and yield parameters of selected chilli varieties and genotypes.

Treatments	Height/ plant (cm)	Canopy diameter (cm)	Branch/ plant	Leaf/ plant	Leaf surface area (mm^2)	Fruit/ plant	Fruit length (mm)	Fruit diameter (mm)	Yield/plant (g)	No. of mites/leaf
BARI Morich-1	28.33 cd	20.89 d	7.67 abc	622.3 bc	84.27 d	28.33 d	75.93 b	9.64 bcd	62.62 cde	0.98
G10	55.11 a	46.22 a	7.33 abc	1222.0 a	144.89 ab	49.67 c	76.67 b	11.70 ab	153.92 b	4.54
G13	27.67 cd	31.56 bc	8.00 abc	470.0 cd	86.77 d	76.67 b	47.20 c	10.77 bc	101.94 c	1.40
BARI Morich-2	43.00 b	24.22 cd	6.00 bc	742.3 b	132.59 bc	21.33 de	90.27 b	9.30 cd	49.63 def	2.89
BARI Morich-3	23.33 de	17.61 d	5.33 c	545.0 cd	121.92 bcd	20.33 de	85.00 b	7.75 de	36.18 ef	1.21
G25	35.11 bc	25.50 cd	9.33 a	654.3 bc	178.01 a	8.67 e	53.53 c	13.05 a	21.02 f	7.24
G27	37.67 bc	41.39 ab	7.00 abc	480.0 cd	109.12 bcd	52.67 c	58.00 c	7.08 e	65.39 cde	0.85
G30	42.44 b	42.06 a	8.67 ab	1256.0 a	103.12 cd	108.33 a	125.00 a	10.67 bc	512.27 a	1.76
G31	16.22 e	22.94 cd	7.33 abc	391.0 d	106.07 bcd	76.00 b	44.33 c	9.65 bcd	80.19 cd	0.69
CV	10.14	11.35	14.11	9.34	11.50	11.55	7.26	7.18	11.80	-

Application data are the average of 9 observations from 3 replications. In a column, means followed by the same letter(s) are non-significantly different by Tukey's HSD Test at $p \leq 0.05$.

Morich-1 (622.3/plant) was ranked in that order. The plant with the least number of leaves (391.0/plant) was in the G31.

Among the chilli varieties/genotypes, Genotype 25 (G25) was found with the highest leaf surface area (178.01 mm^2/leaf). Following BARI Morich-2 (132.59 mm^2/leaf) and BARI Morich-3 (121.92 mm^2/leaf), G10 had the second-highest leaf surface area (144.89 mm^2/leaf). In BARI Morich-1, the smallest leaf surface area (84.27 mm^2/leaf) was observed.

Mite populations per leaf increased with the increasing number of branches per plant. New growth is stunted or suspended by the mite infestation, forcing additional shoots to develop and causing more branching (Sarmento *et al.*, 2011). In the presence of mites, plant development has been testified to be halted (Vichitbandha and Chandrapatya, 2011). It has been reported mites attack the young tender leaves. The stems caused severe growth losses, particularly ceasing the growth of young branches (Jangra *et al.,* 2017) and eventually resulting in less fruit production (Kamruzzaman *et al*., 2013). Interestingly, adequate growth of plants was observed even with mite infestation when alternate food was provided for the mites (Duarte *et al.,* 2015), indicating the damage efficiency of mites on chilli plant growth and development.

The toxic components in mites' saliva result in deformed and curly leaves with less leaf area (Kotresh *et al.*, 2020). The mite pest infestation also causes leaf shading and ultimately reduces the number of leaves in the plant (Jangra *et al.,* 2017). In a quest to screen the mite-resistant genotypes, tolerant ones were found to have more leaf and higher leaf area under mite infestation than the susceptible genotypes (Sarwar 2014; Satpathy *et al.,* 2008). Apart from the number, the area of the mite-infested plant leaves has been reported to be reduced (Nasrin *et al.,* 2021). While studying the population dynamics, the mite presence was found to reduce the number of leaves, and the area of leaves managed to sustain against the severe infestation (Kumar *et al.*, 2019).

The leaf number and area reduction may be related to the egg-laying pattern of the mite, as the adult female usually lay their eggs on the ventral surface preferably on the young unfolded ones (Pal and Karmakar, 2017). And eventually, the extreme infestations of mites result in the withering and dropping off of young leaves, flowers and fruits, and may cause more than 60% yield loss in the chilli plant (Srinivasan *et al.*, 2003).

Effects of chilli mite infestation on the yield parameters: Genotype 30 (G30) produced the maximum number of fruits (108.33/plant), followed by Genotype 13 (76.67/plant), Genotype 31 (76.00/plant), and Genotype 27 (52.67/plant). On the contrary, the G25 had the lowest number of fruits (8.67 per plant), followed by the BARI Morich-3 (20.33 per plant), the BARI Morich-2 (21.33/plant), and BARI Morich-1 (28.33 per plant).

The G25 had the largest fruit diameter (13.05 mm/fruit), followed by the G10 (11.70 mm/fruit), the G13 (10.77 mm/fruit), and the G30 (10.67 mm/fruit). In the G27, the lowest fruit diameter (7.08 mm/fruit) was noted. The G30 variety had the longest total fruit length (125.00 mm/fruit), followed by the BARI Morich-2 (90.27 mm/fruit), the BARI Morich-3 (85.00 mm/fruit), and the G10 (76.67 mm/fruit). The G31 had the shortest fruit length (44.33 mm/fruit). The G30 yielded the highest amount of crop per plant (512.27 g), followed by the G10 (153.92 g/plant), the G13 (101.94 g/plant), and the G31 (80.19 g/plant). The yield reported at the lowest rate (21.02 g/plant) was from the BARI Morich-3, followed by the BARI Morich-2, the BARI Morich-1, and 36.18 g/plant from the BARI Morich-3.

The number of fruits is negatively correlated with the number of mites, and the severity of the mite affected the amount of fruit formed. The fruit becomes smaller as the plant's ability to meet nutrient requirements during fruit development is reduced. The curling of leaves due to heavy infestation of mites also causes flowers and fruit to drop, thereby reducing the number of fruits formed and yielded (Kamruzzaman *et al*., 2013). The severe infestation of mites results in fruit discoloring and premature fruit dropping (Kumar *et al.*, 2019) The dented fruit that is not presentable in the local market can be used for processing but it’s quite troublesome (Pena and Campbell, 2005). The results are consistent with the findings of Reddy and Baskaran (1991). The findings of van Maanen et al. (2010) further confirmed that chilli mites attack young leaves and shoots, causing significant losses including stunted growth of branches and flower drops leading to a marked reduction in the number of fruits formed in the chilli plant.

Calculating the data between mite infestation and fruit length of chilli varieties/genotypes, the correlation on the prevalence of *P. latus* infection in chilli plants showed that an increase in the mite population resulted in a correspondingly significant reduction in fruit length (Jangra *et al.*, 2017).

The highest yield was recorded in the G30 with lower mite infestation, and the lowest yield was obtained from the G25 with the highest mite infestation. The individual yield of each plant was negatively correlated with mite infestation (-0.13). A study by Reddy and Puttaswamy (1984) yielded similar results. The greater the damage to the crop, the lower the chilli yield. Mites caused leaf curl damage, resulting in reduced fruit and overall yield. Varieties (BARI Morich 1, 3) that showed the lowest flower and fruit infestation levels were categorized as moderately resistant to mites (Nasrin *et al.*, 2021). Reddy and

Puttaswamy (1984) suggested that crop losses due to *P. latus* varied between 23.87 and 73.29%. Severe infestation of mites damages the leaf flower and fruiting seriously and may reduce the yield by 60% (Srinivasan *et al.,* 2003). Latha and Hunumanthraya (2018) screened chilli genotypes, sorted them on the leaf curl index and found the tolerant group with the most fruit and eventually the highest yield. Fruit number is imperative to study the tolerance against mites. Vichitbandha and Chandrapatya (2011) reported dropping chilli fruit production and fruit weight when mites damaged plant.

Weekly mite infestation of selected chilli varieties and genotypes: Knowing pest populations is of utmost importance to an effective pest control system. The number of chilli mites on the leaf of chilli plants was counted at weekly intervals (Fig. 1). This study exposed that mites started to grow at the beginning of January. Initially, in January, the growth was controlled on a small scale. On 1st of February, we found the least number of mites in all genotypes. After that, the number started to increase, and the peak abundance of mites on all the chilli varieties was observed on 9th March, when the plants were juicy, succulent and green and remained in the flowering stage or green fruits. The mite abundance continued till the final harvesting in all the genotypes. High temperature and low relative humidity favored the development of the mite population to the peak during the study period.

In another study in Bangladesh, the peak of the mite was recorded in the second week of April (Nasrin *et al.,* 2021). The development and reproduction of mites depend on the temperature and rainfall pattern (Gotosh *et al.,* 2014). Kethran *et al.* (2014) studied the prevalence of mites on chilli plants in Pakistan and found the highest frequency of mites in the fourth week of March because of the differences within the geographical position, the ambient weather situations, and the chilli varieties. Our conclusions are different. Although our results showed slight variation, temperature and humidity played an important role in all the findings. In every study, the peak was observed in hot and dry conditions, and the mite population sharply declined after the rainfall. Many authors have reported a positive correlation between temperatures on the population of *P. latus* and a negative correlation with relative humidity and rainfall (Chakrabarti and Sarkar, 2014).

The average mite infestation of the genotypes over the study period is presented in Fig. 2. the G25 had the highest number of mites (36.21 mites/5 leaves), followed by the G10 (22.70 mites/5 leaves), the BARI Morich-2 (14.45 mites/5 leaves), and the G30 (8.82 mites/5 leaves). Contrarily, the G31 had the least amount of mite infestation (3.45 mites/5 leaves), followed by the G27 (4.24 mites/5 leaves), the BARI Morich-1 (4.91 mites/5 leaves), and the BARI Morich-3 (6.06 mites/5 leaves).

The average number of mites during the study period helps to reveal the endurance capacity of chilli genotypes. At the ultimate infestation of mites, Patil and Nandihalli (2009) observed 6.4 mites/leaf of chilli plants in the fourth week of April in Karnataka, India. Kethran *et al*. (2014) observed the maximum abundance of mites from the first week of March to the fourth week of August. A mean abundance of 0.52 mites/leaf was recorded by Kethran *et al*. (2014). The screening of 14 chilli hybrids was introduced to select the mite-tolerant one. Though none was found completely immune to mites, 2.53 mites/ leaf were observed in the best hybrid chilli genotype (Jangra *et al.*, 2022). They ended up grouping the hybrids based on susceptibility, mainly based on the number of mites per leaf. In our study, the prevalence of mites over the study period could be a good indicator for selecting tolerant genotypes.

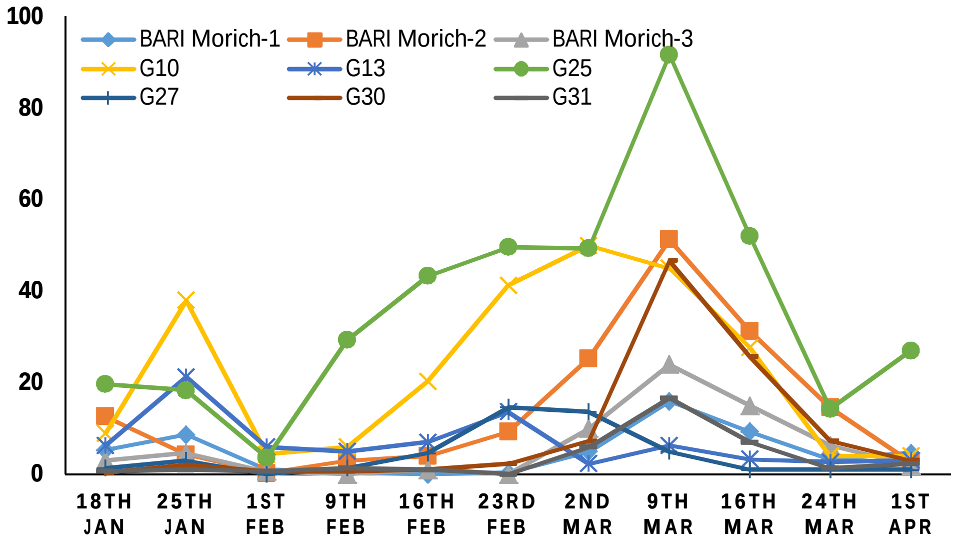

Fig. 1. Weekly mite infestation of three varieties and six genotypes of chilli during the experimental period.

Categorization of selected chilli varieties and genotypes against mite infestation: Based on the mite population (number of mites/5 leaves), three varieties and six genotypes of chilli were grouped (Table 2). The data for assessing mite damage was inconsistent. In this case, average mite populations were considered to assess the response of different chilli varieties and genotypes to mite infestation.

Thus, three varieties and six genotypes were differentiated into 5 major response groups based on the average mite swarming (recorded from weekly intervals). One variety and 2 genotypes which harbored <5 mites/5 leaves, namely BARI Morich-1, Genotype 27, and Genotype 31, were designated as highly resistant; Genotype 13, BARI Morich-3, and Genotype 30 with 5 to 10 mites/5 leaves as resistant; BARI Morich-2 as moderately resistant with 11 to 20 mites/5 leaves; Genotype 10 was recorded with 21 to 30 mites/5 leaves as tolerant and Genotype 25 was found as susceptible with >30 mites/5 leaves (Table 3).

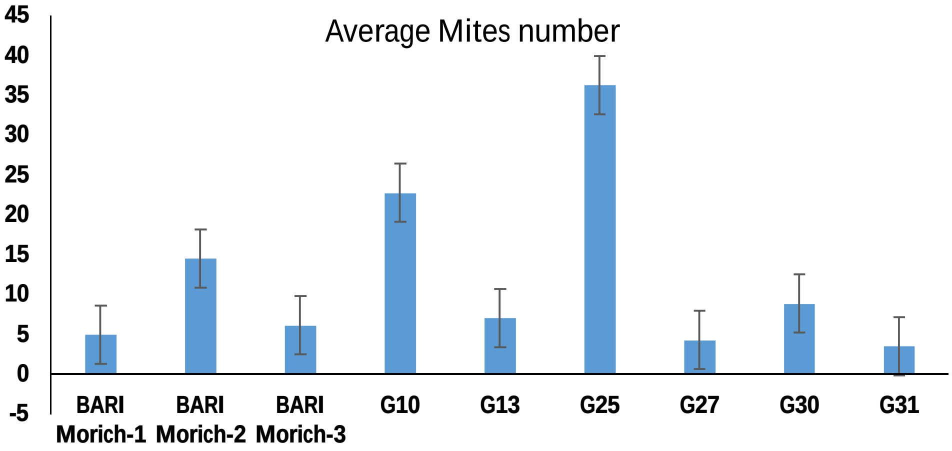

Fig. 2. Average number of mites in chilli plant during the experiment period.

Table 2. Category of chilli varieties and genotypes based on mean mite population.

Category	No. of mites/5 leaves	Varieties/genotypes
Highly resistant	<5 mites	BARI Morich-1, Genotype 27, Genotype 31
Resistant	5-10 mites	Genotype 13, BARI Morich-3, Genotype 30
Moderately resistant	10-20 mites	BARI Morich-2
Tolerant	20-30 mites	Genotype 10
Susceptible	>30 mites	Genotype 25

Mites are tough to manage because of their polyphagous nature and high reproduction percentage and resistance to the host plant plays a key role in alternate pest management approaches. Several workers in India reported a series of screening of chilli genotypes in the quest to find the resistant chilli (Singh and Pandey, 2015; Bala *et al.*, 2016). The current study resembles the results of Gillis *et al.* (2019) examined the genotypes of 30 hot peppers and ranked the genotypes based on mite populations. The existence of mite resistance to chilli cultivars was observed by Samanta *et al.* (2017), who revealed tolerant and the most susceptible hybrids to yellow mites. Latha and Hunumanthraya (2018) screened 30 chilli genotypes and grouped them as resistant, moderately resistant, susceptible and highly susceptible. Nasrin *et al.* (2021) studied five chilli varieties and concluded BARI Morich 1, and BARI Morich 2 were moderately tolerant and others as susceptible to mites. The findings are similar to our results.

Conclusions

Genotype 25 was found to have the highest number of 7.24 mites/leaf, while the least number of 0.69 mites/leaf was revealed in Genotype 31. The yield was negatively correlated with a mite infestation. The yield was proportional to the number of fruits per plant and the weight of each fruit. Genotype 30 was the most prolific (512.27 g/plant) in production. On the other hand, the relative fruit number per plant in G10 and G13 provided an optimum yield and the lowest 21.02 g/plant from G25 with the highest mite infestation per plant.

Except for Genotype 25, which was vulnerable and had the lowest yield, all evaluated varieties and genotypes were tolerant to highly resistant to chilli mite infestation. Genotype 30 produced the highest (512.27 g/plant) and had fewer chilli mite infestations per plant. This genotype could be grown in regions where the chilli mite is a major pest and used as a starting point for creating resistant varieties. The findings of the current experiment could be beneficial for breeders to select appropriate genotypes resistant to mites. It opens a scope for the breeders to take the opportunity to develop a mite-resistant variety of chilli plants.

References

Aarwe, R., A. Shukla, R. Bajpai, A.K. Bhowmick and R.B. Singh. 2019. Seasonal incidence of insect pests and abundance of natural enemies in chilli crop. *J. Entomol. Zool. Stud.* **8**(1): 870-874.

Bala, S.C., K. Karmakar and D.K. Ghosh. 2016. Field evaluation of chilli germplasms against yellow mite, *Polyphagotarsonemus latus* (Banks) (Acari: Tarsonemidae) and its management under Gangetic basin of West Bengal. *Environ. Ecol.* **34**(1): 17-21.

Borah, D.C. 1987. Bioecology of *Polyphagotarsonemus latus* (Banks) (Acari: Tarsonemidae) and *Scirtothrips dorsalis* Hood (Thysanoptera: Thripidae) infesting chilli and their natural enemies. Ph. D. thesis. *Dharwad: Univ. of Agric. Sci.* pp. 165-202.

Chakrabarti S, and P.K. Sarkar. 2014. Studies on efficacy of some acaricidal molecules for the management of *Polyphagotarsonemus latus* (Banks) (Acari, Tarsonemidae) infesting chili (*Capsicum annuum* L.) in West Bengal. *Curr. Biotica.* **7**: 299-305.

David, P.M.M. 1987. Influence of insecticidal sprays on the resurgence of yellow mite *Polyphagotarsonemus latus* (Banks) on chillies. In *Resurgence of sucking pests: proceedings of national symposium/edited by S. Jayaraj.* Coimbatore, India: Centre for Plant Protection Studies, Tamil Nadu Agric. Univ. pp. 65-72.

de Coss-Romero, M. and J.E. Peña. 1998. Relationship of broad mite (Acari: Tarsonemidae) to host phenology and injury levels in *Capsicum annuum*. *Florida Entomologist*, **81**: 515-526.

Duarte, M.V.A., M. Venzon, M.C. de S. Bittencourt, F. A. Rodríguez-Cruz, A. Pallini and A. Janssen. 2015. Alternative food promotes broad mite control on chilli pepper plants. *BioControl.* **60**: 817-825. (https://doi.org/10.1007/s10526-015-9688-x).

Gillis C., F. Mirzaei, M. Potashman, MA Ikram and Maserejian N. 2019. The incidence of mild cognitive impairment: A systematic review and data synthesis. *Alzheimers Dement (Amst).* **8**(11): 248-256. (https://doi.org/10.1016/j.dadm.2019.01.004).

Girish, R., N. Srinivasa, Y.S. Basanth and H.R. Shruthi. 2019. Response of chilli genotypes to the yellow mite, *Polyphagotarsonemus latus* Banks population and biochemical basis of resistance. *J. Entomol. Zool. Stud*. **7**(1): 250-255.

Gotosh, T, M. Saito, A. Suzuki and G. Nachman. 2014. Effects of constant and variable temperatures on development and reproduction of the two-spotted spider mite *Tetranychus urticae* (Acari: Tetranychidae). *Exp. Appl. Acarol.* **64**(4): 465-78. (doi: 10.1007/s10493-014-9841-8).

Hosamani, A. 2007. *Management of chilli murda complex in irrigated ecosystem* (Doctoral dissertation, UAS Dharwad).

Jangra, M., R. Gulati and Sonika. 2017. Incidence of chilli mite, *Polyphagotarsonemus latus* (Banks) on chilli fruit parameters under field conditions. *Emergent L. Sci. Res.* **3**(2): 26-31.

Jangra, M., R. Gulati, K. Sonika, A. Poonia and V.K. Batra. 2022. Evaluation of chilli germplasm against, yellow mite, *Polyphagotarsonemus latus* (Banks) (Acari: Tarsonemidae). *J. Appl. Entomol.* **2**(1): 06-09.

Jeyarani, S. and M. Chandrasekaran. 2006. Bioefficacy of certain acaricides against chilli mite, *Polyphagotarsonemus latus* (Banks). *Agricultural Science Digest*. **26**(2): 132-134.

Kamruzzaman, A.S.M., M.Z. Alam and M.R.U. Miah. 2013. Effect of yellow mite, *Polyphagotarsonemus latus* (banks) density on hosts (*Corchorus olitorius* L.) phenology and assessment of yield loss under net house condition. *Afr. J. Agric. Res*. **8**: 380-385.

Keerthana, B, E. Sumathi, M. Murugan, H.U.N. Devi and A. Senthil. 2022. Population dynamics of chilli mite, *Polyphagotarsonemus latus* (Banks) in relation to weather parameters. *J. Pharm. Innov.*. **11**(7S): 404-407.

Kethran, M.R., S. YingYing, S, Baloch, S. Baloch, L.L. Wu, T.T. Yang, H. Zhan, A. Salam, S. Iqbal and S. Bashir. 2014. Effect of Different Sowing Dates on Insect Pest Population of Chillies (*Capsicum annuam* L). *J. Biol. Agric. Healthcare*. **4.** 196-208.

Kotresh, S., M. Raghuraman and A. Srushtideep. 2020. Management of chilli mites using newer formulations. *J. Entomol. Zool. Stud.* **8**(4): 74-77.

Kumar, D., S.V.S. Raju and K.R. Sharma. 2019. Population Dynamics of Chilli Mite and their Management with Certain Newer Insecticide Combination Formulations. *J. Pharmacogn. Phytochem.* **8**(2): 403-407.

Latha, S. and L. Hunumanthraya. 2018. Screening of chili genotypes against chili thrips, Scirtothrips dorsalis (Hood) and yellow mite, *Polyphagotarsonemus latus*(Banks). *J. Entomol. Zool. Stud.* **6**: 2739-2744.

Manjunatha, M. 1982. *Bioecology and control of the Spider Mite Tetranychus Neocaledonicus Andre (ACARI: Tetranychidae) on Vegetables* (Doctoral dissertation, Univ. of Agric. Sc., Department of Agricultural Entomology, Bangalore. 1982).

Naituku, L.K., M.K. Palomar and E. Jovicich. 2017. Occurrence and Damage of Broad Mites (*Polyphagotarsonemus latus* Banks) in Sweet Pepper (*Capsicum annuum* L.) in Samoa. *Ann. Trop. Res*. **39**(2): 1-12.

Nasrin, M., M.R. Amin, M.R.U. Miah, A. M. Akanda, M.G. Miah, O. Kwon, and S. Suh. 2021. Occurrence and severity of mite *Polyphagotarsonemus latus* (Tarsonemidae) on chili plants: Analysis of pest-weather and host plant characteristics. *Entomol. Res.* **51**(6): 273-281. (10.1111/1748-5967.12491)

Pal, S. and K. Karmakar. 2017. Population dynamics and management of yellow mite, Polyphagotarsonemus latus (Banks) (Acari: Tarsonemidae) infesting gerbera under protected cultivation. *J. Entomol. Zool. Stud.* **5**: 795-799.

Patil, R.S., and B.S. Nandihalli. 2009. Seasonal incidence of mite pests on brinjal and chilli. *Karnataka J. Agril. Sci.* **22**: 729-731.

Pena, J.E. and C.W. Campbell. 2005. Broad mite. EDIS. New Delhi, India: Malhotra Publishing House **25**: 944-949. *Plant Arc*. **15**(1): 493-497.

Reddy, D.N.R. and Puttaswamy. 1984. Pests infesting chilli (*Capsicum annum* L.) in the nursery. *Mysore J. Agric. Sci.* **18**(2): 122-125.

Reddy, G.P. and P. Baskaran. 1991. Biology and varietal preference of *Tetranychus ludeni* Zacher (Acari: Tetranychidae) on four varieties of eggplant, *Solanum melongena*. *Mysore J. Agric. Sci.* **25**: 331-334.

Rodrı´guez-Cruz, F. A. 2014. *Biological control of broad mites in chili pepper and physic nut.* Thesis Federal Univ. of Vicosa, Brazil.

Samanta, A., K. Sen, P. Bakshi and A.K. Sahoo. 2017. Screening of some chilli germplasm against yellow mite and thrips in the gangetic plains of West Bengal. *J. Entomol. Zool. Stud.* **5**(1): 881-884.

Sarmento, R.A., D.M. Rodrigues, F. Faraji, E.A. Erasmo, F. Lemos, A.V. Teodoro and A. Pallini. 2011. Suitability of the predatory mites *Iphiseiodes zuluagai* and *Euseius concordis* in controlling *Polyphagotarsonemus latus* and *Tetranychus bastosi* on *Jatropha curcas* plants in Brazil. *Exp. Appl. Acarol*. **53**(3): 203-214.

Sarwar, M. 2014. Influence of host plant species on the development, fecundity and population density of pest *Tetranychus urticae* (Koch) (Acari: Tetranychidae) and predator *Neoseiulus pseudolongispinosus* (Xin, Liang and Ke) (Acari: Phytoseiidae). *N. Z. J. Crop Hortic.* **42**: 10-20.

Satpathy, S., A. Kumar, T.M. Shivalingaswamy and A.B. Rai. 2008. Screening of Chilli Germplasms Against Yellow Mite and Thrips on the Basis of Leaf Symptoms. *Prog. Hortic.* **40**(2): 227-228.

Singh, N.K. and A. Pandey. 2015. Field screening of different genotypes of chilli against infestation of thrips. *Prog. Horti.* **47**(1): 142-145.

Srinivasan, M.R., J.S. Kennedy and S. Palaniswamy. 2003. Bioefficacy of Fenpyroximate 5SC against okra mite, Tetranychus cinnabarinus (Boisduval). *Indian J. Plant Prot*. **31**: 146-147

Tatagar, M.H., J.S. Awaknavar, R.S. Giraddi, H.D. Mohankumar, C.P. Mallapur and P.A. Kataraki. 2011. Role of border crop for the management of chilli leaf curl caused due to thrips, *Scirtothrips dorsalis* (Hood) and mites, *Polyphagotarsonemus latus* (Banks). *Karnataka J. Agric. Sci*. **24**(3): 294-299.

van Maanen, R., E. Vila, M.W. Sabelis and A. Janssen. 2010. Biological control of broad mites (*Polyphagotarsonemus latus*) with the generalist predator *Amblyseius swirskii*. *Exp. Appl. Acarol.* **52**(1): 29-34.

Venkatesh, K.M., V. Munniyappa, K.S. Ravi and P.R. Krishnaprasad. 1998. Management of chilli leaf curl complex. *Advances in IPM for Horticulture Crops. Reddy, PP, Kumar NKK and A. Verghese (Eds.), Association for Advancement of Pest Management in Horticultural Ecosystems, Division of Entomology and Nematology, Indian Institute of Horticultural Research, Bangalore, India*, 111-117.

Vichitbandha, P. and A. Chandrapatya. 2011. Broad Mite Effects on Chili Shoot Damage and Yields. *Pakistan J. Zool*. **43**(4): 637-649

Zeeshan, N. and N. Kudada. 2019. Ecofriendly management of chilli leaf curl disease complex through plant products. *J. Pharmacogn. Phytochem*. **8**(1): 1045-1049

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