

Effect of Neem Seed Extract on the Insect Pest Population of Different Chilli Varieties

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Abstract: The study was carried out on Effect of Neem seed extract on the insect pest population of different Chilli varieties in green house of the Faculty of Agriculture, Lasbela University of Agriculture, Water and Marine Sciences Uthal, Pakistan. The Repellency of Neem Seed Extract was studied against insect pests on chilli plants by free choice method. Three varieties of chilli, were sown were sprayed with Neem Seed Extract against whitefly, jassid, aphid and borer. The population of these insect pests and predators which was compared on three varieties of chilli crop sown in Randomized Complete Block Design (RCBD). The results showed that varietal preference of insect pests differed significantly. In chilli, varieties per population of whitefly were 2.10 and 1.97 on Talhari and Moro chilly respectively. The apex population was 5.5 whitefly / leaf on 25th January. It was 0.96 and 0.87 jassids / leaf on Moro chilly and Talhari varieties respectively. The apex population was 1.8 jassid / leaf on 19th February. It was 0.74 and 0.57 aphids / leaf on Moro chilly and Mirch shezadi respectively. The apex population was 2.95 aphid / leaf on 25th January. Per plant population of predators was 0.74 and 0.72 on chilli varieties Moro chilly and Talhari respectively. The apex population was 1.49 predator / plant on 9th February. Since pest population was increased beyond ETL on 25th January. Therefore 2 percent neem seed extract was applied on the crops on 25th January, 09th February and 24th February. These applications kept the pest population below ETL till the last observation on 5th March. Population of predators was not affected significantly by application of 2 percent of neem seed extract because of predators are not phytophagous like other pests.

Keywords: Pest population; Neem seed; Chilli varieties; sucking insect pests; predators.

1. INTRODUCTION

Vegetables are the essential component of human life for sustenance and play a vital role in food security and ensure the nutritional requirements for the rapidly growing human population. Vegetables are a major component of human diet. These are rich sources of vitamins which are essential for human health [5]. Chilli (*Capsicum annuum*) is a great economic important [9] plant grown in tropical and sub tropical areas and widely cultivated in Pakistan for its pungent fruits. Besides traditional use of chilli as vegetables, spices, condiments, suaces and pickle, it is also used in pharmaceuticals, cosmetics and beverages [4]. There are many sucking insect pests such as Jassid, Whitefly and Aphid which attack chilli crop and cause huge loss by infesting leaves and floral parts. The occurrence of these pests on this crop not only reduces photosynthetic activities but also transmit viral disease which poses serious threat to its production [11]. There are few eco-friendly pest-control systems that can be used to avoid excessive rely on greatly toxic chemicals. These methods and treatments for pest control are greatly effective. They can prevent insect pests to infest the crop. All these eco-friendly pest control systems are the part of Integrated Pest Management (IPM). The judicious use of all possible methods to pest control which

do not result in the disturbance of environment and no harmful side effects are produced. Therefore preservation and encouragement of the natural enemies is the central feature of the Integrated Pest Management [6]. It coordinates the use of pest biology, environmental information, and available approach to prevent unacceptable levels of pest damage by the most economical means, while posing the least possible risk to people, property, resources, and the environment. IPM provides an effective strategy for managing pests in all areas from developed residential and public areas to wild lands. IPM serves as an umbrella to provide an effective, all encompassing, low risk approach to protect resources and people from pests [8]. IPM is often mistakenly associated only with entomology and insect pests. However, in contrast to entomology, plant pathology has, since its beginning, approached plant pests through multiple, or integrated strategies [10]. Average seasonal population of mites was 6.58 ± 0.45 , thrips 4.37 ± 0.37 , whitefly 1.00 ± 0.18 , mealy bug 7.22 ± 0.48 / leaf, termite 0.51 ± 0.13 per cent and *H. armigera* 0.41 ± 0.11 / plant on chilli [7]. Quality of chilli fruits can be obtained by the organic cultivation methods, which will result in increased export [3]. Efficacy of synthetic pesticides alone or in combination with oil of neem against *Bemisia tabaci* did not observe a considerable impact on insect population.

Profenofos alone and Profenofos+ neem oil had higher efficacy against whitefly than rest of the treatments [1]. The proposed study was carried out on the comparison of pest population and integrated pest management on different varieties of chilli under field conditions with the objectives to record population of major insect pests on chilli compare major insect pests on different varieties of chilli and study botanical pest control material (Neem Seed Extract) against insect pests of chilli under field conditions.

2. MATERIALS AND METHODS

The studies were carried out on carried out on Effect of Neem seed extract in the insect pest population of different Chilli varieties as affected by spray application of neem extract against key pests such as whitefly, jassid, aphid, borers and their predators. The efficacy of neem based bio-pesticide (neem seed extract) against these insect pests using three chilli varieties. The experimental crops were grown an experimental field in Coconut Farm, Department of Agriculture at Uthal, District Lasbella, Balochistan.

Chilli crop was sown three varieties were cultivated four replicated Randomized Complete Block Design (RCBD). The experimental area consisted of one acre of land which was divided into 4 blocks. Each block was divided into 3 plots. All experimental area was divided into 12 plots. Each plot size was 11 m x 22 m.

The land for sowing the experimental crops was adapted not in season. In the beginning, the experimental area had ploughed with running disc plough & 15 day leave. Later, the tractor had used for crushing of clods and leveling the land. Then the area came in proper condition, finally using strips for isolation of plots & preparing channel of feeding 60 cm for row to row distance & 30 cm for plant to plant distance for all experimental crops.

In this study, neem seed extract was applied for controlling the insect pests and dynamical number of the dominant pest & predators was monitored for the entire growing season of chilli crop by using the six plants randomly of each variety from each plot. The treatment details are as under;

2.1 Chilli varieties

V 1- Mirch Shezadi,
V2-Talhari
V3- Moro chilly.

The experimental crop was sown at recommended sowing time and all the crop production technologies were adopted from sowing view point, inputs application as well as for crop management. For controlling insect pests, the neem seed extract was prepared & sprayed when insect pest appears.

2.2 Preparation of neem seed extract

2 % neem seed extract was prepared from 40 gm powder of neem seed which had added of 5 gm of detergent. This was wrapped in a muslin cloth and dipped in 2 L of hot water. After 15-20 hours the concentrate was squeezed out and

diluted to 2 % by adding water. During attack of insect pests on crops, application of 2 % neem seed extract was applied on the crops at 15 days intervals in the field. Neem seed extract spray was applied as repellent in order to keep the insect pests away from the crops.

The result that were together had observed in statistical analysed by using analysis of variance (ANOVA) know the significance differences in insect pests infestation in different treatments and LSD test was employed to compare treatment means. In view of the statistical analysis, the tables containing summarized experimental results were prepared and detailed descriptions are presented.

2.3 Green house studies

Total 24 nursery plants of Chilli were collected from different field of farmers in Uthal. Then these Plants were kept in gamla. Then for 24 plants twelve cages were made. In each cage two plants (treated and untreated) were kept for experiment of neem seed extract.

This experiment data was taken after (6, 12, 18 hours) intervals. Three control application of neem seed extract (0.5 percent, 1.0 percent and 2.0 percent) were applied in one plant for each cage of two plants (treated and untreated). Chilli vegetable 1.0 percent was applied in three cages. In every cage ten whiteflies were released and then counted number of whiteflies after every 6 hours, 12 hours and 18 hours interval. Similarly three reading were taken in chilli concentration at different time intervals and noted in the diary.

2.4 Statistical analysis

The collected data were statistically analysed using MSTATc software and entire means were subjected to Least Significant Difference (LSD) as well as Tukey test at $P < 0.05$.

3. RESULTS

The study was carried out on Effect of Neem seed extract on the insect pest population of different Chilli varieties. Repellent effect of neem seed water extract application to chilli plants were initially studied against whitefly in a free choice method in a green house in the Faculty of Agriculture, LUAWMS. Further studies on population dynamics of whitefly, jassid, aphid, borers and predators were compared on different varieties of chilli, *Capsicum annuum* (Mirch shezadi, Talhari, Moro chilly), separately as affected by spray application of neem seed extract. The experimental crops were grown in an experimental area of Coconut Farm, Department of Agriculture Uthal. Three varieties of chilli were sown separately in Randomized Complete Block Design (RCBD).

3.1 Repellency of Neem Seed Extract against whitefly on chilli

Chilli was used to evaluate repellent effect of neem seed extract against whitefly in green house studies by free choice

method as given below. The extract was applied in 2.0, 1.0 and 0.5 % concentrations to chilli plants.

3.1.1 Repellency of whitefly on chilli crop

A comparison of mean percent repellency of whitefly on chilli crop at different concentrations of neem seed extract (NSE) is presented in Table 3.1. It revealed that the highest repellency of 41.44 percent was recorded at 2 percent concentrations which was significantly different from 25.88, 23.00 and 16.88 percent at application rates of 1.00, 0.50 and control respectively. Repellency values at 1.0 percent and 0.5 percent were non significant from each other but these were significantly higher than 16.88 percent in control.

A comparison of percent repellency of whitefly on chilli crop after 6 hours, 12 hours and 18 hours interval is presented in Table 3.2. It revealed that the highest repellency of 34.66 percent was recorded after 6 hours which was significantly higher than 20.83 and 24.91 percent after 12 hours and 18 hours respectively. However, repellency recorded after 18 hours was significantly higher than after 12 hours.

A comparison of percent repellency in the interaction between both concentrations of neem seed extract and time intervals is presented in Table 3.3. The highest repellency of 80.0 percent was recorded at 2.0 percent concentration after 6 hours of application. The lowest repellency was recorded in control after 18 hours. Generally, repellency values were higher at higher concentration of neem seed extract.

Table 3.1: Percent repellency of whitefly at different concentrations of Neem Seed Water Extract applied to chilli plants.

CONCENTRATION	% REPELLENCY
2.00%	41.44 ^a
1.00%	25.88 ^b
0.50%	23.00 ^b
Control	16.88 ^c

Note: Mean values having the same letter is not significantly various by Tukey test (P<0.05).

Table 3.2: Percent repellency of whitefly at different time intervals after application of Neem Seed Water Extract to chilli plants

HOURS	% REPELLENCY
6	34.66 ^a
12	20.83 ^c
18	24.91 ^b

Note: Mean values having the same letter is not significantly different by Tukey test (P<0.05).

Table 3.3: Percent repellency of whitefly at different concentrations and time intervals

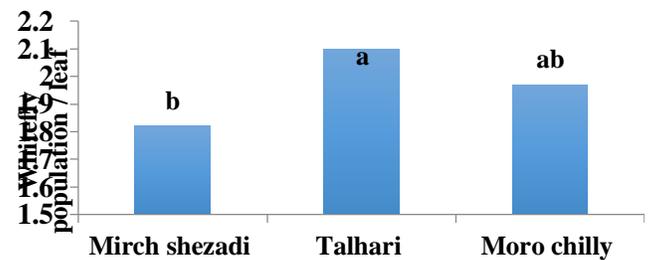
Concentration	% REPELLENCY AFTER TIME INTERVALS		
	6 hours	12 hours	18 hours
2.00%	80.00 ^a	19.33 ^e	25.00 ^d
1.00%	18.66 ^e	26.66 ^d	32.33 ^b
0.50%	26.00 ^d	14.00 ^f	29.00 ^{bc}
Control	14.00 ^f	23.33 ^d	13.33 ^f

Note: Mean values having the same letter is not significantly different by Tukey test (P<0.05).

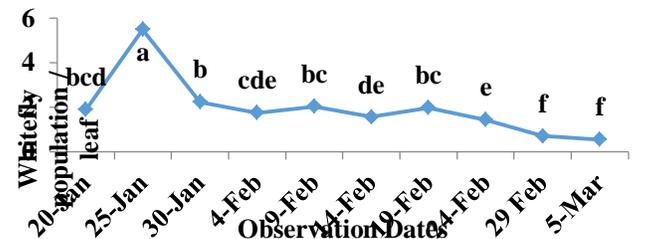
3.2 Insect pests of Chilli varieties

3.2.1 Whitefly population on chilli varieties

The result of per leaf population of whitefly on three chilli varieties at different dates is presented in Table 3.4. It revealed that in all the three varieties the highest population of whitefly was recorded on 25th January in Talhari variety. It



was 4.89, 5.28 and 6.33 / leaf on Mirch shezadi, Talhari and Moro chilly respectively. Therefore, Neem Seed Extract was



applied at 2 percent concentrations on 25th January which was continued at 15 days intervals on 9th February and 24th February. However, the lowest number of 0.49 whitefly / leaf was recorded on 5th March in Mirch shezadi variety which was not significantly different from 0.86 observed on 29th February. In case of Talhari variety, the lowest number of whitefly 0.64 and 0.76 / leaf was observed on 29th February and 5th March which was not significantly different from each other. In case of Moro chilly variety similar trend was observed, the lowest number of whitefly 0.49 and 0.51 / leaf was observed on 29th February and 5th March which was not significantly different from each other.

A comparison of mean number of whitefly on three varieties of chilli is presented in Figure 3.1. It revealed that the lowest number of 1.82 whitefly / leaf was observed in Mirch shezadi variety, whereas the highest number of 2.10 and 1.97 whiteflies / leaf was recorded from Talhari and Moro chilly variety which was not significantly different from each other. Moreover, the values of Mirch shezadi and Talhari varieties were significantly different from each other.

A comparison of mean number of whitefly on chilli varieties at different dates is presented in Figure 3.2. It revealed that the lowest number of 0.55 whitefly / leaf was observed on 5th March which was not significantly different from 0.7 was recorded on 29th February. However, the highest number of 5.5 whitefly / leaf was recorded on 25th January which was significant different from population which was recorded on all other dates. Interaction between all the three varieties indicated that highest and significantly different whitefly population was recorded on 25th January which dropped significantly with the application of neem seed extract on 25th January after 15 days intervals. The population of whitefly remained lower but significantly different on different varieties.

Table 3.4: Mean number of whitefly nymph / leaf on chilli varieties at different Observation dates.

Obs. Dates	Chilli varieties		
	V1= Mirchshezadi	V2= Talhari	V3= Moro chilly
20-Jan	1.83 ^{ef}	1.94 ^{def}	1.90 ^{def}
25-Jan	4.89 ^{ab}	6.33 ^a	5.28 ^{ab}
30-Jan	1.99 ^{def}	2.26 ^{cde}	2.46 ^{cd}
4-Feb	1.81 ^{ef}	1.61 ^{efg}	1.83 ^{ef}
9-Feb	1.88 ^{ef}	2.09 ^{de}	2.11 ^{de}
14-Feb	1.44 ^{fgh}	1.74 ^{efg}	1.49 ^{fg}
19-Feb	1.81 ^{ef}	1.96 ^{def}	2.16 ^{de}
24-Feb	1.19 ^{hi}	1.64 ^{efg}	1.47 ^{fg}
29 Feb	0.86 ⁱ	0.76 ^{ij}	0.49 ^{jk}
5-Mar	0.49 ^{jk}	0.64 ^{jk}	0.51 ^{jk}

Note: Mean values having the same letter is not significantly different by Tukey test (P<0.05).

Figure 3.1: Mean number of whitefly on chilli varieties.

Figure 3.2: Mean number of whitefly on chilli varieties at different observation dates.

Note: Means sharing similar letters are not significantly different by Fisher's LSD test at P = 0.05

3.2.2 Jassid population on chilli varieties

The result of per leaf population of jassid on three chilli varieties at different dates is presented in Table 3.5. It revealed that the highest population of jassid was recorded on 25th January in Moro chilly variety. It was 1.79, 1.83 and 1.89 / leaf on Mirch shezadi, Talhari and Moro chilly respectively. Therefore, Neem Seed Extract was applied at 2 percent concentrations on 25th January which was continued at 15 days intervals on 9th February and 24th February. However, the lowest population of 0.08 jassid / leaf was recorded on 29th February in Mirch shezadi variety which was not significantly different from 0.16 and 0.11 / leaf recorded on 20th January and 5th March respectively. In case of Talhari variety, the lowest number of jassid 0.14 was

observed on 20th January which was not significantly different from 0.17 and 0.16 / leaf recorded on 29th February and 5th March respectively. In case of Moro chilly variety similar trend was observed, the lowest number of 0.09 jassid / leaf was observed on 5th March which was not significantly different from 0.11 and 0.13 recorded on 29th February and 20th January.

A comparison of mean number of jassid on three varieties of chilli is presented in Figure 3.3. It revealed that the lowest number of 0.87 jassid / leaf was observed in Mirch shezadi and Talhari varieties which was not significant different from each other. However, the highest number of 0.96 jassid / leaf was recorded in Moro chilly variety.

A comparison of mean number of jassid on chilli varieties at different dates is presented in Figure 3.4. It revealed that the lowest number of 0.12 jassid / leaf was observed on 29th February and 5th March which was not significantly different from 0.14 recorded on 20th January. However, the highest number of 1.8 jassid / leaf was recorded on 19th February which was not significantly different from 1.68 and 1.63 jassids / leaf was recorded on 25th January and 30th January both was not significant different from each other but significantly higher than the number which was recorded on all other dates. Jassid population fluctuated during 30th January to 5th March.

Interaction between all the three varieties indicated that highest and significantly different jassid population was recorded on 25th January which dropped significantly with the application of neem seed extract on 25th January and 15 days intervals. The population of jassid remained lower but significantly different on different varieties.

Table 3.5: Mean number of jassid nymph / leaf on chilli varieties at different observation dates.

Obs. Dates	Chilli varieties		
	V1= Mirchshezadi	V2= Talhari	V3= Moro chilly
20-Jan	0.16 ^{ij}	0.14 ^{ij}	0.13 ^{ij}
25-Jan	1.79 ^{ab}	1.50 ^{bcd}	1.76 ^{ab}
30-Jan	1.59 ^{bcd}	1.59 ^{bcd}	1.69 ^{abc}
4-Feb	0.74 ^{ef}	1.38 ^{cd}	1.54 ^{bcd}
9-Feb	1.01 ^{cde}	0.78 ^{def}	0.93 ^{de}
14-Feb	0.71 ^{ef}	0.47 ^{fg}	0.56 ^{efg}
19-Feb	1.68 ^{bc}	1.83 ^{ab}	1.89 ^a
24-Feb	0.81 ^{def}	0.71 ^{ef}	0.89 ^{de}
29 Feb	0.08 ⁱ	0.17 ^{hij}	0.11 ^{ij}
5-Mar	0.11 ^{ij}	0.16 ^{hij}	0.09 ⁱ

Note: Means sharing similar letters are not significantly different by Fisher's LSD test at P = 0.05

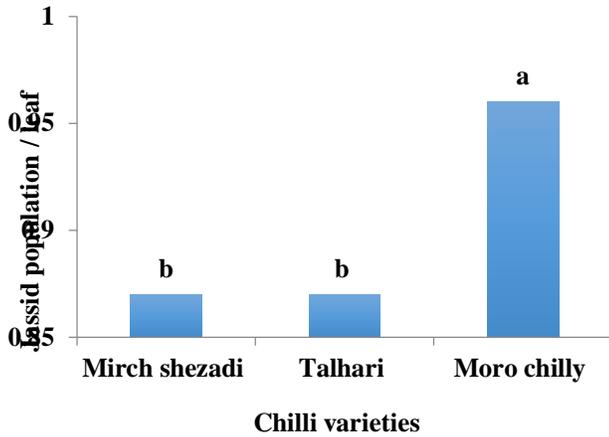


Figure 3.3: Mean number of jassid on chilli varieties.

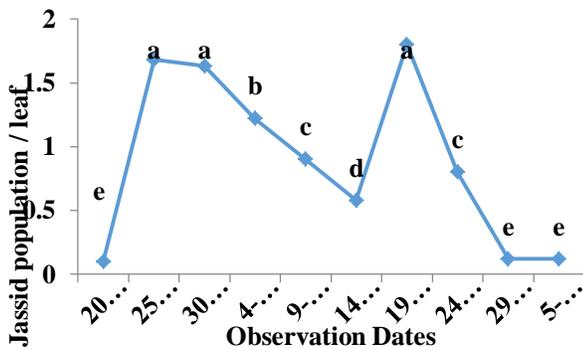


Figure 3.4: Mean number of jassid on chilli varieties at different observation dates.

Note: Means sharing similar letters are not significantly different by Fisher's LSD test at P = 0.05

3.2.3 Aphid population on chilli varieties

The result of per leaf population of aphid on three chilli varieties at different dates is presented in Table 3.6. It revealed that the highest population of aphid was recorded on 25th January in Talhari variety. It was 2.58, 3.04 and 3.24 / leaf on Mirch shezadi, Moro chilly and Talhari varieties respectively. Therefore, Neem Seed Extract was applied at 2 percent concentrations on 25th January which was continued at 15 days intervals on 9th February and 24th February. However, the lowest number of 0.06 aphid / leaf was recorded in Mirch shehzadi variety on 29th February which was not significantly different from all other values except on 25th January, 30th January, 19th February and 24th February. The lowest population of 0.04 aphid / leaf was observed on 29th February in Talhari variety which was not significant different from 0.07 recorded on 5th March. The lowest number of 0.03 aphid / leaf was recorded on 5th March in Moro chilly variety which was not significantly different from 0.06 observed on 29th February.

A comparison of mean number of aphid on three varieties of chilli is presented in Figure 3.5. It revealed that the lowest number of 0.57 aphid / leaf was observed in Mirch shezadi

variety which was significantly lower than 0.74 in Talhari and Moro chilly varieties. However, these two values were not significantly different from each other. But the highest number of 0.74 aphid / leaf was recorded in Moro chilly and Talhari varieties.

A comparison of mean number of aphid on chilli varieties at different dates is presented in Figure 3.6. It revealed that the lowest number of 0.05 aphid / leaf was observed on 29th February which was not significantly different from 0.15, 0.2 and 0.06 / leaf recorded on 20th January, 9th February and 5th March respectively. However, the highest number of 2.95 aphid / leaf was recorded on 25th January which was significantly different from all other values which was recorded from 20th January to 5th March.

Interaction between all the three varieties indicated that highest and significantly different aphid population was recorded on 25th January which dropped significantly with the application of neem seed extract (NSE) on 25th January and after 15 days intervals. The population of aphid remained decreased but significantly different in different varieties.

Table 3.6: Mean number of aphid nymph / leaf on chilli varieties at different observation dates.

Obs. Dates	Chilli varieties		
	V1= Mirchshezadi	V2= Talhari	V3= Moro chilly
20-Jan	0.09 ^g	0.21 ^{hi}	0.16 ^{hi}
25-Jan	2.58 ^b	3.24 ^a	3.04 ^a
30-Jan	1.33 ^{cd}	1.26 ^d	1.63 ^c
4-Feb	0.29 ^{ghi}	0.69 ^f	1.06 ^{de}
9-Feb	0.21 ^{hi}	0.19 ^{hi}	0.19 ^{hi}
14-Feb	0.12 ⁱ	0.47 ^{gh}	0.31 ^{ghi}
19-Feb	0.46 ^{fgh}	0.56 ^{fg}	0.19 ^{hi}
24-Feb	0.49 ^{fgh}	0.68 ^f	0.76 ^{ef}
29 Feb	0.06 ⁱ	0.04 ⁱ	0.06 ⁱ
5-Mar	0.08 ⁱ	0.07 ⁱ	0.03 ⁱ

Note: Means sharing similar letters are not significantly different by Fisher's LSD test at P = 0.05

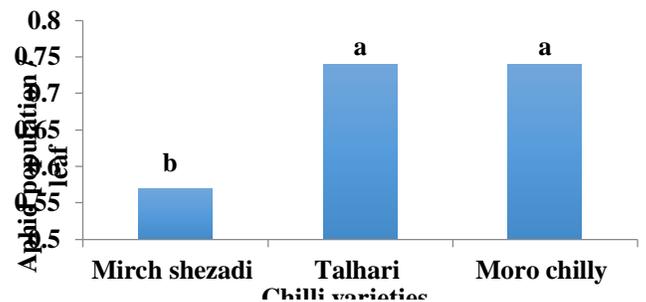


Figure- 3.5: Mean number of aphid on chilli varieties.

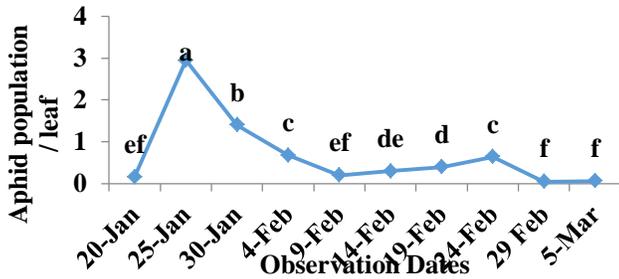


Figure- 3.6: Mean number of aphid on chilli varieties at different observation dates.

Note: Means sharing similar letters are not significantly different by Fisher’s LSD test at P = 0.05

3.2.4 Predators population on chilli varieties

The result of per plant population of ladybird beetle (*Coccinella septempunctata*) adults on three chilli varieties at different dates is presented in Table 3.7. It revealed that the highest population of *C. septempunctata* was recorded on 9th February in Talhari variety. It was 1.33, 1.53 and 1.61 / plant on Mirch shezadi, Moro chilly and Talhari varieties respectively. Therefore, Neem Seed Extract was applied at 2 percent concentrations on 25th January which was continued at 15 days intervals on 9th February and 24th February. However, the lowest number of 0.03 *C. septempunctata* / plant was recorded on 20th January and 29th February which was not significantly different from 0.13 recorded on 5th March in Mirch shezadi variety. In case of Talhari variety, the lowest number of 0.04 *C. septempunctata* / plant was observed on 20th January which was not significantly different from 0.11, 0.18 and 0.21 / plant recorded on 25th January, 29th February and 5th March respectively. In case of Moro chilly variety similar trend was observed, the lowest number of 0.03 *C. septempunctata* / plant was observed on 20th January which was not significantly different from 0.11, 0.14 and 0.09 / plant recorded on 25th January, 29th February and 5th March respectively.

A comparison of mean number of predators on three varieties of chilli is presented in Figure 3.7. It revealed that the lowest number of 0.59 *C. septempunctata* / plant was observed in Mirch shezadi. However, the highest number of predators 0.74 and 0.72 / plant was recorded in Moro chilly and Talhari varieties which was not significantly different from each other.

A comparison of mean number of predators on chilli varieties at different dates is presented in Figure 3.8. It revealed that the lowest number of 0.03 *C. septempunctata* / plant was observed on 20th January which was not significantly different from 0.14, 0.14 and 0.11 / plant recorded on 25th January, 5th March and 29th February respectively. However, the highest number of 1.49 *C. septempunctata* / plant was recorded on 9th February which was not significantly different from 1.36 was recorded on 30th January.

Interaction between all the three varieties indicated that highest and significantly different predator population was recorded on 9th February which dropped significantly with the application of neem seed extract on 25th January after 15 days intervals. Population of predator remained not decrease but significantly different on different varieties.

Table 3.7: Mean number of predators on chilli varieties at different observation dates.

Obs. Dates	Chilli varieties		
	V1= Mirchshezadi	V2= Talhari	V3= Moro chilly
20-Jan	0.03 ^l	0.04 ^l	0.03 ^l
25-Jan	0.21 ^{kl}	0.11 ^k	0.11 ^k
30-Jan	1.13 ^{de}	1.48 ^{ab}	1.49 ^{ab}
4-Feb	1.14 ^{de}	1.21 ^{de}	1.29 ^{bc}
9-Feb	1.33 ^{bc}	1.61 ^a	1.53 ^{ab}
14-Feb	0.68 ^{hi}	0.88 ^{gh}	0.48 ^{ij}
19-Feb	0.89 ^{fg}	0.71 ^{hi}	1.23 ^{cd}
24-Feb	0.34 ^{jk}	0.74 ^h	1.06 ^{rf}
29-Feb	0.03 ^l	0.18 ^k	0.14 ^{kl}
5-Mar	0.13 ^{kl}	0.21 ^{kl}	0.09 ^{kl}

Note: Means sharing similar letters are not significantly different by Fisher’s LSD test at P = 0.05

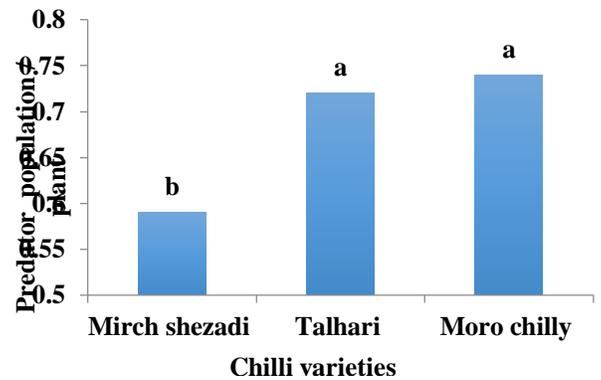


Figure 3.7: Mean number of predators on chilli varieties.

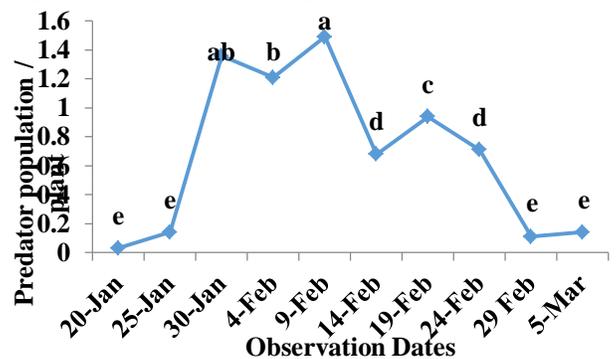


Figure 3.8: Mean number of predators on chilli varieties at different observation dates.

Note: Means sharing similar letters are not significantly different by Fisher's LSD test at $P = 0.05$

4. DISCUSSION

The present study was carried out on Effect of Neem seed extract on the pest population of different Chilli varieties in green house of the Faculty of Agriculture, Lasbela University of Agriculture, Water and Marine Sciences Uthal, Pakistan.

Repellency of Neem Seed Extract was studied against whitefly on chilli plants by free choice method in the green house of the Faculty of Agriculture, LUAWMS. Three genotypes of chilli were sown at Coconut Farm, Uthal. Chilli was sown had sprayed with Neem Seed Extract against whitefly, jassid, aphid, borer and population of these insect pests and predators was compared on three varieties of chilli crop separately sown in Randomized Complete Block Design (RCBD). Chilli variety Mirch shehzadi showed relative resistance to whitefly over Moro chilly and Talhari. The highest population was recorded on 25th January. Talhari and Mirch shehzadi varieties also showed some resistance to jassid as compared to Moro chilly. While apex population was recorded on 25th January and lowest population was observed on 5th March after spray of neem seed extract on 25th January, 09th February and 24th February. Mirch shehzadi suffered markedly lesser with aphid population than Talhari and Moro chilly varieties; However, the highest population was seen on 25th January and lowest on 5th March. Moro chilly and Talhari chilli varieties were attracted more predators as compared to Mirch shehzadi and highest population was on 14th February but predators remained in minor population upto the final observation on 5th March. [3] stated that thrips, mite and aphid populations were 16.9, 8.8 and 4 percent as compared to 26.3, 12.8 and 3.2 percent reduction, respectively in conventional plot. Similarly, [12] found that neem seed extract against aphid population was highly effective to suppress the insect below economic injury level. [2] suggested that all the use of trial plant extracts particularly these bio-pesticides have been established for controlling of insect pests; garlic, sweetsop and tobacco they have been found to be very promising botanical pesticide in the control of insect pests on chilli. It has been performed that the field trials to evaluate the effectiveness of botanical extracts and reported that extracts of (Neem) *Azadirachta indica* and (garlic) *Allium sativum* on the concentrations of 0.01 percent were effective to control insect pests. Preference and non preference of pests due to biochemicals especially secondary compounds. Predator population is dependent on the availability of pests. In the current research it was deserved that predator population decreased after the decrease of sucking pests but later on it slightly increase due to the availability of less active insect pests in the field. Finally it was deserved that population of all the pests on various crop varieties remained below EIL after the application of 2 percent NSE on 25th Janaury and later on at fortnightly intervals. These showed that insect pests of all

these vegetable crop varieties can be managed with this treatment.

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