

Assessment of Pest Population and Repellency of Neem Seed Extract on Different Eggplant Varieties in Uthal

¹Enayat Aziz, ²Ghulam Jilani, ³Abdul Ghaffar Khoso, ⁴Farrukh Asghar, ⁵Ameer Uddin, ⁶Nadir Ali, ⁷Khalil Asghar

¹ Deputy Director Office (Ext) , Agriculture Department Lasbela, at uthal, 90150, Pakistan

²Department of Entomology, Lasbela University of Agriculture, Water and Marine Sciences (LUAWMS)
Uthal, 90150, Pakistan

³Department of Entomology , Sindh Agriculture University, (SAU), Tando Jam, 70060, Pakistan
E-mail address: khoso05@yahoo.com (Corresponding author)

⁴Department of Entomology, Sindh Agriculture University, (SAU) , Tando Jam, 70060, Pakistan

⁵Horticulturist Agriculture Research, Agriculture Research Institute, (ARI), Awaran, 89300, Pakistan

⁶Directorate of Pulses, Agriculture Research Institute, (ARI), Sariab, 87550, Pakistan

⁷Department of Plant Breeding and Genetics, Balochistan Agriculture College, (BAC), Quetta, 87300, Pakistan

Abstract: The study carried out on Assessment of Pest Population and Repellency of Neem Seed Extract on Different eggplant Varieties in Uthal during 2016-2017. Repellency of Neem Seed Extract was studied against insect pest on eggplant plants by free choice method in the green house of the Faculty of Agriculture, Lasbela University of Agriculture, Water and Marine Sciences Uthal, Pakistan. Three varieties of eggplant 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 eggplant crop sown in Randomized Complete Block Design (RCBD). The results showed that varietal preference of insect pests differed significantly. On eggplant, variety per leaf population was 2.73 and 2.42 on F1-advanta-305 and PPL respectively. The higher population was 3.27 whitefly / leaf on 25th January. It was 1.31 and 1.30 jassids / leaf on Black long and PPL eggplant varieties respectively but higher population was 2.68 jassid / leaf on 25th January. It was 1.31 and 1.30 on Black long and PPL varieties respectively. The apex population was 2.48 aphid / leaf on 25th January. While the predator population was 0.98 and 0.95 predators / plant on F1-advanta-305 and Black long varieties respectively. The peak population was 2.06 predator / plant on 4th February.

Keywords: Pest Population; Repellency; Neem Seed Extract; eggplant Varieties; predator.

1. INTRODUCTION

Eggplant (Brinjal) *Solanum melongena* L., in western world called as aubergine is among the top ten vegetables for extensive cultivation in the world. It is a tropical perennial, closely related to tomato and grown for its edible fruit. The plant has branching stem and simple long flat coarsely lobed leaves which are green in color. The leaves are 10-20 cm long and 5-10 cm broad [12]. Eggplant is major vegetable of human diet. It has rich sources of vitamins which are essential for human health [3]. Among vegetables, the solanaceous crop eggplant considerable as a vegetable of great economic important [9]. There are many sucking insect pests such as Jassid, Whitefly and Aphid which attack eggplant crop and cause huge loss by infesting leaves and stems. 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 [14]. Among the insect pests infesting eggplant, the major ones are shoot and fruit borer, whitefly and leafhopper. Brinjal shoot and fruit borer, *Leucinodes orbonalis* is considered the main constraint as it losses the crop whole the year. The yield loss due to the pest is to the extent of 60-90 % [7].

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 [11]. 5 % neem seed extract showed the lowest

infestation of aphids and maximum crop yield [5]. While [2] found that neem extract observed its superiority in efficacy to combat whole the insect pests studied in eggplant, followed by chemical control, tobacco extract, Tooh extract, akk extract and datura remained the least. Regardless the bio-pesticides, the highest efficacy was observed against jassid during both the sprays. Mites persisted more than borers and jassid to remain in the eggplant fields. For effective and safe control of brinjal insect pests in the field, the crop may be preferably sprayed with neem seed extract followed by tobacco and tooh extract; and at least one spray monthly is essential to keep the insect pests below economic injury level. There is no need to apply chemical control, because neem seed extract resulted better than the chemical control. Similarly, [10] observed that bio-pesticides, especially neem seed extract (NSE) and tobacco based products may be used against insect pests of *Lycopersicon esculentum*, because the efficacy of neem based bio-pesticides remained highest throughout the study period against all the target pests. Efficacy of synthetic pesticides alone or in combination with oil of neem against *Bemisia tabaci* did not observe a considerable impact on insect population [1]. Profenofos alone and Profenofos+ neem oil had higher efficacy against whitefly than rest of the treatments. The proposed study will be carried out on the comparison of pest population and integrated pest management on different varieties of eggplant under field conditions with the objectives to record population of major insect pests on eggplant, compare major insect pests on different varieties of eggplant vegetable and study botanical pest control material (Neem Seed Extract) against insect pests of eggplant vegetable under field conditions.

2. MATERIALS AND METHODS

The studies were carried out on Assessment of Pest Population and Repellency of Neem Seed Extract on Different eggplant Varieties in Uthal during 2016-2017 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 varieties each of eggplant. The experimental crop was grown in an experimental field in Coconut Farm, Department of Agriculture at Uthal, District Lasbella, Balochistan.

Three varieties of eggplant vegetable were cultivated in 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 crop was adapted 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 each vegetable crop by using the six plants randomly of each variety from each plot. The treatment details are as under;

3.1 Eggplant varieties

V1-PPL Agroimpex India

V2-Black Long F₁ hybrid

V3-F₁.advanta-305

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.

3.2 Preparation of neem seed extract

2 percent 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 percent by adding water. During attack of insect pests on crops, application of 2 percent 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 analysis 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.

3.3 Green house studies

Total 24 nursery plants of eggplant vegetable were collected from different field of farmers in Uthal. Then these Plants were kept in gamla. Then for 24 plants twelve cages were made. Due to this 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 hrs) intervals. Three control application of neem seed extract (0.5 percent, 1.0% and 2.0%) were applied in one plant for each cage of two plants (treated and untreated). Eggplant vegetable 1.0 % was applied in three cages. In every cage ten whiteflies were released and then counted number of whiteflies after every 6 hrs, 12 hrs and 18 hrs interval. Similarly three readings were taken in each vegetable concentration at different time intervals and noted in the diary.

3.4 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

Repellent effect of neem seed water extract application to eggplant 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 eggplant (PPL, Black long, Advanta-305) as affected by spray application of neem seed extract. The experimental crops were grown in an experimental area of Coconut Farm, Deptt of Agriculture Uthal. Three varieties of eggplant vegetable were sown in Randomized Complete Block Design (RCBD).

3.1 Repellency of Neem Seed Extract against whitefly on eggplant

Vegetables eggplant 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 eggplant plants.

3.1.1 Repellency of whitefly on eggplant crop

A comparison of mean percent repellency of whitefly on eggplant crop at different concentrations is presented in Table-3.1. It revealed that the highest repellency of 49.44% was recorded at 2% concentrations which was significantly different from 37.77, 37.22 and 25.44% at application rates of 1.00%, 0.50% and control respectively. Repellency values at 1.0% and 0.5% were significant from each other but these were significantly higher than 25.44% in control.

A comparison of percent repellency of whitefly on eggplant crop after 6 hrs, 12 hrs and 18 hrs intervals is presented in Table 3.2. It revealed that the highest repellency of 40.33 percent was recorded after 18 hrs which was significantly higher than 36.58% and 35.50% after 6 hrs and 12 hrs, respectively. However, repellency recorded after 6 hrs was significantly higher than after 12 hrs.

A comparison of percent repellency in the interaction between concentrations of Neem Seed Extract and time intervals is presented in Table-3.3. The highest repellency of 69.66 percent was recorded at 2.0 percent concentrations after 6 hrs of application. The lowest repellency was recorded in control after 6 hrs. Generally, repellency values were higher at higher concentrations of Neem Seed Extract.

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

CONCENTRATION	% REPELLENCY
2.00%	49.44 ^a
1.00%	37.77 ^a
0.50%	37.22 ^a
Control	25.44 ^a

Note: Mean values having the same letter is not significantly different 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 eggplant plants.

HOURS	% REPELLENCY
6	36.58 ^a
12	35.50 ^a
18	40.33 ^a

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%	69.66 ^a	49.00 ^a	29.66 ^a
1.00%	30.66 ^a	26.00 ^a	56.66 ^a
0.50%	26.00 ^a	40.66 ^a	45.00 ^a
Control	20.00 ^a	26.33 ^a	30.00 ^a

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

3.2 Insect pests of eggplant varieties

3.2.1 Whitefly population on eggplant varieties

The result of per leaf population of whitefly on three eggplant varieties at different dates is presented in Table-3.4. It revealed that in all three varieties of eggplant highest population of whitefly was recorded on 20th Jan. in F₁-advanta-305 variety. It was 3.10, 3.31 and 3.70/ leaf on PPL, Black long and F₁-advanta-305 respectively. Therefore, Neem Seed Extract was applied at 2 percent concentrations on 25th Jan. which was continued at 15 days intervals on 9th Feb. and 24th Feb. However, the lowest number of 1.50 whitefly/ leaf was recorded on 14th Feb. in PPL variety which was not significantly different from 1.91 observed on 29th Feb. In case of Black long variety, the lowest number of 1.64 whitefly/ leaf was observed on 14th Feb. which was not significantly different from 1.74 and 1.81 which were recorded on 9th Feb. and 30th Jan. In case of F₁-advanta-305 variety similar trend was observed that the lowest population of 1.66 whitefly/ leaf was recorded on 14th Feb. which was not significantly different from 1.98 observed on 30th Jan.

A comparison of mean number of whitefly on three varieties of eggplant is presented in Figure-3.1. It revealed that the lowest population of 2.37 whitefly/ leaf was observed in Black long variety which was not significantly different from 2.42 recorded in PPL variety, whereas significantly the highest number of 2.73 whitefly/ leaf was recorded from F₁-advanta-305 variety.

A comparison of mean number of whitefly on eggplant varieties at different dates is presented in Figure-3.2. It revealed that the lowest number of 1.6 whitefly/ leaf was observed on 14th Feb. which was not significantly different from 2.0 recorded on 29th Feb. However, the highest number of whitefly 3.27 and 3.1/ leaf was recorded on 20th and 25th Jan. which was not significantly different from each other.

Interaction between all the three varieties indicated that highest and significantly different whitefly population was recorded on 25th Jan. which dropped significantly with the application of neem seed extract on 25th Jan. and 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 eggplant varieties at different observation dates

Obs. Dates	Brinjal varieties		
	V1= PPL	V2= Black long	V3= F1 advanta-305
20-Jan	2.70 ^{bc}	2.91 ^{ab}	3.70 ^a
25-Jan	3.10 ^{ab}	3.31 ^{ab}	3.39 ^{ab}
30-Jan	2.81 ^{bc}	1.81 ^{hi}	1.98 ^{gh}
4-Feb	2.39 ^{de}	2.91 ^{ab}	3.14 ^{ab}
9-Feb	2.06 ^{ef}	1.74 ^{ij}	3.52 ^{ab}
14-Feb	1.50 ^j	1.64 ^{ij}	1.66 ^{ij}
19-Feb	2.94 ^{ab}	2.64 ^{cd}	3.16 ^{ab}
24-Feb	2.43 ^{de}	2.18 ^{ef}	2.26 ^{ef}
29 Feb	1.91 ^{gh}	2.04 ^{ef}	2.04 ^{ef}
5-Mar	2.36 ^{de}	2.61 ^{cd}	2.44 ^{de}

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

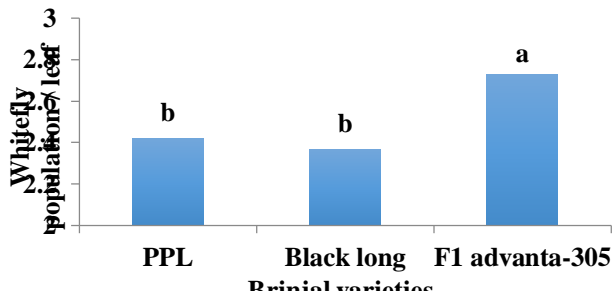


Figure 3.1: Mean number of whitefly on brinjal varieties.

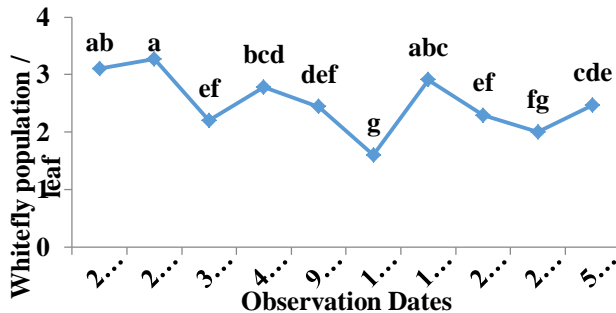


Figure 3.2: Mean number of whitefly on eggplant varieties at different observation dates.

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

3.2.2 Jassid population on eggplant varieties

The result of per leaf population of jassid on three eggplant varieties at different dates is presented in Table- 3.5. It revealed that the highest population of jassid was recorded on 25th Jan. in F₁-advanta-305 variety. It was 2.72, 2.44 and 2.86/leaf on PPL, Black long and F₁-advanta-305 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 0.14 jassid / leaf was recorded on 29th February in PPL variety which was not significantly different from 0.56, 0.43 and 0.51, which was

observed on 20th January, 14th February and 5th March respectively. In case of Black long variety the lowest number of jassid 0.18 and 0.19 / leaf was observed on 14th February and 29th February which was not significantly different from each other. In case of F₁- advanta-305 variety similar trend was observed, the lowest number of 0.14 jassid / leaf was observed on 29th February which was not significantly different from 0.18 was recorded on 14th February.

A comparison of mean number of jassid on three varieties of eggplant is presented in Figure-3.3. It revealed that the lowest population of 1.23 jassid/ leaf was recorded in F₁- advanta-305 variety which was not significantly different from 1.3 and 1.31/ leaf were recorded in PPL and Black long varieties. However, these all values of three varieties were not significantly different from each other.

A comparison of mean number of jassid on eggplant varieties at different dates is presented in Figure- 3.4. It revealed that the lowest number of 0.16 jassid/ leaf was observed on 29th Feb. which was not significantly different from 0.26 was recorded on 14th Feb. While the highest number of 2.68 jassid / leaf was recorded on 25th Jan.

Interaction between all the three varieties indicated that highest and significantly different jassid population was recorded on 25th Jan. which dropped significantly with the application of neem seed extract on 25th Jan. and after 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 eggplant varieties at different observation dates.

Obs. Dates	Eggplant varieties		
	V1= PPL	V2= Black long	V3= F1 advanta-305
20-Jan	0.56 ^{ghi}	0.51 ^{ghi}	0.46 ^{ghi}
25-Jan	2.72 ^a	2.44 ^{ab}	2.86 ^a
30-Jan	2.04 ^{cd}	1.91 ^{def}	1.69 ^{def}
4-Feb	1.84 ^{def}	2.18 ^{cd}	2.13 ^{cd}
9-Feb	1.33 ^{hi}	1.18 ^{efg}	1.06 ^{fg}
14-Feb	0.43 ^{hi}	0.18 ^{ikl}	0.18 ^{ikl}
19-Feb	2.21 ^{bcd}	2.31 ^{bcd}	2.29 ^{bcd}
24-Feb	1.22 ^{efg}	1.26 ^{ef}	1.19 ^{efg}
29 Feb	0.14 ^{kl}	0.19 ^{ikl}	0.14 ^{kl}
5-Mar	0.51 ^{ghi}	0.98 ^{fg}	0.34 ^{hi}

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

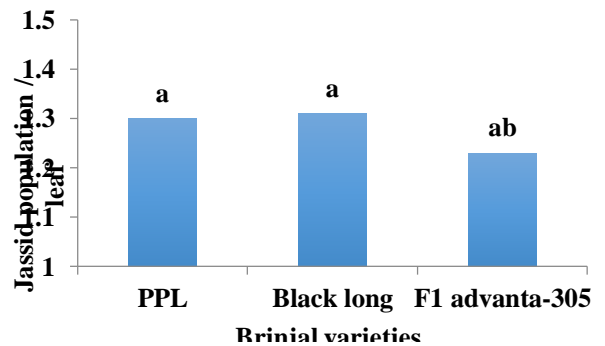


Figure- 3. 3: Mean number of jassid on eggplant varieties.

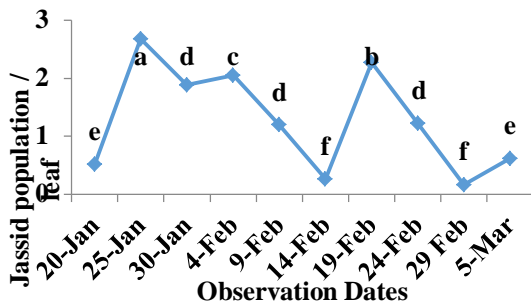


Figure- 3.4: Mean number of jassid on eggplant varieties at different observation dates.

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

3.2.3 Aphid population on eggplant varieties

The result of per leaf population of aphid on three eggplant varieties at different dates is presented in Table- 3.6. It revealed that the highest population of aphid was recorded on 25th Jan. in Black long variety. It was 2.26, 2.39 and 2.79/ leaf on PPL, F₁.advanta-305 and Black long varieties respectively. Therefore, Neem Seed Extract was applied at 2 percent concentration on 25th Jan. which was continued at 15 days intervals on 9th Feb. and 24th Feb. The lowest number of 0.04 aphid/ leaf was recorded on 5th Mar. in PPL variety which was not significantly different from 0.11, 0.07 and 0.18/ leaf was recorded from 14th Feb., 24th Feb. and 29th Feb. respectively. In all three varieties, However, the values of 0.11 aphid/ leaf in PPL on 14th Feb. and 0.09 aphid /leaf in Black long, 0.09 aphid/ leaf in F₁.advanta-305 on 14th Feb. were also not significantly different from one another.

A comparison of mean number of aphid on three varieties of eggplant is presented in Figure- 3.5. It revealed that the lowest population of 1.23 aphid/ leaf was recorded in F₁. advanta-305 variety which was significantly lower than 1.3 in PPL and 1.31 in Black long varieties. However, these two values were not significant from each other.

A comparison of mean number of aphid on eggplant varieties at different dates is presented in Figure- 3.6. It revealed that the lowest number of 0.05 aphid/ leaf was observed on 5th Mar. which was not significantly different from those values which was recorded on 14th Feb. to 29th Feb. While the highest number of 2.48 aphid/ leaf was recorded on 25th Jan. which was significantly different from all those values recorded from 20th Jan. to 5th Mar.

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

3.2.4 Predators population on eggplant varieties

The result of per plant population of ladybird beetle (*Coccinella septempunctata*) adults on three eggplant varieties at different dates is presented in Table- 3.7. It

revealed that in all three varieties the highest population of *C. septempunctata* was recorded on 4th Feb. in F₁.advanta-305 variety. It was 1.94, 1.99 and 2.26 / plant on PPL, Black long and F₁.advanta-305 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 Jan. in PPL variety which was not significantly different from 0.09 was recorded from 25th January. In case of Black long variety, the lowest number of 0.05 *C. septempunctata* / plant was observed on 20th Jan, which was not significantly different from 0.08 was recorded on 25th Jan. In case of F₁-advanta-305 variety similar trend was observed, whereas the lowest number of 0.03 *C. septempunctata*/ plant was observed on 20th and 25th January which was not significantly different from 0.28, 0.29 and 0.33/ plant were recorded on 24th Feb., 29th Feb. and 5th Mar. respectively.

A comparison of mean number of predators on three varieties of eggplant is presented in Figure- 3.7. It revealed that the lowest number of 0.86 *C. septempunctata*/ plant was recorded in PPL variety. Whereas significantly the highest number of 0.98 and 0.95 *C. septempunctata*/ plant were recorded in Black long and F₁.advanta-305 varieties which was not significantly different from each other.

A comparison of mean number of predators on eggplant varieties at different dates is presented in Figure- 3.8. It revealed that the lowest number of 0.04 and 0.06 *C. septempunctata*/ plant was observed on 20th and 25th Jan. which was not significantly different from each other. While the highest number of 2.06 *C. septempunctata*/ plant was recorded on 4th Feb.

Interaction between all the three varieties indicated that highest and significantly different predator population was recorded on 4th Feb. which was not be dropped significantly with the application of neem seed extract on 25th Jan. and after 15 days intervals. The population of predators were not decreased but significantly different on different varieties.

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

Obs. Dates	Eggplant varieties		
	V1= PPL	V2= Black long	V3= F1advanta-305
20-Jan	1.38 ^{de}	1.85 ^{bcd}	1.73 ^{cd}
25-Jan	2.26 ^b	2.79 ^a	2.39 ^b
30-Jan	1.51 ^{cde}	1.49 ^{cde}	1.23 ^{def}
4-Feb	0.69 ^{fg}	0.89 ^{ef}	0.46 ^{fg}
9-Feb	0.53 ^{fg}	0.28 ^{hij}	0.23 ^{ijk}
14-Feb	0.11 ^{jk}	0.09 ^k	0.09 ^k
19-Feb	0.29 ^{hij}	0.21 ^{ijk}	0.23 ^{ijk}
24-Feb	0.07 ^k	0.13 ^{jk}	0.23 ^{ijk}
29 Feb	0.18 ^{jk}	0.24 ^{ijk}	0.18 ^{jk}
5-Mar	0.04 ^k	0.04 ^k	0.06 ^k

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

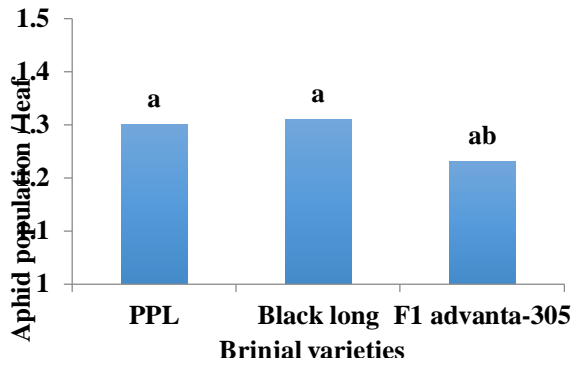


Figure- 3.5: Mean number of aphid on eggplant varieties.

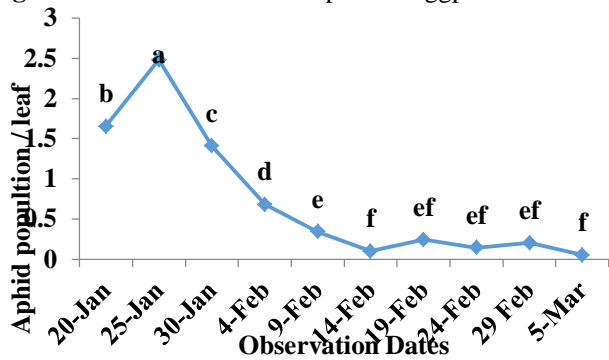


Figure-3.6: Mean number of aphid on eggplant varieties at different observation dates.

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

4. DISCUSSION

The present study carried out on Assessment of Pest Population and Repellency of Neem Seed Extract on Different eggplant Varieties in Uthal during 2016-2017. Repellency of Neem Seed Extract was studied against whitefly on eggplant plants by free choice method in the green house of the Faculty of Agriculture, LUAWMS. Three genotypes of eggplant crop were sown at Coconut Farm, Uthal.

Eggplant crop 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 eggplant crop sown in Randomized Complete Block Design (RCBD).

In eggplant varieties, Black long had greater resistance to whitefly as compared to PPL and F₁Advanta-305. The highest population was recorded on 25th Jan. Against Jassid brinjal variety F₁ advanta-305 showed some resistance to jassid and aphid as compared to PPL and Black long; while the highest population was recorded on 25th Jan. and lowest population on 5th Mar. Eggplant varieties F₁-Advanta-305 and Black long attracted more predators as compared to PPL variety; and predator population was highest on 4th Feb.

Present study agrees with [13] examined bio-pesticide against jassid on eggplant using oil of neem, leaves of Tobacco, powder of Neem, oil of Neem and beneficial micro-organism. The 1st spray of neem oil caused 71.97%

mortality of jassid; powder of Neem 61.56% and Tobacco leaves 54.75%. In the 2nd spray tobacco leaf caused maximum reduction of followed by 80% neem seed, oil of Neem + B.M. Beneficial micro-organism 75.7 percent and 70.7% in neem seed. This study also agrees with those [15] indicated that the formulated plant extracts are more toxic than crude extracts. The differences in chemical combination of the crude leaf extracts may explain the observed differences in mortality. The analysis revealed that the chemical components of the extracts explained the observed mortality which could decrease reliance on synthetic pesticides. Further study is needed to investigate performance of plant extracts components as new insecticides. This study also agrees with [4] examined the effect of plant extracts of Datura, Khabar, Neem Akk, Sufaida on larval development of brinjal fruit borer, *Leucinodes orbonalis*. This indicates that the plant extracts had effectively controlled the development of eggplant fruit borer. It is suggestible that Datura extract and Neem extract may preferably to be used to combat the development of eggplant fruit borer. The fertility was highest in control, while no fertility was observed in fruit borers treated with Datura, Neem and Khabbar extracts. However, the insect longevity was higher (20 days) under neem extract treatment and lowest when eggplant fruits were treated with Datura extract. Present study agrees with [2] reported that neem extract observed its highly activity to conflict whole the insect pests observed in eggplant, followed by chemical control, tobacco extract, tooh extract, akk extract and datura remained the least. Regardless the bio-pesticides, the apex potential was observed against *Amrasca davastan* during both the sprays. Mites persisted more than borer and jassid to remain in the eggplant fields. For effective and safe control of eggplant insect pests in the field, the crop may be sprayed with neem extract followed by extracts of tobacco & tooh. At least on spray monthly is essential to keep the insect pests below economic injury level. There is no need to apply chemical control, because neem extract resulted better than the chemical control. Preference and non-preference of pests due to biochemical products, especially secondary compounds. The predatory population depends on the availability of pests.

In current research, it deserved that the population of predators decreased after the reduction of sucking pests, but then increased slightly due to the availability of insect pests less active 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 January and later on at fortnightly intervals. These showed that insect pests of all these vegetable crop varieties can be managed with this treatment.

5. CONCLUSION

Since pest population increased beyond ETL on 25th January. Therefore, 2 percent neem seed extract was applied on the test vegetables on 25th January, 09th and 24th February. These

applications kept the pest population below ETL till the last observation on 5th March. Population of predators were not affected significantly by application of 2 percent neem seed extract because of predators which are not phytophagous like other pests.

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