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Effect of Plant extracts and Neem products and their Combinations against Chilli Fruit borer *Helicoverpa armigera*

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Abstract

Investigations on the effect of Plant extracts and Neem products and their combinations on the activity of pests of chilli Fruit borer Helicoverpa armigera carried out during 2012-213 and 2013-2014 kharif seasons at the Karchal village of Medak District, Telangana state. The experiment was laid out in RBD (Randomized Block Design). The spray schedule treatment (T3) was found to be the most effective against the fruit borer H.armigera. In this, 2 sprays of Nimbecidine (NB) (5ml/l) at 2 and 5 WAT (Weeks After Transplanting), 2 sprays of 5% Custard Apple Leaf Extracts (Cae) at 7 and 11 WAT and Neem Oil (NO) (5ml/l) at 9 WAT, were applied, recorded a least fruit borer.

Keywords: *Helicoverpa armigera*, Custard apple leaf Extracts, Vitex Decoction, Neem Seed Kernel Extract (NSKE), Pongamia Seed Extract (PSE), Neem Oil, NPM (Non-pesticidal Management).

Introduction

India is the largest producer of chilli (*Capsicum annuum L)* in the world. It is being damaged by more than 20 pests of which most important ones are thrips, aphids, fruit borer and mites. Farmers use chemical pesticides for the control of these pests. As per the results of the survey conducted by Asian Vegetable Research and Development Centre (AVRDC) in Asia, the major insect pests that attack chilli are aphids *(Myzus persicae Sulzer, Aphis gossypii Glover)*, mites (*Polyphagotarsonemus latus Banks)* and thrips *(Scirtothrips dorsalis Hood)*. hilli thrips multiply appreciably at a faster rate during dry weather periods and causes yield loss of 30 to 50 per cent in South India[1] and sometime more than 90 per cent yield reduction[2].

Though the recommended schedules of pesticides sprays are 3 - 4, the farmers are spraying different pesticides more than ten times for the crop protection against these pests. This ultimately lead to high cost of production, low net returns, heavy debts and finally into a crisis situation and pesticide residues being left in the environment polluting air, water and soil. Hence it is necessary to overcome this problem; Non Pesticidal Management (NPM) is one of the best alternatives, presently attracting a lot of attention. In this approach, no chemical pesticides are used in cultivating crop.

It is an 'ecological approach to pest management using knowledge and skill based practices to prevent insects from reaching damaging stages and damaging proportions by making best use of local resources, natural processes and community action'. It involves applying sustainable solutions for managing the agro-ecosystem of field crops. It involves making best use of natural resources locally available and takes best advantage of the natural processes. NPM can reduce human and environmental exposure to hazardous chemicals, and potentially lower overall cultivation costs.

Materials and Methods

An experiment to evaluate the effect of Plant extracts and Neem products and their combinations against chilli fruit borer was conducted during kharif 2012-2013 and 2013-2014 at Karchal village of Medak (District) Telangana State.

Byadagi dabbi Chilli seeds were sown during 22nd and 20th June of 2012-2013 and 2013-2014, on nursery beds, after 40 days old Seedlings of chilli Byadagi dabbi were transplanted main field during 2nd and 30th August of 2012-2013 and 2013-2014 respectively. The experiments was laid out in Randomized Block Design (RBD) method with 12 treatments and three replications, Plot was laid out as per the plan before transplanting. Plots size 6.0 m x 4.2 m (Length x width) with 90 cm x 60 cm spacing (Flat bed x inter and inter row spacing).The crop was raised by following recommended pesticides of practices (RPP) plant protection measures. To compare the efficacy, Four sprays of Recommended pesticide practices (RPP), In this, two sprays of Dimethoate (1.7ml/l) at 2 and 5 WAT (Weeks After Transplanting) and Dicofol (2.5ml/l) + Carbaryl (4 g/l) at 7 and 11 WAT as a chemical check was also maintained and a Control with no manure and chemicals were also maintained.

The Larval population of *Helicoverpa armigera* count was taken at 70, 85, 100 and 115 DAT, For counting these, five plants were selected randomly in each plot and observed, later number of *H.armigera* larvae per plant was worked out.

The per cent fruit damage was worked out by counting total number of fruits per plant and number of damaged fruits per plant on five randomly selected plants in each treatment at every picking.

The treatment effect was compared by following Duncan's Multiple Range Test (DMRT) and read at 0.05 probability, (P= 0.05) using M-STATC ® software package.

Results and Discussion

Activity of *Helicoverpa armigera:* During 2012: At 70 DAT, significantly less larval density (0.26) was recorded by 2 Sprays of Nimbecidene (NB) + 2 Spray of Custard apple leaf extract (Cae) + Neem oil (NO) (T3) and 2 Sprays of Nimbecidene (NB) + 2 Sprays of Vitex Decoction (VD) + Neem oil (NO) (T4), and Recommended Pesticide practices (RPP) (T11). All the treatments were found to be significantly superior over control (T12), which registered significantly highest pest pressure on fruits.

At 85 DAT, larval density as influenced by various treatments ranged from 0.32 to 1.61. The crop that received interventions of 2S NB + 2S Cae + NO (T3) was found to be significantly superior by recording least larval density (0.32). However, the crop left unprotected (T12) registered a significantly higher larval infestation (1.61).

At 100 and 115 DAT, the trend of significance among the treatments remained more or less same. When mean larval density was considered, it exhibited the same pattern of treatment efficacy and was of the order– T3<T4<T11<T9<T10<T1<T5<T2 <T6<T8<T7<T12 in terms of larvae per plant (Table-1).

During 2013: At 70 DAT, significantly less larval density (0.21) was recorded in 2S NB + 2S Cae + NO (T3) and was on par with the treatments viz., 2S NB + 2S VD + NO (T4) (0.27), 2S NB + 2 Sprays of Pancha Ghavya (PG) + NO(0.33), 2S NSKE+ 2 Sprays of Pongamia Seed Extract (PSE) + Garlic Chilli Kerosene Extract (GCKE) (0.34), 2S NSKE+ 2 Sprays of Neem Gold (NG) + GCKE(0.48), and RPP (T11) and control (T12) (1.13) which failed to suppress *H. armigera* population.

All the treatments were found to be significantly superior over control (T12), which registered significantly highest pest pressure on fruits (Table-2).

At 85 DAT, 2S NB + 2S Cae + NO (T3) and 2S NB + 2S VD + NO (T4) recorded significantly less larval density of 0.22 larva / plant and RPP (0.28). Again unprotected crop was ravaged by *H. armigera* to the extent of 1.21 larvae per plant.

At 100 DAT, larval density as influenced by various treatments ranged from 0.27 to 1.13. The pattern of treatment significance was as that of 85 DAT.

At 115 DAT, among the different treatments, 2S NB + 2S Cae + NO (T3) was found to be significantly superior by recording least larval density (0.15) and was on par with 2S NB + 2S VD + NO (T4) (0.20) and RPP (T11) (0.20). Significantly higher density was recorded in control (1.08).

Mean data revealed a similar trend with the treatment efficacy in the order of T3<T4<T11<T2<T6<T5<T10<T1<T9<T8<T7 <T12 in terms of larvae per plant.

Pooled: At 70 DAT, the treatments, 2S NB + 2S Cae + NO (T3) recorded significantly less larval density (0.24) and was on par with 2S NB + 2S VD + NO (T4) (0.27), 2S NB + 2S PG + NO (0.47), 2S NSKE + 2S PSE + GCKE (0.51) and RPP (T11) (0.30). While others supported moderate larval load. However all the treatments were found to be significantly superior over control (T12) (0.81) (Table-3).

At 85 DAT also, the trend remained same while at 100 DAT, 2S NB + 2S Cae + NO (T3) and 2S NB + 2S VD + NO (T4) recorded significantly less larval density of 0.37 larva / plant and control (1.50) which supported fairly higher infestation of *H. armigera*.

At 115 DAT, significantly less number of larva (0.24) was registered in 2S NB + 2S Cae + NO (T3). Untreated crop recorded highest *H. armigera* larvae. Mean data also revealed similar trend of treatment significance with larval pressure of the order T3<T4<T11<T2<T9<T10<T5<T6<T1<T8<T7<T12.

Fruit damage: During 2012: At first picking, fruit damage as influenced by various treatments varied from 5.35 to 11.76 per cent. The crop that received 2S NB + 2S Cae + NO (T3) recorded least fruit damage (5.35%) and was on par with the rest of the treatments except 4S NSKE + VD and Control (T12) which received damage of 11.76 per cent (Table-4).

At second picking, the treatment, 2S NB + 2S VD + NO (T4) registered least fruit damage (5.04) and was on par with 2S NB + 2S Cae + NO (T3) (5.30), 2S NSKE+ 2S NG + GCKE (7.14), 4S GCKE + NSKE (6.95)and RPP (T11) (5.24). Significantly highest per cent fruit damage was registered in Control (T12) (13.16).

At third picking, significantly highest fruit damage was noticed again in control (T12). Whereas 2S NB + 2S VD + NO (T4) was found to be significantly superior by recording least fruit damage of (6.42) per cent and was on par with rest of the treatments except 4S NSKE + VD (10.20), 4S GCKE + NSKE (10.10), which registered higher per cent fruit damage.

At fourth picking, fruit damage varied from 7.05 to15.16. Lowest fruit damage (7.05) was registered in 2S NB + 2S Cae + NO (T3), whereas control registered highest fruit damage of 15.16 per cent. Other treatments registered moderate fruit damage. Mean data also revealed similar trend.

During 2013: At first picking, 2S NB + 2S Cae + NO (T3) recorded significantly less per cent fruit damage (2.75) and was on par with 2S NB + 2S VD + NO (T4) (3.12) and RPP (T11) (3.29). Significantly higher fruit damage (9.91) was registered in control (T12). However, all the treatments were found to be significantly superior over Control (T12) (Table-5).

At second picking, fruit damage varied from 3.26 to 10.36 per cent. Significantly least per cent fruit damage (3.26) was recorded in 2S NB + 2S Cae + NO (T3) and was on par with 2S NB + 2S VD + NO (T4) (3.49), 4S NSKE + VD (4.29) and RPP (T11) (4.28). While the untreated crop control (T12) registered higher fruit damage (10.36).

At third picking, 2S NB + 2S Cae + NO (T3) (4.28), 2S NB + 2S VD + NO (T4) (4.46) and RPP (T11) (4.52) were found to be significantly effective by recording less fruit damage compared to the other treatments. Except control (T12), which showed highest incidence (11.65), the rest of the treatments resulted into moderate fruit damage.

At fourth picking, fruit damage as influenced by various treatments ranged from 4.39 to 12.14. Significantly less fruit damage (4.39) was recorded by 2S NB + 2S Cae + NO (T3) and was on par with 2S NB + 2S VD + NO (T4) (4.66) and RPP (T11) (4.85). Similar trend was also observed for mean data.

Pooled: At first picking, per cent fruit damage varied from 4.05 to 10.84. The treatment, 2S NB + 2S Cae + NO (T3) registered least per cent fruit damage (4.05) and was on par with 2S NB + 2S VD + NO (T4) (4.44), 2S NB + 2S NSKE + PSE (5.14), 2S NB + 2S PG + NO (5.49), 2S NSKE + 2S GCKE + PG (6.20), 2S NSKE + 2S Cae + GCKE (6.37), 4S NSKE + VD (6.60) and RPP (T11) (4.51). Untreated check (control) (T12) recorded highest per cent fruit damage (10.84) and rest of the treatments registered moderate fruit damage ranging from 4.05 to 10.84% (Table-6).

At second picking, least per cent fruit damage (4.27) was noticed in 2S NB + 2S VD + NO (T4) and was on par with 2S NB + 2S Cae + NO (T3) (4.28), 2S NB + 2S NSKE + PSE (5.15), 2S NB + 2S PG + NO (5.92), 2S NSKE+ 2S Cae + GCKE (5.93), T_8 (6.19), T_9 (6.21) and RPP (T11) (4.76). Except control (T12), rest of the treatments recorded moderate fruit damage.

At third picking, per cent fruit damage ranged from 5.41 to 12.98. Significantly least fruit damage (5.41) was registered in 2S NB + 2S Cae + NO (T3) and was on par with 2S NB + 2S VD + NO (T4) (5.45), 2S NB + 2S NSKE + PSE (7.45), 2S NSKE + 2 PSE + GCKE (7.55), 4S NSKE + VD (8.18) and RPP (T11) (5.85). However, higher fruit damage was recorded in control (T12) plots.

At fourth picking, treatments 2S NB + 2S Cae + NO (T3) (5.72), 2S NB + 2S VD + NO (T4) (5.90), 2S NB + 2S NSKE + PSE (8.65), 2S NSKE+2S Cae + GCKE (8.94) and RPP (T11) (6.15) were found to be significantly effective by recording lower fruit damage, whereas control recorded higher fruit damage. Mean data also revealed similar kind of treatment significance and the intensity of fruit damage in various treatments.

Discussion: Significantly least mean larval population (0.28 larva/plant) and fruit damage (4.86 %) was seen in 2S NB + 2S Cae + NO (T3), being on par with treatments 2S NB + 2 Spray Vitex Decoction (VD) + Neem Oil (NO) (T4) and Recommended Pesticide practices (RPP) (T11). Whereas other treatments, 2S NB + 2S NSKE + Pongamia Seed Extract (PSE), 2S NSKE+ 2S Cae + Garlic chilli Kerosene Extract (GCKE), 2S NSKE+ 2 PSE + GCKE, 2S NSKE + 2S GCKE + PanchaGavya (PG), 4S NSKE + VD, 4S GCKE + NSKE recorded moderate larval density and fruit damage. However all the treatments were found superior to over control (T12)., (Table-3, 6).

Rajashri *et al*[3], reported the efficacy of commercial neem formulations against chilli fruit borers, *H. armigera* and *S. litura* and noticed least fruit damage. Manisegaran *et al* [4], reported the efficacy of leaf extract of vitex 5 percent , neem oil 3 per cent, NSKE 5 percent, leaf extract of tobacco at 5 per cent recorded minimum fruit damage of 7.4 per cent, which was next best to chemicals and far superior to control. Efficacy of NSKE 5%, neem oil 5 ml/l chilli fruit borer, *H. armigera* in reducing larval population and fruit damage has been documented by Shivaramu[5]. Seedling dip in NSE 5% before transplanting and spraying of NSE (Neem seed extracts) 5% in alternation with monocrotophos 0.05%, was also found effective against *H. armigera*[6], further Rosaiah[7], reported the Pongamia seed extract showed least fruit infestation by H.armigera in okara. Raman, G.V., *et al* [8], reported the efficacy of Custard apple leaf extracts was found be the most effective against tobacco cut worm, *spodoptera litura* on Rabi ground nut crop.

Further, Kulkarni and Shekharappa[9], reported that application of Nimbecidine in combination of Neem oil was found to be best alternative next to RPP against chilli fruit borer, *H. armigera* and recorded least fruit damage. Combined application of GCKE (0.05%) + Nimbecidine (2.5 ml/lit) was found to be effective against *H. armigera* in chilli[10]. Similarly, application of NSKE 5% + Garlic extract 3% found effective in reducing larval population of *H. armigera* in chilli[11]. Which lend support to the present findings?

Figure-1. Shows that effect of Plant extracts and Neem products on the fruit borer *H.armigera.*

Table-1
Effect of Plant extracts and Neem products on the larval density of chilli fruit borer, *H. armigera* during 2012

Treatments	*H. armigera* (No. of larvae per plant)				
	70 DAT	**85 DAT**	**100 DAT**	**115 DAT**	**Mean**
T_1	0.52 bcd	0.60 bc	0.80 bc	0.73 bcd	0.66 b-e
T_2	0.60 bcd	0.73 bc	0.80 bc	0.73 bcd	0.72 b-e
T_3	0.26 d	0.32 c	0.47 c	0.33 d	0.35 e
T_4	0.26 d	0.40 bc	0.47 c	0.40 cd	0.38 de
T_5	0.60 bcd	0.53 bc	0.80 bc	0.80 bc	0.68 b-e
T_6	0.67 bcd	0.80 b	0.93 b	0.87 bc	0.82 bc
T_7	0.81 b	0.87 b	0.93 b	0.87 b	0.87 b
T_8	0.75 bc	0.80 b	0.93 b	0.87 b	0.84 bc
T_9	0.33 cd	0.47 bc	0.60 bc	0.53 bcd	0.48 cde
T_{10}	0.40 bcd	0.53 bc	0.67 bc	0.60 bcd	0.55 b-e
T_{11}	0.33 cd	0.40 bc	0.53 bc	0.47 bcd	0.43 be
T_{12}	0.48 a	1.61 a	1.87 a	1.67 a	1.41 a
CV	7.03	7.54	6.00	7.08	6.04
S. Em±	0.05	0.06	0.05	0.05	0.05
C.D. at 5%	0.15	0.16	0.14	0.16	0.13

In a column, means indicated by the same alphabet/alphabets shows that there is no significant difference by DMRT(0.05). In a column, means indicated by the different alphabet/alphabets shows that there is significant difference by DMRT(0.05). DAT: Days after Transplanting.

Table-2
Effect of Plant extracts and Neem products on the larval density of chilli fruit borer, *H. armigera* during 2013

Treatments	*H. armigera* (No. of larvae per plant)				
	70 DAT	**85 DAT**	**100 DAT**	**115 DAT**	**Mean**
T_1	0.74 abc	0.60 bcd	0.67 bc	0.53 bcd	0.64 bcd
T_2	0.33 de	0.40 cde	0.33 d	0.27 cde	0.33 def
T_3	0.21 e	0.22 e	0.27 d	0.15 e	0.21 f
T_4	0.27 de	0.22 e	0.27 d	0.20 de	0.24 f
T_5	0.48 cde	0.53 bcd	0.73 bc	0.40 b-e	0.54 b-f
T_6	0.34 de	0.40 cde	0.53 cd	0.40 b-e	0.42 c-f
T_7	0.83 abc	0.73 b	0.93 ab	0.73 ab	0.81 abc
T_8	0.81 abc	0.80 b	0.80 abc	0.73 ab	0.79 abc
T_9	0.74 abc	0.67 bc	0.73 bc	0.47 bcd	0.65 bcd
T_{10}	0.61 bcd	0.68 bc	0.71 bc	0.48 bcd	0.62 bcd
T_{11}	0.27 de	0.28 de	0.27 d	0.20 de	0.26 f
T_{12}	1.13 a	1.21 a	1.13 a	1.08 a	1.14 a
CV	5.81	5.81	5.61	6.16	6.12
S.Em±	0.05	0.03	0.05	0.04	0.06
C.D. at 5%	0.14	0.13	0.12	0.13	0.15

In a column, means indicated by the same alphabet/alphabets shows that there is no significant difference by DMRT(0.05). In a column, means indicated by the different alphabet/alphabets shows that there is significant difference by DMRT (0.05). DAT: Days after Transplanting.

Table-3
Effect of Plant extracts and Neem products on the larval density of chilli fruit borer, *H.armigera* (Pooled)

Treatments	*H. armigera* (No. of larvae per plant)				
	70 DAT	**85 DAT**	**100 DAT**	**115 DAT**	**Mean**
T_1	0.63 b-e	0.60 b-e	0.74 bcd	0.63 b-e	0.65 bc
T_2	0.47 b-f	0.57 b-e	0.57 bc	0.50 b	0.52 b
T_3	0.24 f	0.27 de	0.37 e	0.24 de	0.28 d
T_4	0.27 f	0.31 e	0.37 e	0.30 e	0.31 d
T_5	0.54 b	0.53 b	0.77 b	0.60 b	0.61 b
T_6	0.51 c-f	0.60 b-e	0.73 b	0.64 b-e	0.62 bcd
T_7	0.82 def	0.80 bcd	0.93 b-e	0.80 bcd	0.84 bcd
T_8	0.78 b-f	0.80 bcd	0.87 b-e	0.80 bcd	0.81 bc
T_9	0.54 b	0.57 b	0.67 bc	0.50 b	0.57 b
T_{10}	0.51 bc	0.61 bc	0.69 b	0.54 b	0.59 bc
T_{11}	0.30 ef	0.34 cde	0.40 de	0.34 cde	0.34 cd
T_{12}	0.81 a	1.41 a	1.50 a	1.38 a	1.27 a
CV	5.83	6.01	6.20	6.09	6.03
S.Em±	0.04	0.04	0.05	0.04	0.04
C.D. at 5%	0.12	0.13	0.14	0.13	0.13

In a column, means indicated by the same alphabet/alphabets shows that there is no significant difference by DMRT (0.05). In a column, means indicated by the different alphabet/alphabets shows that there is significant difference by DMRT (0.05). DAT: Days after Transplanting.

Table-4
Chilli fruit borer damage as influenced by Plant extracts and Neem products during 2012

Treatments	Fruit damage (%)				
	I picking	**II picking**	**III picking**	**IV picking**	**Mean**
T_1	5.55 bc	5.15 e	6.44 e	7.15 e	6.07 e
T_2	6.77 bc	7.24 bcd	9.12 b-e	9.87 b-e	8.25 b-e
T_3	5.35 c	5.30 cde	6.53 de	7.05 e	6.06 e
T_4	5.75 bc	5.04 e	6.42 e	7.10 e	6.07 e
T_5	6.87 bc	7.14 bcd	9.02 b-e	9.87 b-e	8.23 b-e
T_6	7.64 abc	7.85 b-e	9.00 b-e	10.32 b-e	8.70 bcd
T_7	7.88 abc	6.53 b	9.35 b-e	10.26 b-e	8.51 bcd
T_8	8.19 abc	7.75 b	8.92 b-e	10.73 b-e	8.90 bcd
T_9	9.42 ab	8.13 b-e	10.20 a-d	13.12 ab	10.22 b
T_{10}	7.76 abc	6.95 de	10.10 a-d	11.54 abc	9.09 bc
T_{11}	5.73 bc	5.24 e	7.17 cde	7.45 de	6.40 de
T_{12}	11.76 a	13.16 a	14.31 a	15.16 a	13.60 a
CV	13.77	8.05	11.31	10.45	8.31
S.Em±	1.26	0.72	1.14	1.13	0.81
C.D. at 5%	3.62	2.07	3.29	3.24	2.34

In a column, means indicated by the same alphabet/alphabets shows that there is no significant difference by DMRT (0.05). In a column, means indicated by the different alphabet/alphabets shows that there is significant difference by DMRT (0.05). DAT: Days after Transplanting.

Table-5
Chilli fruit borer damage as influenced by Plant extracts and Neem products during 2013

Treatments	Fruit damage (%)				
	I picking	**II picking**	**III picking**	**IV picking**	**Mean**
T_1	4.73 bcd	5.14 b-e	8.48 bc	10.14 a-d	7.12 bc
T_2	4.20 b-e	4.60 c-f	8.79 bc	8.96 b-e	6.64 bc
T_3	2.75 f	3.26 fg	4.28 e	4.39 f	3.67 e
T_4	3.12 ef	3.49 fg	4.46 e	4.66 f	3.93 e
T_5	5.93 b	6.33 b	8.59 bc	11.72 ab	8.14 b
T_6	5.11 bc	5.31 b-e	6.09 d	9.88 a-d	6.60 bc
T_7	4.85 bcd	5.32 b-e	6.48 d	7.62 de	6.07 bcd
T_8	4.20 b-e	4.62 c-f	8.79 bc	8.96 b-e	6.64 bc
T_9	3.78 c-f	4.29 d-g	6.15 d	6.96 e	5.30 cde
T_{10}	5.87 b	6.27 bc	9.54 b	10.93 abc	8.15 b
T_{11}	3.29 def	4.28 efg	4.52 e	4.85 f	4.24 de
T_{12}	9.91 a	10.36 a	11.65 a	12.14 a	11.02 a
CV	9.12	8.14	7.24	7.91	9.95
S.Em±	0.67	0.63	0.65	0.78	0.85
C.D. at 5%	1.93	1.80	1.88	2.25	2.44

In a column, means indicated by the same alphabet/alphabets shows that there is no significant difference by DMRT (0.05). In a column, means indicated by the different alphabet/alphabets shows that there is significant difference by DMRT (0.05). DAT: Days after Transplanting.

Table-6
Chilli fruit borer damage as influenced by Plant extracts and Neem products (Pooled)

Treatments	Fruit damage (%)				
	I picking	**II picking**	**III picking**	**IV picking**	**Mean**
T_1	5.14 b-e	5.15 bcd	7.45 b-e	8.65 cde	6.60 bc
T_2	5.49 bcd	5.92 b-f	8.96 bcd	9.42 b-e	7.44 bc
T_3	4.05 e	4.28 ef	5.41 f	5.72 f	4.86 e
T_4	4.44 e	4.27 f	5.45 f	5.90 f	5.01 e
T_5	6.40 bcd	6.74 b-f	8.81 bc	10.80 b-e	8.18 b
T_6	6.38 b-e	6.58 b	7.55 bcd	10.10 ab	7.65 b
T_7	6.37 b-e	5.93 b-e	7.92 c-f	8.94 de	7.29 bcd
T_8	6.20 bcd	6.19 bcd	8.86 def	9.85 b-e	7.77 bc
T_9	6.60 cde	6.21 c-f	8.18 def	10.04 ef	7.76 cde
T_{10}	6.82 b	6.61 b	9.82 bcd	11.24 ab	8.62 b
T_{11}	4.51 de	4.76 def	5.85 ef	6.15 f	5.32 de
T_{12}	10.84 a	11.76 a	12.98 a	13.65 a	12.31 a
CV	8.35	8.41	8.52	7.87	7.74
S.Em±	0.60	0.69	0.81	0.80	0.71
C.D. at 5%	2.02	2.12	2.35	2.34	2.05

In a column, means indicated by the same alphabet/alphabets shows that there is no significant difference by DMRT (0.05). In a column, means indicated by the different alphabet/alphabets shows that there is significant difference by DMRT (0.05). DAT: Days after Transplanting.

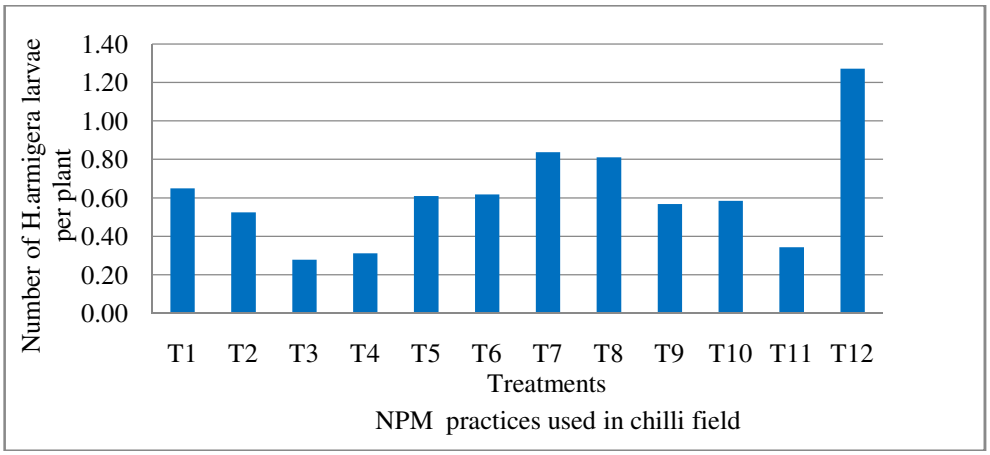

Figure-1
Effect of Plant extracts and Neem products on the fruit borer *H.armigera*

Conclusion

Two sprays of Nimbecidine (NB) (5ml/l) at 2 and 5 WAT (Weeks After Transplanting), 2 sprays of 5% Custard Apple Leaf Extracts (Cae) at 7 and 11 WAT and Neem Oil (NO) (5ml/l) at 9 WAT, were applied, recorded a least fruit borer .

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