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Effect of organic soil amendments and plant extracts against chilli fruit borer *H.armigera* at Karchal Village of Medak (District) Telangana State

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Abstract— *Investigations on the effect of organic soil amendments and plant extracts on the activity of pests of chilli fruit borer H.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). Among the organic soil amendments and plant extracts tested against chilli pests, the most effective treatment was T8. In this, the Combined application of Vermicompost @1250 kg/ha + Neemcake @250 kg/ha at the time of transplanting and 50 DAT (Days After Transplanting). With the combined application sprays of Nimbecidine 5ml/l at 2, 7 WAT (Weeks After Transplanting) and NSKE 5% at 5, 11 WAT, was found to be the most effective treatment against fruit borer H.armigera.*

Keywords— fruit borer H.armigera, NPM (Non-pesticidal Management) organic soil amendments, plant extracts.

I. 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 Vasundararjan[1] and sometime more than 90 per cent yield reduction Krishnakumar[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.

II. MATERIAL AND METHODS

An experiment to evaluate the different organic soil amendments and plant extracts against chilli pests 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 with 90 cm x 60 cm spacing. The crop was raised by following recommended pesticides of practices (RPP) plant protection measures. The organics soil amendments were incorporated in the field thoroughly a week before as well as 50 Days After Transplanting (DAT) of chilli seedlings. To compare the efficacy of the treatments, 100

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Percent RDF(Recommended Dose of Fertilizer with four sprays of Recommended Pesticides Practices (RPP) at 2nd, 5th, 7th and 11th Week After Transplanting (WAT) as 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 treatment effect was compared by following Duncan's Multiple Range Test (DMRT), and read at probability,(P= 0.05).

III. RESULTS

The results of the experiment carried out to evaluate the effects of organic soil amendments and plant extracts against *H.armigera* revealed.

H. armigera : During 2012, the larval density of *H. armigera* recorded at different crop age is presented in Table-1. At 70 DAT, significantly less larval density (0.28) was registered in NC 250 + JVM -SS (T_6) and was on par with treatments, T_1 (0.59), T_2 (0.53), T_3 (0.58), T_4 (0.40),T8 (0.40), T_9 (0.60),T_{11} (0.44), except Poultry manure (PM) (T5) 8000 kg/ha -SS, FYM 2500 + PM 400-SS (T7), Control (T10) and control (H) (T12) which supported a significantly higher larval density (ranging from 0.76 to 1.33) on the crop. However, all the treatments proved to be quite effective vis-a- vis control. At 85 DAT, larval density as influenced by various treatments ranged from 0.40 to 1.40. Treatments, Neem cake (NC) 250 kg/ha + Jeevamrutham(JVM) 20 kg/ha -SS (T_6) registered significantly less number of larval population (0.40 larva / plant), which were on par with the treatments, T_1 to T_4 and T_8 and T_9 except PM 8000-SS (T5), FYM 2500 + PM 4000-SS (T7), control and control (H) (T12) where it ranged from 0.80 to 1.40, a high pest pressure. Significantly higher larval load was noticed in control (1.40 larvae / plant). At 100 DAT, NC 250 + JVM –SS (T_6) was found to be highly promising against *H. armigera* by recording least larval population (0.47 per plant) and the trend of treatment significance for other intervention made was as that of 85 DAT. At 115 DAT, larval density ranged from 0.53 to 1.87. All treatments proved to be as effective as the standard check by recording significantly least larval density compared to control, which registered significantly a higher fruit borer infestation.

Mean larval population also revealed similar trend of treatment significance against *H. armigera* and it was of the order $T_6<T_8<T_4<T_{11}<T_3<T_9<T_2<T_1<T_5<_{12}$ $<T_7<T_{10}$.

Larval density of the fruit borer as influenced by different treatments in 2013 is presented in Table 2.

The fruit borer population was slightly less during 2013 compared to previous year, with mean populations varying from 0.34 to 1.45 larvae/plant. At 70 DAT, VC 1250 + NC 250 -SS (T_8) recorded significantly less number of larval population (0.21 larva / plant). The treatments, FYM 2500+JVM-SS (T4) and RDF (T9) were found to be equally effective by recording least population of 0.27 larva per plant. While other treatments recorded a higher larval population ranging from 0.34 to 0.40. However, all the treatments were found to be superior over control. At 85 DAT, fruit borer number ranged from 0.34 to 1.33 with VC 1250 + NC 250 -SS (T8) recording significantly less number of larva (0.34), being on par with the treatments viz., T2,T1,T4,T6,T9,T11 and T7 except T5, control and control (H), which supported fairly higher activity of *H. armigera.* At 100 DAT, the trend of treatment significance was as that of 85 DAT, while at 115 DAT, larval density as influenced by different treatments ranged from 0.32 in T8 to 1.74 in T10. All the treatments were found to be superior over control, which harboured significantly higher larvae per plant (1.74). Mean data also disclose similar pattern of treatment results. Pooled data : At 70 DAT, the treatments, NC 250 + JVM -SS (T6) and VC 1250 + NC 250 -SS (T8) were found to be most effective by recording least larval population of 0.28 larva / plant followed by T4,T11,T2,T9,T1 and T3. However, PM 8000 -SS(T4), FYM 2500 + PM 4000-SS (T7) recorded moderate population density of fruit borer and found relatively less effective. Significantly highest number of (1.27 Larva / plant) larvae were registered in control. At 85 DAT, VC 1250 + NC 250 -SS (T8) was found to be superior by recording least larval population of 0.38 larva per plant and was on par with rest of the treatments except PM 8000-SS(0.84), FYM 2500 + PM 4000-SS (T7) (0.64), control(T10) (1.37) and control (H) (T12) (0.89). At 100 DAT, NC 250 + JVM -SS (T6) was found to be equally effective by recording least larval population of 0.40 larva / plant, being on par with the remaining treatments except T5,T7, T10 and T12, which supported significantly higher *H. armigera* population. At 115 DAT, VC 1250 + NC 250 -SS (T8) stood superior by recording lowest larval load (0.42 larva/plant) compared to rest of the treatments followed by T4 and T6. All the treatments were found to be significantly superior over control. Cumulative mean also revealed similar pattern of treatment significance (Table 3) and the treatment effect vis-à-vis pest densities was of the order T8<T6<T4<T11≤T9<T2 <T1<T7<T5<T12<T10.

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Table.1: Effect of NPM practices and conventional practices on chilli fruit borer H. armigera during 2012

Treatments	*H. armigera* (No. of larvae/plant)				
	70 DAT	85 DAT	100 DAT	115 DAT	Mean
T_1	0.59 bcd	0.60 b-e	0.66 bcd	0.69 bcd	0.64 c-f
T_2	0.53 bcd	0.53 cde	0.67 bcd	0.68 bcd	0.60 c-f
T_3	0.58 bcd	0.47 de	0.60 cd	0.60 cd	0.56 ef
T_4	0.40 d	0.47 de	0.53 cd	0.60 cd	0.50 f
T_5	0.81 bc	0.86 bc	0.94 bc	0.92 bcd	0.88 bcd
T_6	0.28 de	0.40 e	0.47 d	0.53 d	0.42 f
T_7	0.81 bc	0.86 bc	0.87 bcd	1.08 b	0.91 bc
T_8	0.40 d	0.42 bc	0.58 cd	0.51 d	0.48 f
T_9	0.60 bcd	0.47 de	0.53 cd	0.67 bcd	0.57 ef
T_{10}	1.33 a	1.40a	1.53 a	1.87 a	1.53 a
T_{11}	0.44 cd	0.47 de	0.53 cd	0.60 cd	0.51 f
T_{12}	0.76 bc	0.93 b	0.93 bcd	1.00 bc	0.91 bc
CV	4.48	5.83	5.78	5.41	5.19
S.Em±	0.04	0.04	0.05	0.05	0.04
C.D. at 5%	0.12	0.13	0.15	0.14	0.10

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 NPM practices and conventional practices on chilli fruit borer H. armigera during 2013

Treatments	*H. armigera* (No. of larvae/plant)				
	70 DAT	85 DAT	100 DAT	115 DAT	Mean
T_1	0.39 def	0.40 d	0.40 ef	0.46 d	0.41 cde
T_2	0.35 f	0.36 d	0.35 f	0.40 d	0.37 e
T_3	0.46 cde	0.52 bcd	0.55 c-f	0.53 cd	0.52 b-e
T_4	0.27 f	0.40 d	0.34 f	0.40 d	0.35 e
T_5	0.66 bc	0.81 bc	0.82 bc	0.81 bc	0.78 bcd
T_6	0.27 def	0.40 d	0.33 f	0.40 d	0.35 e
T_7	0.35 f	0.41 d	0.41 ef	0.46 d	0.43 de
T_8	0.21 ef	0.34 d	0.28 f	0.32 d	0.29 e
T_9	0.27 def	0.40 d	0.33 f	0.40 d	0.35 e
T_{10}	1.20 a	1.33 a	1.40 a	1.74 a	1.42 a

T_{11}	0.34 f	0.40 d	0.40 ef	0.47 d	0.40 d
T_{12}	0.61 bcd	0.85 b	0.80 bc	0.87 bc	0.78 bcd
CV	5.19	5.38	5.25	5.60	5.99
S.Em±	0.03	0.04	0.24	0.04	0.04
C.D. at 5%	0.09	0.12	0.11	0.12	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 .3: Effect of NPM practices and conventional practices on chilli fruit borer H. armigera (Pooled)

Treatments	***H. armigera* (No. of larvae/plant)**				
	70 DAT	**85 DAT**	**100 DAT**	**115 DAT**	**Mean**
T_1	0.49 de	0.50 e	0.53 d	0.58 d	0.52 f
T_2	0.44 b-e	0.45 cde	0.51 cd	0.54 cd	0.48 c-f
T_3	0.52 cde	0.50 de	0.58 cd	0.57 d	0.54 def
T_4	0.34 e	0.44 bcd	0.44 cd	0.50 b	0.43 b-e
T_5	0.74 bc	0.84 bc	0.88 cd	0.87 b	0.83 bc
T_6	0.28 e	0.40 e	0.40 d	0.47 d	0.39 f
T_7	0.81 b	0.64 bc	0.64 b	0.77 b	0.71 b
T_8	0.31 e	0.38 e	0.43 d	0.42 d	0.38 f
T_9	0.44 cde	0.44 e	0.43 d	0.54 d	0.46 b
T_{10}	1.27 a	1.37 a	1.47 a	1.81 a	1.48 a
T_{11}	0.39 cde	0.44 e	0.47 d	0.54 d	0.46 f
T_{12}	0.69 bcd	0.89 b	0.87 bc	0.94 b	0.84 bc
CV	5.53	5.07	6.13	5.08	5.12
S.Em±	0.04	0.04	0.05	0.04	0.04
C.D. at 5%	0.12	0.11	0.13	0.10	0.10

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 .

IV. DISCUSSION

H. armigera : From Tables 3 it is clear that, least mean of *H. armigera* larval population (0.38) was recorded in VC 1250 + NC 250 - SS (T_8) and was on par with treatments, NC 250 + JVM -SS (T_6), FYM 2500 + JVM-SS (T_4), VC 2500-SS (T_2), RDF (T9) and Control (sucking pests) (T11). Moderate amount of larval density was noticed in FYM and poultry manure applied plots.

It appears that application of vermicompost, neem cake as sole or combined input to soil along with neem based foliar sprays later give the crop the ability to fight against pest debilitation and nutrition as well thus sustaining the crop productivity.

Varma[3] reported superiority of vermicompost against chilli fruit borer *H. armigera* compared to straight fertilizers. Similarly, combination of Neem Cake soil application 500 Kg/ha + seedling root dip with Neem Oil emulsion 1% for 12 hours + Neem oil 1% spray at weekly interval was found to be effective against chilli fruit borers *H. armigera* and *S. litura* (Mallikarjun Rao *et al*[4]. Ravikumar[5] observed that soil application of Neem cake @ 1 t/ha and vermicompost @ 2 t/ha were proved to be

effective in reducing fruit borer, *H. armigera* larval population and fruit damage in chilli. Giraddi *et al* [6] also reported least amount of chilli fruit damage by Neem cake 500 Kg/ha + 50% Recommended Dose of Fertilizer. These findings are in close agreement with the present research findings.

Neem cake is the important by product obtained after extraction of oil from Kernels. Neem cake contains two per cent of bitter terpenoids mainly azadirachtin which is responsible for the antiovipositional, antifeedant, growth disruptunt, fecundity and fitness reducing properties on insects apart from plant nutrients. Pest suppressing activity of neem cake is attributed primarily to certain phenolic compounds released during decomposition Alam *et al*[7]apart from stimulatory effect on root growth Mehrotra[8]. Hence, this could be the reason for reduced activity of sucking pests on chilli crop that received neem cake in the present study.

Vermicompost possess both macro and micro plant nutrients in available forms, besides enzymes, antibiotics, vitamins and plant growth hormones and have definite advantage over organic manures Meerabai and Asha[9]. This would probably make plant system more defensive against pest infestation and they might induce resistance in the plants. Bhawalkar and Bhawalkar[10] and Bhide[11] who claimed that plants develop pest resistance due to balanced nutrition provided by vermicompost, while Kale[12] reported that secretion of earthworms have effect on growth and yield of crops as well as resistance in plants to withstand against crop pests and diseases. These reports lend support to the present findings on effect of Vermicompost on pest activity in chilli.

Organic soil amendment work like slow release fertilizers providing balanced nutrition to plants facilitating balanced growth, finally making them less prone to pest incidence Gour[13].

V. CONCLUSION

Among the organic soil amendments and plant extracts tested against chilli pests fruit borer, the combined application of Vermicompost @1250 kg/ha + Neemcake @250 kg/ha at the time of transplanting and 50 DAT (Days After Transplanting), with sprays of Nimbecidine 5ml/l at 2, 7 WAT (Weeks After Transplanting) and NSKE 5% at 5 and 11 WAT, was found to be the most effective against *H.armigera.*

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