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Effect of organic manure (FYM) in management practices of chilli mite, *Polyphagotarsonemus latus* (Banks)

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Abstract
A field experiment was conducted on chilli hybrids to study the effect of Farm Yard Manure (FYM) (20t/ha) in management of natural *Polyphagotarsonemus latus* population. Chilli hybrids were raised from June, 2013 to November, 2013 with standard agronomic practices. The experiments were laid out in randomized block design (RBD). During present investigation, FYM application @ 20 t/ha reduced 27.35 percent fecundity and 20.28 percent of mobile stages of *P. latus* population. The *P. latus* population was significantly less (4.52 mites/leaf) in experimental units with FYM application (CD=0.38; p=0.05) as compared to units where no fertilizer was applied (5.67 mites/leaf). This showed that Farm Yard Manure @ 20t/ha was effective as compared to control.

Keywords: Chilli hybrids, FYM, *Polyphagotarsonemus latus*

Introduction
Chilli (*Capsicum annuum* L.) is an important spice crop and belonging to the family Solanaceae. According to FAO estimate (Anon., 2011) [1], globally the area and production of chilli is consistently increasing. The productivity of chilli in India is 10.18 q/ha as compared to 15.4 q/ha of the world, however, the potential productivity lies between 4-5 q/ha (Rao *et al*., 2009). Asian Vegetable Research and Development Centre (AVRDC) in Asia were conducted survey, their results shows the major insect pests that attack chilli are aphids, mites and thrips. India is the largest producer of chilli in the world. The yellow mite, *Polyphagotarsonemus latus* (Banks) (Acari: Tarsonemidae), is one of the most serious pests of several greenhouse crops including chilli (Gerson, 1992) [3]. It is known to cause leaf curling and limits the yield leading to huge economic losses.

Now a day the farming totally depends on use of chemical fertilizers, pesticides and growth regulators for enhancing their crop productivity. 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. The organic (biological/ecological) approach is one of the alternatives to conventional production system currently being advocated (Subba Rao *et al*., 2007) [9]. The concept that a "high proportion of humus in the soil" promotes crop-plant resistance to insect pests and plant pathogens. In addition, the organic matter improves soil structure and water-holding capacity, and encourages beneficial soil organisms and natural enemies of pests (Purvis and Curry, 1984) [6]. Considering the potential environmental benefits of organic production and its compatibility with integrated farming approaches, quality of food and sustainability, organic agriculture is considered as an ecofriendly and viable alternative for sustainable agricultural development (Ramesh *et al*., 2005) [7].

Using organic sources like FYM, compost, vermicompost, sheep and goat manure in combination with liquid organic manures like cow urine, vermiwash, bio-digested liquid *etc*. deserves priority for sustained production and better on farm resource recycling and utilization. Vogtmann (1984) [12] proposed that organically grown plants are healthier than commercially fertilized plants and are therefore more resistant to attack.

The conventional farming practices which uses chemical methods to kill both useful and harmful life forms indiscriminately, resulting in the malfunctioning of food chain and food web. To overcome these problems, use of organic manure, plant based substances and certain indigenous practices offer safe alternatives in pest management. In these methods insect pests and pathogens are managed by using biological methods without harming the environment and

other beneficial organisms. With this background a field trial was conducted to study the effect of organic manure (FYM) in management practices of chilli mite, *P. latus*.

Materials and methods

Seeds of chilli (*Capcicum annum* L.) hybrids were grown under natural conditions from June, 2013 to November, 2013 following recommended agronomical practices. The experiments were laid out in randomized block design with three replications having a plot size of 3.0 m × 2.7 m at a spacing of 60 cm × 45 cm. FYM (20t/ha), NPK (25:12:12 kg/ha) and no fertilizer were applied in separate plots before transplanting following standard practices. The treatment in which no fertilizer was applied acted as corresponding control. After the appearance of natural mite infestation, two leaves each from top, middle and bottom were selected from ten plants per plot per week randomly to count the number of eggs and mobile stages per leaf under Stereo Zoom Binocular Microscope. The observations were continued till the crop was terminated.

For assessing the effectiveness of the treatments, mean numbers of *P. latus* were pooled and analyzed using standard statistical tools. The percent reduction in mite count as compared to count in control treatment was calculated by the formula:

$$\text{Percent Reduction} = \frac{(\text{Average number of mites in control} - \text{Average number of mites in treatment})}{\text{Average number of mites in control}} \times 100$$

The treatments were analyzed statistically, doses recommended in chilli/ other vegetable crops were taken to evaluate their effectiveness in reducing *P. latus* population. These were compared with control.

Statistical Analysis

Field experiments were laid in randomized block design with three replicates. From each replicate observation was recorded from ten plants.

Critical difference (CD) was calculated between the organic manures/inorganic fertilizer treatments by using two factorial CRD. This was done to know the efficacy of the treatments in reducing the *P. latus* population in chilli plants. The Software 'OPSTAT', developed at the Computer Centre, College of Basic Sciences and Humanities, CCS Haryana Agricultural University, Hisar was used for the analysis.

Results

When the results on population build up of *P. latus* in two treatments (Farm Yard Manure and no fertilizer) were compared, a significant effect of observation period was recorded (CD=0.95; p=0.05) (Table 1). Irrespective of treatment, the number of eggs was found to significantly increase with each observation period (3.09, 3.14, 6.38 eggs/leaf in July, August and September, respectively) till the attainment of peak in the month of October (9.87 eggs/leaf), which afterwards showed a decline in the month of November (4.19 eggs/leaf). However, the eggs count in first two months was found to be at par with each other. Between the treatments, significantly more number of eggs (6.18 eggs/leaf) were recorded in experimental units where no fertilizer was applied as compared to units where FYM was given (4.49 eggs/leaf) (CD=0.60; p=0.05). An interaction was recorded between observation period and treatment, indicating that at each observation period, number of eggs laid was more in no fertilizer treatment as compared to FYM. During present investigation, FYM application @ 20 t/ha reduced 27.35 percent fecundity of *P. latus* population.

Effect of Farm Yard Manure on *P. latus* population is presented in Table 2. Consistent with the results above, the *P. latus* population was significantly less (4.52 mites/leaf) in experimental units with FYM application (CD=0.38; p=0.05) as compared to units where no fertilizer was applied (5.67 mites/leaf). During initial period of study, the number of mites was statistically comparable in the months of July (3.17 mites/leaf) and August (3.22 mites/leaf) (CD=.60; p=.05). In the remaining period of study, mobile stages of *P. latus* differed significantly with each other. The mobile stage count was 6.22, 8.83 and 4.02 mites/leaf in the months of September, October and November, respectively.

A significant interaction between treatment and observation period (CD= 0.85; p= 0.05) revealed that as the duration of infestation increased from July to October and November, mite number also increased from 3.51 to 10.11 and 4.39 in without fertilizer treatment and 2.84 to 7.55 and 3.64 mites/ leaf in Farm Yard Manure application. FYM treatment @ 20 t/ha reduced 20.28 percent yellow mite population on chilli plants.

Table 1: Effect of Farm Yard Manure on fecundity of *Polyphagotarsonemus latus* on chilli hybrid leaves

Observation Period	Average number of eggs/ leaf of chilli (Mean ± S.E.)						Mean (OP)		Pooled Mean (OP)
	Top leaf		Middle leaf		Bottom leaf				
	NF	FYM	NF	FYM	NF	FYM	NF	FYM	
July	3.14± 0.58	2.87± 0.33	3.87±0.67	2.67± 0.33	3.33±0.67	2.67± 0.33	3.44	2.73	3.09[a]
August	3.33±0.88	2.80± 0.33	4.13± 0.58	2.19± 0.33	3.33±0.67	3.07± 0.33	3.59	2.68	3.14[a]
September	7.20±0.67	5.33± 0.58	8.13±0.88	5.20±0.88	7.33± 0.58	5.13±0.88	7.55	5.22	6.38
October	13.40± 0.58	10.00± 0.58	10.47±1.20	7.26± 0.58	10.47±1.15	7.67± 0.58	11.44	8.31	9.87
November	5.26±0.88	3.73± 0.33	5.00±0.33	3.53±0.88	4.40± 0.58	3.27± 0.33	4.88	3.51	4.19
Mean							6.18	4.49 (27.35%)	

NF=No fertilizer, FYM = Farm Yard Manure (20t/ha)

Figure in parenthesis is percent reduction in mite eggs over NF

C.D. for Observation Period (OP) = 0.95, SE(m) =0.32 C.D. for Treatment (T) =0.60, SE(m)=0.20

C.D. for Interaction OP × T= NS, SE(m)=0.45 Values with the same superscript do not differ significantly

Table 2: Effect of Farm Yard Manure on mobile stages of *Polyphagotarsonemus latus* on chilli hybrid leaves

Observation Period	Average number of mobile stages/ leaf of chilli (Mean ± S.E.)						Mean (OP)		Pooled Mean (OP)
	Top leaf		Middle leaf		Bottom leaf				
	NF	FYM	NF	FYM	NF	FYM	NF	FYM	
July	3.93 ± 0.58	1.93± 0.58	3.47± 0.67	3.67± 0.58	3.13±0.67	2.93±0.33	3.51	2.84	3.17[a]
August	3.53± 0.67	2.47± 0.58	3.53± 0.58	3.4± 0.58	3.67±0.67	2.73±0.33	3.57	2.86	3.22[a]
September	6.27±0.88	6.27±0.88	7.07± 0.58	5.80±0.33	6.93± 0.58	5.00±0.88	6.75	5.69	6.22
October	10.33 ±1.20	7.87±0.88	10.00±1.15	8.00±0.88	10.01±0.88	6.80±0.88	10.11	7.55	8.83
November	4.86±0.88	3.74± 0.58	4.40±0.33	3.73± 0.58	3.93±0.67	3.47±0.33	4.39	3.64	4.02
Mean							5.67	4.52 (20.28%)	

NF=No fertilizer, FYM = Farm Yard Manure (20t/ha)
Figure in parenthesis is percent reduction in mite population over NF
C.D. for Observation Period (OP) = 0.60, SE(m) =0.20 C.D. for Treatment (T) =0.38, SE(m)=0.13
C.D. for Interaction OP × T= 0.85, SE(m)=0.29 Values with the same superscript do not differ significantly

Discussion

In India, FYM is the most commonly used organic manure which contains 0.7-1.3 percent N, 0.3-0.9 percent P_2O_5 and 0.4-1 percent K_2O and 24-40 percent organic carbon depending upon the type of animals and nature of feed (Chhonkar, 2003) [2]. After using FYM (20t/ha) as soil amendment during present study, population of *P. latus* decreased to 27.35 percent fecundity and 20.28 percent of mobile stages when compared to no fertilizer treatment. A comparison of fertilizer treatments showed that farm yard manure @ 20t/ha was most effective, followed by vermicompost (5t/ha), poultry manure and neemcake (2t/ha) treatment as compared to NPK and control. Combined application of full dose of NPK+FYM @ 5 t ha^{-1} + vermicompost @ 5 t ha^{-1} recorded lower incidence of sucking pests in chilli and application of half dose of NPK+FYM @ 5 t ha^{-1} + vermicompost @ 5 t ha^{-1} recorded least thrips incidence (Patnaik and Mohapatra, 1997) [5]. Soil application of FYM combination with full dose of NPK recorded minimum population of aphids and mites ad highest yield of chilli (Varma and Supare, 1997) [11]. The growth parameters of chilli *viz.*, plant height, number of branches, leaf area, leaf area index and dry matter production in various plant parts were significantly higher with combined application of organic compost and FYM (Sunitha, 2000) [10].

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