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Eco friendly pest management of chili crop

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A study on integrated insect pest management in organic farming system in chili crop was carried out at Farmers Field, during summer season 2008. The slope rate of pest population increase was 0458X and R-square was 0.96 and it was lowest with a declining curve-0.479X and R-square was 0.98. Predator population was highest (0.68) /leaf on 3rd October. The regression equation showed that the population growth with time interval was highly significant 0.078X and R-square was 0.96. It decreased and reached its minimum with a declining curve-0.087X. It was concluded that neem powder was found effective against whitefly, thrip and bud mite. However, tobacco extract found most effective against and Amrican boll worm, and aphid on chili crop up to 48 hrs. In the light of experiment, it could be recommended that neem powder and tobacco extract can be applied for controlling of pests on chili crop up to 48 hrs.

Keywords: Pest, Management, Organic, Chili

Introduction

The Chili, *Capsicum frutesence* L. belong to family Solanaceae, genus capsicum. It is commercially grown throughout Indo-Pakistan sub-continent (Khoso, 1994). A number of sucking insect pests attack chili and cause great damage to this crop by infesting leaves and floral parts. The insects which attack this crop are whitefly, *Bemisia tabaci*, thirps, *Scirtothrips dorsalis*, aphid, *aphis gossipii* Glover), bud mite, *Polyphagotarsonemus latus* Banks), American bollworm, *Helicoverpa armigera* Hubner. Predators, spider sp., zigzag beetle, *Menochilus sexmaculatus*, green lace wing, *Chrysoperla carnea* and *Orius insidious* which consume several preys during their developmental stage (Baez *et al.* 2004).

The biological control is a main component of IPM, because a number of pests of a crop remain under in natural control. A strategy should be to attempt control serious pests without disturbing the natural control that already exists. In pest management is one of the most important components is the use of

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botanical insecticides for crop protection. Neem tree, Azadirachta indica produces many compounds which are effective against many insect pest - species. The primary active ingredient of neem based pesticides having excellent insecticidal activity against many phytophagous insect pests. As botanical pesticide their importance is highly appreciated when the utilized in agricultural fields, for that reason these are not only safe and cheap but also highly lethal for noxious targeted insect pests (Kumar and Chakraborty, 1997).

Keeping the above points in the view, a field experiment was conducted to examine the existing of predators and effect of plant extracts on insect pest in chili crop. It is hoped that this information will encourage further studies of bio and bio-pesticide control under Integrated Pests Management on chili crop.

Materials and methods

The field study on integrated insect pest management in organic farming system in chili crop was carried out at Farmers Field, during summer season 2008.

Sampling

For two different experiments four replications for each experiment having area 40 x 50 fts was selected. 1. No insecticidal sprays were applied in or around the first experimental plots. The pests visited chili crop was recorded on weekly intervals. 2. In second experiment the comparative effectiveness of two bio-pesticides (neem powder, *Azadirachtia indica* and tobacco extract, *Nicotiana tobaccum*) were observed in the form of suspension. The following methods were used to make the suspension of each bio-pesticide. Tobacco Extract: After grinding tobacco leaves, these were put in the water for over night. In the next day morning, after filtering the solution was sprayed on chili crop. Neem Powder: After grinding the neem seeds, the powder was put in to the water for over night. The next day the suspension was sprayed on chili crop. The recommended doses of above mentioned treatments were sprayed with the help of knapsack hand sprayer. The comparative effectiveness of the products was recorded after different post treatments interval i.e. 24, 48, 72 hours and one week. The details regarding bio-pesticide doses are given in Table-1.

Table 1. The bio-pesticides and their doses against pests on chili crop

Treatments	Bio-pesticides	Recommended doses per acre	Dose applied sub plots
T_1	Neem Powder	3 kg	41.32gms
T_3	Tobacco Extract	5 kg	68gms
T_5	Control	-	-

Data collection

For this purpose, five plants were observed randomly from each sub plot. Five leaves were examined from each plant. These leaves were selected two from top and middle and one from bottom portion of the plant. For first experiment pest and predator population was carefully counted with help of 5 x magnifier lens and relationship between pest and predators population with meteorological factors (Temperature and Humidity) were also recorded. In second experiment effect of bio-pesticides against pests on chili were observed. Population growth was analyzed by simple logistic model (Southwood, 1978) as given in equation 1.

$Nt_i = Nt_0 \quad eRT$---------- *(1)*

Nt_i = number of pest and predators at time interval i, Nt_0, number of pests and predators at time interval zero. e the base of natural logarithm R the rate of increase, T the time elapsed in days.

$ln\ Nt_i = ln\ Nt_0 + RT\ n\ r\ s\ F$ ---------- *(2)*

Nt_i = natural log of pests and predator at time interval i, Nt_0 the intercept of y on natural log pests and predators population, R the slope of curve and T the time in days, n the observations used in calculation, r the correlation coefficient, s standard deviation from regression and F – statistics.
The regression equations were computed using Statgraphics (1991) and the data transformed in log.

Results and discussionS

Present study on, "integrated insect pest management in organic farming system in chili crop" was carried out at Farmers Field, during summer season 2008. The results presented in figure 1-2, indicate that chili crop was attacked by the pests (whitefly, *Bemisia tabaci*, thirps, *Scirtothrips dorsalis*, aphid, *aphis gossipii* Glover), bud mite, *Polyphagotarsonemus latus* Banks), American bollworm, *Helicoverpa armigera* Hubner during its growing period.

Pest population

The results given (figure-1) depicted that population of thrips and whitefly was 3.3 and 0.09 per leaf, respectively on 9th August, however aphid was absent in the months of August, September and October. The aphid activity started on 1st November 0.3 per leaf. The mean population of thrip, whitefly and aphid increased and peaked (17.5, 6.14 and 1.00) per leaf on 24th October and 15th November, respectively. The mean population of American boll worm and mite was 0.2 and 2.00 per leaf on 15th and 9th August, respectively. The mean population of American boll worm and mite was maximum (17.5 and 6.14) per leaf on 15th and 8th November. After that, the population of pest decreased up to maturity of the crop.

Consolidated population of sucking insect pests

The consolidated data (Figure-2) showed that the pest population was highest (0.84) per leaf on 24th October. The regression equation showed that the population growth with time interval was highly significant. The slope rate of population increase was 0.75X. The R-square was 0.98 which explained that about 98 percent variation in population increase was observed by weeks. Subsequently, population decreased and reached its minimum with a declining curve-1.69X it also showed a highly significant relation among population and dates. The R-square was 96. It indicated that 96% variation in population decrease was related due to weeks. Later, the population of pests decreased as crop advanced towards the maturity. From the data it was observed that chili crop was attacked by a number of pests (thrip, whitefly, aphid, mite and American boll worm). Similarly many authors have reported that the occurrence of pests in chili (Panickar and Patel, 2001; Ruiz and Medina, 2001) during different stages of the crop.

In our observation the highest population of pests was in second week of October when crop was on cotyledon stage. Panickar and Patel (2001) reported that the activity of *Scirtothrips dorsalis* on chili was found from first week of September to second week of November. In present studies the aphid, *Aphis gossypii* appeared at the last stage of the crop. Mostly alate aphids (migratory adult) were observed in the first week of November. It is substantiated by Karimullah and Ahmed (1999) in Pakistan reported that aphids migrate from north to south in winter when environment becomes unfavorable, which forces them for migration to favorable habitat. These findings are in close conformity with those of Deguine and Leclant (1996). They trapped alate aphid *Aphis gossypii* in cotton using yellow traps.

Predators

During the investigation predators collected were: zigzag, *Menochilus* (*sexmaculatus*) brumus beetle, (*Brumus suturalis*) pirate bug, (*Orius laevigatus*) lace wing, (*Chrysoperla carnea*) and spider sp., throughout its growing period.

The data presented in figure-4, reveled that the predators (lacewings, orius, zigzag and spider) appeared in initial days as pest appeared on chili crop. The minimum mean population of predators was (0.1, 0.05, 0.08 and 0.1) per leaf, respectively on 9th August. Thereafter, its population increased gradually as the population of the pest. The population of predators (lacewings, orius, zigzag and spider) increased and reached highest (0.90, 1.2, 0.5 and 1.4) per leaf, respectively on 24th October. The population of predators decreased proportionally with that of pest and maturity of the crop. These workers have reported that *Chrysoperla carnea, Orius* sp. and coccinellids predators, prey on thirps, aphids and whitefly on chilies. These predators can reduce the population of sucking insect pests by effective management and application of biological control methods on chilies and other crops.

Consolidated population of predators

The consolidated data (Figure-5) showed that the predator population was highest on 24th October. The regression equation showed that the population growth with time interval was highly significant. The slope rate of population increase was 0.068X. The R-square was 0.99 which explained that about 99 percent variation in population increase was observed by weeks. Thereafter, population decreased and reached its minimum with a declining curve -0.19X it also showed a highly significant relation among population and dates. The R-square was 0.91. It indicated that 91 percent variation in population decrease was related due to weeks. The correlation analysis showed that there was highly significant positive relationship between predator and pest at p-value 0.001 level.

During the observation it was found that there was a large number predator in chili crop, they may also have accounted for counting decline of pests, but crop also stopped growing over this period and reduced pest population may be partly attributable to the declining food value of leaves (Srivastava *et al*. 1996). These findings are substantially in agreement with those of Baez *et al.* 2004. They reported that biological control agents minimized pest population in chili by consuming several preys.

Predator –prey ratio

Pest infestation started in 2nd week of August. However, the predator appeared at the same time. The results of predator-prey ratio were 1:15 on 9th August. It was observed that predator population increased in response of increasing pest. The predator-prey ratio decreased in response of decline in pest population which reached it lowest 1:4.2 on 23rd November (figure-6).

During present study it was noted that predator abundance is correlated with the population of pests on chili crop. Similarly many researches have reported the occurrence of predators on chili crop with their prey population. (Srivastava *et al.* 1996; Hansen *et al.* 2003; Baez *et al.* 2004 and Chang *et al.* 2004). These researchers have reported that *Chrysoperla carnea, Orius sp* and coccinellids predators, prey on thirps, aphids and whitefly on chilies. These predators can reduce the population of sucking insect pests by effective management and application of biological control methods on chilies and other crops.

Pest vs biotic and abiotic factors

The correlation analysis indicated that there was highly significant and positive relationship between pest, predator and humidity and it was negative with temperature.

Efficacy of two bio-pesticides against pests

An efficacy of two bio-pesticides against white fly *(Bemisia tabaci* Gennadius), thrip, (*Scirtothrips dorsalis* Hood), aphid (*aphis gossipii* Glover), bud mite (*Polyphagotarsonemus latus* Banks) and American bollworm (*Helicoverpa armigera* Hubner) on chili crop indicated that the mean population of whitefly, thrip, aphid, bud mite and American bollworm is presented in fiigure-7 and 8. It reveals that the efficacy of bio-pesticides on overall mean population of whitefly remained 6.60, 3.38 and 15.63 and that of for thrip was 23.7, 10.25 and 32.14 and it was 0.88, 1.09 and 2.5 for aphid when treated with neem powder, tobacco extract and control treatment, respectively. The results showed that tobacco extract was more effective against whitefly and thrips, while neem powder application was relatively less effective but it was more affective against aphid. The results indicated that the overall mean population of the American bollworm was 2.45, 3.86 and 14.02 when it was treated with neem powder, tobacco extract and control treatment, respectively. It was observed that neem powder was more effective against this pest. The comparative mean population of the bud mite was 10.95, 7.3 and

20.15, when treated with neem powder, tobacco extract and control, respectively. The results showed that tobacco extract was more effective against bud mite. While, neem powder treated plots was less effective against this pest. The result is agreed by by researchers and they reported that tobacco extract give encouraging results against sucking and chewing insect pestsp (Akbar *et al*. 1993, 1996, 1999; Aliniazee *et al.* 1999; Dash *et al.* 1997; Bhatnagar & Sharma, 1997; Bhanukiran & Panwar, 2000).

The comparative mean population of pests

The data revealed the comparative mean population of pests was thrips (8.53), followed by bud mite (12.8), American boll worm (6.77) and aphid (1.49) per leaf, respectively. The analysis (ANOVA) revealed that comparative population was highly significant (F=512 df=4, P< 0.01). The DMR test for overall mean population showed that there was highly significant difference between them.

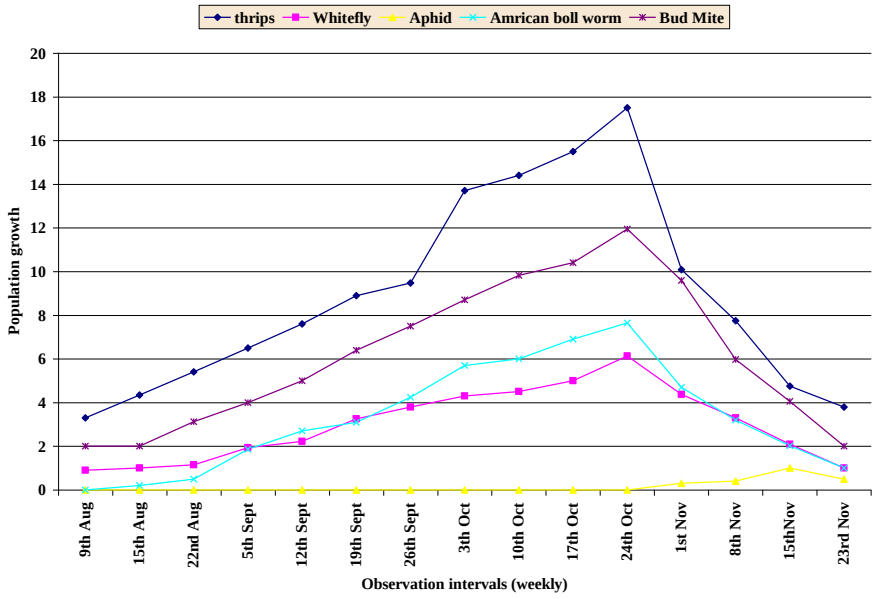

Fig. 1. Population fluctuation of pests in chili crop

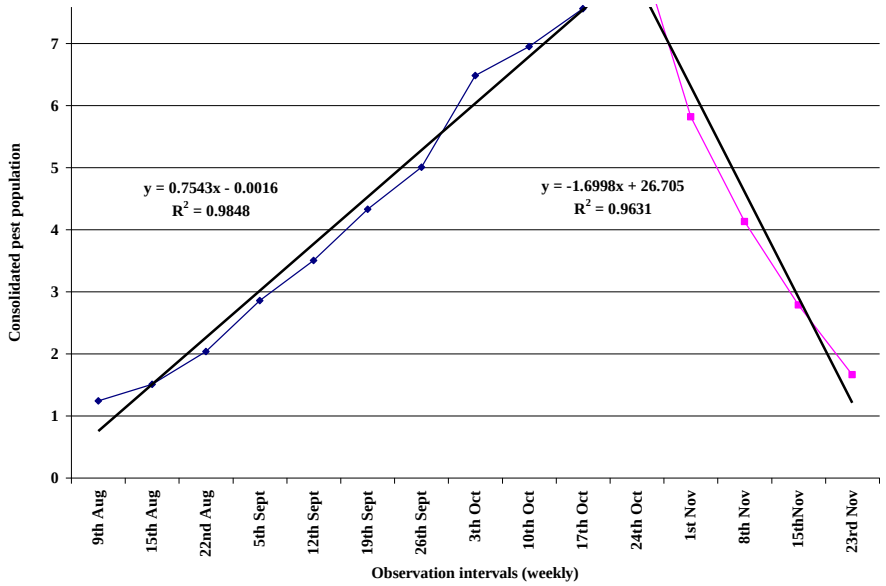

Fig. 2. Consolidated pest population in chili crop

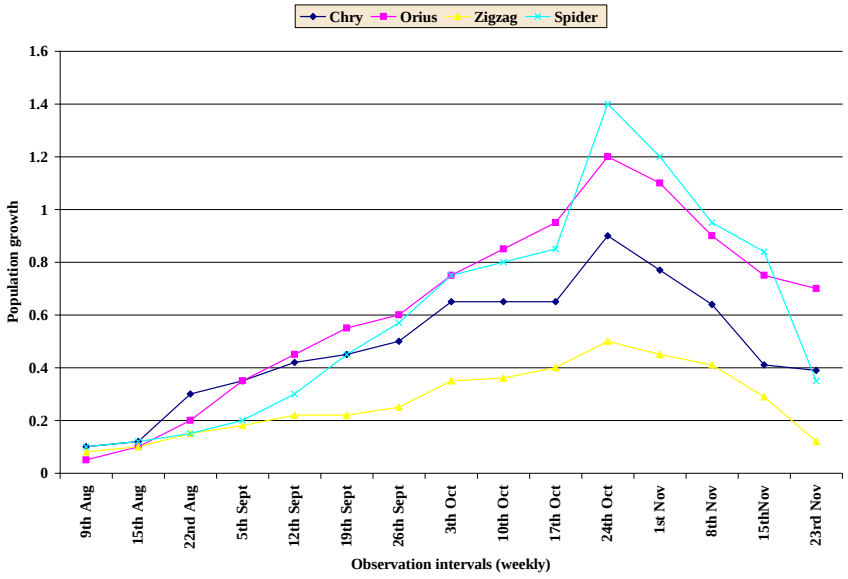

Fig. 3. Population fluctuation of predators in chili crop

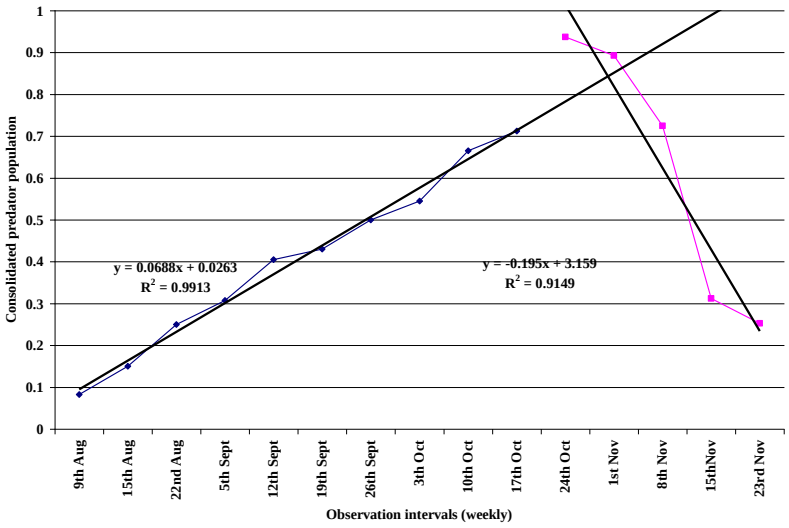

Fig. 4. Consolidated population of predator in chili crop

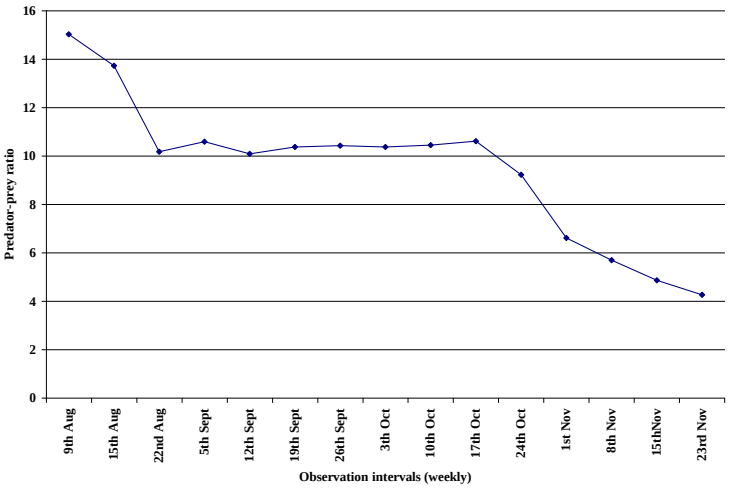

Fig. 5. Predator –prey ratio

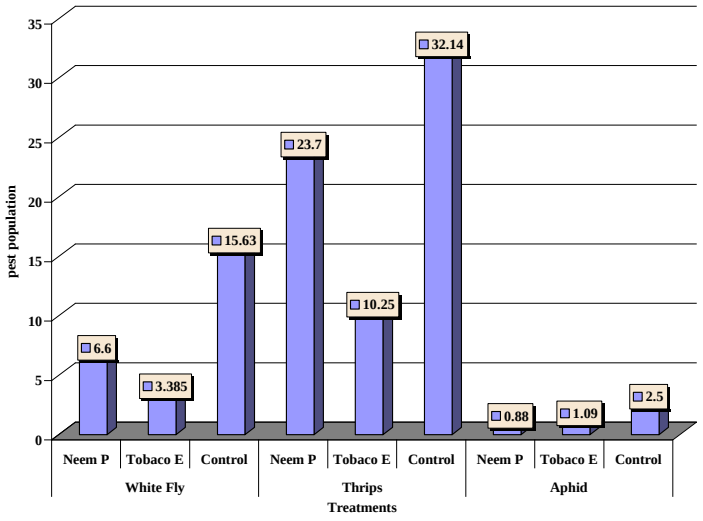

Fig. 6. Efficacy of two bio-pesticides against sucking insect pests

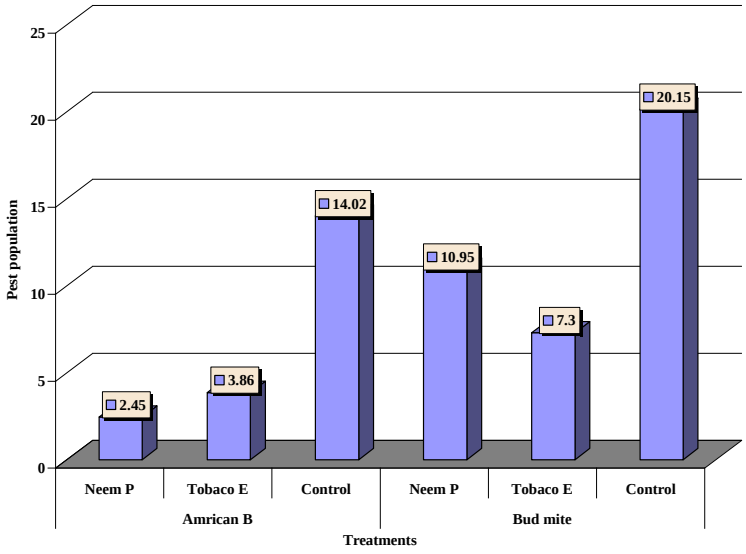

Fig. 7. Efficacy of two bio-pesticides against chewing insect pests

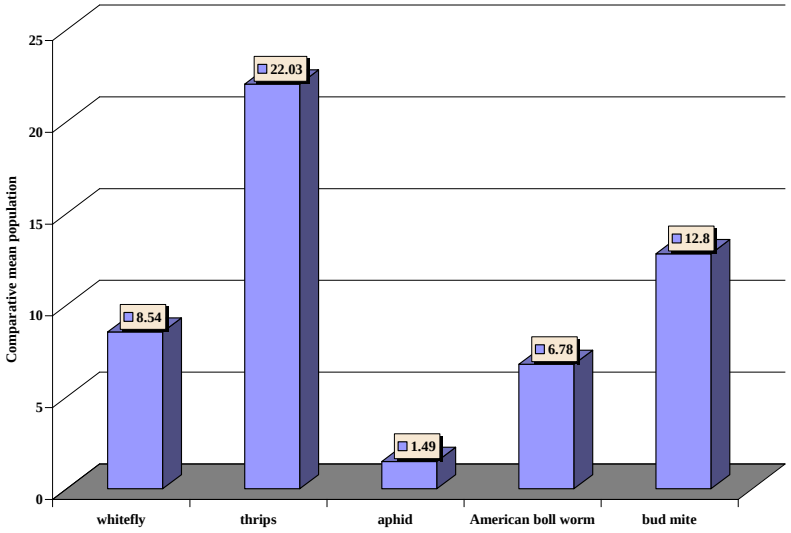

Fig. 8 . Comparative population of insect pests

Conclusions

It was concluded that neem powder was found effective against whitefly, thrip and bud mite. However, tobacco extract found most effective against and Amrican boll worm, and aphid on chili crop up to 48 hrs. In the light of experiment, it could be recommended that neem powder and tobacco extract can be applied for controlling of pests on chili crop up to 48 hrs.

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