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A Current Scenario of Implementation of Integrated Pest Management Techniques to Combat Global Warming

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Abstract

Global warming has recently been highlighted as a major threat for all the living beings on earth. In the current scenario the agriculture ecosystem significantly plays a role in global warming, indirectly, because of heavy quantities of chemical fertilizers and pesticides used to increase the yield. Through the increasing use of nitrogen fertilizer, which is added at a rate of 1 billion tons per year presently to the already existing amount of reactive nitrogen. Nitrous oxide (N_2O), has become the third most important greenhouse gas after carbon dioxide and methane. For reducing above mentioned problem in agriculture ecosystem, IPM (Integrated Pest Management) is one of the most suitable programme which establishes chemical use on a need basis only. The current study based on chickpea crop field for controlling Helicoverpa armigera (Hub.) through some IPM techniques during 2009-2010, revealed that first appearance of Helicoverpa armigera larvae in IPM treated plot was in the 2nd week of February while in control plot (with net) it was in 2nd week of January. The total grain yield in IPM plot was 15.20 q/ha whereas in control plot (with net) it was 10.12 q/ha recorded. The maximum number of larvae/10 plants in control plot (with net) was 24.0 but in IPM treated plot the maximum number of larvae/10 plants was only 10.33 recorded. Hence we can combat with global warming through IPM techniques by minimizing the quantity of chemical insecticides and fertilizers.

Keywords: Global warming, Helicoverpa armigera, Integrated Pest Management.

Introduction

Increase in the average temperature of atmosphere, ocean and landmasses of earth is called global warming. Global fertilizer use was merely 27 million tons in 1959 and 1960, which increased five times, to 141 million metric tons over the 40 year period in 2000. Similar to fertilizers use, there has also been a rapid increase in global pesticide use. In fact, success of the green revolution depended on the use of pesticides. Global pesticide use was 4 million tons, 5 million tons and 6 million tons in the years 1970, 1985, 2001 respectively. In India, approximately 59 million Kg. of pesticides are applied to agriculture annually. Over 98% of sprayed insecticides and 95% of herbicides reach a destination on non target species, air, water, bottom sediments and food, instead of their target species[1]. Heavy use of chemical fertilizers and pesticides (soil mismanagement) can have adverse impacts on the environment, including the eutrophication of surface water, contamination of ground water and emission of green house gases such as N_2O (Nitrous oxide) from agricultural ecosystem into the atmosphere. Nitrous oxide (N_2O) has become the third most important green house gas after carbon dioxide and methane. According to SAR (Second Assessment Report of IPCC's) the global warming potential is 21 for CH_4 and 310 for N_2O as compared to CO_2. In last two decades, atmospheric concentration of Nitrous oxide is increasing at a rate of 0.25% per year. Many alternatives are available to reduce the effects of pesticides from the environment. Pests can be prevented by removing pest breeding sites, maintaining healthy soils which grow healthy plants that are resistant to pests, and use of biocontrol agents such as birds and other pest eating organism. The present study was done for reducing the use of chemical fertilizers and pesticides, to combat global warming through IPM. IPM seeks to integrate multidisciplinary methodologies to develop pest management strategies that are practical, effective, economical and protective for public health and environment.

Material and Methods

The present study was done for controlling of the podborer *Helicoverpa armigera* (Hubner) larval population on chickpea in the field of Kapren (Bundi) during Rabi season 2009-2010. The experiment was carried over in two plots, one plot (8mx13m. with net) as a control and another with IPM techniques (8mx13m).The experiments were replicated thrice. The techniques like, pheromone trap, trap cropping (marigold), mixed cropping (wheat + chickpea), bird perches and vermicompost manure application, were used in IPM treated plot, while control plot was covered with nylon net to prevent the access of predatory birds approaching their prey. Observation of larval population was recorded on weekly basis from 10 randomly selected tagged plants. Average number of larvae per 10 plants was calculated.

Result and Discussion

Integrated pest management techniques have shown a promising result in the suppression of *Helicoverpa armigera* larvae. Table-1 and figure-1 show that 1st appearance of *Helicoverpa armigera* larvae in IPM treated plot was during 2nd week of February, while in control it was in 2nd week of January. The maximum average number of larvae / 10 plants in control plot was 24.0 but in IPM treated plot it was only 10.33 during 20 March to 26 March. However the overall larval population of *Helicoverpa armigera* / 10 plants (mean of 17 weeks) in control plots were 11.50 while it was 3.35 in IPM plots.

Table- 1
***Helicoverpa armigera* larvae/10 plants in control plots and IPM plots.**

Week	Average number of larvae / 10 plants in control plot	Average number of larvae / 10 plants in IPM plot
12- Dec. - 18Dec.	0.0	0.0
19 Dec. - 25 Dec.	0.0	0.0
26 Dec. - 01 Jan.	0.0	0.0
02 Jan. - 08 Jan.	0.0	0.0
09 Jan. - 15 Jan.	3.00	0.0
16 Jan. - 22 Jan.	8.00	0.0
23 Jan. - 29 Jan.	9.33	0.0
30 Jan. - 05 Feb.	12.00	0.0
06 Feb. - 12 Feb.	14.66	1.00
13 Feb. - 19 Feb.	15.33	4.33
20 Feb. - 26 Feb.	15.66	5.33
27 Feb. - 05 Mar.	18.00	5.66
06 Mar.- 12 Mar.	19.66	6.66
13 Mar.- 19 Mar.	22.00	7.66
20 Mar.- 26 Mar.	24.00	10.33
27 Mar.- 02 Apr.	19.33	9.66
03 Apr. - 09 Apr.	14.44	6.33
Mean of 17 weeks	11.50	3.35

Table- 2
Chickpea yield (q/ha) in IPM plot and control plot.

Treatment	Average number of pods / plant	Percent pod damage	Yield (q/ha)
IPM	59.56	13.03	15.20
Control	51.83	29.38	10.12

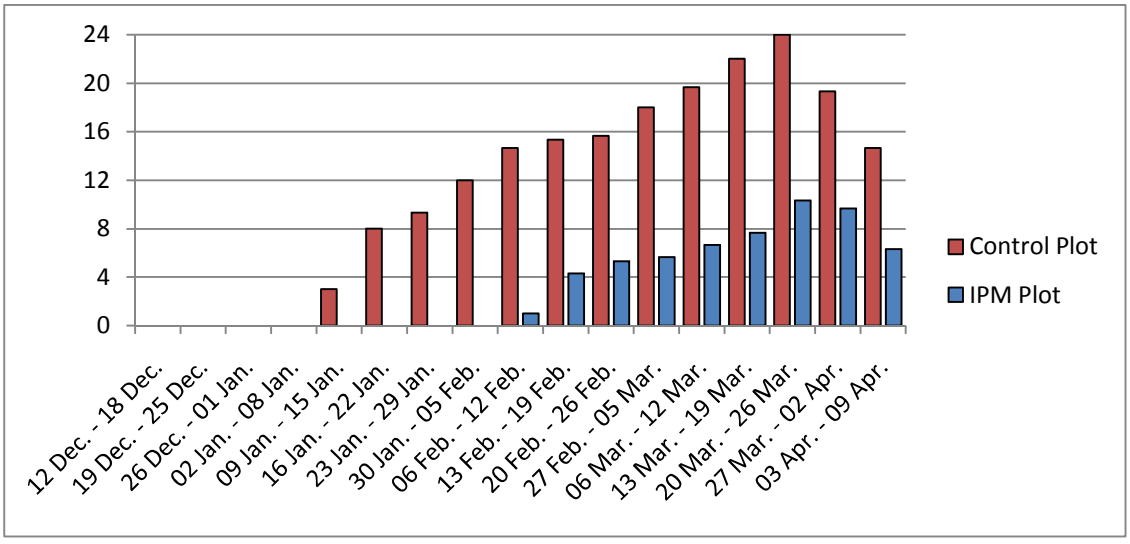

Figure- 1
Average number of larvae / 10 plants in Control plots and IPM plots.

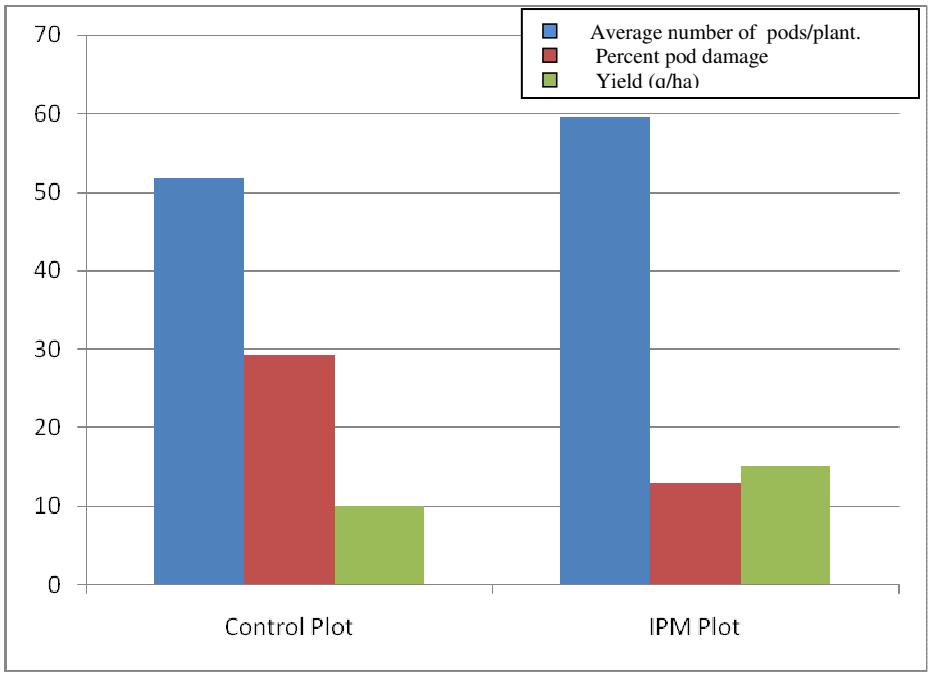

Figure- 2
Chickpea Yield (q/ha) in control plot and IPM plot.

Birds like house sparrow (*Passer domestics),* cattle egret (*Bubulcus ibis*), redwettled lapwing (*Vallenus indicus*), black drongo (*Dicrurus adisimilis*), house crow (*Corvus splendens*), blue jay (*Caracias benghalensis*) etc. were found feeding on *Helicoverpa armigera* larvae in IPM treated plot. Insectivorous birds such as black drongo, house sparrow, blue jay, cattle egret, rosy pastor and mynah predating on *Helicoverpa armigera* and lepidopteran insects on chickpea, pigeonpea and groundnut crops[2].

During present investigation it was observed that birds viz. black drongo, house sparrow, house crow, blue jay were frequently using the T-shape perches while cattle egret and redwettled lapwing were not using them. Predation by birds on *Helicoverpa armigera* larvae was increased in the perch installed plot[3]. First larval appearance of *Helicoverpa armigera* in crop was much earlier in control plot as compared to IPM plot, which shows *Helicoverpa armigera* larval suppression through IPM techniques. The effect of mixed cropping and intercropping showed the less infestation of *Helicoverpa armigera* as compared to monoculture of *Cajanus cajan*[4].

Table-2 and Figure-2 show that average number of pods per plant in IPM plots was much higher (59.56) as compared to control plots (51.83). Low larval population of *Helicoverpa armigera* in IPM plots resulted as low pod damage. The percent pod damage in control plots was recorded as 29.38, while it was 13.03 in IPM plots. The total grain yield in IPM plots was 15.20 q/ha whereas in control plot it was 10.12 q/ha recorded. Various integrated pest management components on *Helicoverpa armigera* and their impact on natural enemies present in chickpea field and among various treatments higher cost benefit ratio (1:3:1) was obtained in plots treated with IPM[5].

In present investigation higher yield and low larval population in IPM plots might be due to influence of organic manure, mixed cropping, trap cropping, attraction of male moths by pheromone trap and larval predation by birds. Various techniques which were used in IPM module put combined effect against bollworms on cotton crop field[6].

Conclusion

All IPM techniques are ecofriendly, which are not only cheap but also effective techniques. Hence by using IPM we can minimize the use of insecticides and chemical fertilizers, and control the global warming.

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