International Journal of Agriculture Innovations and Research
Volume 5, Issue 4, ISSN (Online) 2319-1473
Manuscript Processing Details (dd/mm/yyyy) :
Received: 03/01/2017 | Accepted on: 07/01/2017 | Published: 18/01/2017

Population Dynamics and Bio-Control of Insect Pest Through Traps and Pheromone Lures

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Abstract — **Sustainability of the livelihood depends on the fulfillment of the basic needs ensured with quality and required quantity. Food being the most required need of the population around the world, it is important to concentrate on various factors and reasons responsible for the prevailing scenario of damaged crops, reduced production rate, affected quality and thereby quantity of the crop yield. In India almost all states and productive land is utilized for the production of various crops including vegetables, fruits, paddy crops, cash crops and Pulses. All these produced materials are being exported within and outside the nation which also results in building up the economy of the nation. Large hurdle for obtaining this target is loss in the agricultural products due to pest like insects, rodents and plant disease. Among which the present paper elaborates the details of insect pest infestation on various crops along with their natural control agents (Bio-predators) through various traps enabling organic and sustainable farming at Nasik region in Maharashtra, India.**

Keywords — **Agriculture, Export, Insect Pest, Bio-predators, Organic Farming, Sustainable Development.**

I. INTRODUCTION

The economy of developing country like India depends basically on agriculture, Variety of crop products including vegetables, fruits, spices and paddy are been exported to various countries all around the world. As per the surveyed and recorded data, there is a deduction in the quality and quantity of the agricultural products (E.C.Oerke, 2006). The reasons observed for these are whether and climatic along with damage created by pest infestation and increased rate of chemical fertilizers and pesticides. The agriculturist work hard inducing most effective nutrients and prevention methods from variety of on field agricultural pest such as insects and rodents (Carmer. H, 1967). In order to increase the quality and quantity of the crops, there is introduction of large scale fertilizers and on the other hand increasing infestation of the pest demand for large scale introduction of pesticides (S.R. Yadav et.al, 2013). In the present investigation is done at the agricultural field of Nasik district in Maharashtra, India with variety of crops such as brinjal, cabbage, onion, beetroot and tomato gives us a cumulative data and pest infestation level is been monitored and controlled through the introduction of sticky tarps and pheromone traps.

II. MATERIAL AND METHOD

The present evaluation of the field pest on various crops were undertaken at manur village Nisarg sanskar organic farm, Nasik, Maharashtra, India. This is a region which lies in the northeast part of Maharashtra at $19^0 59'0''$ latitude and $73^0 48'0''$ longitude which has Average rainfall is 2600 to 3000 mm with relative humidity of 32% to 62% and temperature 6^0C to 42.5^0C at different seasons and varying climatic conditions. Cultivable area in Nasik is about 8,64,000 hectares having different soil types namely shallow red soil, medium red black soil and deep black soil. Different types of crops including rabi crops, kharif crops, horticultural crops are commercially grown in different regions of Nasik. Agricultural crops being evaluated in the present study are brinjal, onion, cabbage, beetroot and tomato along with which inter-cropping of these crops is observed along with trap plants such as mustard and marigold. The crops are surveyed and monitored through placement of various types of traps such as yellow sticky traps, white sticky traps and pheromone traps of different moths like *Spodoptera litura, helicoverpa armigera* and *Leucinodes orbonalis*. The trap were placed at evening time in equal distance and in between the fields of cabbage, brinjal, tomato and beetroot in order to trap almost all the insect pest present in the field.

III. RESULT

The survey and monitoring of various crops such as brinjal, cabbage, tomato and beet root shows maximum infestation of the field through sucking pest such as whitelies and thrips along with major infestation of fruit borer *Leucinodes orbonalis*. The sucking pest were found to be traped on the yellow and blue sticky traps along with some fruit fly species, small moths and house flies. There were eight sticky traps including yellow and blue in the same region two pheromone trap each of *Spodoptera litura, helicoverpa armigera* and *Leucinodes orbonalis* were placed at equal interval in between the crops in an acre of agricultural field. In accordance with the surveyed data maximum infestation of sucking pest was present in tomato followed by brinjal, cabbage beetroot and onion ound traped in the sticky traps. Whiteflie (*Bemicia tabaci*) as a whole was found mostly traped to yellow sticky trap and the other two observed pest jassid *(Bigutulla bigutulla*) and thrips (*Scirtothrips dorsalis*) were more attracted and being trapped on blue sticky trap

(graph 1). The infestation of lepidoptera insect pest including *Spodoptera litura, helicoverpa armigera* and *Leucinodes orbonalis* were observed more on brinjal followed by tomato, cabbage, beetroot and onion (table 1). Bio- predators and natural enemies such as *Adalia bipunctata, Coccinella septempunctata* and *Harmonia sedecimnotata* were observed and recorded on various insect pest of the recoded vegetable crops (table 2).

IV. Discussion

Insect pest are most difficult to control as they are attaining resistance to various pesticides presently applied in the agricultural field. In accordance with the present scenario it is mandatory to find a solution and alternative for this persisting problem. The present field study included survey and monitoring of the infested pest, natural predators, pollinators through eco-friendly approach by using sticky traps and pheromone traps. Infestation of sucking pest such as *Bemicia tabaci, Biguttula biguttula* and *Scirtothrips dorsalis* were found at great extent on crops such as brinjal and cabbage similar to the observation by T,V. sathe and his co-workers (2016) on various vegetable crop at Kolhapur district, Maharashtra. Ruchika kataria and Dolly kumar (2012) have also recorded various sucking pest along with shoot and fruit borers on various vegetable crops such as brinjal, Cabbage, tomato and beetroot. For the proper control of these pest without affecting the environment agriculturist are trying to find an alternative for chemical insecticides and initiated use of bio-control agents and convenient trapping methods. Along with this large number of entamophagus species are found in the environment and on field, which could be an alternative for insect pest control. In the present work we have observed and recorded some bio-predators like *Adalia bipunctata, Coccinella septempunctata* and *Harmonia sedecimnotata* on various insect pest on the vegetable crops. N.dandapani (2002) along with his research team had applied various bio-intensives including bio-predators and bio-pesicides for the control of Lepidoptera pest such as *Spodopera litura, Helicoverpa armigera* and *Leucinodes orbonalis* on various vegetable crops at Tamil nadu. Placement of pheromone traps specific to *Spodoptera litura, Helicoverpa armigera* and *Leucinodes orbonalis* were effective to have a control in their population and infestation level, similar observations were made by S. Das and co-workers on brinjal crop (2014). Thus, through introduction of bio-control measures by using natural predators and trapping technology insect pest in the agricultural field could be controlled on a large scale creating an option and alternative for harmful pesticides.

V. Conclusion

The present study supports the natural and eco-friendly approaches for the control of insect pest on the agricultural crops enable us to carryout sustainable cropping and avoid use of harmful pesticides. According to many recent research use of species specific pheromones and light traps are adding great success for controlling these insect pest. Along with this natural enemies (Entomophagus insects and predators) contributes for large extent control of agricultural harmful insect pest.

VI. Acknowledgment

The corresponding author is thankful for the guidance provided by the co-author Mr. Ashok. E .desai, Associate professor, KTHM College, Nasik. Also appreciation and gratitude towards Mr. Sukhdeo Ushir, Mr. Pankaj Ushir and Mr. Gavit for enabling on field trials on vegetable crops of " **Nisarg sanskar organic farm**".

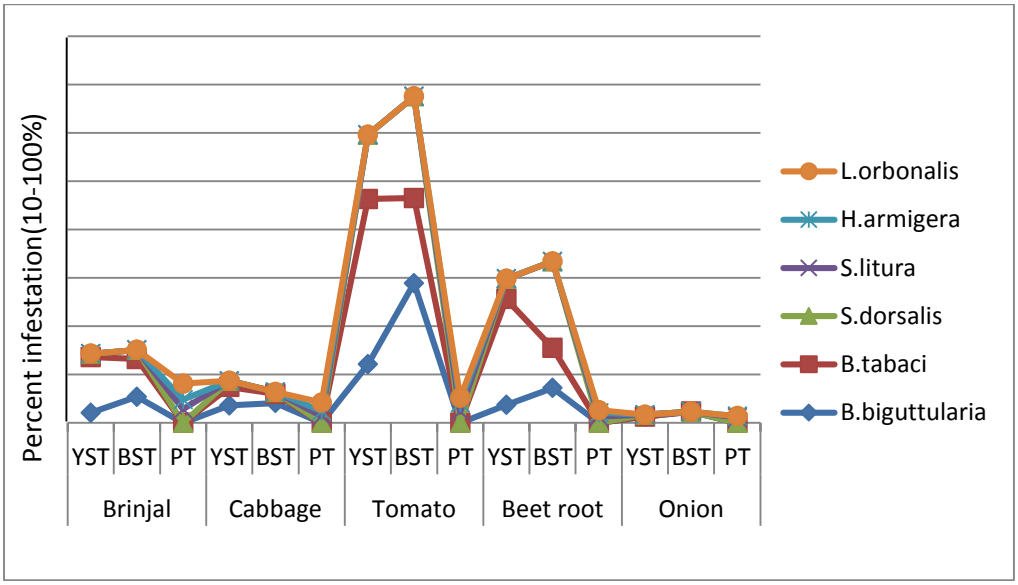
Table1. Level of various insect pest infestation on different vegetable crops.

Sr. no	Name of plant	Types of trap	Infestation of insect pest					
			B. biguttula	B. tabaci	S. dorsalis	S. litura	H. armigera	L. orbonalis
01.	Brinjal	YST	21	115	07	0	0	0
		BST	54	78	19	0	0	0
		PT	0	0	0	28	20	33
02.	Cabbage	YST	36	38	13	0	0	0
		BST	41	19	04	0	0	0
		PT	0	0	0	14	10	18
03.	Tomato	YST	121	342	133	0	0	0
		BST	289	176	210	0	0	0
		PT	0	0	0	23	18	11
04.	Beet root	YST	37	219	42	0	0	0
		BST	72	83	179	0	0	0
		PT	0	0	0	13	08	05
05.	Onion	YST	13	0	04	0	0	0
		BST	23	0	0	0	0	0
		PT	0	0	0	11	03	0

*YST- yellow sticky trap, BST – blue sticky trap, PT- pheromone trap.

Table 2. Evaluation of bio-control agents and pollinators on different crops of the field.

Sr.no.	Name of plant	Predator			Pollinator (Aphis dorsata)
		Adalia bipunctata	Coccinella septempunctata	Harmonia sedecimnotata	
1.	Brinjal	09	05	02	17
2.	Cabbage	13	02	00	08
3.	Cauliflower	17	09	05	24
4.	Tomato	04	06	00	33
5.	Beetroot	00	03	00	21



Graph no 1. Comparative analysis of trap efficacy on various insect pest on specific host plant.

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