

Sustainable Pest management approach in organic farming

Yimjenjang Longkumer and Manoj Kumar

Abstract: Pest management in organic farming highly accentuates on preventive methods rather than utilization of deleterious inputs such as chemicals. Through these measures the environment and the natural enemies in the cropping system remain unaffected. With its efficient performance in controlling the target pest an incipient horizon is establish in plant protection. Their potential and compatibility with various components such as trap cropping, pheromone lures, botanicals etc creates a sound ecosystem and have eventually resulted as an alternative approach to synthetic chemicals. Thus, to counteract the menace caused by the pests through these methods cannot be ignored.

Key words: Pest management, trap cropping, pheromones, botanicals.

According to IFOAM which is the umbrella organization of organic movements defines organic farming as “a production system that sustains the health of soils, ecosystems and people. It relies on ecological processes, biodiversity and cycles adapted to local conditions, rather than the use of inputs with adverse effects. Organic Agriculture combines tradition, innovation and science to benefit the shared environment and promote fair relationships and a good quality of life for all involved”. Despite of the instant effect provided by the chemical pesticides it is imperative to know the other side of the story of conventional farming system. The chemical build up in the environment, intensive application of fertilizer’s due to loss of valuable nutrients as a result of continuous monoculturing, loss of biodiversity etc. are the impact of conventional farming. However, these scenarios can be delineated by adopting organic farming. It involves the cultivation of crop without the involvement of any source of chemicals. In such farming

system, the cultivated crops will be exposed to various pests during their life cycle. Their occurrence can be categorized as sporadic, endemic, epidemic etc. So proper intervention must be employed to overcome such activities to protect the crop damage. Such type of farming system totally relies on eco-friendly approaches in management perspective viz., cultural control and biological control. Globally, Australia ranks first in area under organic cultivation while area under organic system in India is 1.18 million hectares (willer and lernoud, 2017). Madhya Pradesh ranks first among the highest area under organic farming followed by Himachal Pradesh and Rajasthan. The following components are the efficient tactics to counteract the activities of pest against the crop.

1. Trap crop

It refers to the cultivation of two or more crops in which the insect pest are towards the crop grown as a trap other than the main crop. This protects the main crop from the harmful activities of the pest. This method

also the population of the natural enemies, preserves the biodiversity and sustains the environment since the use of chemicals are totally restricted. The list in table 1 depicted most efficient trap crop that protects the main crop against a particular pest. Aphids transmits more than 100 viral diseases of which *Myzus persicae* is known to transmit around 150 diseases such as papaya ringspot virus, potato leaf roll virus etc. with the utilization of trap crop for the aphid's activities, the damage can be avoided or maintained below ETL. The most efficient trap crop reported for different aphid species are presented in Table 2.

2. Pheromones

Pheromones are chemicals released by an organism which evoke an intraspecific communication in the population. Pheromones may be of aggregation, trail, epideictic, alarm and sex pheromone, but in insect pest management sex pheromones are well known. Due to their eco-friendly impact in nature they are emerging as an alternative to synthetic chemicals. Sex pheromones are exploited in three ways *viz.*, monitoring, mass trapping and mating disruption. Over 150 species of female insect pheromones have been isolated. The male and female sex pheromones differ in their property and action. The female sex pheromone acts at a longer range; the male sex pheromones on the other hand act at short range (Ganai *et al.*, 2017). Although, only few pheromones have been isolated, they play a vital role in controlling many key insect pests which are known to cause havoc in every cropping season. For example, *Scirpophaga incertulas* have been reported to cause yield loss of about 1-19% in early planted and 38-80% in late transplanted rice

crops (Seni and Naik, 2017). In India, it has been reported that yield loss of around 52 % is caused by *Plutella xylostella* in cabbage (Devi and Tayde, 2017). The following pheromone lures (Table 3) are currently being developed by Pest Control India (PCI).

Fifty traps /ha was found effective in annihilation of males of *H. armigera* in pigeon pea (Shah *et al.*, 2015). Satpathi *et al.* (2017) also reported the highest yield of 53.98 q/ha in treatment comprising of mating disruption against 40.80 q/ha in control against rice stem borer. Pheromone trap resulted the lower infestation (4.20, 8.82, 9.31% DH and 9.41% WEH) caused by rice yellow stem borer than that of the untreated control (4.88, 23.75, 27.68% DH and 22.72% WEH) at 15, 30, 50 and 90 DAT.

3. Essential oils as Green pesticides

The term "Green pesticides" includes all natural materials that can reduce the pest population and increase food production. Consequently, EOs playing an vital role of pest control in organic food production globally (Abdel, 2016). Essential oils comprises of different chemical composition such as acetic, aldehydic, ester, etc that reacts differently and synergistically (Libs and Salim, 2017). Essential oils are known to have neurotoxic, cytotoxic, phototoxic and mutagenic action and the essential oils act at multiple levels in the insects due to which the possibility of developing resistance is low.

Conclusion

The above sustainable approaches have high active against insect, mite and nematodes. As such, they are considered as potential crop protectants crop protectants and for

pest management in other situations (e.g. urban pest control). Current information indicates that they are safe to the user and the environment. Integration of all the methods as a viable component in IPM can result in satisfactory control of target pest without hazard to the crop and the environment in the long run.

Reference

Abdel T H M. 2016. Green pesticides: Essential oils as biopesticides in insect-pest management. *Journal of Environmental Science and Technology* 9: 354-378.

Devi H D, Tayde A R. 2017. Comparative Efficacy of Bio-Agents and Botanicals on the Management of Diamondback Moth (*Plutella xylostella* Linn.) on Cabbage under Allahabad Agro climatic Conditions. *International Journal of Current Microbiology and Applied Science* 6(7): 711-716.

Dewangan S R, Sahu G D. 2014. Trap Cropping- A Valuable Pest Management. Technique. *Popular Kheti* 2(3): 131-134.

Ganai M A, Khan Z H, Dar M A. 2017. Pheromones in lepidopteran insects: Types, production, reception and its application. *Journal of Pharmacognosy and Phytochemistry* 6(5): 2552-2558.

Hikal W H, Baeshen R S, Hussein, A.H. 2017. Botanical insecticide as simple extractives for pest control. *Cogent Biology* 3:1-16.

Kumar A, Misra A K, Satyanarayana P, Kumar, J. 2012. Population dynamics and management of yellow stem borer (*Scirpophaga incertulas* Walker) with insect sex-pheromone trap. *International Journal of Plant Protection* 8(1): 157-161.

Libs E R S, Salim E R A. 2017. Formulation of Essential Oil Pesticides Technology and their Application. *Agricultural Research and Technology* 9(2): 1-19.

Refka B I, Gomez L, Gautier, H. 2017. Companion Plants for Aphid Pest Management. *Insects* 8(4): 112.

Satpathi C R, Raut A M, Krishnaiah K. 2017. Auto confusion technology- an innovative and novel method of use of pheromone for management of rice yellow stem borer *Scirpophaga incertulas* (walker) in Eastern India. *International Journal of Plant, Animal and Environmental Sciences* 7(1): 1-10.

Seni A, Naik, B. S. 2017. Efficacy of some insecticides against major insect pests of rice, *Oryza sativa* L. *Journal of Entomology and Zoology Studies* 5(4): 1381-1385.

Shah K D, Gole C A, Zala M B, Bharpoda, T. M. 2015. Standardization of Number of Pheromone Traps for The Management of *Helicoverpa armigera* (Hubner) Hardwick in Pigeon Pea. *Trends in Biosciences* 8(1): 224-226, 2015.

Willer H, Lernoud H. (Eds) .2017. The world of organic agriculture, Statistics and Emerging trends 2017. Research Institutes of Organic Agriculture (FiBL), Frick and IFOAM- Organics International, Bonn. Version 1.3 of February 20,2017.

AUTHORS

Yimjenjang Longkumer (Corresponding author) and **Manoj Kumar**, Dr. Rajendra Prasad Central Agricultural University, Pusa, Bihar, 848125, India email: dawson567890@gmail.com
