

Habitat Management: The Eco-Friendly Plant Health Management to Play Down Insecticide Resistance Against Insect Pests

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Insect pests infestation is one of the major biotic stress for the lower productivity of crops. Pests problem have increased due to monoculture, over reliance on nitrogenous fertilizer, dense cropping and availability of preferred host. Entomologists have been developed several crop and even pest-wise integrated pest management (IPM) to minimize the use of insecticides and to conserve, increase and encourage the action of defenders (natural enemies of pests) for eco-friendly pest management. Habitat management is the first line of defense against insect pest, however chemical insecticides are still front-line defense and due to misuse, over use and use of insecticides at sub lethal doses there is development of pest resistance, resurgence, secondary pest outbreak, destruction of natural enemies and environmental pollution. The habitat manipulation tactics creates a suitable microhabitat within agricultural ecosystem which supplies the resources such as food and shelter to natural enemies in a pesticide free zone for their better survival and increase predation efficiency.

Habitat manipulation by growing of attractant plants to attract the natural enemies, repellent plants to repel the pests, trap plants to attract and trap the crop pests, barrier/guard plants to prevent the entry of pests. It also includes trap crops that divert pests away from crops and changing monocultures to polycultures in agro-ecosystem. Enhancing plant diversity to increase the fitness of natural enemies in a conservation biological control system. Changes in landscape diversity due to monoculture have led to

more insect outbreaks, because of the removal of natural vegetation and decreased habitat diversity.

Habitat management or manipulation is an important agro-ecological approach, which can be used to minimize pest pressure in the agro-ecosystem through improving natural enemies' fitness by the presence of plant functional diversity. Habitat can be managed within crop, within farm or at the landscape level. The habitat management is influenced by the landscape composition, nature of plants, flower color, longevity of flowers, non-crop habitats such as weedy lots, hedgerow, field margins.

Habitat manipulation by growing insectary plant/flowering plant species provides a suitable microhabitat within agricultural ecosystem that attract or accumulate natural enemies or pests by providing shelter, nectar, pollen, alternate host, physical refugia, and lekking sites and/or by releasing volatile compounds. Nectar in flowers is an important source of carbohydrates that natural enemies use to maintain their activity and metabolism. Pollen is an important source of proteins, minerals, and vitamins that enhance fecundity, survival and abundance of natural enemies. Natural enemies' fitness in agro-ecosystems is influenced by floral traits such as quality and availability of nectar and pollen, flower color, shape, size and morphology of the corolla, and plant volatiles. Insectary flowering plants around field also attracts different kinds of pollinator that helps in natural cross pollination and increases yield.

The key concept of the habitat management is conserving and enhancing entomophages by increase

plant biodiversity and growing of flowering plants that provides nectar and pollens to natural enemies to promote biological control for a sustainable agriculture under zero insecticide condition.

Conclusion

Habitat management for pest management is the environmentally sustainable plant health management practices to maintain pest population

below ETL by enhance pest: defender ratio and that reduce over reliance on chemical pesticides to avoid the development of pesticide resistance on insect pests. It is not a 'high-tech' approach, but simple, eco-friendly and practical method for all farmers to implement, which fits with the popular perception that diversity leads to stability and productivity.

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