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ROLE OF TRAP CROPPING IN INSECT PEST MANAGEMENT

Vimal singh Rajput, Brajnandan Singh Chandrawat

M.Sc. (Agri.), Deparment of Agricultural Entomology CPCA, (SDAU) Dantiwada,

Ph.D. Scholar, Department of Nematology RCA ,(MPUAT), Udaipur,

E-mail: rajput.vimal08@gmail.com

Introduction: The concept of trap cropping fits into the ecological framework of habitat manipulation of an agro-ecosystem for the purpose of pest management. Various methods alter the habitat as a part of an integrated pest management (IPM) strategy, and such manipulation can occur either within a crop, a farm, or at a landscape level (Landis *et al*. 2000). Prior to the introduction of modern synthetic insecticides, trap cropping was a common method of pest control for several cropping systems (Talekar and Shelton, 1993). The recent resurgence of interest in trap cropping as an IPM tool is the result of concerns about potential negative effects of pesticides on human health and the environment, pesticide resistance, and general economic considerations of agricultural production.

DEFINATION: "plant stands grown to attract insects or other organisms like nematodes to protect target crops from the pest attack".

Modalities of Trap Cropping:

(A) Modalities Based on the Trap Crop Plant Characteristics:

Conventional Trap Cropping: A trap crop planted next to a higher value crop is naturally more attractive to a pest as either a food source or oviposition site than the main crop. Thus, preventing or making less likely the arrival of the pest to the main crop and or concentrating it in the trap crop where it can be economically destroyed. Manjunath *et al*. (1970) reported that flowers of marigold highly attracted *H. armigera* females for deposition of eggs. Growing Castor around the tobacco nursery (*N. tabacum*) as an ovipositional trap crop and collection and destruction of egg masses as well as newly hatched caterpillars from castor leaves helps in minimizing the *Spodoptera litura* population (Chari *et al*.,1983).

Dead-End Trap Cropping: Plants that are highly attractive to insects but on which they or their offspring cannot survive. Such crops serve as a sink for pests, preventing their movement from the trap crop to the main crop.

Genetically Engineered Trap Cropping: 'Use of Genetically modified plants with improved quality to serve as trap crop'. This modality of trap cropping may not be considered unique in and of itself because it can produce plant characteristics that fit other modality we describe. However, because of it present importance and growing potential, we believe it bear special consideration. Its importance in the development and improvement of trap crop is likely to increase in the future.

(B)Modalities Based on the Deployment of the Trap Crop:

Perimeter Trap Cropping: The use of a trap crop planted around the border of the main crop. The use of field margin manipulation for insect control is becoming common in IPM programs and is similar in practice to the early use of traditional trap cropping using borders of more attractive plant.

Sequential Trap Cropping: Trap crops that are planted earlier and / or later than the main crop to attract the targeted insect pest. This modality involves trap crop that are planted earlier and or later than the main crop to enhance the attractiveness of the trap to the targeted insect pest.

Multiple Trap Cropping: It involves planting several plant species simultaneously as trap crops with the purpose of either managing several insect pests at the same time or enhancing the control of one insect pest by combining plants whose growth stages enhance attractiveness to the pest at different times. Ex. ground nut with castor, millet and soybean for green leaf miner .

Push-Pull Trap Cropping: The push-pull or stimulo-deterrent diversion strategy is based on a combination of pull and push components. The trap crop (Pull component) attracts the insect pest and combined with the repellant intercrop (Push component), diverts the insect pest away from the main crop.

(C) Additional Trap Cropping Modalities:

Biological Control-Assisted Trap Cropping: A part from diverting the insect pests away from the main crop, trap crops can also reduce insect pest populations by enhancing populations of natural enemies.

Semio-chemically Assisted Trap cropping: They are either trap crops whose attractiveness is enhanced by the application of semio-chemicals or regular crops that can act as trap crops after the application of semio-chemicals.

Applications of Trap Cropping in Pest Management:

- Use trap cropping in insect pest management has been common in entomological research.
- It includes the level of implementation of the trap crop and interpretation of whether it was successful.
- Success in preliminary laboratory, greenhouses, screen houses or field studies may not necessarily result in a successful use at the commercial level, where additional variables and different environmental condition may affect insect behavior.
- Adoption of trap cropping is also dependant on the potential economic return to the grower in a particular situation (Shelton and Badenes-Perez, 2006).
- **Increasing the effectiveness of trap crops**
- In general, combining biological and / or insecticidal control to supplement the effects of the trap crop can increase the effectiveness of a trap crop.
- By exploiting specific characteristics of the plants which are used as a trap crop, and host preference of the target insect can be changed with reference to time (season) and space (cropping pattern).
- Enhancing the effectiveness of the trap crop is vital to minimize the land sacrificed to production when using trap cropping.
- About 10% of the total crop area is planted with trap crop, although the percentage of trap crop needed for each particular system has to be determined for each case.
- Cultural control methods can also be used to increase the effectiveness of trap crops

- Host utilization by most insect herbivores, particularly specialists, is consistent with the resource concentration hypothesis in that they are more likely to find and remain in hosts that are concentrated.
- Plant breeding can be used to develop trap crop cultivars with enhanced attractiveness to the insect pest and / or low larval survival, such as glossy wax trait.
- **Factor Determining the Success of Trap Cropping Systems**
- The potential success of trap cropping system depends on the interaction of the characteristics of the trap crop and its deployment with the ecology and behavior of the targeted insect pest.
- The combination of insect and trap crop characteristics and practical considerations determines the success of trap cropping system.
- The most important characteristics of insects to be managed by trap crops are the insect stage targeted by the trap crop, insect's ability to direct its movement, its migratory behavior and its host-finding behavior.
- Low proportion of trap crop in a field may not be sufficient to reduce pest populations significantly, even if the trap crop is highly attractive and results in insect arrestment.
- **Advantages of Trap Cropping:**
- Reduces the use of pesticide.
- Lower cultivation cost.
- Conservation of indigenous natural enemies.
- Improvement of the crop's quality and quantity.
- Conservation of soil and environment**.**
- **Limitations of Trap Cropping**
- A limited number of cases of trap crops are implemented at the commercial level vary with the crop system and insect pest.
- In many cases, crops are attacked by a complex of insect pest and because trap crops tend to be relatively species specific makes them less practiced compared with other alternatives IPM strategies.
- Agronomic and logistical considerations associated with implementing trap crops.
- The success of trap cropping systems is highly variable often increasing the risk of economic loss of the grower.
- Trap cropping is knowledge-intensive and demands information on the temporal and spatial attractiveness of potential trap crops to maximize their effectiveness

Conclusion:

Successful implementation of trap cropping has provided sustainable and long term management solutions to control difficult pests. Successes have been achieved in both developed and developing countries. With the advent of biotechnology, new opportunities for trap cropping have arisen. Traditional trap cropping methods, such as the use of mustard to manage the DBM in cabbage and the use of marigold to manage *H. armigera* in tomato are likely to be implemented at the commercial level. To develop trap cropping to its full potential, however requires a multifaceted approach involving research and extension.

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