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Trap Cropping – An Innovative Practices for Managing Insect Pests Damage

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Insect pests are major constraints in crop production. Managing pests without chemical pesticides requires innovative practices. One such innovative practice is growing trap crops. The concept of trap cropping fits into the ecological framework of habitat manipulation of an agro-ecosystem for the purpose of pest management. Trap cropping generally involves early planting of border strips of a particular crop to attract insects where they may be destroyed by insecticides. It also has a tremendous potential to control other crop pests. It can minimize the use of insecticides and can be integrated with other IPM tactics. The reduction in insecticides will result in less disruption to the environment and to associated beneficial organisms in cropping systems.

Introduction

Trap crop is a crop which attracts pests more than the main crop. It can be planted along with the main cash crop to protect it from a specific pest or several pests by attracting them for feeding, breeding and survival. These crops are generally planted along the main crop as intercropping, as border or in strips. Trap cropping is the planting of a trap crop to protect the main cash crop from a certain pest or several pests. The principle of trap crop relies on pest preference for certain crops or stages of crop growth. These crops can be planted around the circumference of the field to be protected, or interspersed among them. The crop can be from the same or different family group, than that of the main crop, as long as it is more attractive to the pest.

Two preliminary techniques used in trap crops are:

- Selection of more preferred species
- Planting of the same crop before the main crop so that preferred stage of the development will arrive earlier than the main crop

Trap crop layout

- Around the circumference of the field to be protected
- Adjacent to the main crop
- Interspersed within the main crop e.g. planted every tenth row.

Trap crops are generally planted at a key time in the pest's lifecycle, and then destroyed before that life cycle finishes and the pest transfers from the trap plants to the main crop.

When considering trap crops

- Choose crops with rapid growth
- Proportion of land need for trap crops ranges from 10–20%
- Plant early and in dense rows
- Choose a simple design that is easy to manage

Modalities of trap cropping

I) Modalities Based on the Trap Crop Plant Characteristics

a) Conventional trap crop: It is most common practice. These plants are preferred fro oviposition. Growing of trap crops next to the main crops.

Ex: Castor and marigold in Ground nut crop and Alfalfa as a trap crop for Lygus bugs in Cotton.

b) Dead end trap cropping: Trap crops which are highly attractive to insects but they or their offsprings can't survive. Such crops serve as a sink for pests, preventing their movement from the trap crop to the main crop

Ex: Indian mustered for Cabbage diamond back moth.

Sun hemp for bean pod borer

c) Genetically modified trap cropping: Crops are genetically modified to attract pests. This modality of trap cropping may not be considered unique in and of itself because it can produce plant characteristics that fit other modality. However, because of it present importance and growing potential, we believe it bear special consideration.

Ex. Genetically engineered Potato for colerado Potato beetle

II) Modalities Based on the Deployment of the Trap Crop

a) Perimeter trap cropping: Growing trap crops 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.

Ex. Borders of early-planted potatoes have been used as a trap crop for Colorado potato beetle, which moves to potato fields from overwintering sites next to the crop, becoming concentrated in the outer rows, where it can be treated with insecticides, cultural practices.

b) Sequential trap cropping: Growing trap crops earlier or later than the main crop to attract the 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.

Ex. Indian mustard as a trap crop for diamnon back month in Cabbage

c) Multiple trap cropping: Planting of several species simultaneously as trap crops for attracting pests 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. use of a mixture of castor, millet, and soybean to control Groundnut leaf miner and the use of corn and potato plants combined as a trap crop to control wireworms in sweet potato fields.

d) Push – Pull trap cropping: The pushpull 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.

Ex. Marigold and Onion in Chillies

Additional Trap Cropping Modalities:

a) 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.

b) Semiochemically Assisted Trap Cropping: They are either trap crops whose attractiveness is enhanced by the application of semiochemicals or regular crops that can act as trap crops after the application of semiochemicals.

Tips for successful trap cropping:

- Select a trap crop that is more attractive to pest than the main crop
- Monitor trap crops regularly
- Immediately destroy the eggs that are found on the trap crop

Some of the examples of trap cropping practices are listed below:

S.No.	Main crop	Trap crop	Method of planting	Pest controlled
Pulses				
1.	Red gram	Soybean / Green gram	Border crop	Thrips
2.	Bengal gram	Marigold	Intercrop	*Heliotis sp.*
3.	Cowpea	Cotton	Row intercrop in every 5 rows of cotton	*Heliotis sp.*
4.	Soybean	Corn	Row intercrop	*Heliotis sp.*
5.	Beans	Soybean	Row intercrop	Mexican bean beetle
6.	Chick pea	Cotton	Block trap crop at 20 plants/ sq m	*Heliotis sp.*
7.	Beans and other legumes	Corn	Row intercrop	Leaf hopper, Leaf beetles, Stalk borer Fall armyworm
Oil seeds				
8.	Sunflower	Cotton	Row intercrop in every 5 rows of cotton	*Heliotis sp.*
		Marigold	Intercrop	*Heliotis sp.*
		Castor	Border crop	Tobacco caterpillar
9.	Groundnut	Cowpea	Intercrop	Leaf folder
		Castor	Border crop	Tobacco caterpillar
10.	Castor	Cotton	Border crop	*Heliotis sp.*
11.	Mustard	Cabbage	Strip intercrop in between cabbage plots	Cabbage head caterpillar
Fibre crops				
.	Cotton	Marigold	Intercrop	*Heliotis sp.*
		Alfa alfa	Strip Intercrop	Laygus bug
		Castor	Border crop	*Heliotis sp.*
		Sunflower / Tobacco	Border crop	*Heliotis sp.*
12.		Cowpea	1 rows intercrop, planted in every 5 rows of cotton	*Heliotis sp.*
		Chick pea	Intercrop	*Heliotis sp.* (Caterpiller)
		Corn	1 rows intercrop, planted in every 20 rows of cotton	*Heliotis sp.*
Horticulture crop				
Vegetables				
13.	Tomato	Cabbage	Intercrop (Tomato is planted 2 weeks ahead at the plots' borders)	Diamondback moth
		Marigold	2 rows planted in every 14 rows of Tomato	Tomato fruit borer and Root knot nematodes
14.	Brinjal	Coriander/ Fennel	1 rows planted in every 2,rows of Brinjal	Shoot and Fruit borer
15.	Okra	Cotton	Border crop	Flower cotton weevil

Cole crops				
16..	Cabbage	Radish	Planted in every 15 rows of cabbage	Flee beetle
		Indian Mustard	2 rows planted in every 25 rows of cabbage	Diamondback moth
		Nasturtium	Row intercrop	Aphids, Flea beetle, Cucumber beetle
		Sesamum	Border crop	Diamond back moth
17.	Cauliflower	Sesamum	Border crop	Diamond back moth
Root and tuber vegetables				
18.	Radish	Cabbage family	Row intercrop	Flea beetle Root maggot
19..	Carrot	Onion and garlic	Border crop	Carrot fly
20..	Potato	Marigold	Intercrop	Nematodes
21.	Potato	Horse radish	Intercrop	Colorado potato beetle
Bulb vegetables				
22.	Onion	Carrot	Border crops or barrier crops in between plots	Carrot root fly Thrips
Spice crop				
23.	Garlic	Carrot	Border crops or barrier crops in between plots	Carrot root fly Thrips
		Marigold	Border crop	Thrips

Advantages of trap cropping- Trap cropping is economical and environmental benefits are often associated with this strategy.

- Lowers the pesticide cost
- Conserves or attracts natural enemies.
- Improves the crop's quality.
- Helps conserve the soil and the environment.
- Increase productivity.
- Enhance biodiversity.
- Reduces pest incidence to manageable levels.
- Reduces over use of insecticides.
- Requires no investment in large equipment

Conclusion

The insect stage to be controlled by the trap crop is of critical importance in designing an effective trap crop strategy. In general, the attractiveness of the trap crop and the proportion of trap crops in the field are important factors in the arrestment of the insect and in the success of a trap cropping system. In situations in which trap cropping has been successfully implemented, it has provided sustainable and long-term management solutions to control difficult pests. With the advent of biotechnology, new opportunities for trap cropping have arisen (e.g. Bt potatoes). Organic growers and those farmers interested in biologically based pest management shown increased interest in trap cropping.To develop trap cropping to its full potential, however requires a multifaceted approach involving research and extension.