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Trap Cropping- A Valuable Pest Management Technique

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Insect pests are one of the major limiting factors in crop production crops are affected by many species of chewing insect pests like caterpillars and sucking insect pests in mid to late-season. Sucking insect pests have needle-like mouthparts that penetrate the skin of fruits and inject toxic saliva resulting in off-colored and off-flavored fruits. Trap cropping has indicated benefits in terms of economic returns on an average of 10-30 per cent increase in net profits mainly resulting from reduced insecticide use and pest attack. It is a useful strategy in managing several pests in various cropping systems.

Introduction

Trap crops have been defined as "plant stands grown to attract insects or other organisms like nematodes to protect target crops from pest attack, preventing the pests from reaching the crop or concentrating them in a certain part of the field where they can be economically destroyed".

Trap crops are plants grown to attract insects or other pests that destroy the main crops. Trap crops can be planted around the circumference of the field to be protected, or interspersed among them. The trap crop can be from the same or different family group.

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

- Improves the crop's quality.
- Helps conserve the soil and the environment.
- Increase productivity.
- Enhance biodiversity.
- Conserves or attracts natural enemies.
- Reduces pest incidence to manageable levels.
- Reduces over use of insecticides.

Disadvantages

- Growers need knowledge of insect behavior and migration.
- Need for additional planning such as early planting and resources like land, labour, capital, seeds.
- Insecticides may still be needed.
- Timely management.

Types of trap crops- Trap crops can be classified based on spatial distribution and characteristics of trap crops.

A. Based on characteristics of trap crop-

1. **Conventional trap crop-** It is most common practice. Growing of trap crops next to a higher value crop is naturally more attractive to a pest as either a food source or oviposition site than is 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. Ex: Castor and Marigold in Ground nut crop, Alfalfa as a trap crop for Lygus bugs in Cotton.
2. **Dead end Trap cropping-** Trap crops which are highly attractive to insects but they or their offspring's can't survive. Dead-end trap crops serve as a sink for pests, preventing their movement from the trap crop to the main crop later in the season Ex: Indian mustered for Cabbage diamond back moth, Sun hemp for Bean pod borer.
3. **Genetically modified trap cropping-** Crops are genetically modified (i.e., the deliberate manipulation of genes through the use of biotechnology) to attract pests. Ex. Genetically engineered (Bt.) Potato for Colerado Potato beetle.

B. Based on spatial distribution-

1. **Perimeter trap cropping-** Growing trap crops around the borders of the main crop. For example 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.
2. **Sequential trap cropping-** Growing trap crops earlier or later than the main crop to attract the pest. **Ex.** Indian mustard as a trap crop for diamond back month in Cabbage.
3. **Multiple trap cropping-** Planting of several 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 for attracting pests. For 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.
4. **Push – Pull trap cropping-** Growing combination of trap crop and repellent crops. The trap crop attracts the insect pest and, combined with the repellent intercrop, diverts the insect pest away from the main crop. **Ex.** Marigold and Onion in Chilli. A push-pull strategy based on using either Napier or Sudan grass as a trap crop planted around the main crop, and either Desmodium or Molasses grass planted within the field as a repellent intercrop, has greatly increased the effectiveness of trap cropping for stem borers.

System of planting some trap crop: - Ex.

- Planting Indian mustard as a trap crop for management of Diamond Back Moth**.** Sowing of two rows of bold seeded Mustard in every 25 rows of Cauliflower/Cabbage.
- Planting Cow pea as intercrop for management of *Heliothis sp.* Sowing of one rows of Cow pea in every 5 rows of cotton.
- Planting Tobacco as trap crop for management of *Heliothis sp.* Sowing of two rows of Tobacco in every 20 rows of Cotton.
- Planting African marigold as trap crop for management of Fruit borer. Sowing of two rows of marigold in every 14 rows of Tomato.
- Planting Coriander or Fenugreek as trap crop for management of shoot and fruit borer. Sowing of one rows of Coriander or Fenugreek in every two rows of Brinjal.
- Planting Coriander or Marigold as a trap crop for management of Gram pod borer**.** Sowing of one rows of Coriander or Marigold in every 4 rows of Gram.
- Planting Corn as trap crop for management of *Heliothis sp.* Sowing of two rows of Tobacco in every 20 rows of Cotton.

Some examples of trap crops using in main crops

S.N.	Main crop	Trap crop	Method of planting	Controlled pest
Horticultural crops				
1	Cabbage	Raddish	Planted in every 15 rows of cabbage	Flee beetle
2	Cabbage	Indian Mustard	2 rows planted in every 25 rows of cabbage	Diamond back moth
3	Cabbage	Nasturtium	Row intercrop	Aphids, Flea beetle, Cucumber beetle
4	Garlic	Marigold	Border crop	Thrips
5	Carrot	Onion and garlic	Border crop	Carrot fly
6	Tomato	Marigold	2 rows planted in every 14 rows of Tomato	Tomato fruit borer and Root knot nematodes
7	Field beans	Chrysanthamum	Border crop	Leaf minor
8	Cauliflower /Cabbage	Sesamum	Border crop	Diamond back moth
9	Potato	Marigold	Intercrop	Nematodes
10	Potato	Horse radish	Intercrop	Colorado potato beetle
11	Brinjal	Coriander/ Fennel	1 rows planted in every 2,rows of Brinjal	Shoot and Fruit borer
Agronomical crop				
1	Sun flower	Mari gold	Intercrop	*Heliothis sp.*
2	Sun flower	Castor	Border crop	Tobbacco catter pillar
3	Cotton	Marigold	Intercrop	*Heliothis sp.*
4	Ground nut	Cow pea	Intercrop	Leaf folder
5	Red gram	Soya bean/ Green gram	Border crop	Thrips
6	Bengalgram	Marigold	Intercrop	*Heliothis sp.*
7	Cotton	Alfa alfa	Strip intercrop	Laygus bug
8	Cotton	Castor	Border crop	*Heliothis sp.*
9	Cotton	Sunflower/ Tobacco	Border crop	*Heliothis sp.*
10	Cotton	Cow pea	1 rows intercrop, planted in every 5 rows of cotton	*Heliothis sp.*
11	Cotton	Chick pea	Intercrop	*Heliothis sp.*(Catter pillar)
12	Cotton	Corn	1 rows intercrop, planted in every 20 rows of cotton	*Heliothis sp.*
13	Corn	Beans and other legumes	Row intercrop	Leaf hopper, Leaf beetles, Stalk borer
14	Arhar	Sorghum/Maize/ Marigold	Row intercrop	Gram catterpillar
15	Soybean	Green beans	Row intercrop	Mexican bean beetle
16	Soybean	Sunflower/Castor	Border crop	Tobbacco catter pillar
17	Corn	Napier grass/ Sudan grass	Intercrop, border crop	Stem borer
18	Corn	Desmodium	Row intercrop	Stem borer
19	Cotton	Okra	Border crop	Bollworms
20	Groundnut	Castor/ Sunflower	Intercrop	Leaf eating caterpillar, Leaf minor

Tips for successful trap cropping

- Make a farm plan. This will guide you on where the trap crops are to be sown or planted.
- Learn to know and identify the pests.
- Select a trap crop that is more attractive to the pest than the main crop. Ask for assistance from your local agriculturist.
- Monitor your plants regularly.
- Immediately control the pests that are found in the trap crop. Prune or remove the trap crops once the pest population is high, otherwise they will serve as the breeding ground and the pests will attack the rest of your farm.
- Be ready to sacrifice your trap crop as an early crop and destroy them once pest infestation is high.

Conclusion

The most important insect characteristics that determine whether an insect may be subject to management by trap crops are the insect stage targeted by the trap crop and the insect's ability to direct its movement, its migratory behavior and its host-finding behavior. 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. Successes have occurred in both developed (e.g., Lygus bugs on cotton) and developing countries (e.g., use of push-pull trap cropping to control stem borers in corn).With the advent of biotechnology, new opportunities for trap cropping have arisen, as illustrated by the examples of Bt potatoes.

Organic growers and those farmers interested in biologically based pest management programs have especially shown increased interest in trap cropping, as have nongovernmental organizations and other educational organizations working in developing countries where access to effective insecticides is limited. In my opinion, trap cropping will be greatly enhanced if farmers, scientists, and extension educators expand their concepts of trap cropping to include the diverse modalities we highlight in this chapter.