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# Pest Damage Effects: Evaluating the Benefits of Perimeter Trap Cropping and Row Intercropping

## **Abstract**

Trap cropping is the planting of a trap crop to protect the main crop from a pest, by having the trap crop appear more attractive to the pest than the main crop. There are two forms of trap cropping; perimeter trap cropping (PTC), also known as border trap cropping, and row intercropping. Perimeter trap crops completely surround the main crop, preventing an attack from any direction. Row intercrops are planted in alternating rows with the main crop. While PTC and row intercropping can be useful methods in pest control, they may not alleviate a problem completely, but provide a sustainable way to monitor and control target pests.

## **Keywords**

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## **Disciplines**

Agricultural Science | Agriculture

# Pest Damage Effects: Evaluating the Benefits of Perimeter Trap Cropping and Row Intercropping

## RFR-A1092

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### Introduction

Trap cropping is the planting of a trap crop to protect the main crop from a pest, by having the trap crop appear more attractive to the pest than the main crop. There are two forms of trap cropping; perimeter trap cropping (PTC), also known as border trap cropping, and row intercropping. Perimeter trap crops completely surround the main crop, preventing an attack from any direction. Row intercrops are planted in alternating rows with the main crop. While PTC and row intercropping can be useful methods in pest control, they may not alleviate a problem completely, but provide a sustainable way to monitor and control target pests.

The objectives of this study were to evaluate the performance of PTC and row intercropping methods using selected companion plants, determining which method(s) provided the best protection against common *Brassica* and *Solanaceae* pests via trap cropping, and biochemical pest suppression.

### Materials and Methods

Five vegetable species: broccoli, *Packman Hybrid*; cauliflower, *Snow Crown Hybrid*; cabbage, *Stonehead Hybrid*; lettuce, *Buttercrunch* and *Summer Glory Blend*; tomato, *Celebrity*; and five companion plant species: peppermint, anise (hyssop), marigold, basil, and thyme were evaluated according to their performance in PTC and row intercropping. The companion plant species were chosen based on their performance the

previous year in addition to recommendations from compiled resources. The vegetables and the companion plants were seeded in the greenhouse on March 16.

The specimens were transplanted outdoors on May 21 and 22. The five vegetable species were planted at random in two replications, the first replication used PTC and the second used row intercropping. Each consisted of six 3 × 5 ft blocks—one block for each companion plant selection in addition to control blocks for both replications. Irrigation was by hand application. Tomato plants were staked prior to bloom. On July 26, the more heat tolerant lettuce variety, *Summer Glory Blend*, was planted.

Vegetable plants were evaluated according to the presence of insect damage on leaves, flowers, and fruit; the presence of frass on the cole crops; and the existence of pest(s). Insecticides or pesticides were not used to control pest outbreaks.

### Discussion and Results

Similar to the wet season experienced the previous year, the 2010 growing season was unseasonably wet. Rainfall totals for the months of June, July, and August exceeded 19 in.—nearly 8 in. fell in June alone. Unlike the mild temperatures seen the previous year, the 2010 growing season was warm. Average high temperatures ranged above 80°F for the months of June, July, and August. Average soil temperatures were above normal early in the growing season, ranging from 72–78°F for the months of June, July, and August. As a result, the high rainfall amounts and high temperatures made a favorable environment and there was an increase in pathogens and pests including but not limited to bacterial

spot, anthracnose, and septoria leaf spot on tomato.

Cabbage looper and cabbage worm damage to broccoli stayed relatively low until the week of June 25 to July 1, when average soil temperatures were above 75°F. The highest damage appeared in the control blocks, followed by the PTC blocks of basil and peppermint, and the row intercrop block of basil with greater than 50 percent damage. In the following weeks, pest damage rose to nearly 90 to 100 percent damage in the control and PTC of basil. The best control measures for insect damage were found with PTC of marigold and thyme with only 20 percent damage found, followed by the row intercrops of hyssop, thyme, and marigold that had 30 to 35 percent pest damage.

First sign of moderate cabbage worm damage to cauliflower was found in the control plots and both basil plots of PTC and row intercropping. In the following weeks, both control and basil replications showed over 80 percent damage from leaf defoliation, indication of frass, and the presence of cabbage worms. Damage from cabbage worm in both the PTC and the row intercrop blocks of peppermint leveled out after the first week, resulting in 60–65 percent damage. Row intercropping with marigold had slightly higher pest damage than PTC, with the most prevalent damage located on the plants without a marigold barrier. Row intercropping with thyme and hyssop proved to be the best control measure for cabbage worm damage to cauliflower with 40 percent damage or less; PTC of these two companion plants closely followed.

Cabbage worm damage in cabbage first appeared in the fourth week, with leaf defoliation and frass in the control and the row intercropped block of basil. The following

week, cabbage worm damage increased to over 80 percent in the control plots, and 100 percent damage to the row intercrop block of basil. Row intercropping blocks of hyssop, thyme, peppermint, and marigold and the PTC block of thyme exhibited the best resistance to cabbage worm, with only 10 to 15 percent damage recorded in the fourth week of production, increasing to 40 to 50 percent damage in the final week.

Damage to lettuce occurred most heavily in the control plots, with two thirds of the plants missing due to rabbit feeding. One-third rabbit damage occurred in the row intercropping block of thyme. Perimeter trap cropping treatments showed no sign of rabbit damage; however, in both PTC and row intercropping blocks of peppermint, the second planting of lettuce was choked out due to the peppermint's invasiveness.

Increased rainfall and high temperatures proved beneficial for anthracnose, bacteria spot, and septoria leaf spot, resulting in low tomato yields. Of the blocks that were PTC, peppermint and the control blocks demonstrated the lowest marketable yield. In comparison, PTC and row intercropping with marigold proved to have the highest marketable yield of tomato, followed by PTC and row intercropping with basil, and row intercropping with thyme. During the fourth week of production, there were noticeable signs that basil was enhancing the overall growth of the tomato plants in both the PTC and row intercropped blocks.

### **Conclusions**

Although basil may have enhanced the growth of the tomato plants, basil was found not to be a good companion for the crops of broccoli or cauliflower; however, PTC of basil seemed to be beneficial for cabbage, by providing shade to the heads and extending the cabbage harvest period by three weeks. Peppermint

was beneficial in aiding resistance of pest damage to cabbage, cauliflower, and broccoli; however, the invasiveness of peppermint seemed to outweigh the pest issues. Row intercropping with hyssop, peppermint, marigold, and thyme showed better resistance of pest damage to cabbage than PTC with the same companion crops. Likewise, row intercropping of hyssop and thyme showed a much higher resistance of pest damage to cauliflower. In contrast, PTC of marigold and thyme was more advantageous than row

intercropping with marigold or thyme. Row intercropping with hyssop and thyme closely followed. Finally, the control plots that were not companion cropped showed some of the highest amount of damage, either from cabbage worms, cabbage loopers, rabbits, or foliar diseases.

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