

Relay cropping: a management tool for the cabbage maggot (*Delia radicum*)



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Introduction

Relay cropping

- A term used to describe the growing of two or more crops on the same land with the two crops overlapping in space and time for a short period. This process increases the diversity of the agro-ecosystem.

Pest management benefits of diversification

- The greater the diversity of an agro-ecosystem the more likely it will:
 - 1) Harbor beneficials that prey upon pest species (Root 1973)
 - 2) Contain plants that physically or chemically repel insects (Finch & Collier 2000)
 - 3) Disrupt movement of herbivores or their search for target plants (Root 1973, Vandermeer 1989, Finch & Collier 2000)

Relay cropping & the cabbage maggot

- The cabbage maggot, *Delia radicum* L. (Diptera: Anthomyiidae) is a root feeding pest of brassicaceous crops and often a challenge to manage in both conventional and organic production systems.
- The 'appropriate/inappropriate landings' theory helps to explain why *D. radicum* egg-laying is disrupted when brassicas are grown in non-host plant backgrounds (Finch & Collier 2000).

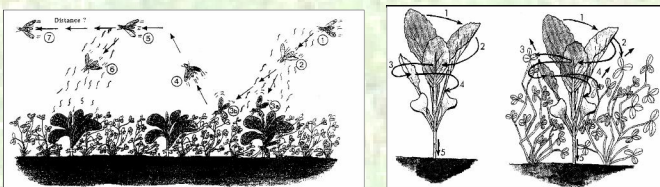


Fig. 1. Illustration of 'appropriate/inappropriate landings' theory (Finch & Collier 2000).

- Sequence of host-finding behaviour: female (♀) attracted by odour, ♀ unable to visually distinguish green host from green non-host and lands on plant at random (3a or 3b). If she lands on non-host (inappropriate landing), she leaves area.
- Sequence of host-acceptance: if ♀ lands on host-plant (appropriate landing), she makes a series of short spiral flights accumulating chemical stimuli by touch. If she contacts the host an average of 4 times, she will be induced to proceed to the soil and lay eggs. If she contacts a non-host during these spiral flights, she reverts to host finding and may leave the area.

Objectives

To assess relay cropping as a management tool through investigation of the effect of relay cropping cauliflower with lettuce on *D. radicum* egg-laying and on cauliflower yield.

Materials and Methods

- Experiments were conducted in St. John's, NL during the summers of 2003 and 2004 and set up as randomized complete blocks with four blocks. Treatments included cauliflower (var. Fremont) grown in bare ground and cauliflower relay cropped with lettuce (var. Belowa).

- Data collection included sampling 10 cauliflower plants/plot for first generation *D. radicum* eggs over three sampling dates in 2003 and five dates in 2004. Ten randomly selected cauliflower plants/plot were harvested to determine above ground weights, trimmed curd weights and curd diameters.

- Data were analysed using the general and generalized linear models within SAS[®] statistical software.

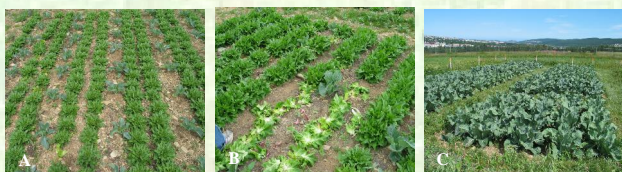


Fig. 2. Relay cropping trial, Agriculture & Agri-Food Canada, St. John's, NL. A) Cauliflower relay cropped with lettuce B) Lettuce harvest, July 16, 2004. C) One week before cauliflower harvest, Aug 14, 2003.

Results

- On each sampling date there were fewer *D. radicum* eggs laid around the base of the cauliflower when relay cropped with lettuce as compared to cauliflower in bare ground (Fig. 3).
- There were fewer eggs laid in 2003 than in 2004 (Fig. 3).

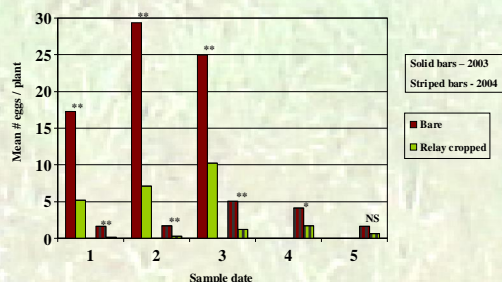


Fig. 3. Effect of relay cropping cauliflower with lettuce on the mean numbers of eggs laid by *D. radicum* on five sample dates. (**, *, NS - significant at $p < 0.001$, $p < 0.05$ and not significant respectively)

Results

- Relay cropping reduced the above ground weight of the cauliflower as compared to bare ground in 2003. There was no reduction in the trimmed curd weight or the curd diameter in 2003 or 2004 (Fig. 4).

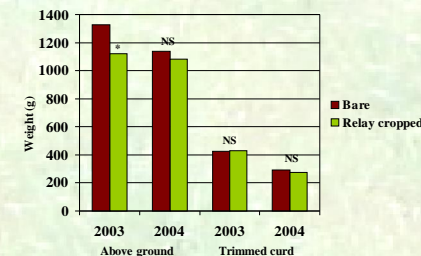


Fig. 4. Effect of relay cropping cauliflower with lettuce on the above ground and the trimmed curd weights of cauliflower in 2003 and 2004. (*, NS - significant at $p < 0.001$ and not significant respectively)

Discussion

Using alternative cropping systems to current bare ground monocultures may aid organic growers with pest management issues. Relay cropping cauliflower with lettuce demonstrated the ability of a non-host plant to disrupt female cabbage maggot flies from finding the cauliflower and resulted in fewer eggs laid. Removing the lettuce after co-existing in the field with the cauliflower for four weeks minimized the time competing for light, water, nutrients etc. and translated into acceptable yields in both treatments. Relay cropping provided an acceptable level of cabbage maggot control and produced a second marketable crop off of the same land. Although further research into other crop combinations and potential effects on other pests and predators and parasitoids is needed, relay cropping could provide the organic grower with a feasible method of managing the cabbage maggot.

References

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