

Agro-ecosystem Diversification and the Cabbage Maggot (*Delia radicum*)

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Introduction

Agro-ecosystem diversification

- This term implies creating a diverse agro-ecosystem. This can be achieved through the use of different cropping strategies including intercropping, undersowing, weedy culture, relay cropping, living mulches and is an alternative to bare ground monocultures.

Pest management benefits of diversification

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

Agro-ecosystem diversification & 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-plant backgrounds (Finch & Collier 2000).

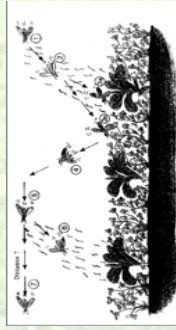


Fig.1. Illustration of the 'appropriate/inappropriate landings' theory and the sequence of host-finding behaviour of the female fly (Finch & Collier 2000).

Objectives

To assess agro-ecosystem diversification as a management tool for the cabbage maggot through:

- Investigation of the effect of undersowing cauliflower with winter wheat on *D. radicum* egg-laying and on cauliflower yield.
- Investigation of the effect of relay cropping cauliflower with lettuce on *D. radicum* egg-laying and on cauliflower yield.

Materials and Methods

- Two experiments, planted in randomized complete blocks with four blocks, were conducted in St. John's, NL in 2003. Treatments included bare ground controls and cauliflower (var. Fremont) either: 1) Undersown with winter wheat (var. AC Sampson) or 2) Relay cropped with lettuce (var. Belowa)
- Data collection included sampling 10-20 cauliflower plants/plot for first generation *D. radicum* eggs on June 22nd, 27th and July 3rd. Ten randomly selected cauliflower plants/plot were harvested on August 22nd to determine above ground weights, trimmed curd weights and curd diameters. Mid-season dry matter was also assessed on 10 randomly selected cauliflower plants/plot in the undersowing experiment.



Fig. 2. Field trials at Agriculture & Agri-Food Canada, St. John's, NL. A) Undersowing trial B) Relay cropping trial C) Cauliflower relay cropped with lettuce

Results

- Winter wheat exerted considerable competitive pressure on the cauliflower. Attempts to control competition via mowing and spring seeding the winter wheat still produced cauliflower yields that were significantly lower than bare ground controls (Table 1).
- In the relay cropping trial, lettuce and cauliflower were in the field together for only four weeks, thus minimizing competition. Although relay cropping reduced the above ground weight of the cauliflower as compared to bare ground, there was no reduction in the trimmed curd weight or the curd diameter (Table 1).

Experiment	Treatment	Above ground weight (g)	Trimmed curd weight (g)	Curd diameter (cm)
Undersowing	Bare	1374 +/- 57	490 +/- 28	13.2 +/- 0.33
	Undersown	295 +/- 18	98 +/- 14	7.75 +/- 0.21
Relay cropping	Bare	1327 +/- 45	424 +/- 28	12.8 +/- 0.28
	Relay cropped	1126 +/- 41	436 +/- 41	13.0 +/- 0.23
		p < 0.001	p = 0.684	p = 0.496

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).
- Undersowing cauliflower with winter wheat also reduced the numbers of *D. radicum* eggs laid (data not shown).

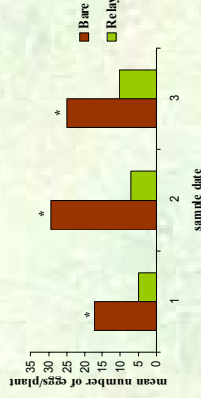


Fig. 3: Effect of relay cropping cauliflower with lettuce on first generation *Delia radicum* egg numbers. (* p < 0.001)

Discussion

- The use of agro-ecosystem diversification may play an important role in the management of certain insect pests. This research will continue to investigate relay cropping with different vegetable species for disruptive effects on egg-laying behaviour as well as ways to minimize competition without compromising the disruption to oviposition. In some cases intercropping can produce yield and pest management benefits (Theunissen 1994), but the economic and labour issues involved in large-scale intercropping remain to be solved.

References

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Acknowledgements

I would like to thank Janet Coombes and Heidi Fry for their support and technical assistance. This project is jointly funded by Natural Sciences & Engineering Research Council (NSERC), Agriculture & Agri-Food Canada and Memorial University of Newfoundland.

