

Fall Cultivation Trial 2003

Title: Efficacy of Cultivation Practice for Management of the Cabbage Root Fly, *Delia radicum* (L.) in Turnips and Rutabagas.

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Objective: To test the efficacy of fall cultivation practices to reduce the spring population of cabbage maggots (*Delia radicum* L., Diptera: Anthomyiidae)

Introduction:

Spring emergence of cabbage maggot populations (Diptera: Anthomyiidae, *Delia radicum* (L.)) can lead to severe maggot infestations throughout the year. Many growers disk their fields in the Fall in order to chop up the roots housing the pupae. Some growers plow the roots under, hoping that the flies can't emerge if they're buried deep enough. Others leave the disked roots on the surface, hoping that the larvae and pupae will dry out or be exposed to extreme weather, or exposed to natural enemies.

To test the efficacy of fall cultural practices for reducing fly emergence of overwintering pupae in the spring, we set up a three-treatment trial in a heavily-infested field of turnips and rutabagas (>50% damage). The dry fall weather allowed us to test the cultivation practice in the fall.

Methods:

The trial was conducted at the North Willamette Research and Extension Center in Aurora, Oregon. The trial took place in a fall-planted turnip and rutabaga field in 2002. Two rows of each bed were planted to rutabagas and the other two rows were planted to turnips. Plots measured 75 feet long by 5.5 feet wide.

To simulate the practice of leaving a fall crop in the ground until spring (because rain may prevent a grower from cleaning up the field in the fall), the turnip and rutabaga field was not harvested in the Fall plots,. This is a common practice in the Willamette Valley during years when the market value of turnips or rutabagas is low, or the weather gets too wet for cultivation.

The following treatments were included:

- 1. Untreated-** No action was taken. The live crop was left in the ground.
- 2. Double-disked-** The crop was chopped with two complete passes made by a disker. In this process, some roots were brought to the surface and others were buried at a shallow depth.
- 3. Double-disked and plowed –** The crop was chopped with two passes made by a disker. A plow was then used to bury the roots to a depth of approximately one foot. One pass was made by a roller to smooth and pack the soil.

Treatments were replicated 3 times and arranged in a randomized complete block design (Fig. 1). One set of emergence cages were placed in the centers of all plots, and a second set of emergence cages were placed 10 feet from the west border of all plots (Fig. 2). Emergence cages were checked weekly, and fly counts were recorded. All flies were removed weekly from the jars on top of the emergence cages.

Schedule:

- 10/14/02- Field cultivation performed
- 10/16/02- Emergence cages set up
- 10/21/02- Cultivated trials rolled (emergence cages removed for rolling, then replaced)
- 4/18/03- Field mowed, avoiding emergence cages
- 11/14/02-7/3/03- Fly emergence was monitored weekly using emergent cages over a period of 8 months.

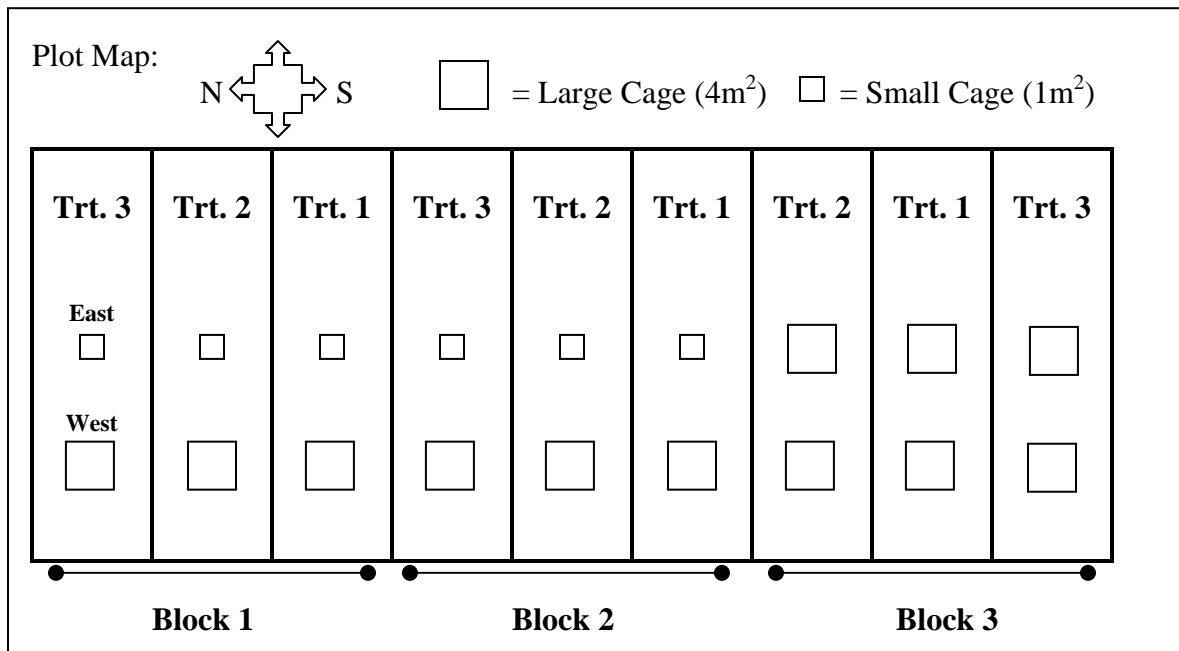


Figure 1: Field plot diagram.

Figure 2: Emergence cages are used to trap adult flies as they emerge from the soil. Flies are phototactic, and migrate upward towards the light. The flies are captured in a glass jar mounted on top of the structure and counted.



Results:

There were no significance differences in fly emergence between treatments. High variation in fly captures existed between replicates within each treatment. Variation in plots was higher among treatment one and two than among treatment three. Treatment two had extreme outliers in the block two east cages (Table 1, Fig. 3). When all block two (east cages) were removed from the data analysis, results showed significant differences between untreated and the plowed/disked cultivation practices (Fig. 4). No significant differences were seen between disking and deep-plowing/disking.

Treatment	Block	Rep	Flies
1	1	East	35
1	1	West	65
1	2	East	2
1	2	West	8
1	3	East	5
1	3	West	17
2	1	East	12
2	1	West	1
2	2	East	46
2	2	West	0
2	3	East	142
2	3	West	26
3	1	East	10
3	1	West	8
3	2	East	6
3	2	West	15
3	3	East	17
3	3	West	2

Table 1: Number of adult flies caught in jars of emergence cages.

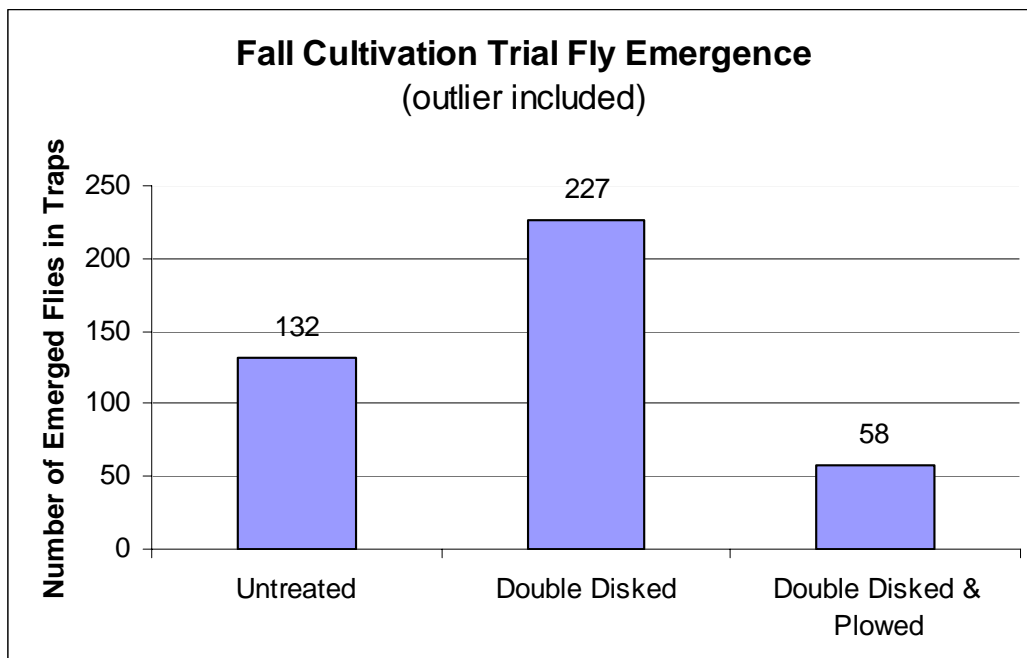


Figure 3: Total number of adult flies captured by treatment.

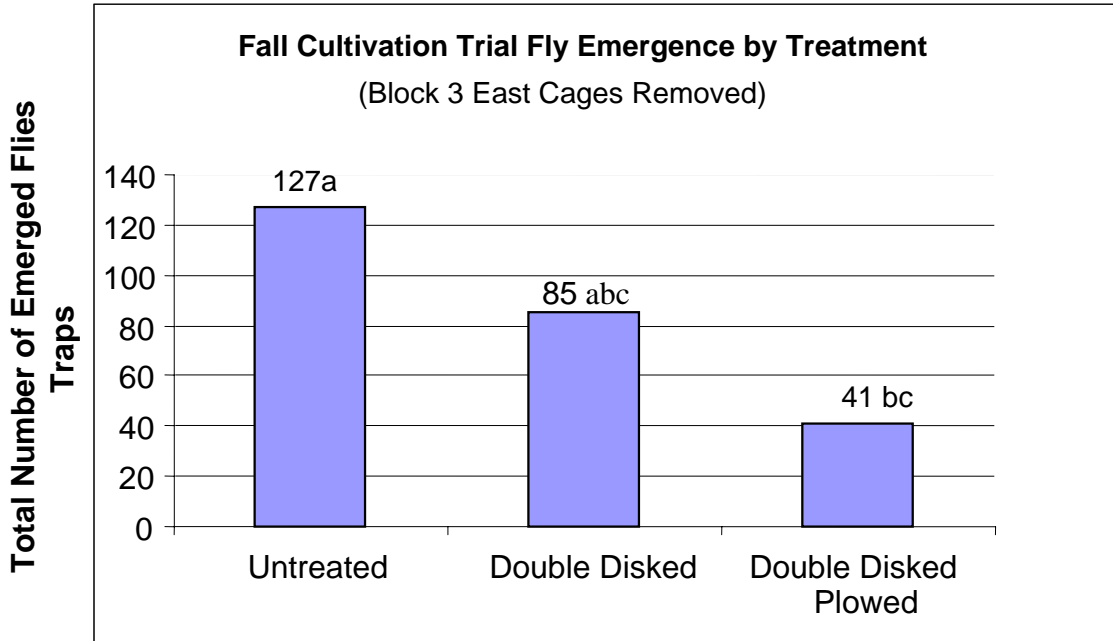


Figure 4: Total number of adult flies captured by treatment after block 2 east cages are removed.

Discussion:

A number of factors could have contributed to the high variation in fly catch in trial plots. The biggest factor was low number of emergence cages used, as there were only six emergence cages per treatment.

In addition, because roots were moved around during the disking and plowing process, the number of infested roots under each emergence cage most likely varied. In treatments one and two, we were able to see the number of roots included under each cage. In treatment three, however, the roots were underground and we were not certain how many roots were under each cage.

According to the literature and our preliminary results, plowing has potential to reduce cabbage maggot emergence. However, plowing is currently a subject of great controversy in agriculture, and maggot management is only one of many factors a grower must consider. Growers have traditionally embraced plowing as a means of weed control, soil aeration and leveling or “shaping” of the soil. Plowing is also a common practice for incorporating fertilizers and other amendments into the soil, managing crop residues, and reducing insect pests. (Phillips 1973; Phillips 1984). It would be important to plow, cultivate and/or somehow destroy infested turnips if *D. radicum* is in the larval stage in roots.

Today, many researchers argue that plowing is not necessary for effective agriculture. Furthermore, they assert that the costs outweigh the benefits. Negative effects of plowing include increased soil erosion and water runoff, reduced soil fertility, and increased outbreaks of some pests (Reicosky 1996; Durham 2003). Therefore plowing to control cabbage maggots may only be advisable when infestation levels are significant.

References:

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Analysis Variable : Flies

Treatment	N Obs	Median
1	5	17.000000
2	5	12.000000
3	5	8.000000