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# Effect of a Hay Mulch and of a Companionate Planting on Cabbage Pest Populations

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# EFFECT OF A HAY MULCH AND OF A COMPANIONATE PLANTING ON CABBAGE PEST POPULATIONS[1]

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ABSTRACT

Cabbage crop environments were modified by either use of a hay mulch or intercropping with "companionate" plants (nasturtium, thyme, and rosemary). A temporary reduction in egg and larval numbers of imported cabbageworm *(Artogeia rapae* L.) occurred on mulched plots. This effect disappeared later in the season as the plants grew large and covered the mulch. On some interplanted plots, temporary increases in cabbage looper (*Trichoplusia ni* Hübner) larvae and decreases in imported cabbageworm eggs were noted. However, on most dates, there was no effect of interplanting on pest populations. The general lack of effects on cabbage insect pests due to these cultural changes indicates that use of a mulch or interplanting cannot provide effective pest suppression under Minnesota conditions.

Selective changes in the diversity of the agro-ecosystem is generally recognized as a method to manage insect pests (Way 1966, van Emden and Williams 1974). Such changes may act directly on the pest by reducing the attractiveness of the crop to colonization. Indirect effects on pest populations can occur by modifying the environment so that the activity of natural enemies of the pest are increased.

In *Brassica* crops, predator activity has been shown to increase with the provision of shelter areas in the vicinity of the crop. Such shelter has been produced by planting the crop near neighboring vegetation (Root 1973), allowing weed growth to increase within the crop (Dempster 1969), and by undersowing a ground cover within the crop (Dempster and Coaker 1975). Unfortunately, these methods are not compatible with commercial operation because they either restrict the size of the planting or they compete with the crop and reduce yield. However, use of an organic mulch might provide the necessary quality of shelter within a planting, yet be feasibly employed in *Brassica* production. Such a mulch might also affect the crop background which can affect colonization by some pests (Smith 1969).

Reductions in *Brassica* pest populations are also purported from the pest-averting qualities of various "companionate" plants. Presumably, the effect of such plants employed about the crop is to either repel the pest from the crop or to concentrate the feeding of the pest on the companionate plant. Among the plants reported to affect populations of pest lepidopterans are nasturtium, *Tropaelum minus* L., thyme, *Thymus vulgaris* L., and rosemary, *Rosmarinus officinalis* L. However, recent studies have shown no protective effects resulting from companionate plantings of thyme and nasturtium (Dessell et al. 1975, Latheef and Irwin 1979) and trends of increasing pest problems with companionate plantings were indicated by Latheef and Irwin (1979). Rosemary has not previously been included in published companionate planting experiments. A study was undertaken in 1981 to investigate the uses of a hay mulch and of some companionate plants to favorably modify the crop environment for pest control of cabbage, *Brassica oleracea* var. *capitata* L., under Minnesota conditions.

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## MATERIALS AND METHODS

**Mulch planting.** 'Late Flat Dutch' cabbage was transplanted 2 June to 90-cm rows with a 60-cm in-row spacing at the Rosemount Agricultural Experiment Station, Dakota County, Minnesota. Plots were 5-row, 7.3 m in length, arranged in a randomized complete block design with four replications. On mulched plots, three bales of alfalfa hay/plot were laid between plants 8 July. Remaining plots were not mulched and served as controls. Six cabbage heads, two from each of the central three rows in a plot, were examined on four dates at which time were counted all eggs and larvae of the imported cabbageworm, *Artogeia rapae* L., and larvae of cabbage looper, *Trichoplusia ni* (Hübner).

**Companionate planting.** Plots to investigate the effects of companionate plants each consisted of three cabbage heads buffered with two untreated cabbage heads within a row and by two buffer rows between treated rows. Companionate plants were planted 12 June as seed (nasturtium) or as transplant seedlings (thyme, rosemary) at each corner of each treated plant. This resulted in a planting density (90 cm within row, 60 cm across row) similar to the close planting arrangement of Dessell et al. (1975). Check plots were arranged identically but without surrounding companionate plants. Experimental design was a 4 by 4 Latin Square. All plots were maintained weed-free by regular hoeing and counts of cabbage insects were made 3 and 27 August and 11 September.

## RESULTS AND DISCUSSION

**Mulch planting.** The hay mulch had little effect on pest insect populations (Table 1). Numbers of eggs and larvae of the imported cabbageworm were significantly lower on the first date, 3 August, but this difference did not continue on subsequent counting dates. Reductions in oviposition on the younger plants may have resulted from changes in the crop background produced by the mulch which made the crop less attractive to adults. Such effects would tend to lessen as the plants grew larger and increasingly obscure the mulch.

Cabbage looper populations were higher on mulched plots 11 September, but were not different from populations on control plots on earlier dates. The increase in cabbage

Table 1. Cabbage insect populations on plants as affected by the use of a hay mulch, Rosemount, Minnesota, 1981.

| Treatment | Date | Insects/24 heads (total 4 reps.)[a] | | |
|---|---|---|---|---|
| | | Imported cabbageworm eggs | Imported cabbageworm larvae | Cabbage looper larvae |
| Mulch | Aug 3 | 74 A | 31 A | 13 A |
| Check | | 132 B | 60 B | 27 A |
| Mulch | Aug 11 | 132 A | 234 A | 2 A |
| Check | | 148 A | 251 A | 3 A |
| Mulch | Aug 27 | 39 A | 302 A | 26 A |
| Check | | 41 A | 274 A | 33 A |
| Mulch | Sep 11 | 94 A | 83 A | 43 B |
| Check | | 55 A | 73 A | 19 A |

[a]For each date, numbers followed by the same letter are not significantly different (P = 0.05) by Duncan's MRT.

looper on the late date may have resulted from the plants becoming more attractive to the ovipositing females since the mulch would tend to provide cover and increased humidity about the plant.

The failure of the mulch to modify the crop environment to allow substantial increases in predation of pest species may have several bases. Dempster (1969) concluded that the carabid *Harpalus rufipes* was the primary species responsible for reducing imported cabbageworm numbers on weedy Brussels sprouts plantings. The species found most frequently in Minnesota cabbage fields, *Harpalus pennsylvanicus* DeGeer and *Pterostichus chalcites* Say (Weires 1972), may not similarly respond to cultural practices which increase shelter about the plants. In addition, cabbage may not be as readily searched by carabids as Brussels sprouts (Dempster 1969, Dempster and Coaker 1974) or collards (Root 1973) due to differences in growth habit or morphology of the crops.

**Companionate planting.** Use of companionate plants did not reduce pest populations on cabbage (Table 2), a result that has been similarly reported previously (Dessell et al. 1975, Latheef and Irwin 1979). Greatest effect on pest populations was a reduction of imported cabbageworm oviposition on cabbage plants surrounded by nasturtium. Nasturtium was the only companionate plant used in this study on which oviposition also occurred. However, there were no effects on imported cabbageworm larval populations from any of the companionate planting treatments. Trends of increasing imported cabbageworm infestation, such as were indicated by Latheef and Irwin (1979), were not noted in this study.

On some dates cabbage looper larvae were more numerous on cabbage plants surrounded by thyme and nasturtium. This may be due to microenvironment changes resulting from the denser crop canopy on plots with companionate interplantings. However, no consistent pattern of pest population shifts were observed on any interplanted plots suggesting that the cultural practice cannot effectively control cabbage insect pests in Minnesota.

Table 2. Cabbage insect populations on plants as affected by the use of interplanted companionate plants, Rosemount, Minnesota, 1981.

| Companionate planting | Date | Insects/12 heads (total 4 reps.)[a] | | |
|---|---|---|---|---|
| | | Imported cabbageworm eggs | Imported cabbageworm larvae | Cabbage looper larvae |
| Thyme | Aug 3 | 104 A | 38 A | 11 A |
| Nasturtium | | 63 A | 38 A | 7 A |
| Rosemary | | 91 A | 44 A | 10 A |
| Check | | 87 A | 47 A | 10 A |
| Thyme | Aug 27 | 6 AB | 175 A | 28 B |
| Nasturtium | | 4 A | 169 A | 32 B |
| Rosemary | | 18 AB | 180 A | 17 A |
| Check | | 23 B | 174 A | 19 A |
| Thyme | Sep 11 | 10 A | 32 A | 26 B |
| Nasturtium | | 15 A | 52 A | 22 AB |
| Rosemary | | 29 A | 44 A | 13 A |
| Check | | 45 A | 43 A | 13 A |

[a]For each date, numbers followed by the same letter are not significantly different (P = 0.05) by Duncan's MRT.

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