Phytosuppression of Scentless Chamomile (*Matricaria perforata* Merat) for Carrot Rotation

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Introduction

- Carrot is a slow-growing crop that suffers high yield losses from weed competition.
- Scentless chamomile (SC), is a very persistent problem in carrot fields in Nova Scotia.
- SC competes for nutrients, water, and sunlight with carrot plants.
- Weed control options are very limited in carrots and SC causes a problem because control by herbicides and cultivation is inadequate.
- Most of the common herbicides will not control this weed at crop tolerant rates.
- Prometryne, (Gesagard™), to some degree controls scentless chamomile (Yee et al. 1985).
- Prometryne is not licensed for use in carrots in the United States, but it is allowed for use in Canada.
- This creates problems in shipping carrots from Canada to the United States because of possible prometryne residues in the carrots.

Purpose

- To evaluate the ability of various crops to suppress SC
- To determine the effect of various crop population densities on suppression of SC.
- To test the hypothesis that a rotational crop(s) will suppress SC growth.

Materials and Methods

- The project was carried out in a greenhouse at the Nova Scotia Agricultural College, and was planted on the 30 April 2001.
- RCBD with four replicates.
- Treatments were: wheat (Triticum aestivum L.), barley (Hordeum vulgare L.), oats (Avena sativa L.), canola (Brassica rapa L.), soybean (Glycine max L.), alfalfa (Medicago sativa L.), sunflowers (Helianthus annuus L.), triticale (Triticosecale L.), and carrots along with SC in 15 cm diameter plastic pots.
- Crop populations were 3, 6, 9, and 12, along with SC thinned to a population of 9 plants/pot.
- Controls included SC growing without the crops and each crop growing in the absence of SC.
- Light intensity readings were taken using a photoradio meter, on 30 June 2001, and the plants were harvested on 7 July 2001.
- The biomass of SC and the biomass of the crop plants were weighted. The plants were dried, and dry weights were obtained using a balance.
- The analysis of the data was done with a factorial model, using a GLM procedure using SAS. The data was normally distributed when checked using Minitab.

Results

- The interaction between crops and crop densities, were marginally significant (P = 0.0858) for dry weight, as shown in Figure 1.
- Amongst all the crops, barley, canola, and triticale were the least effected by SC. No suppression of growth, due to the presence of SC was observed.
- Increasing population density altered the dry weight of the different crop species, significantly (P < 0.0001).

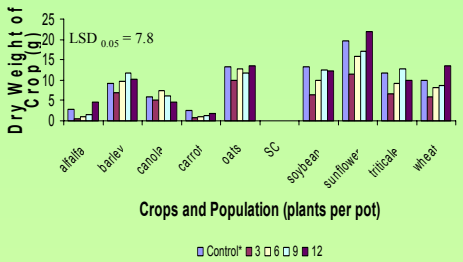

Figure 1. The Effect of Scentless Chamomile (SC) on the Dry Weight (g) of Different Crops at Different Populations.

- The interaction between crop species, crop densities on dry weight was insignificant (P = 0.3103).
- The main factor effect on crop species was significant (P < 0.0001). Amongst all the crops, barley was the most suppressive of SC growth. Suppression by barley was nearly 100%, as shown in Figure 2.

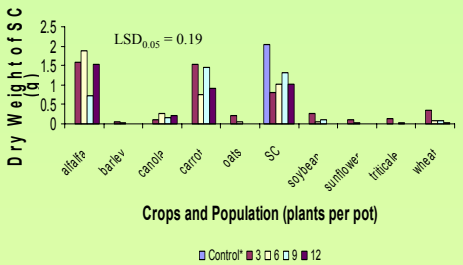

Figure 2. The Effect of Different Crops at Different Populations on the Dry Weight (g) of SC.

Discussion

- Amongst all the crops tested, sunflower and oats provided the greatest suppression of SC, while alfalfa provided the least suppression.
- Such a suppressive effect by sunflower (Figure 3.) and oats can be due to their smothering effect.
- Smother crops are the crops that compete for light, nutrients, and moisture with the weeds.
- Sunflower and oats have also been found to be superior weed suppressers due to allelopathic activities (Alteri and Liebman 1998). It is possible that the suppression of SC by sunflower and oats could be due to this possibility.

Figure 3. The Effect of Sunflowers on Scentless Chamomile.

- Crop density also played a major role in suppressing SC. Increasing crop densities of sunflower and oats would be expected to control SC through their smothering effects.
- The suppressive effects cannot be claimed to be due to competition for light, since the light interception measurement did not differ significantly among the crop species under various densities.
- The suppression of SC growth by sunflower and oats cannot also be ascribed to be entirely due to competition for nutrients since all of the plants were adequately supplied with nutrient solution every week.
- The light interaction between SC and the crops suggests that light was not the limiting factor in the growth of the crops. Visual observations suggest that a nutrient and water competition did not occur.
- The insignificant interaction between crop species, crop density suggests that light was not the main factor that SC and the crops are competing for. This explains why alfalfa and wheat, two competitive crops, did not suppress the growth of SC. However, SC did not effect the growth of these two crops.

Conclusion

- Oats and sunflower suppressed SC significantly and completely. Alfalfa was the least effective in suppressing SC.
- The crop densities suppressed SC growth differently and with most crops, the suppression was higher at high crop densities.
- The suppressive effects of oats and sunflower was not due to 1. Inhibition of SC seed germination, 2. Increased light interception of the crops, 3. Competition for nutrition, but perhaps due to allelopathic properties.

References

- Altieri, M.A. and Liebman, M. 1988. Weed management in agro ecosystems: ecological approaches. CRC Press Inc., Boca Raton Florida.
- Yee, D., Weinberger, P., and Khan, S.U. 1985. Release of Soil-Bound Prometryne Residues Under Different Soil pH and Nitrogen Fertilizer Regimes. Weed Sci. 33: Nov. 1985: 882-887.