Control of sclerotinia within carrot crops in NE Scotland: the effect of irrigation and compost application on sclerotia germination.

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Gordon Couper[a], Audrey Litterick[b] and Carlo Leifert[c]

[a]Aberdeen University Centre for Organic Agriculture, MacRobert Building, King Street, Aberdeen, AB24 5UA;
[b]Land Management Dept., SAC, Land Management Dept., Craibstone Estate, Bucksburn, Aberdeen, AB21 9YA;
[c]Tesco Centre for Organic Agriculture, King George VI Building, Newcastle University, Newcastle, NE1 7RU

Abstract
Carrots are susceptible to attack from *Sclerotinia sclerotiorum*. This pot study showed that irrigation encouraged, and compost inhibited carpogenic germination.

Introduction
Yield and quantity of conventional carrots produced in NE Scotland is often significantly reduced by sclerotinia (*Sclerotinia sclerotiorum*) infection of foliage and root. In this study, the effects of irrigation and compost on sclerotia germination are investigated.

Materials and Methods
Preparation: Twenty square, 10 litre pots, (surface area 300 x 300 mm), were filled with sieved topsoil, (sandy loam, pH 6.4, Dalcross, NH 3774 8511). Two rows of eight carrot seeds, (variety Nairobi) were sown in each pot, with spacing representative of a commercial drilling pattern, (34 mm between each carrot within a row, 150 mm between rows). Pots were inoculated with field-collected sclerotia (source; commercial carrot crop, medium sandy loam, pH 6.6, Mains of Ravensby, near Carnoustie, NO 3535 7353) at 55 sclerotia m^{-2}, giving five sclerotia per pot.

Treatments: **S** (sclerotia inoculation only); **NS** (no sclerotia); **C** (compost applied at 35 t ha^{-1}); **I** (soil was maintained at pot capacity by daily irrigation). Each treatment and control had five replicates and the pots were laid out in a randomised block design.

The compost was manufactured by TIO Ltd., according to the CMC process (Lubke, 1995), and was applied immediately before sowing and inoculation of sclerotia. It was mixed into the top 25 mm of soil. Irrigation began in the third week after planting and stopped in the eleventh week after planting.

Recording: The number and position of each germinated sclerotium and associated apothecia were recorded weekly.

Results and Discussion
During the first 8 weeks after inoculation, more sclerotia carpogenically germinated in the irrigation treatment (**I**) than in the positive control treatment (**S**), and more germinated in the positive control treatment (**S**) than in the compost treatment (**C**),(Figs. 1 & 2). In the compost treatment, germination peaked in week 12, and the other treatments peaked in week 6.

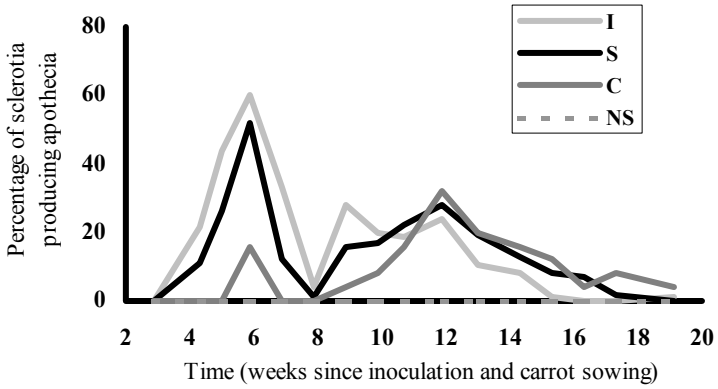

Fig. 1 The effect of irrigation and compost application on sclerotia germination with time.

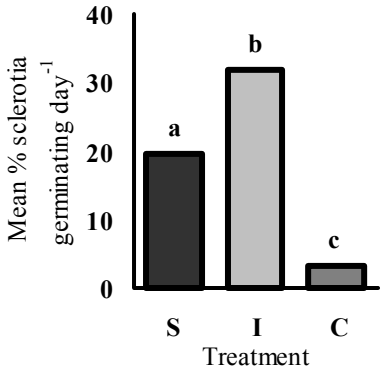

Fig. 2 The effect of irrigation and compost on sclerotia germination[1] in the first 8 weeks after inoculation.

[1]Means with different letters are significantly different (P≤0.05) according to Fisher's individual error rate test.

Regular irrigation to pot capacity resulted in greater volumes of moisture on the soil surface and higher relative humidity in the foliar canopy, compared to non-irrigated plots. These conditions are known to promote carpogenic germination (Abawi and Grogan, 1975). Application of compost affects the physical, chemical and biological composition of the soil. Compost increases the matric potential of the soil, creating a wetter environment for both crop and soil organisms including pathogens. Results from the irrigation treatment suggest that this may have led to increased germination. Compost also adds available nitrogen to the soil. This has been shown to increase subsequent sclerotinia infection of carrot foliage and root (G. Couper, unpublished data). However, in this experiment, addition of compost to soil resulted in significantly reduced carpogenic germination. The biological component of the compost may have been responsible for the inhibition of carpogenic germination. The germination peak in week 12 supports this hypothesis.

The microbial population profile of a freshly manufactured compost can change significantly after 8 weeks in a cool, agricultural soil (Lalande *et al*., 1998). In this study, the microbes present in the first 8 weeks after inoculation may have actively inhibited carpogenic germination, but as ambient soil conditions influenced the compost microflora over time, apothecia production was less affected by the microbial profile present in the compost. A study to confirm this hypothesis would involve repeating the experiment with the addition of a sterilised compost treatment, eliminating the biological component of the compost.

References

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