

## 31<sup>e</sup> Congrès international sur la carotte 31<sup>st</sup> International Carrot Conference

Longueuil (Québec, Canada), 11 au 14 septembre 2005  
Longueuil (Quebec, Canada), September 11 to 14, 2005

### Effect of onion and winter cover crops on *Meloidogyne hapla* densities and subsequent carrot yields

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The effect of onion crop rotation and winter cover crops on root-knot nematode (*Meloidogyne hapla*) densities and subsequent carrot yields was determined under field microplot conditions in Quebec from 1996 to 2000. In two separate experiments, onion was either cropped once every two years or for two consecutive years, and then followed by two years of carrot. In both experiments, barley, sudan-grass, oats, oilseed radish, pearl millet, phacelia, rye and white mustard were all evaluated as a winter cover crop and sown in late August in onion plots after harvest. Check plots included carrot monoculture without a winter cover crop and onion without a winter cover crop, with or without fall ploughing. In the alternate onion rotation system, cover crops were either ploughed late that same fall (late October) or killed the following spring by cultivation (mid May). Fall plough of cover crops had no significant effect on *M. hapla* densities when compared with spring cultivation. In the consecutive onion rotation system, fall *M. hapla* densities were significantly lower following onion (6 per 100 cm<sup>3</sup> soil) when compared with carrot (1164 per 100 cm<sup>3</sup>). The following year, the percentages of marketable carrot were 92 and 51% following onion and carrot respectively. In the alternate onion rotation system, *M. hapla* densities were significantly lower following onion (14 per 100 cm<sup>3</sup>) when compared to carrot (1329 per 100 cm<sup>3</sup>) and average percentages of marketable carrot were 73 and 33% following onion and carrot, respectively. In both rotation systems, the inclusion of a winter cover crop had no effect on the final population of *M. hapla* and on subsequent carrot yield. An economic production of carrot for two consecutive years was not possible following onion where the percentage of marketable carrot dropped consistently below 60% the second year.

### Sensitivity of carrots to mechanical cultivation in organic soil

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The impact of cultivation on carrot development must be documented before this practice can be integrated into carrot production systems as a viable alternative to herbicides. Our objective was to identify critical carrot stages sensitive to mechanical weeding that would result in stand reduction, quality and/or yield reduction in organic soil. The experiment was conducted at the experimental farm of Sainte-Clotilde (Quebec), Canada, as a split plot with three replications in 2003, and as a randomized complete block design with three replications in 2004. A blanket treatment of linuron was applied pre-emergence at 1.125 kg a.i. ha<sup>-1</sup> and post-emergence at 2.25 kg a.i. ha<sup>-1</sup> to control weeds throughout the season. Carrot cultivar Sugar Snax 54 was seeded in three rows spaced 60 cm apart, at 100 seeds per m in 1.8 m x 8 m plots. Treatments were: 1) a control with no cultivation; 2) cultivation with a basket weeder (Buddingh™ model C); 3) cultivation with a torsion weeder (rigid steel rods) with "Spyders" (spiked disks) on each side of the row (Bezzeries™); and 4) cultivation with a rototiller. Carrots were cultivated either with a single pass at the cotyledon (COT), 1 leaf (1L), 2 leaves (2L) or 3 leaves (3L) growth stages, or with multiple passes at the COT+1L, COT+2L, 1L+2L, 2L+3L, COT+1L+2L, 1L+2L+3L, COT+1L+2L+3L growth stages. Carrots were monitored by counting carrots in two permanent quadrats (50 cm x 50 cm) located on the rows before and 5 d after each cultivation; by measuring carrot biomass within the quadrats 7 d after the last cultivation; and by evaluating carrot yield on 2 m rows at harvest. Cultivation with the basket weeder resulted in greater crop damage than with the other two cultivators. This was attributed to the proximity of the crop rows to the basket weeder (10 cm), especially at the early phenological crop stages. Any cultivation at the cotyledon stage resulted in reduced carrot stands, reduced mid-season biomass and reduced percentage of marketable yield. Consequently, mechanical weed control in carrots is an acceptable alternative to herbicides in organic soil as long as cultivation is scheduled when carrots are at the first true leaf stage or greater. The choice of cultivator is limited to implements that work at least 12 cm away from carrot rows.