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Inventory of Beet Cyst Nematode on Sugar Beet farms of three Machine Rings in Finland 2004-2006

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Common machines can carry infected soil and spread pests and diseases from farm to farm. Sugar beet harvesters are very complicated and difficult to clean. Harvesters are not the only source of infested soil, - tractors, drilling machines, sprayers and also lorries transporting beets can bring infested soil to the farm.

Machine rings is a relatively new phenomenon in Finnish sugar beet cultivation. Earlier many farmers had their own machines, which gave a certain kind of protection against outer threats, but also isolated the problems to the farm. First harvester rings in Finland were established at end of 1990.

Beet cyst nematodes (*Heterodera schachtii* and *betae*) are a big threat for sugar beet cultivation reducing beet yield dramatically. Beet cyst nematodes (BCN) are spreading with soil, wind and water. Common harvesters might be one way in this spreading pattern.

The effect of harvester ring in the spreading of BCN was studied during the growing season 2004 to 2006. Three rings, three farms per ring and three fields per farm were taken to inventory. One of the selected farms within each ring had BCN as a problem. Soil samples were taken after the drilling of sugar beet in spring 2004, 2005 and 2006. The size of studied area was 90 m x 90 m marked by GPS. Subsamples 15 m apart from each were taken from tillage layer (0-25 cm).

The cultivation history of trial fields was documented from 2000 to 2004 and it was completed in 2005 and 2006. The trial farms included different kind of crop rotations with cereal, grass, potato, green pea and spinach. One farm had cultivated sugar beet in monoculture during 2000-2006. The results of first BCN analyze of spring 2004 were sent to farmers in spring 2005. The results included also a recommendation how to cultivated the trial fields in following years. All farmers followed the recommendations.

Three farms of nine were totally clean from *H. schachtii* in spring 2004 and 63 % of all trial fields had no larvae of *H. schachtii*. Two fields were very slightly infected (number of larvae below 0.05 pcs/g dry soil), but 30 to 200 larvae were found in one gram of soil in five fields (19 %). In 2005 the number of clean farms was four and the level of BCN in the most polluted fields was reduced 57 to 90 %. One field on the monoculture farm had got the first identification of *H. schachtii*.

In spring 2006 the number of clean farms was three. Two of these farms were the same as in 2004 and 2005. Both of them had a very good crop rotation. Five fields from 27 were slightly infested (19 %). Two of the three investigated fields on monoculture farm had the clear infestation of BCN. The number of larvae was increased to 10-13 per g soil.

Common machines (harvesters) and BCN are not any significant risk for farm, which have the good crop rotation of sugar beet, cereals, potato and/or grass. If the level of BCN is very low, sugar beet can be cultivated in the same field for 2 to 3 years with no higher risk in Finnish conditions. Spinach and green pea is possible to include also crop rotation, but the other crops should cut down the increase of BCN very effectively. Heavy infestation of BCN demands a long cleaning period (longer than 3 years). Monoculture fields are very sensitive for infestation and especially if the soil type is light with high moisture. They shouldn't be included to the harvester ring at all.