Effect of Crop rotation on root-knot nematode control

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In intensive cropping systems under greenhouses, where several crops follow one another throughout the year, the main reasons for yield losses are soil-borne pests and diseases. Among them, root-knot nematodes (*meloidogyne* spp.) are an increasing problem for mediterranean production of organic vegetables. Rotations widely used in the South-East of France imply susceptible species (salads in winter followed by a cucurbitaceous or a solanaceous in spring). All the more, the effects of "alternative" methods (soil solarisation, nematicidal amendments or green manures...) are too limited in heavy infestation conditions. A higher crop diversification is necessary to prevent and control nematodes, and thus to preserve soil fertility.

We first present the results of a 12-years trial in organic vegetable production, comparing 1) an "intensive" crop rotation, salad in winter and cucurbitaceous (melon or cucumber) in spring, to 2) an "ethic" rotation, with a 3 year-rotation (6 different vegetables/3 years). Each cropping system was present in one 400 m^2 unheated plastic greenhouse. To assess meloidogyne infestation, we used a root gall index (scale from 0 to 10) based on a visual estimation of the number of galls and of the percentage of infested roots. These notations were realised at the end of each spring crop. In the intensive crop rotation 1, *meloidogyne* infestation appeared after 7 years, in 2000, and rapidly increased to reach an average root gall index of 4 in 2003. In the "ethic" rotation, no galls were observed on the roots. These results show that crop rotation is higly effective to prevent soil-borne pests. The observations on this trial also showed that nematodes diversity was higher in the "ethic" crop rotation, with more free nematodes, and that some other soil-borne pests, such as *sclerotinia minor* on lettuce and corky-root on melon, were reduced.

The aim of the second study is to evaluate, in high infestation conditions, the efficiency of inserting poor host plants in rotation to limit the nematodes reproduction. We first identified the lowest susceptible species by surveying organic farmers, and we then verified in the field the host status of the 12 identified species. The comparison of the 12 vegetable species' susceptibility during 2009 summer allowed us to show that all these species are less susceptible than a salad control. Moreover, we determined 5 poor hosts of meloidogyne which could be cultivated to reduce the infestation level : onion, fenel, leek, lamb's lettuce and rocket salad. At the same time, we started a 4 years trial in 2008, to evaluate the effectiveness of a 1) poor-host rotation in comparison with a 2) classic farming system consisting in salad crop in automn and zucchini crop in spring. Each cropping system is present in two 200 m^2 unheated plastic greenhouse. The root gall index is measured at the end of each crop. First results are encouraging, showing fewer attacks on the "low susceptible" rotation. We will continue this study in the next 2 years, to see if the break in the biological cycle of meloidogyne with poor host crops during 3 years allows a significant reduction of the infestation level on a same susceptible crop in the two cropping systems.

These studies highlight the importance of cropping system to prevent or suppress soil-borne pathogens problems in organic farming, and thus to maintain soil fertility. Specialised systems are not compatible with a sustainable vegetable crop production because they are too susceptible to soil-borne pathogens.