Clover fatigue - a reason for precaution in organic farming?

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Implications

Different species of fungi and nematodes cause clover fatigue. The literature review shows that there is a lack of knowledge about the status of clover fatigue in Norway. Samples from fields with clover/grass ley on organic farms in Norway demonstrated the presence of plant parasitic nematodes (Serikstad and De Boer 2013).

High densities of fungi and nematodes can impair the growth of legumes. Intensive use of clover in organic farming systems and a warmer climate are factors that indicate a need for attention to increased occurrence of diseases and pests in clover (Brandsæter et al. 2006). Problems with growing legumes will influence the nitrogen supply and economy in organic farming negatively.

Background and objectives

Before chemical fertilizers were widely used, different clover species were common in leys and clover fatigue was a serious problem. In the Nordic countries, Stem nematode (*Ditylenchus dipsaci)* was a wide-ranging problem. Plant breeding then focused on nematode resistance. Nowadays, there is little awareness about clover fatigue. Lately, no systematic surveys have been done regarding the situation in Norway.

Legumes, such as clover, provide a major source of nitrogen in organic farming systems, and help to maintain soil fertility. Organic farming systems have been intensified in the past ten years. On a number of farms the crop rotation mostly consists of grass/clover leys. Recently some farmers have noticed a decrease in the amount of clover in the ley, and even a reduction of the total harvest.

The intention of the preliminary study was to provide knowledge about the situation of clover fatigue in organic farming in Norway and to collect knowledge on how they cope with the problem in neighboring countries.

Key results and discussion

Both fungi and nematodes can cause clover fatigue. Few cultivars are resistant to these organisms, so knowledge on the occurrence of fungi and nematodes is essential for effective crop rotations.

In soil from 6 farms the following groups and species of plant parasitic nematodes were detected (Table 1): Stunt nematodes (*Tylenchorhynchus dubius*, *T. maximus* and *Merlinius* sp.), spiral nematodes (*Helicotylenchus canadensis*, *H. pseudorobustus* and *Rotylenchus* sp.), root lesion nematodes (*Pratylenchus crenatus* and *P. fallax*), ring nematodes, pin nematodes (*Paratylenchus* sp. and *P. bukowinensis*), needle nematodes (*Longidorus elongatus*), stubby root nematodes (*Paratrichodorus pachydermus*) and cyst nematodes (*Heterodera trifolii*). Root lesion nematodes occurred in all farms (8), followed by ring nematodes (7), stunt nematodes (6), pin and stubby root nematodes (5), clover cyst nematode (4) and ring and needle nematodes (1). Stem nematode (*Ditylenchus dipsaci*), which was common in the past, was not detected. *Heterodera trifolii*, occasionally related to clover fatigue, was present in 50 % of the samples. In a first year ley with damage in red clover, *H. canadensis* occurred in the remarkable high density of 1320 ind./250 ml soil. In one farm trichodids (including *Paratrichodorus*) reached 100 ind./250 ml soil. Even in the samples taken from fields where clover thrived, pathogenic nematodes were present. Not all of the nematodes found are known to be pathogenic to clovers, but *L. elongatus, P. bukowinensis* and the trichodorids can multiply on clover and damage following crops like strawberry, carrot and celeriac.

We wish to continue the work with clover fatigue, focusing on mapping of occurrence, organisms involved, economic damage threshold of the pathogens involved and preventive actions to avoid problems. Co-operation with researchers and advisers in Nordic and Baltic countries are most welcome.

Tabel 1. Numbers of different nematode groups in samples of 250 ml soil from six Norwegian organic farms.

Farm no.	*Stunt nematodes*	*Spiral nematodes*	Root lesion nematodes	Ring nematodes	*Pin nematodes*	*Needle nematodes*	*Stubby root nematodes*	*Cyst nematodes*
1	0	1320	0	0	0	0	0	0
1	4	106	6	0	0	0	0	2
2	0	265	144	0	0	0	0	0
2	0	124	213	0	0	0	0	0
3	0	3	29	0	30	0	8	8 cysts
3	0	57	5	1	12	0	2	0
3	0	4	0	1	0	0	0	1 cysts
3	0	35	0	0	0	0	14	1 cysts
4	13	0	130	0	10	10	15	1 cysts
4	93	0	42	0	0	6	0	0
4	35	0	33	0	0	8	0	-
4	97	0	8	0	0	3	0	-
5	12	262	50	0	58	0	1	16 cysts
5	56	5	118	0	6	0	0	0
6	11	420	27	0	73	0	7	0
6	17	9	20	0	0	0	100	0

How work was carried out.

We made a literature review about possible pathogenic organisms and how the situation is regarding clover fatigue in other countries. Researchers and advisers in Sweden, Denmark and Holland were asked how they cope with the problems in their countries. Advisers in organic farming were asked to take samples of soil and clover plants from fields they considered relevant for analyses. The samples were only analyzed for nematodes. Samples were also taken from fields where clover thrived.

References

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