

Clover rot: Ascospore infection in autumn

# CLOVER ROT AND SOUTHERN ANTHRACNOSE

## Risk to forage legumes

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High-performance forage legumes are especially important in organic cropping systems where clover is a vital source of nutrients and soil fertility – in fact, it is regarded as the main driver of crop rotation.

The two pathogens posing the greatest threat to forage legumes today are the long-established clover rot and southern anthracnose, which has started to become more prevalent in Germany only in recent years. Both pathogens are fungal

diseases that are transmitted with the seed and both can kill the plants. Given susceptible plant material and favourable weather conditions, they can cause massive failure throughout the crop, leading to yield reductions, forage losses and

increased weed infestation. On organic farms however, it is mainly the reduction in nitrogen fixation combined with the escalation and potential spread of the pathogen that can prove fatal.

### Southern anthracnose

Unlike clover rot, southern anthracnose (caused by the fungus *Colletotrichum trifolii*) is an entirely seed-borne disease which causes damage from summer through to autumn in warm, damp weather. Individual, wilting plants signal the start of infection. The top of the stem is typically bent over. Orange fruiting bodies may be clearly visible, from which the southern anthracnose spreads through the crop, carried by wind and rain. Infection initially occurs in small pockets. As the fungus grows into the root crown, infected plants can easily be broken off from the roots.

The fungus overwinters in the seed or in plant residues on the surface of stored harvesting equipment. In mild weather it also seems able to survive the winter outdoors in infected plants. Since these plants can also be more susceptible to winter-kill, damage may only become apparent after winter and may not necessarily be attributed to southern anthracnose.

The most effective means of preventing or inhibiting the spread of the disease is to grow resistant varieties and use certified seed. When the disease first appears, an early cut can prevent it from spreading. Careful attention must be paid to field hygiene, because the fungus can be transferred to infection-free fields by plant residues adhering to the mower. Southern anth-

racnose can occur in various forage legumes. It mainly affects red clover and alfalfa, but is also found in black medick and crimson clover. White clover, bird's-foot trefoil and Persian clover are considered resistant to the disease.



Red clover plants infected with southern anthracnose

### Clover rot

Damage caused by clover rot (*Sclerotinia trifoliorum*) becomes apparent in spring after the snow has melted. The disease causes plants to wither, collapse and die. An investigation of the upper layer of surrounding soil or the root and stem crown of the plants will reveal the resting fungal spores. These sclerotia enable the fungus to survive in the soil for several years. They can be transmitted to other fields by cultivators, for example, or carried with the seed. The fungus lies dormant in the summer months and then in autumn the sclerotia germinate from the upper soil layers to form fruiting bodies. These produce spores which are ejected during damp weather and carried on to nearby clover leaves by wind and rain.

Small black spots on the leaves are indications of infection by these spores, which mainly occurs in densely planted crops. For this reason, crops must be carefully monitored during mild, wet autumns.

If these leaf spots are widespread, it is advisable to mow or graze the clover again to slow the

spread of infection as far as possible. During the winter a white mycelium grows outwards from the leaf tissue into the stem from where it infects the root crown. This web can spread from plant to plant under a covering of snow. A mild winter or an uninterrupted covering of snow provides the fungus with optimal conditions for growth, although its development is greatly curbed by severe minus temperatures. Infection with clover rot can persist in the spring if weather conditions are favourable.



Plants infested with clover rot after the snow has melted

In addition to small-grain forage legumes, species of vetch, various weeds and large-grain legumes are cited in literature as host plants of clover rot. There are likely to be different regional variations of the fungus with variations in virulence and host specificity.



Red clover seed and clover rot sclerotia



Kink in stem typically associated with *Colletotrichum trifolii*.

### Preventative measures

It is important to ensure optimum seed quality, because both diseases and many other fungal pathogens can be transferred with the seed, causing leaf spot diseases in forage legumes and impacting forage quality and animal health; the same applies to nematodes (e.g. stem eelworms) and parasitic seed-bearing plants such as dodder. The use of certified seed greatly reduces the risk of contamination.

Furthermore, it is important to maintain an adequate rotation interval between both forage legumes and large-grain pulses, since these can be infected by pathogens which also occur in small-grain legumes. For instance, *Phoma medicaginis*, which causes spring black stem in red clover, is also one of the pathogens associated with 'foot disease complex' in peas. Thus crop rotation planning must allow for cover crops and mixtures.

The use of organic fertiliser in the crop rotation not only improves the nutrient supply, it also stimulates soil organisms which speed up the breakdown of plant residues and the harmful pathogens adhering to them. Growing with grasses reduces the cultivation risk, whilst mixing different species of forage legumes can also be advantageous. Ensuring good soil structure, selecting species and varieties adapted to the local environment and sowing under optimum conditions will also help to successfully establish fast-growing crops.



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