FUNGOUS DISEASES OF PASTURE PLANTS

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Summary

Some effects that fungus diseases of pastures have on the quantity and quality of herbage are outlined. Ways in which some pasture parasitic fungi and fungal saprophytes in pasture litter can affect animal health are discussed.

INTRODUCTION

PRESENT day farming methods with their emphasis on high stock numbers per hectare demand high performance pastures. Such pastures on ploughable land in New Zealand are usually ryegrass (*Lolium perenne*) and white clover (*Trifolium repens*) swards. Unfortunately these vigorously growing dense swards which are sown down in only two or three pasture plant species are more prone to attack by fungi than are the older type of pastures which had many plant species in them.

OCCURRENCE AND EFFECTS OF PARASITIC FUNGI

It is only in recent years that we have become aware of the importance of fungus diseases in pastures. Even today the damage caused by fungi is sometimes attributed to other causes. Scald (*Rhynchosporium orthosporum*) of ryegrass and cocksfoot (*Dactylis glomerata*) causes the leaf tips to die back with a concomitant general browning. To the inexperienced eye this condition is often mistaken for frost damage or wind burn. Ryegrass net blotch (*Helminthosporium dictyoides*) is common in late winter. This disease is characterised by brown leaf lesions and a general yellowing of the plant. I know of cases where this yellowing has been attributed to lack of soil nitrogen.

Nineteen fungus diseases of ryegrass have been recorded in New Zealand by Latch (1966a, 1966b). Several other seedling and root infecting fungi not recorded in these papers also attack our ryegrasses. Other pasture grasses such as cocksfoot, timothy (*Phleum pratense*), prairie grass (*Bromus unioloides*), crested dogtail (*Cynosurus cristatus*) and browntop (*Agrostis tenuis*) are attacked by a number of fungi.

White clover has at least 14 fungus diseases recorded on it in this country and most of the other clover species found in pastures are also susceptible to the same fungi.

All parts of the pasture plant are susceptible to fungus attack. Leaf diseases are the most obvious but not necessarily the most important. Root rot fungi kill seedlings in newly sown pasture and the losses can be high. Charles (1961) reported that only 20% of the ryegrass, cocksfoot and timothy seed sown in trials at Aberystwyth was present as plants

some two months after sowing. Other people have reported similar losses and it has been shown that root infecting fungi are responsible for some of this loss. Mature plants can also be killed, especially when they are under stress such as in waterlogged soil or very dry soil. *Codinaea fertilis*, root rot of white clover is most severe in areas which experience dry summers such as Hawke's Bay. This is probably because the plants are checked by drought conditions and cannot withstand the fungous attack.

Fungous infection of the flowers can reduce seed yield. Examples in New Zealand are blind seed disease (*Gloeotinia temulenta*) of ryegrass, ergot (*Claviceps purpurea*) on most of our grasses, head smut (*Ustilago bullata*) on *Bromus* spp. and scorch (*Kabatiella caulivora*) on the flower and leaf stalks of many clovers.

With leaf diseases the amount of necrosis can be determined and hence the loss in yield measured. Less obvious but also measurable are some of the other effects of leaf diseases such as reduced tillering and root growth of diseased plants. Lancashire and Latch (1966) have documented this for the effects of crown rust (*Puccinia coronata*) on ryegrasses. Most pasture grasses and clovers in New Zealand are attacked by rust fungi. The peak of rust infection on grasses is in the summer and autumn with little rust present in winter, whereas clover rusts are common throughout the year. Rusts are probably the most important fungous diseases of pastures and the selection of resistance to them plays an important part in the development of new varieties at Grasslands Division. Evidence of the successfulness of this breeding programme is provided by Latch and Lancashire (1970). They found that over a 5-week period crown rust caused yield reduction of up to 64% in Ruanui ryegrass. Ariki ryegrass, a more recently developed variety had a yield reduction of 22%.

EFFECT ON PASTURE QUALITY

Plant death or leaf necrosis are obvious ways in which fungous diseases can affect animal production. Less obvious losses are from the effects that fungi have on the chemical composition of the plant. Carr and Catherall (1963) have shown that the level of water soluble carbohydrates in cocksfoot plants is greatly reduced when plants are infected with rust. Hence the quality of rusted herbage is reduced and this means a loss in animal production. Carr (1961) has also shown that some leaf spotting fungi can reduce the amount of water soluble carbohydrates in cocksfoot. One such fungus, *Mastigospirium rubricosum*, can reduce this carbohydrate level by 50% when only 9% of the leaf area is necrotic. It is likely that many plant products are affected by rust and other plant diseases. With more emphasis now being placed on pasture quality it is essential that we investigate this aspect of pasture diseases.

While some fungi may alter the nutritive value of pasture plants other fungi may cause plants to produce compounds which affect stock health. One case we have studied is that of fungous leafspot diseases on white clover and the effect they have on plant phenolic compounds. Wong and Latch (1971) have shown that levels of the coumestan and flavone constituents in the leaves of white clover were greatly increased after infection by each of a number of leaf spotting fungi. Subsequent work by Wong *et al* (1971) showed that coumestan concentrations in diseased white clover are sufficient to be oestrogenic in sheep and mice. The practical significance of these findings has yet to be explored but the occasional field

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reports on breeding problems attributed to pasture oestrogens may be due to stock eating diseased white clover.

Ergotism is another example of a toxic fungus affecting animal health. If animals eat sufficient grass seed heads diseased with ergot they become unsteady in their gait and in severe cases the blood supply to the extremities is cut off causing gangrene and death. I doubt whether ergotism is of much consequence in New Zealand except on *Paspalum dilatatum*. This grass is very prone to ergot infection and a few cases of ergotism in stock have been reported.

Fungi in pastures are responsible for some health problems in stock. *Pithomyces chartarum*, the fungus causing facial eczema in sheep lives saprophytically on dead pasture litter. Its spores are present in large numbers at the time of the year when ryegrass rust is at its peak. I believe that rust is indirectly responsible for many of the *P. chartarum* spores in pasture. The dead rusted leaves provide a good substrate in which the facial eczema fungus can grow. Provided the farmer doesn't create a lot of litter by topping his pastures, the severity of facial eczema would be reduced if ryegrass rust was controlled.

Other diseases of animals such as ryegrass staggers, Kikuyu toxicity and general ill thrift could be caused by fungi in pastures. There are many species of *Fusarium* and *Phoma* fungi in our pastures and we know from numerous overseas reports that these fungi can be toxic to animals under certain conditions. Latch (1972 and unpublished results), has shown that there are a number of fungi present in New Zealand pastures which are toxic to mice and at least one fungus, *Fusarium avenaceum* is toxic to sheep. di Menna and Mortimer (1971) have also recorded that the fungus *Myrothecium* which occurs in pastures can be toxic to cattle and sheep.

EFFECT ON PASTURE PALATABILITY

Some fungous diseases, besides affecting the quantity and quality of herbage for animals, have an effect on animal intake. Cruickshank (1957) has shown that sheep prefer non-rusted ryegrass. Some dairy farmers have told me that cows also show a distaste for rusted grass, and if forced to eat it their milk production declines. It has also been noted by Latch (1966a) and Carr (1971) that ryegrass plants heavily infected with scald (*Rhynchosporium orthosporum*) are unpalatable to sheep and cattle.

CONCLUSION

This paper has briefly outlined some of the effects that fungous diseases have on pastures. Many are important, not only for the direct damage they do in reducing herbage yield but also because of their effects on herbage quality and stock health. Control of pasture fungi through breeding for disease resistance, by pasture management and by the use of fungicide sprays would appear to be essential if we are to increase farm production.

REFERENCES

- Carr, A. J. H., 1961. *Rept. of Welsh Pl. Breeding Sta.*: pp 102.
- Carr, A. J. H., 1971. *Rept. of Welsh Pl. Breeding Sta.*: pp 59.
- Carr, A. J. H.; Catherall, P. L., 1963. *Rept. of Welsh Pl. Breeding Sta.*: pp 96-97.

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- Charles, A. H., 1961. *J. Brit. Grassl. Soc.* 16: 69-75.
Cruickshank, I. A. M., 1957. *N.Z. Jl. Sci. Tech.*, A38: 539-43.
di Menna, M. E.; Mortimer, P. H., 1971. *N.Z. Vet. J.* 19: 246-48.
Lancashire, J. A.; Latch, G. C. M., 1966. *N.Z. Jl. Agric. Res.*, 9: 628-40.
Latch, G. C. M., 1966a. *N.Z. Jl. Agric. Res.*, 9: 394-409.
———, 1966b. *N.Z. Jl. Agric. Res.*, 9: 808-819.
———, 1972. *N.Z. Vet. J.*, 20: 204.
Latch, G. C. M.; Lancashire, J. A., 1970. *Proc. XI Int. Grassl. Congress:*
pp 688-91.
Wong, E.; Latch, G. C. M., 1971. *N.Z. Jl. Agric. Res.*, 14: 633-38.
Wong, E.; Flux, D. S.; Latch, G. C. M., 1971. *N.Z. Jl. Agric. Res.*, 14:
639-45.