Damage caused by mites and fleas in pastures

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Summary

The literature on the damage caused by mites and flea in pastures is reviewed and the need for further research in this area is discussed.

Introduction

Lucerne flea (*Sminthurus viridis* (Linnaeus)), redlegged earth mite (*Halotydeus destructor* (Tucker)), and blue oat mite (*Penthaleus major* (Dugès)) are three exotic pests which occur in pastures in southern Australia. *S. viridis* and *H. destructor* feed mainly on broad leaved plants, particularly capeweed (*Arctotheca calendula)* and pasture legumes (*Medicago* spp. and *Trifolium* spp.), whereas *P. major* prefers grasses, although all three species are capable of feeding on a much broader host range than mentioned above. Sloane *et al.* (1988) estimated that *H. destructor, S. viridis* and bluegreen aphid (*Acyrthosiphon kondoi*) cause $228 million of productivity losses and pasture decline annually in southern Australia.

These three pests can affect legume-based pastures in various ways; seedling numbers can be reduced in the autumn, herbage production can be reduced during the growing season, seed yields can be reduced, and the botanical composition of the pasture may be altered, often leading to less desirable species becoming dominant (i.e., *A. calendula*). There have been some studies to measure pasture losses caused by *H. destructor, S. viridis* and *P. major*, but generally there is a gap in our knowledge in this area. More importantly, apart from Wallace and Mahon (1963) who related a *H. destructor* damage rating to dry matter losses, and Allen *et al.* (1989) who measured mite numbers and seed yield losses in annual medics, no one has developed threshold levels for any of these pests. Hence it has always been difficult for farmers to decide whether to spray for these pests. The current information on losses caused by *H. destructor, S. viridis* and *P. major* is summarized below.

H. destructor

In Western Australia, Grimm (1986) measured the influence of insects and mites on subterranean clover seedling numbers in pastures but failed to show that *H. destructor* caused any major losses. However, he and Gillespie *et al.* (1983) indicate *H. destructor* can cause major losses in seedling numbers in autumn, particularly if the mites become active prior to germination.

Nicholas and Hardy (1976) showed *H. destructor* can reduce herbage production in early winter and spring in different varieties of subterranean clover to varying degrees. In spring, the reductions in the dry matter production of the subterranean clover component of the pastures caused by *H. destructor* for Seaton Park and Yarloop were 11% and 51% respectively. Further, the yields of the grass components of the pastures in this trial were reduced by about 40%.

Norris (1944) measured herbage production losses of the subterranean clover component of the pastures due to *H. destructor* that ranged from 550 to 2400 kg of dry matter per hectare in ungrazed experiments with subterranean clover dominant (> 50% subterranean clover dry matter) pastures. Wallace and Mahon (1963) measured losses of about 500 kg of dry matter per hectare of the subterranean clover component in ungrazed and grazed pastures damaged by *H. destructor*. The magnitude of the losses were less than those measured by Norris (1944) because the pastures used by Wallace and Mahon had a low subterranean clover component(< 20% subterranean clover).

Norris (1944) measured subterranean clover seed yield losses caused by *H. destructor* of up to 500 kg ha^{-1} and noted that these losses were due to foliar damage which reduced the longevity and vigour of the plants. Little damage was caused directly to flowers, burrs or seeds. Grimm (1983) showed that *H. destructor* reduced seed yields in Yarloop / Woogenellup subterranean clover pasture by about 44% to a yield of 440 kg ha^{-1}. Recently, Grimm (unpublished data) has shown that *H. destructor* and *A. kondoi* may reduce seed yields of Daliak subterranean clover by 80% (1100 to 290 kg ha^{-1}) in ungrazed pastures, but these losses were reduced if the grazing pressure of stock was increased. Allen *et al.* (1989), working in annual medic pasture *Medicago truncatula* var. Jemalong, showed the combined effect of *A. kondoi* and *H. destructor* reduced seed yield from 400 to 50 kg ha^{-1}. These losses were greater than those that were recorded for *A. kondoi* alone.

Wallace and Mahon (1963) and Norris (1948) showed that the botanical composition of subterranean clover pastures changes when damaged by *H. destructor*. Such pastures often become dominated by weedy and less desirable species such as *A. calendula* and storksbill, *Erodium botrys* when attacked.

Pratley *et al.* (1991) have suggested that *H. destructor* affects the palatability of pastures as they have shown that livestock preferred to graze treated rather than untreated pastures. Ridsdill-Smith (1991) measured clover digestibility with and without *H. destructor* and used a pasture model to suggest that the effect of *H. destructor* feeding on pasture quality may be more important than on pasture quantity with regard to wool production.

S. viridis

There have been fewer studies carried out on *S. viridis* than *H. destructor.* Wallace and Mahon (1963) estimated that the stocking rate could be increased by 0.6 sheep per hectare if severe infestations of *S. viridis* were controlled. Allen *et al.* (1989) showed that *A. kondoi* and *S. viridis* behaved in a similar way to *A. kondoi* and *H. destructor* producing large seed yield losses in annual medic (Jemalong) in South Australia.

Walters (1964) measured the losses caused by *S. viridis* in a lucerne / subterranean clover / grass pasture over a six week period in South Africa and recorded dry matter yield losses of 59%, 11% and 23% for the lucerne, subterranean clover and grass components of the pasture respectively, where *S. viridis* was not controlled. In another experiment by Walters, approximately 90% of the lucerne component of the pasture was lost due to *S. viridis* attack over a three month period.

P. major

The biology and ecology of this mite has been studied in New South Wales recently but there have been no attempts to estimate the damage caused by this species in pastures (D. James, personal communication).

Current studies

Grimm (personal communication) is studying the damage caused by *H. destructor, S. viridis* and *A. kondoi* in subterranean clover pastures in Western Australia with particular emphasis being placed on the effect of seasonal conditions and management practices (fertilizer use and grazing pressures) on the damage caused by this spectrum of pests. Taverner (personal communication) is studying the same group of pests in annual medic pastures in South Australia to determine the relationship between pest numbers and pasture losses (seedling numbers dry matter production and seed yields) so that economic threshold levels can be developed to assist farmers in making cost-effective decisions on pest control in pastures.

Discussion

The information in the literature demonstrates that *H. destructor* and *S. viridis* can cause severe losses in legume-based pastures. There is a need to determine the relationship between these losses and pest numbers so that economic threshold levels can be developed. In developing these threshold levels, emphasis will need to be placed on the effects of the pests on the seedling numbers, early winter dry matter production and seed yields. Carter (personal communication) showed that seed reserves, and in turn seedling numbers, are important factors in the successful regeneration of an annual medic pasture. Seed reserves over 200 kg ha^{-1}, given favourable opening rains, can lead to pasture with up to 3000 seedlings per square metre which can produce approximately five tonnes of dry matter per hectare by early June.

There are many different varieties of pasture legumes now available and any varietal differences will need to be taken into account when determining threshold levels. For instance, in annual medics, bluegreen aphid tolerant varieties are likely to respond differently to *H. destructor* and *S. viridis* than aphid susceptible varieties (Allen *et al.* 1989).

The stocking rate of a legume pasture is an important factor in optimizing the return from it. Grazing pressure is known to effect the damage caused by arthropods (M. Grimm, personal communication) and hence it is essential for all pastures in damage assessment studies to be grazed at least at a rate which is accepted as the 'standard' for the district where the study is conducted.

In conclusion, with regard to the need for further studies on the damage caused by mites and flea in pastures, the work of Taverner should lead to the development of economic thresholds for *H. destructor* and *S. viridis* in annual medic pastures. Grimm is working on *H. destructor, S. viridis* and *A. kondoi* in subterranean clovers but because *A. kondoi* does not always occur in combination with *H. destructor* and *S. viridis* in many parts of southern Australia, there is a need for further studies to be done on these two pests where they occur in subterranean clover pastures without *A. kondoi*. Further, there is a need for work to determine if *P. major* is causing losses in pastures throughout southern Australia.

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