GRAZING AFFECTS PEST AND BENEFICIAL INVERTEBRATES IN AUSTRALIAN PASTURES

P.J. Michael[1], M, Grimm[2], M. Hyder[2] and P.T. Doyle[3]

[1]Agriculture Western Australia, 3 Baron-Hay Court, South Perth, Western Australia 6151

[2]Agriculture Western Australia, Albany Highway, Albany, Western Australia 6330

[3]Agriculture Victoria, Kyabram Dairy Centre, Kyabram, Victoria, Australia 3620

ABSTRACT

Grazing annual subterranean pastures in Western Australia to targeted levels of pasture mass, instead of at a set stocking rate, affected numbers of invertebrates at the commencement of the following season. Treatments were controlled grazing to 1.4 t ha^{-1} or 2.8 t ha^{-1} dry weight of green pasture and set stocking at the average for the district. Grazing reduced numbers of redlegged earth mite, *Halotydeus destructor*, but increased numbers of lucerne flea, *Sminthurus viridis*. The most likely reason for the reverse effect on lucerne flea was the presence of an effective predator, the pasture snout mite, *Bdellodes lapidaria*, which was itself adversely affected by grazing. Despite this, controlled grazing is advantageous for pest management as it is effective in reducing numbers of the redlegged earth mite, which is the more serious pest, and will not allow very large populations of lucerne flea to develop because of the direct effect on that pest.

KEYWORDS

Halotydeus destructor, Sminthurus viridis, Bdellodes lapidaria, pasture, grazing

INTRODUCTION

Redlegged earth mite and lucerne flea are widespread in Australia and are damaging pests of annual pasture in autumn and spring (Wallace and Mahon 1963). Chemical control of both pests is cheap and is currently effective although insecticide resistance to commonly used chemicals is suspected. Grazing management and biological control methods are useful pest management options (Michael et. al. 1996). Controlled grazing has been shown to reduce numbers of redlegged earth mite from 50,000 m^{-2} to less than 500 m^{-2} during the rapid plant growth phase in spring (Grimm et. al. 1995). The pasture snout mite is a widespread and useful predator of lucerne flea (Wallace 1967). Although two other effective predators have been introduced for this pest complex, they still have a very restricted distribution (Michael et. al. 1995).

The effects of controlled grazing treatments, in the previous season, on populations of these two pests and the pasture snout mite which hatch in autumn are investigated. The interactions of these two pest management options are discussed.

METHODS

The trial was sited in the south west of Western Australia, at Mt Barker, which has an annual rainfall of 640 mm which falls mostly in the winter and spring months. There were three blocks of three grazing treatments on pasture consisting of annual grasses and subterranean clover.

In the two controlled grazing treatments, feed levels were maintained at 1.4 t ha^{-1} or 2.8 t ha^{-1} of green dry matter throughout winter and spring by adjusting sheep numbers. Plot size in these treatments was 0.5 ha. The other grazing treatment was set stocking at the rate considered average for the area i.e. eight sheep (wethers) per hectare. Plots for this treatment were one hectare so that the eight sheep could remain on the plots throughout the year. When low moisture content in summer caused pasture growth to slow and cease, all plots were reduced to the set stocking rate. Feed levels were assessed each week during the growing phase and every three weeks during the dry phase with 90 visual score estimates per plot. Each sampler made 15 additional estimates which were cut, oven dried and weighed so that the plot estimates could be corrected.

Invertebrates were collected from 30 random points in each plot with a suction machine similar to that of Wallace (1972). Samples were placed in alcohol for preservation until counted. Plot means were transformed for analysis of variance.

RESULTS AND DISCUSSION

Maximum levels of feed on offer in the growing season were around the target levels of 1.4 t ha^{-1} or 2.8 t ha^{-1} in the controlled grazing treatments and were 7 t ha-1 in the set stocking treatment. In the dead pasture phase, feed levels were reduced to 0.3 t ha^{-1}, 0.6 t ha^{-1} and 3.5 t ha^{-1} respectively (Table 1).

Transformed invertebrate data and back-transformed numbers per square metre from a sampling in autumn, early in the growing season, are given in Table 1. Populations of redlegged earth mite hatching with autumn rains were significantly reduced by grazing in the 2.8 t ha-1 treatment and further reduced in the 1.4 t ha^{-1} treatment, thus reflecting the effects of controlled grazing in spring.

Pasture snout mite numbers were also reduced significantly by controlled grazing whereas lucerne flea numbers increased significantly in the two controlled grazing treatments (Table 1). The most likely reason for the increase in lucerne flea numbers is the effect of grazing on the predator. Wallace (1967) showed that this predator is effective against lucerne flea if numbers present in autumn are in excess of 25 m^{-1} (Wallace 1967). Further evidence for the importance of the predator was found at one of our other sites where the pasture snout mite was in very low numbers. Controlled grazing at that site significantly reduced autumn numbers of lucerne flea ($p < 0.05$) from 578 m^{-1} to 50 m^{-1} in the 28 t ha^{-1} treatment and 2 m^{-1} in the 14 t ha^{-1} treatment.

Whereas redlegged earth mite was always suppressed by grazing in our experiments, lucerne flea was suppressed by grazing when predator numbers were very low but increased by grazing when adequate numbers of the predator were present. Despite the adverse effects on the snout mite in this experiment, controlled grazing remains advantageous for pest management overall as redlegged earth mite is the more serious pest in most pastures of southern Australia, and as yet there is no well distributed predator of this pest. Our research has shown that grazing to lower levels of feed will not result in very large populations of lucerne flea because of the direct suppressing effect of grazing. Moreover, there are agronomic and economic advantages in the utilisation of greater proportions of pasture.

ACKNOWLEDGMENTS

Support for this work from the Meat Research Corporation in Australia is gratefully acknowledged.

REFERENCES

Grimm, M., Michael, P., Hyder, M. Doyle, P, McDonald, G. (ed.) Hoffmann, A.A. 1995. Effects of pasture pest damage and grazing management on efficiency of animal production. Proceedings of the 2nd national workshop on redlegged earth mite, lucerne flea and blue oat mite, held in Rutherglen, Victoria, Australia, October 1994. Plant Prot. Quart. 10:2 62-64.

Michael, P., Grimm, M., Hyder, M. and Doyle, P. 1996. Options for pest management in pastures. J. Agric. Western Australia, **37**:1 24-29.

Michael, P, McDonald, G. (ed.) Hoffmann, A.A. 1995. Biological control of redlegged earth mite and lucerne flea by the predators *Anystis wallacei* and *Neomulgus capillatus*. Proceedings of the 2nd national workshop on redlegged earth mite, lucerne flea and blue oat mite, held in Rutherglen, Victoria, Australia, October 1994. Plant Prot. Quart. **10**:2 55-57.

Wallace, M.M.H. 1967. The ecology of Sminthurus viridis (L) (Collembola) 1. Processes influencing numbers in pastures in Western Australia. Aust. J. Zool. **15**: 1173-206.

Wallace, M.M.H. 1972. A portable power-operated apparatus for the field collecting of epigaeic Collembola and Acari. J. Aust. Ent. Soc. **11**: 261-3.

Wallace, M.M.H. and Mahon, J.A. 1963. The effect of insecticide treatment on the yield and botanical composition of sown pastures in Western Australia. Aust. J. Exp. Agric. Anim. Husb. **3**: 39-50.

Table 1
Density of pest and beneficial invertebrates in pasture at the commencement of the growing season after different grazing treatments.

Feed on offer (t / ha dried)		**Pests**				**Predator**	
max. (green)	min.(dry)	*H. destructor*[x]	No. / m^2	*S. viridisx*	No. / m^2	*B. lapidariax*	No. / m^2
1.4	0.3	2.49	260	3.19	1,537	0.55	3
2.8	0.6	3.96	8,845	2.94	862	1.12	12
7	3.5	4.26	18,025	2.29	195	2.11	127
	P value	<0.001		<0.01		<0.001	
	SED	0.142		0.235		0.287	

[x] transformed means