Pasture Pests
Research Note

PRELIMINARY FIELD STUDIES ON THE USE OF AN INDIGENOUS PARASITIC NEMATODE FOR CONTROL OF PORINA

W.M. KAIN, T.K. WYETH and A.J. KALE

Research Division, MAF, Palmerston North.

SUMMARY

A parastic nematode *Neoaplectana bibionis* Bovien commonly causes low levels of mortality in field populations of porina (*Wiseana* sp) Inundative releases of this nematode in early autumn gave high levels of control, but as autumn advanced these decreased and in May were only significant at the highest application rate. The practical use of this nematode for porina control is discussed.

INTRODUCTION

Recently the use of entomophagous nematodes for the short term control of insect pests has been shown to be both technically feasible (Bedding 1976) and economically viable (Bedding and Miller 1981 a.b). This form of biocontrol has been used successfully for the control of currant clearwing (*Synanthedon tipuliformis*) (Bedding and Miller 1981a), black vine weevil (*Otiorhynchus sulcatus*) (Bedding and Miller 1981b) and lemon tree borer (*Oemonia hirta*) (Clearwater and Wouts 1980).

The economic considerations of the ever increasing cost of insecticides and the relatively stable product prices of pastoral produce has focussed attention on alternative methods of controlling pasture pests. Based on laboratory studies Jackson *et al* (1981) considered that three species of parasitic nematodes have potential for controlling pasture pests in this country.

N. bibionis which has successfully been used for the control of currant clearwing (Bedding and Miller 1981a) commonly causes low levels of mortality in porina populations in the southern North Island. This paper reports on preliminary studies on the use of this parasitic nematode for the control of this pest.

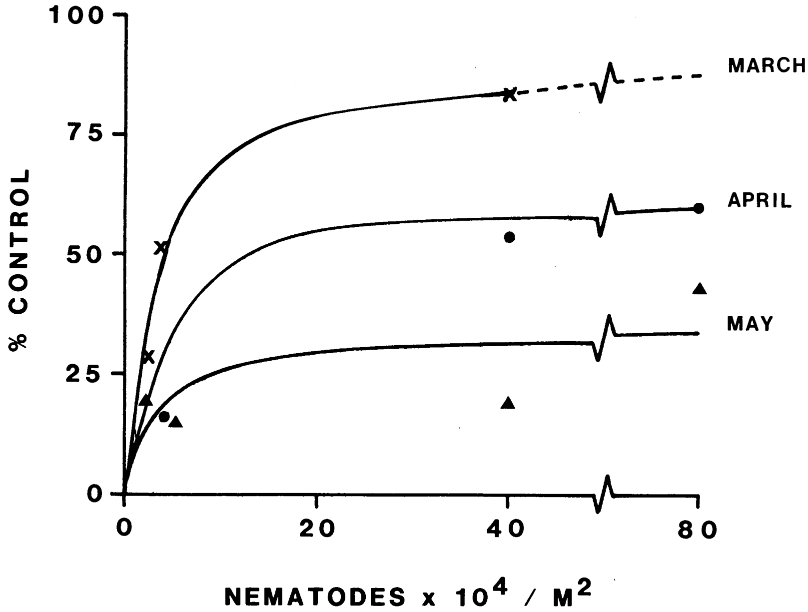
METHODS

N. bibionis were taken from infected porina collected in the field and cultured in the larvae of the greater wax moth *(Galleria mellonella)* (Poinar 1979). Infective juvenile nematodes cultured in this way were suspended in water and applied to three small field plots trials in the Pahiatua hill country at three or four rates (see Fig. 1). Plots (0.66 x 0.33 m) in all trials were separated by 20 cm wide buffer strips. One trial was laid down in March, another in April and the last in May of 1981. Applications were made to short pasture through a perforated polythene bag at an equivalent rate of 2500 litres of water/ha. An untreated control which received the same rate of water was included. Treatments were laid out in single randomised blocks and were replicated 8 or 12 times. Each of the three trials were sampled for porina about 17 and 25 days following treatment. Soil temperatures were monitored over the duration of the trial and soil moisture in the top 2 cm was measured twice weekly.

RESULTS AND DISCUSSION

The relationship between percent porina control (based on the untreated plots) and nematode rate was found to be asymptotic (Fig. 1). The level of control at which the asymptote occurred, decreased as autumn advanced, but the approximate range in

Fig. 1. Relationship between percent control and application rate of nematodes (---estimated response).



nematode rate which spanned the points of inflection and the asymptote were similar irrespective of the levels of control obtained. Whether the decrease in control with time, was related to a fall in the mean minimum soil temperature, an increase in soil moisture levels (Table 1) or a change in the susceptibility of the pests is not known. Laboratory studies with porina have shown that the effectiveness of nematode control does not decrease with larval age or within the soil moisture ranged encountered in these studies. Constant temperature studies confirmed, that the most probably cause for this decrease in control was the fall in soil temperatures which occurred from March to May (Table 1).

In March, 85% control of porina was obtained with 40 x 10^4 nematodes/m^2, in April 55% and 19% in May (Fig. 1). Bedding (pers comm) considers that with current technology nematodes can be cultured for about 2 cent per million. Hence the high level of control achieved with a rate of 40 x 10^4 nematodes/m^2 in March would cost $80/ha for nematodes alone and at a tenth of this rate, which gave 50% control, $8/ha.

TABLE 1: Mean and range ( ) of soil temperatures and moistures measured on the trial sites.

Month	Mean soil temp. (°C) at 2 cm	Mean % soil moisture (0-2 cm)	
	Min	Max	
March	13 (12-14)	19 (18-20)	26 (22-34)
April	10 (9-12)	16 (13-18)	72 (62-82)
May	5 (2-10)	13 (8-16)	68 (57-85)

Clearly, the optimal use of *N. bibionis* for short term porina control is dependent on the precise definition of the porina control-nematode rate response curves for a wide range of environmental conditions. It is only with this information that the optimal cost/efficiency of this form of biocontrol can be compared with other methods of control.

In conclusion, these results substantiate the observation of Jackson *et al* (1981), that parasitic nematodes may offer considerable potential for the control of pasture pests, and have defined some of the information required to use them most effectively as short term methods for pest control.

ACKNOWLEDGEMENT

These studies were conducted largely as a result of the enthusiasm for the potential of parasitic nematodes for pest control engendered by a visit from Dr R.A. Bedding of CSIRO. The generous assistance of Hawkes Bay Farmers for part financing his trip and CSIRO for supporting his visit are gratefully acknowledged. The identification of the species of nematode used in these studies by Dr Bedding and the assistance of Mr R. Lawrence on whose property these studies were conducted is also acknowledged.

REFERENCES

Bedding, R.A., 1976. New methods increase the feasibility of using *Neoaplectana* spp. (Nematoda) for the control of insect pests. *Proc. 1st Int. Conf. Invertebrate Pathology,* Kingston, Canada: 250-254.

Bedding, R.A., 1981. Low cost, in vitro mass production of *Neoaplectana* and *Hecterorhabditis* species, (Nematode) for field control of insects pests. *Nematologica:* in press.

Bedding, R.A. and Miller, L.A., 1981a. Disinfesting blackcurrant cuttings of *Synanthedon tupiliformis,* using the insect paracitic nematode, *Neoaplectana bibionis. Environmental Entomology in press.*

Bedding, R.A. and Miller, L.A. 1981b. Use of a nematode, *Heterorhabditis heliothidis,* to control black vine weevil, *Otiorhynchus sulcatus,* in potted plants. *Environmental Entomology* in press.

Clearwater, J.R. and Wouts, W.M. 1980. Preliminary trials on the control of lemon tree borer with nematodes. *Proc. 33rd N.Z. Weed and Pest Control Conf.:* 133-135.

Jackson, T.A. Bedding, R.A. Trought, T.E.T. Kain, W.M. and East, R., 1981. The potential use of nematodes for the control of pasture pests. *Proc. 34th N.Z. Weed and Pest Control Conf.:*

Poinar, G.O. Jr., 1979. Nematodes for Biological control of insects. CRC Press, Boca Raton, Florida.