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Investigations of ryegrass toxicity

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1977 - SUMMARY OF RESULTS OF FIELD EXPERIMENTS

INVESTIGATIONS OF RYEGRASS TOXICITY

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RESIDUAL EFFECT OF NEMATICIDE ON RYEGRASS TOXICITY A SEASON AFTER TREATMENT

Experiment	:	76KA30
Location	:	M. Butterworth and F. Quartermaine, Katanning. J. Griffith, Gnowangerup.
Aim	:	To determine the residual control of the nematode, *Anguina* sp., on experimental plots sprayed with phenamiphos (Nemacur) in 1975 (75KA23).
Treatments	:	Phenamiphos was applied in 1975 (75KA23) at four rates (0, 2.5, 5.0 and 10.0 l/ha) x three times of applications (June; June and July; or June, July and August).
Methods	:	The plots were mown to simulate summer grazing and stock was excluded during the growing season. The numbers of nematodes per gram of threshed grain was estimated for each plot.
Results	:	Table 1 shows results.

COMMENTS

The levels of nematodes in 1976 were not significantly different between the sprayed and unsprayed plots at each property. However, between 1975 and 1976, the populations declined on the unsprayed plots at both Quartermaine's and Griffith's which were one year out of crop when the sprays were applied. For the same period, the levels remained unchanged on Butterworth's which was two years out of crop at the time of spraying. Consequently, even though there is no residual control of nematodes one season after spraying, there appears to be a natural drop in populations in successive years after cropping. These results suggest that the use of nematicides to control ryegrass toxicity may only be necessary in seasons immediately following cropping when the risk of toxicity is highest.

TABLE 1

NEMATODE LARVAE PER GRAM RYEGRASS SEED

Times of Application	Rate of Nematicide l/ha			
	0	2.5	5.0	10.0
Quartermaine property:				
June	21,025[A] (7,777)[B]	9,250 (6,117)	8,350 (17,735)	16,475 (4,965)
June + July		75 (650)	450 (1,862)	475 (2,182)
June + July + August		225 (2,760)	100 (4,835)	150 (6,135)
Griffith property:				
June	23,700 (1,822)	42,700 (2,910)	13,125 (1,080)	48,700 (1,950)
June + July		5,950 (1,245)	75 (1,477)	100 (1,027)
June + July + August		150 (825)	0 (1,860)	0 (514)
Butterworth property:				
June	3,400 (2,760)	2,318 (1,695)	1,625 (1,582)	1,430 (913)
June + July		700 (1,605)	2,400 (2,565)	25 (285)
June + July + August		0 (2,100)	275 (1,215)	0 (555)

A 1975 populations

B 1976 populations in parenthesis

SURVIVAL OF ANGUINA SP. AND EMERGENCE FROM GALLS

Experiment : 76KA28

Location : J. Griffith, Gnowangerup.

Aim : To determine how long the nematode *Anguina* sp. will survive in the field in the absence of ryegrass.

Methods : Nylon mesh bags (approximately 30 mm x 30 mm), each containing 10 nematode galls, were lightly covered with soil and left in a paddock with a known history of toxicity. Eight nylon bags were collected at intervals of 2 weeks during the growing season and 4 weeks during summer. The larval content of each gall was estimated.

Results : The average number of larvae remaining in galls during the 1976 season were as follows:

	Larvae per gall
April	1,690
May	1,566
June	922
July	512
August	1,248
September	210
October	307
November	187

COMMENTS

These results suggest that up to 10% of the larval complement in galls can survive for a second season. A similar loss in the second season would leave a negligible population by the third year. However, in this experiment the survival of larvae in the soil after leaving the gall was not considered. Further investigations are planned to consider this aspect.

EFFECT OF NEMATICIDES ON THE DEVELOPMENT OF TOXICITY IN RYEGRASS PASTURE

Experiment : 77KA22

Location : J. Griffith, Gnowangerup.
Paddock cropped 1974, 1975. Eighty cattle mortalities recorded in December 1975.

Aim : Repeated spraying with nematicide during a season has been shown to control the nematode *Anguina* sp. and prevent the development of toxic ryegrass (75KA23). However, the cost of repeated spraying is prohibitive (3 sprays of Nemacur at 2.5 l/ha costs $62.85 per ha.). Nevertheless, results have suggested that strategic spraying in relation to climate or plant development at low rates and at less frequent intervals may provide an economic means of control. An experiment was done to evaluate this strategy.

Treatments : Phenamiphos (Nemacur) was applied at 5 rates (0, 2, 4, 8 or 16 l/ha) x 6 times of application (at 4, 6, 8, 10, 12 or 14 weeks after opening rain which correspond to July 13, July 26, August 11, August 24, September 6 and September 22).

Methods : Nematicide was applied with a hand spray. Stock was excluded during the growing season. Nematode, bacterial and total number of galls were estimated per gram of threshed grain at maturity.

Results : Table 1 shows results.

COMMENTS

Low numbers of nematode and bacterial galls present in the plots harvested at the end of the season reflected good control of nematodes in plots sprayed either 4, 6 or 8 weeks after the opening rains. During this period, the level of control did not differ significantly between any of the rates used.

With later sprays, the level of control was proportional to the rate of nematicide applied although even at the highest rate of 16 l/ha, the populations of nematodes were still higher than on the plots treated with 2 l/ha between 4 and 8 weeks after the opening rain. These results confirm that a low rate of nematicide (2 l/ha) sprayed at a critical period (in 1977 between 4 and 8 weeks after emergence) will give good control of *Anguina* sp.

TABLE 1

EFFECT OF PHENAMIPHOS ON THE DEVELOPMENT OF NEMATODE AND BACTERIAL GALLS IN RYEGRASS PASTURE

Rate of nematicide (l/ha)	Time of spray					
	13 July	26 Jul	11 Aug	24 Aug	6 Sept	22 Sept
(a) Number of nematode galls per gram threshed seed:						
0	25.3	24.8	14.4	15.4	19.7	16.5
2	2.4	2.4	4.3	14.8	16.9	10.3
4	1.0	0.8	0.7	10.9	7.4	6.5
8	0.1	0.8	0	2.5	9.7	3.4
16	0.4	0.3	0.2	3.8	8.4	2.2
(b) Number of bacterial galls per gram threshed seed:						
0	7.7	8.1	6.8	5.0	5.3	5.1
2	0.4	1.5	1.4	4.4	8.1	5.2
4	0.5	0.1	0.1	5.4	7.3	6.0
8	0	0.4	0	3.7	5.0	2.6
16	0.9	0.4	0.1	2.5	4.7	3.0
(c) Total number of galls per gram threshed seed:						
0	33.0	32.9	21.2	20.4	25.2	21.6
2	2.2	3.9	5.6	19.3	25.0	15.6
4	1.5	0.9	0.8	16.4	14.7	12.6
8	0.1	1.3	0	6.2	14.7	6.0
16	1.3	0.6	0.3	6.3	13.1	5.2

(a) lsd (.05) = 6.7
(b) lsd (.05) = 4.6
(c) lsd (.05) = 10.0

EFFECT OF BURNING, CROPPING AND CULTIVATION ON RYEGRASS TOXICITY

Experiment : 77KA21

Location : J. Griffith, Gnowangerup.

Aim : To determine the effect of burning, cropping and cutlivation on the incidence of nematodes and bacteria and the development of toxic ryegrass. This study was initiated to determine why ryegrass pasture is most toxic the year immediately following a crop and subsequently becomes safer to graze.

Treatments : There were four main treatments:-

1. Cultivation with cropping.
2. Cultivation without cropping.
3. No cultivation with crop (minimum tillage operation).
4. No cultivation, no crop.

Each of these four main treatments were replicated in areas that were:-

1. Last cropped in 1975 and not burnt.
2. Last cropped in 1975 and burnt in April 1977.
3. Last cropped in 1976 and burnt in April 1977.

Methods : In December 1977 the mature ryegrass seed was collected from each plot and the number of nematode and bacterial galls present were estimated.

Results : Tables 1 and 2 summarize the results.

COMMENTS

The results show that cropping and cultivation *per se* had no significant effect on the levels of nematode or bacterial galls that developed in the ryegrass pasture. It seems likely therefore that the level of ryegrass toxicity is simply related to the density of ryegrass which increases following cropping.

However, there was a significant response to burning. Table 2 shows that there was significantly fewer bacterial galls in the burnt plots irrespective of the length of the pasture phase. These results suggest that even though the total number of galls are unchanged, the proportion that become colonized by bacteria can be reduced by up to 85%. Since the toxicity of ryegrass is directly related to the level of bacterial galls present, the practice of burning in April, particularly in crop stubbles, may reduce or even eliminate the risk of toxicity in the following spring. The minimal cost and additional benefits from pasture improvement will make this a popular strategy for farmers to accept.

TABLE 1

THE EFFECT OF CROPPING AND CULTIVATION
ON THE NUMBER OF NEMATODE AND BACTERIAL GALLS
PER GRAM OF THRESHED RYEGRASS SEED

Treatment		Number of galls/g threshed seed		
Cultivated	Cropped	Nematode	Bacterial	Total
+	+	22.1	10.2	32.3
+	-	14.5	11.9	26.4
-	+	20.3	6.5	27.5
-	-	21.1	7.6	28.7
l.s.d. (0.05)		n.s.	n.s.	n.s.

TABLE 2

THE EFFECT OF DURATION OF PASTURE PHASE
AND AUTUMN BURNING ON THE NUMBER OF NEMATODE AND
BACTERIAL GALLS PER GRAM OF THRESHED RYEGRASS SEED

Year last cropped	April burn	Number of galls/g threshed seed		
		Nematode	Bacterial	Total
1975	-	10.5	22.3	33.3
1975	+	27.1	8.1	35.2
1976	+	20.2	3.0	23.2
l.s.d. (0.05)		n.s.	8.0	n.s.