COMPARATIVE EFFECTS OF KELP PREPARATIONS AND ETHOPROP ON NEMATODE-INFECTED BERMUDAGRASS[1]

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Accepted:
29.III.1983
Aceptado:

ABSTRACT

Tarjan, A.C., and John J. Frederick, 1983. Comparative effects of kelp preparations and ethoprop on nematode-infected bermudagrass. Nematropica 13:55-62.

A 'Tiflawn' bermudagrass [*Cynodon dactylon* (L.) Pers.] area at the University of Florida campus Percy Beard Track in Gainesville was treated with various kelp preparations and ethoprop. The grass roots were parasitized mainly by *Belonolaimus longicaudatus* Rau, 1958; and sporadically by *Hemicriconemoides wessoni* Chitwood and Birchfield, 1957; *Trichodorus christiei* Allen, 1957; *Pratylenchus neglectus* (Rensch, 1924); *Hoplolaimus galeatus* (Cobb, 1913); *Helicotylenchus erythrinae* (Zimmermann, 1904); *Xiphinema vulgare* Tarjan, 1964; and *Criconemoides sphaerocephalus* Taylor, 1936. Materials used were soluble seaweed (Maxicrop®), kelp meal (Maxicrop®), liquified seaweed (PanaSea®) alone and with Zip® spray adjuvant or Aqua Gro® soil penetrant, Cytex® cytokinins, Ekol® leaf mold, and ethoprop. Two months after treatment, ethoprop treatment resulted in a significantly (P=0.10) higher grass yield than any of the other test materials. Ethoprop-treated plots had some significant reductions in total plant-parasitic nematode populations for the first month after treatment as compared to some of the other materials applied, but this difference dissipated the following month.

Additional key words: bermudagrass, kelp, seaweed, ethoprop

RESUMEN

Tarjan, A.C., y John J. Frederick, 1983. Efectos comparativos de preparaciones derivadas de algas marinas y ethoprop sobre la yerba bermuda infectada de nematodos. Nematrópica 13:55-62.

Un area de yerba bermuda [*Cynodon dactilon* (L.) Pers.] en terrenos de la Universidad de la Florida en Gainesville fué tratada con varias preparaciones derivadas de algas marinas, ethoprop y otros productos. Las raices de las hierbas estaban parasitadas por *Belonolaimus longicaudatus* Rau, 1958; y esporadicamente por *Hemicriconemoides wessoni* Chitwood y Birchfield, 1957; *Trichodorus christiei* Allen, 1957; *Pratylenchus neglectus* (Rensch, 1924); *Hoplolaimus galeatus* (Cobb, 1913); *Helicotylenchus erythrinae* (Zimmermann, 1904); *Xiphinema vulgare* Tarjan, 1964 y *Criconemoides sphaerocephalus* Taylor, 1936. Los materiales usados fueron: alga marina soluble (Maxicrop®), harina de quelpo (Maxicrop®), alga marina liquada (PanaSea®) sola y con el acondicionador de la solución rociadora Zip® ó el penetrante del suelo Aqua

Gro®, la citoquinina Cytex®, el hongo foliar Ekol® y el insecticida-nematicida ethoprop. Dos meses después de la aplicación el tratamiento ethoprop produjo rendimientos de hierba significativamente (P=0.1) más altos que el resto de los materiales probados. Los lotes tratados con ethoprop un mes después de la aplicación experimentaron cierta reducción significativa en los totales de las poblaciones de los nematodos parasiticos comparado con los otros materiales usados en la prueba, pero esta diferencia desapareció en los meses siguientes.
Palabras claves adicionales: yerba bermuda, quelpo, alga mariana, ethoprop.

INTRODUCTION

Bermudagrass is used extensively in Florida on golf courses and other areas such as sports fields and lawns (1). Nematodes can affect bermudagrass as adversely as they do other turfgrasses (2,4). The debilitating effects of nematode infection on turf are more evident during stress periods (6), and it becomes increasingly more expensive to relieve stress conditions on affected turf during such periods. Costs of supplemental irrigation, fertilizer and chemical nematicides have all risen.

A feasible solution to the problem is the development and use of "low energy" pest management technology. Many gardeners rely on heavy applications of garden compost to reduce water and fertilizer needs of the plants. A common mulching material for coastline Europeans is seaweed (5), from which soil amendment products have been prepared commercially for several years. Seaweed extract [e.g. from *Ascophylum nodosum* (L.) LeJolis] contains micronutrients and phenols which may increase plant vigor, and has been reported to have nematicidal properties (3). However, those nematicidal properties can be inadequate for economic control of nematodes (7) and commercial chemical nematicides are still necessary to adequately reduce nematode populations. Nonetheless, use of seaweed derivatives could conceivably reduce the need for chemical nematicides by contributing to nematode control and simultaneously aiding in plant growth.

This study was designed to compare the effects of seaweed products with a commercial leaf mold and ethoprop, a commercially available nematicide, on nematode-infected 'Tiflawn' bermudagrass.

MATERIALS AND METHODS

Bermudagrass turf [*Cynodon dactylon* (L.) Pers., var 'Tiflawn'] at the Percy Beard track on the University of Florida campus in Gainesville, was found to contain a relatively even distribution of sting nematodes, *Belonolaimus longicaudatus. Hemicriconemoides wessoni, Trichodorus christiei, Pratylenchus neglectus, Hoplolaimus galeatus, Helicoty-*

lenchus erythrinae, *Xiphinema vulgare*, and *Criconemoides sphaerocephalus* occurred sporadically and in low numbers. The test area was divided into fifty 0.9 x 10.1 m (3 x 33 ft) plots. Each of 10 treatments were replicated five times in a randomized complete block design. Treatments applied on 17 June 1981 were: 1) soluble seaweed (Maxicrop®) at 27 kg/ha (24.1 lbs/acre); 2) kelp meal (Maxicrop®) at 3018 kg/ha (2695 lbs/acre); 3) liquified seaweed (PanaSea®) at 5 l/ha (0.5 gal/acre); 4) liquified seaweed at 11 l/ha (1.2 gal/acre); 5) liquified seaweed at 11 l/ha plus spray adjuvant (Zip®) at 1 l/ha (0.1 gal/acre); 6) liquified seaweed at 11 l/ha plus soil penetrant (Aqua-Gro®) at 11 l/ha; 7) cytokinins (Cytex®) at 5 l/ha (0.5 gal/acre); 8) leaf mold (Ekol®) at 15,680 kg/ha (7 tons/acre); 9) ethoprop (Mocap®) 10G at 22.4 kg (ai)/ha (20 lbs/acre); 10) untreated controls. The test area was irrigated the day before application of treatments with 3.8-5.1 cm (1.5-2 inches) of water.

The water-soluble and liquified test materials (Treatments 1,3,4,5,6, and 7) were added to 7.6 l(2 gal) of water and sprinkled on test plots. Kelp meal and leaf mold (Treatments 2 and 8, respectively) were applied by hand. A shaker jar was used to distribute the granular ethoprop (Treatment 9) after which the granule-treated plots were irrigated [using approximately 30 l(8 gal) of water, sprayed on each plot]. A few hours after application of treatments, 5.3 cm (2.1 inches) of rain wetted the experimental area.

Soil and root samples [four 2.54 cm (one inch) diameter plugs per plot] were obtained from each plot one and two months after application. The soil from the plugs was thoroughly mixed and a 250 cm^3 aliquant processed for nematodes by a standard sugar solution flotation technique. Plant-parasitic nematodes thus isolated were identified and counted. Grass clippings were obtained 10 July, 5 August, and 10 September using a professional reel-type mower with attached grass catcher. The test was terminated after 4 months.

Data on nematode populations and fresh weights of grass collected from the plots were analyzed for variance and ranked by the Duncan's multiple range test.

RESULTS

One month after application of treatments, plots treated with ethoprop yielded significantly fewer total numbers of plant-parasitic nematodes than other test plots, including controls ($P=0.10$). When compared to the pertinent nematode counts obtained from control plots: (a) there was a noticeable, though not significant, reduction of *Belonolaimus longicaudatus* in plots treated with ethoprop; (b) none of the treatments significantly reduced *Criconemoides sphaerocephalus* or *Helicotylenchus erythrinae;* (c) only the ethoprop and PanaSea (11 l/ha) treatments significantly reduced numbers of plant parasites, exclusive of those named above (Table 1).

Two months after application of materials there were no significant reductions of plant-parasitic nematodes in any of the treatment plots as compared to those in control plots (Table 2).

Grass clipping mean weights one and two months after treatment were greatest from the ethoprop-treated plots but were statistically significant as compared to the control only in the second month after treatment ($P=0.10$). Grass weights were similar in all treatments three months after treatment (Table 3).

DISCUSSION

Although the use of seaweed products to stimulate plant growth has been advocated, the results of this experiment did not support such advocacy. Application of the commercially available nematicide ethoprop reduced nematode populations for one, but not two, months after application (Table 1). Yet, while the increase in total plant-parasitic nematode population from July to August was only 23% for controls, the nematodes in ethoprop-treated plots increased 340%! This resulted in what was a 52% decrease in nematode population, as compared to controls, for the July count of the ethoprop treatment to a 30% increase for the August count (Table 2).

Monitoring populations of *B. longicaudatus, C. sphaerocephalus,* and *H. erythrinae* for two months after treatment yielded no significant or new information.

Ethoprop was superior to other treatments in stimulating turf growth during the four months this test was conducted (Table 3).

Table 1. Effect of treatments on mean numbers of plant-parasitic nematodes on 10 July 1982, one month after treatment.

Treatment	*Belonolaimus longicaudatus*	*Criconemoides sphaero-cephalus*	*Helicotylenchus erythrinae*	Other Plant Parasites	Totals	% increase (+) or decrease (–)
1. Maxicrop® soluble seaweed @ 27 kg/ha	112ab[x]	12a	58a	54abc	236ab	+ 2[y]
2. Maxicrop® kelp meal @ 3018 kg/ha	142ab	24a	10c	42bdc	218abc	– 6
3. PanaSea® liquified seaweed @ 5.1/ha	146ab	32a	18bc	40bdc	236ab	+ 2
4. PanaSea® liquified seaweed @ 11 l/ha	108ab	14a	10c	20dc	152bc	–34
5. PanaSea®liquified seaweed @ 11 l/ha + Zip® spray adjuvant @ 1 l/ha	104ab	24a	14bc	48bc	190bc	–18
6. PanaSea®liquified seaweed @ 11 l/ha + Aqua-Gro® penetrant @ 11 l/ha	184 a	22a	24bc	88a	318a	+37
7. Cytex® cytokinin soln. @ 5 l/ha	170a	22a	18bc	34bdc	244ab	+ 5
8. Ekol® Leaf Mold @ 15,680 kg/ha	146ab	16a	44ab	54abc	260ab	+12
9. Mocap® 10G @ 22 kg (ai)/ha	64b	22a	16bc	8d	110c	–52
10. Untreated control	126ab	30a	4c	72ab	232ab	—

[x]Data in columns followed by the same letter are not significantly different ($P=0.10$).
[y]Total of means for each treatment compared to untreated control.

Table 2. Effect of treatments on mean numbers of plant-parasitic nematodes on 5 August 1982, almost two months after treatment.

	Treatment	*Belonolaimus longicaudatus*	*Criconemoides sphaero-cephalus*	*Helicoty-lenchus erythrinae*	Other Plant Parasites	Totals	% increase (+) or decrease (−)
1.	Maxicrop® soluble seaweed @ 27 kg/ha	144a[x]	56ab	46a	96b	342a	+19[y]
2.	Maxicrop® kelp meal @ 3018 kg/ha	144a	22b	8a	206a	380a	+33
3.	PanaSea® liquified seaweed @ 5 l/ha	102a	34ab	20a	84b	240a	−16
4.	PanaSea® liquified seaweed @ 11 l/ha	124a	98ab	56a	70b	348a	+22
5.	PanaSea® liquified seaweed @ 11 l/ha + Zip® spray adjuvant @ 1 l/ha	108a	44ab	18a	84b	254a	−11
6.	PanaSea® liquified seaweed @ 11 l/ha + Aqua-Gro® penetrant @ 11 l/ha	102a	12b	6a	148ab	268a	− 6
7.	Cytex® cytokinin soln. @5 l/ha	100a	14b	18a	68b	200a	−30
8.	Ekol® Leaf Mold @ 15,680 kg/ha	100a	32ab	22a	66b	220a	−23
9.	Mocap® 10G @ 22 kg (ai)/ha	148a	140a	8a	78b	374a	+30
10.	Untreated control	140a	38ab	6a	102b	286a	—

[x]Data in columns followed by the same letter are not significantly different (P = 0.10).
[y]Total of means for each treatment compared to untreated control.

Table 3. Effect of treatments on mean weights of grass clippings (in g) one to three months after treatment.

Treatment	Sampling Date: 10 July 81	Sampling Date: 5 Aug 81	Sampling Date: 10 Sept 81	$\bar{X}$	% increase (+) or decrease (–)
1. Maxicrop® soluble seaweed @ 27 kg/ha	327ab[x]	214b	992a	511	– 1[y]
2. Maxicrop® kelp meal @ 3018 kg/ha	329ab	228b	1033a	530	+ 3
3. PanaSea® liquified seaweed @ 5 l/ha	325ab	184b	966a	500	– 3
4. PanaSea® liquified seaweed @ 11 l/ha	274b	182b	961a	472	– 9
5. PanaSea® liquified seaweed @ 11 l/ha + Zip® spray adjuvant @ 1 l/ha	315b	209b	969a	498	– 4
6. PanaSea® liquified seaweed @ 11 l/ha + Aqua-Gro® penetrant @ 11 l/ha	348ab	204b	954a	502	– 3
7. Cytex® cytokinin soln. @5 l/ha	289b	181b	886a	452	–13
8. Ekol® Leaf Mold @ 15,680 kg/ha	314b	191b	1046a	517	0
9. Mocap® 10G @ 22 kg (ai)/ha	415a	288a	1033a	579	+12
10. Untreated control	328ab	225b	1000a	517	—

[x]Data in columns followed by the same letter are not significantly different (P=0.10).
[y]Mean weight over three sampling dates compared to untreated control.

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Received for publication:

4.II.1983

Recibido para publicar:

[1]Florida Agricultural Experiment Station Journal Series No. 4487.