

Effective Microorganisms for Controlling Ticks in Cattle

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Abstract.

A study was conducted in 1994 to determine the effect of Effective Microorganisms (EM) on controlling ticks (*Boophilus microplus* Canestrini, 1887) in cattle. Three lots of 15-month old crossbred animals (five animals per lot) were sprayed six times from October to December with EM 5 using backpack sprayers (Jacto brand) with a 20-liter capacity. At each spraying, individual animals received three liters of EM 5 solution diluted with water to either 50% or 30%. Within the first 60 days after EM 5 was applied, there was a significant reduction in the number of engorged female ticks. In late December, EM 5 at 30% showed effective control of tick populations and a reduction in costs. At first, the untreated control lot contained medium to high infestations, but subsequently there was an increase in the population of engorged females. During the entire period of observation, the control lot showed medium to high infestations. The results of EM 5 applications were comparable to conventional pyrethroid pesticides used to control ticks. Applications of EM5 solution at 30% (at 15-day intervals) significantly reduced the cost of tick control compared with two applications of pyrethroid pesticides. EM5 was also effective in controlling the infestation of botflies (*Dermatobia* sp,).

Introduction

The infestation of cattle by ticks (*Boophilus microplus*) is a serious problem in Brazil. This particular pest is the cause of major economic losses in milk and meat production in the State of Rio de Janeiro. Control measures, based mainly on chemical pesticides, have also had adverse effects on the environment and human health. Because of these concerns, and the high cost of chemical control with acaricides, dairymen and ranchers have been unable to invest in animal genetic improvement programs that might provide some natural resistance to this bloodsucking arachnid. Consequently, with the introduction of Effective Microorganisms (EM) into Brazil in the early 1990's as a microbial inoculant to enhance soil quality and plant protection, there has been considerable interest in whether EM could provide a measure of biological control against this pest. While this was the principal focus of the present investigation, the effect of EM in controlling the infestation of botflies (*Dermatobia* sp.) was also of interest.

Materials and Methods

The Experimental Site

The experiment was conducted from October to December in 1994. The Vila Pepita Farm located in Barra Mansa County, 100 km from the city of Rio de Janeiro and 10 km from Barra Mansa City (longitude 44°10'46"W., latitude 23 °32'23"S.). The topography is hilly; the climate is tropical with an average temperature of 28°C. There is a dry season from May to

October and a rainy season from November to March.

Selected Animals and Epidemiology

Three lots of 15-month old, crossbred, male beef cattle (five animals per lot) were selected for the experiment. Two lots were treated with EM5 during the experimental period while the third lot served as an untreated control. A parasitic profile was established for each animal to assess the initial level of tick infestation and number of engorged females. The animals were sprayed with EM5 at 15-day intervals and the parasite dynamics were assessed by counting the number of 3-mm diameter engorged females between sprayings. Each animal was identified by a numbered tag attached to the ear.

Concentration and Volume of EM5 Applied

The treated animals were sprayed with EM5 stock solution diluted with water to 50 percent between October 14 and November 24, and diluted to 30 percent thereafter based on significant positive results from the higher concentration. A backpack sprayer (Jacto brand, 20-liter capacity) was used to apply the EM formulations with each animal receiving 3 liters of EM solution at each spraying.

Results and Discussion

Observations

Results reported in Table 1 indicate that the animals in both lots treated with EM5 (50-percent dilution) showed a definite decrease in the number of engorged female ticks (*Boophilus microplus*) about 40 days after the initial application compared with the untreated control lot. The tick population continued to decline as the EM5 concentration was reduced to 30 percent which indicates a residual effect of EM5. By the end of the experiment some of the EM-treated animals were completely parasite-free, while the control animals were highly infested.

Ticks smaller than 3 mm in diameter were not counted or reported in Table 1. However, it was noted that the number of ticks smaller than the standard size, as well as the number of eggs, decreased significantly in animals treated with EM5.

Botflies (*Dermatobia hominis*) are a serious bovine parasite that cause serious damage to the subcutaneous tissues, reducing the market value of the animal's hide. An important observation here is that some of the lesions in the hides of EM-treated animals tended to undergo a rapid cicatrization (i.e., healing), thereby preserving hide quality. Also, EM appeared to parasitize the botflies, destroying them after two or three sprayings.

Another noteworthy observation is that tick populations tended to be higher in dark-colored animals compared with the light-colored ones. However, the opposite was true for the botfly populations. The exact reason for this is unclear, and whether it has some scientific basis should be investigated.

Ticks in the neck, ear, dewlap and inguinal (i.e., groin) areas of some EM-treated animals were difficult to control and continued to grow for some time. Nevertheless, the tick populations in these areas did not show a significant increase after EM treatment.

The general health of the EM-treated animals increased progressively compared with the control lot. Following EM treatment they showed a steady weight gain, healthier and brighter-colored hides, greater disease resistance, and increased wound cicatrization

Cost / Benefit Comparison of EM with Conventional Acaricides

The cost of treatment per animal for tick infestation using EM5 (applied at 30% dilution) compared with two commercially-available acaricides, Ivermectin and Doramectin (applied at 1% active ingredient) is shown in Table 2. The treatment cost per animal is substantially lower for three applications of EM5 over a 45-day period than two applications of either acaricide over a 60-day period. Moreover, it became apparent that after the initial treatment period, EM5 could provide acceptable tick control when applied at monthly intervals due largely to its high residual effect. Meanwhile, animals treated with the acaricides still had a significant tick population which indicated a very low residual effect. Thus, the cost / benefit effect of EM5 was far greater than either of the acaricides and eliminated the potential adverse effects of these chemicals on animal health, human health, and the environment.

Conclusions

Despite the short period over which observations were made on EM-treated animals, EM5 was shown to be a cost-effective method for biocontrol of ticks in cattle compared with acaricides. In addition, EM improved the health and condition of the animals, increased their rate of gain, and enhanced their resistance to disease. The use of EM5 presents a promising new and affordable approach for the control of tick populations and infestations in bovine animals which avoids environmental pollution and adverse effects on human and animal health.

Table 1. Number of Engorged Tick Females (*Boophilus microplus*), per Animal as Affected by Time of Application and Concentration of EM 5.

Lot (No.)	Animal (No.)	Time of EM5 application (No. of engorged females)					
		10-14-94	11-3-94	11-12-94	11-24-94	12-1-94	12-15-94
1	78	31	24	24	9	8	5
	81	35	30	25	16	3	0
	90	25	15	15	5	5	3
	95	7	4	0	0	0	0
	98	14	25	10	8	6	2
2	79	8	10	9	6	5	2
	85	13	10	5	0	0	0
	86	11	8	8	5	2	2
	89	11	8	9	6	1	0
	99	0	2	9	3	0	0
Control	w/n ^o	0	8	17	16	21	31
	83	6	15	19	18	27	26
	94	14	11	16	17	23	21
	96	3	11	19	31	30	35
	100	32	26	33	29	35	34

EM 5 stock solution was diluted with water and applied to animals at the following concentrations on the dates indicated:

10-14-94 to 11-24-94 50% EM5

12-01-94 to 12-15-94 30% EM 5

Table 2. Treatment Cost of Tick (*Boophilus microplus*) Control per Bovine Animal Using EM5 Compared with Two Conventional Acaricides.

Treatments	Treatment cost per animal	
	Unit cost (\$US)	Total cost (\$US)
EM5 (30%)	3.78	11.34
Ivermectin (1%)	6.72	13.44
Doramectin (1%)	6.44	12.88

EM 5 at 30% dilution was applied 3 times during a 45-day period.

Ivennectin and Doramectin at 1% active ingredient were applied 2 times during a 60-day period.

Appropriate References

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