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Animal Health

The objective of the Section is to study and develop preventive medicine schemes adapted to the pasture and management production systems developed by the Tropical Pastures Program. Strategies for attaining this objective were explained in detail before (CIAT 1979, Tropical Pastures Program Annual Report).

Animal Disease Inventory

This inventory is important to understand the evolution of current infections, comparing findings for different areas and ecosystems, and deciding on entities or conditions that need more study throughout the target area. The listing described in last year's Annual Report, with rankings by priority for the Tropical Pastures Program has been confirmed by findings from Brazil and Venezuela.

ETES Brazil. Herds surveyed in the vicinity of Brasilia revealed that the farms milking cows in more intensive production systems have considerable more control measures for ticks, hemoparasite and gastrointestinal parasites, than beef herds. Several farms have installed preventive schemes with dippings every 15 days for tick control. This is in concurrence with the need to keep ticks at a level which will not affect productivity, maintaining at the same time a high degree of protection against hemoparasites. In contrast, at the moment there is no widespread control against ticks in pure beef herds in the area. It appears that most of the beef animals are zebu types which are somewhat more resistant to ticks. On the other hand, animal density is much lower in beef than in the mixed dairy herds, an average of 0.5 AU/ha vs. 1 AU/ha, respectively.

As far as vaccination is concerned, 10 of 12 farms in the ETES Brazil Project vaccinate against foot and mouth disease; all of the farms vaccinate against black-leg, and only one vaccinates against brucelosis. This lack of vaccination against brucelosis is probably one of the reasons for the high prevalence of Brucela abortus infection in beef cattle herds under extensive range conditions in the north of Mato Grosso.

Most technical assistants are recommending vaccination of adult animals agains botulism. Even though this could be useful in herds where cases of botulism have appeared, it is not economical for all herds in the area, since reports of botulism cases are localized.

In relation to nematode infestation most farms deworm once a year; however, they treat adults more often than young animals. This practice does not agree with most recommendations, since field studies revealed that young animals are more susceptible to round-worms than adults, and it is more important to remove parasites from growing animals.

In relation to photosensitization, three of seven farms reported cases in animals between 10 and 12 months of age. Ranchers associate the problem with the first grazing of the pasture and believe that it appears more often when the pasture is high.

ETES Venezuela. Some of the farms in the ETES Venezuela Project reported similar problems. Several include ticks as an increasing problem in recent years. Farmers feel they have more tick problems toward the beginning of the dry season. They also feel that Dermatobia hominis, "nuche", is rapidly increasing. One possible reason is the forest invasion of the open savannas. This new cover provides an adequate environment for the fly and the vectors. The forest cover is expanding because savannas are not burned, a practice which is banned in Venezuela.

It is also of interest that small farmers who have credit for milk operations have experienced calf mortality problems, probably due to internal parasites and hemoprotozoos, and also are being forced to spray against ticks every 21 days to prevent losses and to maintain milk production. Some farmers at low technical input levels do not treat animals against internal parasites until they experience losses from high infestation and anemia.

In Venezuelan farms two other conditions are reported. One is "sequita" which is probably similar to "secadera" from the Llanos of Colombia and "peste de secar" in the Cerrado of Brazil. Farmers believe that "sequita" occurs at any age including that of young animals. Antibiotic treatments and body stimulants have been tried with limited success. If this conditions is similar to the "secadera" cases in Colombia, mineral deficiencies could be involved. Ranchers also report cases of botulism, especially in areas of "Valle de la Pascua" and "El Tigre". Even though there are no confirmed laboratory cases, farmers are beginning to vaccinate. The main problem could be a mineral deficiency that induces animals to consume carcases, thereby picking up the botulism toxin.

ETES Project

This project is carried out in full cooperation among the Cattle Production Systems, Economics and Animal Health Sections. A complete description of the project appears in the Cattle Production Systems Section. Animal health information was obtained from surveys as reported above, of cattle ranches and examination of individual samples in each farm. Data analysis from farms in the Colombia and Brazil Projects was presented in CIAT 1980 Annual Report. Collection of data for ETES Venezuela has been completed and will be analyzed shortly.

Carimagua Surveillance

Overall cattle mortality in Carimagua decreased over the last four years. Present mortality (2.0%) is at a reasonable low level (Table 1). As stated in last year's CIAT Annual Report, this is a reflection of better nutrition of the herds as well as of closer and more effective animal management. Calf mortality stabilized this year at 6.2% of 550 registered births (Table 2). The main factors that contribute to calf mortality in Carimagua are sequelae of navel infections that induce poliartritis and abcesses. This is secondary to difficulties in management when calves are not treated soon after birth.

Table 1. Surveillance of cattle mortality in Carimagua[1].

Cause	1980[2]	1981[2]
Sinking in watering holes	17	8
Malnutrition	19	20
Bone fractures	8	10
Hepatogenous photosensitivity	1	7
Snake bite	2	1
Miscellaneous	14	17
Undiagnosed	25	18
Total	87	81

[1] Cattle population in 1980, 3500, in 1981, 4000; mortality rates (%), 1980, 2.5, in 1981, 2.0.
[2] Through September 31.

Table 2. Surveillance of calf mortality in Carimagua.

	1980		1981	
	No. births	Mortality (%)	No. births	Mortality (%)
Management systems herd	190	6.3	263	6.1
Breeding test herds	202	4.4	182	4.9
Other	261	7.6	105	5.7
Total	653	6.3	550	6.2

Nutrition-disease relationships. Monitoring of various herds in Carimagua showed the usefulness of two tests to study nutrition-disease relationships. A comparison is made in Table 3 of blood parameters from a group of animals with clinical malnutrition, with apparently normal cattle, and a group with external photosensitivity lesions. The animals with clinical malnutrition have total blood serum protein levels significantly lower than the steers on grass/legume associations ($P < 0.10$). In the photosensitivity animals blood protein is at normal levels and G.G.T. enzyme is significantly higher than in the other two groups ($P < 0.10$), indicating a liver lesion from some toxic effect. Animals with no apparent disease (steers on grass/legume associations) have both total protein and G.G.T. enzyme at normal levels.

Table 3. Comparison of clinical malnutrition and photosensitivity at Carimagua.

Herd	No. animals	Total serum protein[1] Range	Total serum protein[1] Average	G.G.T. enzyme Range	G.G.T. enzyme Average
Steers on native savanna with clinical malnutrition	5	4.2- 8.0	5.9[a2]	5.4- 17.4	10.0[a]
Steers on grass/legume associations	12	6.8- 8.0	7.5[b]	6.4- 19.3	11.1[a]
Steers on B. decumbens with clinical photosensitization	16	4.0-10.0	7.6[b]	10.3-122.0	59.0[b]

[1] $LSD_{\text{serum protein}}$ 1.39, LSD_{GGT} 24.78

[2] Different letters denote differences significant at the 0.1 level.

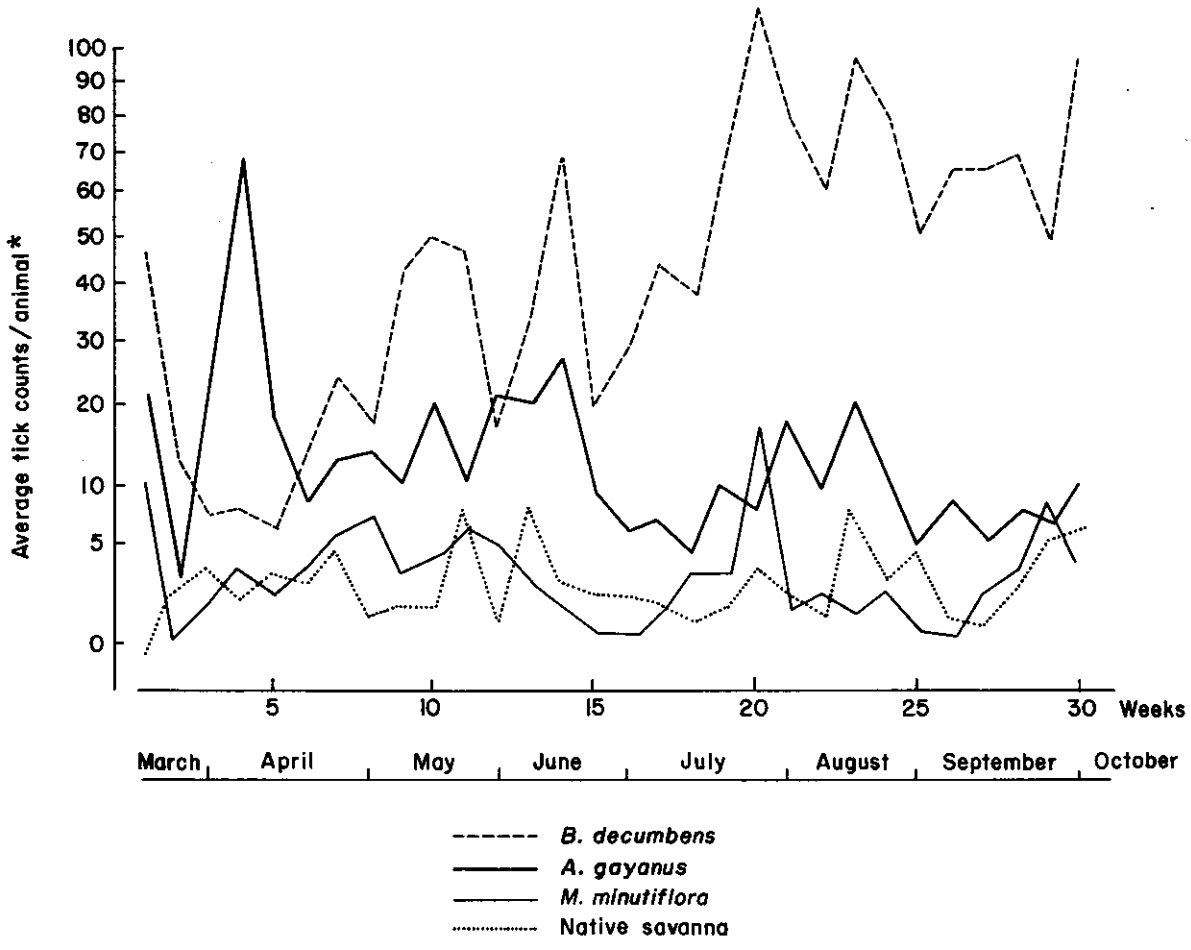
Bioecology of Boophilus microplus. This is the most important external parasite in the Topical Pastures Program target area. It has become one of the priorities for in-depth studies and is one of the factors being modified by changes in animal management resulting from introduction of sown pastures. A project was designed to study population dynamics of the tick in the Colombian Llanos. Its main objective is to study the effects of ecological factors in the infestation levels in animals with adult ticks. It is especially important to know seasonal variations of tick levels in the pastures and in the animals in this area.

The ecological conditions provided by Andropogon gayanus, Brachiaria decumbens, Melinis minutiflora and native savanna in pure stands for tick populations are evaluated during two full rainy and dry seasons. Animals are under continuous grazing and optimum stocking rates for each grass in each season, as described in CIAT's 1980 Annual Report.

Each paddock is infested with 500 evenly distributed engorged female ticks per animal. No acaricides are applied to the animals at any time. Evaluations (height and coverage) of grass in each paddock are made to define the conditions under which the larvae and adult populations are present. Tick larvae are evaluated on the pastures every two weeks and adult ticks on the animals every week.

Tick larvae populations are in the process of stabilization. After the first 13 samplings, Melinis grass had the lowest counts, followed by native savanna, Brachiaria decumbens and A. gayanus; however, the counts on B. decumbens increased toward the end of the rainy season.

Levels of adult ticks on the animals are probably a better reflection of the environment influence on the tick population. Heifers in B. decumbens and A. gayanus paddocks have the highest infestation levels during the first six months of the rainy season (Figure 1).



* Counts transformed by statistical expression $\sqrt{X+1/2}$, where X is the No. of ticks/head.

Figure 1. Boophilus microplus tick counts on heifers grazing four pastures in Carimagua.

Levels of infestation in Brachiaria have increased gradually from low levels of 20 adult ticks/head per day, to levels above 100 ticks/head, which are considered high. Levels in animals on Andropogon gayanus are of medium intensity, averaging between 20 and 30 adult ticks. For animals on M. minutiflora and native savanna the levels of adult ticks are similar and low (5-10 ticks average). In the first rainy season Brachiaria and Andropogon provided better environment for the persistence of larvae that end up as adult ticks in the animals. Pasture coverage could be one of the factors explaining differences in tick levels. At the August sampling (Table 4), Andropogon gayanus had roughly half the coverage of Brachiaria, and the average tick counts on the animals were much lower in the Andropogon group (20-30 ticks/head) as compared to the Brachiaria group (100-120 ticks/head) (Figure 1).

The findings of adult tick counts on the animals parallel observations of potted pastures. Larvae of B. microplus are seen readily in the leaves of B. decumbens, A. gayanus and even native savanna. However, they do not crawl on the leaves of M. minutiflora. Larvae in the pots only crawl dry and dead leaves of Melinis, and this is probably one reason why animals pasturing Melinis have low tick levels. This confirms previous observations that Melinis pastures have some repellent effect on the ticks.

The level of hemoparasites in the heifers is being measured. It is becoming evident (Figure 2) that animals grazing B. decumbens and A. gayanus have increased reactions compared with animals grazing M. minutiflora and native savanna.

The reaction to hemoparasites coincided with the tick adult counts, except for the heifers on A. gayanus. Even though these are results of only one rainy season, there is a tendency for M. minutiflora and native savanna to have lower larvae tick counts on the pasture, lower adult ticks on the animals, and less reaction against hemoparasites.

An apparently stable population of ticks in the pasture has been obtained and variations seen in larvae and adult tick counts are beginning to reflect differences in the environment offered by the pastures for tick multiplication and persistence. Information obtained from the next dry and rainy seasons will be useful for best knowledge of tick ecology that can be used in the design of control measures.

Photosensitization in cattle grazing Brachiaria decumbens. Photosensitization in young animals grazing B. decumbens is a limiting factor for the use of this pasture in the Program's target area. Work continued to determine the main epidemiological factors involved in presentation of the syndrome as well as possible control measures. This syndrome resembles the photosensitization seen in sheep and cattle in New Zealand.

No evidence has been found of the seasonality of the condition. However, clinical cases in the past four years show a tendency for cases to appear in the middle and at the end of the rainy season (Figure 3). Age is an important determinant; most cases occurred in cattle between 9 and 24 months of age.

Table 4. Pasture coverage in paddocks under evaluation for tick ecology and population dynamics.

Pasture	December 80		February 81		April 81		August 81	
	Coverage (%)	Height (cm)	Coverage (%)	Height (cm)	Coverage (%)	Height (cm)	Coverage (%)	Height (cm)
Andropogon gayanus	47	60	34	68	35	44	33	51
Brachiaria decumbens	40	30	33	27	36	26	58	30
Melinis minutiflora	66	27	51	32	50	31	64	24
Native savanna	43	24	55	29	54	44	65	51

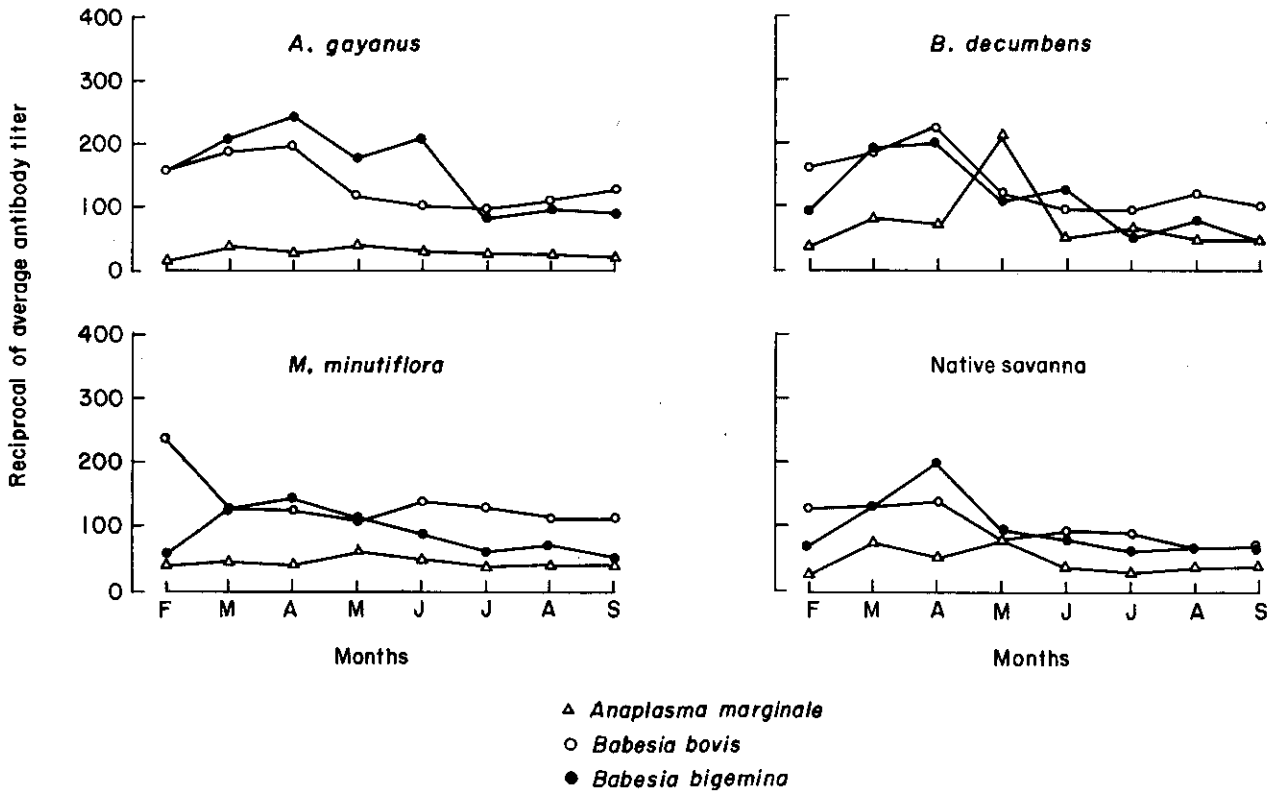


Figure 2. Bioecology of Boophilus microplus tick in Carimagua. Serological reaction to hemoparasites in heifers grazing four pastures.

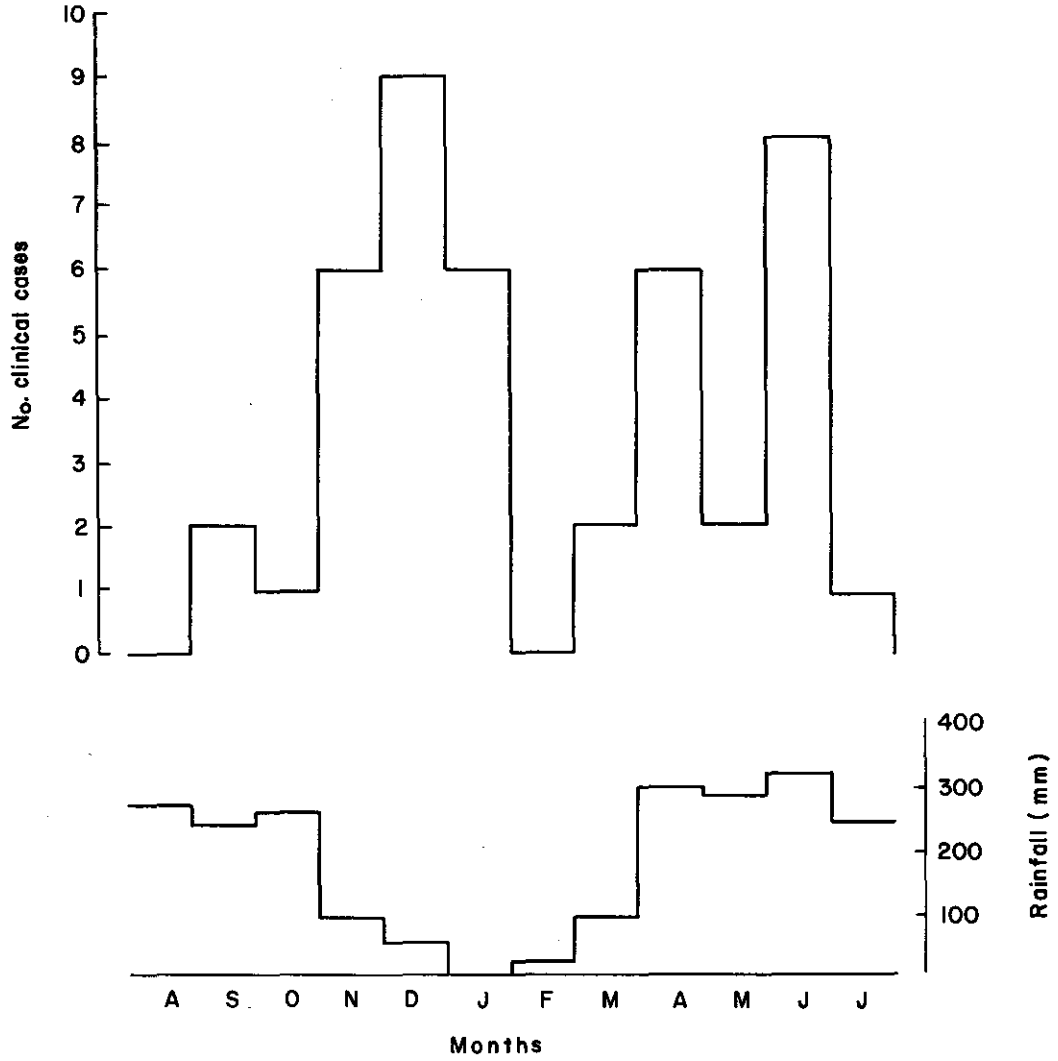


Figure 3. Hepatogenous photosensitivity in animals grazing B. decumbens. Accumulated four-year incidence by month in relation to average rainfall.

Cases in 1981 had two, commonly seen, clinical manifestations (Table 5). The animals developed edemas in the lower neck, dewlap and ears. This edematous form is apparently more acute and usually terminates in death of affected animals (7/6 animals in 1981). There was an obvious liver involvement detected by gross lesions and high levels of G.G.T. and S.G.O.T. enzymes. In the skin necrosis form, the animals developed severe necrosis in several areas of the skin, but most frequently in the perineal region, abdomen and lower part of the neck. Animals thus infected generally recover. The levels of G.G.T. and S.G.O.T. are also elevated as a reflect of liver lesions; animals developed generalized icterous and elarged liver. The clinical and pathological changes were manifestations of the hepatic damage.

Table 5. Characterization of clinical photosensitivity cases from Carimagua in 1981.

Clinical picture	No. animals	No. deaths	Enzyme G.G.T.	Enzyme S.G.O.T.	Total protein
			---------- Range ----------		
Edematous	7	7	10.3- 82.3	178-330	7.0-10.0
Skin necrosis	9	0	12.9-122.0	42-380	4.0-10.0
Total averages	16	7	(59.0)	(183)	(7.6)

Forty-one steers grazing Brachiaria decumbens were monitored through weighings and liver functions tests from the end of the dry season through the middle of the rainy season. Monitoring was conducted in cooperation with the Pasture Productivity and Management Section. Weight losses were valued, assuming gains of 100 gm/head per day for the dry season (December-March), 300 gm for March through May, and 500 gm for May through July, as a minimum for B. decumbens.

A comparison of liver damage and weight changes in animals revealed a significant relationship at the March sampling ($P < 0.10$). For the second sampling in May the relationship was highly significant ($P < 0.01$), and for the July sampling there was no relationship (Table 6). It appears that at the initial stages of liver damage, corresponding weight alterations are not significant. However, as liver damage becomes more pronounced weight is significantly altered. This second stage coincided with appearance of animals with external photosensitivity lesions. Toward the end of the observation period, most animals had recovered from liver damage; however, convalescent animals were not gaining weight as expected. It is evident that when hepatic damage is induced in animals grazing B. decumbens a significant proportion loses weight before developing external photosensitization lesions.

Evaluation was made of the relation of enzyme G.G.T. levels and liver lesions in animals with clinical disease. High average levels are seen at the onset of clinical disease (Figure 4). They begin to drop and reach normal levels 30 days after the first appearance of clinical signs.

A hypothesis for the etiology of photosensitivity is that the Pithomyces chartarum fungus is involved in its appearance. However, a system must be found to reproduce clinical signs to better study the syndrome. A strain of P. chartarum was isolated from a Carimagua paddock; the fungus was cultured in the laboratory, multiplied extensively, and returned to the same paddock in greater concentration.

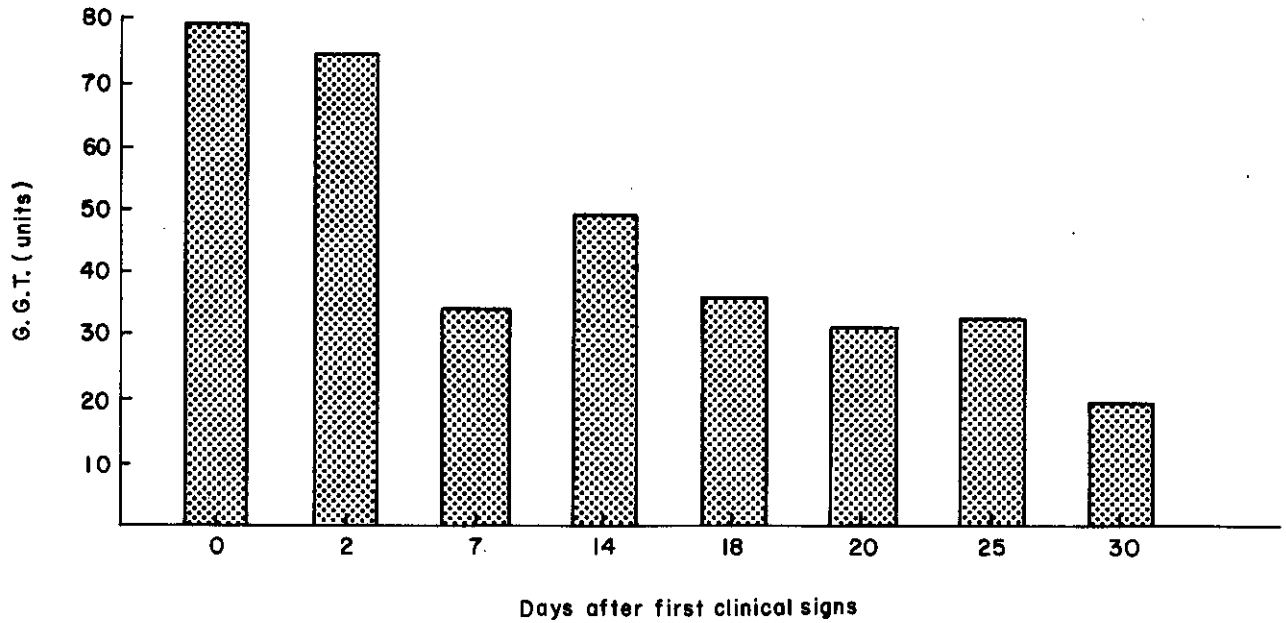


Figure 4. Average enzyme G.G.T. levels from 16 steers with clinical photosensitization grazing B. decumbens.

A suspension of 2.7 x 10^{11} spores was sprayed over four ha of the B. decumbens pasture. Fifteen 18-months old heifers were allowed to graze the inoculated pasture. One month after seeding the spores, one animal showed clinical symptoms of photosensitivity and four more were found with subclinical affection (hepatic damage).

Table 6. Analysis of weight changes and liver damage on steers grazing B. decumbens paddocks where clinical photosensitization appeared.

Sampling (date)	No. animals	Affected weight		Liver damaged measured by G.G.T. enzyme	
		No. animals	Range	No. animals	Range
I (March 10)	41	34	-41.2, +12[(a)]	20	3.2, +145[(b)]
II (May 9)	40	8	-1, +53[(c)]	13	3.8, 60[(d)]
III (July 1)	28	28	-9, +19[(e)]	2	4.8, 32.3[(f)]

Significant correlation between (a) and (b) $P < 0.01$, (c) and (d) $P < 0.05$, (d) and (e) $P < 0.05$.

Levels of fungus on the grass are low (CIAT 1980 Annual Report). B. decumbens isolates from the Colombian Llanos and Santander de Quilichao area were sent to Ruakura Animal Health Laboratory in New Zealand and to the National Research Council labs in Canada for detection of Pithomyces toxin (sporidesmin). From 15 cultures so far tested only three have shown to produce toxin. However, toxin concentration lower than one was obtained from cultures isolated in New Zealand. Hence, it appears that other factors might be involved in the etiology of the syndrome. The next step will be to evaluate the role of zinc in conjunction with the fungus in the etiology and/or as a control mechanism.

Test herds. This section is in charge of the ICA/CIAT herds. Production objectives were described in the 1978 CIAT Annual Report. Main emphasis is to produce experimental animals of high quality and uniformity. There are 300 breeding cows divided in seven herds, with one bull for every 25 cows in a system of seasonal mating from May through September. Calving rate through September of this year was 61.7%, very similar to the previous two years. Calf mortality up to weaning was 5% this year, considerably below that of 1979 and 1980. Calves were weaned at nine months of age.

During the year the test herds provided 318 animals for research projects at Carimagua.