



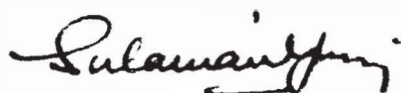
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THE TOXICITY OF BRACHIARIA DETIMBENS

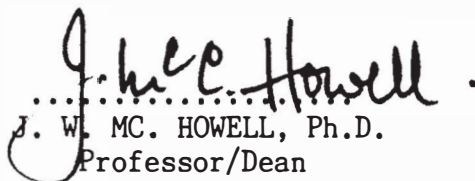
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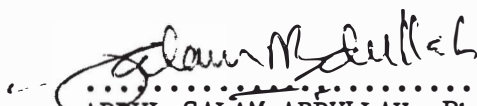
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THE TOXICITY OF BRACHIARIA DECUMBENS

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A thesis submitted in partial fulfilment
of the requirements for the degree of Master of Science in the
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THE TOXICITY OF BRACHIARIA DECUMBENS

by

Noordin Mohamed Mustapha

October, 1988

Chief Supervisor : Associate Prof. Dr. Abdul Salam Abdullah
Co-Supervisor : Dr. Mohd. Ali Rajion
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Nine healthy adult Indigenous Sheep of Malaysia (ISM) of which four were rumen fistulated were allowed to graze on a hectare of pure stands of Brachiaria decumbens. The animals developed signs of photosensitization, jaundice, and even death within three to four weeks. Occasionally signs pertaining to nervous dysfunction and submandibular edema were also observed. By the end of the ninth week there were no survivors. Their serum AST, GLDH, BUN, creatinine, bilirubin (total and direct) rose progressively throughout the entire period of study. There was



evidence of neutrophilic leucocytosis with the absence of toxic neutrophils and the absence of haemolytic crisis in the intoxicated animals.

Ruminal stasis occurred approximately three weeks post-grazing. The gross, histological and ultrastructural changes in the livers and kidneys indicated presence of necrosis and degeneration.

Three healthy adult rumen fistulated Australian Milking Zebu (AMZ) bulls fed B. decumbens for nine weeks did not develop any evidence of toxicosis either clinically or clinicopathologically as that seen in the sheep.

Induction experiments carried out in cattle and rats using pooled and frozen rumen liquor of intoxicated sheep also showed evidence of toxicosis. Although cattle did not exhibit any clinical signs of B. decumbens toxicosis, the clinicopathological changes strongly indicated evidence of hepatic and renal dysfunction.

Significant changes were also observed in rats fed rumen liquor from B. decumbens intoxicated sheep. These rats had a reduced bodyweight gain, markedly elevated serum alanine aminotransferase (ALT), a higher liver and kidney to bodyweight ratio, gross and histological changes in the liver and kidneys



resembling those in intoxicated sheep. However, these changes were not observed in the rats given rumen liquor from sheep not fed B. decumbens and aqueous extract of B. decumbens.

The results suggest that B. decumbens per se are not toxic but is converted into hepatotoxic product(s) in the rumen of sheep possibly by the ruminal microorganism that is specifically present in this species. *Pithomyces chartarum* and copper are not the agents responsible in this toxicosis.

The hepatotoxic product(s) appeared to be stable to physicochemical changes.



Abstrak ini dikemukakan kepada Senat Universiti Pertanian
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Ijazah Master Sains

TOKSISITI BRACHIARIA DECUMBENS

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Sembilan ekor biri-biri betina tempatan berumur diantara dua hingga empat tahun yang mana empat darinya mempunyai rumen yang berfistula telah dilepaskan untuk meragut rumput Brachiaria decumbens. Biri-biri ini menunjukkan tanda-tanda anoreksis, jaundis, fotosensasi, dan kematian selepas tiga ke empat minggu meragut rumput ini. Tanda-tanda kerosakan pada otak dan edema submandibular juga dilihat. Kandungan enzim yang berkait rapat dengan fungsi hati dan ginjal menunjukkan tanda-tanda kerosakan sebelum kematian dan meningkat mengikut peredaran masa. Stasis rumen juga berlaku seawal-awalnya tiga minggu selepas ragutan. Biri-biri yang mati berada didalam keadaan yang amat kurus serta mempunyai tanda-tanda jaundis. Keadaan matakasar, mikroskopik dan ultrastruktural pada hati dan ginjal menunjukkan tanda-tanda nekrosis dan degenerasi.

Tiga ekor lembu "Australian Milking Zebu" yang befistula rumen yang berumur setahun yang diberi makan rumput ini selama sembilan minggu tidak menunjukkan apa-apa kesan seperti yang dilihat pada biri-biri.

Ujikaji induksi dengan menggunakan lembu dan tikus menunjukkan tentang adanya toksin yang terhasil didalam rumen biri-biri yang teracun oleh rumput ini. Didalam lembu perubahan patologi klinikal membuktikan tentang kerosakkan pada hati dan ginjal manakala didalam tikus tanda-tanda klinikal, patologi klinikal, dan patologi mengesahkan tentang kerosakkan pada hati dan ginjal sepertimana yang terdapat pada biri-biri.

Kajian yang dijalankan juga menunjukkan bahawa rumput ini per se adalah tidak toksik. Daripada kajian yang telah dijalankan dapat dirumuskan bahawa rumput ini pada asalnya adalah tidak toksik tetapi menjadi toksik bila berlakunya tindakbalas didalam rumen biri-biri.

Adalah juga dirumuskan tindakbalas ini berkemungkinan besar melibatkan mikroorganisma rumen, serta kulat Pithomyces chartarum dan kuprum bukanlah agen yang terbabit didalam menyebabkan keracunan rumput ini. Akhir sekali sifat-sifat asas toksin ini juga didapati yang mana adalah stabil kepada keadaan fisikokimia.

CHAPTER 1

GENERAL INTRODUCTION

A dramatic increase animal production is expected in the tropics where a year-round growing period for generating animal feed resources is an advantage. However, its animal industries seems to be in an underdeveloped state. The ever increasing human population pressure, the chronic economic buffering caused by the recurrent crisis, as well as the ever widening poverty gap in developing countries are altering the picture of the animal agriculture in tropical Asia towards improvement (Madamba,1982).

Malaysian poultry and swine sectors are so well-developed and highly commercialised that their share of the total animal value of livestock production is 90%.These sectors are able to export these animal products. Sad to say,the ruminant sector could only meet 20% of its milk, 70% of its beef and 15% of its goat meat and mutton requirements. Obviously, the rearing of sheep and goats especially on small farmholdings plays an important role in the production of meat. Insufficient intake and utilization of nutrients from available feed resources have contributed to the overall poor performance of both species. Considering their good economic potential, research on their nutrition and management is being actively carried out on both large farms and small holders in Malaysia.



This goal can be partly achieved by using a very nutritive and highly productive pasture grass that is well adapted to the local climatic conditions. Local research conducted has shown that Brachiaria decumbens (signal grass) is well adapted to the local climatic condition (Wong, 1980) and gave impressive yields of both green and dry matter composition (Yuen et al., 1979). This grass has been extensively planted in almost all livestock farms in Malaysia. In recent years increasing interest has been shown in various countries especially in Africa, Asia, South America, Pacific, and South and Central America (Loch, 1977). High productivity, tolerance towards low fertility conditions, drought resistance and relative freedom from pests and diseases account for the current interest.

In Malaysia, photosensitization and hepatic jaundice have been observed to be associated with sheep and goats grazing B. decumbens (Suparjo and Wahid, 1980; Abas Mazni et al., 1983a; 1983b; 1985; Shahirudin et al., 1983; Zamri Saad et al., 1987).

Similarly, there were also reports of similar incidence in sheep and cattle in Colombia (Anon, 1978), Brazil (Carnago et al., 1976; Dobreiner et al., 1976; Nobre and Andrade, 1976; Andrade et al., 1978; Oliveira et al., 1979), Indonesia (Tribudhi et al., 1983), West Africa (Opasina, 1985) and in Australia (Briton and Paltridge, 1940). However the case reported in Australia concerned the grass identified as B. brizantha.



No detailed study has been carried out to investigate or postulate the pathophysiology of the above syndrome. In addition, reports concerning this toxicosis revealed different etiological agents. Reports from Australia, Indonesia, Malaysia, and West Africa considered the grass as hepatotoxic. Workers from Brazil and Colombia strongly suggested the involvement of the fungus, Pithomyces chartarum which produces a very potent hepatotoxin known as sporidesmin.

It is worthwhile to mention that the above syndrome resembles other hepatogenous photosensitization such as facial eczema, geeldikop, ngjiao and Lantana camara poisoning.

If conditions that lead to intoxication were fully understood, it would be possible to use B. decumbens to advantage without serious risk. As mentioned earlier that no study has been done on this toxicosis and the actual agent/s and pathophysiology involved are still in a flux state.

It is the purpose of this project to present a description of the clinical signs, hematological, biochemical, the gross and microscopic lesions, and ultrastructural changes that may be observed and to discuss the possible pathophysiology of this toxicosis.

CHAPTER 2

LITERATURE REVIEW

PLANT POISONING IN LIVESTOCK

Although poisoning continues to be one of the most common causes of death and loss of production in domestic animals, toxicology still remains as one of the most neglected fields of the veterinary profession (Singer, 1968). Livestock poisoning by plants occurred worldwide and has always been a problem to livestock producers (Shupe et al., 1978; James, 1980).

Deaths due to the ingestion of poisonous plants are easy to ascertain, but insidious economic losses of physical malformations, abortions, photosensitization, and simply reduced growth and production are not easy to quantify (Dwyer, 1978). It is difficult to assign a precise economic value of these losses for the livestock industry (Whittem, 1978a). The presence of poisonous plants, even in small amounts may require changes in grazing management, livestock handling, and range improvement practices (Schuster, 1978).

Although animals generally refuse poisonous plants, there are incidences where they may develop a taste for these plants (Clarke et al. 1981). Under any circumstances, the recognition of toxic plants and a knowledge of conditions under which they may become



dangerous are essential for intelligent management (Everist, 1978). The absence of pathognomonic lesions or biochemical changes, time consuming techniques, identical toxin produced by different plants, untimely and inefficient autopsies performed in remote pastoral situations (where most cases occurred) are the factors causing difficulties in collecting reliable data on plant poisoning (Whittem, 1978b). In addition, the lack of interest or opportunity, the absence of sufficient quantities of suitable toxic plant materials have lead to little work being carried out to confirm suspicion of plant poisoning.

However, even with the lack or absence of epidemiological information on plant poisoning, there has been much research interest in the subject which is justified by the need to improve supplies of animal protein and fibre for human consumption and it is important to understand the occurrence of sudden death and ill-thrift of the grazing animal upon ingestion of the poisonous plants (Whittem, 1978b).

The scope of this review is restricted to studies dealing with the diagnosis of hepatotoxicosis, hepatotoxic plants, their active alkaloids, and their effects on livestock particularly sheep and goats. These subjects are emphasized because they are the main areas of investigation reported in this thesis.

