POISONOUS PLANTS FOR RUMINANTS IN SOUTH AMERICA. IMPORTANCE AND CONTROL MEASURES

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Economic losses due to livestock poisoning by plants can be defined as direct and indirect. Direct losses are caused by death of animals, lower reproductive performance (abortions, infertility, and malformations), reduced production of surviving animals and other alterations due to transitory illness, sub clinical diseases with decreased production of milk, meat or wool, and increased susceptibility to other diseases due to suppressed immunological response. Indirect losses include cost of controlling poisonous plants in the pastures, management measures to prevent poisoning such as fencing and alternative grazing, reduction in the value of the forage due to delayed or deferred grazing, reduced land value, cost of replacement of the breeding stock lost by plant poisoning, and the cost associated with diagnosis and treatments of the affected animals. The economic loss by plant poisonings is difficult to estimate because reliable data are not available for many components of the cost, but losses due to deaths are easy to measure if there are data from diagnostic laboratories related with the frequency of different causes of death.

Considering those plants that caused at least one reported outbreak of poisoning in ruminants or horses there are at least 179 species of poisonous plants belonging to 103 genera in Brazil, Uruguay, Argentina, Colombia, and Chile. In Brazil, data from disease reports from 1978 to 1998, showed that 10% of the cases diagnosed were due to plants, and it can be estimated that the annual death rate due to toxic plants in Brazil varies from 975,000 to 1.365 million cattle. In Uruguay data from the last 10 years of the Regional Diagnostic Laboratories East and Norwest, at Treinta y Tres and Paysandú, showed that plant intoxications in cattle represent 16% and 10% of the field diagnostic cases of both diagnostic centers, respectively. In Argentina data from INTA Balcarce shows that toxic plants correspond to 12.4% of all diseases diagnosed. In Northeastern Brazil, malformation and abortion in sheep, goats and cattle associated with the ingestion of Mimosa tenuiflora are very frequent. In recent studies it was determined that losses due to malformation caused by this plant can be estimated at 273,120 kids and 259,582 lambs.

Up to date, most research with toxic plants in South America was concerned mainly with the identification of hazardous plants and definition of the clinical signs, pathology and some aspects of the epidemiology of the intoxications. Few efforts were made to identify the toxins of these plants and to define the biochemical mechanisms of their actions. In some toxic plants is necessary to identify the active principle and to define their biochemical mechanisms of action. The isolation and characterization of toxic natural products is the first step in preventing livestock losses due to poisonous plants. Actually the toxic principle is unknown in at least 64 of the 179 species of toxic plants reported in Brazil, Uruguay, Argentina, Colombia and Chile. Plants containing pyrrolizidine alkaloids (Senecio spp, Crotalaria spp, Echium plantagineum, Erichites hieracifolia) and plant containing fluoracetate (Palicourea spp, Arrabidaea spp, and probably Mascagnia spp) are probably the most important group of toxic plants. Other important groups are plants containing saponin (Bracharia spp, Panicum spp and Tribullis terrestris), carboxytaclairactilisides (Cestrum spp, Xanthium spp, Wedelia glauca and probably Sessea spp and Vestia foetida), and swainsonine (Ipomoea spp, Turbinia cordata and Sida carpinifolia). Cyanogenic plants, calcinogenic plants, nitrate and nitrite containing plants, and Pteridium aquilinum are also very important in many South America countries.

Prevention and control of plant poisoning have been based mainly on the knowledge of factors related to the plant, the affected animal, and the environment and management variables that may contribute to the occurrence of intoxications. Such measures include: 1) management of pastures and animals including prevention of overgrazing, use of livestock not susceptible to the toxic plants present, and avoidance of turning hungry and/or thirsty animals onto pastures infested with toxic plants; 2) use of fences to isolate areas with toxic plants; 3) elimination of toxic plants by spraying, grubbing, plowing, burning, mowing or pulling, 4) use of controlled seeds using only those free of contamination by weeds; 5) avoidance of contamination by toxic plants during hay or silage production. Nevertheless, the efficiency of such preventive and control measures in the control of plant intoxications have been limited, and some of the more important plants still producing severe economical impact. For their control it is necessary to develop, in South America, some more efficient control measures, including conditioned food aversion, use of plant breeding and selection programs to obtain non-toxic or less toxic forages or crops, vaccination, biologic control, microbial detoxification in the rumen, and the use of resistance animals to the intoxication. Recently in Brazil, results of experiments with Bracharia spp poisoning demonstrated that there are resistant animals to the intoxication, and there are strong evidence supporting the genetic origin of this resistance. There are variations in the saponin content between of Bracharia species and the selection of Bracharia species or varieties with low saponin content will be a way to prevent the intoxication. The results of three trials using lithium chloride to avert goats against swainsonine contained plants suggest that aversion is efficient to prevent the ingestion of Ipomoea carnea in goats, and to control the poisoning by Turbinia cordata under field conditions. Also the use of LiCl was effective in creating aversion to Mascagnia rigida. Two trials are ongoing for the control of Senecio spp by grazing sheep, and preliminary results show that this is a good way to control Senecio spp populations. Studies on the biology of the insect Phaedon confinis revealed that it causes serious damage to plants of Senecio brasiliensis. Normal diet, oviposition, survival and development of P. continis is restricted to S. brasiliensis suggesting its potential use as a biocontrol agent for this plant. In a recent research it was demonstrated that sheep ingesting 3.5 g/kg bw of Crotalaria retusas seeds died acutely. On the other hand, sheep receiving several daily doses of 2 g/kg pv developed resistance to single doses of 10-20 g/kg pv. These results are being used successfully in the biologic control of C. retusa with sheep in areas where this intoxication affects sheep and horses. The use of fluoracetate degrading microorganisms in the rumen of susceptible livestock would be a way to reduce the toxicity of fluoracetate-containing plants. With this objective experiments to obtain bacteria of vegetal origin able to degrade fluoracetate had been conducted in two ways: selection of ruminal microorganisms; and construction of a heterologous system for the expression of ruminal microorganisms. Two dehalogenases containing bacteria (Enterococcus sp and Bacillus sp) had been isolated.
The development of modern techniques of controlling plant intoxication will contribute, in the future, to the use of these techniques in other plant intoxications and also for the development of new techniques. The identification and quantification of plant toxins, the development of diagnostic procedures, control, and prophylactic measures, as well as the implementation of strategies to minimize livestock poisoning by these plants will need the efforts of an interdisciplinary team. For these reason the contribution of chemists, veterinarians, agronomists, molecular biologists, bacteriologists and range scientist is very important to get significant results. This interdisciplinary approach is necessary to solve problems on plant intoxications, which are complex events in which plant, animal, environmental and management variables may contribute to produce anything from a mild intoxication event to a catastrophic intoxication.

**Key words:** ruminants, poisonous plants.

**References:**


