



## Poisoning by *Amorimia (Mascagnia) sepium* in sheep in northern Brazil

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### ARTICLE INFO

#### Article history:

Received 19 December 2010

Received in revised form 6 February 2011

Accepted 9 February 2011

Available online 17 February 2011

#### Keywords:

Sudden death

Sheep

Cardiotoxic plants

*Mascagnia*

### ABSTRACT

The aim of this study was to determine the cause of sudden deaths in sheep in the Anari Valley of the state of Rondônia, in northern Brazil. In one outbreak, sheep were placed in an area where the owner had cut *Amorimia (Mascagnia) sepium* and let it dry for two days. Fourteen out of 35 sheep died with few outward clinical signs observed over a period of about 10 h after the ingestion of the dry plant. Dry *A. sepium* was administered experimentally to 9 sheep. Five died after the ingestion of single doses of 3–6.6 g/kg body weight (bw). Two sheep died after the ingestion of total doses of 6.4–31 g/kg bw over the course of 4 and 5 days, respectively, and one died after being treated with 33 daily doses of 0.56 g/kg bw. Six sheep died during exercise, and three died without exercise. Clinical signs were anorexia, muscular tremors, dyspnea, jugular engorgement, tachycardia, apathy, opisthotonos, foam in the nose, and recumbence. One sheep, which ingested a single dose of 1 g/kg bw, was not affected. The main macroscopic lesion was pulmonary edema. Histologic examination of the heart revealed degeneration and necrosis of cardiomyocytes, as well as multifocal inflammatory infiltrate of mononuclear cells. Fibrosis, neo-vascularization and infiltration by mononuclear inflammatory cells were observed in the sheep that ingested the plant for 33 days. Vacuolar-hydropic degeneration was observed in the epithelial cells of renal tubules of four sheep. It is concluded that *A. sepium* is responsible for sudden deaths in sheep.

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### 1. Introduction

In Brazil, sudden death in ruminants is generally caused by the ingestion of *Palicourea* spp., *Mascagnia* spp., *Arrabidaea* spp., and *Pseudocalymma elegans* (Tokarnia et al., 1990). *Palicourea marcgravii* is the plant most commonly associated with sudden death in ruminants due to its widespread distribution (Tokarnia and Döbereiner, 1986). Other *Palicourea* spp., such as *Palicourea aeneofusca*, *Palicourea juruana* and *Palicourea grandiflora*, also cause sudden death in cattle, although they are less important due to their limited geographic distribution (Tokarnia et al., 1981, 1983;

Tokarnia and Döbereiner, 1982). In studies of experimental poisoning with *Palicourea* spp., it has been shown that most animals died suddenly without being exercised but that exercise can trigger clinical signs and death in animals that have no previous signs of disease (Tokarnia and Döbereiner, 1986; Tokarnia et al., 2000).

Among the species of *Mascagnia* that cause sudden death in ruminants, the most important is *Mascagnia rigida*, which is widely distributed in northeastern Brazil and north of the states of Minas Gerais and Espírito Santo (Tokarnia et al., 1985, 2000). *M. rigida* poisoning occurs in cattle (Tokarnia et al., 1985; Medeiros et al., 2002; Vasconcelos et al., 2008a), sheep, and goats (Vasconcelos et al., 2008b). Other toxic species of *Mascagnia* are *Mascagnia elegans*, found in the semiarid area of Pernambuco (Tokarnia et al., 1990); *Mascagnia pubiflora*, reported in Mato Grosso do

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Sul, São Paulo, Goiás and Minas Gerais (Tokarnia and Dobereiner, 1973); *Mascagnia aff. rigida*, found in northern Espírito Santo (Tokarnia et al., 1985), and *Mascagnia exotropa*, found in the states of Santa Catarina and Rio Grande do Sul (Gava et al., 1998). Poisoning by *Mascagnia* spp. is associated with animal movements that trigger signs of clinical poisoning and death (Tokarnia et al., 2000).

In the state of Rondonia, sudden deaths in cattle are caused by *P. marcgravii* in the regions of Porto Velho and Vila Tabajara (Tokarnia and Dobereiner, 1986) and by *Palicourea grandiflora* in the regions of Presidente Hermes and Pimenta Bueno (Tokarnia et al., 1981). In the Anari Valley, on the border between Rondonia and the state of Mato Grosso, sudden deaths of cattle and sheep occur primarily from November to February. Recently the disease was observed in three farms of the region. In one farm seven out of 28 heifers recently introduced in the farm were found dead. When the rest of the herd was removed from the paddock another three heifers died. In another farm seven out of eight cattle died suddenly during their removal from a paddock. In the third farm seven out of 200 cattle died suddenly when the herd was being transported to the corrals for vaccination. These deaths were attributed by some owners to the consumption of a *Mascagnia* sp., popularly known as *tingui*. Other farmers claimed that the deaths were caused by the ingestion of *Palicourea* sp. known as *erva de rato*. This species was administered experimentally to rabbits with negative results. Most outbreaks occur at the beginning of the rainy season when there is a shortage of food. Cattle may die with few outward clinical signs observed. In most cases, clinical signs are precipitated by exercise. Engorgement of the jugular, positive venous pulse, respiratory distress, staggering gait, muscle tremors, opisthotonos, and recumbence with paddling are observed, followed by death within a few minutes. Some cattle that remained at rest after the onset of clinical signs recovered. Subcutaneous edema was also observed in some cases (Sandro V. Schons, unpublished).

The objectives of this study were to determine the toxicity of the *Mascagnia* sp. found in the region, report the clinical–pathological aspects of the poisoning, identify the plant, and demonstrate that it is responsible for the sudden deaths that occur in sheep in the Anari Valley of Rondonia.

## 2. Materials and methods

Epidemiological data and the history of outbreaks of sudden death in cattle and sheep were collected on visits to properties of the Anari Valley, located Latitude S 9°51'53.69" and Longitude W 62°09'57.48", in Rondonia in 2009 and 2010. A sample of *Mascagnia* sp. used in the experiments was sent to the National Institute for Amazon Research (INPA) for botanical identification.

Nine sheep were used, 5 males and 4 females, aged between 10 months and 2 years. Before the start of the experiment, animals were treated with anti-helminthics, and a general clinical examination was performed. Two sheep of similar age received the same management as experimental animals and were used as controls.

The *Mascagnia* sp. used was collected in February at the growing phase; in July, during flowering and seeding; and in September, after flowering. The plant was initially dried in the shade for 24 h and then dried at 50 °C for 24 h. Sheep 1–5 were fasted for 24 h and then treated with a single dose of the ground plant mixed with 1 L of water, administered by gastric tube. Sheep 6–9 ingested the ground plant mixed at 10% with concentrated commercial food in the amount equivalent to 2% of their body weight. The protocol used in the experiments is presented in Table 1.

Approximately 5 h after administration of the plant-based mixture, all sheep (except Sheep 4) were forced to run a distance of approximately 20 m or until refusing to move. After exercise, clinical examination was carried out, and the sheep were placed in the paddock, where they remained throughout the day.

Animal death was considered at three different times (Table 1): 1) during movement, when the animals were walking to the paddock where they remained during the day; 2) during exercise, when they were being forced to run; and 3) at rest, when in their stalls at night.

The sheep that died were immediately necropsied, and samples of the organs of the abdominal and thoracic cavities and the entire central nervous system (CNS) were fixed in 10% buffered formalin. For evaluation of the CNS, transverse sections of medulla oblongata, pons, rostral colliculi, thalamus, internal capsule, cortex, cerebellar peduncles, and cerebellum were examined histologically. All tissues

**Table 1**

Experimental poisoning by *Amorimia sepium* in sheep. Plant and dose administrated, onset of clinical sign and outcome.

| Sheep<br># | Weight (kg) | Month of collection<br>and stage of the plant | Dose (g/kg) |       | # of doses | Onset of signs after the<br>administration of the plant<br>and occasion in which<br>they appeared | Clinical evolution | Clinical signs <sup>a</sup> |
|------------|-------------|-----------------------------------------------|-------------|-------|------------|---------------------------------------------------------------------------------------------------|--------------------|-----------------------------|
|            |             |                                               | Daily       | Total |            |                                                                                                   |                    |                             |
| 1          | 15.5        | Feb (sprouting)                               | 6.6         | 6.6   | 1          | 8 h at moving                                                                                     | 4 h                | 3, 4, 8                     |
| 2          | 19.0        | Feb (sprouting)                               | 5.0         | 5.0   | 1          | 8 h at moving                                                                                     | 4 h                | 3, 4, 5, 6, 7, 8, 9         |
| 3          | 20.5        | Jun (inflorescence)                           | 6.4         | 6.4   | 1          | 12 h at moving                                                                                    | 5 min              | 3, 9                        |
| 4          | 22.5        | Feb (sprouting)                               | 3.0         | 3.0   | 1          | 15 h at rest                                                                                      | 5 min              | 2                           |
| 5          | 21.7        | Feb (sprouting)                               | 1.0         | 1.0   | 1          | Not affected                                                                                      |                    |                             |
| 6          | 20.0        | Feb (sprouting)                               | 1.6         | 6.4   | 4          | 48 h after 1st dose,<br>during exercise                                                           | 48 h               | 1, 3, 4, 6, 8               |
| 7          | 21.0        | Feb (sprouting)                               | 1.6         | 6.4   | 4          | 72 h after 1st dose, at rest                                                                      | 24 h               | 1, 4, 5, 8, 9               |
| 8          | 36.0        | Sep (mature)                                  | 6.2         | 31    | 5          | 48 h after 1st dose, at rest                                                                      | 48 h               | 1, 2, 3, 4, 5, 6, 7         |
| 9          | 20.0        | Feb (sprouting)                               | 0.56        | 18.6  | 33         | 17 days at moving                                                                                 | 16 days            | 1, 2, 3, 4, 5               |

<sup>a</sup> Anorexia = 1; Recumbence = 2; Muscular tremors = 3; Dyspnea = 4; Jugular engorgement = 5; Tachycardia = 6; Apathy = 7; Opisthotonos = 8; Foam in the nose = 9.

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