



Short communication

Poisoning by *Marsdenia hilariana* and *Marsdenia megalantha* (Apocynaceae) in ruminants

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ABSTRACT

Neurological signs were observed in cattle consuming the roots of *Marsdenia hilariana* and sheep consuming leaves of *Marsdenia megalantha*. Similar nervous signs to those observed in spontaneous poisoning were induced experimentally by the administration of roots of *M. hilariana* to goats, and by the administration of leaves and roots of *M. megalantha* to sheep. No lesions were observed at necropsies and on histological examination of the nervous system and other tissues.

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Farmers in the semiarid region of Northeastern Brazil claim that plants known popularly as “mata-calado” (silent killer), of the genus *Marsdenia* R. Br. (Asclepiadoideae, Apocynaceae), are responsible for deaths of ruminants. Also, the roots and the fruits from these plants are utilized by farmers as venom to kill animals, like dogs, cats, and rats. In a toxic plant survey with farmers and veterinary practitioners in the semiarid area of the state of Rio Grande do Norte, 6 farmers reported mortalities of cattle and sheep associated with the ingestion of roots or leaves of *Marsdenia* sp. (Silva et al., 2006). Also, one farmer reported nervous signs in 10 pigs fed with 5 roots of *Marsdenia* sp. The signs were observed approximately 1 h after ingestion; 5 pigs died and the others recovered (Silva et al., 2006).

The aim of this paper is to report the spontaneous poisoning in cattle and sheep by *Marsdenia hilariana* E. Fourn. (Fig. 1) and *Marsdenia megalantha* Goyder & Morillo (Fig. 2), respectively. *M. hilariana* is a climbing vine

widespread in neotropical region and *M. megalantha* is a rupicolous shrub up to 60 cm high endemic to the Brazilian *caatinga* vegetation. The experimental reproduction of the disease in goats with *M. hilariana* and in sheep with *M. megalantha* is also reported.

1. Poisoning by *M. hilariana*

One outbreak of poisoning caused by the ingestion of *M. hilariana* was observed in the municipality of Soledade, State of Paraíba, in December 2003, in a paddock where the trees were uprooted and the roots of *M. hilariana* were exposed along with the roots of the trees. Two cows, one calf, and one bullock grazing in the paddock consumed the roots of *M. hilariana*. In the morning of the following day, one cow, the calf, and the bullock were in lateral recumbence, showing staggering, salivation, and chewing motions. At the end of the day the other cow showed staggering and severe incoordination, followed by sternal recumbence. The first cow that showed clinical signs died in approximately 24 h. After 48 h, the bullock and the calf

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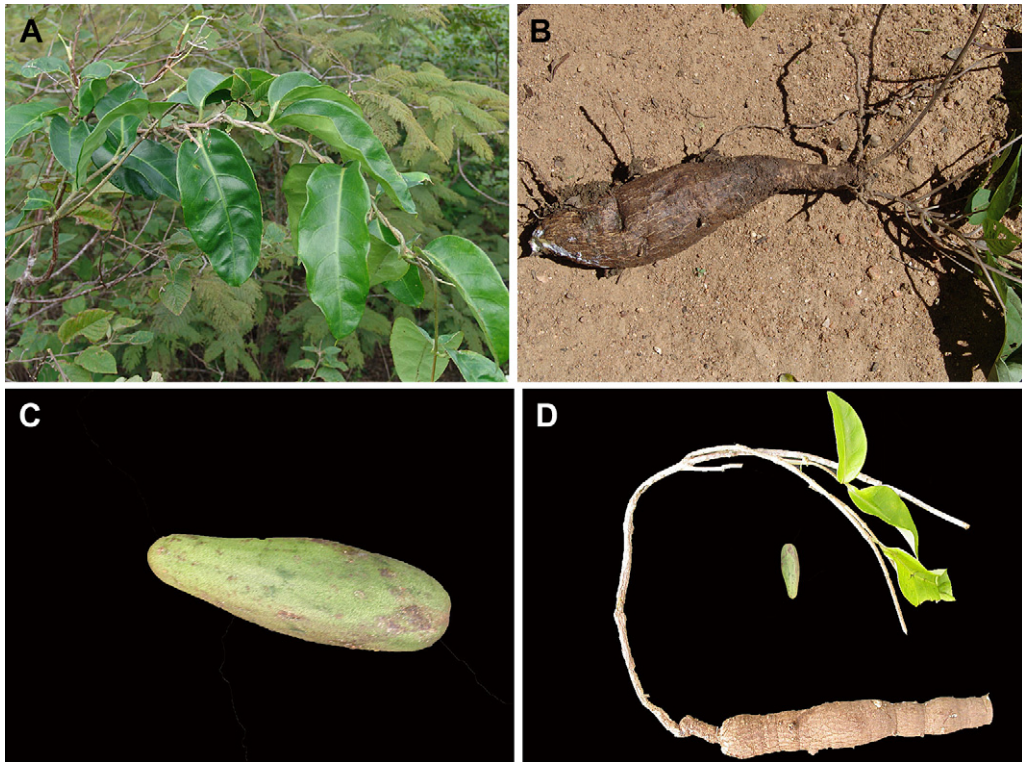


Fig. 1. *Marsdenia hilariana*. Municipality of Soledade, State of Paraíba, Northeastern Brazil. A) Aerial part; B) root; C) capsule; D) whole plant.

were in permanent lateral recumbence, showing dyspnea, and paralysis. When placed in sternal recumbence returned to lateral recumbence. When the animals were stimulated, they showed muscle fasciculation in the head and ears, hyperesthesia, and tetany. The bullock also showed opisthotonos. Six days after the start of the signs, the bullock died and the calf was euthanized and necropsied. For histological examination, the central nervous system and other tissues were fixed in 10% buffered formalin, embedded in paraffin, sectioned at 5 μm , and stained with hematoxylin and eosin. Macroscopic or histological lesions were not observed. The second cow that showed clinical signs recovered in 8 days.

For experimental reproduction of the poisoning, single doses of *M. hilariana* roots collected in the paddock where the disease occurred were administered orally to two 4-months-old goats at doses of 10 and 40 g per kg (g/kg) body weight (bw) (Table 1). The roots were sliced in pieces of 0.5–1 cm and administered by putting small amounts into their mouths. One animal was used as control. Before the experiment, all animals were kept in individual pens, fed daily amount of commercial ration equivalent to 1% bw and water and Tifton grass *ad libitum*. The experimental animals showed initially mild tremors of the hind legs and jaw, sleepiness, and paralysis of tongue; this evolved into loss of equilibrium, generalized tremors and flaccid paralysis with sternal and subsequently lateral recumbence. Nistagmus, paddling, mydriasis, periodic tetanic crisis with

marked opisthotonos, bruxism, marked salivation, and groans were also observed. The control animal showed no clinical signs. Because of the severe clinical signs the animals were euthanized. Details on the experiment are presented in Table 1. No lesions were observed at necropsies and on histological examination of the nervous system and other tissues.

2. Poisoning by *M. megalantha*

The disease occurred in January 1995, on a farm in the municipality of Jardim de Seridó, State of Rio Grande do Norte, affecting 270 sheep of a flock of 700 that was introduced in one paddock severely invaded by *M. megalantha*. Most sheep were found dead after feeding on the green leaves of the plant. Affected animals showed incoordination, tremors, salivation, recumbence and death in few hours. Few animals with mild nervous signs recovered. Necropsies were not realized. According to farmers of the region, death in sheep associated with ingestion of this plant has been observed since 1988.

For the experimental reproduction of the poisoning leaves and roots of *M. megalantha* were collected in the farm where the disease occurred and administered by putting small amounts into their mouths to four 5 to 6-months-old sheep (Table 2). Two sheep were used as controls. All animals were kept in individual pens, and fed daily amount of commercial ration equivalent to 1% bw, and



Fig. 2. *Marsdenia megalantha*. Municipality of Jardim do Seridó, State of Rio Grande do Norte, Northeastern Brazil. A) Aerial part; B) flower and leaves; C) capsules; D) roots.

water and Tifton grass *ad libitum*. Severe incoordination, intention tremors, loss of equilibrium, falling, and wide-based stance were observed in Sheep 1–3. The signs were exacerbated when the animal was forced to walk or when the head raising test was applied. Sheep 3 showed only mild diarrhea. All animals recovered. The control animals showed no clinical signs.

3. Discussion

The genus *Marsdenia* comprises approximately 300 species (Morillo, 1997) distributed throughout the Americas, Africa, Europe, Asia, Oceania, and Australia (Omlor, 1998). There has been little work to identify potentially toxic phytochemicals in this genus. The most studied species are *Marsdenia cundurango* Rchb. f., *Marsdenia tenacissima* (Roxb.) Moon, and *Marsdenia rostrata* R. Br. The

former contains glycosides and alkaloids (Duke, 1992) and is used traditionally as a medical plant in the South-American Andes (Wiersema and León, 1999). *M. tenacissima* contains several pregnane glycosides and genins and has been used for a long time in Chinese folk medicine (Yang et al., 2011). *M. megalantha* is the only Brazilian species of the genus whose pharmacological effects have been studied so far, and the stalk and leaf extracts of the plant have shown to be potentially useful as antioxidants and anticancer drugs (Oliveira, 2011).

The only species of *Marsdenia* reported as toxic for livestock is *M. rostrata* in Australia (Radostits et al., 2007). This species contains cardioactive steroidal glycosides (Thorp and Watson, 1953) and steroidal alkaloids (Summons et al., 1972; Gellert and Summons, 1973). One steroidal glycoside encountered in *M. rostrata* is similar to

Table 1
Experimental poisoning with roots of *Marsdenia hilariana* in goats.

Goat N ^o	Dose	Onset of nervous signs after administration	Euthanasia (hours after first clinical signs)
1	10 g/kg ^a	8 h	3
2	40 g/kg	30 min	2
3	Control	NCS ^b	–

^a g (wet weight) per kg body weight.

^b NCS = no clinical signs observed.

Table 2
Experimental poisoning by *Marsdenia megalantha* in sheep.

Sheep N ^o	Dose (part of the plant)	Onset of nervous signs after administration	Time to Recovery
1	20 g/kg ^a (leaves)	14 h	62 h
2	10 g/kg (roots)	8 h	48 h
3	10 g/kg (roots)	12 h	72 h
4	5 g/kg (roots)	NCS ^b	NCS
5	Control	NCS	NCS
6	Control	NCS	NCS

^a g per kg body weight.

^b NCS = no clinical signs observed.



Fig. 3. *Marsdenia* aff. *zehntneri* Fontella. Municipality of Quixeremobim, State of Ceará, Northeastern Brazil.

cynanchoside, which is found in the genus *Cynanchum* L., and causes nervous signs including hypersensitivity, restlessness, stumbling gait, tremors, recumbence, tetanic and clonic convulsions, opisthotonos, teeth grinding, dyspnea, salivation, and vomiting (Radostits et al., 2007). These signs are similar to those observed in the poisonings reported in this paper, suggesting that these two species of *Marsdenia* contains a toxin similar to cynanchoside.

Our results demonstrate that *M. megalantha* and *M. hilariana* are poisonous for ruminants in the semiarid region of Brazil, causing nervous signs. Farmers of the State of Ceará claim that *Marsdenia* aff. *zehntneri* Fontella (Fig. 3), also known as *mata calado* is toxic to livestock. The roots of this species also induced nervous signs after the experimental administration of 5 g/kg bw to sheep (unpublished data). Therefore, there are at least three toxic species of *Marsdenia* in the semiarid region of northeastern Brazil. Diagnosis should consider the presence of the plants or their roots, and the absence of lesions in the nervous system. The main differential diagnosis is with rabies and botulism. There is no known treatment. The epidemiologic observations suggest that the leaves are occasionally eaten by hungry animals, but tubercles are palatable and if they are uprooted during plowing or exposed by other means, animals ingest them readily. The roots have to be collected and kept from the reach of animals when they are exposed by plowing, soil erosion or tree growth.

Conflict of interest

The authors declare that there are no conflicts of interest.

Acknowledgments

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