

SPONTANEOUS POISONING BY *PALICOUREA MARCGRAVII* IN BOVINE IN THE FEDERAL DISTRICT, BRAZIL

(Intoxicação espontânea por *Palicourea marcgravii* em bovino no Distrito Federal, Brasil)

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RESUMO

Palicourea marcgravii é considerada a planta tóxica mais importante do Brasil e, até os anos 90, a planta mais importante do Centro-Oeste. Esse fator é explicado devido à sua extensa distribuição, boa palatabilidade, alta toxicidade e efeito cumulativo. Um bovino, Nelore, macho, dois anos, de uma propriedade no Distrito Federal, foi encontrado morto. A propriedade apresentava histórico de acesso à floresta e morte de outros animais. Não foram observadas alterações macroscópicas. Microscopicamente, nos rins, foi observada degeneração hidrópico-vacuolar das células epiteliais do túbulo contorcido distal urinário. Áreas multifocais de cardiomiócitos com necrose de coagulação foram observadas no coração, apresentando núcleos picnóticos com citoplasma hipereosinofílico e perda de estriação. Durante uma visita à propriedade rural, foram encontrados galhos e arbustos com frutos reconhecidos como *P. marcgravi*. Este relato apresenta os achados patológicos de intoxicação espontânea por *P. marcgravii* em bovino no Distrito Federal.

Palavras-chave: *Palicourea marcgravii*, lesão cardíaca, lesão renal, ruminante.

ABSTRACT

Palicourea marcgravii is considered the most important toxic plant in Brazil and, until the 1990s, the most important plant in the Central-Western. This factor is explained due to its extensive distribution, good palatability, high toxicity and cumulative effect. A bovine, Nelore, male, two years old, of a property in the Federal District, was found dead. The property presented history of access to the forest and death of other cattle. No macroscopic changes were observed. Microscopically, in the kidneys, were observed hydropic-vacuolar degeneration of distal contoured urinary tubule epithelial cells. Multifocal areas of cardiomyocytes with coagulation necrosis were noted in the heart presenting pycnotic nuclei with hypereosinophilic cytoplasm and loss of striations. During a visit to the rural property, were found branches and shrubs with fruits recognized as *P. marcgravii*. This report presents the pathological findings of spontaneous poisoning by *P. marcgravii* in bovine in the Federal District, Brazil.

Key words: *Palicourea marcgravii*, heart injury, kidney injury, ruminant.

INTRODUCTION

The Central-Western region of Brazil, the most important area for cattle production in the country, is composed of the states of Goiás, Mato Grosso, Mato Grosso do Sul and the Federal District. The most important poisonous plants in the region are *Brachiaria* spp., which cause hepatogenous photosensitization, and *Palicourea marcgravii* and *Mascagnia pubiflora*, which cause “sudden death” precipitated by exercise (FURLAN *et al.*, 2012; TOKARNIA *et al.*, 2012). *Palicourea marcgravii* is a shrub of the family Rubiaceae, known by the popular names of “cafezinho”, “erva-de-rato”, “café-bravo”, “roxa”, “roxinha”, “roxona” and “vick” (TOKARNIA *et al.*, 2012).

Palicourea marcgravii (Rubiaceae) is considered the most important toxic plant in Brazil and, until the 1990s, the most important plant in the Central-Western. This factor is explained due to its extensive distribution, good palatability, high toxicity and cumulative effect (FURLAN *et al.*, 2012; SANT'ANA *et al.*, 2014). All species are susceptible to the intoxication, but cattle are more affected. Regarding the toxic principle of *P. marcgravii*, the presence of monofluoroacetic acid (sodium monofluoroacetate) (KREBS *et al.*, 1994).

It is known that this substance, by interfering with the Krebs cycle, has a marked toxic effect on the heart and causes death from ventricular fibrillation and cardiac arrest (TOKARNIA *et al.*, 2012).

The clinical signs of intoxication in cattle and buffaloes consist of positive venous pulse, reluctance to walk, instability, muscular tremors, sternocervical and lateral decubitus, pedal movements and tonic seizure (SANT'ANA *et al.*, 2014). Some animals are found dead without exercise (TOKARNIA *et al.*, 1990). Some animals that are reluctant to walk when moved, if they are left in the field and are not forced to move, may recover within 24 to 48 hours after the onset of clinical signs (RIET-CORREA *et al.*, 2011). There are no significant gross lesions. Microscopically some animals had necrosis and hydropic degeneration of the epithelium of some renal tubules (TOKARNIA e PEIXOTO, 2006).

The diagnosis is based on a history of sudden death, usually associated with exercise and the presence of the plant. The presence of renal histological lesion helps to confirm the diagnosis (RIET-CORREA *et al.*, 2011). The aim of this work is to report the occurrence of spontaneous poisoning by *P. marcgravii* in bovine in the Federal District, Brazil.

PATIENT SERVICE

One bovine, Nelore, male, two years old, of a property in the Federal District, was found dead. The property presented history of access to the forest and death of other cattle. At necropsy, tissue samples of organs were collected and fixed in 10% phosphate-buffered formalin solution, embedded in paraffin wax, cut into 5- μ m sections and stained by haematoxylin and eosin (H&E).

No macroscopic changes were observed. Microscopically, in the kidneys, a moderate amount of contiguous proximal and distal tubules were observed with epithelial cells distended by large, non-stained intracytoplasmic vacuoles, predominantly with a pycnotic nucleus and displaced to the apical edge (Fig. 01). Multifocal areas of cardiomyocytes with coagulation necrosis (Fig. 02) were noted in the heart presenting pycnotic nuclei with hypereosinophilic cytoplasm and loss of striations. In addition, there were mild to moderate perivascular and interstitial mononuclear infiltrates, with rare neutrophils, and rare intranuclear vacuoles. During a visit to the rural property, it was verified that there was a gallery forest present in the enclosure of the animals, shaded and humid area, where were found branches and shrubs with fruits recognized as *P. marcgravii* (Fig. 03). At the site, signs of plant grazing and ruminant footprints were also observed.

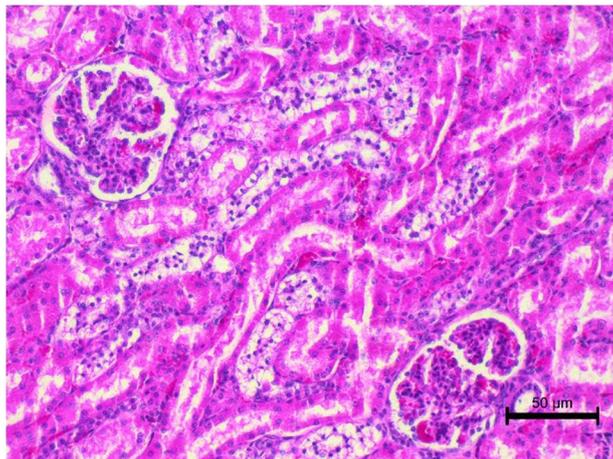


Figure 01: Spontaneous poisoning by *P. marcgravii* in bovine. Kidney. Hydropic-vacuolar degeneration of distal contoured urinary tubule epithelial cells. (H&E. Bar = 50 μ m)

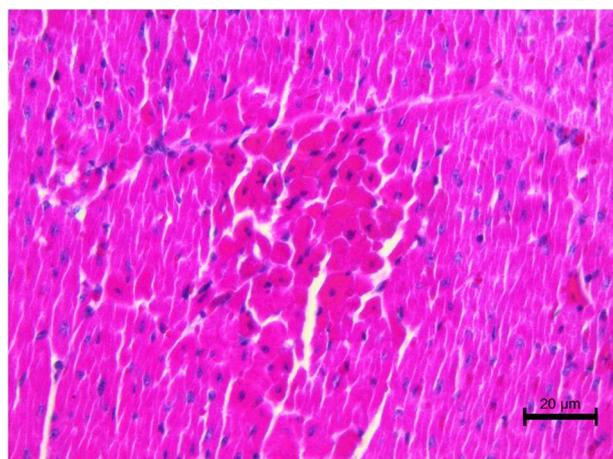


Figure 02: Spontaneous poisoning by *P. marcgravii* in bovine. Heart. Cardiac fibers with coagulation necrosis. (H&E. Bar = 20 μ m)



Figure 03: Spontaneous poisoning by *P. marcgravii* in bovine. *Palicourea marcgravii* with fruits.

RESULTS AND DISCUSSION

The diagnosis of *P. marcgravii* poisoning in a cattle raising estate in the Federal District was based on the pathological findings and presence of the plant in the property. *P. marcgravii* it is the most important toxic plant in the group that causes "sudden death" (TOKARNIA *et al.*, 2012). Among the deaths from plant poisoning in Brazil, it is estimated that 50% of them result from the ingestion of plants that cause sudden death in cattle (PESSOA *et al.*, 2013).

Although *P. marcgravii* toxicity is widely known to cause mortality in cattle in the Central-Western region, with the exception of Mato Grosso do Sul (FURLAN *et al.*, 2012; PESSOA *et al.*, 2013; SANT'ANA *et al.*, 2014), no detailed descriptions of spontaneous intoxication in cattle in the Federal District and surroundings, with an emphasis on epidemiological and anatomopathological findings. Surveys performed in the southwest of Goiás indicate the presence of the plant causing death in animals, however without necropsy or histopathology as definitive diagnostic methods (SANT'ANA *et al.*, 2014). In the Federal District, the death of goats was observed, kept in areas with access to riparian forests, which contained small amounts *P. marcgravii* and with signs of ingestion of the plant by animals (BARBOSA *et al.*, 2015).

P. marcgravii poisoning occurs when bovines and buffaloes have access to or into the forests or when the plant invades pastures. Leaves and fruits are toxic. For cattle, 0.6g \ Kg of fresh leaves has been established as a lethal dose (TOKARNIA *et al.*, 2012). Due to the good palatability, high toxicity and, because it has a cumulative effect, the existence of a small quantity of the plant in the region is sufficient for there to be cases of intoxication (SANT'ANA *et al.*, 2014).

Additionally, hydropic-vacuolar degeneration of the renal tubule epithelium was a remarkable finding and, although it was not considered pathognomonic (TOKARNIA *et al.*, 2012), had a diagnostic value when associated with the history and presence of the plant in the property. In the present report, signs of grazing of the plant as well as cattle footprint were visualized where there was forest. These signs together with the history of "sudden death" and the presence of kidney histological lesion helped to confirm the diagnosis.

The monofluoroacetic acid was experimentally assigned as a determinant of the injury observed in the kidney and the death of animals by plants that cause sudden death (NOGUEIRA *et al.*, 2010; SANT'ANA *et al.*, 2014). Once ingested, the compound is converted in fluorocitrate, which inhibits aconitase, the enzyme responsible for the breakdown of citrate, which results in the interruption of the cycle (TOKARNIA *et al.*, 2012). Sodium monofluoroacet has a cardiotoxic action in cattle (BANDINELLI *et al.*, 2014). In this case, coagulation necrosis of cardiomyocytes similar to those reported for intoxication by other plants causing sudden death such as *Amorimia exotropa* (Malpighiaceae) was observed (PAVARINI *et al.*, 2011). In administrations of repeated doses of *P. marcgravii* in sheep regression-proliferative type alterations were found (SANT'ANA *et al.*, 2014), in contrast, in the present case, the alteration was uniform and consistent with an acute cytotoxic injury.

P. marcgravii is considered the most important toxic plant in Brazil and one of the main plants in the Central-Western region (TOKARNIA *et al.*, 2012). Differential diagnosis should be made, especially in relation to other plants that cause "sudden death". In the studied

region, *Mascagnia pubiflora* should be considered (SANT'ANA *et al.*, 2014). Another differential diagnosis is poisoning by cyanogens, such as *Manihot* spp. (cassava) (SANT'ANA *et al.*, 2014). It is valid to consider diseases that promote superacute evolution, such as anthrax (LANGENEGGER, 1994) and ophidian accident (TOKARNIA *et al.*, 2012). In addition, it is important to differentiate from urea intoxication, in which, besides the different clinical signs, histopathological lesions are not observed, and there is a history of feeding with urea, mainly without previous adaptation (SANT'ANA *et al.*, 2014). It is noteworthy that no other plants were found to cause sudden death at the site, besides macro and microscopic lesions characteristic of other diseases of superacute evolution.

The farm's forest area was not fenced and the animals had free access. As a control and prophylaxis of intoxication, when the amount of the plant is low, it is recommended to pull it out. When found in woods and river banks, it is recommended to fence the area and in case of suspected intoxication, it is recommended to avoid moving the animals for a period of one week (RIET-CORREA *et al.*, 2011).

CONCLUSIONS

Therefore, *P. marcgravii* intoxication should be considered in outbreaks of sudden death in cattle registered in the Federal District and Surroundings.

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