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CASE REPORT

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Spontaneous poisoning by *Palicourea aeneofusca* (Müll.Arg.) Standl. in cattle in the agreste region of Pernambuco

Intoxicação espontânea por *Palicourea aeneofusca* (Müll.Arg.) Standl. em bovinos no agreste de Pernambuco

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ABSTRACT: Plants containing monofluoroacetic acid constitute an important group responsible for poisoning in ruminants. In this sense, *Palicourea aeneofusca* stands out for being the main representative of these plants in the Agreste region of Pernambuco, Northeast Brazil, causing considerable economic losses. Therefore, the objective of this study is to describe the epidemiological, clinical, and pathological aspects of two outbreaks of spontaneous poisoning caused by *P. aeneofusca* in cattle in this region. Technical visits were carried out on two properties (A and B) with reports of sudden death in cattle, between August and September 2023, in two municipalities in the Southern Agreste region of Pernambuco. Epidemiological data were collected, in addition to inspection of pastures and identification of plants with toxic potential. Two cattle that died, one from each of the respective properties, were subjected to necropsy examination with collection of material for histopathological evaluation. *P. aeneofusca* was identified as the cause of cattle poisoning on the properties, both of which maintain preserved forest areas within their territory. In total, four cattle from property A (herd of 60 animals) and one animal from property B (herd of seven animals) died. The histopathological evaluation revealed hydropic-vacuolar degeneration in the cytoplasm of tubular epithelial cells and multifocal lymphocytic myocarditis with small hemorrhagic foci. Epidemiological data, histopathological lesions, and botanical identification of the plant were used as elements to confirm the diagnosis of poisoning by *P. aeneofusca*, confirming the negative impact of poisoning by this plant on cattle herds in the region.

Keywords: monofluoroacetic acid; histopathology; sudden death; toxic plant.

RESUMO: As plantas que contêm ácido monofluoroacético constituem um importante grupo responsável por intoxicações em ruminantes. Nesse sentido, *Palicourea aeneofusca* recebe destaque por ser a principal representante dessas plantas no Agreste de Pernambuco, Nordeste do Brasil, ocasionando consideráveis perdas econômicas. Diante disso, o objetivo desse trabalho é descrever os aspectos epidemiológicos, clínicos e patológicos de dois surtos de intoxicação espontânea causada por *P. aeneofusca* em bovinos nessa região. Realizou-se visitas técnicas a duas propriedades (A e B) com relato de morte súbita em bovinos, entre agosto e setembro de 2023, em dois municípios do Agreste Meridional de Pernambuco. Foram levantados dados epidemiológicos, além da inspeção das pastagens e identificação de plantas com potencial tóxico. Dois bovinos, das respectivas propriedades, que evoluíram a óbito foram submetidos a exame necroscópico com coleta de material para avaliação histopatológica. *P. aeneofusca* foi identificada como a causa de intoxicação de bovinos nas propriedades que mantinham áreas de mata preservadas em seu território. Quatro bovinos da propriedade A (rebanho de 60 animais) e um animal da propriedade B (rebanho de sete animais) evoluíram à óbito. Na avaliação histopatológica foram identificadas degeneração hidrópico-vacuolar no citoplasma de células epiteliais tubulares e miocardite linfocítica, multifocal, com pequenos focos de hemorragia. Os dados epidemiológicos, lesões histopatológicas e identificação botânica da planta foram usados como elementos para confirmação do diagnóstico de intoxicação por *P. aeneofusca*, confirmando o impacto negativo das intoxicações por essa planta em rebanhos bovinos da região.

Palavras-chave: ácido monofluoroacético; histopatologia; morte súbita; planta tóxica.

INTRODUCTION

Palicourea aeneofusca (Rubiaceae), popularly known as "rat grass", is a shrub widely distributed in the Northeast region of Brazil (Albuquerque *et al.*, 2013; Brito *et al.*, 2016; Vasconcelos *et al.*, 2008), and is responsible for causing sudden deaths associated with exercise in ruminants (Tokarnia *et al.*, 1983, 2012). In the Agreste region of Pernambuco, the state's dairy basin, *P. aeneofusca* was found to be responsible for 16% of cattle poisonings, making it one of the most important toxic plants in the region (Melo *et al.*, 2021).

Allowing the animals access to shaded areas, such as preserved forests, constitutes a risk factor for poisoning, since the plant is highly palatable and does not require starvation conditions for its consumption (Tokarnia *et al.*, 1983). These areas are preferred for the growth of *Palicourea aeneofusca*, since this genus is more sensitive to direct exposure to sunlight (Oliveira *et al.*, 2018). Experimental studies have shown that in cattle the lethal dose from the consumption of *P.*

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aeneofusca leaves is 0.75 g/kg (Tokarnia *et al*., 1983). After consumption of this plant, the most evident clinical signs are tachycardia, tachypnea, motor incoordination, muscle tremors, convulsions, vocalization, and recumbency, followed by death (Tokarnia *et al.*, 1983; Oliveira *et al*., 2013).

The hyperacute evolution of the clinical-pathological framework of animals intoxicated by *P. aeneofusca* is related to the presence of monofluoroacetic acid (MFA) (Lee *et al.*, 2014 Cook *et al.,* 2014). This compound plays a disruptive role in cellular metabolism, directly interfering with the Krebs cycle (Collicchio-Zuanaze; Sakate, 2005; Nogueira *et al.*, 2011). This interference significantly reduces the production of adenosine triphosphate, the main source of cellular energy, especially in tissues with high energy expenditure, such as the heart and central nervous system (Nogueira *et al*., 2011).

Therefore, the objective of this work is to describe the epidemiological, clinical, and pathological aspects of two outbreaks of spontaneous poisoning caused by *P. aeneofusca* in cattle in the Agreste region of Pernambuco, Northeastern Brazil.

MATERIAL AND METHODS

Technical visits were carried out on two properties (A and B) with reports of sudden death in cattle, between August and September 2023, located, respectively, in the cities of São João and Angelim, municipalities in the Southern Agreste region of Pernambuco, Brazil. These regions are composed of forested areas, with a sub-humid tropical climate and an average annual rainfall of 876.5 mm (APAC, 2023; BDE, 2023).

Epidemiological data were obtained through interviews with the owners during the visits, and animals with a history of access to forest areas were subjected to clinical evaluation according to Dirksen *et al.* (1993). In addition, inspections of the properties and the animals' grazing areas were carried out. The specimens of plants with toxic potential were collected and sent to the Dárdano de Andrade Lima Herbarium of the Agronomic Institute of Pernambuco for botanical identification, under registry number 94983.

Two cattle that died, one from each property, underwent necropsy with collection of material for histopathological evaluation. The collected organ fragments were fixed in 10% buffered formalin, then submitted to routine histopathological processing, and stained with hematoxylin-eosin (HE). Furthermore, fragments of the nervous system (brain and spinal cord) of these animals were frozen and subjected to direct immunofluorescence tests and inoculation in mice, carried out at the Veterinary Analysis and Diagnosis Laboratory of the Goiás Agricultural Defense Agency, for differential diagnosis of rabies.

CASE REPORT

During the months of August and September 2023, the cattle owners requested a visit from the technical team at the Garanhuns Cattle Clinic, Campus of the Federal Rural University of Pernambuco, after reports of the sudden death of four cattle belonging to the herd on property A and one animal from property B.

The herd on property A consisted of 60 male Nelore cattle, with an average age of 36 months, kept in an extensive breeding system. These animals were purchased in neighboring municipalities and subjected to deworming and vaccination against rabies and clostridial diseases at the time of purchase. In turn, property B held seven male, crossbred Jersey cattle, raised extensively, approximately 12 months of age, and acquired four months previously.

According to the owners' reports, the cattle were kept in native pasture areas and, on both properties, there were preserved forest areas to which the animals had access. There were no previous records of plant poisoning on property A. On the other hand, on property B, it was reported that two animals had died after presenting clinical signs similar to those observed in the outbreak in question.

After inspecting the pastures, the presence of *Palicourea aeneofusca* was observed in large quantities, distributed throughout the entire length of the forest areas present on properties A and B (Figure 1). In addition, signs of cattle grazing were identified in these locations, as well as the carcasses of animals that died suddenly during this period (Figure 2). According to the owners' report, the animals showed clinical signs of convulsions, sialorrhea, aggression, and collapse, followed by death. On property A, during the movement of the animals from one pasture to another, one bovine died, presenting the same symptoms as the previous cattle that died.

Macroscopically, multifocal ecchymoses were identified in the epicardium and a hyperemic liver, with

Figure 1 – Preserved forest areas with the presence of *Palicourea aeneofusca.*

A. Presence of *Palicourea aeneofusca,* in large quantities, in a forest area. B. *P. aeneofusca* in foliation. C. Immature fruits of *P. aeneofusca.*
Source: author's collection.

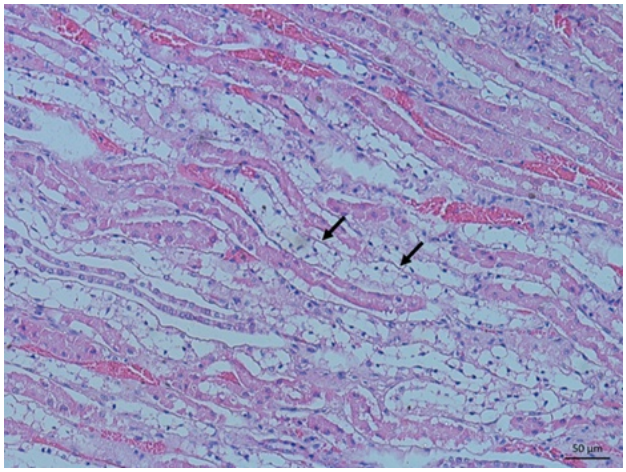
Figure 2 – Carcass of a cow poisoned by *Palicourea aeneofusca* found in a wooded area on the property Source.

Source: author's collection.

bulging edges. Histopathological evaluation identified mild to moderate multifocal tubular degeneration of the kidneys. Renal lesions in the cortical region were characterized by hydropic-vacuolar degeneration in the cytoplasm of tubular epithelial cells (Figure 3). In the glomerular spaces and in the lumens of tubules in the cortical region, a moderate amount of amorphous, eosinophilic content was identified, in addition to congestion of blood vessels in the medullary region.

In turn, in the heart, multifocal lymphocytic myocarditis was found, characterized by inflammatory

Figure 3 – Renal tubular degeneration in cattle poisoned by *Palicourea aeneofusca.*

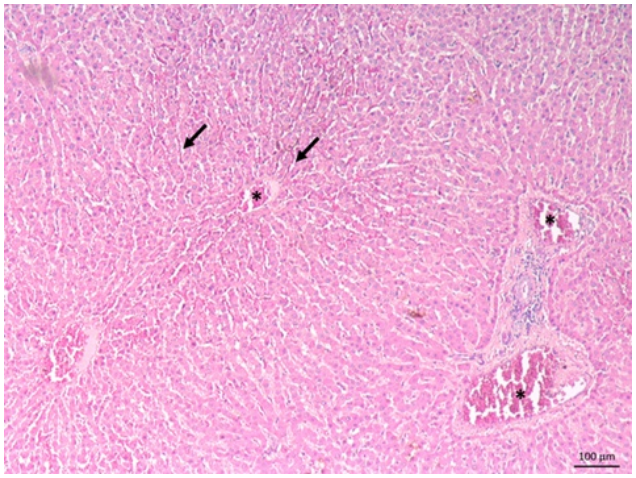


Multifocal areas of the corticomedullary region with hydropic-vacuolar degeneration in the cytoplasm of tubular epithelial cells (arrows) and with moderate nuclear pyknosis, found in a forested area on the property.
Source: author's collection.

infiltrates of lymphocytes and small hemorrhagic foci, to a mild degree, in the connective tissue of the myocardium and in the endocardium, in addition to congestion of capillaries and larger caliber blood vessels. Finally, mild congestion was observed in the liver in the centrilobular veins and adjacent sinusoids (Figure 4).

The results of direct immunofluorescence and

Figure 4 – Hepatic congestion in cattle poisoned by *Palicourea aeneofusca.*



Discrete quantity of erythrocytes in the sinusoids (arrows) and in larger blood vessels (asterisks).
Source: author's collection.

inoculation in mice ruled out the presence of rabies virus infection in the animals that died.

DISCUSSION

Epidemiological data, anatomopathological evaluation, inspection of pastures, and botanical identification were used to guide the establishment of the diagnosis of poisoning by *Palicourea aeneofusca*. From an epidemiological point of view, the time of year in the regions where the poisonings occurred is characterized by the rainy season, which predisposes the sprouting, flowering, and fruiting of toxic plants. Despite this, Brito *et al.* (2016) identified cases of spontaneous poisoning of cattle by this plant in the same region where the cases described here occurred, but during the dry season, attributing the consumption of *P. aeneofusca* to the presence of forested areas as the only option for cattle pasture. These results demonstrate that this poisoning occurs independent of climatic conditions.

Access to preserved forest areas is the main risk factor for *Palicourea aeneofusca* poisoning, since this plant is highly palatable and does not require dietary restrictions for cattle to consume it. Melo *et al.* (2021) identified scares of *P. aeneofusca* poisoning in cattle raised in the municipalities in question and in other surrounding regions, attributing the scares to the presence of forest areas on rural properties.

The clinical signs of the animals that consumed *Palicourea aeneofusca* reported by the owners are consistent with those described in the literature. In experimental poisonings in cattle, motor incoordination, sudden collapse, with or without touch stimuli, lateral recumbency, and acute death have been described (Tokarnia *et al.*, 1983). In spontaneous poisonings, tachypnea, tachycardia, positive venous pulse, sternal or lateral recumbency, muscle tremors, falls, convulsions, and, when moved, reluctance to move, and death in approximately five to ten minutes are reported (Brito *et al.*, 2016; Vasconcelos *et al.*, 2008).

Although some studies did not identify the presence of macroscopic lesions in cattle poisoned by this plant (Brito *et al.*, 2016; Nascimento *et al.*, 2018a), our findings revealed multifocal ecchymosis in the epicardium, as found by Tokarnia *et al.* (1983). In turn, the results of the cardiac histopathological evaluation are consistent with those described in the literature, with reports of diffuse areas of hemorrhage and discrete edema, fibrin deposits, and mononuclear cell infiltration in the interstitial spaces (Brito *et al.*, 2016). Although cardiac necrosis was not observed in the outbreaks reported herein, it was described in spontaneous poisoning of cattle by *P. aeneofusca* (Brito *et al.*, 2016) and in poisoning by other plants containing MFA (Tokarnia *et al.*, 1985; Pavarini *et al.*, 2011).

Renal histological alterations, such as those identified in the current study, may or may not be present, but when observed, they are of diagnostic value for MFA poisoning (Nogueira *et al.*, 2011, Oliveira Neto *et al.*, 2017), characterized by hydropic-vacuolar degeneration of renal epithelial cells, mainly of the distal convoluted tubules, with evident nuclear pyknosis (Brito *et al.*, 2016; Nascimento *et al.*, 2018b, Oliveira Neto *et al.*, 2017), in addition to congestion and necrosis of varying degrees of severity in the epithelial cells of the renal convoluted tubules (Brito *et al.*, 2016).

According to the results, restricting access to these locations is the main prophylactic measure that should be adopted. Another strategy that can be used to

prevent this poisoning in extensive farming systems is conditional food aversion, which was experimentally induced in cattle by administering lithium chloride after the ingestion of *P. aeneofusca,* and lasted for 12 months (Brito *et al*., 2016).

CONCLUSION

Spontaneous poisoning by *Palicourea aeneofusca* was identified as the cause of sudden death in cattle in the Southern Agreste region of Pernambuco, which resulted in economic losses for the owners. Epidemiological data, histopathological lesions and botanical identification of the plant were used as elements to confirm the diagnosis of poisoning by *P. aeneofusca*, confirming the negative impact of poisoning by this plant on cattle herds in the region.

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