



Spontaneous poisoning by *Dodonaea viscosa* (Sapindaceae) in cattle in Southern Brazil¹

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ABSTRACT.- Zamboni R., Alberti T.A., Venancio F.R., Quevedo L.S., Bonel J., Raffi M.B., Schild A.L. & Sallis S.V. 2021. **Spontaneous poisoning by *Dodonaea viscosa* (Sapindaceae) in cattle in southern Brazil.** *Pesquisa Veterinária Brasileira* 41:e06988, 2021. Laboratório Regional de Diagnóstico, Departamento de Patologia Animal, Faculdade de Veterinária, Universidade Federal de Pelotas, Rua Gomes Carneiro 1, Centro, Pelotas, RS 96010-610, Brazil. E-mail: rosi_zamboni@yahoo.com.br

In this study, an outbreak of spontaneous poisoning by *Dodonaea viscosa* (*D. viscosa*) in a herd of dairy cattle in the municipality of Capão do Leão, Rio Grande do Sul, was investigated. Three deaths occurred in a batch of 16 Jersey cattle, aged between three and four years, kept in a native field. The clinical signs observed were apathy, decreased production, and anorexia, with death occurring within approximately 48 h after the onset of signs. The three cattle were necropsied, and tissue samples were sent for histopathological examination. Necropsy findings included serosanguineous fluid in the abdominal cavity, intestines with congested serosa, and marked mesenteric edema. The mucosa of the abomasum of two of the animals was hemorrhagic with bloody content, and among the ruminal content of a bovine, leaves with morphological characteristics compatible with *D. viscosa* were observed. The livers of the three animals were enlarged, with accentuation of the lobular pattern. Histologically, centrilobular coagulation necrosis with congestion and hemorrhage was observed in the liver. Vacuolization and degeneration of hepatocytes were observed in the mid-zonal and periportal regions. The diagnosis of poisoning by *D. viscosa* leaves was based on epidemiological data, necropsy findings, and histopathological alterations. The presence of the plant in the rumen and in the grazing site of the affected cattle was essential for the diagnosis.

INDEX TERMS: Spontaneous poisoning, *Dodonaea viscosa*, Sapindaceae, cattle, Brazil, acute hepatotoxicity, disease of cattle, poisonous plants, liver necrosis.

RESUMO.- [Intoxicação espontânea por *Dodonaea viscosa* (Sapindaceae) em bovinos no sul do Brasil.] Neste trabalho, é descrito um surto de intoxicação espontânea por *Dodonaea viscosa* (*D. viscosa*) ocorrido em um rebanho de bovinos leiteiros, no município de Capão do Leão, no Rio Grande do Sul. Ocorreram três mortes em um lote de 16 bovinos da raça Jersey com idades entre três e quatro anos, mantidos em campo

nativo. Os sinais clínicos observados foram apatia, queda na produção e anorexia, com morte em aproximadamente 48 horas após o início dos sinais. Os três bovinos foram necropsiados, e amostras de tecidos foram encaminhadas para exame histopatológico. Os achados de necropsia incluíam líquido serossanguinolento na cavidade abdominal, intestinos com serosas congestionadas e marcado edema de mesentério. A mucosa do abomaso de dois animais apresentava-se hemorrágica com conteúdo sanguinolento e, em meio ao conteúdo ruminal de um bovino foram observadas folhas com caracteres morfológicos compatíveis com *D. viscosa*. O fígado dos três animais estava aumentado, com acentuação do padrão lobular. Histologicamente no fígado havia necrose de coagulação centrilobular com congestão e hemorragia. Nas regiões médio-zonal e periportal observou-se vacuolização e degeneração dos hepatócitos. O diagnóstico de intoxicação

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pelas folhas *D. viscosa* foi baseado nos dados epidemiológicos, nos achados de necropsia e nas alterações histopatológicas. A presença da planta no rúmen e no local de pastoreio dos bovinos afetados foi fundamental para o diagnóstico.

TERMOS DE INDEXAÇÃO: Intoxicação espontânea, *Dodonaea viscosa*, Sapindaceae, bovinos, Brasil, hepatotoxicidade aguda, doença de bovinos, plantas tóxicas, necrose hepática.

INTRODUCTION

Dodonaea viscosa (*D. viscosa*) is a native plant of the Sapindaceae family, popularly known as hopbush, red broom, field broom, deerweed, and red hurdle (Tokarnia et al. 2012). The center of origin of *Dodonaea viscosa* is believed to be Australia, and it is found in all tropical and subtropical regions of the world (Al-Snafi 2017). In Brazil, it is the most abundant shrub species in the Pampa biome, occurring mainly along the coastline, in restingas, plains, and mountain slopes, and is considered a pioneer species of little demand owing to its edaphic characteristics and recovery of degraded areas (Paoli & Sarti 2008, Tokarnia et al. 2012, Carlucci et al. 2015).

The plant has numerous known active properties that are of therapeutic and medicinal importance (Kumar et al. 2013, Al-Snafi 2017). However *D. viscosa* has been associated with acute liver failure in cattle, and its toxic effects have not been determined (Colodel et al. 2003, Cattani et al. 2004, Tokarnia et al. 2012). In Brazil, only one outbreak of spontaneous poisoning was related to the ingestion of *D. viscosa* in cattle in the state of Rio Grande do Sul (Colodel et al. 2003).

Due to the wide distribution of *D. viscosa* in southern Brazil (Tokarnia et al. 2012), there is a scarcity of reports on intoxication and clinical-pathology similar to other acute hepatotoxicosis in cattle. The present study aimed to describe an outbreak of spontaneous poisoning in cattle, which ingested the leaves of *D. viscosa* during their flowering phase in the southern region of Rio Grande Sul.

MATERIALS AND METHODS

Three dairy cattle were necropsied on the farm and sent to the “Laboratório Regional de Diagnóstico” (LRD) of the “Faculdade de Veterinária”, “Universidade Federal de Pelotas” (UFPel). Fragments of all organs were fixed in 10% buffered formalin. After 48 hours of fixation, the samples were cleaved, processed routinely, cut into 3µm thick sections, and stained using routine hematoxylin and eosin (HE) technique. Plant specimens were collected and sent for identification at the Herbarium of the “Departamento de Botânica” of the “Instituto de Biologia”, UFPel (Herbário Pel). Epidemiological and clinical data were obtained during visits to the property where the outbreak happened.

RESULTS

The outbreak of spontaneous poisoning by *Dodonaea viscosa* occurred in April 2016 in a rural dairy farm located in the municipality of Capão do Leão (31°74'88.25" S, 52°54'32.11" W), Rio Grande do Sul. Among the batch of 16 lactating Jersey cows aged three-four years old, three animals showed apathy, decreased production, and anorexia, and died approximately 48 hours after the onset of clinical signs. The cattle in this lot were in native field paddocks with low forage supply, surrounded by areas of native forest (paddocks divided into an average of 5 ha), in which they rotated when they started lactation. In the paddock where the deaths occurred, *D. viscosa* was observed to be present (Fig.1-2), and no other hepatotoxic agents was present. Samples of *D. viscosa* were sent to Herbário Pel, identified, and deposited according to the fall number PEL N° 27.064.

Serosanguineous fluid was observed in the abdominal cavity during necropsy of the three affected cattle. The intestines presented a congested serous with marked edema of the mesentery (Fig.3), and there was hemorrhagic content in the lumen of the small intestine. The mucosa of the abomasum of the two animals was hemorrhagic with bloody content (Fig.4). Amid the ruminal content of the bovine, leaves with morphological characteristics compatible with *D. viscosa* were observed. The livers of the three animals were enlarged, with accentuation of the lobular pattern, and the gallbladder was



Fig.1-2. Exemplary of *Dodonaea viscosa* located in the municipality of Capão do Leão (31°74'88.25" S, 52°54'32.11" W). (1) Large shrub of *D. viscosa* approximately 2m tall in fruiting. (2) Detail of simple and alternate leaves with fruits with three to four wings.

filled with wall edema (Fig.5 and 6). Histologically, centrilobular coagulation necrosis with congestion and hemorrhage was observed in the liver (Fig.7). Vacuolization and degeneration of hepatocytes were observed in the mid- and periportal regions (Fig.8).

DISCUSSION AND CONCLUSIONS

The diagnosis of poisoning by *Dodonaea viscosa* leaves was based on macroscopic and histopathological findings, as well as the presence of the plant in the rumen and grazing site of the affected cattle. The acute liver injury observed in the cattle, which caused the death of the animals, is a characteristic of toxic liver diseases in the species. However, the identification of the hepatotoxic agent is the limiting epidemiological factor for the definitive diagnosis of the cause of acute liver failure (Tokarnia et al. 2012, Alberti et al. 2020).

The main differential diagnoses considered in this outbreak were *Xanthium* spp., *Cestrum parqui*, *Cestrum corymbosum*, *Cestrum intermedium*, *Trema micranta*, and *Perreya flavipes* larvae (Cattani et al. 2004, Soares et al. 2008, Tokarnia et al.

2012, Alberti et al. 2020), which are important hepatotoxic agents frequently diagnosed in the southern region of Rio Grande do Sul. Based on the acute and non-specific clinical symptoms shown by the cattle, the bovine parasitic sadness complex should be considered as a differential symptom in these cases owing to the endemic characteristic of the disease in Rio Grande do Sul (Estima-Silva et al. 2016). In these cases, epidemiological data, presence of the plants, necropsy, and histopathology are essential for the definitive diagnosis and prevention of poisoning by *D. viscosa* (Tokarnia et al. 2012, Alberti et al. 2020).

Epidemiological data on toxicity of the plant are scarce, as cases of spontaneous poisoning have been described (Colodel et al. 2003) in cattle. In a study carried out in rats (higher dose of 1250 mg/kg), there were no signs of acute toxicity by *D. viscosa* (Arun & Asha 2008). Cattani et al. (2004) demonstrated that the leaves of *D. viscosa* were toxic to cattle during budding (June), inflorescence (September/October), and dry stages. The present case occurred in April, considering the flowering period of *D. viscosa* (Carvalho 2014); moreover, the leaves of *D. viscosa* were toxic at different phases.



Fig.3-6. Macroscopic findings of cattle poisoned by *Dodonaea viscosa*. (3) Mesentery edema (asterisks). (4) Abomasum with abundant bloody material and hemorrhagic mucosa. (5) Mild diffuse hepatomegaly and increased gallbladder volume. (6) Hepatic surface with accentuated lobular pattern, characterized by dark red areas interspersed with lighter areas.

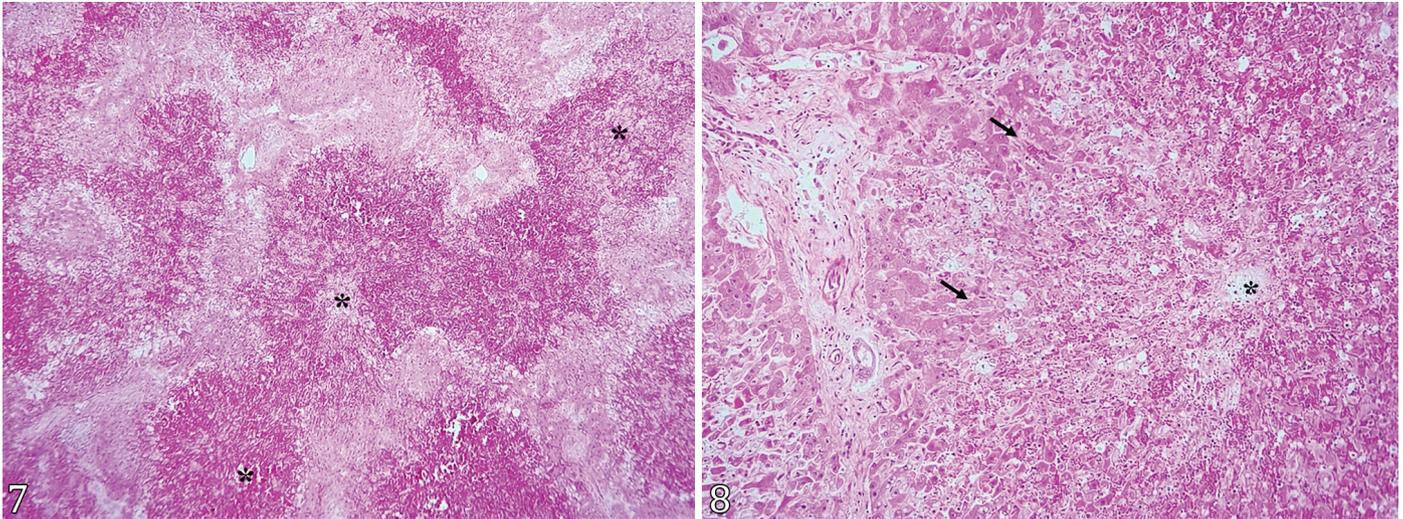


Fig.7-8. Hepatic histopathological lesion in cattle poisoned by *Dodonea viscosa*. (7) Marked coagulation necrosis and centrilobular to medullary hemorrhage, with occasional bridging (asterisks). HE, obj.4x. (8) Centrilobular necrosis (asterisk) with degeneration and vacuolization of hepatocytes (arrows) in the medullary and periportal regions. HE, obj.10x.

It is believed that the cattle accidentally ingested the leaves as a result of low supply of forage combined with the high stocking density in the paddock (approximately 3.5 cattle per hectare). Due to the wide geographic distribution of *D. viscosa*, mainly in the southern region of Brazil, this should be considered as a differential diagnosis in acute hepatotoxicosis in cattle. Furthermore, the presence of the plant in the rumen and grazing site of affected cattle is essential for the definitive diagnosis of spontaneous poisoning by *D. viscosa*.

Conflict of interest statement.- The authors have no competing interests.

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