Research in Veterinary Science 93 (2012) 1337–1340

Contents lists available at SciVerse ScienceDirect

Research in Veterinary Science

journal homepage: www.elsevier.com/locate/rvsc

Primary photosensitization in cattle caused by *Froelichia humboldtiana*

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ARTICLE INFO

Article history:
Received 22 November 2011
Accepted 8 April 2012

Keywords:
Photodermatitis
Plant poisoning
Poisonous plants
Bovines

ABSTRACT

Three outbreaks of primary photosensitization caused by *Froelichia humboldtiana* are reported in the semiarid region of the states of Pernambuco and Paraíba, in northeastern Brazil. The disease occurred from March to June 2011, affecting 27 bovines out of a total of 70. The main lesions consisted of dermatitis of the white skin, with edema and necrosis. All the bovines recovered after removal from the areas invaded by *F. humboldtiana*. To produce the disease experimentally, one bovine with white skin was placed for 14 days into an area with *F. humboldtiana* as the sole forage. This bovine presented photodermatitis on the third day of consumption. The serum concentrations of total, indirect, and conjugated bilirubin and the serum activities of gamma-glutamyl transferase (GGT) and aspartate-aminotransferase (AST) in the spontaneously affected cattle and in the experimental cattle remained within normal ranges. It is concluded that *F. humboldtiana* causes primary photosensitization in cattle in northeastern Brazil.

Froelichia humboldtiana (Roem. & Schult.) (Amaranthacea), commonly known in Portuguese as *ervanço*, is a plant widely distributed in the Brazilian northeastern region and also found in some areas of central-western Brazil (Marchioretto et al., 2002).

Outbreaks of photosensitization affecting horses are well known in the semiarid northeastern region of Brazil, where farmers claimed that the disease also affects mules, donkeys, sheep, and cattle (Macedo et al., 2006; Pimentel et al., 2007). After a spontaneous photosensitization outbreak in sheep, the poisoning was experimentally produced in 4 sheep and in a foal grazing in a restricted area with *F. humboldtiana* as the sole vegetation (Pimentel et al., 2007).

The aim of this study is to report primary photosensitization in cattle in the semiarid region of Brazil and to demonstrate experimentally that the disease is caused by the ingestion of *F. humboldtiana*.

The epidemiologic and clinical data were obtained from owners and veterinarians during visits to the farms in which the disease was occurring. The climate in the region is semiarid, the annual rainfall average is 450 mm, and the vegetation consists of Brazilian caatinga, a biome exclusive to Brazil that is characterized by bushes with twisted branches and deep roots, cacti and bromeliads (Costa et al., 2007). In the three farms studied, 12 cattle naturally poisoned by *F. humboldtiana* were examined, and samples of their peripheral blood were collected to analyze the serum activities of gamma-glutamyl transferase (GGT) and aspartate-aminotransferase (AST), and the serum concentrations of the total, indirect, and conjugated bilirubin (Kaneko et al., 1997).

In one farm in the municipality of Custódia in the state of Pernambuco, 4 cattle out of 18 presented photodermatitis lesions after being kept for 10 days in a newly established grazing area of approximately 3 hectares. The disease occurred from March to May 2011, during the rainy season (Fig. 1), and affected cattle raised in a semi-extensive system. The grazing area was originally covered by the Brazilian caatinga, and buffel grass (*Cenchrus ciliares*) was later planted, but the planting was not successful, and the area was severely invaded by *F. humboldtiana* (Fig. 2).

Other outbreaks of photodermatitis affecting cattle were also observed in two farms in the municipality of Salgado de São Félix, in the state of Paraíba. Twenty-three bovines out of a total of 52 at risk were affected. One 6-month-old calf died as a result of severe photodermatitis. The outbreaks occurred between May and July, also during the rainy season (Fig. 1). The cattle were free to graze in the early morning in areas of approximately 5 hectares and were removed in the late afternoon. In both farms, an intense invasion of the paddocks by *F. humboldtiana* was observed.

The plant is highly palatable, and animals consume large amounts of it. According to the farmers, the disease occurs seasonally during the rainy season when the plant is flowering. Cattle and horses with non-pigmented white skin are more frequently affected, but goats and sheep are also affected. The farmers mentioned that cattle purchased from other regions have more severe lesions of photodermatitis than cattle born on the farms.

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http://dx.doi.org/10.1016/j.rvsc.2012.04.005

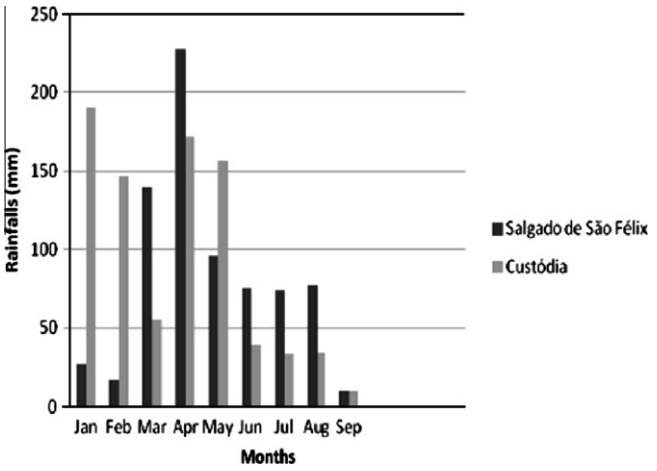

Fig. 1. Monthly rainfall in the municipality of Custódia, state of Pernambuco and Salgado de São Félix, state of Paraíba in 2011 (rainy season). Data from the Brazilian agencies IPA and EMATER.

The cattle naturally poisoned were in good physical condition, and lesions were observed in the areas of white skin (Fig. 3) or devoid of hairs. These animals were restless, scratching themselves, often seeking shaded areas, and constantly licking the areas of injury. Dermatitis with alopecia affected mainly the outside of the ears and around the eyes, the forehead, the nose, the muzzle, the dorsal portion of the neck, the croup, the withers, the scrotum, the teats, and the perineal region. The most severe lesions showed alopecia, edema, crusts and skin necrosis (Fig. 3). The serum activities of the GGT and AST and the serum concentrations of bilirubin in the naturally affected cattle remained normal according to the parameters for the species (Kaneko et al. 1997).

After diagnosis of the poisoning, the herds were removed from the pastures invaded by *F. humboldtiana* and clinically evaluated after 30 and 90 days. The animals with lesions of less than approximately 8 cm in diameter recovered within 30 days. In the bovines with larger and more severe lesions, the lesions took up to 90 days to heal.

Additionally, to study the epidemiology of the disease, 9 other neighboring farms were visited. In the 9 farms, the farmers also reported the occurrence of the disease in horses, cattle, goats, and sheep associated with the presence of *F. humboldtiana.*

To produce the disease experimentally, one 3-year-old Holstein crossbreed cow with areas of white skin was kept for 14 days in a pasture severely invaded by *F. humboldtiana.* This cow came from a region where *F. humboldtiana* was not present. The experiment was performed in April, during the rainy season. In the area where the experimental animal was grazing, other plants were manually uprooted to be sure that the only plant ingested was *F. humboldtiana.* At night, the cow was removed to the corral where it remained without access to other food. The experimental cow was examined daily for the presence of photodermatitis. Samples of its peripheral blood were collected on the 1st and 14th days of the experiment to analyze the serum activities of the GGT and the AST and the serum concentrations of the total, indirect and conjugated bilirubin. Two other 8- and 12-month-old cattle with areas of white skin were used as controls. During the day, these animals were maintained in a paddock of approximately 1 hectare where there was no *F. humboldtiana.* They were removed to the corral at night.

On the third day after being placed in the pasture with the *F. humboldtiana,* the cow was restless and scratched itself frequently. Later, hyperemia and photodermatitis were observed affecting the forehead, the dorsal portion of the neck, the withers, and the proximal hind limbs. On the 12th day of the experiment, alopecia, cutaneous edema, and skin necrosis were also observed. The lesions regressed gradually after the removal of the cow from the paddock, and complete healing of all the lesions occurred without treatment in 45 days. There were no changes in the serum activities of the GGT and the AST and in the serum bilirubin concentrations.

The diagnosis of poisoning and primary photosensitization by *F. humboldtiana* was based on epidemiology, clinical signs, serum biochemistry and the experimental reproduction of the disease. In the spontaneous and experimental cases, the serum activities of the GGT and the AST and the serum concentrations of bilirubin remained within normal limits, demonstrating that the photosensitization was primary and not secondary to liver disease.

Polyphenolic pigments present in some plants cause primary photosensitization. After ingestion, these pigments are absorbed by the digestive tract and distributed by the bloodstream. In animals with non-pigmented skin, these compounds react rapidly with UV rays, producing cell death and tissue necrosis in the epidermal cells (Knight and Walter, 2001).

Fig. 2. (A) Pasture heavily infested by *Froelichia humboldtiana.* (B) Aerial part of *F. humboldtiana.*