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# Alkaloid poisoning in cattle exposed to kodo millet plant in Durg, Chhattisgarh, India

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**Abstract**
Weather conditions like spring and summer appear to have been favourable for a certain kind of poisoning that can affect cattle on pasture. Cool, damp spring weather followed by warmer temperatures favours grasses becoming infected from fungus called *Claviceps purpurea*. Examples of plant species infected include wheat, barley, oats etc. All domestic animals are susceptible to the effects of ergot; however, due to their diets ruminants are usually more commonly affected than others. Two types of ergotism have been described: convulsive and gangrenous. Though these two designations exist, the etiology of both is rooted in the vasoconstrictive ability of ergot alkaloids. An incident of ergot poisoning was recorded from the village in vicinity of Durg district, where a herd of cattle started to show the nervous symptoms including convulsion, tremors, muscle fasciculations. History revealed that the animals were grazing in the field where residues of kodo plant were spread. The feed sample was analysed for presence of toxins showed presence of alkaloids. Microscopic examination revealed presence of fungus *Claviceps.* All the animals were recovered when the source of infection was removed and treated symptomatically.

**Keywords:** Cattle, ergotism, kodo, poisoining, *Claviceps*

## 1. Introduction
This article described the epidemiological and clinical aspects of two outbreaks of neurological diseases in cattle exposed to *Paspalum scrobiculatum* L. commonly known as Kodo millet and mycotoxins in Durg, Chhattisgarh, India. Kodo millet is a staple food of some sections of people of North India. Weather conditions like spring and summer appear to have been favourable for a certain kind of poisoning that can affect cattle on pasture. Cool, damp spring weather followed by warmer temperatures favours grasses becoming infected with *Claviceps purpurea*, which produce substantial amount of a mycotoxin. Ergot is a fungal endophyte that grows in the flower heads of various grasses; perhaps most frequently on rye, wheat, kodo (*Paspalum* spp.) barley and oats. Animals may be poisoned by eating ergot-infected grain, hay or by grazing on infected grass. It is thus incredibly important to monitor feedstuffs for presence of ergot, where possible. The poisoning may be acute if large quantities of ergot are eaten at one time, or the results may be slow and cumulative if small amounts are eaten regularly. All domestic animals are susceptible to the effects of ergot; however, due to their diets ruminants are usually more commonly affected than others. Ergot fungi produce ergot alkaloids as secondary metabolites, which are mycotoxins. Their production occurs in the sclerotia of several species of the genus *Claviceps*, the most common being *Claviceps purpurea*. The effects of ergot alkaloids on animals can vary widely. In cattle, two distinct clinical syndromes are associated with ergotism: (1) the acute or convulsive (neurological and abortogenic) (da Rocha *et al*., 2014) [3] characterized by convulsions, dizziness, and muscle spasms of the hind limbs that may lead to temporary paralysis, and even death. (2) The chronic (gangrenous) form is characterized by reddening and swelling of the extremities, followed by lameness, which, if allowed to proceed, often results in necrosis of the extremities with loss of hooves and ear or tail tips. (Coppock *et al*. 1989) [1]. Though these two forms exist, the etiology of both is rooted in the vasoconstrictive ability of ergot alkaloids. The vasoconstriction by alkaloids is a key factor in an accurate evaluation of clinical disease. Ergot alkaloids affect the supply of blood to the extremities of the body in addition to acting directly on the central nervous system via the pituitary where they activate the D2 dopamine receptors (Richard, 2012) [2].

## 2. Materials and Methods

A number of cattle of a herd from a village in vicinity of Durg (C.G.) were reported showing hallucination, muscle tremors and convulsion and few animals have died. History revealed that the animals were grazing in nearby field where the crop residues of Kodo were spread. It was a cool damp weather. So sample of crop residue from that field, water sample and ruminal content of died animal were collected, post mortem of dead animals was done. Laboratory analysis of feed and biological sample was done. Microscopic examination was done for presence of fungus. Toxicological examination was done for qualitative detection of toxins.

**2.1 Diphenylamine test for Nitrite/Nitrate**: In this test, a solution of diphenylamine and ammonium chloride in sulfuric acid is used. In the presence of nitrates, diphenylamine is oxidized, giving coloration.

**2.2 Picric acid paper test for cyanide**: In presence of cyanide in test sample, yellow picrate paper changes to reddish brown or brick red color.

**2.3 Tests for Alkaloid**

a) **Dragendorff's test**: Dragendorff's reagent is a color reagent to detect alkaloids in a test sample. Alkaloids, if present in the solution of sample, will react with Dragendorff's reagent and produce an orange or orange-red precipitate.
b) **Mayer's test**: the sample is treated with Mayer's reagent (Potassium Mercuric Iodide). Formation of a yellow colored precipitate indicates the presence of alkaloids.

## 3. Results and Discussion

Ergot poisoning may be acute or chronic in nature. A sufficiently large single dose causes signs that persist for several days. Animals display continuous trembling of the large muscle groups, movements are jerky and incoordinated. If they attempt to run, they fall over in awkward positions. Few affected animals died spontaneously after the onset of clinical signs. So, the condition was suspected for poisoning. The diagnosis was based on epidemiological data, clinical signs, necropsy findings and mycology. History revealed that the animals were grazing in the field where residues of *P. scrobiculatum* were spread. The feed sample was analysed and showed significant presence of alkaloids and small amount of nitrites respectively but HCN was not found in detectable amount. Microscopic examination revealed presence of fungus *Claviceps.* These all findings confirm the acute poisoning of Ergot. Chronic poisoning of ergot is reported previously in calves (Miskimin *et al*, 2015) [4] but case report of acute ergot poisoning in cattle are meagre. The ergot and other native species of *P. scrobiculatum* are also poisonous, causing characteristic nervousness and trembling. All the animals were recovered when the source of infection was removed and treated symptomatically.

## 4. Conclusion

These findings suggest that rapid diphenylamine test and Dragendorff and/or Mayer test could be used as field test for qualitative evaluation of endophytic nitrate/nitrite and alkaloids. Also feed and fodder, pasture of animals should be properly monitored for absence of any fungal growth.

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