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Clinical Management of Spontaneous *Leucaena leucocephala* (Subabul) Poisoning in Non Descriptive Goat

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A B S T R A C T

Two three month old female non descriptive kids were presented to Pudupalayam Veterinary dispensary, Department of Animal husbandry, Erode, Tamil Nadu with history of anorexia, generalized alopecia and slight throat enlargement during the month of May 2016. Affected part of skin was thin, dry, hard and showed increased sensitiveness to palpation. Laboratory investigation of skin scraping and faecal samples revealed no organisms of etiological significance. On further investigation it was observed that the animal was fed with subabul (*Leucaena leucocephala*) plant as a major diet for period of two month. The animals were treated with Vitamin A, D3 and E, Liver tonic, and supplement with mineral mixture. Diagnosis of *Leucaena leucocephala* poisoning was made based on the clinical history, typical lesion of diffuse alopecia and disappearance of lesion after withdrawal of subabul as feed for a period of one week along with the above said treatment. Subabul can be used as feed materials without any adverse effects if the diet contain less than 30-40 per cent and it was properly treated and supplemented with mineral mixture.

Introduction

Subabul (*Leucaena leucocephala*) is considered as a miracle tree for its ever-green protein rich foliage (20-30% CP), fast growing habit, pest resistance and durability under grazing, cutting and drought tolerance.

Despite so many good qualities, its use as livestock feed is being limited by the presence of a toxic amino acid mimosine and its metabolites 3, 4 DHP and 2, 3 DHP (Hammond, 1994). Characteristic signs of subabul toxicity are alopecia, anorexia, reduced weight gain and weight loss, excessive salivation, oesophegal lesions, enlarged thyroid and low circulating concentrations of thyroid hormones (Jones, 1979).

Spontaneous poisoning by this plant was described in cattle, sheep and rabbit however it is rare in goat. This communication reports natural occurrence of *Leucaena leucocephala* toxicity in goat and its management under field condition.

Clinical history and Observations

Two three month old female non descriptive kids were presented to Pudupalayam Veterinary dispensary, Department of Animal husbandry, Erode, Tamil Nadu with history of anorexia, generalized alopecia and slight throat enlargement during the month of May 2016. A through clinical examination was carried out and the body temperature (39.3°C), heart rate (95 beats/min), respiratory rate (57 cycle/min) and pulse rate (102 beats/min) were recorded. Affected part of the skin was thin, dry, hard (Fig. 1 and 2) and showed increased sensitiveness to palpation. Microscopical examination of skin scraping and fecal samples revealed no organisms of etiological significance. On further investigation the owner stated that the animal was fed with subabul leafs (*Leucaena leucocephala*) continuously for period of two month. The hair loss started after feeding of the subabul leafs and the general condition of the goat progressively worsened. Even though the animal was debilitated it continued to eat subabul. However it become anorexic with progressive loss of weight, hence the farmer brought for the treatment. HPLC analysis of urine (Dalzell *et al.,* 2012) is currently the most accurate method of measuring DHP toxicity, sampling many animals for analysis by HPLC is too expensive and prohibitive for small and marginal farmers in developing countries like India. Hence in the present investigation *Leucaena leucocephala* poisoning was diagnosed based on the case history, clinical signs and laboratory investigation and confirmed by the response of the animal to the treatment.

Results and Discussion

The animals were treated with Vitamin A, D3 and E @ 2ml/ animal on 1st, 3rd, 6th and 9th day by intramuscular route, Liv -52 (Himalaya herbal healthcare) @ 3 ml/ animal *per os* consecutively for a period of five days and 1.5 gm Mineral mixture bolus (Rikenbik pharma) consisting of Iron 200 mg, Iodine 20 mg, cobalt 80 mg, manganese 80 mg, copper 100 mg, zinc 40 mg and selenium 0.5 mg was given @ 500 mg orally in the morning and evening for a period of two weeks. The owner was advised to stop feeding the subabul and the animal showed responsiveness one week after the initiation of the treatment.

The tree legume *Leucaena leucocephala* (subabul) is a high quality ruminant feed, vitally important for livestock production in the tropics, despite the presence of mimosine in the leaves. The major toxic principle of Subabal is non-protein free amino acid i.e. mimosine. After ruminal degradation of Mimosine it yields 3- hydroxyl – 4 (1 H) – pyridone (3, 4 di hydroxy pyridine; 3,4 DHP) which is a potent goitrogen and mimosine itself also acts as depilatory agent. Some ruminants host specific ruminal bacteria that can degrade 3, 4- or 2, 3-dihydroxypyridine (DHP) to nontoxic compounds (Jones *et al.*, 1985).

In the present case both the animals showed diffuse alopecia which indicates the functional aspect of mimosine. Its depilatory action during the anagenic phase is due to interference in the cysteine synthesis from methionine, by this way reducing the hair protein synthesis that could delay or even interrupt its growth (Hylin, 1969). Structurally, mimosine is known to be a tyrosine analog that suppress tyrosinase and tyrosine decarboxylase. It is also act as anti-peroxidase, inhibiting peroxidase and lactoperoxidase reactions, by interfering with the iodination of tyrosine, thus affecting the synthesis of T_1, T_2, T_3 and T_4 which might cause enlargement of thyroid gland leading to enlargement of neck region on gross examination as observed in the present case (Jones *et al.*, 1985).

Fig.1 Affected goat kid showing generalized alopecia

Fig.2 Appearance of the skin of affected goat (thin, dry and hard)

Circulating DHP in blood inhibits metal-chelating enzymes and forms complexes with Zn and Cu, or Fe leading to excretion and depletion of these metals (Stunzi *et al.,* 1980). Progressive weight loss and debilitation observed in the present study might be due deficiency of thyroid hormone and minerals.

Generally, ruminants (cattle, sheep, and goats) are better at tolerating subabul than non-ruminants (horses, pigs and poultry) due to the presence of micro flora in the rumen (Virk *et al.,* 1991). However ruminants can develop toxic signs depending on the amount and duration of subabul in the diet (Jones *et al.,* 1976). In the present investigation animals developed the clinical signs three weeks after feeding the subabul leafs which indicate chronic toxicity (i.e., develops slowly over several weeks). Feeding of subabul as a major diet over a period of two months might aggravated the clinical manifestation in the present study (Megarrity and Jones, 1983). Possibly, if the owner would not have interfered with the feeding of the goat, the clinical signs would have not been so severe.

Minerals especially zinc, ferrous and copper binds with mimosine and DHP and increase their excretion via faeces. In the present study supplementation of mineral might alleviated the subabul toxicity by preventing absorption

of mimosine and DHP from GI tract (Paul, 2000). Vitamins and liver tonics might improve the health status and facilitated the rapid recovery of the animals in the present study. To prevent the further occurrence of this problem, farmer was advised to feed subabul in smaller proportion (< 40%) in the animal diet, add iodinated salt to subabul during feeding, mineral supplementation and soaking the subabul in water and drying off before feeding. The problem was not observed in the subabul fed animal after following the above said recommendations.

Leucaena leucocephala is an excellent fodder tree especially during summer season due to its high protein content and drought resistance however the presence of mimosine and DHP limits its utilization. Hence remedial measures are needed to control this toxicity and take advantage of the high protein feed on offer. Present study indicates that the subabul can be used as feed materials without any adverse effect if it was properly treated and supplemented with mineral mixture.

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