Mimosa invisa poisoning in dairy cows and its therapeutic management

Pranjal Borah, Utpal Barman, Mridushmita Sonowal, Maradona Nath and Bhaben Chandra Baishya

Abstract
Ten cows with the symptoms of swelling in various body parts, depression, anorexia, respiratory distress and history of ingestion of *Mimosa invisa* was attended. Two cows were reported to die just after showing the symptoms. On clinical examination, the cows were found to be restless, normal rectal temperature, elevated respiratory and heart rate with edema in jowl and perineal region and reduced urine output. Haematology reveals low haemoglobin, lymphocytosis and serum biochemistry showed significantly (*P*<0.01) higher level of serum aspartate aminotransferase, alanine aminotransferase, Blood Urea Nitrogen and creatinine. The cows were treated with anti-inflammatory, diuretics, liver stimulant and sufficient rehydration. Out of 8 cows, 6 cows responded to treatment, while 2 cows died 12 hours post-treatment.

Keywords: *Mimosa invisa*, perineal edema, creatinine, blood urea nitrogen, diuretics, anti-inflammatory

Introduction
Dairy farming is a blooming livestock business in and around Guwahati peri-urban areas catering the need of milk to the Guwahati city. Fodder land is a constraint in the area, and farmers rely on the hilly tract nearby Meghalaya for fodder. During monsoon season the hilly tract evidenced growth of various luxuriant wild vegetation. *Mimosa invisa* is one of the spiny weeds mostly annual in nature and rarely perennial in moist humid condition in the region. It as a troublesome invasive weed in tea estates of Assam, natural forests, forest plantation and agricultural system in Northeastern states of India [1]. The plant contains toxic amino acid “mimosine”, chemically (β-N-3 hydroxy 4 –pyridine)-α-amino propionic acid, which was reported to be an anti-nutritional factor and rumen bacteria convert this compound to 3,4-dihydroxypyridine (DHP) which was a goitrogenic agent and has the potential to cause toxicity in dairy cows [2, 3]. The present paper depicts the toxicity episodes created by the plant in dairy cows.

Materials and Methods
Case History and clinical findings
An owner reported that 10 of his cows are suddenly showing symptoms of swelling in various body parts, depression, anorexia and respiratory distress. It was reported that 2 cows died immediately after showing the symptoms. On clinical examination, the cows were found to be restless with an anxious look. The rectal temperature was within normal limit with an elevated respiratory and heart rate. There was various degree of edematous swelling prominent in perineal region (esp. in perivaginal area) in all the affected cows. Four cows had symptoms of jowl and brisket edema. All the affected cows were in sternal to lateral recumbency with dyspnoea, however they rise on assistance. On enquiry, it was reported that the urine output was decreased in all the affected cows. The respiratory pattern was moderately dyspneic. Mucous membrane was moderately pink. Owner reported that green grasses brought from the nearby hilly areas were offered to the affected cows last night, further enquiry and photographic display evidenced ingestion of *Mimosa invisa*. Blood sample was collected from the affected animal for haematological, biochemical and haem-protozoan investigation.

Haematological parameters viz. haemoglobin (Hb), WBC, Neutrophils and Lymphocytes was estimated using automated haematology cell counter model MS4e and serum biochemicals viz. aspartate aminotransferase (AST), alanine aminotransferase (ALT), Blood Urea Nitrogen (BUN) and creatinine was estimated using Semi Automated Biochemistry Analyzer.
Diagnosis and treatment
Based on clinical presentation, confirmation by owner about feeding Mimosa plant and blood biochemical findings the cases were diagnosed to be Mimosa invisa toxicity leading to acute renal insufficiency. The affected cows were immediately treated with prednisolone IM @ 10 ml for 3 days, mannitol IV @ 1ml per Kg body weight for 3 days, Furosemide (Lasix) @ 20 mg IM for 2 occasions at 12 hours interval along with oral rehydration (Intalyte oral @ 50 ml twice daily for 5 days) and liver stimulant (Pepsid C @ 10 ml IM daily for 5 days).

Results and Discussion
Based on clinical presentation and biochemical findings, the cases were diagnosed as Mimosa invisa toxicity with acute renal insufficiency. Two cows died 12 hour post treatment; postmortem couldn’t be done due to difficult terrain and owner’s reluctance to carry the bodies to pathology lab. The rest 6 cows showed marked recovery clinically at 48 hours post treatment with significant reduction in the swelling, urine output and frequency turning towards normal with normal respiration and appetite.

Table 1: Haemato biochemical values in dairy cows (n=6) with Mimosa invisa intoxication

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Before Treatment</th>
<th>14th day after treatment</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hb (g/dl)</td>
<td>3.78±0.16</td>
<td>9.05±0.19</td>
<td>-</td>
</tr>
<tr>
<td>WBC (x 10^3 / cmm)</td>
<td>8.27±0.21</td>
<td>7.95±1.21</td>
<td>-</td>
</tr>
<tr>
<td>Neutrophils (%)</td>
<td>22.50±0.76</td>
<td>28.62±1.94</td>
<td>-</td>
</tr>
<tr>
<td>Lymphocytes (%)</td>
<td>71.33±1.26</td>
<td>44.93±5.94</td>
<td>-</td>
</tr>
<tr>
<td>Creatinine (mg/dl)</td>
<td>7.87±0.82**</td>
<td>1.52±0.15</td>
<td>0.0002316</td>
</tr>
<tr>
<td>BUN (mg/dl)</td>
<td>81.03±6.87**</td>
<td>13.75±0.57</td>
<td>0.0001368</td>
</tr>
<tr>
<td>ALT (U/L)</td>
<td>54.3±4.56**</td>
<td>27.5±2.75</td>
<td>0.006139</td>
</tr>
<tr>
<td>AST (U/L)</td>
<td>206.23±11.52**</td>
<td>102.17±7.41</td>
<td>1.66e-05</td>
</tr>
</tbody>
</table>

** P<0.01

Haemato biochemical estimation revealed that the affected cows were highly anemic (Hb 3.78±0.16 g/dl) with severe lymphocytosis (71.33±1.26 %); however WBC count and neutrophils percentage were within the normal range (Table 1). There was significant increase in serum creatinine (7.87±0.82 mg/dl) and blood urea nitrogen (81.03±6.87 mg/dl) level with moderate elevation in the concentrations of AST (206.23±11.52 U/L) and ALT (54.3±4.56 U/L) during the toxicity episodes, which indicates typical impairment of kidney function and moderate toxic effect on liver. The haemato biochemical parameters returned to normal 14th day post-treatment in all the cows (Table 1). Similar report of Mimosa invisa toxicity in cows with symptoms of sunken eye balls, jowl edema, brisket edema and dyspnoea with low haemoglobin (3.60 g/dl), elevated creatinine (12.10 mg/dl) and blood urea nitrogen (328 mg/dl) was recorded at Namakkal [4]. Acute renal insufficiency commonly encounters in animals due to ingestion of various toxins (chemicals, heavy metals, plant, metabolic, antigenic etc) or by some drugs like aminoglycosides. In the present case, significant amount of Mimosa invisa ingestion was the cause of renal insufficiency leading to mortality of 4 cows [5]. Similar findings of renal failure was reported in cows following ingestion of mimosa plant with symptoms similar to that noticed in the present cases like inappetence, perivaginal swelling and brisket edema [6]. Mimosa contains the toxic principle “mimosine” which causes potential damage to the nephrons, thereby causing impaired glomerular filtration and resulting retention of sodium and fluid. Significant increase in biochemical parameters (ALT, AST, GGT, creatine kinase, alkaline phosphatase, creatinine and urea) with liver and kidney toxicity during experimental infusion of Mimosa invisa toxic fraction in rabbit was observed [7]. The affected animals were treated with predinsolone which is a steroidal anti-inflammatory agent that reduces ongoing nephritis induced by the plant toxin. Mannitol an osmotic diuretic causes pooling of fluid from extravascular space to systemic circulation. Furosemide (Lasix) is a loop diuretic that increases urine production by reducing the re-absorption of fluid and electrolytes in the distal convoluted tubules and increases the urinary output. Similar treatment with success was reported in earlier studies [8].

Conclusion
Mimosa invisa toxicity has the potential to damage renal and hepatic tissues in dairy cows and if untreated may lead to mortality. Immediate treatment with anti-inflammatory, diuretics, liver stimulant and rehydration of the affected animals yield good result. Awareness programme amongst dairy farmers regarding dairy cow feeding and locally available toxic plants will help in preventing further intoxication.

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References