ISSN: 2456-2912
NAAS Rating (2025): 4.61
VET 2025; 10(12): 135-137

www.veterinarypaper.com
Received: 05-10-2025
Accepted: 04-11-2025

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Phytobezoar-induced recurrent bloat and intestinal occlusion in a madras red ewe: A case report

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DOI: https://www.doi.org/10.22271/veterinary.2025.v10.i12c.2803

Abstract
A two-year-old Madras Red ewe was presented with sudden abdominal distension, anorexia, and reduced appetite. Physical examination revealed tachycardia and tympanic resonance on rumen percussion. Despite initial bloat treatment, the condition persisted with complete cessation of defecation. The animal succumbed within 24 hours despite therapeutic interventions. Postmortem examination revealed multiple phytobezoars (~9 cm diameter) occluding the omasal and intestinal lumens. Fibre composition analysis of the recovered phytobezoars revealed high lignocellulosic content: Neutral Detergent Fiber (NDF) 52.82%, Acid Detergent Fiber (ADF) 38.34%, Acid Detergent Lignin (ADL) 18.18%, and Acid Insoluble Ash (AIA) 6.82%. Further breakdown showed hemicellulose 14.48%, cellulose 20.16%, lignin 11.36%, and silica-bound lignin 6.82%. The high lignin and cellulose content of the phytobezoars explains their indigestibility and persistence. Preventive dietary management focusing on restricting indigestible fiber intake and surgical intervention through rumenotomy represent crucial approaches for managing such cases in small ruminant herds.

Keywords: Phytobezoar, madras red sheep, bloat, intestinal obstruction, lignocellulose, fiber analysis

Introduction
Phytobezoars are concretions of poorly digestible plant materials that accumulate in the gastrointestinal tract of ruminants, causing mechanical obstruction and potentially fatal outcomes. These formations are particularly common in tropical and subtropical regions where animals have access to fibrous, lignin-rich plants (Kumar *et al.* 2019) [4]. The Madras Red sheep, an indigenous breed of Tamil Nadu, India, is particularly susceptible due to its feeding habits and the regional availability of fibrous vegetation (Ramesh *et al.* 2021) [7].

The pathogenesis of phytobezoar formation involves the accumulation of indigestible plant components, primarily lignin, cellulose, and hemicellulose, which resist microbial degradation in the rumen (Anderson *et al.* 2018) [1]. These materials gradually compact, forming obstructive masses that can cause recurrent bloat, anorexia, and complete gastrointestinal obstruction (White and Johnson, 2022) [12].

This case report documents a fatal case of phytobezoar-induced intestinal occlusion in a Madras Red ewe, with detailed analysis of the phytobezoar composition and discussion of preventive strategies.

Case Presentation
History and Clinical Findings
A two-year-old Madras Red ewe weighing approximately 35 kg was presented to the Sheep and Goat Breeding Unit at Post Graduate Research Institute in Animal Sciences, Kattupakkam, with a history of sudden abdominal distension and reduced appetite of 12 hours duration. The animal was from a flock of 45 sheep maintained under semi-intensive management with access to natural grazing and supplemental concentrate feeding.

Physical examination revealed

- **Body condition score:** 2.5/5
- **Rectal temperature:** 38.9 °C (within normal range)
- **Heart rate:** 92 beats per minute (elevated)
- **Respiratory rate:** 28 breaths per minute
- **Rumen motility:** Absent
- **Percussion:** Tympanic resonance over left paralumbar fossa
- **Mucous membranes:** Pale pink, slightly dry

Initial Treatment and Progression

Initial treatment included

- Oral administration of poloxalene (10 g in 500 ml water)
- Mineral oil (200 ml orally)
- Simethicone (10 ml orally)
- Intravenous fluid therapy (Ringer's lactate, 500 ml)

Despite initial treatment, no significant improvement was observed. Within 24 hours, the animal exhibited complete anorexia, cessation of defecation, and progressive weakness. The ewe collapsed approximately 36 hours post-presentation and died despite emergency interventions.

Postmortem Examination and Laboratory Findings

Gross Pathology

Postmortem examination revealed

- Moderate abdominal distension
- Rumen filled with gas and fluid content
- Multiple spherical phytobezoars in the omasum (3 masses, 8-9 cm diameter), (Figure 1, 2).
- One additional phytobezoars in the proximal jejunum (7-8 cm diameter)
- Omasal and intestinal mucosa showing congestion and petechiation
- Areas of pressure necrosis at obstruction sites

Fiber Composition Analysis

The phytobezoars were subjected to comprehensive fiber analysis using the Van Soest method (Van Soest *et al.* 1991) [11]. The results are presented in Table 1 and 2.

Table 1: Fiber composition analysis of Phytobezoars

Parameter	Percentage (%)
Neutral Detergent Fiber (NDF)	52.82%
Acid Detergent Fiber (ADF)	38.34%
Acid Detergent Lignin (ADL)	18.18%
Acid Insoluble Ash (AIA)	6.82%

Table 2: Detailed structural composition

Component	Percentage (%)
Hemicellulose	14.48%
Cellulose	20.16%
Lignin	11.36%
Silica and Nitrogen bound lignin	6.82%

Fig 1: Recovered Phytobezoars-4 NOS

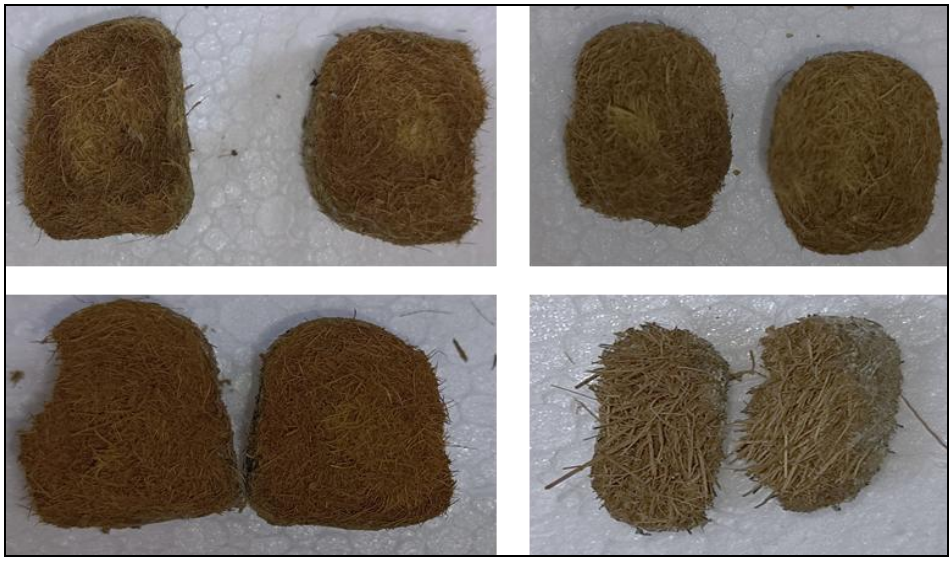

Fig 2: Phytobezoars-Longitudinally Dissected

Discussion

The fiber composition analysis provides crucial insights into the indigestible nature of the phytobezoars. The high NDF content (52.82%) indicates substantial cell wall material, while the elevated ADF (38.34%) and ADL (18.18%) values demonstrate the presence of recalcitrant lignocellulosic compounds that resist microbial degradation (Van Soest, 1994) [10].

The high lignin content (11.36%) is particularly significant, as lignin forms complex bonds with cellulose and hemicellulose, creating a structural matrix that is virtually indigestible by rumen microorganisms (Jung and Allen, 2020). The substantial silica content (evidenced by AIA at 6.82%) further contributes to the recalcitrance of these formations, as silica reinforces plant cell walls and reduces digestibility (Massey *et al.* 2019) [5]. The composition explains the recurrent nature of the bloat and the failure of conservative treatment. The phytobezoars acted as mechanical obstacles, preventing normal digesta flow and gas elimination, leading to progressive ruminal tympany and eventual intestinal occlusion. Our findings align with previous studies reporting phytobezoar composition in small ruminants. Gupta *et al.* (2021) [2] reported similar lignin content (10-12%) in phytobezoars from goats, while Patel *et al.* (2020) noted slightly higher cellulose content (22-25%) in bovine phytobezoars. The high silica content in our case (6.82%) is consistent with regions where silica-accumulating plants are prevalent in grazing areas (Sharma *et al.* 2022) [8].

Therapeutic and Preventive Strategies

Based on our findings and literature review, we recommend early rumenotomy for phytobezoar removal with supportive fluid therapy and rumen modifiers and probiotic supplementation to restore rumen microflora.

Preventive Measures

The preventive measures include dietary management to limit intake of high-lignin forages, supplemental feeding with digestible fiber sources, regular provision of mineral mixtures to prevent pica, access to clean drinking water to maintain proper hydration and strategic grazing management to avoid mature, fibrous vegetation.

Conclusion

This case highlights the serious consequences of phytobezoar formation in small ruminants and emphasizes the importance of understanding plant fiber composition in relation to animal health. The high lignocellulosic content of the phytobezoars, particularly the substantial lignin and silica components, explains their indigestibility and persistence in the gastrointestinal tract. Preventive dietary management, including restriction of indigestible fiber intake and provision of balanced nutrition, is crucial for reducing the incidence of phytobezoar formation in Madras Red sheep and other small ruminants in tropical production systems. Early recognition and surgical intervention remain the cornerstones of successful management in clinical cases.

Acknowledgments

The authors thank the technical staff of the Sheep and Goat Breeding Unit, PGRIAS, Kattupakkam for their assistance in clinical management and sample collection.

Conflict of Interest

The authors declare no conflict of interest.

Financial Support

This work received no specific grant from any funding agency.

Ethical Statement

The case was managed following standard veterinary care protocols, and postmortem examination was conducted with institutional approval.

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How to Cite This Article
Jemimah RE, Muthusamy JA, Balasubramanyam D, Gnanaraj PT. Phytobezoar-induced recurrent bloat and intestinal occlusion in a madras red ewe: A case report. International Journal of Veterinary Sciences and Animal Husbandry. 2025;10(12):135-137.