



Development of Leucaena Mimosine-Degrading Bacteria in the Rumen of Sheep in Myanmar

Aung Aung

University of Veterinary Science, Myanmar

Moe Thida Htun

University of Veterinary Science, Myanmar

Lwin Naing Oo

University of Veterinary Science, Myanmar

Mar Mar Kyi

University of Veterinary Science, Myanmar

Tin Ngwe

University of Veterinary Science, Myanmar

Follow this and additional works at: <https://uknowledge.uky.edu/igc>



Part of the [Plant Sciences Commons](#), and the [Soil Science Commons](#)

This document is available at <https://uknowledge.uky.edu/igc/22/1-2/24>

The XXII International Grassland Congress (Revitalising Grasslands to Sustain Our Communities) took place in Sydney, Australia from September 15 through September 19, 2013.

Proceedings Editors: David L. Michalk, Geoffrey D. Millar, Warwick B. Badgery, and Kim M.

Broadfoot

Publisher: New South Wales Department of Primary Industry, Kite St., Orange New South Wales, Australia

This Event is brought to you for free and open access by the Plant and Soil Sciences at UKnowledge. It has been accepted for inclusion in International Grassland Congress Proceedings by an authorized administrator of UKnowledge. For more information, please contact UKnowledge@lsv.uky.edu.

Development of leucaena mimosine-degrading bacteria in the rumen of sheep in Myanmar

Aung Aung, Moe Thida Htun, Lwin Naing Oo, Mar Mar Kyi and Tin Ngwe

Department of Physiology and Biochemistry, University of Veterinary Science, Yezin, Nay Pyi Taw, Myanmar

Contact email: aung.aaug@gmail.com

Keywords: Leucaena, sheep diet, mimosine toxicity.

Introduction

Myanmar has an agricultural base, and about 70% of people reside in rural areas. They depend for survival on agriculture and small-scale crop production, with ruminant livestock consuming fibrous agricultural residues. For optimal ruminant production, concentrates are needed as supplements to these residues. As concentrates are expensive, researchers are testing alternative protein sources like legumes, including foliage from leguminous trees such as leucaena (*Leucaena leucocephala*). Leucaena is the most widely used leguminous tree as a ruminant feed because it is rich in protein (~ 22%) and contains easily digestible fibre (23% neutral detergent fibre, 16.6% acid detergent fibre; Ni Ni Maw 2004). Khin Htay Myint (2005) noted that 25% of leucaena in the ration tended to increase nitrogen retention without decreasing dry matter and organic matter digestibilities. However, leucaena leaves contain a toxic non-protein amino acid, called mimosine. Research workers have endeavoured to reduce mimosine toxicity in animals fed leucaena in Myanmar (Aung Aung 2007, Wink Phyo Thu 2010) and one avenue of research was the development of mimosine-degrading bacteria in the rumen of sheep fed leucaena. In this paper we describe an experiment tracing the development of mimosine-degrading bacteria in the rumen of sheep.

Materials and Methods

The experiment was carried out using 9 male sheep aged 6-8 months and weighing 11-18 kg. The animals were divided into 3 groups and fed the following 3 diets: rice straw + mixed concentrate (G1); rice straw + mixed concentrate + 50% leucaena leaves (G2); and rice straw + mixed concentrate + gradually increased amount of leucaena leaves from 10% to 50% level (4 days for each level) (G3). Body temperatures of sheep were measured daily when the animals were checked for clinical signs and symptoms of mimosine toxicity. Mimosine concentration in urine was determined at the end of the experiment.

Results

Results of clinical examinations and urinary mimosine concentrations of sheep after feeding 50% leucaena leaf are shown in Table 1. Animals from all groups had the same average body temperature (37.5 °C). Clinical signs appeared 4 days after feeding 50% leucaena in the total diet for animals in G2. The most prominent signs were hair loss, dullness and decrease in feed intake. However, no clinical signs of leucaena mimosine toxicosis were

Table 1. Clinical examination of sheep with and without leucaena in the diet.

Group	Clinical signs			
	Body temperature	Loss of weight	Hair loss	Urinary mimosine (mg)
1	37.5 °C	Nil	Nil	0
2	37.5 °C	Slightly	Present	0.006
3	37.5 °C	Nil	Nil	0.16

Group 1: rice straw + mixed concentrate; Group 2: rice straw + mixed concentrate + 50% leucaena; Group 3: rice straw + mixed concentrate + gradually increased amount of leucaena from 10% to 50% level (4 days for each level).

observed in animals from G3 throughout the experimental period, although urinary mimosine levels in this group were high.

Discussion

The loss of hair by animals from the group fed 50% leucaena after 4 days from the start of feeding is similar to the reports of Hegarty *et al.* (1964). Toxic symptoms in cattle were reported by other research workers (Jones and Hegarty 1984). The failure of toxicity to alter body temperature of the sheep agrees with the experiment of Jones *et al.* (1978), where rectal temperature of all cattle showing toxic symptoms was normal. However, in the experiment of Hegarty *et al.* (1964), the body temperature of sheep was 105 °F (40.6 °C) after 4 days of infusion of mimosine and higher than that of sheep from this experiment. The absence of toxic symptoms when the animals were fed on gradually increased amount of leucaena leaves was unexpected as mimosine levels in urine of this group were high. Molecular identification of bacterial strains from rumen liquor will be performed to check the possibility that mimosine-degrading strains were present. Subsequently, rumen liquor from the sheep which developed the ability to degrade mimosine will be transferred to other ruminants to encourage more extensive use of leucaena in Myanmar.

Conclusion

This study has shown that gradual introduction of leucaena leaf into the diet of sheep can prevent the appearance of symptoms of mimosine toxicity in the sheep. This suggests that rumen microflora have adapted to the changes in dietary composition through the slow introduction of leucaena. This has far-reaching implications for how leucaena can be used in the diets of animals, especially in cut-and-carry systems.

Acknowledgments

The authors thank all teaching and laboratory staff from the Department of Physiology and Biochemistry, University of Veterinary Science. The IAEA Project, MYA/5/011 provided chemicals for this experiment. We also thank Prof. Ted Wolfe for guidelines and advice for this manuscript.

References

- Aung Aung (2007) Feeding of leucaena mimosine on small ruminants: investigation on the control of its toxicity in small ruminants. Ph.D. Thesis, Georg-August-University of Goettingen, Germany.
- Hegarty MP, Schinkel PG, Court TD (1964) Reaction of sheep to the consumption of *Leucaena glauca* Benth., its toxic principle mimosine. *Australian Journal of Agricultural Research* **15**, 153-167.
- Jones RJ, Blunt CG, Nurnberg I (1978) Toxicity of *Leucaena leucocephala*. The effect of iodine, mineral supplementation on penned steers fed a sole diet of leucaena. *Australian Veterinary Journal* **54**, 387-392.
- Jones RJ, Hegarty MP (1984) The effect of different proportions of *Leucaena leucocephala* in the diet of cattle on growth, feed intake, thyroid function and urinary excretion of 3-hydroxy,4-(1H) pyridone. *Australian Journal of Agricultural Research* **35**, 317-325.
- Khin Htay Myint (2005) Evaluation of *Leucaena leucocephala* and *Ziziphus mauritiana* as sources of tannin and their interference to the nitrogen utilization in goat. M.V.Sc. Thesis, University of Veterinary Science, Yezin, Myanmar.
- Ni Ni Maw, Khin San Mu, Aung Aung, Moe Thida Htun (2004) Proceedings of the annual research conference held in Yangon on June 28-30, 2004 (Livestock and Fishery Science). Myanmar Academy of Agriculture, Forestry, Livestock and Fishery Sciences. pp. 163-175.
- Wink Phyto Thu (2010) Study on the effect of silage making on the content of tannin and mimosine in *Leucaena leucocephala*. M.V.Sc. Thesis, University of Veterinary Science, Yezin, Myanmar.