

Molasses-based lick blocks for delivering probiotics to cattle

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Urea-molasses-mineral blocks (UMMB) are often used to deliver supplementary nitrogen and minerals to ruminants ingesting poor-quality forage, particularly grazing ruminants (Lobato and Pearce, 1980). The spore-forming probiotic *Bacillus amyloliquefaciens* strain H57 (H57) has potential for inclusion in UMMB because it may enhance feed intake, digestibility, N retention and liveweight gain in ruminants fed forage diets (Norton *et al.*, 2008). An advantage of *Bacillus* spp. as probiotics are that the spore form is resistant to extreme environmental conditions during feed manufacturing (Nicholson *et al.*, 2000). We investigated the practicality of inclusion of H57 probiotic into hot-poured UMMB as a delivery system to feed these probiotics to cattle.

Bos indicus cross heifers (n = 36) with initial liveweight 211 ± 7.0 kg (S.D.) were allocated to three groups which were held in feedlot pens (6 x 25 m) where they were offered *ad libitum* UMMB containing H57 and Rhodes grass hay (88 g CP/kg DM) fed in racks for 28 days in January 2020. UMMB were prepared by pouring into 40 kg cartons, with the temperature increasing from 59.6°C for the initial blocks to 70.1°C for the final blocks poured in the sequence. The blocks were covered with thermal blankets for 36 h until hardened. The lick blocks

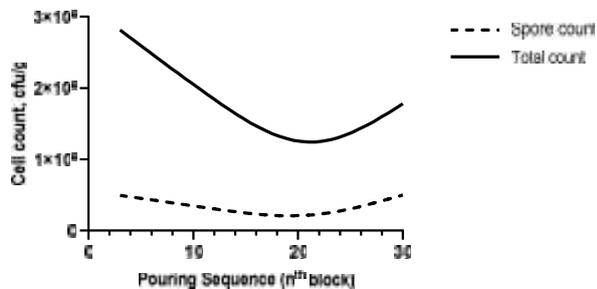


Figure 1. Spore and total count of H57 in lick blocks, cfu/g

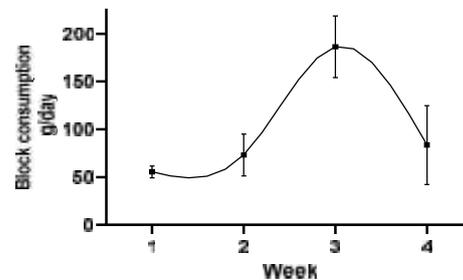


Figure 2. Weekly lick block consumption, g/d

were sampled sequentially during pouring to verify the distribution and concentration of H57. Heifers were weighed at the beginning and end of the 28 d study. UMMB (3 blocks per pen), and another three blocks exposed to the same weather conditions but not available to animals, were weighed twice weekly and intakes for each pen group were calculated after adjusting for weight changes associated with environmental exposure. Daily rainfall totals were recorded. Each pen group was monitored by video surveillance, and licking behaviour of animals were determined during a continuous 48-hr period each week to measure the frequency and duration of visits by heifers to the lick blocks. The data was analysed using the one-way ANOVA in IBM SPSS version 25.0. The mean count of H57 in UMMB after hardening was $2.8 \pm 0.3 \times 10^6$ cfu/g. Across the pouring sequence the mean spore count of H57 was stable ($4.0 \pm 1.0 \times 10^5$ cfu/g) but total cell count declined ($P < 0.05$), indicating loss of vegetative cells (Figure 1). Mean UMMB intake was 107.3 ± 34.8 g/heifer. day and was similar between pens. Mean UMMB intake during week 3 was greater ($P < 0.001$) than in other weeks (Figure 2). This coincided with 40mm rainfall which may have increased intake by softening the surface of the lick blocks.

Lick blocks were readily accepted; UMMB were visited each day by 91% of heifers during week one and by all heifers thereafter. There was a diurnal pattern to UMMB visitations with almost 50% of daily block visits occurring between either 05:00 - 7:00 or 18:00 - 20:00 h. The duration of licking by heifers averaged 15.6 min/day and ranged from 8.0 to 24.7 min/day. However, this duration of licking by individual heifers was not correlated with liveweight change which averaged 640 ± 101 g/d.

The results of this study were encouraging and suggest that UMMB can be used to deliver probiotic supplements to cattle in feedlots. However, further investigation is required to establish optimal manufacturing conditions for H57 viability and stability, and the intakes of UMMB containing H57 by grazing cattle.

References

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