Stability of vitamin A in dry season supplements

M.J. CallaghanAC, A.J. ParkerB and L.J. EdwardsA

A Ridley AgriProducts Pty Ltd, 70-80 Bald Hill Road, Pakenham, Victoria, 3810.  B School of Veterinary and Biomedical Science, James Cook University, Townsville, Queensland, 4811.

Introduction

High perinatal calf mortality associated with gestational vitamin A deficiency has been reported during extended dry seasons in the Mitchell grass rangelands (Hill et al. 2009). Adding vitamin A to supplements may aid prevention however it is inherently sensitive to degradation. Stability depends upon the manufacturing conditions (heat, moisture and pH), oxidising potential of ingredients and storage conditions (Shurson et al. 2011). The objective of this study was to determine the stability of Vitamin A when included in dry season supplements manufactured using different methods.

Methods

Three commercially available dry season supplements were manufactured using contrasting manufacturing methodologies; loose lick (LL), molten blocks (MB) and cold pour blocks (CB). All supplements were blended in a horizontal ribbon mixer. The LL supplements were decanted directly into 25 kg bags. The MB mixture was transferred to a heat jacketed mixing vessel, and then poured into cardboard cartons at 90°C prior to hardening. Manufacturing of CB used a patented manufacturing method (IP No. 725349) under ambient temperature. The major ingredients in LL and MB were salt (275 - 300 g/kg as fed) and urea (250 - 300 g/kg). Composition of CB included 200 g/kg molasses, 150 g/kg urea and 100 g/kg salt. Rovimix® A 1000 (DSM) was included in each supplement to deliver 40 000 iu vitamin A/day. Expected concentrations were 240, 335, 270 iu Vitamin A/g for LL, MB and CB respectively. Samples were collected at day 0, 90 and 180 to determine Vitamin A status.

Results and Discussion

Vitamin A degradation was both immediate and extensive for LL and MB relative to target concentrations (see Table 1). The levels decreased between manufacturing and day 90 for LL and MB (P<0.05), approaching the limit of detection by 180 days. Vitamin A concentrations of CB remained stable for the duration of the trial. The use of a CB manufacturing process is likely to have greater efficacy than either LL or MB when attempting to deliver vitamin A via dry season supplements.

Table 1. Mean concentration of Vitamin A (iu/g) in dry season supplements stored over 180 days.

<table>
<thead>
<tr>
<th>Day</th>
<th>LL*</th>
<th>MB*</th>
<th>CB*</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>80A (33)</td>
<td>117A (35)</td>
<td>307 (114)</td>
</tr>
<tr>
<td>90</td>
<td>21B (9)</td>
<td>17B (5)</td>
<td>257 (95)</td>
</tr>
<tr>
<td>180</td>
<td>10C (4)</td>
<td>10C (3)</td>
<td>267 (98)</td>
</tr>
</tbody>
</table>

Within columns, means with different superscript letters are significantly different (P<0.05).

*The percentage recovery of vitamin A relative to target concentrations is shown in brackets.

References


Corresponding author: matthew.callaghan@ridley.com.au