Effect of energy supplementation on the milk urea nitrogen and blood urea nitrogen level in cross bred cows in early lactation

George Dominic*a, K Allyb, P Muralic and K.S. Anild

a, b, c Department of Animal Nutrition, College of Veterinary and Animal Sciences, Thrissur, Kerala -680651, India. 
dUniversity Livestock Farm and Fodder Research and Development Scheme, Thrissur, Kerala -680651, India.

*Corresponding Author: George Dominic 
Present address: PhD scholar, National Dairy Research Institute, Karnal, 132001 Email: georgedominicp@gmail.com

Received: 14/07/2014  Revised: 20/07/2014  Accepted: 21/07/2014

Abstract
A study was conducted for 150 days in crossbred cows to assess the effect of high energy diet on production performance in early lactation. Eighteen crossbred cows within 10-15 days of lactation were selected and divided into three groups of six each. They were fed with concentrate mixture containing 65 % of total digestible nutrient and 17 % crude protein with 35 % of crude protein as undegradable protein. The animals in the second and third group were supplemented daily with one and two kg of energy supplement (ground maize) respectively. The average milk urea nitrogen (MUN) concentrations of the experimental animals were 14.76, 18.21, and 15.83 mg/dl in the beginning and 16.73, 18.95 and 16.70 mg /dl at the end of the experiment for group I, II and III, respectively. Whereas the final blood urea nitrogen (BUN) concentrations of the animals fed three dietary treatments were 22.14, 21.72 and 22.76 mg/dl, in the groups I, II and III, respectively. Statistical analysis showed no significant difference (p>0.05) in the milk urea nitrogen level and blood urea concentrations between the treatments, energy supplemented groups showed numerically higher values compared to control.

Keywords: Early lactation, ground maize, milk urea nitrogen, blood urea nitrogen.

Introduction
High producing dairy cows require a nutritionally balanced diet to optimize production and profitability. Milk urea nitrogen (MUN) is non invasive to assess the protein and energy balance status of a group of dairy cows and can be used for minimizing feed costs while maximizing production. MUN corresponds to 2.5 to 3.0% of total milk N in dairy cattle (Melendez et al., 2000). Milk urea nitrogen indicates the amount of urea found in milk and these values are closely correlated with the concentration found in the blood. Excess concentrations of urea in the blood can affect milk production, reproductive efficiency, embryo survivability, immune function, and the environment. It has been shown that there is a strong positive correlation between blood urea nitrogen (BUN) and MUN. During early lactation, the amount of energy required for maintenance of body tissues and milk production often exceeds the amount of energy available from the diet (Lounglawan et al., 2011), thus forcing mobilization of body fat reserves to satisfy energy requirements. Increasing the energy content of diet to compensate for this energy deficiency in early lactation can correct the condition to some extent (De feu et al., 2009). Therefore this study was conducted to assess the effect of energy supplementation in the form of ground maize on the milk urea and blood urea nitrogen level of early lactating cross bred dairy cattle in Kerala.

Materials and Methods
Eighteen healthy crossbred cows in early lactation (within 10 to 15 days of lactation) were selected from the University Livestock Farm and Fodder Research and Development Scheme (ULF and FRDS), Mannuthy. They were divided into three groups of six each, as uniformly as possible with regard to age, parity, previous lactation yield and body weight and allotted randomly to experimental rations. All the experimental animals were fed with concentrate mixture containing 65 per cent of total digestible nutrient (TDN) and 17 per cent crude protein (CP) with 35 per cent of CP as undegradable protein (UDP). Green grass was offered as the sole roughage. The ingredient composition of the experimental ration is given in Table 1. The animals were fed as per ICAR (1998). The animals in the second and third group were supplemented daily with one and two kg of energy
supplement (ground maize) respectively. The experiment was carried out for a period of 150 days under similar managemental conditions. The quantity of feed given was revised fortnightly according to milk production and body weight. Clean drinking water was made available to all cows throughout the experiment. All animals were maintained under uniform management conditions prevailing in the farm. The animals were fed twice daily before milking. Milk samples were collected from each animal during the trial and analyzed for MUN (Bector et al., 1998). Blood samples were collected at the beginning and end of the experiment to estimate BUN (modified Berthlot method) using standard kits supplied by Agappe diagnostics, Maharashtra, India. The data’s obtained were compared using ANOVA single factor (Snedecor and Cochran, 2007).

Table 1: Percentage ingredient composition of the experimental concentrate mixtures

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yellow maize</td>
<td>33.5</td>
</tr>
<tr>
<td>Wheat bran</td>
<td>39.5</td>
</tr>
<tr>
<td>Soybean meal</td>
<td>15.5</td>
</tr>
<tr>
<td>Coconut cake</td>
<td>7.5</td>
</tr>
<tr>
<td>Dicalcium phosphate</td>
<td>1.5</td>
</tr>
<tr>
<td>Calcite</td>
<td>2.0</td>
</tr>
<tr>
<td>Salt</td>
<td>0.5</td>
</tr>
</tbody>
</table>

Result and Discussion

The per cent chemical composition of the concentrate mixtures, fodder and ground maize used for experiment are presented in the Table 2. The CP content of the concentrate mixture was 16.49 per cent while that of fodder used for feeding was 8.68 per cent on dry matter basis.

Table 2: Chemical composition of feed, green grass and ground maize fed to experimental animals, % on DM basis

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Concentrate mixture</th>
<th>Fodder</th>
<th>Ground maize</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry matter</td>
<td>92.9</td>
<td>17.08</td>
<td>88.79</td>
</tr>
<tr>
<td>Crude protein</td>
<td>16.49</td>
<td>8.68</td>
<td>7.75</td>
</tr>
<tr>
<td>Crude fibre</td>
<td>7.14</td>
<td>34.69</td>
<td>2.04</td>
</tr>
<tr>
<td>Ether extract</td>
<td>2.91</td>
<td>3.05</td>
<td>2.80</td>
</tr>
<tr>
<td>Total ash</td>
<td>9.65</td>
<td>10.75</td>
<td>2.58</td>
</tr>
<tr>
<td>Nitrogen free extract</td>
<td>63.81</td>
<td>42.83</td>
<td>84.82</td>
</tr>
<tr>
<td>Acid insoluble ash</td>
<td>1.08</td>
<td>1.85</td>
<td>0.61</td>
</tr>
</tbody>
</table>

Milk urea nitrogen

The average MUN concentrations of the experimental animals were 14.76, 18.21, and 15.83 mg/dl in the beginning and 16.73, 18.95 and 16.70 mg/dl at the end of the experiment for group I, II and III respectively and the levels were non-significant but the supplemented groups showed numerically higher values. Melendez et al. (2000) reported that high concentrations of MUN (>18mg/dl) indicate a higher protein intake by the animals or deficiency in rapid fermentable carbohydrates. The observation made in the present study is comparable with the level reported by Kauffman and St-Pierre (2001) and Noftsger and St-Pierre (2003) with 17 per cent CP and they observed MUN ranging from 6.09 to 19.09 mg per 100 ml in early lactation. In agreement to the present result Mandebvu et al. (2003) noted no difference in MUN level when cows were fed with Calcium salts of long chain fatty acids (Ca-LCFA) from palm fatty acid distillate and soya bean oil. Similarly Strusinska et al. (2006) also reported the lack of effect of increased dietary levels of both energy and protein in early lactating cows on MUN concentration. Wadhwa et al. (2012) noticed that MUN was comparable in control and cows supplemented with 150 to 200 g of Ca salts of rice bran oil but the MUN values declined with advancement of lactation irrespective of the treatment.

Table 3: Milk urea concentration (MUN)* of animals maintained on three experimental rations

<table>
<thead>
<tr>
<th>Fortnight</th>
<th>Group I</th>
<th>Group II</th>
<th>Group III</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>14.76 ± 1.20</td>
<td>16.21 ± 0.82</td>
<td>15.83 ± 0.50</td>
</tr>
<tr>
<td>5</td>
<td>16.5 ± 1.61</td>
<td>19.3 ± 1.47</td>
<td>17.05 ± 0.82</td>
</tr>
<tr>
<td>10</td>
<td>16.73 ± 1.20</td>
<td>18.95 ± 0.82</td>
<td>16.70 ± 0.50</td>
</tr>
</tbody>
</table>

*Mean of six value

In contrary to the observed result, Reis et al. (2001) found a reduction in MUN in early lactating cows supplemented with finely ground dry shelled corn or coarsely ground high moisture ear corn. Similarly A linear reduction in MUN and proportion of MUN in milk non protein nitrogen (NPN) were observed with increasing dietary energy content whereas an increase in MUN level was observed when dietary CP was increased (Broderick, 2003). Similarly Delahoy et al. (2003) and Alvarez et al. (2006) reported a decrease in MUN level when cows were fed with steam flaked corn and high moisture corn based feed, respectively. Gowda et al. (2009) and Tyagi et al. (2009) also found that a decrease in milk urea nitrogen in early lactating dairy cows were supplemented with energy supplements like powered ragi grain or bypass fat in dairy cows during the early to mid lactation.
Plasma urea nitrogen

The initial values of BUN was 19.25 mg per cent. The final BUN concentrations of the animals fed three dietary treatments were 22.14, 21.72 and 22.76 mg/dl, in the groups I, II and III, respectively. The observed level is comparable with the level of 24 per cent reported by Hareesh (2007). But a lower value of 13.19 mg/dl and higher value of 43.01 mg/dl were reported by Joseph (2005) and Ally et al. (2007), respectively in lactating cattle fed with concentrate having 17 per cent CP. Statistical analysis showed no significant difference ($p>0.05$) in the plasma urea concentration between the treatments. Augustine (2008) found no significant difference in BUN level in early lactating cows fed one kilogram of ground maize or 100 g protected fat per day. A similar observation was made by Alvarez et al. (2006) and Wadhwa et al. (2012) who also reported that plasma urea nitrogen showed no significant difference when lactating cows were supplemented with high moisture corn based concentrate and Ca salts of rice bran oil, respectively.

In contrast Garcia-Bojalil et al. (1998) observed an increase in the plasma urea nitrogen in lactating cows upon supplementing Ca-LCFA. Whereas Delahoy et al. (2003); Tyagi et al. (2009) and Lien et al. (2010) reported a decrease in the plasma urea nitrogen level when cows were supplemented with energy supplements.

Conclusion

From the overall evaluation of results obtained it could be concluded that though the supplementation of energy in the form of ground maize did not affect the MUN as well as the BUN level significantly, energy supplemented groups showed a better values compared to control. So the supplemented groups had a better protein digestibility and nutritional status compared to the non-supplemented group.

Acknowledgement

The facilities provided by the Kerala Veterinary and Animal Science University and the Dean, College of Veterinary and Animal Sciences, Mannuthy, for conducting this study are gratefully acknowledged. We also thank all staff members of the livestock farm unit for their assistance in the care and feeding of the cows used in this research.

![Blood urea nitrogen (mg %)](chart)

Fig 1: Blood urea nitrogen content in animals maintained on three experimental rations

Reference


Livestock Research International | July-September, 2014 | Vol 2 | Issue 3 | Pages 68-71
© 2014 Jakraya Publications (P) Ltd


