EFFECT OF BYPASS FAT SUPPLEMENTATION ON MILK YIELD, FAT CONTENT AND SERUM TRIGLYCERIDE LEVELS OF MURRAH BUFFALOES

G.G. Barley and R.P.S. Baghel

ABSTRACT

Forty Murrah buffaloes were divided in two groups of 20 each: a supplemented and a non-supplemented control group to study the effect of bypass fat on milk yield, fat percentage and serum triglyceride content. It was observed that bypass fat supplementation increased weekly average milk yield of supplemented buffaloes as well as fat content and serum triglyceride content. The increased energy supply to the animals in negative energy balance was responsible for increased milk yield and availability of low density serum triglyceride in plasma led to increased fat content and serum triglyceride levels.

Keywords: bypass fat, milk yield, fat content, serum triglyceride, buffaloes

INTRODUCTION

The impact of energy is reflected significantly more in lactating and high producing animals, which enter into negative energy balance during early lactation because they cannot consume adequate feed to meet the nutrient requirements for high levels of milk production. Overton (1999) emphasized optimization of feeding management of cows through the transition period and early lactation in order to decrease the duration and magnitude of negative energy balance by feed high quality diets to maintain rumen health, maximizing microbial protein synthesis, and providing large amounts of energy to the cow. The addition of fat sources may also improve the energy status of high-yield dairy animals. Further, it also causes an increase in the energy density of feed. There has been an increasing interest in feeding fats to dairy animals and a wide variety of fat sources are used to increase the energy density of diets fed to animals in early lactation or to high-yield dairy animals in negative energy balance.

Earlier workers (Hammon et al., 2008) showed that feeding rumen-protected fat (RPF) is an alternative to increase energy density of the diet and therefore energy intake in dairy cows. They also observed that milk and lactose yields were higher in RPF fed animals than control. Palmquist and Jenkins (1982) demonstrated the digestibility of pre-formed calcium soaps of fatty acids, their beneficial effect on increased digestibility of all dietary components and increased energy for lactation (Palmquist, 1984). Palmquist and Jenkins (1980) stated that the uniquely high acidity in the duodenum combined with detergent action of bile acids, lysolecithin, and fatty acids causes saturated fatty acids to be more digestible in ruminants than in non-ruminants. However, most of the studies conducted so far are in high-lactating cows only. In India, buffaloes contribute a major part of high-fat milk and suffer nutritional imbalances during the lactation period. There is thus a need for studies of supplementing buffaloes’ diet with protected fat and the effect of this on the yield and composition of milk in Murrah buffaloes. The present study was aimed to investigate the efficacy of bypass fat on overall milk production including increase in fat percentage and serum triglyceride content of Murrah buffaloes in early stages of lactation.

MATERIALS AND METHODS

The trials were conducted at a private dairy farm at Jabalpur. All Murrah buffaloes were examined clinically for good health status. Optimum
health score condition and good managerial care were confirmed in each animal before including it in the trial. Forty buffaloes were divided in two treatments, each treatment having four replicates of five buffaloes each. The animals were subjected to identical housing and management conditions. The feed ingredients and fodder offered to them was unchanged during the period of trial and the treatment group was offered Bypass fat supplement 100 gms once in a day/animal. The trial was conducted for 45 days and data were recorded for 2 weeks prior to supplementation and for 4 weeks during supplementation. Fat percentage was estimated by using Gerber’s butyrometer using Gerber method. Serum triglycerides were estimated by using auto analyzer.

RESULTS AND DISCUSSION

The data were recorded for 15 days prior to start of feeding trial and as evident in Table 1 no significant difference was observed in milk production of various groups as the randomization is done to bring homogeneity amongst the different treatments.

During the first week of feeding the average milk production ranged from 289.5±2.06 (Control) to 339.25±2.32 (Bypass Fat). During the second week the production ranged from 296.25±1.43 (Control) to 366.50±1.93 (Bypass fat). During the third week the production ranged from 311.25±1.03 (Control) to 373.25±3.59 (Bypass fat). During the fourth week the production trend was continued from third week and ranged from 317.0±2.27 (Control) to 381.5±3.57 (Bypass fat). As evident from the data in Table 1, all the groups were equal in terms of milk production prior to supplementation. Supplementation of bypass fat resulted in immediate increase in milk yield during the first week and sustained the increasing trend in subsequent weeks of lactation. This trend can be attributed to high energy supplementation by way of bypass fat which brings the animal out of negative energy balance. This clearly shows that the most important aspect at the early lactation is energy balance. Earlier workers (Hammon et al., 2008) have also showed the positive effect of rumen protected fat in increasing the milk yield during early lactation by correcting the negative energy balance of the animal. Bypass oil (protected with calcium salts) is incorporated directly into milk and body fat, thus saving glucose needed for NADPH synthesis, when fat is synthesized from acetate (Preston, 1995)

The milk fat percentage on first week was recorded in the range of 5.32±0.04 (Control) to 5.27±0.08 (Bypass Fat). However no significant difference was observed during pretrial period amongst the treatment and control. During the first week of trial, the highest fat percentage was recorded for the bypass fat supplemented group, which was significantly higher than the control group.

Table 1. Effect of bypass fat supplementation on milk yield, fat percentage and serum triglyceride content of Murrah buffaloes.

<table>
<thead>
<tr>
<th>Weeks</th>
<th>Milk Yield (l/Week)</th>
<th>Fat Percentage (Avg.)</th>
<th>Serum Triglyceride</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Control</td>
<td>Bypass Fat</td>
<td>Control</td>
</tr>
<tr>
<td><strong>PRE SUPPLEMENTATION PERIOD</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>278.25±0.85&lt;sup&gt;a&lt;/sup&gt;</td>
<td>276.25±3.29&lt;sup&gt;a&lt;/sup&gt;</td>
<td>5.32±0.04&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>II</td>
<td>290.50±1.7&lt;sup&gt;a&lt;/sup&gt;</td>
<td>294.75±2.83&lt;sup&gt;a&lt;/sup&gt;</td>
<td>5.32±0.06&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>DURING TRIAL PERIOD</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>289.50±2.06&lt;sup&gt;a&lt;/sup&gt;</td>
<td>339.25±2.32&lt;sup&gt;b&lt;/sup&gt;</td>
<td>5.74±0.02&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>II</td>
<td>296.25±1.43&lt;sup&gt;a&lt;/sup&gt;</td>
<td>366.50±1.93&lt;sup&gt;b&lt;/sup&gt;</td>
<td>5.77±0.16&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>III</td>
<td>311.25±1.03&lt;sup&gt;a&lt;/sup&gt;</td>
<td>373.25±3.59&lt;sup&gt;b&lt;/sup&gt;</td>
<td>5.85±0.03&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>IV</td>
<td>317.0±2.27&lt;sup&gt;a&lt;/sup&gt;</td>
<td>381.5±3.57&lt;sup&gt;b&lt;/sup&gt;</td>
<td>5.75±0.06&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
</tbody>
</table>
The fat percentage ranged from 5.74±0.02 (Control) to 6.42±0.11 (Bypass Fat). The trend of higher fat percentage in the bypass fat supplemented group continued during second third through the fourth week. Gulati et al. (2003) suggested that feeding protected fat supplements increased fat, protein and yield of milk significantly. In the present study, the trend we observed that the fat content of milk was increased significantly during early lactation when compared to the pretrial fat content of milk of same animal. This was due to correction of energy balance of animal that previously was in negative energy balance. Palmquist and Jenkins (1980) stated that large quantities of added dietary fat increase concentrations in plasma of very low density lipoprotein triglyceride, and this increases their uptake by the mammary gland with inhibition of short chain fatty acid synthesis and consequent changes in milk fatty acid composition. In some cases, secretion of milk fat is increased.

During early lactation, the pretrial serum triglyceride level ranged from 31.02±0.58 to 31.18±0.77 during the first week and from 31.07±0.61 to 31.34±0.33 during the second week. Non-significant differences were observed amongst the treatments. During the trial, the serum triglyceride of control animals ranged from 31.16±0.70 (I week) to 31.45±0.70 (IV Week), while the serum triglyceride level of bypass fat supplemented animals ranged from 37.23±0.70 (I Week) to 41.60±0.17 (IV Week). A significant difference was observed in the serum triglyceride levels of animals fed bypass fat compared to control animals. Critical perusal of the data revealed an immediate increase in serum triglyceride in the supplemented animals compared to the control animals. It also showed a consistent increase in weekly averages, which indicates the beneficial effect of supplementation. This trend is in line with increased fat content of milk and supports the view of Palmquist and Jenkins (1980) who stated that large quantities of added dietary fat increase concentrations in plasma of very low density lipoprotein triglyceride, and this increases their uptake by the mammary gland with inhibition of short chain fatty acid synthesis and consequent changes in milk fatty acid composition. In some cases, secretion of milk fat is increased. On the basis of the observations, it was concluded that provision of bypass fat to Murrah buffaloes during early lactation significantly increased milk yield and milk fat by correcting negative energy balance and increased serum triglyceride level.

REFERENCES


