EFFECT OF ENERGY SUPPLEMENTATION ON DRY MATTER INTAKE AND DIGESTIBILITY OF NUTRIENTS IN EARLY LACTATING CROSSBRED DAIRY CATTLE*

George Dominic[1], K. Ally[2], K. S. Anil[3] and A. D. Mercy[4]
Department of Animal Nutrition,
College of Veterinary and Animal Sciences,
Thrissur, Kerala -680651

Received: 12.09.2013
Accepted: 02.11.2013

Abstract

A study was conducted for 150 days in crossbred cows to assess the effect of high energy diet on 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 per cent of total digestible nutrient and 17 per cent crude protein with 35 per cent of CP as un-degradable protein (ration I). The animals in the second and third group were supplemented daily with one (ration II) and two kg (ration III) of energy supplement (ground maize) respectively. There was no significant effect (P>0.05) of maize supplementation on the body weight of the animals. The total daily dry matter intake as well as the DMI/ 100 kg body weight were significantly higher (p<0.05) for maize supplemented groups. The EE digestibility of ration III was significantly higher (P<0.05) compared to ration I whereas ration II had similar digestibility as ration I and III. The digestibility of DM, CP, CF, NDF and ADF was similar in all treatment groups.. From the overall evaluation of results it could be concluded that though the supplementation of energy in the form of ground maize did not improve the performance significantly, but resulted in better performance.

Keywords: *Crossbred cows, early lactation, ground maize, dry matter intake, digestibility*

Energy is one of the most important nutritional factors that limit production in dairy cattle. During early lactation cows are unable to consume enough energy from the feed to meet their energy demand for lactation. Thus the body reserves are mobilized, leading to the negative energy balance. Negative energy balance is one of the major problems related to nutritional management of early lactating cows. It can lead to higher risk of metabolic diseases, infections, suboptimal milk yield and infertility.

**Part of M.V.Sc thesis submitted to Kerala Veterinary and Animal Sciences University*

1. *Corresponding author: George Dominic, email: georgedominicp@gmail.com,* Ph*: 09896494380*
   PhD scholar, National Dairy Research Institute, Karnal, Haryana-132001
2. *Professor and Head,Animal Nutrition, CVAS, Mannuthy*
3. *Professor and Head, ULF&FRDS, Mannuthy*
4. *Professor and Head (Retd.)*

The average peak of daily milk production of dairy cow in Kerala ranges from 7 to 8 kg. A dietary crude protein (CP) level of 17 per cent in the concentrate mixture has been found sufficient to meet the requirements of cows in early lactation with a peak yield of 10 kg milk per day (Ally *et al*. 2007). Increasing the energy content of diet to compensate for this energy deficiency in early lactation could correct the condition to some extent (De feu *et al.* 2009). In this context this study was conducted to assess the effect of energy supplementation in the form of ground maize on dry matter (DM) intake and digestibility of nutrients the 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 and were divided into three groups of six each, as uniformly as possible with regard to age, parity, body weight and previous lactation yield. They were allotted randomly to the three experimental rations. All the experimental animals were fed with concentrate mixture containing 65 per cent of total digestible nutrient (TDN) and 17 per cent CP with 35 per cent of CP as undegradable protein (UDP). Green grass was offered as the sole roughage. The animals were fed as per ICAR (1998). The total dry matter given was fixed at three per cent of the body weight in the beginning of the experiment for all the three groups. The animals in the second and third group were supplemented daily with one and two kg of energy supplement (powdered maize) respectively. The quantity of feed given was revised fortnightly according to milk production and body weight. The experiment was carried out for a period of 150 days under similar managemental conditions. Individual data on daily dry matter intake (DMI) of the experimental animals were maintained. Body weight was recorded at fortnightly intervals. A digestibility trial was conducted during the last five days of the feeding trial to find out the digestibility coefficients of the nutrients.

Table 1. Composition of feed

Ingredient	**Per cent**	
Yellow maize	33.5	
Wheat bran	39.5	
Soybean meal	15.5	
Coconut cake	7.5	
Dicalcium phosphate	1.5	
Calcite	2.0	
Salt	0.5	
Chemical composition, % DM basis		
Item	**Concentrate mixture**	**Fodder**
Dry matter	92.9	17.08
Crude protein	16.49	8.68
Crude fibre	7.14	34.69
Ether extract	2.91	3.05
Total ash	9.65	10.75
Nitrogen free extract	63.81	42.83
Acid insoluble ash	1.08	1.85
Neutral detergent fibre	36.16	74.37
Acid detergent fibre	16.84	45.77
Calcium	1.13	0.63
Phosphorus	0.93	0.30
Magnesium	0.37	0.60

Results and Discussion

The ingredient and per cent chemical composition of the concentrate mixtures and fodder fed to the experimental animals are presented in Table 1. 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.

Body weight: The data on the body weight of the animals at fortnightly intervals fed with the three experimental rations is depicted in Fig. 1. There was no significant difference (P>0.05) between the body weight of the animals of three experimental groups in any of the fortnights. The average body weight of the experimental animals belonging to three experimental group at the beginning of the feeding trial was 339.5, 335.83, and 327.17 kg, respectively, and at the end of the feeding trial of 150 days the corresponding weights were 350.33, 353.33, and 355.83 kg, respectively. There was a loss in body weight of animals in all three groups during the first fortnight of the feeding trial. Thereafter the animals gained body weight in all the groups throughout the feeding trial. A loss in body weight of the animals during early stages of lactation when the DMI was not sufficient to meet the requirements of production was also reported by Blauwiekel and Kancaid (1986), Howard *et al*. (1987), Joseph (2005) and Ally *et al*.(2007).

Dry matter intake: The data on total DMI, daily DMI, DMI per 100 kg body weight and DMI per kg metabolic body weight are given in Table 2 and represented in Fig. 2. The average total daily DM intake of animals of the three experimental groups were 9.5, 10.86, 11.68 kg respectively, the DMI of control being significantly lower (p<0.05) than the supplemented groups in all fortnights except 2nd and 3rd fortnights. The higher DMI in the group II and III might have been due to the higher quantity of feed offered due to the supplementation of one kg and two kg powdered maize. The DMI per 100 kg body weight in the three groups were 2.77, 3.14 and 3.42 kg, respectively and the DMI per kg metabolic body weight were 0.12, 0.14, and 0.15 kg, respectively. It could be seen that the DMI per 100 kg body weight and per kg metabolic body weight was significantly higher (P<0.05) in one and two kg maize supplemented group compared to that of control group. The result is in agreement with Reis *et al.* (1997) who observed an increase in the DMI with supplementation of ground corn in lactating cattle fed legumes as sole roughages. Likewise Broderick and Radloff (2004) also observed higher DMI in dairy cows supplemented with dried molasses at 0, 4, 8 and 12 per cent levels. On contrary to the observed result, Augustine (2008) found no significant difference in DMI between the treatments when early lactating cows were fed 17 per cent CP diet supplemented with one kg of ground maize

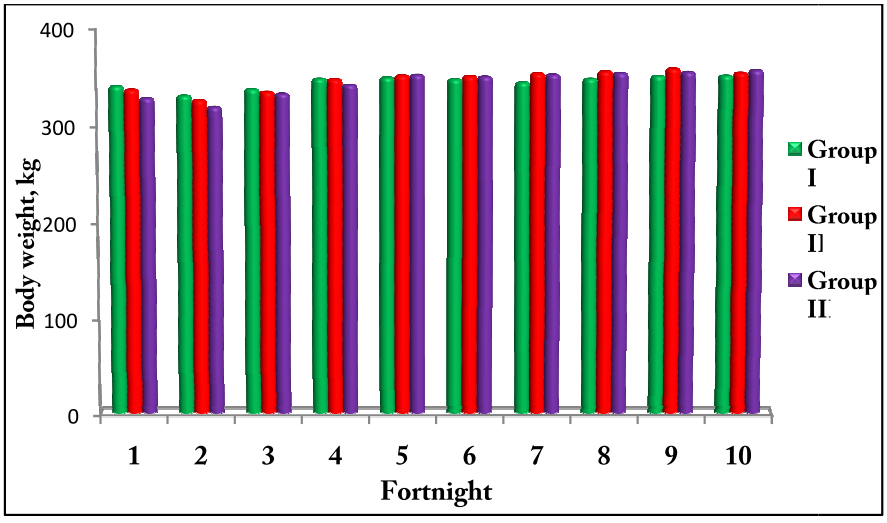

Fig.1. Fortnightly body weight of animals maintained on three experimental rations

or 100g of protected fat to experimental diet with 17 per cent CP. Likewise Wadhwa *et al.* (2012) also observed that supplementing early lactating cows with 150 or 200g of calcium salts of rice bran fatty acid oil did not have any effect on DMI.

Digestibility coefficients of nutrients: The digestibility coefficient of nutrients such as DM, CP, crude fibre (CF), ether extract (EE), neutral detergent fibre (NDF), acid detergent fibre (ADF) and nitrogen free extract (NFE) are given in Table 2. There was no significant effect of

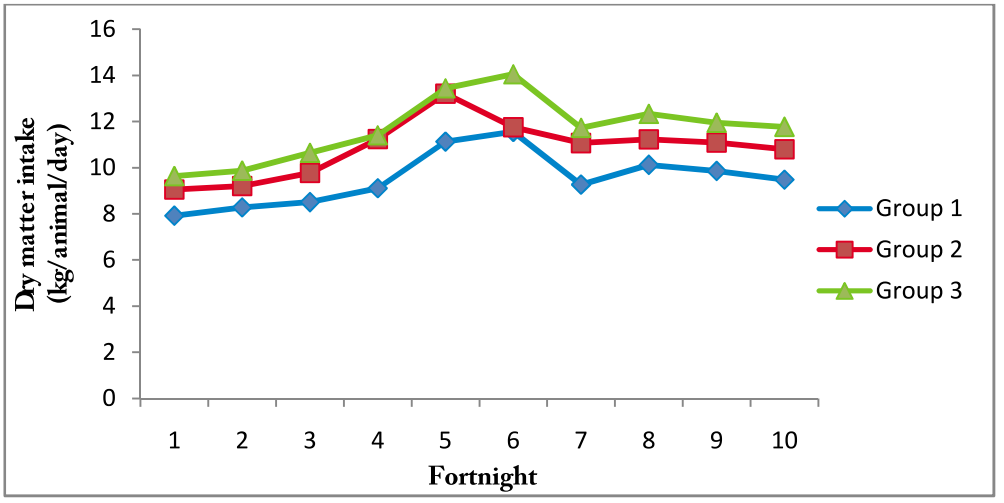

Fig. 2. Average daily dry matter intake of animals fed the experimental rations

the maize supplementation on the digestibility of nutrients except for the digestibility of EE, which was higher ($P<0.05$) for the two kg maize supplemented group compared to control. An increase in the EE digestibility in lactating cattle was reported by Tyagi *et al.* (2009) when supplemented with by pas fat at 2.5 per cent. In contrary to the present result, Augustine (2008) reported no significant difference in the EE digestibility in lactating cows supplemented with energy in the form of ground maize (one kg/day) or protected fat (100g/ day). The digestibility of the DM, CP, CF, NDF and ADF of the ground maize supplemented groups were numerically higher than that of control group. Elliot *et al*. (1995) reported the digestibility of DM, CF, ADF, and NDF in lactating dairy cattle fed hydrogenated palm fatty acid as energy supplements.

Table 2. Body weight, DM intake and digestibility of nutrients in different treatments

Parameters	Group I (control)	Group II	Group III
Initial body weight (kg)	339.5± 32.11	335.83± 15.78	327.17± 20.95
Final body weight (kg)	350.33± 27.18	353.33± 16.04	355.83± 21.69
Metabolic body weight, W $kg^{0.75}$	80.98±11.90	81.50±8.01	81.93±10.05
Total dry matter in 150 days, kg	8583.01^{a}	9779.59^{b}	10563.01^{b}
Dry matter intake per 100 kg body weight, kg	2.77^{a}±0.08	3.14^{b} ±0.09	3.42^{c} ±0.09
Dry matter intake per kg metabolic body weight (W $kg^{0.75}$)	0.12^{a}±0.04	0.14^{b}±0.04	0.15^{b}±0.04
Dry matter intake (kg/day)			
Concentrate	4.189^{a}±0.16	5.638^{b}±0.46	6.46^{b}±0.42
Green	5.35± 0.03	5.22±0.06	5.26±0.02
Total	$9.5±0.19^{a}$	$10.86±0.49^{b}$	$11.68±0.41^{b}$

Digestibility coefficients (%)			
Dry Matter	56.38± 0.001	61.65± 0.002	60.22± 0.002
Crude Protein	59.24±0.001	62.17±3.35	60.92± 1.76
Crude Fibre	52.37±1.49	55.49±3.6	53.24±2.95
Ether Extract	69.17±1.26[a]	74.54±2.39[ab]	79.15±2.61[b]
NFE	62.76±1.38	67.40±2.48	66.63±1.36
NDF	52.96±1.93	54.72±3.64	53.74±1.88
ADF	40.46±2.23	42.08±4.74	40.35±3.61

*Mean of six values

a, b –means with different superscripts in the same row for each parameter differ significantly (P<0.05)

References

Ally, K., Mercy, A. D. and Viswanathan, T. V. 2007. Effect of dietary crude protein levels on the performance of lactating cows. *Indian J. Anim. Nutr*. **24:** 84-87.

Augustine, R. 2008. Energy supple mentation on production perfor mance of cows under field condition. *M.V.Sc. thesis*, Kerala Agricultural University, Thrissur, 83 p.

Blauwiekel, R. and Kancard, R. L. 1986. Effect of crude protein and solubility on performance and blood chemistry of dairy cows. *J. Dairy Sci*. **69:** 2091-2098.

Broderick, G. A. and Radloff, W. J. 2004. Effect of molasses supplementation on the production of lactating dairy cows fed diets based on alfalfa and corn silage. *J. Dairy Sci*. **87:** 2997–3009.

De feu, M. A., Evans, A. C. D., Lonergan, P. and Butler, S. T. 2009. The effect of dry period duration and dietary energy density on milk production, bioenergetic status and post partum ovarian function in Holstein-Friesian dairy cows. *J. Dairy sci*. **92:** 6011-6022.

Elliott, J. P., Drackley, J. K., Fahey, C. J. R., and Shanks R. D. 1995. Utilization of supplemental fat by dairy cows fed diets varying in content of non structural carbohydrates. *J. Dairy Sci*. **78:** 1512-1525.

Howard, H. J., Aalseth, E. P., Adams, J. D., Bush, L. J., Mc New, R. W. and Dawson, L. J. 1987. Influence of dietary protein on reproductive performance of dairy cows. *J. Dairy Sci.* **70:** 1563-1571.

ICAR. 1998. Cited in *Nutrient Requirements of Llivestock and Poultry by* Ranjhan, S. K. 1998. (2nd Ed.). Indian Council of Agricultural Research, New Delhi. 5p.

Joseph, S. 2005. Effect of urea as a source of rumen degradable protein on milk production of cross bred cows in early lactation. *M. V. Sc. thesis*, Kerala Agricultural University, Thrissur, 87p.

Reis, R. B., Allen, M. S. and Erickson, P. S. 1997. Lasalocid and particle size of corn grain for dairy cows in early lactation: Effect on performance, serum metabolites, and nutrient digestibility. *J. Dairy Sci.* **79:** 557-564.

Tyagi, N., Thakur, S. S. and Shelke, S. K. 2009. Effect of feeding bypass fat supplement on milk yield, its composition and nutrient utilization in crossbred cows. *Indian J. Anim. Nutr*. **26:** 1-8.

Wadhwa, M., Grewal, R. S., Bakshi, M. P. S. and Brar, P. S. 2012. Effect of supplementing bypass fat on the performance of high yielding crossbred cows. *Indian J. Anim. Sci.* **82:** 200-203.

■