

# **Effect of supplementation and its frequency on performance and utilization of nutrients by dairy heifers**

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## **SUMMARY**

Eighteen dairy heifers (mean body weight = 86.8 kg) were assigned to three treatments for a 60 day study to determine the effects of feeding a supplemental concentrate mixture (sorghum grains 20%, wheat bran 20%, cottonseed cake 59% and sodium chloride 1%) and the frequency of its feeding on performance and utilization of nutrients. Treatments were forage only and forage plus 1.50 kg concentrate mixture/ head/ day fed to heifers individually once aday at 07.30 hr, or divided into two equal portions and fed twice , a -day at 07.30 and 16.30 hr. The forage which was available as one part alfalfa and two parts *Sorghum vulgare* "abu 70" was fed *ad libitum*. Average daily gain, dry matter intake and feed conversion ratio were significantly lower ( $p < 0.05$ ) for forage fed heifers than for supplemented ones. These parameters appeared to be consistently better for heifers supplemented once aday than for those supplemented twice aday. Digestibilities of organic matter, crude protein, crude fibre and ether extract were significantly higher ( $p < 0.05$ ) for heifers fed forage plus supplement once aday than for those fed forage only or forage plus supplement twice aday.

## **INTRODUCTION**

In Sudan, dairy heifers are usually fed soley on roughage. Concentrate feeding in conjunction with roughage (supplementation) is shown to increase daily gains (Laben et. al., 1982) which means that heifers would reach service weight early in life. Information pertaining to supplementation of dairy heifers under Sudan conditions is lacking. therefore, this experiment was

conducted to investigate the effect of supplementation on performance and utilization of nutrients by dairy heifers. The effect of frequency of supplementation on the mentioned parameters was also studied.

## MATERIALS AND METHODS

Eighteen cross bred (Friesian X Butana) heifers (mean body weight - 86.8 kg) were randomly assigned to three treatments (six heifers/ treatment). Treatments were forage (approx. two - thirds *Sorghum vulgare* and about one third of it alfalfa) only and forage plus 1.5 kg/ head/ day of supplement (table 1) . fed to heifers individually once aday at 07.30 (am) or divided into two equal portions and fed twice aday at 07.30 hr (am) and 16.30 hr (pm). Each group was divided into three pens (two heifers/ pen) and fed the forage *ad. libitum*. The daily record of total feed intake of each pen was taken. Heifers were weighed fortnightly during the feeding trial of 60 days. From these weights the average daily gain and feed conversion ratio were computed.

Table 1: Ingredient composition of the concentrate mixture and chemical composition of the forages and concentrate mixture.

Ingredients in the concentrate	Percentage		
Sorghum grain	20.0		
Wheat bran	20.0		
Cottonseed cake	59.0		
NaCl	1.0		
Chemical composition of the forage and concentrate:			
	Abu 70	Alfalfa	Concentrae mixture
Dry matter	93.8	93.7	93.9
Ash	7.8	10.6	4.5
Crude protein	4.7	16.8	21.6
Crude fibre	32.0	28.0	25.3
Ether extract	1.2	2.1	7.7
Nitrogen - free extractives	48.2	36.1	34.6
Lignin	3.8	6.5	6.9

At the end of the feeding trial, one heifer/ pen was randomly selected and used for collection of faecal grab samples on day 61 through 67. Faecal samples were then stored frozen until thawed, dried at 100 °c for 24 hr in a forced air oven and ground (2 - mm screen) through a Wiley mill. Proximate analysis and permanganate lignin were performed on feed and faecal samples by standard procedures (A. O. A. C., 1980). Digestibilities of organic matter and organic nutrients were determined by lignin ratio technique (Church, 1976).

Data from the completely randomized design were analysed by analysis of variance. When a significant F - test was observed, treatment means were separated with least significant difference (Steel and Torrie, 1980).

## RESULTS

Table 2 presents performance data. Final body weight, average daily gain, dry matter intake and feed conversion ratio were significantly lower ( $p < 0.05$ ) for heifers fed forage only compared with the supplemented ones. There were no significant difference ( $p > 0.05$ ) for these parameters between heifers supplemented once aday and those supplemented twice aday. However, all these parameters appeared to be slightly better for heifers supplemented once aday than for those supplemented twice aday. Final body weight, average daily gain and dry matter intake tended to be higher, whereas, feed conversion ratio to be lower for once aday supplemented heifers.

Daily intakes of digestible nutrients are given in table 3. Daily consumption of digestible crude protein, crude fibre and ether extract were lowest ( $p < 0.05$ ) for heifers fed forage only and highest ( $p < 0.05$ ) for those supplemented once aday. Daily intakes of nitrogen - free extractives were not significantly affected ( $p > 0.05$ ) by dietary treatments. consumption of total digestible nutrients was significantly different ( $p < 0.05$ ) among dietary treatments. It was lowest for heifers fed forage only and highest for those supplemented once aday.

Data on digestibility of nutrients are presented in table 4. Organic matter and crude fibre digestion coefficients were significantly greater ( $p < 0.05$ ) for heifers supplemented once aday than for those fed the other two treatments. Crude protein digestibility was significantly lower ( $p < 0.05$ ) for heifers fed forage only compared with the supplemented ones. Digestibility of ether extract was lowest ( $p < 0.05$ ) for heifers fed forage only and highest ( $p < 0.05$ )

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for heifers supplemented once a day. Digestibility of nitrogen - free extractives was not statistically different ( $p > 0.05$ ) among dietary treatments.

*Table 2: Effect of supplementation and its frequency on performance of heifers.*

Item	treatments			SE
	Forage only	Frequency of suppl./day once	Frequency of suppl./day Twice	
No. of animals	6	6	6	
Feeding period, days	60	60	60	
Initial body weight, kg	86.7	88.3	85.5	7.10
Final body weight, kg	113.5 <sup>a</sup>	149.8 <sup>f</sup>	141.7 <sup>b</sup>	11.90
Average daily gain, kg	0.45 <sup>a</sup>	1.021 <sup>'</sup>	0.93 <sup>b</sup>	0.1
Dry matter intake, kg	3.19 <sup>a</sup>	4.39 <sup>"</sup>	4.23 <sup>b</sup>	0.28
Feed conversion ratio kg feed/ kg gain	7.1 <sup>'a</sup>	4.3 <sup>b</sup>	4.6 <sup>b</sup>	0.86

a, b : Means in the same row with different superscript letters are different ( $p < 0.05$ ).

*Table 3: Effect of supplementation and its frequency on daily digestible nutrients*

Item	treatments			SE
	Forage only	Frequency of suppl./day once	Frequency of suppl./day twice	
Digestible nutrient, kg				
crude protein	0.10 <sup>a</sup>	0.35 <sup>b</sup>	0.29 <sup>c</sup>	0.04
Crude fibre	0.55 <sup>a</sup>	0.79 <sup>b</sup>	0.69 <sup>c</sup>	0.03
Ether extract	0.04 <sup>a</sup>	0.32 <sup>"</sup>	0.23 <sup>c</sup>	0.00
Nitrogen - free extract	0.88	1.01	0.92	0.07
TDN, kg	1.57 <sup>a</sup>	2.47	2.13 <sup>c</sup>	0.14

a,b,c : means in the same row with different superscript letters are different ( $p <$

*Table 4: Effect of supplementation and its frequency on the apparent digestibility of nutrients.*

Item	Treatments			SE
	Forage only	Frequency of suppl./day once	Frequency of suppl./day twice	
Digestibility, %				
Organic matter	53.3 <sup>a</sup>	60.0 <sup>b</sup>	55.1 <sup>a</sup>	1.2
Crude protein	39.1 <sup>a</sup>	64.0 <sup>b</sup>	53.7 <sup>a</sup>	3.56
Crude fibre	56.2 <sup>a</sup>	61.9 <sup>b</sup>	56.5 <sup>a</sup>	1.57
Ether extract	37.8 <sup>a</sup>	89.8 <sup>b</sup>	72.2 <sup>c</sup>	1.92
Nitrogen - free extract	61.9	55.9	52.5	13.30

*a, b, c : Means in the same row with different superscript letters are different (p < 0.05).*

## DISCUSSION

Supplementation improved general performance of heifers (table 2). Average daily gain was significantly greater ( $p < 0.05$ ) for supplemented heifers compared with those fed forage only. This faster growth rate of supplemented heifers could be attributed mainly to provision of optimum nutrients. Consumption of digestible nutrients (table 3) gives support to this explanation. Also, digestion coefficient of crude protein was significantly higher ( $p < 0.05$ ) for supplemented heifers than for those fed forage only. The low protein digestibility for heifers fed the forage only was attributed mainly to the low concentration of **this nutrient in the forage mixture. This work agrees with previous studies (Levy, Holzer and Samuel, 1986; Smith and. Warren, 1986) which showed increased growth rate and feed efficiency by supplemented beef cattle when compared to the controls which were fed forage only. Also, the significant improvement in protein digestibility observed in this study as a result of supplementation is in complete agreement with a recent work by Lofgreen, El Tayeb and Kiesling (1981)..**

**Feed efficiency** was significantly better for supplemented heifers than for **those fed forage only** and compared favourably to results reported by Smith

and Warren (1986).

No statistical difference ( $p > 0.05$ ) in performance was observed between heifers supplemented once a day and those supplemented twice a day (table 2). However, there was a slight consistent improvement in growth rate, feed intake and feed conversion ratio for animals supplemented once a day than those supplemented twice a day. This agrees with a previous work (Gibbons, 1958) which disclosed that performance of 7 sets of twin heifers was not significantly affected by frequency of feeding. In contrast, Pritchard and Males (1982) demonstrated that high frequency of supplementation resulted in better animal performance than less frequency of supplementation.

It was observed that digestible crude protein, crude fibre, ether extract and total digestible nutrients were significantly higher ( $p < 0.05$ ) for heifers supplemented once a day than for those supplemented twice a day. This agrees with a recent study (Istasse, Reid, Tait and Orskov, 1986) which revealed that feed intake and digestible nutrients were significantly higher for cows given the concentrate portion of the diet once a day than for those given the concentrate twice a day.

In conclusion, it could be said that under Sudan conditions supplementation of cross - bred heifers would allow them to exhibit their maximum growing potentials. It was also recommended that the concentrate supplement should be given once a day.

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