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EFFECT OF CONCENTRATE TO ROUGHAGE RATIO AND BAKER'S YEAST SUPPLEMENTATION DURING HOT SEASON ON PERFORMANCE OF LACTATING BUFFALOES

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ABSTRACT

Sixteen lactating buffaloes after 8 weeks of calving in the 2[nd] to the 5[th] lactating season, weighing 500 to 600 kg during summer season were used in a complete switch–back design (Lucas, 1956) with four groups and three successive experimentation periods. Buffaloes in the first and the second group were fed ration consisting of 60% concentrate feed mixture and 40% roughages (berseem hay and rice straw) without (G_1) or with 15 g baker's yeast (*Saccharomyces cerevisiae*)/head/day (G_2) on DM basis. While those in the third and the fourth group were fed ration consisting of 40% concentrate feed mixture and 60% roughages on DM basis (berseem hay and rice straw) without (G_3) or with 15 g baker's yeast/head/day (G_4).

Obtained results showed that the contents of dry matter (DM), organic matter (OM), crude protein (CP), ether extract (EE) and nitrogen free extract (NFE) tended to increase; their digestibilities and total digestible nutrients (TDN) and digestible crude protein (DCP) values increased significantly ($P<0.05$), however, the contents of CF and ash tended to decrease and CF digestibility decreased significantly ($P<0.05$) with increasing level of concentrate and decreasing roughages level. The digestibilities of all nutrients and nutritive values increased significantly ($P<0.05$) with barker's yeast supplementation. The intake of DM, TDN and DCP increased significantly ($P<0.05$) with increasing level of concentrate and decreasing roughages level. The intake of TDN and DCP increased significantly ($P<0.05$) with baker's yeast supplementation.

Ruminal pH value decreased significantly ($P<0.05$), while ruminal total volatile fatty acids (TVFAs) and ammoniacal nitrogen (NH_3-N) concentrations increased significantly ($P<0.05$) with increasing level of concentrate. However, ruminal pH value and NH_3-N concentration decreased significantly ($P<0.05$) and TVFAs concentration increased significantly ($P<0.05$) with baker's yeast supplementation. The yield of actual milk increased significantly ($P<0.05$) with increasing level of concentrate, while the yield of 7% fat corrected milk (FCM) increased significantly ($P<0.05$) with increasing level of concentrate as well as with baker's yeast supplementation. The contents of protein, lactose and SNF increased significantly ($P<0.05$), however, fat content decreased significantly with increasing level of concentrate and decreasing level of roughages. The contents of all milk constituents except ash increased significantly ($P<0.05$) with baker's yeast supplementation.

The amounts of DM, TDN and DCP per kg 7% FCM increased significantly ($P<0.05$) with increasing level of concentrate and decreasing level of roughages in the rations as well as with baker's yeast supplementation. The average daily feed cost and feed cost per kg 7% FCM increased significantly ($P<0.05$), however, economic efficiency decreased significantly ($P<0.05$) with increasing level of concentrate and decreasing level of roughages in the rations. Average daily feed cost tended to increase, but the output of 7% FCM and economic efficiency increased significantly ($P<0.05$), while feed cost per kg 7% FCM decreased significantly ($P<0.05$) with baker's yeast supplementation. It could be concluded that lactating buffaloes fed ration consisted of 40% concentrate feed mixture and 60% roughages (berseem hay and rice straw) with 15 g baker's yeast supplementation/head/day on DM basis (G_4) showed the best results concerning milk yield, feed conversion and economic efficiency.

Key words: Lactating buffaloes, concentrate/roughage ratio, baker's yeast, digestibility, rumen fermentation activity, milk yield, feed conversion, economic efficiency

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INTRODUCTION

The dairy industry in Egypt is buffalo oriented. Egypt has approximately 3.8 million buffaloes and their milk contributes to 70% of the total milk production in Egypt (MOA, 2003). Egyptian buffalo population was estimated to be approximately 3.6 million and contributes to about 5% of the world buffalo milk (FAO, 2004). Buffalo's milk is preferred by the Egyptian consumers for its richness and sensory attributes. Therefore, buffalo's milk gets almost double the price of cow's milk in the local market (Abdel-Aziz, 2005). Generally, there is an increasing demand for buffalo milk in Egypt. Buffaloes are superior to domesticated cattle because they digest feed more efficiently than cattle do, particularly when the feed is of poor quality and is rich in cellulose. Buffalo milk is therefore cheaper to produce; buffaloes take less time to adjust to changes in the diet composition.

Low portions of hay in the ration significantly reduced the pH-value and increased the NH_3-N concentration. An increased hay portion in the ration resulted in an increased NDF degradation in the rumen as compared to concentrate-rich rations. Due to an increased flow of microbial OM after high concentrate feeding, the apparent ruminal digestibility of OM was calculated to decrease although the quantity of fermented organic matter increased. Feeding the rations poor in hay increased the flow of non ammoniacal nitrogen and utilisable crude protein significantly due to the increased microbial protein synthesis and an improved efficiency of microbial protein synthesis (Flachowsky et al., 2006).

Significant ($P<0.05$) increases were detected in milk protein and 4% fat corrected milk yield, but there was no significant difference in milk fat percentage with yeast culture supplementation (Konyves *et al*., 2005). Yeast supplementation resulted in a numerical increase in ruminal pH, ammonia-N concentration, and total VFA concentration (Fadel Elseed and Abusamra, 2007). Supplementation with live yeast cells significantly increased the total milk yield but the chemical composition of milk was not influenced by the treatments, with the exception of milk fat that was significantly higher in yeast culture group (Masek *et al*., 2008).

Yeast had significant effects on milk yield in early lactation, mid lactation and the whole lactation ($P<0.001$). Effect was higher in early lactation (22%). Yeast effect was similar for primiparous and multiparous cows. Moreover, yeast effect on milk yield during early lactation was higher for cows calving in the hot season (July- October). Fat and protein percentages and yields were higher with yeast supplementation and during hot season (Majdoub-Mathlouthi *et al*., 2009).

Yeast supplementation significantly ($P<0.05$) increased digestibility of dry matter (DM), organic matter (OM), crude protein (CP), NDF and ADF of tomato pomace where the gross digestibility derived from the supplementation was superior for 4 g yeast compared to the control group. In addition, sheep fed yeast had a marked increase in energy digestibility of tomato pomace at 4 g level (Paryad and Rashidi, 2009).

Yeast supplementation significantly accelerated the increase in milk yield during early lactation and compared to the pre-experimental period, the cows of the live yeast (LY) group achieved significantly higher milk yield than those of the control group (Rihma *et al.*, 2009).

Yeast culture can improve feed efficiency of heat stressed dairy cows in mid lactation (Schingoethe *et al.*, 2004). Supplementation of yeast culture (YS) increased dry matter intake (DMI) during the transition period and increased DMI postpartum (Dann *et al*., 2000). The ruminal digestion would be more easily affected by dietary YS addition when rams consumed a diet rich in forages (Galip, 2006).

The aim of the current work was to investigate the effect of concentrate to roughage ratio and baker's yeast supplementation during summer season on digestibility, rumen fermentation activity, feed intake, milk yield, feed conversion and economic efficiency of lactating buffaloes.

MATERIAL AND METHODS

The current work was carried out at a commercial dairy buffalo farm, Kafr El-Sheikh Province, Egypt in the year 2007.

Experimental animals and rations

Sixteen lactating buffaloes after 8 weeks of calving in the 2^{nd} to the 5^{th} lactating season, weighing 500 to 600 kg during summer season were used in complete switch–back design with four groups and three successive experimental periods. Each period consisted of 28 days, the first 14 days of each period were considered a transition period followed by 14 days of test period, as described by Lucas (1956). Lactating buffaloes were individually fed to cover the recommended requirements according to Animal Production Research Institute (1997) for lactating buffaloes. Rations were recalculated every two weeks based on milk yield and body weight of animals.

Experimental rations and management

Buffaloes in the first and the second groups were fed rations consisting of 60% concentrate feed mixture and 40% roughage (berseem hay and rice straw) on DM basis without (G_1) or with 15 g baker's yeast (*Saccharomyces cerevisiae*)/head/day (G_2). While those in the third and the fourth groups were fed rations consisting of 40%

concentrate feed mixture and 60% roughages (berseem hay and rice straw) on DM basis without (G_3) or with 15 g baker's yeast/head/day (G_4).

Concentrate feed mixture was offered two times daily at 8 a.m. and at 4 p.m., berseem hay once daily at 11 a.m. and rice straw was given twice daily at 9 a.m. and 5 p.m. Baker's yeast was supplemented with concentrate mixture during the morning feeding. Buffaloes were allowed to drink water thrice daily at 7 a.m. and at 1& 7 p.m. and were kept under the routine veterinary supervision throughout the whole feeding trial.

Digestibility trials

Four digestibility trials were conducted during the 2nd period of feeding trial with 4 animals from each group to determine nutrient digestibility coefficients and nutritive values of the experimental rations using acid insoluble ash (AIA) as a natural marker (Van Keulen and Young, 1977). Feces samples were taken from the rectum of each animal twice daily at 12 hours interval during the collection period. Samples of tested feedstuffs were taken at the beginning, middle and end of the collection period. The samples of feedstuffs and feces were composted and representative samples were analyzed according to AOAC (1995).

Rumen liquor samples

Rumen liquor samples were collected 3 hours after morning feeding from buffaloes during the 2nd period of feeding trial using a stomach tube and filtered through double layers of cheese cloth. pH value was determined directly using Orian 680 digital pH meter. The concentration of total VFA was determined in rumen liquor samples by the steam distillation method (Warner, 1964) using markham micro-distillation apparatus. The concentration of NH_3-N was determined using saturated solution of magnesium oxide distillation according to the method of AOAC (1995).

Milk yield and samples

Individual morning and evening milk yields of lactating buffaloes were recorded daily and corrected for 7% fat content (FCM) using the formula of 7% FCM = 0.265 x milk yield (kg) + 10.5 x fat yield (kg) as stated by Raafat and Saleh (1962). Milk samples from consecutive evening and morning milking were taken at the 4th week of each period and mixed in proportion to yield. Milk fat, protein, lactose and total solids were determined using Milko-Scan (133B Foss Electric).

Feed conversion

Feed conversion was calculated as the amount of concentrate feed mixture, berseem hay, rice straw, DM, TDN (kg) and DCP (g) required to produce 1 kg 7% FCM.

Economic efficiency

Economic efficiency is expressed as the daily feed cost, price of 7% FCM, feed cost per kg 7% FCM and the ratio between daily feed cost and price of 7% FCM. The price of one ton was 1800 LE for concentrate feed mixture, 800 LE for berseem hay and 100 LE for rice straw. The price of one kg was 10 LE for baker's yeast and 3 LE for one kg 7% FCM in the year 2007.

Statistical analysis

The data were subjected to statistical analysis according to Lucas (1956). Significance between the means was determined by multiple range test (Duncan, 1955).

RESULTS AND DISCUSSION

Chemical composition of experimental rations

Chemical composition of tested feedstuffs and experimental ration used in feeding lactating buffaloes are presented in Table (1). The results showed that the contents of DM, OM, CP, EE and NFE tended to increase with increasing level of concentrate. However, the contents of CF and ash tended to increase with increasing

Table 1: Chemical composition of tested feedstuffs and experimental rations used in feeding lactating buffaloes

Item	DM %	Composition of DM %					
		OM	CP	CF	EE	NFE	Ash
Feedstuffs							
Concentrate feed mixture*	92.60	91.43	16.50	13.02	3.17	58.74	8.57
Berseem hay	90.43	89.16	12.48	27.92	2.81	45.95	10.84
Rice straw	90.30	83.59	2.56	31.79	1.09	48.15	16.41
Calculated composition of experimental rations:							
$G_1 – G_2$	9168	89.20	12.52	19.93	2.61	54.14	10.80
$G_3 – G_4$	91.25	88.31	10.98	23.16	2.41	51.76	11.69

G_1: (60% concentrate:40% roughage without baker's yeast). G_2: (60% concentrate:40% roughage with baker's yeast)
G_3: (40% concentrate:60% roughage without baker's yeast). G_4: (40% concentrate:60% roughage with baker's yeast)

*Concentrate feed mixture consisted of 32% undecorticated cotton seed cake, 24% wheat bran, 22% yellow corn, 12% rice bran, 5% line seed cake, 2% molasses, 2% limestone and 1% common salt roughage level. These results could be attributed to the differences in chemical composition of tested feedstuffs.

Digestibility coefficients and nutritive values

The nutrients' digestibility coefficients and nutritive values of experimental rations are presented in Table (2). The digestibility coefficients of DM, OM, CP, EE and NFE and TDN and DCP values increased significantly (P<0.05), while CF digestibility decreased significantly (P<0.05) with increasing level of concentrate and decreasing level of roughages in the rations. Moreover, the digestibility coefficients of all nutrients and nutritive values of experimental rations increased significantly (P<0.05) with baker's yeast supplementation. These results may be due to the differences in chemical composition of experimental rations as shown in Table (1). These results agree with those obtained by Paryad and Rashidi (2009) who found that yeast supplementation significantly (P<0.05) increased digestibility of dry matter (DM), organic matter (OM), crude protein (CP), NDF and ADF of tomato pomace where the gross digestibility derived from the supplementation was superior in 4 g yeast compared to the control group. In addition, sheep fed yeast had a marked increase in energy digestibility of tomato pomace at 4 g level. Yang *et al*. (2001) reported that reducing the ratio of forage to concentrate improved total digestion.

Feed intake

The effect of concentrate to roughages ratio and baker's yeast supplementation on average daily feed intake by lactating buffaloes are shown in Table (3). The intake of concentrate feed mixture (CFM), DM, TDN and DCP increased significantly (P<0.05) with increasing level of concentrate. However, the intake of berseem (B) and rice straw (RS) increased significantly (P<0.05) with increasing level of roughages. The intake of concentrate feed mixture, berseem, rice straw, DM and DCP tended to increase, but TDN and DCP intake increased significantly (P<0.05) with baker's yeast supplementation. Buffaloes in G_2 showed the highest intake of CFM, DM, TDN and DCP, but those in G_4 had the highest intake of B and RS. The intake of TDN and DCP increased with increasing TDN and DCP values of experimental rations. These results are in agreement with those obtained by Mohsen *et al*. (2001) who observed that feed intake by Friesian calves increased with increasing level of concentrate feed mixture and decreasing level of corn silage. Llamas-lamas and Comb (1991) reported that Lactating cows consumed more DM on low silage than on medium or high silage diets. Dann *et al.* (2000) indicated that cows supplemented with YC increased dry matter intake more rapidly than non-supplemented cows did.

Table 2: Nutrients' digestibility coefficients and nutritive values of experimental rations by lactating buffaloes

Item	Digestibility coefficient %						Nutritive value %	
	DM	OM	CP	CF	EE	NFE	TDN	DCP
Concentrate: Roughage ratio								
60:40	68.20^{a}	70.78^{a}	65.73^{a}	65.46^{b}	73.84^{a}	70.75^{a}	63.92^{a}	8.23^{a}
40:60	65.39^{b}	67.27^{b}	62.81^{b}	68.57^{a}	71.19^{b}	67.85^{b}	61.77^{b}	6.90^{b}
Yeast supplementation								
Without yeast	65.86^{b}	67.87^{b}	63.35^{b}	65.33^{b}	71.01^{b}	68.17^{b}	61.70^{b}	7.45^{b}
With yeast	67.72^{a}	70.18^{a}	65.19^{a}	68.70^{a}	74.03^{a}	70.43^{a}	63.99^{a}	7.67^{a}
Interaction (Concentrate: Roughage ratio with Baker's Yeast supplementation)								
G_1	67.19^{b}	69.30^{b}	65.10^{b}	63.54^{c}	72.28^{b}	69.59^{b}	62.74^{b}	8.14^{b}
G_2	69.20^{a}	72.25^{a}	66.35^{a}	67.38^{b}	75.40^{a}	71.90^{a}	65.10^{a}	8.31^{a}
G_3	64.54^{d}	66.44^{d}	61.59^{d}	67.12^{b}	69.73^{c}	66.76^{c}	60.65^{c}	6.76^{d}
G_4	66.23^{c}	68.10^{c}	64.02^{c}	70.02^{a}	72.65^{b}	68.95^{b}	62.88^{b}	7.03^{c}

a, b, c and d: Means in the same column for each item with different superscripts differ significantly (P<0.05)

G_1: (60% concentrate:40% roughage without baker's yeast). G_2: (60% concentrate:40% roughage with baker's yeast)

G_3: (40% concentrate:60% roughage without baker's yeast). G_4: (40% concentrate:60% roughage with baker's yeast)

Table 3: Average daily feed intake (kg/head) by lactating buffaloes fed experimental rations

Item	CFM	BH	RS	DM	TDN	DCP
Concentrate: Roughage ratio						
60:40	11.03^{a}	3.06^{b}	2.52^{b}	17.06^{a}	10.91^{a}	1.40^{a}
40:60	6.82^{b}	4.98^{a}	3.47^{a}	15.76^{b}	9.73^{b}	1.09^{b}
Yeast supplementation						
Without yeast	8.85	4.00	4.96	16.29	10.05^{b}	1.22^{b}
With yeast	9.00	4.05	5.03	16.53	10.58^{a}	1.27^{a}
Interaction (Concentrate: Roughage ratio with Baker's Yeast supplementation)						
G_1	10.92^{b}	3.05^{b}	4.49^{c}	16.92^{b}	10.62^{b}	1.38^{b}
G_2	11.14^{a}	3.07^{b}	4.54^{c}	17.19^{a}	11.19^{a}	1.43^{a}
G_3	6.78^{c}	4.94^{a}	5.43^{b}	15.65^{d}	9.49^{d}	1.06^{d}
G_4	6.86^{c}	5.02^{a}	5.51^{a}	15.87^{c}	9.98^{c}	1.12^{c}

a, b, c and d: Means in the same column for each item with different superscripts differ significantly (P<0.05)

G_1: (60% concentrate:40% roughage without baker's yeast). G_2: (60% concentrate:40% roughage with baker's yeast).

G_3: (40% concentrate:60% roughage without baker's yeast). G_4: (40% concentrate:60% roughage with baker's yeast)

Rumen fermentation activity

Results in Table (4) showed that ruminal pH value decreased significantly (P<0.05), while ruminal TVFAs and NH_3-N concentrations increased significantly (P<0.05) with increasing level of concentrate. Moreover, ruminal pH value and NH_3-N concentration decreased significantly (P<0.05), while ruminal TVFAs concentration increased significantly (P<0.05) with baker's yeast supplementation compared to without yeast supplementation. The concentration of TVFAs increased with increasing NFE content. The concentration of NH_3-N increased with increasing CP content. These results are in accordance with those obtained by Mohsen et al. (2001) who stated that the concentration of TVFAs and NH_3-N in rumen liquor of Friesian calves increased, while pH value decreased with increasing level of concentrate feed mixture and decreasing level of corn silage in the rations. Vlaeminck et al. (2006) reported that total fatty acid concentration increased with dietary concentrate. Flachowsky et al. (2006) stated that low portions of hay in the ration significantly reduced the pH value and increased the NH_3-N concentration.

Milk yield

The yield of actual milk increased significantly (P<0.05) with increasing level of concentrate as well as with baker's yeast supplementation, while the yield of 7% FCM increased significantly (P<0.05) with baker's yeast supplementation (Table 5). Moreover, the interaction between the concentrate to roughages ratio and baker's yeast supplementation showed that the yield of actual milk and 7% FCM for buffaloes fed the high level of roughage with baker's yeast supplementation (G_4) was nearly similar to those fed the high level of concentrate without baker's yeast supplementation (G_1). Yeast supplementation significantly accelerated the increase in milk yield during early lactation and compared to the pre-experimental period, the cows of the live yeast group achieved significantly higher milk yield than those of the control group (Rihma *et al.*, 2009). Yeast had significant effects on milk yield in early lactation, mid lactation and the whole lactation (P<0.001). Effect was higher in early lactation (22%). Yeast effect was similar for primiparous and multiparous cows.

Moreover, yeast effect on milk yield during early

Table 4: Rumen fermentation activity of lactating buffaloes fed experimental rations

Item	pH	TVFAs (meq/ 100 ml)	NH_3-N (mg/ 100 ml)
Concentrate: Roughage ratio			
60:40	5.70[b]	16.07[a]	22.25[a]
40:60	5.89[a]	15.40[b]	18.56[b]
Yeast supplementation			
Without yeast	5.83[a]	14.35[b]	21.50[a]
With yeast	5.76[b]	17.13[a]	19.31[b]
Interaction (Concentrate: Roughage ratio with Baker‘s Yeast supplementation)			
G_1	5.73[c]	14.80[c]	23.33[a]
G_2	5.67[d]	17.33[a]	21.16[b]
G_3	5.93[a]	13.87[d]	19.67[c]
G_4	5.85[b]	16.93[b]	17.45[d]

a, b, c and d: Means in the same column for each item with different superscripts differ significantly (P<0.05)
G_1: (60% concentrate:40% roughage without baker's yeast). G_2: (60% concentrate:40% roughage with baker's yeast).
G_3: (40% concentrate:60% roughage without baker's yeast). G_4: (40% concentrate:60% roughage with baker's yeast)

Table 5: Milk yield and composition of lactating buffaloes fed experimental rations

Item	Milk yield (kg)		Milk composition %					
	Actual	7% FCM	Fat	Protein	Lactose	SNF	TS	Ash
Concentrate: Roughage ratio								
60:40	10.63[a]	9.99	6.42[b]	4.39[a]	5.33[a]	10.44[a]	16.86	0.72
40:60	9.93[b]	9.82	6.88[a]	3.98[b]	4.93[b]	9.60[b]	16.48	0.70
Yeast supplementation								
Without yeast	9.84[b]	9.32[b]	6.50[b]	4.05[b]	5.02[b]	9.77[b]	16.27[b]	0.70
With yeast	10.72[a]	10.49[a]	6.80[a]	4.32[a]	5.24[a]	10.27[a]	17.07[a]	0.71
Interaction (Concentrate: Roughage ratio with Baker‘s Yeast supplementation)								
G_1	10.18[b]	9.41[b]	6.28[d]	4.26[b]	5.24[b]	10.21[b]	16.49[b]	0.71
G_2	11.07[a]	10.56[a]	6.56[c]	4.52[a]	5.42[a]	10.66[a]	17.22[a]	0.72
G_3	9.50[c]	9.22[b]	6.72[b]	3.84[d]	4.79[d]	9.32[d]	16.04[c]	0.69
G_4	10.37[b]	10.41[a]	7.04[a]	4.13[c]	5.06[c]	9.89[c]	16.93[a]	0.70

a, b, c and d: Means in the same column for each item with different superscripts differ significantly (P<0.05)
G_1: (60% concentrate:40% roughage without baker's yeast). G_2: (60% concentrate:40% roughage with baker's yeast).
G_3: (40% concentrate:60% roughage without baker's yeast). G_4: (40% concentrate:60% roughage with baker's yeast)

lactation was higher for cows calving in the hot season (July- October). Fat and protein percentages and yields were higher with yeast supplementation and during hot season (Majdoub-Mathlouthi *et al*., 2009).

Milk composition

As shown in Table (5), the contents of protein, lactose and SNF increased significantly (P<0.05), however, fat content decreased significantly with increasing level of concentrate and decreasing level of roughages. The contents of fat, protein, lactose, SNF and TS also increased significantly (P<0.05) with baker's yeast supplementation. Buffaloes in G_4 showed the highest fat content, but those in G_2 had the highest contents of protein, lactose, SNF and TS. These results are in agreement with those obtained by Schingoethe *et al.* (2004) who reported that cows of both parities supplemented with yeast culture had numerically higher milk components. Milk fat was found to be significantly higher in yeast culture group (Masek *et al*., 2008). Fat and protein percentages and yields were higher with yeast supplementation and during hot season (Majdoub-Mathlouthi *et al*., 2009).

Feed conversion

Feed conversion expressed as the amounts of DM, TDN and DCP per kg 7% FCM are shown in Table (6). The amounts of CFM, DM, TDN and DCP per kg 7% FCM increased significantly (P<0.05), while BH and RS decreased significantly (P<0.05) with increasing level of concentrate and decreasing level of roughages in the rations. The amount of CFM, BH, RS, DM, TDN and DCP per kg 7% FCM decreased significantly (P<0.05) with baker's yeast supplementation. Buffaloes fed ration contained 40% concentrate and 60% roughages with baker's yeast supplementation (G_4) showed better CFM, DM, TDN and DCP conversion, while those fed ration containing 60% concentrate and 40% roughages with baker's yeast supplementation (G_2) showed better BH and RS conversion. Yeast culture can improve feed efficiency of heat stressed dairy cows in mid lactation (Schingoethe *et al*., 2004).

Economic efficiency

Economic efficiency of lactating buffaloes as affected by concentrate to roughages ratio and baker's yeast supplementation are presented in Table (7). The

Table 6: Feed conversion per kg 7% FCM of lactating buffaloes fed experimental rations

Item	CFM (kg)	BH (kg)	RS (kg)	DM (kg)	TDN (kg)	DCP (g)
Concentrate: Roughage ratio						
60:40	1.11^{a}	0.31^{b}	0.45^{b}	1.71^{a}	1.09^{a}	140.89^{a}
40:60	0.70^{b}	0.51^{a}	0.56^{a}	1.61^{b}	0.99^{b}	110.97^{b}
Yeast supplementation						
Without yeast	0.95^{a}	0.43^{a}	0.53^{a}	1.75^{a}	1.08^{a}	130.64^{a}
With yeast	0.86^{b}	0.39^{b}	0.48^{b}	1.58^{b}	1.01^{b}	121.22^{b}
Interaction (Concentrate: Roughage ratio with Baker's Yeast supplementation)						
G_1	1.16^{a}	0.32^{c}	0.48^{b}	1.80^{a}	1.13^{a}	146.46^{a}
G_2	1.05^{b}	0.29^{d}	0.43^{b}	1.63^{c}	1.06^{b}	135.32^{b}
G_3	0.74^{c}	0.54^{a}	0.59^{a}	1.70^{b}	1.03^{b}	114.82^{c}
G_4	0.66^{c}	0.48^{b}	0.53^{a}	1.52^{d}	0.96^{c}	107.12^{d}

a, b, c and d: Means in the same column for each item with different superscripts differ significantly (P<0.05)

G_1: (60% concentrate:40% roughage without baker's yeast) G_2: (60% concentrate:40% roughage with baker's yeast)
G_3: (40% concentrate:60% roughage without baker's yeast) G_4: (40% concentrate:60% roughage with baker's yeast)

Table 7: Economic efficiency of lactating buffaloes fed experimental rations

Item	Average feed cost (LE/day)	feed cost LE/ kg 7% FCM	Output of 7% FCM	Economic efficiency
Concentrate: Roughage ratio				
60:40	22.83^{a}	2.29^{a}	29.96	1.31^{b}
40:60	16.88^{b}	1.73^{b}	29.45	1.74^{a}
Yeast supplementation				
Without yeast	19.62	2.10^{a}	27.95^{b}	1.45^{b}
With yeast	20.09	1.91^{b}	31.46^{a}	1.60^{a}
Interaction (Concentrate: Roughage ratio with Baker's Yeast supplementation)				
G_1	22.55^{a}	2.40^{a}	28.23^{b}	1.25^{d}
G_2	23.11^{a}	2.19^{b}	31.68^{a}	1.37^{c}
G_3	16.70^{b}	1.81^{c}	27.66^{b}	1.66^{b}
G_4	17.07^{b}	1.64^{d}	31.24^{a}	1.83^{a}

a, b, c and d: Means in the same column for each item with different superscripts differ significantly (P<0.05)
G_1: (60% concentrate:40% roughage without baker's yeast) G_2: (60% concentrate:40% roughage with baker's yeast)
G_3: (40% concentrate:60% roughage without baker's yeast) G_4: (40% concentrate:60% roughage with baker's yeast)

average daily feed cost and feed cost per kg 7% FCM increased significantly ($P<0.05$), however, economic efficiency decreased significantly ($P<0.05$) with increasing level of concentrate and decreasing level of roughages in the rations. Average daily feed cost tended to increase, but the output of 7% FCM and economic efficiency increased significantly ($P<0.05$), while feed cost per kg 7% FCM decreased significantly ($P<0.05$) with baker's yeast supplementation. Buffaloes fed ration containing 40% concentrate and 60% roughages with baker's yeast supplementation (G_4) recorded the lowest feed cost and feed cost per kg 7% FCM and the highest economic efficiency ($P<0.0$). These results are illustrated with those obtained by Mehrez *et al*. (1993) who found that feed cost of buffalo calves increased with increasing level of concentrate in the rations. El-Ashry *et al.* (2001) found that return over feed and additive as well as relative economic efficiency was higher with yeast supplementation in rations of buffalo calves.

CONCLUSION

From these results it could be concluded that lactating buffaloes fed ration consisting of 40% concentrate feed mixture and 60% roughages on DM basis (berseem hay and rice straw) with 15 g baker's yeast supplementation/head/day (G_4) showed the best results concerning milk yield, feed conversion and economic efficiency.

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