J. Agric. Sci. Mansoura Univ., 33 (12): 8433 - 8447, 2008

EFFECT OF FEEDING LEVEL AND DIETARY SUPPLEMENTATION OF DRY BEAKER'S YEAST ON PRODUCTIVITY OF GROWING FRIESIAN CALVES

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ABSTRACT

To evaluate the effect of feeding level and dietary supplementation of dried Baker's yeast (DBY) on the performance of Friesian growing calves, total of 36 calves with average body weight of 160±2.34 kg and 9.47±0.30 mo of age were assigned randomly into three feeding level groups 80, 100 and 120% of NRC (1989), 12 animals in each. Each feeding level group was further divided into two equal subgroups, one without dietary supplementation (control) and another group supplemented with 10 g DBY/h/d. 6 animals in each. Feeding level lasted for ????. Results show during the summer or winter feeding, calves fed 80% with DBY showed the highest ($P<0.05$) digestibility coefficients for most nutrients, while the lowest values were almost obtained for those fed 120% without DBY diet. Live body weight (LBW) of calves was the highest ($P<0.05$) with 120% feeding level plus DBY, while the lowest LBW were recorded with 80% without DBY. Average daily gain (ADG) increased ($P<0.05$) by increasing feeding level from 100 to 120%. However, DBY supplementation improved ($P<0.05$) ADG only with feeding level of 80%. The best feed efficiency was recorded ($P<0.05$) for calves fed 80% with DBY, while those fed 80 or 100% without DBY showed the poorest ($P<0.05$) feed efficiency. Feeding level showed marked ($P<0.05$) effect on pH values, and concentrations of total volatile fatty acids (TVFA) and NH_3-N in RL during summer and winter feeding. However, the effect of DBY supplementation was more pronounced ($P<0.05$) TVFA concentrations in RL during summer and winter feeding. Total protein and globulin concentrations in blood plasma increased ($P<0.05$) by increasing feeding level. However, DBY supplementation increased ($P<0.05$) total protein concentration only with 80% feeding level. Overall concentration of T4 in blood plasma increased ($P<0.05$) feeding level up to 120%, and was not affected by DBY supplementation. According to this study growing Friesian calves fed 80% with DBY showed the highest feed efficiency from the nutritional and economical points of view.

Keywords*:* *Calves, feeding level, dry Baker's yeast, growth performance**.***

INTRODUCTION

Several authors study the effect of feeding level on nutrient digestibility coefficients. Some of them showed that the digestibility of the DM, CP and gross energy were better with *ad lib*. than restricted feeding (90% of *ad lib*.). Meanwhile, others found that diet nutrient digestibility was increased with restricted feeding compared to *ad lib*. one (Glimp *et al*., 1989 and Hicks *et al*., 1990).

On the other hand, few results are available on the effect of feeding level on rumen liquor of Frisian calves (Abd El-Latif, 2003).

Yeast culture supplementation (*Saccharomyces cerevisiae*) in ruminant diets to improve their performance has been reviewed by Wallace (1994) and Williams (1998).

A few studies have concerned dairy calves, when brewer's yeast (Seymour *et al*. 1995), live yeast (Abdel-Khalek *et al*., 2000) or Baker yeast as a dried yeast (Ghorab, 2007) was included in calf diets at levels between (2-12 gram/head/day) 0.001% and 1.00%.

Influences of yeast culture (YC) supplementation on numerous growth and production traits have been studied by several authors in ruminants at different ages and kind of production. However, the reported results are somewhat inconsistent throughout the literature, partially due to confounding effects of ration composition, and level and source of yeast culture (Williams *et al*,. 1991). Most of these studies reported that YC supplementation has significant impact on animal productivity, in items of increasing live body weight and gain (Aboul-Ela *et al*., 2006 and Ghorab, 2007).

Therefore, this study was undertaken to evaluate the effect of feeding level with or without dietary supplementation dry baker yeast (DBY) on nutrient digestibility coefficient, rumen liquor parameters and growth performance of Friesian calves.

MATERIALS AND METHODS

The experimental work was carried out at Sakha Animal Production Research Station belonging to the Animal Production Research Institute, Agricultural Research Center, Ministry of Agriculture in cooperation with the Department of Animal Production, Faculty of Agriculture, Al-Azhar University, during the period from July 2004 to October 2005.

A total of 36 growing Friesian calves with average body weight of 160±2.34 kg and 9.47±0.30 months of age was assigned randomly into three feeding groups (12 calves in each). Calves in the 1st group (control) fed 100% of NRC (1989), while those in the 2nd and 3rd groups were fed 80 and 120 %, respectively. Each feeding group was further divided into two equal subgroups, namely control and supplemented with 10 g/h/d from dry baker yeast (DBY).

Calves in all dietary treatment groups were fed a basal ration composed of concentrate feed mixture (CFM), fresh berseem (FB) and rice straw (RS) during the winter feeding interval from November to May and CFM, berseem hay (BH) and RS during the summer feeding from June to October. The CFM composted of 35% undecorticated cottonseed cake, 5% linseed cake, 25% ground yellow corn, 20% wheat bran, 10% rice bran, 3% molasses, 1% limestone and 1% common salt. Chemical analyses of different feedstuffs are shown in Table (1).

Table (1): Chemical composition of experimental feedstuffs.

Feedstuff	DM %	Composition of DM %					
		OM	CP	CF	EE	NFE	Ash
CFM	92.61	91.43	16.50	13.02	3.17	58.74	8.57
Fresh berseem	15.90	85.80	15.40	23.50	2.95	43.95	14.20
Berseem hay	91.21	87.20	12.85	26.65	2.70	45.00	12.80
Rice straw	90.31	83.59	2.56	31.79	1.09	48.15	16.41

Amounts of CFM for each treatment group were offered two times/day at 8 a.m. and 3 p.m.. The daily amount of RS was divided into two equal parts and given at 9 a.m. and 4 p.m., while FB or BH was offered once time daily at 10 a.m. Fresh and clean drinking water was two times/day. The amounts of different feedstuffs were adjusted biweekly to cover the requirements according to LBW.

Diet with dry baker yeast (DBY) was supplemented with DBY at a level of 10 g/head/day during on experimental feeding period of 180 day. Amount of DBY was added to morning CFM.

Throughout the experimental period from 12 up to 15 months of age, calves were monthly weighed morning before feeding. Thereafter, average daily gain and feed efficiency were calculated.

Six digestibility trials were conducted twice through the experimental period during the summer and winter feeding using three calves chosen randomly from each group to determine nutrient digestibility coefficients and nutritive values of the experimental rations using acid insoluble ash (AIA) as a natural marker according to Van Keulen and Young (1977).

Digestibility trial consisted of 15 days as a preliminary period followed by 7 days collection period. Representative samples of feedstuffs and feces were composted and dried in a forced air oven at 70 ^{o}C for 48 hours, then ground and kept for chemical analysis. Nutrient digestibility was calculated from the equation stated by Schneider and Flatt (1975). Representative samples and feces were analysis according to the methods of A.O.A.C (1990).

Rumen liquor (RL) samples were collected at 3 hours after morning feeding from three animals in each subgroup once during summer and another during winter feeding using stomach tube attached to vacuum pump. Ruminal pH was immediately recorded by pH-meter (Orian 680 digital pH meter). Concentration of TVFA was determined in RL by the steam distillation method using Markham micro-distillation apparatus (Warner, 1964), while concentration of NH_3-N was determined using saturated solution of magnesium oxide distillation according to the method of A.O.A.C. (1990).

Blood samples were monthly collected in clean test tubes via the jugular vein from all cows in each group. Blood plasma was separated by centrifugation of the collected blood at 15 *g* for 10 min, and then plasma was kept frozen at –20 ^{0}C until chemical analyses. Concentration of total proteins (Tietz, 1994), albumin (Tietz, 1990) and urea-N (Patton and Crouch, 1977) as well as concentration of thyroxin was performed after the method of Larsen and Ball (1972) in blood plasma were determined using commercial kits (Diagnostic System Laboratories, Inc USA). Plasma globulin was calculated by subtracting concentration of albumin from total proteins.

Results were statistically analyzed according to Snedecor and Cochran (1982) by general linear models procedure adapted by SPSS (2004) for user's guide using one-way ANOVA as follows:
For growth parameters, digestibility coefficients and rumen parameters the completely randomized design was used and the statistical model was:

$$Y_{ij} = U + A_i + e_{ij}.$$

Where: Y_{ij} = Observed values; U = Overall mean; A_i = Treatment group and e_{ij} = Random error
Factorial design (6 groups x 3 ages) for concentration of thyroxin (T4), was used and the statistical model was:

$$Y_{ijk} = U + A_i + B_j + AB_{ij} + e_{ijk}.$$

Where: Y_{ijk} = Observed values; U = Overall mean; A_i = Treatment group; B_j = Sampling time; AB_{ij} = Interaction due to experimental group x sampling time and e_{ijk} = Random error.
The significant differences among treatment groups were tested using Multiple Range Test according to Duncan (1955).

RESULTS AND DISCUSSION

Digestibility coefficients:

For summer and winter feeding results in Table (2) show that reducing feeding level from 100 to 80% significantly (P<0.05) increased in the digestion of DM, OM, CP, CF and NFE, while digestion of EE did not differ significantly. However, increasing level of feed intake from 100 to 120% significantly (P<0.05) reduced the digestion of all nutrients. In similar trend with the present results, several authors reported that feed intake and digestibility are inversely related (Tyrrel and Moe, 1975). Also, Glimp *et al*. (1989) and Hicks *et al*. (1990) found that nutrients digestibility increased with restricted feeding compared to *ad lib.* feeding.

Moreover, the recent results of Mohi-Eldin *et al*. (2004) indicated that the digestion coefficients of all nutrients were significantly higher (P<0.05) for Friesian calves fed at 85% than those fed 100% of *ad lib*. level. The observed significant decrease in CF digestibility by increasing feeding level from 100 to 120% was emphasized by (Mostafa *et al*., 1993).

It is of interest to note that DBY supplementation to all feeding levels significantly (P<0.05) increased digestibility of DM, OM, CP during summer and winter feeding. While, digestibility of EE during summer feeding for 80 and 100% feeding level significantly (P<0.05) decreased by DBY supplementation. However, digestibility coefficients of CF with 80% feeding level and of NFE with 120% feeding level were not affected significantly by DBY supplementation (Table 3).

In accordance with the present results, digestibility coefficient of CP with higher in ration supplemented with than without DBY (Metwally *et al.,* 2001). Moreover, the obtained results are in good accordance with those found by Allam *et al*. (2001) and El-Shaer (2003) in sheep and El-Ashry *et al*. (2001) and Farag, (2004) in buffaloes. All previous investigators postulated that the digestibility coefficients of most nutrients were clearly enhanced with yeast culture supplementation as compared to unsupplemented diets.

Table (2): Average values of nutrients digestibility coefficients and nutritive values in different dietary groups during summer and winter feeding.

Item	Dietary group						SEM
	100%		80%		120%		
	Without	DBY	Without	DBY	Without	DBY	
Summer feeding							
Digestibility coefficient (%):							
DM	62.93^{c}	64.70^{b}	65.70^{b}	67.81^{a}	59.31^{d}	62.10^{c}	0.67
OM	66.54^{c}	69.27^{b}	68.46^{b}	71.49^{a}	63.21^{e}	65.43^{d}	0.66
CP	61.77^{c}	64.19^{b}	63.29^{b}	66.53^{a}	55.46^{e}	59.89^{d}	0.86
CF	62.39^{c}	69.10^{a}	69.07^{a}	68.75^{a}	60.58^{d}	64.97^{b}	0.83
EE	79.00^{a}	74.42^{c}	78.47^{a}	75.38^{bc}	72.16^{d}	76.81^{b}	0.63
NFE	69.04^{c}	70.23^{b}	68.89^{c}	73.50^{a}	65.57^{d}	66.37^{d}	0.64
Nutritive value (%):							
TDN	61.00^{c}	63.53^{b}	62.94^{b}	65.52^{a}	58.11^{d}	60.24^{c}	0.59
DCP	7.29^{c}	7.58^{b}	7.47^{b}	7.86^{a}	6.55^{e}	7.07^{d}	0.10
Winter feeding							
Digestibility coefficients (%):							
DM	64.54^{c}	66.23^{b}	67.19^{b}	69.20^{a}	61.09^{d}	63.76^{c}	0.64
OM	67.44^{c}	70.10^{b}	69.30^{b}	72.25^{a}	64.21^{e}	66.40^{d}	0.64
CP	61.59^{c}	64.02^{b}	63.10^{b}	66.35^{a}	55.26^{e}	59.71^{d}	0.86
CF	67.12^{c}	72.99^{a}	72.96^{a}	72.96^{a}	65.54^{d}	69.38^{b}	0.73
EE	70.80^{e}	74.33^{c}	78.38^{a}	75.28^{c}	72.07^{d}	76.73^{b}	0.63
NFE	68.74^{c}	69.95^{b}	68.58^{c}	73.23^{a}	65.24^{d}	66.05^{d}	0.64
Nutritive value (%):							
TDN	60.68^{c}	63.09^{b}	62.51^{b}	64.98^{a}	57.91^{d}	59.95^{c}	0.56
DCP	6.92^{c}	7.20^{b}	7.09^{b}	7.46^{a}	6.21^{e}	6.71^{d}	0.10

a, b…d: Means having different superscripts within the same row are significantly (P<0.05) different.

Feeding values:

Results in Table (2) regarding feeding values show that reducing level of feed intake, from 100 to 80% significantly (P<0.05) increased the nutritive values of the diet as TDN and DCP, while the corresponding values significantly (P<0.05) decreased by increasing level of feed intake from 100 to 120%. Although, this finding contrasted that reported by Mohi-Eldin (2002), they are in agreement with the results of Mehany (1999), who found that TDN and DCP values decreased with increasing the level of CFM in the ration.

Regarding the effect of DBY on nutritive values of the tested rations, it was clear that the total nutritive values as TDN and DCP significantly (P<0.05) increased by DBY supplementation with all feeding levels during summer and winter seasons (Table 3). In good agreement with the obtained results, Ghorab (2007) found that the nutritive values as TDN and DCP was significantly (P<0.05) improved for Friesian calves fed DBY diet as compared to the control. In sheep, Metwally *et al.* (2001) found that the nutritive values as TDN was significantly (P<0.05) higher for yeast diet than the control one, but nutritive values as DCP was not affected significantly by yeast supplementation. Also, in accordance with the present results, Allam *et al*. (2001) and El-Shaer (2003) in sheep and El-Ashry *et al*. (2001) and Farag

(2004) in buffaloes reported that dietary supplementation of yeast culture significantly improved the nutritive values in term of TDN and DCP%.

Growth performance:

The present results revealed that the differences in final LBW of calves were significant (P<0.05), being almost the highest in calves fed at a level of 120% with DBY and the lowest in those fed at a level of 80% without DBY (Table 3). It is of interest to note that the differences LBW of calves fed at a level 120% without or 100% with DBY was slight than those fed 120% with DBY, and were not significant. Also, the obtained results indicated that no useful effect of DBY supplementation with 80, 100 and 120% feeding level on final LBW of calves.

Table (3): Growth performance of calves in different treatment groups at successive ages.

Item	Dietary group						SEM
	100%		80%		120%		
	Without	DBY	Without	DBY	Without	DBY	
Average daily fed intake (kg/head/day):							
Total DM	8.37	8.37	6.70	6.70	10.05	10.05	0.21
TDN	5.38	5.17	4.43	4.27	6.13	6.41	0.16
DCP	0.63	0.60	0.52	0.49	0.70	0.65	0.02
Growth parameters:							
Initial weight, kg	158.2	157.4	167.0	146.3	163.0	165.3	7.1
Final weight, kg	277.6^{b}	323.1^{ab}	264.2^{b}	303.1^{b}	339.4^{a}	342.0^{a}	7.6
ADG, kg	0.568^{b}	0.789^{a}	0.463^{b}	0.748^{a}	0.840^{a}	0.856^{a}	0.043
Feed efficiency	0.068^{b}	0.094^{a}	0.069^{b}	0.112^{a}	0.084^{a}	0.085^{a}	0.006

a and b: Group means denoted with different superscripts are significantly different at (P<0.05).

Also, ADG feed efficiency significantly (P<0.05) higher in calves fed at a level of 120% with or without DBY, 100% and 80 with DBY compared with those fed 80% and 100% without DBY. This was reflected in significant differences in ADG and feed efficiency between calves fed either 80 or 100% with DBY versus those without DBY may indicate the pronounced effect of DBY supplementation when the diet contained lower or 100%. However, insignificant effect of DBY supplementation was observed when calves were fed a higher level of feed intake (120%).

In agreement with the present results, Sarma and Sharma (1989) found that, ADG appeared a linear increase (P<0.01) as the levels of energy intake increased. Also, Lacasse *et al*. (1993) found that ADG was 0.72 and 0.84 kg for heifers fed a moderate and *ad lib.* intake, respectively. Bortone *et al*. (1994) found that feeding Holstein heifers 115% of NRC (1989) nutrient requirements from 3 to 12 mo of age increased rate of weight gain at 12 mo of age. Mostafa *et al*. (1998) reported that daily gain of buffalo calves was markedly increased as TDN level in the rations increased. Nagah (2002) found that ADG were lower for the 100% energy level than those of 120% energy level. Recently, Baptiste *et al.* (2005) found that mean ADG was greater in fed high than low energy diets (P<0.05). The highest ADG and improvement in feed efficiency of heifers fed 120% TDN without DBY supplementation was indicated by Mohi-Eldin *et al*. (2002). Generally, many authors found marked improvement in LBW and gain of buffaloes fed DBY or yeast culture (YC) (El-Ashry *et al.,* 2001).

Concerning the obtained improvement (P<0.01) in feed conversion of heifers fed supplemented ration with 80 or 100 % feeding levels, the present results come in line with the observations of several authors, who found that some of these enhancements may be directly related to stimulation of growth and activity of ruminal bacteria as a result of yeast supplementation (Pive *et al*., 1993 and Newbold *et al.*, 1995)..

Rumen function:

During summer and winter feeding, ruminal pH value significantly (P<0.05) increased in RL of heifers by decreasing level of feeding from 100 to 80%, while it significantly (P<0.05) decreased by increasing feeding level from 100 to 120% (Table 4). Similarly, many investigators found that ruminal pH value decreased with increasing the level of concentrate in the ration (Etman *et al*., 1986 and Leventini *el al.,* 1972).

Table (4): Average values of ruminal parameters of heifers in different treatment groups during summer and winter feeding.

Item	Dietary group						SEM
	100%		80%		120%		
	Without	DBY	Without	DBY	Without	DBY	
Rumen parameter during summer feeding:							
pH value	5.63^{b}	5.56^{bc}	5.86^{a}	5.79^{a}	5.45^{cd}	5.38^{d}	0.05
TVFA(meq/dl)	20.35^{c}	22.05^{ab}	18.55^{d}	20.30^{c}	21.00^{bc}	23.10^{a}	0.45
NH_3-N (mg/ dl)	12.68^{b}	12.76^{b}	15.95^{a}	10.71^{c}	11.10^{c}	11.39^{c}	0.78
Rumen parameter during winter feeding:							
pH value	6.23^{b}	6.14^{bc}	6.47^{a}	6.40^{a}	6.02^{cd}	5.95^{d}	0.05
TVFA(meq/dl)	18.37^{c}	19.95^{ab}	16.78^{d}	18.37^{c}	19.00^{bc}	20.90^{a}	0.40
NH_3-N (mg/dl)	11.69^{b}	11.64^{b}	14.72^{a}	9.69^{c}	9.57^{c}	10.21^{c}	0.70

a, b ….d: Means having different superscripts within the same row are significantly (P<0.05) different. TVFA: Total volatile fatty acids

During summer and winter feeding, concentration of TVFA in RL of heifers decreased significantly (P<0.05) by decreasing level of feeding from 100 to 80% and insignificantly by increasing feeding level from 100 to 120% (Table 4). In accordance with the present results, Eadie *et al*. (1967) reported that increasing proportion of concentrates in ration of cattle increased ruminal TVFA concentration. Also, El-Gallad *et al*. (1988) revealed that feeding goats high energy diet slightly increased total VFA concentrations in rumen fluid.

As affected by DBY supplementation, concentration of TVFA significantly (P<0.05) increased in RL of heifers fed all levels with than without DBY, being the highest in those fed 120% level (Table 7). These results are similar to those reported on ruminants fed diets contained YC (Fayed, 2001 and El-Shaer, 2003).

During summer and winter feeding, concentration of NH_3-N in RL of heifers significantly (P<0.05) increased by decreasing level of feeding from 100 to 80% and decreased by increasing feeding level from 100 to 120%

(Table 4). Similar trend was observed by Nagah (2002), who recorded lower ($P<0.05$) ruminal ammonia nitrogen concentration with 120% than 100% energy level. However, Mohi-Eldin and Swiefy (2004) showed that NH3-N concentration were insignificantly higher in Friesian calves fed restricted ration with high-TDN level.

As affected by DBY supplementation, concentration of NH_3-N significantly ($P<0.05$) decreased in RL of heifers fed diets with than without DBY only for 80% feeding level. However, it was not affected by DBY supplementation at levels of 100 or 120% (Table 4). In harmony with the present changes in concentration of NH_3-N as affected by DBY at a level of 80%, Harrison *et al.* (1988) reported much lower concentration of rumen ammonia-N with YC supplemented diets. Also, Erasmus *et al.* (1992) found that ammonia-N concentration decreased by 10% after YC supplementation. Furthermore, El-Shaer (2003) and Farag (2004) in sheep reported that consuming YC tended to have lower ($P<0.01$) ruminal ammonia concentrations. The reduction in concentrations of ammonia in the rumen appeared to be the result of increased incorporation of ammonia into microbial protien (Harrison *et al.*, 1988).

Also, Nagah (2002) found significantly lower ruminal pH value of the diets containing 120 than 100% energy level. As affected DBY supplementation, pH values with all feeding levels did not differ significantly. El-Badowi *et al.* (1998) and Gado *et al.* (1998) found that yeast culture had no significant effect on ruminal pH, and these was relationship between close ruminal VFA production and ruminal pH, which is considered as an important regulator for microbial yield (Russell and Dombroski, 1980).

Biochemical parameters of blood:

Results revealed that concentration of TP and GL significantly ($P<0.05$) in blood plasma increased by increasing feeding level from 100 to 120%, while reducing feeding level to 80% resulted in insignificant decrease in TP and GL concentration. However, albumin (AL) and AL/GL ratio was not affected significantly ($P>0.05$) by feeding level (Table 4). This finding indicated that the trend of change in TP and GL concentration in blood serum of heifers was mainly affected by dietary contents from energy and CP.

Table (5): Biochemical blood parameters in blood plasma of heifers in different treatment groups.

Item	Dietary group						SEM
	100%		80%		120%		
	Without	DBY	Without	DBY	Without	DBY	
Total protein	7.09[bc]	7.30[b]	6.49[c]	7.19[b]	8.12[a]	8.26[a]	0.19
Albumin	3.86	3.80	3.52	3.80	3.87	3.92	0.13
Globulin	3.23[bc]	3.50[b]	2.97[c]	3.40[bc]	4.26[a]	4.35[a]	0.17
AL/GL ratio	1.21	1.09	1.20	1.17	0.94	0.97	0.11
Urea-N	31.67[ab]	32.2[ab]	29.40[bc]	28.33[c]	34.23[a]	35.00[a]	0.82

a and b: Means denoted with different superscripts within the same row are significantly different at ($P<0.05$).

The observed increase in TP concentration with increasing level of feeding was associated with the positive relationship between dietary protein and plasma TP concentration as (Mahmoud *et al.*, 1978). Also, Nagah (2002) found that feeding high energy level (120%) was reflected in higher (P<0.05) TP and AL concentration than 100% energy level. In agreement with the tendency of reduction in TP and GL concentration with feeding level of 80%, Mohi-Eldin and Swiefy (2004) found that responding to restricted regime, plasma TP and GL was depressed (P<0.05) by reducing the feed intake by 85% of the *ad lib.* level. As affected by DBY supplementation, TP concentration in blood serum significantly (P<0.05) increased in diets with than without DBY only with feeding level of 80% (Table 5). Similar effect was indicated by El-Ashry *et al.* (2001) and Farag (2004) on growing buffalo-calves fed YC. The obtained results for feeding levels of 100 and 120% are in agreement with those reported by Ibrahim (2004), who found that supplementation of YC (gustor nature) showed insignificant change in TP concentration in blood plasma of lactating buffalo cows. Also, no significant effect on total protein concentration in blood was found by Iwanska *et al.* (1999) on cattle, Salem *et al.* (2002) on lactating buffaloes. The present trend of changes in concentration of GL as affected by DBY agreed with the results of Iwanska *et al.* (1999) on cattle.

Increasing feeding level from 80 to 120% resulted in significant (P<0.05) increase in urea-N level from 31.67 to 34.23 mg/dl (Table 5). Urea-N concentration was the highest in serum of heifers fed 120% with or without DBY, and the lowest in those fed 80% with or without DBY. The present values of urea-N in blood serum of heifers are within the normal range reported for Friesian calves (Metwally *et al*., 1999).

Tetraiodothironin (T4) concentration:-

The presented in Table (6) show that concentration of thyroxin (T4) was significantly (P<0.05) higher in serum of heifers fed 120% feeding level with or without DBY than that in the other treatment groups. This trend indicated that T4 as a metabolic hormone was affected mainly by dietary energy level as affected by increasing feeding level. However, DBY supplementation did not affect T4 level regardless feeding level.

Table (6): Average concentration of T4 in serum (n mol/l) of heifers in different treatment groups at per-pubertal ages.

Age (month)	Dietary group						SEM
	100%		80%		120%		
	Without	DBY	Without	DBY	Without	DBY	
13	3.153	2.702	3.414	4.465	4.060	4.620	0.189
14	3.866	3.454	3.045	3.582	3.936	3.177	0.130
15	2.749	2.987	2.829	2.852	3.909	4.504	0.206
Mean	3.256^b	3.048^b	3.096^b	3.299^b	4.03^a	4.101a	0.102

a and b: Means denoted with different superscripts within the same row are significantly different at (P<0.05).

Economic efficiency:

As affected by feeding level system in this study, the lowest daily feed cost was recorded for calves fed 80% with or without DBY. Inspite this trend, feed cost/kg gain was the lowest and price of daily gain was the highest for calves fed 80% with DBY as compared to other groups, reflecting the highest economic efficiency of feeding growing calves on feeding level of 80% with DBY supplementation (Table 7).

Table (7): Economic efficiency of Friesian calves in different dietary groups.

Item	Dietary group						SEM
	100%		80%		120%		
	Without	DBY	Without	DBY	Without	DBY	
Fed cost (L.E.)	5.83	5.99	4.67	4.83	6.99	7.15	0.19
Fed cost/kg gain	10.09	7.69	9.71	6.55	8.50	8.22	0.22
Price of gain(L.E.)	7.54	10.65	6.49	9.68	10.75	11.34	0.36
Economic efficiency	1.29	1.78	1.39	2.01	1.54	1.59	0.05

According to this study growing Friesian calves fed 80% with DBY showed the highest feed efficiency from the nutritional and economical points of view.

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تأثير مستوى التغذية والجميرة علي خصائص النمو ومعامل الهضم وسائل الكرش في العجلات الفريزيان النامية

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أجريت هذه الدراسة في محطة بحوث الإنتاج الحيواني بسخا–التابعة لمعهد بحوث الإنتاج الحيواني – مركز البحوث الزراعية – وزارة الزراعة بالتعاون مع قسم الإنتاج الحيواني – كلية الزراعة جامعة الأزهر خلال الفترة من يوليو ٢٠٠٤ حتى أكتوبر ٢٠٠٦.

استخدمت في هذه الدراسة ٣٦ عجلة فريزيان في عمر ١٠,٤٧ شهر وكان متوسط وزن الجسم الحي ١٧٥,٦ كجم – قسمت إلى ثلاثة مجاميع وزن والعمر قسمت إلى ثلاثة مجاميع متشابهة في وزن والعمر. ثلاثة مستويات غذائية مختلفة ٨٠ و١٠٠ و١٢٠% (١٢ عجلة في كل مستوي) و تحت كل مستوى غذائي مجموعتين المجموعة الأولى كنترول و الثانية مضاف لها خميرة الخباز الجافة بمعدل ١٠ جرام لكل رأس في اليوم.

وتهدف هذه الدراسة إلى تأثير المستويات المختلفة من التغذية والخميرة على خصائص النمو والكرش ومعاملات الهضم وبعض خصائص الدم لعجلات الغريزيان خلال فترة ما قبل البلوغ.

وكانت النتائج المتحصل عليها كالتالي:-

- زاد وزن الجسم الحي عند مستوى ٠,٠٥% للعجلات المغذاة على مستوى ١٠٠ و١٢٠% مع الخميرة ونقص و وزن الجسم الحي للعجلات المغذاة على مستوى ٨٠ %.
- زاد معدل النمو اليومي زيادة معنوية (٠,٠٥ %) بزيادة مستوى التغذية من ١٠٠ إلى ١٢٠ % وأدت إضافة الخميرة إلى تحسين معدل النمو اليومي زيادة معنويا للعجلات المغذاة على مستوى ٨٠ % فقط.
- تحسنت الكفاءة الغذائية معنويا عند مستوى ٠,٠٥% للعجلات المغذاة على مستوى ٨٠ % مع الخميرة. بينما للعجلات المغذاة على مستوى ١٠٠ و ١٢٠ % مع الخميرة أظهرت تحسن طفيف في الكفاءة الغذائية.
- معامل هضم المواد الغذائية عالي المعنوية عند مستوى (٠,٠٥) للعجلات المغذاة على ٨٠ % مع الخميرة أو بدونها مقارنة بالـ ١٢٠%.
- ارتفعت درجة تركيز أيون الهيدروجين (pH) لسائل الكرش بمعنوية للعجلات المغذاة على ٨٠ % بدون خميرة في الصيف والشتاء بينما انخفض للعجلات المغذاة على١٢٠ % فى الصيف والشتاء.
- أنخفض تركيز الأحماض الدهنية الكلية الطيارة (VFA's) بمعنوية عند مستوى (٠,٠٥) في سائل الكرش بنقص مستوى الغذاء من ١٠٠ إلى ٨٠ % بينما لم يتأثر معنويا بزيادة مستوى الغذاء، كما ذادت تركيز الأمونيا بمعنوية عند مستوى (٠,٠٥) في سائل الكرش بزيادة مستوى التغذية من ١٠٠ إلى ١٢٠%.
- ارتفع تركيز هرمون الثيروكسين في سيرم الدم بمعنوية عند مستوى (٠,٠٥) في العجلات المغذاة على ١٢٠% مقارنة بباقي المجموعات.
- زاد تركيز البروتين الكلى والجلوبيولين بزيادة مستوى التغذية من ١٠٠ إلى ١٢٠ % وانخفض تركيزهما بإضافة الخميرة على مستوى ٨٠ % فقط. أما الالبيومين لم يتأثر معنويا في جميع المعاملات. كما زاد تركيز اليوريا في الدم في العجلات المغذاة على ١٢٠ % مع أو بدون خميرة . وانخفض في العجلات المغذاة على ٨٠ % مع أو بدون خميرة.

وتوصى هذه الدراسة بستخدام مستوى غذائي ١٠٠ أو ١٢٠% مع الجميرة للعجلات الفريزيان النامية حيث أنها حسنت النمو والكفاءة الغذائية وحسنت اداء الكرش للعجلات الفريزيان.