J. Agric. Sci. Mansoura Univ., 31 (2): 655 - 665, 2006

EFFECT OF PARTIAL REPLACEMENT OF CONCENTRATE FEED MIXTURE BY CORN GRAINS IN RICE STRAW RATIONS FOR LACTATING FRIESIAN COWS ON : 2- MILK YIELD AND COMPOSITION, BLOOD PARAMETERS AND FEED EFFICIENCY .

Maklad Eman, H. M. [1]; H. M. E. Ead[2] and R. I. H. Al-Ahwall[2]

1- Animal Production Department, Faculty of Agriculture, Mansoura University, Egypt.

2- Animal Production Research Institute, Agriculture Research Center, Dokki, Giza, Egypt.

ABSTRACT

The effect of substitution of concentrate feed mixture (CFM) by yellow corn grains fed along with rice straw ration of lactating cows on their performance for milk yield and composition as well as blood metabolites was investigated. Five lactating Friesian cows were used in a " Swing-over" design. with mean metabolic body size ($BW^{0.75}$) of 102 kg were used in this study. All animals were in the 2[nd] to 4[th] lactation season. The experimental rations were formulated as follows :R1: ration 1: 69 % concentrate feed mixture (CFM) + 31 % rice straw (RS) (as a control ration), R2: ration 2: 62 % (CFM) + 7% % ground corn grains (GCG) + 31 % (RS), R3 : ration 3: 55 % (CFM) +15% (GCG) + 31 % (RS). These proportions were chosen to achieve approximately iso nitrogenous, iso-caloric rations containing about 12.2-13.0% crude protein (CP) and 2.14 to 2.24 Mcal / kg as recommended by (Ørskove *et al* 1972) to ensure maximal rate to fermentation in the rumen..

The results showed that the intake of rations by cows was fixed and calculated as the percentage of roughage to concentrate ratio to satisfy their recommended requirments. The total DM intake g/kg $BW^{0.75}$ /day of R1, R2 and R3 were 209, 209 and 216.5 respectively. The crude protein intake (CPI g/ kg $BW^{0.75}$ /d) for R1, R2 and R3 were 27.3, 26.3 and 26.7 respectively. The urea-N concentration ranged from 18.03 to 25.75 mg/100 ml in the blood-serum, and its levels was significantly ($p<0.05$) increased when feeding on R1 or R3 than R2. The average daily fat corrected milk (FCM 3.5%) yield was the highest ($p<0.05$) with R3 (22.2 kg/h/d) than feeding on R1 or R2 (17.89 and 17.22 kg/h/d, respectively),but without significant effect, while the net energy (NE_L Mcal/kg milk) value was higher significantly ($p<0.05$) when feeding on R1 or R3 (0.639 and 0.656 Mcal/kg milk respectively) than feeding on R2 (0.539 Mcal/kg milk). On the other hand fat yield increased ($p<0.05$) when feeding on R3 (0.778 kg/d) than feeding on R1 or R2 (0.586 and 0.494 kg/d respectively). Regarding the milk composition, the total solids (TS), fat, total N, protein and non casein nitrogen (NCN)% were significantly ($p<0.05$) increased when feeding onR1 or R3 than feeding on R2. The whey protein nitrogen (WPN) or whey protein (WP) concentrations were increased ($p<0.05$) when feeding on R1or R3 than feeding on R2, while casein % decreased ($p<0.05$) when feeding on R3 than feeding on R1 or R2. The highest value of production efficiency was that recorded with R3 while the lowest value was with R1. The highest return was also obtained when feeding on R3, while feeding on R1 or R2 showed negatively effect on the return.

Keywords: lactating cows, ground corn grains, rice straw, milk yield, production efficiency

INTRODUCTION

Forage quality is usually sufficient to support normal levels of production early in the growing season. However, as forages mature they increase in fiber content and decrease in protein and digestibility. Consequently, low quality forages often require some form supplementation to maintain desired levels of production.

Forage consumed by cattle vary in quality due to differences in species, maturities, seasons, and management. When quality is low, forages alone may not support desired rate of animal performance. In such cases, it is necessary to supplement with protein and energy. The many combinations of forage and supplements intake it difficult to determine the most economical supplementation program (Moore and Kunkle, 1995).

The nutrient requirements of dairy cattle are well documented and readily available to producers. Thus a supplementation program can be defined as a program that provides the difference between the nutrients required by the cattle and the nutrients provided by the low-quality forage (Bohnert and Delcurto, 2003).

Most energy supplements consist of grains (starch based) or fermentable fiber. Supplementating low-quality forage with grains can depress forage intake and digestibility by increasing the proportion of starch digesting bacteria and decreasing the number of cellulose (fiber) digesting bacteria within the rumen. Results have been variable, but supplementation within grains at 0.4% of body weight has generally not depressed the intake and digestibility of low-quality forage by cattle. The maximum level of grains supplementation believed to minimally affect forage intake and digestibility is 0.8% of body weight (Bohnert and Delcurto, 2003).

Cereal grains are often considered for supplementing cows fed low-quality forage due to their relatively inexpensive cost. Also, another consideration when using cereal grains in this manner is that they may be used to actually limit the intake of low-quality forage, this may be an advantage when there is a limited supply of forage and conservation is indicated (Wiedmeier *et al* 2001).

The main objective of this study was to evaluate, the effect of partially substituting of concentrate feed mixture (CFM) by ground corn grains fed together with rice straw on milk production and composition, some blood constituents, feed efficiency and economic efficiency with lactating Friesian cows.

MATERIALS AND METHODS

This study was conducted at El-Karada Animal Production Research Station, Animal Production Research Institute, Agricultural Research Center, Ministry of Agriculture and Department of Animal Production, Fac. of Agric., Mansoura University during the year 2003.

Five lactating Friesian cows were used in "swing-over" design as described by Lucas (1956), Abou Hussein (1958). The average body weight was about 480 kg, All animals were in the 2^{nd} to 4^{th} lactation season. The experiments were running during the peak production for the animals. The animals were individually fed according to NRC (2001) recommendations, based on their live body weight and milk yield (requirements for maintenance were 1% of LBW concentrate +1% of LBW roughage and requirements for lactation were ½ Kg concentrate per 1Kg milk yield).

The cows were fed the following rations:

R 1: ration 1 : 69 % concentrate feed mixture (CFM) + 31 % rice straw (RS) (as a control ration).

R 2: ration 2 : 62 % CFM +7 % ground corn grains (GCG) + 31 % (RS).

R 3: ration 3: : 55 % CFM +14 % (GCG) + 31 % (RS).

The experimental rations were formulated to be almost iso-nitrogenous, iso-caloric and contained about 12.2-13 % crude protein and 2.14 to 2.24 Mcal / kg as recommended by Ørskov *et al.* (1972) to ensure maximal rate of fermentation in the rumen.

The animals were offered twice daily the concentrate feed mixture (CFM) fed with or without ground corn grains (GCG) firstly, while rice straw was offered after consumption of the concentrate. Mineral blocks (5kg weight) were available for all animals free choice at all time and the content of minerals and vitamins in the blocks as recommended by the company of (Biomix-333) for lactating cows. Drinking fresh and clean water was available at all time. The chemical composition of tested ingredients and the tested rations were showed in part 1 (Maklad 2006).

The intake of rations by cows were fixed and calculated as the percentage of roughage to concentrate ratio (Table 1) to satisfy their maintenance and production requirements (Ghoneim, 1967). The animals were milking by machine twice daily at the morning and evening, about 0.5% of the total milk yield produced were taken for analysis from each animal individually during the experimental periods of the tested rations. The daily fat, lactose content was assessed as described by Barnett and Abdel-tawab (1957), protein, SNF, NCN, NPN, CN, casein, WPN and WP percentage was determined during the experimental periods. In the middle day of each experimental period a daily representative samples were taken at morning and evening then mixed in proportion to yield. The chemical analysis of milk samples were determined according to Ling (1963).

Blood samples were taken from each animal individually during the experimental periods of the tested rations. These samples were taken at 3 hrs post-feeding from jugular vein. Blood samples were immediately separated by centrifugation at 4000 r. p. m. for 10 minutes. The serum samples was stored at (–20°C) until analysis were done. The analysis included total protein (Gornall *et al*, 1949), albumin, (Hill and Wells, 1983); globulin, (calculated by differences between the total protein and albumin concentrations), urea, (Freidman *et al.*, 1980); creatinine, (Ullmann, 1976); Glucose, (Teuscher and Richterich, 1971), GOT and GPT, (Reitman and Frankel, 1957).

Statistical analysis:.

The statistical analysis was performed using the least squares method described by Likelihood programmer of SAS (1994). Blood parameters, average monthly milk yield, chemical composition of milk and average monthly milk fat yield were subjected to one way analysis of variance according to the following model:

$Y_{ij} = \mu + T_i + e_{ij}$

Where: Y = Observation of the tested factor

μ = Overall mean T_i = Treatment effect e_{ij} = Error

The differences among means were carried out according to Duncans New Multiple Range Test (Duncan, 1955).

RESULTS AND DISCUSSION

The results in Table (1) showed the average daily dry matter intake of each experimental rations in which were in accordance with those of Hagemeister *et al*, (1981) who reported that the greatest utilization of energy for microbial protein synthesis has been suggested when diets contained approximately 30% roughage and 70% concentrate. In addition Sanson *.et al* (1990) showed that the decrease in intake of low quality roughage did not occur until the level of corn in the supplement reached , 0.75% of BW . This implies a positive associative effect due to correcting a N deficiency in the rumen and indicates the importance of differentiating the type of concentrate fed as supplement with low quality forages .

Table (1): Average daily dry matter intake of concentrate and rice straw by dairy cows.

Items	Ration 1	Ration 2	Ration 3
Average $BW^{0.75}$ (kg)	102	102	102
Roughage : concentrate ratio ratio	31 : 69	31 : 69	30 : 70
Daily dry matter intake			
Concentrate feed g/ kg $BW^{0.75}$ /d gMixture (CFM) Kg/h/d	144	129	123
Corn grains (CG) g/ kg $BW^{0.75}$ /d	0	15	29.5
Total concentrate g/ kg $BW^{0.75}$ /d	144	144	152.5
rice straw (RS) g/ kg $BW^{0.75}$ /d	65	65	64
Daily feed units intake			
DMI g/ kg $BW^{0.75}$ /d	209	209	216.5
TDNI g/ kg $BW^{0.75}$ /d	132	126	136
CPI g/ kg $BW^{0.75}$ /d	27.3	26.3	26.7
TDN: CP ratio	4.70^{b}	4.80^{b}	5.03^{a}
DCPI g/ kg $BW^{0.75}$ /d	16	15	16

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

The results of feed units based on the results of the first of this series (Maklad, 2006) by cows indicated that feed units intake as TDN, CP, DCP and ME (Mcal /kg) were s shown in Table (1). Such values were recommended and sufficient for local dairy cows and generally for ruminants of medium production level (Ministry of Agriculture, Egypt, 1996).

The CPI g/ kg $BW^{0.75}$ /d values were ranging between 26.3 to 27.3. Ration nutrient balance is important for cows to be efficient and avoid wastage of nutrients. High level of protein and low to moderate energy and / or nonfiber carbohydrates (needed for microbial cell production) will result is excess nitrogen being excreted. The CPI g/h/d for cows with average BW 500 kg and 20 kg milk yield per day was ranged from 2700 to 2800, as recommended by NRC (2001).

Data in table (2) showed that there were no significant effects on serum total protein concentration when animals were feeding on R1, R2 and R3. The obtained values were in the normal range, but the highest values were recorded with R1 and R3 (7.61 and 7.21 g/100 ml, respectively), and the lowest value was with R2 (6.13 g/100 ml). The same trends were observed with albumin and globulin concentrations. The values for serum creatinine concentrations were in the normal range (1–2.7 mg/100ml) as reported by Mohamed and Selim (1999), and it is level was significant $p<0.05$) increased when animals with R3 than R1 but there was no significant between R1 and R2 or R2 and R3. Urea-N concentration ranged from 18.03 to 25.75 mg/100 ml in the serum, and its level was significantly ($p<0.05$) increased when animals were feeding on R1 or R3 than R2. the concentration of Urea-N in blood and milk is affected not only by dietary intake of digestible crude protein in the rumen but also by balance between energy and protein in the diet (Hoffman and Steinhofil, 1990). Moore and Kunkle(1995) reported that supplements generally (but not always) improved animal performance. In many studies , performance was not increased as much as was expected from the amount of supplement fed. In a few studies, however, performance increased more than was expected. The reasons for the unexpected effects of supplements on animal performance are that forage intake and TDN may either be increased or decreased. The effects on intake and TDN depend on the quality and composition of the forage, as well as the composition and amount of the supplement. The negative associative effect was found when the concentrate was more than 50% of the total dry matter intake (Mehreze et al, 1983), so there were no significant effect on the TDN values of the presented study because of roughage : concentrate ratio among the rations did not increased than 1: 1

The TDN: CP ratio ranged from 4.68 to 4.95 for the experimental rations. Bohnert and Delcurto (2003) reported that the dietary ratio of TDN to CP (TDN: CP) is often used to evaluate the energy and protein balance of forage diets. A ratio of about 4: 1 is assumed to maximize forage intake. Most research suggest that protein supplementation may be needed when the TDN : CP ratio is greater than 6 : 1 to 8 : 1.

Increasing the intake of DCP or digestible CP/MJ of metabolizable energy increases the urea content in blood and milk (Grings *et al.*, 1991). Feeding a balanced diet was found to reduce the concentration of urea in milk.

The serum glucose ranged between 50.55 to 57.4 mg/100 ml with different rations. The mean value showed that the concentration was not significantly affected by increasing the proportion corn grain, however the lower values were recorded when were fed on R2 or R3 (51.77 and 50.55 mg /100 ml, respectively) than feeding on R1 (57.4 mg/100 ml).

Fouad *et al.* (2002) found that the increase in plasma glucose may be attributed to the increase of carbohydrate metabolism and the increase the rate of intestinal glucose absorption.

Data concerning milk yield and its composition are presented in Table (3). The average daily fat corrected milk (FCM 3.5%) yield was the highest with feeding on R3 (22.21 kg/h/d) than feeding on R1 or R2 (17.89 and 17.22 kg/h/d respectively), but there were no significant effect of the treatments, while the NE Mcal/kg milk was higher ($p<0.05$) when feeding on R1 or R3 (0.639 and 0.656 Mcal/kg milk) than feeding on R2 (0.539 Mcal/kg milk).

Table (2): Effect of experimental rations on some blood serum parameters

Items	Experimental rations		
	Ration 1	Ration 2	Ration 3
Total protein (T.P.) g/100ml	7.61	6.13	7.21
Albumin (A) g/100 ml	4.26	3.93	3.99
Globulin (G) g/100 ml	3.35	2.20	3.22
Creatinine (Cr) mg/100 ml	1.37^{b}	1.43^{ab}	1.63^{a}
Urea-N mg/100 ml	25.75^{a}	18.03^{b}	25.20^{a}
GOT IU/L	58.25	56.67	67.00
GPT IU/L	24.00	23.67	23.50
GOT/GPT ratio	2.43	2.39	2.85
Glucose (mg/100 ml)	57.4	51.77	50.55

a, b, c and d : Means within the same raw with different superscripts are significantly different (P<0.05).

On the other hand, the fat yield was increased (p<0.05) when feeding on R3 (0.778 kg/d) compared to feeding on R1 or R2 (0.586 and 0.494 kg/d respectively). Improving of nutrients composition, its digestibility and the feeding value of R3 as TDN/CP ratio (5.1) than R1 or R2 (4.71 and 4.78 respectively) (Maklad 2006a) were reflect on the more FCM and fat yield produces by cows. Abou Hussein *et al* (1992) suggested that milk yield was elevated with increasing glycogenic energy supply from the readily fermentable carbohydrates in the diet.

regarding the milk yield and its composition Table (3) milk total solid (TS), fat, total N, protein and non casein nitrogen (NCN) % were significantly (p<0.05) increased when feeding on R1 or R3 than feeding on R2. These results were related to blood metabolites for CP and urea-N in the serum for cows fed the same rations. The whey protein concentration was increased (p<0.05) when feeding on R1 or R3 than feeding on R2, while casein-N% decreased (p<0.05) when feeding on R3 than feeding on R1 or R2.

Wachirapakorn (2004) reported that most dairy cows raised by small-holder farmers in Thailand are cross breeds between Holstein-Friesian and Zedu breeds. Most of them produce around 2500 to 3000 kg per lactation. Average milk production of dairy cows is 11 kg /day with 3.95% fat, 3.1% protein, 4.51% lactose, 8.76% solids-non-fat and 12.68% total solids. Milk yield and milk composition are affected by several factors. Rice straw plays a crucial role as a roughage source in dairy systems farmers used rice straw not only in the dry season but also in the rainy season. Due to low nutritive values of rice straw, supplementation of concentrate is necessary to increase nutrient intake to meet animal requirements. Separate feeding of roughage and concentrate is concentrate is commonly practiced.

Feeding on roughage to concentrate ratios are in the range of 40: 60 to 20: 80. This feeding practice resulted in increase of milk production. Data from 24 research works have been analyses to determine correlation between feeding practice and milk yield and composition. It was found that dry matter intake was highly correlated to milk yield, but negatively correlated to milk protein. High roughage ration was negatively correlated to milk yield and milk lactose. On the other hand, it was positively correlated to milk fat and milk protein. Crude protein content of diet did not have any effect on milk composition, while high rumen degradable protein (RDP) in diet decreased milk protein and also total solids. Bohnert and Delcurto (2003) suggested that, providing energy supplements at greater than 0.5% of BW should be discouraged if the goal is to optimize beef cattle production from low-quality forage. Owens et al (1986) showed that, between 18 to 42% of dietary starch from corn passed from the rumen intact. The potential for starch digestion in the small and large intestine is important in predicting nutrient availability to the animal.

Table (3): Effect of feeding lactating cows on experimental rations on milk yield and some chemical composition of milk.

Items	Experimental rations		
	Ration 1	Ration 2	Ration 3
Total solids (T.S%)	11.53^{b}	10.66^{c}	12.22^{a}
Fat%	3.08^{a}	2.34^{b}	3.48^{a}
Lactose%	4.49^{a}	4.35^{ab}	4.21^{b}
Total N	0.504^{a}	0.428^{b}	0.476^{a}
Protein%	3.23^{a}	2.73^{b}	3.04^{a}
Solids non fat (SNF%)*	8.41	8.68	8.81
Non casein nitrogen (NCN%)	0.185^{a}	0.091^{b}	0.187^{a}
Non protein nitrogen (NPN%)	0.039	0.040	0.004
Casein nitrogen (CN%)**	0.319^{ab}	0.337^{a}	0.288^{b}
Casein%***	2.04^{ab}	2.15^{a}	1.84^{b}
Whey protein nitrogen (WPN%)****	0.146^{a}	0.057^{b}	0.147^{a}
Whey protein (WP%)*****	0.933^{a}	0.365^{b}	0.939^{a}
Milk yield kg/day	19.41	21.28	22.17
FCM****** kg / day	17.89	17.22	22.21
Fat yield kg/h/day	0.586^{b}	0.494^{b}	0.778^{a}
Protein yield kg/h/day	0.623	0.581	0.669
Lactose yield kg/h/day	0.869	0.924	0.931
NE (Mcal / kg)	0.639^{a}	0.539^{b}	0.656^{a}

a, b and c : Means within the same raw with different superscripts are significantly different (P<0.05). * Solids non fat (SNF%) = TS – fat

** Casein nitrogen (CN%) = TN – NCN *** Casein% = CN * 6.39

**** Whey protein nitrogen% (WPN%) = NCN – NPN ***** Whey protein (WP%) = WPN * 6.39

****** FCM : Average of dairy production of calculated 3.5% fat corrected milk (Kg/day) = 0.432 x milk (kg) + 16.23 x fat (kg) (Britt *et al.*, 2003).

******* NE (Mcal / kg) = (0.0929 x Fat%) + (0.0547 x Protein%) + (0.0395 x Lactose%) (NRC, 2001).

Wachirapakon (2004), reported that increasing feed intake and the resulting increase in energy, can increase milk protein content by 0.2 to 0.3 %. Also, increased feeding frequency of low fiber, high grain diets increases milk fat levels. The greatest increase occurs in diets of less than 45% forage and when grain is fed separately as in parlor feeding.

Harris and Bachman (1988) showed that, feeding extra energy to high producing cows may increase the SNF by about 0.2% units. For example, when increasing levels of concentrate feeding, SNF increased from 8.3 to 8.6%. A higher SNF content in milk is easier to maintain under good feeding and management practices. Feeding for peak production tends to reduce the possibility of a SNF problem since energy intake is more closely associated with the SNF content of milk. Early lactating cows can be fed more liberally because high producing cows are more profitable. Underfeeding total digestible nutrients (TDN) or net energy will reduce milk production, SNF and protein yeilds. The best approach is to feed more energy in early lactation in order to attain peak production. Starch is one of the principal energy sources, it is a glucide which, according to its structure, will more or less quickly be degraded by the microorganisms of the paunch. For example, the wheat or barley starch degraded will be quicklier in the paunch than that of the corn grain. The maximum level of starch recommended in the rations is between 22% and 25% of the total dry matter. In the rations very rich in concentrates, one will use starches with slow degradation preferably. An excess of starch will raise protein and will penalize the fat without counting the medical risks due to chronic acidosis. These reports were in agreement with our present results about the feeding system and milk yield and composition when corn grain was increased in the rations.

Data in Table (4) showed the feed efficiency of the feeding on R1, R2 and R3. The highest value of production efficiency was recorded with R3 however the lowest value was with R1.

Table (4): Feed efficiency with lactating cows fed the experimental rations.

Item	Ration 1	Ration 2	Ration 3
DOM%	61.59	59.84	60.98
MEI (Mj/d)	194.25	185.58	200.79
*ME $(Mj/d)_{increment}$	64.10	61.24	66.26
**ME_m (Mj/kg)	0.985	0.957	0.976
***ME_m (Mj/d)	21.05	20.46	21.72
****ME_p (Mj/d)	109.10	103.88	112.81
****ME_p (Mcal/d)	26.09	24.84	26.99
*****NE_p (Mcal/d)	16.80	16.00	17.37
******Milk(FCM)kg/d (calculated)	25.08	23.88	25.93
Milk(FCM)kg/d (observation)	17.89	17.22	22.21
*******Production efficiency	71.33	72.11	85.65

DOMD% , MEI (Mj/d) Maklad (2006) *ME $(Mj/d)_{increment}$ = 33% of MEI VanDeHaar (1998)
$^{**}ME_m$ (Mj/kg) = 0.016 * DOMD McDonald *et al* (1995) *ME_m (Mj/d) =ME/kg*DMI**
******ME_p (Mcal/d) = TME - $ME_{increment}$ - ME_m *****NE_p (Mcal/d) = MEp * 0.644 Moe (1981)**
******** Milk(FCM)kg/d (calculated)= NE_p (Mcal/d) / 0.67 NRC(1989)**
********* Production efficiency% =FCM kg/d / FCM kg/d (calculated)**

The results of return (profit L.E), showed that the highest return was obtained when feeding on R3, while feeding on R1 or R2 showed negative return , as a result of the price of feeding was more than the price of output in these rations when feeding to lactating cows.

In conclusion, it could be concluded that the replacement of amounts of the concentrate feed mixture in lactating cow rations at 14% of total DMI/day course ground corn grain are often considered for supplementing cows fed low-quality roughage.

Such replacement resulted in improving milk production, feed conversion and economic efficiency.

Table (5): Economic efficiency with lactating cows fed the experimental rations.

Item	Ration 1	Ration 2	Ration 3
Average daily feed consumption (as fed)			
Concentrate feed mixture, kg (CFM)	16.67	14.93	14.27
Corn grains , kg	0	1.73	3.4
Rice straw, kg	7.33	7.33	7.33
Average daily milk production			
Fat corrected milk Kg FCM	17.89	17.22	22.21
Price of FCM daily yield (LE)	23.79	22.90	29.54
Cost of total daily feeds intake / cow	24.81	24.57	25.43
Profit (LE) as total feed / cow	- 1.02	- 1.67	4.11
Economic efficiency %	- 4.11	- 6.78	16.18

a, b and c : Means within the same raw with different superscripts are significantly different ($P<0.05$).

Market price Pt./kg of : Concentrate feed mixture = 107.5 FCM = 133
Corn grains = 94 RS = 7.8

REFERENCES

Abou-Hussein, E.R.M. (1958). Economical feeding of dairy cows and buffaloes for milk production in Egypt Ph.D. thesis, Fac. Of Agric. Cairo University.

Abou-Hussein, E.R.M.; Sabbah M. Allam ; M.A. Hanafy and E.M. Soliman (1992). Urea and source of energy versus concentrate mixture in the rations of lactating cows. J. Agric. Sci. Mansoura Univ., 17(3): 468-477.

Allaire, F.R. and C.S. Thraen (1985). Prospectives for genetic improvements in the economic efficiency of dairy cattle. J. Dairy Sci. 68: 3110 .

Barnett, A. J. and AbdEl-Tawab (1957). A rapid method for determination of lactose in milk and cheese. J. Sci. Food Agric. 8: 437.

Bath, D.L. (1985). Biological requirements for economic efficiency . Nutritional requirements and economics of lowering feed costs. J. Dairy Sci., 68: 1579.

Bohnert, D. and T. Delcurto (2003). Fundamentals of supplementing low-quality forage. Oregon State University.

Britt, J.S. , R.C. Thomas , N.C. Speer and M.B. Hall (2003). Efficiency of converting nutrient dry matter to milk in Holstein herds . J. Dairy Sci., 86: 3796 .

Duncan, D.B. (1955). Multiple Range and Multiple F Test. Biometrics, 11:10.

Fouad, R.T.; T.A. Deraz and S.A. Attia-Ismail (2002). A feeding strategy of lambs to increase nutrient utilization and reduce feed cost . J.Agric. Sci. Mansoura Univ., 27 (3): 1381- 1392.

Freidman, R. B.; R. E. Anderson; S. M. Entire and S. B. Hinshberg (1980). Clin. Chem. 26.

Ghoneim, A. (1967). Animal Nutrition, Principles and Feeding-stuffs 2nd Edt. Anglo.. Egyptian Library, University. (Arabic Text Book).

Gornall, A. C., Bard will and M. M. David (1949). Determination of total serum protein. J. Biol. Chem., 177: 751.

Grings, E.E. , R.E. Roffler and D.P. Deitehoff (1991). Response of dairy cows in early lactation to additions of cottonseed meal in alfalfa based diets. J. Dairy Sci. 74 : 2580 .

Hagemeister, H.; W. Lupping. and W. Kaufmann. (1981). Microbial protein synthesis and digestion of the high yielding cows. (C.F. Clark *et al.*, 1992; J. Dairy Sci., 75: 2304).

Harris, B. and K. C. Bachman(1988). National and Management Factors affecting Solids Not-Fat, acidity and Freezing Point of milk. Dairy Science Department, Florida, Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida.

Hill, P. G. and T. N. Wells (1983). Ann. Clin Biochem., 20: 265.

Hoffman, M. and O. Steinhofel (1990). Possibilities and restriction in using milk urea concentrations as markers of energy and protein balance . Mh. Vet. Med. 45: 223.

Ling, E.R. (1963). A Text Book of Dairy Chemistry. 2nd Ed. Academic Press, New York and London, 1.

Lucas, H. (1956). Switch back trails for more than tow treatments. J. Dairy Sci., 99:146.

Maklad, Eman H. M. (2006a). Effect of partial replacement of concentrate feed mixture by corn grains fed together with rice straw for lactating Friesian cows. 1- Nutrients digestibility, nutritive value and some rumen liquor parameters of the rations. J. Agric Sci ., Mansoura Univ. (31): 641

McDonald, P. Edwards, R. A. and Greenhalgh, J. F. D. (1995). Animal Nutrition 5th Edition.

Ministry of Agriculture (1996). Ministerial decision No. 1498/1996 for Regulation, manufacturing, handling and control of feedstuffs. Ministry of Agriculture, Egypt.

Mohamed, H.A. and H.M., Selim (1999) Hand book of Veterinary Internal Medicine . Department of Animal Medicine , Faculty of veterinary medicine , Zagazig Univ.

Moor, J. E. and W. E. Kunkle (1995). Improving forage supplementation programs for beef cattel. Pp. 65-74. in 6th Annual Florida Ruminant Nutrition Symposium, Gainesvaille.

Moe, P. W. (1981). Energy metabolism of dairy cattle. J. Dairy Sci. 64: 1120.

NRC (National Research Council), (1989). Nutrient Requirements of Dairy Cattle, Sixth Revised Ed. Update. Washington, D. C.: National Academy press.

NRC (National Research Council), (2001). Nutrient Requirements of Dairy Cattle, 7th rev. ed. National Academy Sci., Washington, DC.

Ørskov, E.R.; C. Fraser and I. McDonald (1972). Digestion of concentrates in sheep.4. The effects of urea on digestion, nitrogen retention and growth in young lambs. Br. J. Nutr., 27:491.

Owens, F.N. , R.A. Zinn and T.K. Kim (1986). Limits to starch digestion in the ruminant small intestine. J. Anim. Sci., 63: 1634 .

Reitman, A. and S. Frankel (1957). A colorimetric method of determination of s.GOT and s.GPT. American J. of Clinical Pathology, 28: 56.

Sanson, D.W., D.C. Clanton and I.G. Rush (1990). Intake and digestion of low quality meadow hay by steers and performance of cows on native range when fed protein supplements containing various levels of corn. J. Anim. Sci. 68: 595 .

SAS Institue (1994). SAS / STAT R User's Guide : Statistics. Ver. 6.04, Fourth Edition SAS Institute Inc, Cary, NC.

Siest, G., J. Henny and F. Schiele (1981). Interpretation des examens de laboratories, Kargered, 206.

Teuscher, A. and R. Richterich (1971). Schweiz. Med. Woschr. 101: 345.
Ullmann, K. (1976).Bonitz. Med. Labor., 29:137 .
VanDehaar, M.J. (1998). Efficiency of nutrient use and relationship to profitability on dairy farms. J. Dairy Sci., 81: 272.
Wachirapakorn, C. (2004). Feeding strategies and milk composition in dairy cows, Department of Animal Science, Faculty of Agriculture, Khon Kaen University, Khon Kaen 40002, Thailand.
Wiedmeier, R. D., Zobell, D. R. and Burrell, C. (2001). Feeding and supplementation of low-quality forage as an alternative for wintering beef cows. Department of Animal Dairy and Veterinary Science, Utah State University.

تأثير احلال حبوب الاذرة جزئيا محل مخلوط العلف المصنع مع التغذية على قش الأرز على

٢- انتاج اللبن ، قياسات الدم والأستفادة الغذائية فى الأبقار الفريزيان الحلابة.

إيمان حنفى محمود مقلد*، حسين محمد الشافعى عيد**، رشاد ابراهيم هنداوى الاحول**
* قسم إنتاج الحيوان ،كلية الزراعة ، جامعة المنصورة.
** معهد بحوث الانتاج الحيوانى ، مركز البحوث الزراعية.

اجرى هذا البحث بهدف دراسة تأثيرزيادة الطاقة فى كرش الابقار الفريزيان الحلابة بتغذيتها على حبوب الاذرة جزئياباحلالها جزئيا (٧ أو ١٤%) محل مخلوط العلف المصنع على كل من انتاج اللبن ومكوناته وبعض قياسات الدم والأستفادة الغذائية والكفاءة الأقتصادية

تم تكوين ثلاثة علائق على النحو التالى :

(عليقة اولى) ٦٩ % علف مصنع +٣١% قش ارز (عليقة كنترول).
(عليقة ثانية) ٦٢ % علف مصنع +٧% حبوب ازرة مجروشة +٣١% قش أرز.
(عليقة ثالثة) ٥٥ % علف مصنع +٧% حبوب ازرة مجروشة +٣١% قش أرز.

تم استخدام خمس بقرات فيريزيان حلابة بطريقة العودة الى ذى بدء لدراسة تأثير تلك العلائق على انتاج اللبن ومكوناته وبعض قياسلت الدم وكانت مدة كل تجربة تستغرق ٣١ يوم (١٦ يوم تمهيدى ، ١٥ يوم رئيسى) وتم تسجيل اللبن مرتين يوميا مع أخذ عينات للتحليل من اللبن والدم فى اليوم الاوسط من الدور الرئيسى.

وكانت اهم النتائج المتحصل عليها كما يلى :

١- تشير قياسات الدم إلى زيادة تركيز اليوريا نيتروجين معنويا (٠,٠٥) ٧,٧١عند التغذية على العليقة الاولى والثالثة مقارنة بالعليقة الثانية.
٢- ازداد متوسط الإنتاج اليومي للبقرة من اللبن المعدل الدهن ٣,٥% عند التغذية على العليقة الثالثة مع احلال الاذرة بنسبة ١٤ % من العليقة الكلية بالمقارنة بباقى المجموعات ولكن لم يكن التاثير معنوى حيث كانت متوسطها (٢٢,٢ كجم / للرأس / يوم) مقارنة بالعليقة الأولى والثانية (١٧,٨٩ ، ١٧,٢٢ كجم / للرأس / يوم على الترتيب).
٣- ازدادت الطاقة الصافية لكل كجم لبن معنويا (٠,٠٥) عند التغذية على العليقة الاولى والثالثة (٠,٦٣٩ ، ٠,٦٥٦ ميجا كالورى/كجم لبن)مقارنة بالتغذية على العليقة الثانية (٠,٥٣٩ ميجا كالورى/كجم لبن) .
٤- ازدادت مكونات اللبن معنويا (٠,٠٥) من المركبات الصلبة الكلية ، الدهن ، البروتين ، النيتروجين الكلى عند التغذية على العليقة الاولى والثالثة مقارنة بالعليقة الثانية، كما زاد ايضا نيتروجين بروتين الشرش ، بروتين الشرش معنويا (٠,٠٥) مع التغذية على العليقة الاولى او الثالثة مقارنة بالعليقة الثانية بينما انخفض الكازين معنويا (٠,٠٥) عند التغذية على العليقة الثالثة مقارنة بالعليقة الاولى والثانية.
٥- تحسن معدل التحويل الغذائى (الأستفادة الغذائية) عند التغذية على العليقة الثالثة مقارنة مع العليقة الاولى والثانية وكان اعلى عائد اقتصادى عند تلك العليقة بينما لوحظ ان العائد الاقتصادى سالب بالتغذية على العليقة الاولى والثانية .

وتوصى الدراسة انه يمكن فى الظروف المماثلة لهذه التجربة تغذية أبقار الفريزيان الحلابه خلال فترة الانتاج العالى على علائق تحتوى على حبوب الاذرة المجروشة بنسبة ١٤% من المادة الكلية اى (٠,٧% من وزن الجسم) بجانب العلف المصنع حيث وجد أن هذه الخلطة هى الأفضل غذائيا" وإنتاجيا" وإقتصاديا".