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EFFECT OF PARTICALLY SUBSTITUTING OF CONCENTRATE FEED MIXTURE BY CORN GRAIN FED WITH AMMONIATED RICE STRAW AND BENTONITE SUPPLEMENT ON:
2. MILK YIELD AND BLOOD PARAMETERS OF LACTATING FRIESIAN COWS.

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ABSTRACT

The effect of substitution of concentrate feed mixture (CFM) by yellow corn fed along with ammoniated rice straw plus bentonite ration of lactating cows on their performance for milk yield and composition as well as blood metabolities was investigated. Twenty lactating Friesian cows with body weight ranging from of 450 to 620 kg were used in this study. All animals were in the 2nd to 4th lactation season. Cows were randomly distributed into five similar groups for days after calving (four animals each). The exprementa! period lasted for 140 days after calving (20 weeks). the experimental rations were formulated as follows :G 1 : Control : 70 % concentrate feed mixture (CFM) + 30 % rice straw (RS), G 2 : ration 1 : 70 % (CFM) + 30 % ammoniated rice straw (ARS) +bentonite (B) , G 3 : ration 2: 65 % (CFM) +5% ground corn grain (GCG) + 30 % (ARS) +(B), G 4 : ration 3 : 60 % (CFM) +10% (GCG) + 30 % (ARS) +(B) and G 5: ration 4 : 55 % (CFM) +15% (GCG) + 30 % (ARS) + (B) .These proportions were chosen to achieve approxmitley iso nitrogenous ration containing about 12-13% CP.

The obtained results showed that urea-N concentration for blood serum ranged from 17.5 (ration 3) to 31.8 (control) mg/100 ml and its levels was significantly ($p<0.05$) decreased by increasing replacement corn grain in the ration 3 & 4 . The serum glucose cocentration ranged between 44.6 to 59.2 mg/100 ml with different rations and its level was significantly ($p<0.05$) decreased by increasing replacement corn grain, compared with the control and ration 1. The average daily fat corrected milk (FCM) yield was the highest ($p<0.05$) with group fed ration 4 (24.2 kg/d), when compared with the other rations. The persistency period with replacement corn grain and bentonite supplementation was longer than both the control or ration 1.The solids non fat (SNF%), protein yield (kg/d) and lactose yield (kg/d) were increased ($p<0.05$) with increased the replacement of corn grain and bentonite supplementation, based on the average values, the highest ($p<0.05$) was with the ration 4 compared with the other rations.The net energy of ration (NE_D Mcal/kg) values were significantly ($p<0.05$) higher with ration 4 (1.8 Mcal/kg) than with the other rations, but the net energy (NE_L Mcal/kg milk) value was not significantly different among treatments and the highest value was recorded when feeding on ration 1 (0.615 Mcal/kg milk) but the lowest value was with ration 4 (0.574 Mcal/kg). The feed conversion (NE_L/NE_D) values were significantly ($p<0.05$) increased with the control or ration 1, compared with the other ones and the lowest value was noticed with the ration 4 (31.88%) .The highest value of feed cost was estimated with ration 4, but the lowest value was with the control . The highest value of the total output as the price of fat corrected milk (FCM) was recorded with feeding ration 4, but the lowest value was with the control . The results of return (profit L.E) , showed that the highest return was obtained when feeding on ration 4, followed by ration 1 and the lowest was with ration 3.

Keywords: lactating cows, ground corn grains, ammoniated rice straw, bentonite, milk yield

INTRODUCTION

In Egypt, there is a growing competition for land used for arable farming and cash cropping. Ruminant production is often on the basis of crop residues high in fiber, of low digestibility and poor in many essential nutrients. Future challenges are to find ways to improve digestibility and to find suitable supplements to eliminate their deficiencies. Intensive ruminant production like for instance with dairy cows is only possible on the basis of high quality feeds. Roughages still play an important role, but because the intake of roughages is limited increasing amounts of concentrate are being used .Priority has shifted from feeding the rumen to feeding the whole animal. In addition, attention increases more toward host and nutrients, which escape microbial degradation in the rumen, such as rumen escape starch and protein (Preston and Leng, 1987).

The known principles of ruminal adaptation suggest that increasing grain feeding toward the end of the period should decrease the risk for sub acute ruminal acidosis (SARA) in early lactation periods. These results suggest that high dry matter intake is a more important risk factor for SARA than ruminal adaptation problems in dairy herds.

The rumen microbial system alters the nutrients finally made available to the animal converting fibrous carbohydrate, sugars, starch and soluble protein to microbial cells, short chain organic acids and waste products in the form of methane, carbon dioxide and heat. The critical issue for the animal is the ratio of protein (from microbial and dietary origin) to energy yielding substrates (the P/E ratio expressed as g protein/Mj and energy from volatile fatty acids available for metabolism), since this determines efficiency and level of productivity, (Bird and leng, 1985).

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

MATERIALS AND METHODS

The experimental work of 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 years 2003-2005.

Twenty lactating Friesian cows from the herd of the station with body weight ranging from of 450 to 620 kg were used in this study. All animals were in the 2[nd] to 4[th] lactation season. Cows were randomly distributed into five groups (four for each group) to study the effect of feeding graded levels of corn grains as a source of starch to substitute concentrate feed mixture with ammoniated rice straw rations on some blood parameters , milk production and its composition. All groups 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 1/2Kg concentrate per 1Kg milk yield). The experimental period lasted for 140 days (20 weeks) after calving.

Five experimental rations were formulated as follows:

G 1 : Control : 70 % concentrate feed mixture CFM + 30 % rice straw RS.

G 2 : ration 1 : 70 %CFM+30 % ammoniated rice straw ARS+(3% bentonite B of dry matter intake) .

G 3 : ration 2: 65 % CFM +5% ground corn grain GCG + 30 % ARS +3%B.

G 4 : ration 3 : 60 % CFM +10% GCG + 30 % ARS +3%B.

G 5: ration 4 : 55 % CFM +15% GCG + 30 % ARS + 3%B.

The experimental rations were formulated to be almost iso-nitrogenous and contain about 12.5-13.5% crude protein as recommended by Ørskov *et al.* (1972) to ensure maximal rate of fermentation in the rumen.

Management of feeding

The concentrate feed mixture (CFM) fed with or without ground corn grain (GCG) was offered firstly at morning, while untreated or treated rice straw was offered after consumption of the CFM+GCG. Drinking fresh and clean water was available at all times.

Blood parameters:

Blood samples were taken at the end of the last month of experiment from the jugular vein of dairy cows at 3 hrs post-morning feeding. Blood samples were separated by centrifugation at 4000 r.p.m for 10 minutes. The serum samples were frozen at –20°C until analysis for total proteins, (Doumas *et al.*, 1981); albumin, (Hill and Wells, 1983); globulin, by deference (TP% - albumin%); urea, (Freidman *et al.*, 1980); creatinine, (Ullmann, 1976); Glucose, (Teuscher and Richterich, 1971) and GOT and GPT, (Reitman and Frankel, 1957).

Milk yield and sampling:

Animals were mechanically milked. Milk yield was recorded individually twice daily for each cow and about 0.5% of the total milk yield was taken for analysis from each animal individually during the experimental periods (proportionate sample from morning and evening milking) of both control and four tested groups at the end of every four weeks . The analysis included fat, total proteins, lactose, total solids (TS) and solids non-fat (SNF) in milk. The chemical analysis of milk samples was carried out according to Ling (1963).

Economic evaluation:

Economic efficiency was calculated according to the following formula :

$$\text{Economic efficiency} = \frac{\text{Price of daily milk yield}}{\text{Daily feed cost}}$$

Statistical analysis:.

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 Duncan s New Multiple Range Test (Duncan, 1955).

RESULTS AND DISCUSSION

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 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.

Concerning blood metabolites, data in Table (2) showed that the highest serum total protein concentration ($p < 0.05$) 8.32 g/100 ml was recorded with control ration, while the lowest value ($p < 0.05$) was noticed with ration 4 (7.19 g/100 ml), but the differences among rations 1, 2, 3, 4 were not significant. Urea-N concentration ranged from 17.5 to 31.8 mg/100 ml in the serum, and its level was significantly ($p<0.05$) decreased by increasing the replacement corn grain in the ration 3 & 4 compared with the control or ration 1&2. The concentration of urea 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 Steinhofel 1990). Increasing the intake of digestible CP 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 44.6 to 59.2 mg/100 ml with different rations. the mean value showed that the concentrate was significantly ($p < 0.05$) decreased by increasing the replacement corn grain, compared with the control and ration 1. Fouad et al (2002) found that the increase in plasma glucose may be attributed to the increases of carbohydrate metabolism and the increase the rate of intestinal glucose absorption.

Landau et al. (1993) showed that lower blood glucose concentrations were associated with lower levels of concentrate supplementation and decrease milk production rates. However, the lower glucose concentrations during the first two months of lactation suggest that the combination of increased utilization of glucose for milk lactose synthesis. These results were in agreement with Abdel–Raouf et al (1994) who found that, supplying bentonite or clays to ureated ration decreased blood serum urea than ureated ration . These also, agreed well with those of Aiad (1990), Abd El-Baki et al. (1992), Nowar et al. (1993), El-Hakim et al. (1994), Hassona et al. (1995), Galal (1997) and Ahmed (1999).

Table (1): Average daily dry matter intake of concentrate, rice straw, ammoniated rice straw with or without bentonite supplementation by dairy cows

Items	Control	Ration 1	Ration 2	Ration 3	Ration 4
Average body weight (kg)	476.7	530.0	606.7	540.0	513.3
Roughage : concentrate	30 : 70	30 : 70	30 : 70	30 : 70	30 : 70
Bentonite g/h/d	0.00	630	690	700	740
Daily dry matter intake					
Feed Mixture (CFM) Kg/h/d	13.30	14.56	15.03	13.77	13.24
Corn grain (CG) Kg/h/d	0.0	0.0	1.15	2.29	3.60
Total concentrate Kg/h/d	13.30	14.56	16.18	16.05	16.84
Rice straw (RS) Kg/h/d	5.75	0.0	0.0	0.0	0.0
3%Ammoniated rice straw strawstraw(ARS) Kg/h/d	0.0	6.30	7.01	6.95	7.20
Daily feed units intake					
DMI Kg/h/d	19.05	20.87	23.18	23.01	24.04
TDN%	73.81^{b}	69.67^{b}	72.78^{b}	69.89^{b}	78.36^{a}
TDNI Kg/h/d	14.05^{d}	14.52^{cd}	16.86^{b}	16.10^{b}	18.83^{a}
NE_D Mcal* / kg DMI	1.688^{b}	1.587^{b}	1.663^{b}	1.592^{b}	1.800^{a}

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

*** NE_D (Mcal / kg) = (TDN% x 0.0245) – 0.12 (NRC, 2001)**

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

Items	Experimental rations				
	Control	Ration 1	Ration 2	Ration 3	Ration 4
Total protein (T.P.) g/100ml	$8.32{\pm}0.23^{a}$	$7.50^{b}{\pm}0.12$	$7.83^{ab}{\pm}0.38$	$7.39^{b}{\pm}0.13$	$7.19^{b}{\pm}0.11$
Albumin (A) g/100 ml	3.37±0.16	3.35±0.16	2.94±0.09	3.31±0.25	3.35±0.18
Globulin (G) g/100 ml	4.95±0.18	4.15±0.22	4.89±0.42	4.08±0.22	3.84±0.24
Creatinine (Cr) mg/100 ml	$1.83^{b}{\pm}0.13$	$1.87^{b}{\pm}0.08$	$1.97^{a}{\pm}0.09$	$2.01^{a}{\pm}0.07$	$1.98^{a}{\pm}0.11$
Urea-N mg/100 ml	$31.8^{a}{\pm}0.63$	$23.0^{cb}{\pm}1.32$	$26.0^{b}{\pm}1.45$	$17.5^{d}{\pm}1.19$	$21.1^{cd}{\pm}1.91$
GOT IU/L	$50.3^{a}{\pm}1.76$	$43.7^{b}{\pm}1.20$	$45.3^{b}{\pm}1.33$	$36.7^{c}{\pm}0.88$	$38.0^{c}{\pm}1.0$
GPT IU/L	$18.3^{b}{\pm}0.88$	$11.7^{c}{\pm}0.33$	$22.3^{a}{\pm}1.45$	$19.0^{b}{\pm}0.58$	$24.3^{a}{\pm}1.20$
GOT/GPT ratio	$2.76^{b}{\pm}0.21$	$3.75^{a}{\pm}0.13$	$2.04^{c}{\pm}0.08$	$1.94^{cd}{\pm}0.10$	$1.57^{d}{\pm}0.04$
Glucose (mg/100 ml)	$59.2^{a}{\pm}0.83$	$56.0^{a}{\pm}2.16$	$44.6^{b}{\pm}2.25$	$51.9^{ab}{\pm}3.87$	$45.4^{b}{\pm}2.08$

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

Data concerning milk yield and its composition are presented in Table (3) and illustrated in Fig 1&2. The average daily fat corrected milk (FCM) yield was the highest (p<0.05) with group fed ration 4 (24.20 kg/d), compared with the other rations, however improving of nutrients composition, its digestibility and the feeding value of ration 4 were reflect on the more FCM produced by cows fed that ration which had abut 4.74 kg/d more 3.5% FCM than the control ration. It should be mentioned that the persistency period with the replacement corn grain and bentonite supplementation groups was longer than those fed the control or ration 1. Abou Hussein et al (1992) suggested that milk yield was elevated with increasing glycogenic energy supply from the readily fermentable carbohydrates in the diet. Ahmed et al (1982) showed that the NPN supplementation is compatible with high milk yield. Kirilove et al (1994) showed that the diet which supplemented with bentonite or clays increased milk production of dairy cattle especially in the first and second months of lactation .

Regarding the milk composition , (Table 3) , milk TS , fat, lactose and protein % did not significantly affect by dietary treatments . The solids non fat (SNF%), and lactose yield (kg/d) were increased (p<0.05) with increased the replacement of corn grain and bentonite supplementation, based on the average values, the highest (p<0.05) was with the ration 4 compared the other rations. Roussel et al (1992) suggested that feeding on forage contained sodium bentonite increased milk content of total solids, solids non fat, protein and lactose contents.

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

Items	Experimental rations				
	Control	Ration 1	Ration 2	Ration 3	Ration 4
T.S%	10.50	10.56	10.37	10.38	9.56
Fat%	3.52	3.56	3.32	3.03	3.00
Lactose%	4.04	4.06	3 98	4.28	4.30
Protein%	2.24	2.27	2.30	2.37	2.31
SNF%	6.98^{b}	7.02^{b}	6.97^{b}	7.35^{a}	7.27^{a}
NE_l (Mcal/kg)*	0.609	0.615	0.591	0.580	0.574
FCM ** kg / day	19.46^{b}	21.52^{b}	21.44^{b}	21.12^{b}	24.20^{a}
Fat yield kg/day	0.688	0.743	0.727	0.744	0.854
Protein yield kg/day	0.435^{d}	0.485^{c}	0.510^{c}	0.590^{b}	0.858^{a}
Lactose yield kg/day	0.785^{d}	0.862^{c}	0.882^{c}	1.060^{b}	1.225^{a}
NE_L/NE_D	36.07	38.75	35.53	36.43	31.88

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

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

**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).

The net energy of ration (NED Mcal/kg) value was significantly (p<0.05) higher with ration 4 (1.8 Mcal/kg) than with the other rations, but the net energy (NEL Mcal/kg milk) values were not significantly different among all treatments and the highest value was recorded when feeding on ration 1 (0.615 Mcal/kg milk) but the lowest value was with rations 4 (0.574 Mcal/kg) . The NEL/NED values were significantly (p<0.05) increased with the control or ration 1, compared with the other ones. The lowest value was noticed with the ration 4 (31.88%).

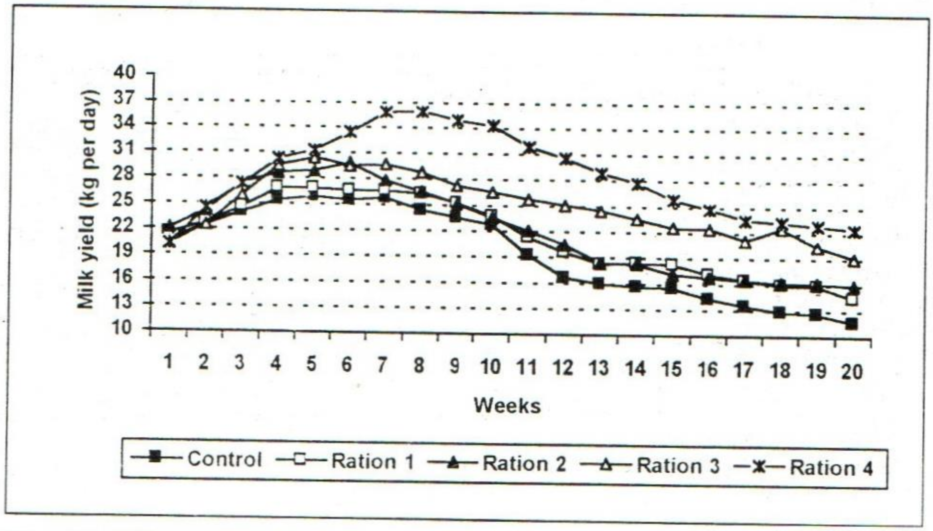

Fig. (1): Effect of feeding the experimental ration on the mean weekly milk yield of the Friesian cows:

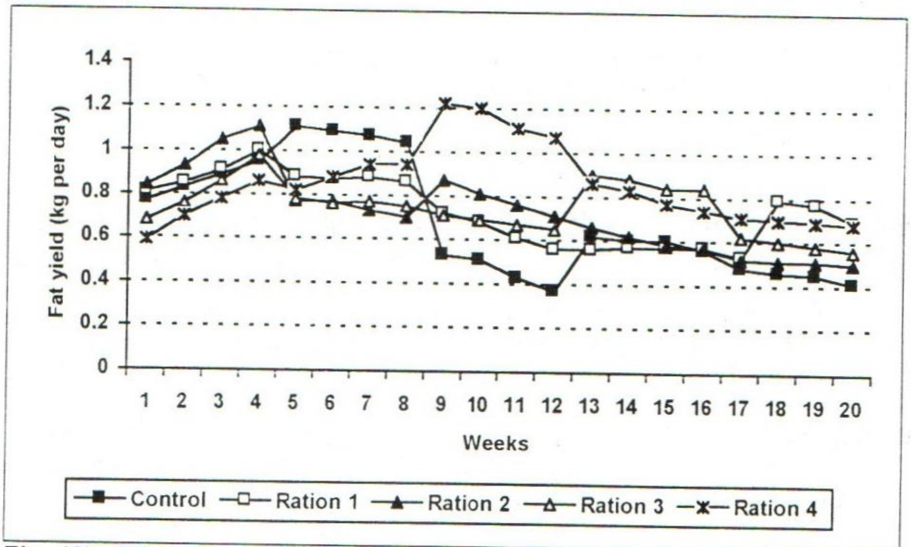

Fig. (2): Effect of feeding the experimental rations on the mean weekly fat yield of the Friesian cows

Data in Table (4) showed that the highest value of feed cost was estimated with ration 4 but the lowest value was with the control one. The highest value of the total output as the price of fat corrected milk (FCM) was recorded with feeding ration 4 but the lowest value was with the control .

The results of return (profit L.E), showed that the highest return was obtained when feeding on ration 4, followed by ration 1 and the lowest was with ration 3.

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

Items	Control	Ration 1	Ration 2	Ration 3	Ration 4
Average daily feed consumption (as fed):					
Feed mixture, kg (CFM)	14.38	15.80	16.0	14.86	14.68
Maize, kg	0.00	0.00	1.23^{c}	2.49^{b}	4.01^{a}
Rice straw, kg	6.16	0.00	0.00	0.00	0.00
Ammoniated Rice straw, kg	0.00	6.93^{b}	7.39^{ab}	7.43^{ab}	7.88^{a}
Bentonite, kg	0.00	0.635^{b}	0.685^{ab}	0.693^{ab}	0.735^{a}
Average daily milk production					
Fat corrected milk Kg FCM	19.46^{b}	21.52^{b}	21.44^{b}	21.12^{b}	24.20^{a}
Price of FCM(LE)	25.88^{b}	28.62^{b}	28.52^{b}	28.08^{b}	32.19^{a}
Cost of total feeds	15.93^{c}	18.15^{b}	19.61^{ab}	19.57^{ab}	20.88^{a}
Profit (LE) as total feed	9.94	10.47	8.91	8.52	11.32

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 Bentonite = 20 Rice straw = 7.8

In conclusion, yellow corn grain can be supplemented at the rate of 0.7% of BW as a source of energy instead of part of concentrate feed mixture in ration fed with ammoniated rice straw and supplemented by bentonite (3% of dry matter intake) of lactating cows

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

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تأثير إحلال حبوب الأذرة جزئيا محل مخلوط العلف المصنع مع التغذية على قش الأرز المعامل بالأمونيا وإضافة البنتونيت على : ٢- قياسات الدم وانتاج اللبن فى ابقار الفريزيان الحلابة

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اجرى هذا البحث بهدف دراسة تأثير زيادة الطاقة المتاحة فى كرش الابقار الحلابة بتغذيتها على حبوب الأذرة باحلالها بنسب مختلفة (٥ ، ١٠ ، ١٥ %) محل مخلوط العلف المصنع على كل من قياسات الدم وانتاج اللبن ومكوناته. تم تكوين خمس علائق على النحو التالى :

(مجموعة المقارنة) ٧٠ % علف مصنع + ٣٠% قش أرز غير معامل.
(عليقة اولى) ٧٠ % علف مصنع +٣٠% قش أرز معامل بـ ٣% أمونيا+٣% بنتونايت.

(عليقة ثانية) ٦٥ % علف مصنع + ٥% حبوب أذره مجروشة +٣٠% قش أرز معامل بـــ ٣% أمونيا + ٣% بنتونايت.
(عليقة ثالثة) ٦٠ % علف مصنع+ ١٠% حبوب أذره مجروشة +٣٠% قش أرز معامل بـــ ٣% أمونيا + ٣% بنتونايت.
(عليقة رابعة) ٥٥ % علف مصنع + ١٥% حبوب أذره مجروشة +٣٠% قش أرز معامل بـــ ٣% أمونيا + ٣% بنتونايت.

واستمرت التجربه لمدة ٢٠ اسبوعاً على خمس مجموعات مـــن ابقـــار الفريزيـــان الحلابـــة (٤ حيوانات بكل مجموعة) وتم تسجيل اللبن مرتين يوميا مع أخذ عينة كل شهر للتحليل وكذلك أخذ عينة دم لاجّراء القياسات المطلوبة عليها وكانت اهم النتائج المتحصل عليها كما يلى :

١. تشير مقاييس الدم (بروتين – جلوكوز –يوريا الدم-GOT) إلى وجود تأثير معنـــوى حيـــث كانت مرتفعه عند التغذية على عليقة المقارنه ، بينما إنخفض معنوياً تركيز الكرياتينين وإنزيم GPT عند التغذية على عليقة المقارنه بالمقارنة بالمجموعة الأخيرة وكذلك فإن تركيز إنـــزيم GPT فى الدم كان مرتفعا مع المجموعة الأخيرة بالمقارنة بباقى المجموعات.
٢. إزداد معنويا متوسط الإنتاج اليومي من اللبن خلال فترة التجربه مع مجموعات إحلال الأذره بالمقارنة بعليقة المقارنة وعلى وجه الخصوص مـــع العليقـــة الأخيـــرة (١٥%حبـــوب أذره) بالمقارنة بباقى المجموعات الأخرى حيث كان متوسطها (٢٨,٥١كجم/اليوم).
٣. إزداد متوسط الإنتاج اليومي من دهن اللبن خلال فترة التجربة مع مجموعات إحـــلال الأذره بالمقارنة بعليقة المقارنه وعلى وجه الخصوص مـــع العليقـــة الأخيـــرة (١٥%حبـــوب أذره) بالمقارنة بباقى المجموعات الأخرى حيث كان متوسطها (٠,٨٥٤كجم/اليوم).
٤. استمرت فترة المثابرة حوالي عشرة أسابيع وبمتوسط إنتاج (٣٣كجم /اليوم تقريبا) وذلك مـــع المجموعة الأخيره (١٥%حبوب أذره) وهى تعتبر الأطـــول بالمقارنـــة ببـــاقى المجموعـــات الأخرى.
٥. لم تتأثر معنوياً مكونات اللبن من المركبات الصلبة الكلية.T.S - الدهن.F – البروتين.P عند التغذية على العلائق المختلفة ، بينما زاد معنويا المركبات الصلبة اللادهنيةSNF وذلك مـــع مجموعات إحلال الأذره (المجموعتين الثالثة والرابعة) بالمقارنة بعليقة المقارنه.
٦. تحسنّ معدل التحويل الغذائى فى صورة المادة الجافة المأكولة بالكجم/كجم لبن معدل الـــدهن عند التغذية على العلائق المحتوية على حبوب الأذره وخاصة" المجموعة الرابعـــة مقارنـــة" بباقى المجموعات الأخرى.

وتوصى الدراسة إنه يمكن فى الظروف المماثلة لهذه التجربة تغذية أبقـــار الفريزيـــان الحلابه على علائق تحتوى على حبوب الأذره المجروشة بنسبة ٠,٧ % من وزن الجسم بجانـــب العلف المصنع وذلك عند التغذية على القش المعامل بنسبة ٣% أمونيا مع إضافة البنتونايت أثناء التغذية حيث وجد أن هذه الخلطات هى الأفضل غذائيا" وإنتاجيا" وإقتصاديا" وبدون اى اثار سلبية على مكونات الدم أو صحة الحيوانات بصفة عامة.