EFFECT OF USING DRIED DISTILLER GRAINS WITH SOLUBLE (DDGS) AS A NEW PROTEIN SOURCE ON MEAT AND MILK PRODUCTION AND THEIR QUALITIES. 2- COMPARATIVE STUDIES TO USE DRIED DISTILLER GRAINS WITH SOLUBLE (DDGS) INSTEAD OF COTTON SEED OR SOYBEAN MEALS AS A SOURCE OF PROTEIN IN RATION OF FATTENING FRIESIAN CALVES.

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SUMMARY

The aim of this investigation was to determine the effect of using dried distiller grains with soluble (DDGS) instead of cotton seed cake or soybean meal as a source of protein in ration formulation of growing crossed Friesian calves .Twenty - four crossed Friesian calves averaging 322 kg live body weight (LBW) were randomly chosen and divided into four groups (6 in each).Animals were received four experimental rations containing concentrate feed mixture (CFM), berseem hay (BH) and rice straw (RS) with rate of 60,25 and 15%,respectively.The CFM of ration B ,C and D contained cotton seed cake, soybean meal and dried distiller grains with soluble (DDGS), respectively as a source of 50% protein. CFM of ration A (control ration) contained the three previous items which gave 50% as a source of protein. The feeding trial lasted about 180 days, in which feed intake, body weight and feed utilization efficiency were determined. Four digestibility trials were carried out using acid insoluble ash (AIA) technique to determine digestibility coefficients and nutritive values of the experimental rations. The results showed significantly ($P<0.05$) increase in digestibility coefficient of all nutrients and feeding values of ration D (containing DDGS). Significantly increased in total and daily gains were observed in animals fed ration D, recording 202.21 and 1.125 kg, respectively. The feed efficiency expressed as kg DM/kg gain was significant ($P<0.05$) higher with ration D, while increasing in feed efficiency as kg TDN or DCP /kg gain was not significant. Moreover, ration D (containing DDGS) recorded the highest net revenue and economic efficiency with the lowest feed cost to get one kg weight gain. At the same time the rumen parameters and blood measurements with using DDGS in ration D showed no adverse effect and the parameters were within normal values. Generally, using DDGS as a source of protein in CFM in crossed Friesian calves rations increased digestibility , feeding values , daily gain, net revenue and decreased feed cost to get one kg gains. Moreover, rumen parameters and liver and kidney function measurements were normal with no adverse effect.

Keyword: *DDGS, feed intake, digestibility coefficients, feeding values, daily gain, economic efficiency, blood and rumen parameters.*

INTRODUCTION

The animal production projects depend on some factors especially available energy and protein resources .Because of the shortage resources of the last ones many attempts have been carried out to solve the problem by usinga new sources of protein and energy.

Dried distiller grains with soluble (DDGS) is one of the sources of protein and energy for feeding meat and milk animals (Shwerab *et. al.,* 2010). DDGS is a co-product of ethanol industry rich in energy and protein (Etman *et. al.,* 2010).This product has been used in many trials as a source of energy or protein in ration formulation of dairy animals,beef steers,heifers and sheep (May *et.al.,* 2009 and Leupp *et. al.,* 2009). Moreover, Etman *et. al.,* (2011) reported that the DDGS can be used with rate of 27% in rations of fattening buffalo calves .In addition, Etman *et. al.,* (2014) showed higher daily gain of growing lambs with using 30% DDGS in ration of sheep. In this respect, El-Shinnawy *et. al.,* (2015) found that the protein replacement (10,

20 and 30%) of soya bean meal and yellow corn by DDGs increased DM intake, digestion coefficient and daily gain and improved economic efficiency with growing buffalo calves.

The objective of the current study was to determine the effect of using DDGs as a source of protein to cover 50% protein of concentrate feed mixture of ration formulation on digestibility coefficients, feeding values, animal performance and economic efficiency with growing crossed Friesian calves.

MATERIALS AND METHODS

This study was carried out in Dina El-Maadawy Station at Cairo Alexandria desert road and Animal House belonging to Animal Nutrition Department of Animal Production Research Institute, Agricultural Research Center, Egypt. Twenty - four crossed Friesian calves averaging 322 kg live body weight (LBW) were randomly chosen and divided into four groups (6 in each) to receive four experimental rations containing concentrate feed mixture (CFM), berseem hay (BH) and rice straw (RS) with rate of 60,25 and15%, respectively. The CFM of ration (A) contained cotton seed cake, soybean meal and dried distiller grains as a source of 50% protein ,while the same previous protein percentage in concentrate feed mixture of rations B,C and D were come from cotton seed cake, soybean meal and dried distiller grains, respectively (Table 1). All animals were fed experimental rations according to Kearl (1982). Daily allowances from experimental rations were adjusted every two weeks based on the change of body weight gains. The CFM was offered to animals twice daily at 8.00 a.m. and 4.00 p.m. followed by berseem hay, while rice straw and fresh water were available during the whole day. The feeding trial lasted about 180 days, in which changes

Table (1): Ingredient of concentrate feed mixture (CFM) containing different sources of protein for experimental rations.

Item	CFM 0f experimental ration			
	A	B	C	D
Ingredients :				
Yellow corn	25	25	25	20
Cotton seed cake	10	29	-	-
Soybean meal 44%	6	-	17	-
Dried distiller grains	9	-	-	28
Wheat bran	20	24	27	30
Rice bran	20	15	15	7
Sugarcane molasses	7	3	13	12
Protected fat	-	1	-	-
Limestone	2	2	2	2
Salt	1	1	1	1

of body weight and feed intake were recorded at two week intervals. Four digestibility trials were carried out using twelve calves (3 in each) to determine the digestion coefficients and feeding value of the different experimental rations using acid insoluble ash (AIA) technique as a natural marker according to Van Keulen and Young (1977). Representative samples of CFM, BH, RS and feces were chemically analyzed according to AOAC (2000). Also, rumen liquor samples were taken from the same animals of digestibility trials after 3hrs. feeding using stomach tube. Each sample of rumen liquor was divided into two parts, the 1^{th} to determine the pH value using Orion 680 digital pH meter and the 2^{nd} part was preserved in dry clean glass bottles with addition of two drops of mercuric chloride to determine total-N, protein-N and NH3-N concentrations according to AOAC (2000). While VFA's concentrations were determined according to Eadie *et. al.*,(1976). Blood samples were also taken from the jugular vein of the same animals of digestibility trials after 3hrs. feeding. They were centrifuged for 15 minutes at 4000 r.p.m. Serum was separated from blood to determine total protein as shown by Cornell *et. al.*, (1949) and albumin as described by Drupt (1974), while the globulin concentration was determined by differences between total protein and albumin.Creatinin concentration was determined according to young (1990). The GOT and GPT concentration as liver function activities were determined as described by Reitman and Frankel (1957), while blood urea –N concentration was determined according to Fawcett and Scott (1960).

Data were statistically analyzed as one way analysis of variance using general linear model (GLM) program of SAS (2000) according to the following model:

$$Yij=\mu + Ti + eij$$

Where: Yij = the observation, μ = Over all means, Ti = effect of treatment, eij = experimental error

The significant differences among means were tested using Duncan multiple range test (Duncan, 1955).

RESULTS AND DISCUSSION

The ingredients of concentrate feed mixture (CFM) for different experimental rations are presented in Table (1).It could be shown that the experimental ration (A) contained cotton seed cake, soybean meal and DDGS as a source of 50% source of protein while the same percentage of protein for rations B, C and D were taken from cotton seed cake, soybean meal and dried distiller grain with soluble (DDGS), respectively. All the CFM for the different experimental rations were almost iso- nitrogenous. The chemical composition of ingredients and CFM for different experimental rations are shown in Table (2). Data showed that chemical compositions of berseem hay (BH), rice straw (RS), cotton seed cake (CSK), soybean meal (SBM) and dried distiller grains with soluble (DDGS) were agreement with those recorded by Etman *et.al.*,(2018). Data presented in Table (2) showed also that the chemical composition of CFM for the different experimental rations were nearly equal in all different nutrients especially CP percentage which recorded 15.44, 15.10, 15.93 and 15.02% CP with rations A, B, C and D, respectively. Consequently, the calculated composition of the different experimental rations were equal in the most of nutrient percentages, showing 90.43 , 90.90 , 90.39 and 90.84 % as OM and 13.55 ,13.35 , 13.85 and13.30 %as CP for rations A,B,C and D, respectively, as shown in Table (3).At the same time ,all experimental rations were isonitrogenous and isocaloric.

Table (2): Chemical composition of ingredient and concentrate feed mixtures.

Item	DM %	Composition of DM (%)					
		CP	EE	CF	NFE	Ash	OM
Berseem hay (BH)	90.80	15.20	3.10	25.14	46.71	9.85	90.15
Rice straw (RS)	91.45	3.25	1.74	45.12	37.84	12.05	87.95
Cotton seed cake (CSK)	90.52	26.10	1.56	25.15	41.25	5.94	94.06
Soybean meal (SBM)	88.26	44.18	1.58	8.03	39.26	6.95	93.05
Dried distiller grains (DDGS)	89.65	27.23	8.12	8.26	48.85	7.54	92.46
Concentrate feed mixture (CFM)							
CFM of ration (A)	91.14	15.44	5.50	8.69	61.53	8.84	91.16
CFM of ration (B)	91.20	15.10	4.48	11.91	60.46	8.05	91.95
CFM of ration (C)	90.85	15.93	4.35	6.52	64.30	8.90	91.10
CFM of ration (D)	90.74	15.02	5.31	6.95	64.57	8.15	9.85

CFM of ration (A) containing cotton seed cake, soybean meal and DDGS as a sources of protein which were contributed together to get 50 % crude protein and each of them was shared with 50% as a source of protein in rations B, C and D, respectively .

***Digestibility coefficients and feeding values**:*

The results of Table (3) showed that the significant (P<0.05) differences among experimental rations in all nutrients digestibility were found. It could be observed that the ration D (containing DDGS) had significant (P<0.05) higher in all nutrients digestibility than the others, recording 89.84, 95.16, 69.95,74.20,65.13 and 73.10%for DM,OM,CP,EE,CF and NFE% digestibility coefficients, respectively. The data recorded that the differences between ration B (containing cotton seed cake) and ration C (containing soybean meal) in all digestibility coefficients except DM digestibility were not significant. However, the ration C showed somewhat higher digestibility coefficients than that of ration B. Generally, the digestion coefficients of all nutrients for ration B, C and D had higher values than those recorded with ration A, showing the highest digestibility coefficients for ration D. The increasing digestibility coefficients for ration

D might be due to its higher CF fractionation and higher level of DDGS as a source of protein as described by Etman *et. al.,* (2014).The results were agreement with those reported by Etman *et. al.,* (2018).

Table (3): Chemical composition, digestibility coefficients and feeding values of different experimental rations.

Item	Experimental ration				Significant
	A	B	C	D	
Calculated composition of experimental rations(DM basis %):					
DM	91.10	89.14	90.93	90.86	
OM	90.43	90.90	90.39	90.84	
CP	13.55	13.35	13.85	13.30	
EE	4.34	3.73	3.65	4.23	
CF	18.27	20.21	16.97	17.23	
NFE	54.27	53.61	55.92	56.08	
Ash	9.57	9.10	9.61	9.16	
Nutrient digestibility coefficients of experimental rations %:					
DM	84.56^{c}	86.84^{b}	88.72^{a}	89.84^{a}	(P<0.05)
OM	90.12^{b}	91.30^{b}	92.14^{b}	95.16^{a}	(P<0.05)
CP	65.25^{b}	65.80^{b}	66.15^{b}	69.95^{a}	(P<0.05)
EE	70.20^{b}	70.85^{b}	70.91^{b}	74.20^{a}	(P<0.05)
CF	58.64^{c}	60.76^{b}	62.83^{b}	65.13^{a}	(P<0.05)
NFE	70.28^{b}	69.95^{b}	70.22^{b}	73.10^{a}	(P<0.05)
Feeding values of experimental rations:					
TDN (%)	64.53^{b}	66.50^{b}	64.92^{b}	68.57^{a}	(P<0.05)
DCP (%)	8.84^{b}	8.78^{b}	9.14^{a}	9.30^{a}	(P<0.05)
* DE (M Cal/ Kg DM)	2.85^{b}	2.84^{b}	2.86^{b}	3.02^{a}	(P<0.05)
** ME (M Cal/ Kg DM	2.32^{b}	2.32^{b}	2.34^{b}	2.47^{a}	(P<0.05))

**DE was calculated according to Church and Pond (1982)*
***ME = DE × 0.82 (NRC, 2001).*
a, b and c: mean in the same row with different superscripts are significantly (P<0.05) differed.

The feeding values of the different experimental rations are shown in Table (3). The results revealed that the ration D was significantly (P<0.05) higher TDN, DCP,DE and ME, being 68.75, 9.30%, 3.02 and 2.47(Mcal/ Kg DM), respectively. The differences in feeding values among rations A,B, and C were not significant, (Table 3). Increasing feeding value of ration D might be due to higher nutrient digestibility coefficients than the others. The results were agreement with those reported by El-Monayer (2015) and Etman *et. al.,* (2014 and 2018). Moreover, Leupp *et. al.,* (2009) observed that increasing and improving of digestibility coefficients and nutritive values of ration containing DDGS might be attributed to higher availability of nutrient contents of DDGS.Generally, ration D(containing DDGS) appeared to have higher nutrient digestibility coefficients and feeding value than the other rations as reported by El-Shinnawy *et. al.*,(2015).

Average feed intake, daily gain and feed efficiency

Results Table (4) obtained revealed that the animals fed ration D (containing DDGS) as a source of protein appeared to higher feed intake than the others, being 9.755, 6.689 and 0.907 kg DM ,TDN and DCP per head, respectively, versus 127.40 , 87.36 and 11.85 gm DM ,TDN and DCP per $w^{0.75}$,respectively. At the same time ,animals fed ration C (containing soybean meal) showed higher DM intake followed by those fed ration A (control ration) and ration B (containing CSK) , as shown in Table (4).Increasing DM intake of ration D (containing DDGS) might be due to higher palatability of DDGS. The significant differences in kg DM intake /kg gain (Table 4) were recorded among different experimental rations, indicating the most efficiency was observed with ration D (containing DDGS), while efficiency as TDN or DCP intake /kg gain among different treatments were not significant. With this respect, the feed utilization efficiency with ration D recorded 8.671, 5.946 and 0.806 kg DM, TDN and DCP per kg gain, respectively, while feed utilization with ration A as kg TDN or DCP per kg gain were the most efficient as shown in Table (4). Generally, the better feed efficiency with animals fed ration D (containing DDGs) was agreement with those reported by Etman *et. al.,* (2014a and 2018) and El-Shinnawy *et. al.* (2015).

Table (4): Effect of treatments on growth performances .

Item	Experimental ration				Significant
	A	B	C	D	
No. of animals	6	6	6	6	
Experimental period (day)	180	180	180	180	
Av. initial LBW (kg)	221.25	224.45	225.18	223.94	
Av. final LBW (kg)	420.14	410.32	422.10	426.35	
Av. total LBW gain (kg)	198.89 [a b]	185.87 [b]	196.92 [b]	202.21 [a]	
Av. daily LBW gain (kg)	1.105[ab]	1.033 [b]	1.094 [b]	1.125 [a]	(P<0.05)
Av. daily feed intakes:					
Kg DM / feed	9.621	9.519	9.708	7.755	
Kg TDN / feed	6.208	6.140	6.302	6.689	
Kg DCP / feed	0.850	0.836	0.889	0.907	
Gain DM / w $^{0.75}$	126.96	126.62	127.23	127.40	
Gain TDN / w $^{0.75}$	81.92	81.67	82.60	87.36	
Gain DCP / w $^{0.75}$	11.22	11.12	11.65	11.85	
Feed utilization efficiency:					
Kg DM / Kg gain	8.707 [b]	7.215 [a]	8.874 [b]	8.671 [b]	(P<0.05)
Kg TDN / Kg gain	5.618 [a]	5.944 [a]	5.761 [a]	5.946 [a]	N S
Kg DCP / Kg gain	0.769 [a]	0.809 [a]	0.813 [a]	0.806 [a]	N S

A and b : means in the same row with different superscripts are significant (P<0.05) differed.
N S: Non Significantly.

Feed cost and economical efficieny

The results of Table (5) showed that the feed cost was 29.678, 28.971, 30.438 and 29.934, L.Efor rations A, B, C and D, respectively. The corresponding values as feed cost perkg weight gain were 26.868, 28.045, 27.823 and 26.608 L.E for the respective rations, indicating the lowest feed cost was shown with ration D (containing DDGS). Accordingly , the net revenue or net revenue /kg weight gain appeared to the highest values with ration D (containing DDGS), being 31.941 and 28.392 L.E, respectively. At the same time, the economic efficiency was 2.048, 1.961, 1.977 and 2.067 with rations, respectively, showing the highest economic efficiency was observed with ration D (containing DDGS). The present results are agreement with those of El-Shinnawy *et. al.*, (2015), Etman *et. al.*, (2018) and Ibrahim (2019).They found that ration contaning DDGS tended to give lower feed cost and highereconomic efficiency.

Table (5): Average daily feed cost and economical efficiency for different experimental rations.

Item	Experimental ration			
	A	B	C	D
Av. daily feed intake, as fed (kg):				
Concentrate feed mixture (CFM)	6.334	6.262	6.412	6.450
Berseem hay (BH)	2.649	2.621	2.673	2.686
Rice straw (RS)	1.578	1.562	1.592	1.600
Av. daily LBW gains (kg)	1.105	1.033	1.094	1.125
Feed cost and economical efficiency :				
* Cost of feed intake (LE/ head)	29.678	28.971	30.438	29.934
Price of LBW gain (LE/ head)	60.775	56.815	60.170	61.875
Daily feed cost/ kg weight gain (LE)	26.858	28.045	27.823	26.608
Net revenue (LE/ head/ day)	31.097	27.844	29.732	31.941
Net revenue / kg LBW gain (LE)	28.142	26.955	27.177	28.392
Economical efficiency	2.048	1.961	1.977	2.067

** Based on the assumption that the price of one ton of berseem hay and rice straw was 2000 and 1000 LE, respectively. The price of concentrate feed mixture sharing in ration A, B, C and D was 3600, 3654, 3665 and 3560 LE, respectively , while the price of one kg weight gain was 55.00 LE.*

Some rumen liquor parameters

The results of ruminal pH, ammonia - N , VFA's, protein – N and NPN concentrations are shown in Table (6). Results showed that no significant differences among different experimental rations in ruminal pH. It could be noticed that the values of pH were within the normal ranges (6.70 - 6.84) as reported by Etman *et. al.,* (2018) and El-Shinnawy *et. al.,* (2015). Results recorded that, the animals fed ration D (containing DDGS) showed small decrease in ruminal pH concentration. The decreasing in pH might be due to the residual strach in DDGS was degraded repidly in the rumen as described by Leupp *et. al.,* (2009).

Table (6): Mean values of some rumen liquor parameters of animals fed different experimental rations.

Item		Experimental ration				Significant
		A	B	C	D	
pH values		6.84	6.81	6.78	6.72	NS
Total VFA's	(meq/ 100ml)	15.96 [a]	15.70 [b]	15.64 [b]	15.20 [c]	(P <0.05)
Total –N	(mg/100ml)	10.24 [b]	10.38 [b]	10.42 [b]	11.25 [a]	(P <0.05)
NH_3 –N	(mg/100ml)	130.32 [b]	132.14 [a]	133.08 [a]	134.64 [a]	(P <0.05)
Protein- N	(mg/ 100ml)	95.35	95.38	95.54	96.12	NS
NPN	(mg/ 100ml)	34.97 [b]	36.76[a]	37.54 [a]	38.52 [a]	(P <0.05)

A and b : means in the same row with different superscripts are significant (P<0.05) differed.
N S: Non Significantly.

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The results obtained in Table (6) showed that the NH3-N contcentration significantly (P<0.05) decreased with ration D (contaning DDGS), being 15.96, 15.70,15.64 and 15.20 mg/100 ml with rations A,B, C, and D, respectively. The replecement of cotton seed cake or soybean meal with DDGS might have resulted in lower of degradable crude protein in the rumen. The results were agreement with those reported by Anderson et al. (2006) who found that a significant decrease in NH3-N concentration with using DDGS in feeding . The difference inVFA,s concentrations was not significant, showing higher (P<0.05) significant with ration D (11.25, meq/100ml). These results were agreement with those reported by Etman et al (2012) and El-Shinnawy et al (2015). They found that the VFA"s concentration with ration contaminating DDGS were 12.42 and 8.77 meg/100ml, respectively. Ration D (contaminating DDGS) showed significant (P<0.05) increase in total VFA"s concentration. The same previous trend was observed with protein – N and NPN concentration, as shown in Table (6). Differences in protein –N were not significant, while NPN concentration showed significantly (P<0.05) higher with ration D (contaminating DDGS).These results were in agreement with those reported by Etman *et. al.,* (2011), El-Shinnawy *et. al.,* (2015) and Etman *et. al.,* (2018).

Blood parameters:

The results of Table (7) showed non significant increase in serum total protein of animals fed ration D (7.28 gm /100 ml). Consequently, higher values in albumin and globulin were observed with animals fed ration D, being 3.94 and 3.34 gm/100ml, respectively. The A/G ratio took the same trend; recording 1.18 with animals fed ration D. Higher concentration of serum total protein might be attributed to improve nitrogen absorption (Kornegay *et. al.,* 1997). This is reflected on total body weight gain. The differences on both AST and ALT among different experimental rations were not significant, as shown in Table (7). However, higher AST and ALT concentrations were found in animals fed ration D (containing DDGS). The previous trend was observed with creatinine, blood urea- N and ratio between blood urea –N and creatinine, So, the liver and kidney functions were not affected by treatments and there were normal for healthy.It cloud be noticed that higher concentration of total protein, albumin and globulin with animals fed ration D (containing DDGS) might be due to improve of nitrogen absorption (Kornegay *et. al.,* 1997) and increase CP digestibility (Yousef and Zaki, 2001).These result are in agreement with those reported by Etman *et. al.,* (2011) who reported that the concentration of blood protein, albumin and globulin tended to increase with increaseing DDGS levels in rations. Generally, the results of blood parameters indicating normal physiological and healthy status of animals. The present results are also similar with those reported by Lopez *et. al.,* (2010), and Etman et. al., (2018).

Table (7): Mean values of some blood parameters of fattening Friesian calves fed different experimental rations.

Item	Experimental ration				Significant
	A	B	C	D	
Serum protein (gm/dl):					
Total protein	7.22	7.18	7.24	7.28	NS
Albumin (A)	3.88	3.89	3.92	3.94	NS
Globulin (G)	3.34	3.29	3.32	3.34	
A/G ratio	1.16	1.18	1.18	1.18	
Liver function :					
GOT (AST), IU/ L	52.30[b]	52.25[a]	52.32[a]	52.38[a]	(P<0.05)
GPT (ALT), IU/ L	15.45[b]	15.40[a]	15.46[a]	15.49[a]	(P<0.05)
Kidney function					
Creatinine (mg/dl)	1.15	1.18	1.22	1.28	NS
Blood urea-N (mg/100ml)	16.30	16.34	16.39	16.42	NS
BUN / Creatinine	14.17	13.85	13.43	12.83	NS

A and b : Means in the same raw with different superscripts are significant (P<0.05) differed.
N S: Non Significantly.
AST = Aspartate amino transferase.
ALT = Alanin amino transferase.
BUN = Blood urea nitrogen

CONCLUSION

It could be concluded that using DDGS with rate of 28% to cover 50% of total protein concentrate feed mixture in ration of fattening crossed Friesian calves improved digestibility coefficient and feeding values. Moreover, animals fed ration D (containing DDGS) showed higher daily gain, more efficiency to get more weight gain and higher net revenue with the lowest feed cost and the best economic efficiency without any adverse effects on rumen and blood parameters.

REFERENCES

Anderson, J.L.; D.J. Schingoethe; R. F. Kalscheur and A.R. Hippen (2006).Evaluation of dried and wet distillers included at two concentrations in diets of lactating dairy cows. J. Dairy Sci.; 89 (8): 3133-42.

AOAC (2000). Association of Official Analytical Chemists. Official Methods of Analysis Washington, D. C., USA.

Church, D. C. and W. G. Pond. (1982). Feedstuffs for animals. In: Basic Animal Nutrition and Feeding. John Wiley and Sons. NY, USA. E

Cornell, A. G.; C. J. Badawill, and M. M. David, (1949). Determination of serum proteins by means of the buriet reaction . J. Biochem., 177: 551.

Drup, E. (1974) .colorimetric determination of albumin . J. Biocology, 9 : 777.

Duncan, D.B. (1955). Multiple range and Multiple F-test. Biometrics, 11: 1-42.

Eadie, J.M.P.; N. Hobson, and S.O. Mann (1976). A note on some comparisons between the rumen content of barley fed steers and that of young calves fed on high concentrate rations. J. Anim. Prod. 9: 247.

El-Monayer, T.I. (2015).Using new protein sources in feeding ruminants. 2- Using guar korma meal in rations of lactating buffalo cows. J. Animal and Poultry Prod. Mansoura Univ., (8): 537-554.

El-Shinnawy, M.M.; K.E.I. Etman, Gihan, M. El-Moghazy and A.M.El-Shinnawy (2015). Efficiency of different levels of dried distillers grains with solubles as replacement for soybean meal and portion of eh corn in a growing and finishing buffalo calves diet. The 15thScientific Conference of Animal Nutrition 17-20 Nov., Vol. 18 (2), Special Issue, Hurghada, Egypt.

Etman, K.E.I.; A.M.M. Zeid and T.I. El-Monayer (2010). Utilization from new nutritional resources in ruminant feeding: 1) Effect of using dried distillers grains with solubles (DDGS) in rations for fattening Friesian calves. J. Animal and Poultry Prod., Mansoura Univ.Vol. 1 (12) 659-669.

Etman, K.E.I.; T.I.El-Monayer; A. M. M. Zeid; I.M. Ebtehag Abou-Elenin and S.K. Sayed (2011).Utilization of new nutritional resources in ruminant feeding: 2) Effect of using dried distillers grains with soluble (DDGS) as protein source in rations for fattening buffalo calves. J. Animal and Poultry Prod., Mansoura Univ. Vol. 2 (6): 201-215.

Etman, K.E.I.; T.I. El-Monayer; S.K.Sayed; F.A. El-Sayed and Mona, E. Farag (2014).Some studies on using different levels of dried distillers grains with solubles (DDGS) on animal performance. 1- Effect of feeding different levels of DDGS as a source of energy on sheep performance. J. Animal and Poultry Prod., Mansoura Univ. Vol. 5 (2): 27-41.

Etman, K.E.I.; I.M. Ebtehag Abou - Elenin, T.I. El-Monayer, and F.A. El-Sayed (2014a).Using new protein sources in feeding ruminants. 1- Effect of feeding different levels of guar korma as a source of protein on the productive performance of Egyptian buffaloes. J. Animal and Poultry Prod., Mansoura Univ.5 (12): 619-634.

Etman, K.E.I.; T.I. El-Monayer, S.K.Sayed, F.A. El-Sayed and A. H. Ghoniem (2018). Effect of using dried distillers grains with solubles (DDGS) as a new protein source on meat and milk production and their qualities. 1- Using dried distillers grains with solubles (DDGS) instead of cotton seed cake or soybean meal in ration of lactating Friesian cows . J. Animal and Poultry Prod., Mansoura Univ. Vol. 9 (3): 197-203.

Fawcett, J. K. and J. E. Scott (1960) .Colorimetric determination of urea . A n. J. clin. Path., B., 155

Ibrahim, S. A. S. (2019). Effect of vitamin E supplementation during late pregnancy on productive performance and immune function in buffalo cows. PH.D. thesis, Fac. Agri., Al-Azhar Univ., Cairo, Egypt.

Kearl, L. C. (1982). Nutrient requirement of ruminants in developing countries. International Feedstuffs Institute, Utan Agric. Expy. Stat., Utan Univ., USA.

Kornegay, E.T.;Z. Wany; C.M. Wood; and M.D.Lindemann (1997).Supplemental chromium piolinate: Influence nitrogen balance, dry matter,digestibility and carcass traits in growing finishing pigs. J. Anim. Sci., 75: 1319.

Leupp, J.L.; G.P.Lardy; K.K.Karges; M.L. Gibson and T.S. Caton (2009).Effect of increasing level of corn distiller dried grains with solubles on intake, digestion and ruminal fermentation in steers fed seventy percent concentrate diets. J. Anim. Sci., 87: 2906.

Lopez, O.C.; R.Bodas; N.Prieto; P.Fruto; S.Andress and F.J. Giralez (2010).Vinasse added to the concentrate for fattening lambs: Intake, animal performance, and carcass and meat characteristics.J. Anim. Sci., 89: 1153-1162.

May, M. L.; M. J. Quinn; B. E. Depenbusch; C. D.Reinhard;L.Gibson; K.K.Karges;N.A. Cole and J.S. Drouillard (2009). Dried distillers grains with solubles reduced corn silage level in beet finishing diet. J. Anim. Sci., Vol. 10: 2527.

NRC (2001) National Research Council. nutrient requirements of dairy cattle, 7th revised. national academic press, Washington, Dc

Reitman, S and S. Frankel (1957).A colorimetric method for determination of serum glutamic oxaloacetic and glutamic pyruvic transminases. Amer. J. Clin. Path., 28:56 – 63.

SAS (2000).Statistical Analysis System, User Guide Staties, SAS Institute Inc Cary n. C. USA.

Shwerab, A.M. ; M. S. Khalel. ; A. A. Hassan. ; Amany, A. Khayyal and M. H. Yacout (2010). Optimizing the use of corn dried distiller grains with soluble in sheep production. Egyptian J. Nutrition and Feed, 13 (3): 415- 431

Van Keulen, J. and B. A. Young, (1977). Evaluation of insoluble as a natural marker in ruminant digestibility

Young, D. S. (1990).Effect of drug on clinical laboratory testes. 3B ed. AACC Press, Washington , D. C. , USA.

Yousef, H.M. and A.A. Zaki (2001).Effect of barley radical feeding on body weight gain and some physiological parameters of growing Friesian crossbred calves.Egyptian. J. Nutrition and Feeds, 4 (special issue): 465-472.

تأثير استخدام منتجات تقطير الاذرة كمصدر بروتيني جديد على انتاج وجودة اللحوم والالبان. 2- دراسات مقارنة لاستخدام منتجات تقطير الاذرة بدلاً من كسب القطن او كسب الصويا كمصدر للبروتين فى علائق تسمين العجول الفريزيان الخليط.

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يهدف هذا البحث الى استخدام نواتج تقطير الاذرة كمصدر بروتيني بدلاً من كسب القطن او كسب فول الصويا فى علائق عجول الفريزيان الخليط النامية وكان مصدر البروتين من نواتج تقطير الاذرة يمثل 50 % من البروتين الكلى للعلف المركز الخاص بالعلائق التجريبية. تم اختيار عدد (24) عجل بقرى فريزيان خليط متوسط وزن 322 كم و قسمت عشوائياً الى اربعة مجموعات (6 في كل مجموعة) وغذيت على علف مركز ودريس برسيم وقش ارز بنسب 60 , 25 , 15% على التوالي كما يلى :

المعاملة	المكونات
المعاملة الاولي	علف مركز+ دريس برسيم + قش ارز
المعاملة الثانية	علف مركز يحتوي على كسب قطن + دريس برسيم + قش ارز
المعاملة الثالثة	علف مركز يحتوي على كسب صويا + دريس برسيم + قش ارز
المعاملة الرابعة	علف مركز يحتوي على DDGS + دريس برسيم + قش ارز

علماً بأن كسب القطن وكسب الصويا و الـ DDGS مصدراً لـ 50% من بروتين العلف المركز للمعاملة الثانية والثالثة والرابعة على التوالي واستمرت التجربة 180 يوماً بجانب ذلك اجرى عدد اربعة تجارب هضم باستخدام 12 عجل (3 في كل مجموعة) لتقدير القيمة الهضمية والغذائية للعلائق التجريبية مع تقدير بعض قياسات الكرش والدم وحساب الكفاءة الغذائية والاقتصادية .

وقد اظهرت النتائج ارتفاع معاملات الهضم ارتفاعاً معنوياً عند مستوى 5 % لكل المركبات الغذائية للمعاملة الرابعة (التي تحتوي على DDGS) كما ارتفعت ايضاً القيمة الغذائية للمعاملة الرابعة ارتفاعاً معنوياً بالنسبة للمعاملات الاخرى . ايضاً اظهرت المجموعة الرابعة التي تغذت على المعاملة الرابعة (التي تحتوي على DDGS) اعلى معدل نمو يومي (1,125 كم) وافضل كفاءه غذائية (8,671 كجم مادة جافة / كيلوجرام نمو) بالإضافة الي ذلك اظهرت المعاملة الرابعة اقل تكاليف غذائية (26,608 جنيهاً) لكل كيلوجرام نمو مع اعلى عائد اقتصادي (31,941 جنيهاً) واعلى كفاءه اقتصادية (2,067) مقارنة بالمعاملات الاخرى. واظهرت بعض مقاييس الكرش والدم انها داخل المعدل الطبيعي دون ظهور اى اثار جانبية .

من نتائج هذا البحث يتبين إنه يمكن استخدام نواتج تقطير الاذرة كمصدر بروتيني جيد بدلاً من كسب القطن او كسب الصويا فى علائق عجول الفريزيان الخليط النامية حيث حسنت من معاملات الهضم وزيادة النمو اليومي مع انخفاض تكلفة التغذية وارتفاع الكفاءة الغذائية والاقتصادية.