

EFFECTS OF GROUND DATE SEEDS AS A PARTIAL REPLCER OF GROUND MAIZE ON NITROGEN METABOLISM AND GROWTH PERFORMANCE OF LAMBS

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ABSTRACT

Digestibility and feeding trials were conducted to investigate the effect of partial replacement of ground date seeds (GDS) to ground maize (GM) on nutritive values, nitrogen metabolism, and lambs growth performance. Four mature Ossimi rams of 40 ± 1.45 kg live body weight (LBW) were used in digestibility trial and sixteen Ossimi growing male lambs had LBW averaged 19.88 ± 0.86 kg were used in group feeding experiment for 120 days. The basal diets used in both experiments formed of concentrate feed mixture (CFM) + wheat straw (WS) where it represent 3% and 1% of LBW, respectively in the control group (D1). In experimental groups, 15, 30 and 45% of ground maize (GM) in (CFM) were substituted by ground date seeds (GDS) for diet 2 (D2), diet 3 (D3) and diet 4 (D4), respectively. The results of the digestibility trial revealed that all replacing rates of GM with GDS was associated with significant increases in CP, EE, CF and NFE digestibilities. The corresponding nutritive value expressed as total digestible nutrients (TDN) and digestible crude protein (DCP) were increased significantly ($P \leq 0.05$) with GDS inclusion in the diets.

There was significant ($P \leq 0.05$) increase in nitrogen balance (NB) with GDS treatments compared to the control group. Also nitrogen absorption (NA) was increased significantly ($P \leq 0.05$) in the diets containing GDS, being 11.90, 12.13, 12.14 and 12.23 g/day for D1, D2, D3 and D4, respectively.

Significant increases ($P \leq 0.01$) were recorded in total body gain and daily gain of lambs fed all diets containing GDS. Total dry matter consumed during the whole feeding period was significantly differed ($P \leq 0.01$) among groups, being 129.84, 135.91, 139.39 and 143.51 kg for D1, D2, D3 and D4, respectively. Feed conversion efficiency

expressed as kg feed / kg gain was in favor to lambs fed D3 (6.49) than those fed either D2 (6.71), D1 (6.83) or D4 (7.18), respectively. The economic evaluation showed improvement ($P \leq 0.01$) due to GDS inclusion in the diets. Accordingly, results indicates that ground date seeds could replace up to 30% of the ground maize in concentrate feeds of sheep without any adverse effects.

Keywords: sheep, ground date seeds, growth performance and nitrogen metabolism.

INTRODUCTION

In recent years, the prices of feed energy sources has increased dramatically with increasing demand for animals' feed. The increase of feed prices encouraged nutritionists to search for cheaper high energy feed ingredients. In Egypt, there is 11.2 million date palm trees . They produce 1.17 million tons of date and 174.93 thousand tons seeds which enrich the agro-industry by a products could be valuable for feeding livestock (Ministry of Agriculture, 2004). Ground date seed is considered of the low grade protein feeds and as important source of energy. It contains 7.0 to 8.0% crude protein and 73.19% TDN (Al-Yousef *et al.*, 1994). In Egypt, during summer season, the available feeds (mainly concentrate feed mixture and straws) cover only 39% and 22% of animal requirements of energy and protein, respectively (El-Serafy, 1991). Replacing 10 to 20 % of concentrate in the ration with date seeds was associated with a non significant decrease in daily gain for growing lambs (AL-Dabeeb, 2005). Moreover, Soliman *et al.* (2006) revealed that rations containing 40 and 60% date seeds as a replacer for ground maize (GM) increased the digestibility coefficients of feed nutrients, daily gain and economic efficiency of lambs. The main objective of this study was to

EFFECTS OF GROUND DATE SEEDS AS A PARTIAL REPLCER OF GROUND MAIZE ON NITROGEN METABOLISM AND GROWTH PERFORMANCE OF LAMBS

investigate the effect of partial replacement of ground date seeds (GDS) to ground maize (GM) in concentrate feed mixture (CFM) on nutritive value, nitrogen metabolism and performance of fattening lambs.

MATERIALS AND METHODS

This work was conducted in the Agricultural Research Institute, Mallawy Research Station, EL-Minia, Mallawy, Egypt, while the laboratory analysis was done in Faculty of Agric., El-Minia University.

Preparation of CFM:

Concentrate feed mixture (CFM1) of the control diet (D1) was consisted of 35% ground maize, 30% undecorticated cotton seed meal, 15% wheat bran, 12% rice bran, 5% molasses, 2% limestone and 1% common salt. All feed ingredients were purchased from the local market. 15, 30 and 45% of ground maize (GM) were replaced (weight by weight on DM basis) by ground date seeds (GDS) in CFM2, CFM3 and CFM4, respectively as illustrated in Table (1). The ingredients of each diet were mixed together and pelleted separately.

Digestibility trials:

Four mature Ossimi rams averaged 40 ± 1.45 kg LBW were used to estimate the digestibility coefficients of diets containing 0, 15, 30 and 45% date seeds instead of portions of GM of the concentrate. Feed offered at rate of 4% of live body weight. Wheat straw covered 1% of live body weight while the remained 3% was covered with the above mentioned concentrate feed mixtures. The experiment was performed in four stages, three weeks each using Latin square design. Animals were kept in individual metabolic cages. Each trial lasted 21 days, 14 days as preliminary period followed by 7 days for total feces and urine collection. Diets were offered twice daily at two equal portions at 09:00 am and 4:00 pm. Fresh water was available all time in front of animals in cages. Minerals and vitamins blocks were hanged in cages to enable animals licking whenever they require. Daily excreted

feces were weighed, sampled (10% of the total daily collection) and dried at $70C^{\circ}$ for 24 hours. At the end of collection period, 7 days, dried fecal samples of each ram were mixed, grind and kept in nylon bags for laboratorial analysis. Daily acidified urine volume was measured, then 5% representative samples were collected and used for urinary N-determination for each animal.

Feeding experiment:

Sixteen growing male Ossimi lambs aged four months and 19.88 ± 0.86 kg LBW initial body weight were used for 120 days. They were divided into four groups each of four animals. Groups 1, 2, 3 and 4 were fed on CFM1, CFM2, CFM3 and CFM4, respectively at rate 3% of body weight + WS at rate 1% of their LBW for all groups. Amounts of feeds were adjusted according to body weight changes every two weeks. Feeds were offered in two equal portions twice daily at 9:00 am and 4:00 pm. Water was freely available along the experimental period. Lambs were weighed every two weeks before morning feeding.

Laboratorial analysis:

Proximate analysis of feeds and feces were carried out according to the AOAC. (1990) for dry matter (DM), crude protein (CP), crude fiber (CF), ether extract (EE) and ash.

Economical evaluation:

Simple economical evaluation was adapted as the difference between feed cost and price of produced body weight gain (BWG) according to the prevailing market price. Prices per ton of CFM1, CFM2, CFM3, CFM4 and wheat straw, on DM basis, were 1050, 1018, 987, 995 and 300 LE, respectively.

Statistical analysis:

Statistical analysis was performed using General Linear Models (GLM) procedure of SAS system (1998).

RESULTS AND DISCUSSION

The ingredients of different concentrates are presented in Table (1). Meanwhile, the proximate

analysis of feed ingredients of the experimental diets (DM basis) are presented in Table (2). Ground date seeds (GDS) is relatively lower in nitrogen free extract (NFE) compared with ground maize (GM) (69.85 vs. 82.65%). Crude protein (CP) content in GDS was relatively lower than GM (7.51 vs. 8.95 %), while ether extract (EE) was slightly higher in GDS (3.12 %) than GM (2.36 %). Crude fiber content of GDS was about 4 times that of GM. Organic matter (OM), crude protein (CP) and ether extract (EE) of CFM1, CFM2, CFM3 and CFM4 were almost the same, while CF was increased and NFE was decreased as the portion of GDS was increased. The percentages of CF were 15.45, 16.07, 16.68 and 17.30 %, while that of NFE were 60.93, 60.26, 59.59 and 58.91 % for CFM1, CFM2, CFM3 and CFM4, respectively. In this respect, Chemical composition of experimental diets indicate that replacement with GDS increased CF, EE and ash contents, but CP and NFE were decreased for GDS containing diets (D2, D3 and D4). It is clear that GM is characterized by less percentages of CF, EE and ash. The present results are in

agreement with those obtained by Awadalla *et al.* (2002) and Soliman *et al.*, (2006).

Table (1): Ingredients in concentrates of different groups(DM base).

Ingredients %	Experimental CFM			
	CFM 1	CFM 2	CFM 3	CFM 4
Yellow maize	35	29.75	24.5	19.25
Date seeds	---	5.25	10.5	15.75
Udicorticated cotton seed meal	30	30	30	30
Wheat bran	15	15	15	15
Rice bran	12	12	12	12
Molasses	5	5	5	5
Limestone	2	2	2	2
Common salt	1	1	1	1
Total	100	100	100	100

CFM1, 2, 3 and 4 = Concentrate feed mixtures fed to groups 1, 2, 3 and 4, respectively.

Table (2): Proximate analysis of feed ingredients of concentrates and experimental diets.

Ingredients	DM	Nutrients % (DM basis)					
		OM	CP	CF	EE	NFE	Ash
Ground maize (GM) •	88.01	97.85	8.95	3.89	2.36	82.65	2.15
Ground date seeds (GDS) •	95.12	96.13	7.51	15.65	3.12	69.85	3.87
Wheat straw (WS) •	89.04	88.12	2.98	33.42	1.25	50.47	11.88
CFM1 °	89.57	91.55	12.87	15.45	2.3	60.93	8.45
CFM2 °	89.94	91.46	12.79	16.07	2.34	60.26	8.54
CFM3 °	90.32	91.37	12.72	16.68	2.38	59.59	8.63
CFM4 °	90.69	91.28	12.64	17.3	2.42	58.92	8.72
Diet 1 °	89.44	90.69	10.4	19.94	2.04	58.31	9.31
Diet 2 °	89.72	90.62	10.34	20.41	2.07	57.8	9.38
Diet 3 °	90	90.56	10.28	20.87	2.1	57.31	9.44
Diet 4 °	90.28	90.49	10.23	21.33	2.13	56.8	9.51

• = Feed ingredients, ° = Concentrate fed mixture and ° = Experimental diets.

DM = dry matter, OM = organic matter, CP = Crude protein, CF = Crude fiber, EE = Ether extract and NFE = Nitrogen free extract.

EFFECTS OF GROUND DATE SEEDS AS A PARTIAL REPLCER OF GROUND MAIZE ON NITROGEN METABOLISM AND GROWTH PERFORMANCE OF LAMBS

Nutrients digestibility:

Digestibility coefficients of DM, OM, CP, CF, EE and NFE are presented in Table (3). Replacing GDS to GM caused insignificant decrease in OM digestibility by increasing date seeds level. The values were 64.54, 63.43, 62.70 and 62.43 % for D1, D2, D3 and D4, respectively. CP significantly ($P \leq 0.01$) increased by replacing GDS to GM regardless the level of replacement. CF and EE showed slight differences due to GDS replacement, digestibility ranged from 40.17 to 41.87% and from 73.4 to 74.7%, respectively. Digestibility of NFE was significantly improved by replacement of GDS, (70.61% for D1 vs. 73.07, 74.32 and 75.25% for D2, D3 and D4, respectively. Abou el-Nasr (1985) indicated that date seeds have an equal nutritive value to barley, but contained a little digestible protein. The main factor limiting the utilization of date seeds are the low intake and digestibility.

Though digestibility coefficients of CP and NFE were significantly increased for diets containing date seeds than control diet but variations is limited (CP ranged from 10.23 to 10.4% and NFE from 56.8 to 58.31% . These results could be attributed to the limited increase of EE in the diets containing date seed (2.07, 2.1 & 2.13 vs. vs. 2.04 for D2, D3 and D4 vs. D1, respectively). Digestibility coefficients of CP and CF were increased by increasing dietary fat

content (Philips et al., 1985 and Abou-El-Nasr and El-Kerdawy, 2003). The greater percentage of CF in GDS (15.65%) compared to GM (3.89%) could affect the texture of digest containing GDS and reduce the out flow rate of rumen contents and its passage along the alimentary tract, which may give better chance for rumen fermentation and intestinal digestion and absorption (Church and Richard, 2005). In this view, the improvement in nutrients digestibility attained due to GDS inclusion could be explained (Table 3).

Nutritive values

Table (3) illustrates the nutritive values expressed as total digestible nutrients (TDN %), and digestible crude protein DCP % of experimental diets. In general, TDN and DCP values showed slight differences due to GDS replacement to GM where TDN ranged from 59.27 to 62.16% and DCP from 74.35 to 76.43%. Significance in difference only showed between D1 and the other three groups ($P \leq 0.01$) for TDN and between D4 and the other three groups ($P < 0.05$) for DCP. Accordingly, the TDN value was improved due to GDS inclusion. The improvement achieved in digestibility of NFE (more by 3.5 - 6.57% than control diet (D1)) was magnified due to that NFE represent more than 57 % of the concentrate feed mixture.

Table (3): Digestibility coefficients and nutritive values of experimental diets fed to lambs.

Digestibility estimates	Diets ©				± SE
	D1	D2	D3	D4	
DM, %	60.38	62.38	60.03	59.51	0.94 ^{NS}
OM, %	64.54	63.43	62.7	62.43	0.92 ^{NS}
CP, %	64.67 ^b	66.43 ^a	66.87 ^a	67.70 ^a	0.52 ^{**}
CF, %	40.17 ^b	40.80 ^{ab}	41.67 ^{ab}	41.87 ^a	0.48 [*]
EE, %	73.40 ^b	74.20 ^{ab}	74.70 ^a	74.50 ^a	0.29 [*]
NFE, %	70.61 ^b	73.07 ^a	74.32 ^a	75.25 ^a	0.77 [*]
Nutritive values					
TDN %	59.27 ^b	60.89 ^a	61.69 ^a	62.16 ^a	0.46 ^{**}
DCP, g/day	74.35 ^b	75.82 ^{ab}	75.90 ^{ab}	76.43 ^a	0.59 [*]
DCP %	10.88 ^b	11.37 ^{ab}	11.54 ^a	11.68 ^a	0.18 [*]

± SE = Standard error, NS = Not significant, * = ($P < 0.05$), ** = ($P < 0.01$).

© Means in the same row with different letters significantly ($P \leq 0.05$) differ.

Nitrogen metabolism:

Results of nitrogen metabolism are illustrated in Table (4). Total crude protein intake (TCPI g/day) and consequently total nitrogen intake (TNI) were gradually and significantly decreased ($P \leq 0.01$) as GDS increased in the diets. TCPI values were 115.00, 114.13, 113.50 and 112.88 g/day and TNI 18.40, 18.26, 18.16 and 18.06 g/day for D1, D2, D3 and D4, respectively. The same trend was recorded for fecal nitrogen (FN), but urine nitrogen was insignificantly decreased as GDS inclusion in the diet was increased. NB was increased as GDS inclusion increased in the diets but difference was significant only between D1 and D4 ($P \leq 0.05$). The biological values (values of N-balance / N-absorbed) were also improved as GDS inclusion was increased. In the digestibility trial, rams fed the control diet had a higher nitrogen intake (NI) (+1.3% only) associated with greater amount of N excreted in the urine and feces compared to the diets containing GDS (Table 4). Accordingly, higher nitrogen absorbed was observed as the GDS increased in the diet. The DCP % of D4 was improved by 7.35 % as compared with D1. This gain may ensure better N digestion and utilization as indicated by the improvement in nitrogen balance / nitrogen absorbed values (biological value) that reached 46.4 % when D4 was compared by control diet (Table 4). Abd El-Rahman et al. (2003) reported that animals fed GDS containing diet had higher NH₃-N in the rumen liquor compared to the control animals. They attributed this to the higher level of DCP in rations containing GDS compared to the control group. In the present study, DCP (g / day) was higher by 1.9, 2.1 and 2.8 for D2, D3 and D4 relative to the control diet (D1).

Feeding experiment:

Data of group feeding experiment are presented in Table (5). Weight gain was increased significantly ($P \leq 0.01$) as GDS proportion was increased in the diet until 30 % of GM replaced, being 19.00, 20.25 and 21.5 kg for D1, D2 and D3

then gain of D4 was less than D4 and above D1 (20.00 kg). Feed conversion efficiency expressed as kg DM intake / kg gain was had nearly the same trend of weight gain. It improved, but insignificantly, until 20% of GM replaced (6.83, 6.71 and 6.49 for D1, D2 and D3, respectively) then became poorer (7.18) for D4 which significantly differ than control group. Average daily gain was higher in the present study for diet containing GDS at 15, 30 or 45 % replacement rates to GM when compared with the control group. Addition of GDS to the growing lambs diets improved the productivity and positively affects animal performance (Abo-El-Nasr 1985, El-Hag et al., 1993; Abd El-Rahman et al., 2003 and Soliman et al., 2006). El-Hag et al., (1993) reported that the addition of discarded dates at the levels of 15 or 25 % of the whole DM of the ration was valuable, which expressed in improved digestible energy (NRC, 2001) and biological value (N-balance / N-absorbed) (Church and Richard, 2005). It is acceptable that total body weight gain will increase too (NRC, 1996). In the present study, the total gain was improved by 13.16 % for D3 that contain 10.5 % date seeds in comparison with the control diet. Moreover, the dry matter consumed in this study was also greater as the GDS was included and it's proportion was increased. Therefore, the total body weight gain was enhanced (Table 5) as anabolic processes. As observed in this study, the feed consumption was enhanced when GDS represented 10.5 % of the concentrate feed mixture. From this study, it can recommend that, no more than bring the proportion of DS replace the yellow corn grain from 20% so as not to adversely affect the nutritive value of feed intake and consequently on the performance of growing lambs.

Results reported here it can be explained in the light of proximate analysis (Table 2) and increasing the digestibility coefficients of CP, EE, CF and NFE (Table 3).

EFFECTS OF GROUND DATE SEEDS AS A PARTIAL REPLCER OF GROUND MAIZE ON NITROGEN METABOLISM AND GROWTH PERFORMANCE OF LAMBS

Table (4): Nitrogen metabolism by sheep fed diets containing different levels of ground date seeds.

Items	Diets ©				± SE
	D1	D2	D3	D4	
Total crude protein intake g / day	115.00 ^a	114.13 ^b	113.50 ^c	112.88 ^d	0.001 ^{**}
Total nitrogen intake g / day	18.40 ^a	18.26 ^b	18.16 ^c	18.06 ^d	0.001 ^{**}
Fecal nitrogen g / day	6.50 ^a	6.13 ^{ab}	6.02 ^b	5.61 ^c	0.19 ^{**}
Nitrogen absorbed g / day	11.90 ^b	12.13 ^{ab}	12.14 ^{ab}	12.23 ^a	0.09 [*]
Urine nitrogen g / day	8.54	7.64	7.37	7.11	0.49 ^{NS}
Total nitrogen excretion g / day	15.04 ^a	13.77 ^{ab}	13.39 ^b	12.94 ^b	0.52 [*]
Nitrogen balance g / day	3.36 ^b	4.49 ^{ab}	4.77 ^{ab}	5.12 ^a	0.51 [*]
Biological value	0.28 ^b	0.37 ^a	0.39 ^a	0.41 ^a	0.04 [*]

± SE = Standard error, NS = Not significant, * = (P < 0.05), ** = (P < 0.01).

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Table (5): Growth performance of lambs fed the experimental rations.

Items	Diets ©				± SE
	D1	D2	D3	D4	
Initial body weight (kg).	19.5	20.25	19.5	20.25	0.86 ^{NS}
Final body weight (kg).	38.5	40.5	41	40.25	1.05 ^{NS}
Total gain (kg).	19.00 ^c	20.25 ^b	21.50 ^a	20.00 ^{bc}	0.35 ^{**}
Total dry matter intake (kg).	129.84 ^d	135.91 ^c	139.39 ^b	143.51 ^a	0.0001 ^{**}
Feed conversion efficiency (kg DM/kg gain).	6.83 ^{ab}	6.71 ^b	6.49 ^b	7.18 ^a	0.12 ^{**}

± SE = Standard error, NS = Not significant, * = (P < 0.05), ** = (P < 0.01).

© Means in the same row with different letters significantly (P ≤ 0.05) differ.

Economic evaluation

Accordingly, feed cost per kg gain and economic efficiency was better with diets containing GDS meals than those fed control diet (Table 6) . These results due mainly to the high cost of unit of weight gain which ranged between 13.94 and 14.93 L.E. for diets containing GDS compared with the control (15.72 L.E.). These results agree with the finding of Soliman *et al.* (2006) and Awadalla *et al.* (2002) who showed that all diets contained GDS scored less price/kg gain when compared to the control group. The diets containing GDS showed higher return by 12.42, 27.26 and 11.33% for D2, D3 and D3 relative to the control group. It was recognized from the economic analysis that increasing replacing rate with GDS to 45% gave poorest results. Yet it is recommended to not replace more than 30% of grain with GDS.

Accordingly, it could be concluded that replacing up to 30% of dietary yellow corn grain in concentrate feed mixture with ground date seeds resulted in better digestibility, daily gain, feed conversion, yet accomplish better return than control diet.

Table (6):Economic efficiency of replacing GM with GDS in lambs' feed.

Items	Diets ©				± SE
	D1	D2	D3	D4	
Dry matter intake (kg):-					
Roughage	32.46	33.98	34.84	35.88	0.0001 ^{NS}
Concentrate	97.38	101.93	104.51	107.63	0.0001 ^{NS}
Total dry matter intake	129.84 ^d	135.91 ^c	139.39 ^b	143.51 ^a	0.0001 ^{**}
Roughage cost (L.E.)	25.97 ^c	27.18 ^b	27.87 ^b	28.70 ^a	0.0001 ^{**}
Concentrate cost (L.E.)	272.66 ^c	275.24 ^a	271.78 ^b	269.16 ^d	0.0001 ^{**}
Total feed cost (L.E.)	298.63 ^c	302.42 ^a	299.65 ^b	297.86 ^d	0.0001 ^{**}
Feed cost/kg gain	15.72	14.93 ^b	13.94 ^c	14.89 ^b	0.0001 ^{**}
Price of wt. gain (L.E.)	570.00 ^d	607.50 ^b	645.00 ^a	600.00 ^c	0.10 ^{**}
Return	271.37 ^d	305.08 ^b	345.35 ^a	302.14 ^c	4.35 ^{**}
Economic efficiency%	90.87 ^d	100.88 ^c	115.25 ^a	101.44 ^b	1.02 ^{**}
Relative EE %	100 ^c	111.02 ^b	126.83 ^a	111.63 ^b	2.08 ^{**}

± SE = Standard error, NS = Not significant, * = (P≥0.05), ** = (P < 0.01).

*Based on year 2014 free market prices of feed ingredients, the cost of experimental rations was estimated as the total prices of ingredients used in the concentrate feed mixture, yellow corn grain, ground date seed and wheat straw, being, 2800, 2500, 600 and 800 L.E., respectively and the price of one kg body weight on selling, 17.0 L.E.

*Economic efficiency $Y = [(A-B)/B]$, where A= selling cost of obtain gain, and B=feeding cost of this gain.

© means in the same row with different letters significantly = (P ≤ 0.05) differ.

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EFFECTS OF GROUND DATE SEEDS AS A PARTIAL REPLCER OF GROUND MAIZE ON NITROGEN METABOLISM AND GROWTH PERFORMANCE OF LAMBS

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تأثير استبدال نوي البلح المطحون بالذره بالعليقه علي تمثيل النيتروجين وأداء الأغنام

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1 محطة البحوث بملوي – المنيا .

2 كلية الزراعة – قسم الإنتاج الحيواني – جامعة المنيا .

والمستخلص الإيثيري والألياف الخام والمستخلص الخالي من الأزوت في المعاملات الثانيه والثالثه والرابعه بالمقارنه بالعليقه الأولي (القياسيه). زيادة القيمة الغذائية معبرا عنها بالمركبات الكليه المهضومه , معادل النشا , البروتين الخام المهضوم بالجرام / اليوم ونسبة البروتين المهضوم زيادة معنويه في جميع العلائق المحتويه علي نوي البلح بالمقارنه بالعليقه القياسيه. إنخفاض المستهلك اليومي من النيتروجين وكذلك النيتروجين الخارج في البول والروث والخارج الكلي اليومي إنخفاض معنويا مع زيادة المحتجز من الأزوت زيادة معنويه بالعلائق المحتويه علي نوي البلح المطحون بالمقارنه بالعليقه القياسيه.

حدثت زياده معنويه في الوزن الحي وكذلك معدل الزيادة اليومي في حالة الحيوانات التي غذيت علي علائق محتويه علي نوي البلح بالمقارنه بمجموعة الكونترول , وقد أظهرت العليقه الثالثه والتي تحتوي علي 30 % نوي البلح أعلي زياده يومية بالمقارنه بباقي العلائق. حدثت زياده في كل من المستهلك من الغذاء اليومي ومعدل تحويل الغذاء بزيادة مستوي نوي البلح بالعليقه. أظهرت المعامله الثالثه 30 % نوي البلح أعلي معدل تحويل غذائي وأقل تكلفه إقتصاديه لإنتاج وحدة واحده من النمو في الأغنام.

من النتائج السابقه يتضح أنه يمكن استبدال حتى 30 % من الذره المجروشه بنوي البلح في تغذية الأغنام حتى يمكن تحقيق أفضل إنتاجيه بأقل تكلفه ممكنه.

أجريت هذه الدراسه بمزرعة محطة البحوث الزراعيه بملوي بهدف دراسة تأثير استبدال جزء من الذره المجروشه بنوي البلح المطحون في عليقه الأغنام علي تمثيل النيتروجين وحيوية الأغنام.

استخدم في الدراسه 4 من ذكور الأغنام الأوسيمي البالغه متوسط وزن حي $40 \pm 1,45$ كيلو جرام لإجراء تجربة هضم , واستخدم في تجربة النمو 16 ذكر أوسيمي في عمر الفطام بمتوسط وزن حي $19,88 \pm 0,86$ كجم وقد تم توزيعهم علي 4 مجاميع بكل مجموعة 4 حيوانات واستمرت التجربه لمدة 120 يوما.

وكانت العلائق المستخدمه في كلا التجربتين هي :-

العليقه الأولي: العليقه القياسيه تحتوي علي مخلوط علف مصنع + 1 % من وزن الجسم الحي تبن قمح.

العليقه الثانيه: وهي نفس العليقه الأولي مع استبدال 15 % من الذره بالعلف المصنع بنوي البلح المطحون.

العليقه الثالثه: وهي نفس العليقه الأولي مع استبدال 30 % من الذره بالعلف المصنع بنوي البلح المطحون.

العليقه الرابعه: وهي نفس العليقه الأولي مع استبدال 45 % من الذره بالعلف المصنع بنوي البلح المطحون.

وكان من أهم النتائج المتحصل عليها مايلي:-

لم يتأثر معامل الهضم للماده العضويه في حين ارتفعت معنويا (مستوي 0.05) معاملات الهضم لكل من البروتين الخام

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