Effect Of Rice Straw Treated With Urea And Molasses On Nutrient Digestibility And Rumen Fermentation Parameters In Sheep

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ABSTRACT

An experiment was conducted to study the effect of feeding sheep on diets contained 4% urea-treated rice straw or 4% urea-treated rice straw with addition of 5% molasses on nutrient digestibility (dry matter, organic matter, crude protein, ether extract, crude fiber, neutral detergent fiber and acid detergent fiber) and rumen fermentation parameters (pH, total volatile fatty acids and ammonia-nitrogen concentration). Six One-year old healthy Baladi rams were used. They were allotted into 3 equal groups and randomly fed one of three experimental diets; control diet contained 60% concentrate mixture and 40% clover hay, and two experimental diets in which clover hay was replaced with 4% urea-treated rice straw or 4% urea-treated rice straw with 5% molasses. Three digestibility trials were carried out and ruminal samples were taken to measure rumen fermentation parameters. Diets contained 4% urea-treated rice straw or 4% urea-treated rice straw with 5% molasses had significant ($P < 0.05$) higher digestion coefficients for dry matter, organic matter and crude protein as compared to the control. Digestion coefficients for crude fiber, neutral detergent fiber and acid detergent fiber were significantly higher for diets contained 4% urea-treated rice straw or 4% urea-treated rice straw with 5% molasses as compared to the control. Total volatile fatty acids concentration was significantly increased in rumen of sheep fed diet contained 4% urea-treated rice straw or 4% urea-treated rice straw with 5% molasses. Also, ammonia nitrogen concentration was significantly increased in rumen of sheep fed contained 4% urea-treated rice straw or 4% urea-treated rice straw with 5% molasses as compared to the control. Based on this study, implications could be made that using 4% urea-treated rice straw with or without 5% molasses provide a practical and effective treatment of low quality roughage as well as its applicability for use under practical conditions.

INTRODUCTION

Recycling of plants by-products and crop residues to be used as animal feed will decrease costs of animal feeding and decrease the environmental pollution. At least million tons of crop residues are produced in Egypt each year; they are collected and considered a big disposal problem. Rice straw as one of the agricultural by-products has low quality due to low content of essential nutrients like protein, energy, minerals and vitamin as well as poor palatability and digestibility. Therefore, the quality of the rice straw needs to be improved in order to increase its utilization by gastrointestinal tract of ruminants *(1)*. Rice straw is one of the main cereal straws which are produced in large quantities and are underutilized as a potential animal feed due to its low nutritive value, poor digestibility and poor palatability *(2)*. Suitable treatment techniques beside nutrient supplementation could result in improved utilization of rice straw with better benefits. Therefore the present work was carried out to study the effect of chemical treatment of rice straw either with urea with or without molasses on nutrient digestibility and rumen fermentation parameters of sheep.

MATERIAL AND METHODS

Preparation of rice straw and experimental diets

About 96 kg of rice straw was chopped into about 1.5-2 cm length. Four kg of urea were dissolved in a suitable amount of water and sprayed on rice straw and the mass was tightly covered with polyethylene plastic sheet for 21 day *(3)*. Another 100 kg of urea-treated rice straw was prepared with addition of 5% molasses *(4)*. Feedstuffs used in formulation of

experimental diets were analyzed according to standard procedures *(5)* as shown in Table 1. A control diet was formulated to contain (46.75% yellow corn, 7% wheat bran, 5.2% soybean meal (44%), 0.25%, dicalcium phosphate, 0.5% Nacl, 0.3% vitamin premix and 40% clover hay). Two experimental diets were formulated where clover hay was replaced with either 4% urea-treated rice straw or 4% urea-treated rice straw with addition of 5% molasses as shown in Table 2.

Digestibility trials

Six one-year old healthy Baladi rams were allocated into 3 equal groups, each group was housed separately in shaded pen (4*4 meter). Three digestibility trails were carried out to determine the feeding value of experimental diets. Each digestibility trail included two sub-periods, the preliminary period (3 weeks) in which the experimental diets were offered to rams at regular time (8 am and 5 pm) and daily feed intake was recorded. The collections period (7 days) in which experimental diets were offered daily and also daily fecal out put was recorded. The moisture content of daily fresh sample of food and feaces was determined in order to calculate the daily feed intake and fecal out put on dry matter basis. A representative sample (about 25%) of fresh feaces was taken every 24 h just after collection. The facal sample of each animal was dried at 65c for 48 h in hot air oven, thoroughly mixed, weighed, ground and kept in suitable bags for subsequent chemical analysis. At the end of experimental period rumen fluid sample was taken at 0, 3 and 6 hours post feeding for 2 successive days. Each sample was strained through four fold of gauze and divided in two portions: the first portion was used immediately for measurement of pH and ammonia nitrogen concentration. The second portion was preserved by addition of 2 ml N/10 H Cl and 1 ml orthophosphoric acid to each 2 ml of ruminal juice for determination of total volatile fatty acids.

RESULTS AND DISCUSSION

Effect of treatments on nutrient digestibility of the diets

The digestion coefficients of different nutrients as affected by adding urea or urea with molasses on rice straw are shown in Table 3. Digestibility coefficient for dry matter in the diet contained 4% urea-treated rice straw wasn't significantly ($P > 0.05$) different from that of the control diet, while digestibility coefficient for dry matter in the diet contained 4% urea-treated rice straw with addition of 5% molasses was significantly ($P < 0.05$) higher as compared to that of the control diet. Diet contained 4% urea-treated rice straw had a significant ($P < 0.05$) higher value of organic matter and crude protein digestibility (74.4% and 71.77% respectively) when compared to those of the control diet. Similarly, diet contained 4% urea-treated rice straw with 5% molasses had significant higher values of OM and CP digestibility compared to control. Urea-treated barely straw fed for sheep significantly increased the apparent digestibility of organic matter and crude protein *(6)*. Moreover, treatment of rice straw with urea 4% and covered with a polyethylene sheet and stored for 14 days increased digestibility coefficient of OM and CP. The effect of long term feeding of sheep with ureated corn stalk with or without addition of 5% molasses on feed intake, ration digestibility, ruminal parameters and some blood metabolites, results revealed that total digestible nutrients and digestion coefficient of DM, OM, EE, NFE and CP didn't show any significant difference *(7)*.

Ether extract digestibility of the diets contained 4% urea-treated rice straw with or without addition of 5% molasses wasn't significantly ($P > 0.05$) different from that of the control one. Digestibility coefficient of NFE in the diet contained 4% urea-treated rice straw wasn't significantly ($P > 0.05$) different from that of the control, while diet contained 4% urea-treated rice straw with addition of 5% molasses had significantly ($P < 0.05$) higher value for digestibility coefficient of NFE as compared to other dietary treatments.

The results showed that crude fiber digestibility coefficient was significantly ($P < 0.05$) higher in diets contained either 4% urea-treated rice straw or 4% urea-treated rice straw with addition of 5% molasses when compared that of the control diet. Digestibility of crude fiber fractions followed the same trend. Digestion coefficient for both NDF and ADF

were significantly ($P < 0.05$) higher for diets contained either 4% urea-treated rice straw or 4% urea-treated rice straw with addition of 5% molasses, when compared that of the control diet. ADF digestibility was increased ($P < 0.05$) with urea molasses mineral block supplementation *(8)*. Feeding of lactating Friesian cows on 50% concentrate feed mixture + 10% clover hay + 40% ammoniated rice straw (3%) had significantly increased ($P < 0.05$) the apparent digestibility of CF, NDF, ADF, cellulose and ADL than feeding on clover hay alone and increase ($P < 0.05$) DCP when clover hay was used or supplemented with ammoniated rice straw than feeding on ammoniated rice straw alone *(9)*. Digestion coefficient of crude fiber fractions (CF, ADF and NDF) were significantly increased with groups fed ureated corn stalk with or without 5% molasses *(7)*.

Improved nutrient digestibility of diets contained urea-treated rice straw alone or with molasses may be attributed to partial solubilization of hemicellulose, lignin and silica and changes in the fragility of parenchymal layers *(10)*, increased accessibility of rumen microorganisms to structure of carbohydrates of cell wall *(1)* or enhanced digestibility of fibrous constituents due to stimulation of cellulytic bacteria in the rumen *(11)*.

Nutritive values of the diets

Data showed that TDN values for diets contained either 4% urea-treated rice straw with or without addition of 5% molasses was significantly ($P < 0.05$) higher than that for the control one Table 3. Digestible crude protein for the diets contained either 4% urea-treated rice straw with or without addition of 5% molasses was significantly ($P < 0.05$) lower than that for the control one but when we compared the total intake of protein between groups, we found that the digestibility for CP of rice straw improved after treatments. Feeding of lactating Friesian cows on concentrate feed mixture and ammoniated rice straw (3%) significantly increased ($P < 0.05$) DCP *(9)*. Moreover, Treatment of rice straw with urea 4% and covered with a polyethylene sheet and stored for 14 days improved the nutritive value (DCP% and TDN %) *(3)*. The addition of 5% molasses to rice straw improved its nutritive value *(12)*.

Rumen fermentation parameters

Data in Table 4 revealed that pH values were above 6 at different sampling times and at zero time. At zero time (before feeding) ruminal pH concentration for sheep fed diets contained 4% urea-treated rice straw had a significant ($P > 0.05$) lower value as compared to those fed diets contained 4% urea-treated rice straw with addition of 5% molasses or the control. Ruminal pH concentration reached a plateau at 6 hours post feeding, during both times ruminal pH concentration wasn't significantly ($P > 0.05$) different in sheep fed either 4% urea-treated rice straw or 4% urea -treated rice straw with addition of 5% molasses compared to those fed the control diet. The results also showed that ruminal pH concentration peaked three hours post-feeding and reached a plateau at 6 hours post feeding, during both times ruminal pH concentration wasn't significantly ($P > 0.05$) different in sheep fed either 4% urea-treated rice straw or 4% urea-treated rice straw with addition of 5% molasses compared to those sheep fed the control diet. Ruminal pH values of rice straw treated with 4% urea decrease up to 3 hours after feeding, then slightly increased up to 6 hours after feeding *(13)*. However, it has been reported that pH was slightly higher in goats fed urea molasses mineral granules and it was 7.22 also that the TVFA concentration was significantly higher and was (10.55 meq /100ml) *(11)*.

Ammonia nitrogen concentration

The results shown in Table 5 revealed that at zero time (before feeding) ammonia-N concentration in ruminal fluid for sheep fed diets contained either 4% urea-treated rice straw with or without addition of 5% molasses were a very significant ($P > 0.05$) when compared to that of sheep fed the control diet. Ruminal ammonia-N concentration peaked three hours post-feeding and reached a plateau at 6 hours post feeding, during both times ruminal ammonia-N concentration was significantly ($P > 0.05$) higher in sheep fed either 4% urea-treated rice straw or 4% urea-treated rice straw with addition of 5% molasses compared to those fed the control diet.

Feeding Frisian cows on 50% concentrate feed mixture + 10% clover hay + 40% ammoniated rice straw (3%) increased the ammonia nitrogen concentration (mg/100ml), it was maximized after 2 hours and then decreased and it was 17.17 at zero time, 24.16 after 2 hours, 18.95 after 4hours, 19.13 after 8 hours *(9)*. This high level of ammonia may be due to higher crude protein intake, deamination of amino acids and increased availability of free ammonia in rumen from feeding urea-treated straw *(14)*.

Total volatile fatty acids

Production in the rumen of sheep fed diets contained urea-treated rice straw with or without molasses is shown in Table 6. At zero time (before feeding) ruminal VFA concentration for sheep fed diets contained either 4% urea-treated rice straw with or without 5% molasses was significantly (P>0.05) lower than that for sheep fed the control diet. Ruminal VFA concentration peaked three hours post-feeding and sheep fed diets contained either 4% urea-treated rice straw with or without addition of 5% molasses had a very highly significant (P>0.05) higher than that for sheep fed the control diet. Six hours post-feeding animals fed diet contained 4% urea-treated rice straw had very significant (P>0.05) lower values of ruminal total VFA as compared to those fed diets contained either 4% urea-treated rice straw with addition of 5% molasses or the control. TVFA concentration (meq/100ml) of lamb fed on urea treated wheat straw (4% urea) with addition of 5% molasses with concentrates was 4.82 at zero time, 8.82 after 3hours, and 7.2 after 6 hours *(15)*.

Also, total VFA concentration increased after feeding reaching their peak at 3 hour, and then decreased at 6 hour post feeding *(13)*.

Table 1. Chemical composition (%) of feedstuffs used in formulation of experimental diets (values are expressed on DM basis).

	Nutrient (%)										
Feedstuff	**OM***	**TDN***	**CP***	***CF**	**ADF***	**NDF***	**EE***	**Ash***	**Ca***	**P***	**NFE***
Rice straw*	88	40	4	40	55	72	1.4	12	0.25	0.08	42.6
Clover hay*	91	53	16	30	38	50	2.4	9	1.27	0.25	42.6
Molasses**	86	75	6	--	--	--	0.8	14	0.9	0.08	79.2
Urea (46% nitrogen)**	100	--	288	--	--	--	--	--	--	--	--
Yellow corn*	98	88	9	2	3	9	4.3	2	0.02	0.3	82.7
Wheat bran*	93	70	17	11	13	46	4.5	7	0.13	1.29	60.5
SBM*	93	84	49	6	10	15	1.6	7	0.38	0.71	36.4
Dibasicph**	6	--	--	--	--	--	--	94	22	18.65	--

* Values are analyzed *(5)*.

Table 2. Physical and chemical composition (%) of the experimental diets.

Feedstuff	Dietary Treatments		
	Control	4% urea-treated rice straw	4% urea-treated rice straw+ 5% molasses
Yellow Corn, ground	46.75	46.75	46.75
Wheat bran	7	7	7
Soybean meal	5.2	5.2	5.2
Dicalcium phosphate.	0.25	0.25	0.25
Nacl	0.5	0.5	0.5
Mineral and vitamin premix**	0.3	0.3	0.3
Clover hay	40	--	--
4% urea-treated rice straw	--	40	--
4% urea-treated rice straw + 5% molasses	--	--	40
Calculated composition			
DM%	88.74	88.87	76.59
OM%	94.38	93.37	93.33
TDN %	71.61	65.77	66.47
CP %	14.35	11.09	11.86
CF %	14.02	17.38	16.58
ADF %	18.03	23.95	22.85
NDF %	28.21	35.86	34.42
EE %	3.37	2.94	2.93
Ash %	5.62	6.63	6.67
NFE %	62.64	61.96	61.96
Ca %	0.60	0.19	0.20
P %	0.41	0.35	0.35

** Each one kg of ASU mineral and vitamin mixture contained 10% S, 5.0 Mg, 3.0% Zn, 3.0% Mn, 3.0% Fe, 0.5% Cu, 0.025% I, 0.015% Se, 0.004% Co, 2200 IU of vitamin A/g, 662 IU of vitamin D/g, and 8 IU of vitamin E/g.

Table 3. The effect of diets contained 4% urea-treated rice straw or 4% urea-treated rice straw with 5% molasses on nutrient digestibility and nutritive values in sheep (mean± SE).

Digestible nutrients	Dietary Treatments		
	Control	4% urea-treated rice straw	4% urea-treated rice straw+ 5% molasses
DM	69.23±0.45^{b}	70.12±0.47^{b}	72.58±0.51^{a}
OM	72.87±0.39^{c}	74.4±0.4^{b}	76.42±0.62^{a}
CP	69.63±0.47^{b}	71.77±0.43^{a}	72.47±0.6^{a}
EE	82.2±0.25^{a}	81.44±0.28^{a}	82.08±0.31^{a}
CF	50.56±1.38^{c}	60.01±0.67^{b}	64.14±0.61^{a}
NFE	77.36±0.32^{b}	77.53±0.41^{b}	79.75±0.73^{a}
NDF	52.83±1.04^{c}	64.55±0.73^{b}	69.72±0.56^{a}
ADF	52.14±1.31^{c}	62.82±0.86^{b}	68.53±0.63^{a}
Nutritive value %			
TDN	72.55±0.37^{b}	73.37±0.38^{b}	74.87±0.49^{a}
DCP	9.88±0.75^{a}	8.35±0.51^{c}	8.73±0.6^{b}

^{abc} Mean in the same row with different superscripts are different at $P < 0.05$.
TDN* = DCP+ DCF + DNFE +DEE x 2.25 *(5)*.

Table 4. The effect of diets contained 4% urea-treated rice straw or 4% urea-treated rice straw with 5% molasses on ruminal pH in sheep (mean± SE).

Time (hour)	Dietary Treatments		
	Control	4% urea-treated rice straw	4% urea-treated rice straw+ 5% molasses
0	7.3±0.04^{aA}	7.05±0.02^{bA}	7.15±0.06^{abA}
3	6.22±0.02^{aC}	6.37±0.06^{aC}	6.22±0.05^{aC}
6	6.67±0.08^{aB}	6.62±0.02^{aB}	6.5±0.04^{aB}

^{abc} Means in the same row with different small superscripts are significantly different at $P < 0.05$.
^{ABC} Means in the same column with different capital superscripts are significantly different at $P < 0.05$.

Table 5. The effect of diets contained 4% urea-treated rice straw or 4% urea-treated rice straw with 5% molasses on ruminal ammonia nitrogen concentration in sheep (mean± SE).

Time (hour)	Dietary Treatments		
	Control	4% urea-treated rice straw	4% urea-treated rice straw+ 5% molasses
0	8.5±0.58^{cB}	18.9±0.04^{aC}	16.1±0.4^{bC}
3	12.25±0.67^{cA}	30.97±0.59^{aA}	26.85±0.69^{bA}
6	10.5±0.40^{cC}	23.1±0.40^{aB}	19.25±0.67^{bB}

^{abc} Means in the same row with different small superscripts are significantly different at $P < 0.05$.
^{ABC} Means in the same column with different capital superscripts are significantly different at $P < 0.05$.

Table 6. The effect of diets contained 4% urea-treated rice straw or 4% urea-treated rice straw with 5% molasses on ruminal total VFA in sheep (mean± SE).

Time (hour)	Dietary Treatments		
	Control	4% urea-treated rice straw	4% urea-treated rice straw+ 5% molasses
0	5.97 ± 0.08^{aB}	5.3 ± 0.15^{bC}	4.3 ± 0.21^{cC}
3	7.75 ± 0.17^{cA}	8.37 ± 0.08^{bA}	9.15 ± 0.15^{aA}
6	6.52 ± 0.25^{aB}	6.35 ± 0.06^{aB}	6.72 ± 0.16^{aB}

^{abc} Means in the same row with different small superscripts are significantly different at $P < 0.05$.

^{ABC} Means in the same column with different capital superscripts are significantly different at $P < 0.05$.

REFERENCES

1.Yulistiani D, J R Gallagher and R J Van Barneveld, (2003): Intake and digestibility of untreated and 4% urea-treated rice straw base diet fed to sheep. JITV 8 (1): 816.

2.Elseed A M A F, (2005): Effect of supplemental protein feeding frequency on ruminal characteristics and microbial N production in sheep treated rice straw. Small Ruminant Res., 57: 11-17.

3.Prasad, R D, M R Reddy and G V Reddy, (1998): Effect of feeding baled and staked 4% urea-treated rice strawon the performance of crossbred cows. Anim. Feed Sci. Technol., 73: 347-352.

4.Attia-Ismail S A, A M Fayed and A A Fahmy, (2002): Some mineral, nitrogen and water utilization of salt plant fed sheep as affected by monensin. Egy. J. Nutrition and Feeds, 15: 235.

5.AOAC, (1980): Association official analytical chemists. Methods of Analysis. 13th Ed., Washington D.C., U.A.S.

6.Hadjipanayiotonu M, (1984): The value of urea treated straw in diets of lactating goats. Animal Feed science and Technology, 11 (1): 67-74.

7.El-kholy M El H., El I Hassanein, N Edrees, W El-Eraky, M F A El-Gamel and D Ibraheim, (2009): Nutritional Aspects of Recycling Plants By-Products and Crop Residues (Corn Stalk) in Sheep. Pakistan Journal of Nutrition 8 (12): 1834-1841.

8.Debasis D and G P Singh, (2003): Effect of cold process monensin enriched urea molasses mineral blocks on performance of cross bred calves fed a wheat straw based diet. Animal Feed Science and Technology Volume 103, issues 1-4, pages 51-61.

9.Maklad H M and H M Eman, (2006): Influence of partial replacement of clover hay by ammoniated rice straw in basal diets of lactating Frisian cows. Animal production Dept., Faculty of Agriculture, Mansoura University.

10.Fahey G C, L D Joaquin and E C Titgemeyer, (1993): Post harvest treatment of fibrous feed stuffs to improve their nutritive value. In: H.G. Jung, D.R. Hatifield and J. Ralph (Editors), Forage Cell Wall Structure and Digestibility. American Society of Agronomy, Crop Science Society of American Soil Science Society of America, Madison, WI, PP. 715-766.

11.Jain N, S P Tiwari and P Singh, (2005): Effect of urea molasses mineral granules (UMMG) on rumen fermentation pattern and blood biochemical constituents in goat kids fed sola (Aeschonomene Indica Linn) grass-based diet. Veterinarski Arhiv, 75 (6):521-530.

12.El-Shaer H M (2004): Utilization of agriculture residues for animal feeding. Animal and Poultry Production Division. Desert Research Center. Mataria, Cairo, Egypt.

13.Allam A M, (2008): Digestion and rumen fermentation by sheep fed on rations

contained rice straw treated or not with urea, fungus and effective micro-organism. Department of Animal Production, Faculty of Agriculture, Alexandria University.

14.Khadr N E A, (1990): Effect of non protein nitrogenous supplements on digestibility of low quality roughages in goats. M.V.Sc. Thesis, Fac. Vet. Med. Moshtohor, Zagazig Univ. Egypt.

15.Fouad R T and T A Deraz, (2002): Evaluation of different feeding systems for growing Baladi lambs during summer. Animal production Research Institute, Ministry of Agriculture, Dokki, Egypt.

الملخص العربى

تاثير استخدام قش الأرز المعالج باليوريا والمولاس على معاملات الهضم وقياسات التخمر فى كرش الاغنام

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- أجريت هذه الدراسة لمعرفة اثر استخدام قش الأرز المعالج باليوريا مع اضافة المولاس فى علائق الاغنام على معاملات هضم المواد الغذائية (المادة الجافة والمادة العضوية والبروتين الخام والألياف و وNDF ADF وقيم المواد الغذائية المهضومة الكلية (TDN) و قيم المادة البروتنيه المهضومة (DCP)) وقياسات التخمر فى الكرش (الأس الهيدروجيني و تركيز الأمونيا والأحماض الدهنية الطيارة). استخدام في هذة الدراسة ستة من الخراف (متوسط وزن الخروف ٣٠ كيلو تقريبا) قسمت إلي ثلاث مجموعات بالتساوي (إحتوت كل مجموعة ٢ من الخراف) وتم تغذيتها علي النحو التالي:-

المجموعة الظابطة :- علف مركز بنسبة ٦٠% من العليقة+ دريس بنسبة ٤٠% من العليقة.

المجموعة الثانية :- علف مركز نسبة ٦٠% من العليقة + قش الأرز المعالج ٤% يوريا بنسبة ٤٠% من العليقة.

المجموعة الثالثة :- علف مركز نسبة ٦٠% من العليقة + قش الأرز المعالج ٤% يوريا + ٥% مولاس بنسبة ٤٠% من العليقة.

*علف مركز مكون من (الذرة وكسب فول الصويا والردة وثنائى فوسفات الكالسيوم وملح الطعام ومخلوط الفيتامينات والاملاح المعدنية).

- تم تغذية الاغنام لمدة ثلاث اسابيع كفترة تمهيدية (تحضيرية) ثم لمدة أسبوع آخر كفترة تجريبية لإجراء تجارب الهضم فى نهاية التجربة ثم اخذ عينات من الكرش لمدة يومين متتالين لقياس نواتج التخمر.

ويمكن أيجاز أهم النتائج فيما يلي:-

- وجود زيادة معنوية في معاملات هضم كلا من المادة الجافة والمادة العضوية والبروتين الخام فى العلائق التى تحتوى على قش أرز معالج ٤% يوريا او ٤% يوريا و٥% مولاس
- زاد معنويا معامل هضم كلا من نسبة الألياف الخام ونسبة الألياف الغير ذائبة فى المحلول الصابونى المتعادل (NDF) و الألياف الغير ذائبة فى المحلول الصابونى الحامضى (ADF) عند مقارنتها بالعليقة الظابطة.
- زاد معنويا تركيز الأحماض الدهنية الطيارة فى كرش الأغنام التى تم تغذيتها على فى العلائق التى تحتوى على قش أرز معالج ٤% يوريا او ٤% يوريا و٥% مولاس بينما انخفض تركيز نيتروجين الامونيا معنويا عند مقارنتها بالعليقة الظابطة.

وانتهت النتائج الى :-

- يمكن الاستفادة من مخلفات المحاصيل الحقلية (قش الارز) وتحسين قيمتها الغذائية بعد معاملتها باليوريا ٤% والمولاس ٥% واستخدامها فى علائق الأغنام لسد العجز فى مواد العلف المالئة وخفض التكلفة وحماية البيئة من التلوث الناتج عن حرقها.