J. Animal and Poultry Prod., Mansoura Univ. Vol. 6 (1), 43 - 53,2015

USING STRAWBERRY (*Fragaria ananas*) VINE HAY IN RATIONS OF GROWING LAMBS.

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ABSTRACT

This study was conducted at Sids Experiment Station, Animal Production Research Institute, Agricultural Research Center, to evaluate the effect of inclusion strawberry vine (SBV) as an untraditional ingredient in lambs ration on their growth performance. Twelve lambs averaged 17 ± 0.94 Kg live body weight were divided into three similar groups according to their body weights (4 lambs in each) and were used in a comparative feeding trial. Control ration (D1) was formulated from 70% concentrate feed mixture (CFM) plus 30% rice straw (RS) on dry matter basis in order to cover 100% of NRC feeding standard. Tested rations (D2 and D3) were formulated so that 25 or 50% of the total CP of the control ration were supplied from strawberry vines hay, respectively. Digestion trials were conducted to determine the digestibility and feeding values of the experimental rations. Growth performance parameters were evaluated and samples of rumen liquor and blood were analyzed as well.

Results showed that concentration CP and NFE of strawberry vine hay were higher, while CF and ash were lower than those rice straw, while NFE of strawberry vine hay was similar to that of CFM. The OM digestibility of D2 was significantly higher than that of D1 (control) or D3. The digestibility coefficients of CP, EE and NFE of D2 were significantly higher than those of D1 and insignificantly higher than those of D3. Value of CF digestibility of D2 was significantly higher than that of D1 or D3. The TDN of D2 was significantly higher than that of D1 and D3, and the value of DCP of D2 was significantly higher than that of D1 and insignificantly than D3. Rumen pH value of lambs fed D3 was significantly higher than those of D1 and D2 at 3 and 6 hrs post feeding, while the differences between D1 and D2 were not significant. RUMINAL Ammonia-N and total VFA concentrations were not affected by dietary treatments. No significant differences were found among treatments in most measured blood serum constituents. Daily gain of D2 was significantly higher than that of D1 and D3, and D1 was significantly higher than D3. Feed conversion (DMI/gain) of D2 was significantly better than that of D3 and insignificantly better than that of D1. Total cost of D2 and D3 were significantly lower than D1 and the economical efficiency of D2 was higher than that of D1 and D3.

It could be concluded that 25% of CP of lambs ration consisting of concentrate feed mixture and rice straw could be replaced by strawberry vines hay protein, since it increases daily gain and improves the economical efficiency.

Keywords: Strawberry vines, lambs, growth, feed utilization, rumen and blood parameters.

INTRODUCTION

The annual feed requirements for animal wealth in Egypt are about 14 million tones of total digestible nutrients (TDN). The shortage of animal feeds was calculated to be approximately 3.1 million tons of TDN (Fayed *et al*., 2009). According to this problem, growing attention is focused on the use

of crop by-products, agricultural residues, industrial by- products, wastes of fruits and vegetables for ruminant feeding which could be considered as a significant trend to alleviate the acute shortage of feedstuffs in Egypt and most developing countries, as well as diminishing the environmental pollution (Abou Selim and Bendary, 2005). Furthermore, such application certainly reduces the amounts of some feedstuffs that are annually imported for animal feeding.

In Egypt, about 25 million tons of agricultural by products are annually produced (Ministry of Agriculture and land Reclamation, 2008). Utilization of agricultural vines residues can partly alleviate the gab between animal nutritional requirements and available feedstuffs and thus it is so necessary to investigate.

In Egypt, animals are suffering from shortage of feeds especially during summer season during which they almost depend on grains, concentrate feed mixtures and crop by-products mainly wheat and rice straws. The rising costs of concentrate feeds (grains and proteins supplements in particular) have led to significant increases in animal feed cost in recent years (Omer *et al*, 2011). In perspective, including local agricultural by-products into ruminant diets could reduce the feed cost and in turn increase the economical efficiency of live stock production (Borhami and Yacout, 2001). Also, Saleh *et al.,* (2003) reported that including some vegetables vine hays in lactating buffalo rations to replace berseem hay could reduce feed cost by 20% and improve economical efficiency by 27%. Recently, strawberry was introduced as a new fruit crop for human consumption in Egypt and its annual production are steady increasing. Omer *et al*. (2011) and Galal *et al.* (2014), showed that the strawberry vines hay had higher NFE and DE and lower CP and CF than berseem (Egyptian clover). There is a limited literature on using strawberry residues in feeding ruminants, therefore there is an extreme need for more studies on using these residues in feeding farm animals. The aim of this study is to evaluate the nutritive and feeding values of strawberry vine hay and the possibility of inclusion this residue as a source of protein in lambs rations.

MATERIALS AND METHODS

This study was conducted at Sids Experimental Station (Beni Swief Governorate), Animal Production Research Institute, Agricultural Research Center, Ministry of Agriculture, Egypt. Twelve lambs with an average live body weight of 17±0.94 kg were used in a comparative feeding trial to study the potentiality of utilization of strawberry vines hay in lamb rations. Animals were divided into three similar groups of four replicates according to their LBW and rate of daily gain during a 21-d preliminary period, using a randomized complete block design. Animals were individually fed over the 120-d experimental period according to NRC recommended standard for sheep (1985) on the following dietary treatments: D1 (control ration) which consisted of 70% concentrate feed mixture CFM plus 30 % rice straw (RS) to cover 100% of their requirements. Tested rations (D2 and D3) were formulated so that 25 and 50% of total CP of control ration were supplied

from strawberry vines hay (SBV), respectively. Lambs were weighed at the beginning of the experiment, then fortnightly. Daily body gain was determined and feed conversion was calculated. Three digestibility trials were conducted simultaneously on 9 animals (3 in each group) at the last month of the feeding trial to evaluate the digestibility and feeding values of the experimental rations. The chemical composition of diets and feces were analyzed according to AOAC (1996).

Rumen fluid samples were taken from 9 lambs (3 in each group) using a stomach tube at 0, 3 and 6 hours post feeding. The samples were filtered through three layers of cheesecloth. Ruminal pH was immediately measured by a digital pH meter. Rumen ammonia-N was determined according to Conway (1957) and total volatile fatty acids (VFA) were measured as described by Warner (1964).

Blood samples were taken from all lambs at the end of the experimental period from the jugular vein where they were directly collected into vacuum tubes and centrifuged at 4000 rpm for 15 min. Serum was separated into polypropylene tube and stored at -20^{o}C until analysis for total protein and albumin according to Weichelbaum (1946) and Doumas *et.al.* (1971), respectively. Globulin value was calculated by the difference between total protein and the corresponding value of albumin. Urea concentration was determined by the method of Henry and Davidsohn (1974). Gulutamic oxaloacetic transaminase (GOT) and glutamic pyruvic transaminase (GPT) were determined as described by Reitman and Frankel (1957). Creatinine was measured according the method described by Bartels, (1971). Total lipids and cholesterol were estimated according to the methods of Boutwell (1972) and Allain *et.al*. (1974), respectively. All date were statistically analyzed using the general linear models process of SAS (1998). Data of percentages were subjected to arc-sin transformation to approximate normal distribution before being analyzed and means were separated using Duncan's multiple range tests (Duncan ,1955).

For the comparison among means of the experimental diets when the main effects were significant.

The model used was:

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

where:

Yij = the observation of ij

μ = the overall mean

Ti = the effect of i treatments (1:3)

Eij = random error

RESULTS AND DISCUSSION

Chemical composition:

Chemical composition data in (Table 1) showed that CP and NFE contents were markedly higher while CF and ash contents were lower with SBV than those of RS. The contents of OM and NFE of SBV were similar to those of CFM, but there were differences in CP, EE, CF and ash contents between SBV and CFM. The chemical composition of strawberry vine agreed

with that obtained by Omer *et al.* (2011) and Galal *et al.* (2014). On the other hand, contents of CP and CF of strawberry vine hay were lower, while the NFE% was higher than those in legume forage hay as berseem hay (Omer *et al.*, 2011, Hamed *et al*., 2013 and Galal *et al.* 2014), pea straw (Hamed *et al*., 2013) and peanut tops hay (Etman and Soliman, 1999). On comparison with some straws and stover, CP and NFE contents of strawberry vine hay was higher than those of bean straw, corn stalks and rice straw and CF had the opposite trend (Mehrez *et al.,* 2001). The chemical composition of experimental rations were nearly similar in most nutrient contents. Presumably, these nutrient concentrations in the three experimental rations appeared to be closely suitable for growing lambs and agree with (NRC, 1985) for sheep requirements.

Table (1): Chemical composition of feed ingredients and experimental rations on DM basis.

Items	DM%	Chemical composition (%)					
		OM	CP	EE	CF	NFE	Ash
Ingredients :							
CFM*	91.02	90.12	14.01	3.60	14.29	58.22	9.88
RS	89.18	86.75	3.21	2.40	38.95	42.19	13.25
SBV	85.02	88.48	9.10	2.35	17.93	59.10	11.52
Experimental rations							
D1	90.44	89.53	10.85	3.17	21.86	53.65	10.47
D2	88.93	88.57	10.60	3.06	19.99	54.92	10.43
D3	87.41	88.85	10.45	2.79	18.40	57.21	11.15

*** CFM consisted of 35% decorticated cotton seed cake , 25% corn grain, 30% wheat bran, 5% molasses, 2% limestone, 1.5% salt and 1.5% mineral and vitamin mixture.**

Digestion coefficients and feeding values:

Digestion coefficients as shown in Table 2 showed that no significant differences among treatments regarding the digestibility of DM while the OM digestibility of D2 was significantly higher than that of D1(control) or D3, which was significantly higher than the value of D1. The digestibility of CP, EE and NFE of D2 was significantly higher than those of D1 and insignificantly higher than those of D3. The CF digestibility of D2 was significantly higher than that of D1 or D3 while, the differences between D1 and D3 were not significant as shown in Table 2. The digestion coefficients of D2 and D3 (SBV – rations) were nearly similar to those of rations which contained concentrate feed mixture and peanut tops hay using sheep as reported by Etman and Solmian (1999) and higher than those (except CF digestibility) of rations contained concentrate feed mixture with different crop by-products with sheep (Mehrez et al., 2001).

The feeding values as TDN and DCP are presented in Table 2. The TDN of D2 was significantly higher than D1 (control) and D3, but the difference between D1 and D3 was significant, and DCP of D2 was significantly higher than that of D1 and insignificantly than that of D3. These results were somewhat lower than those obtained by Etman and Soliman (1999) who found that TDN values of CFM + peanut tops hay ration ranged from 70.3 to 75.1% and DCP ranged from 8.4 to 9.5%. On the other hand, the

TDN and DCP values of the present experiment were higher than those obtained by Mehrez *et al.* (2001) who used different roughages to concentrate ratios in ruminant rations.

Table (2): Digestibility coefficients and feeding values of the experimental rations.

Items	Experimental rations			S.E.±
	D1	D2	D3	
Digestibility (%)				
DM	67.53	65.62	66.42	1.41
OM	66.40^{c}	74.32^{a}	70.00^{b}	1.08
CP	66.16^{b}	73.02^{a}	69.90^{ab}	1.44
EE	60.21^{b}	66.14^{a}	61.91^{ab}	1.57
CF	54.22^{b}	60.09^{a}	54.67^{b}	1.24
NFE	71.80^{b}	80.19^{a}	75.35^{ab}	2.05
Feeding values (DM,%)				
TDN	61.84^{b}	68.35^{a}	64.42^{b}	0.99
DCP	7.18^{b}	7.74^{a}	7.30^{ab}	0.16

a, b and c Means in the same row with different superscripts are significantly (P< 0.5) different.

Rumen liquor parameters:

The pH values of lambs fed D3 were significantly higher than those of D1 and D2 at 3 and 6 hrs post feeding, while the differences between D1 and D2 were not significant as shown in Table 3. The increases in pH values in D3 may be logically due to the marked low level of CFM in this ration that caused a decrease in TVFA and in turn raised the pH value. The pH values lie within the normal ranges of normally functioning rumen (5.5 to 7.3) as recorded by Hungate (1966), and agreed with those of El-Emam *et al.* (2014), Mohamed and Ibrahem (2003) and Mehrez *et al*. (2001) who investigated different formulas with different ingredients in ruminants rations which extremely affect ruminal fermentative end products. Ammonia-N and total VFA, were not significantly altered by treatments, but the highest value occurred with D2 at 6 hrs sampling time. These values of ammonia-N and TVFA's slightly changed due to the similarity of CP and NFE contents of experimental rations as shown in Table (1). However, the roughage: concentrate ratio (energy levels) of a ration could significantly affect the rumen function and its fermentative products (Mostafa *et al.,* 2004). Moreover, Hungate, (1966) demonstrated that rumen microorganisms can utilize more NH_3-N when more energy sources are fermented. Generally, Van Soest *et al., (*1991) revealed that the variation in TVFA's concentrations in rumen matched with the buffering capacity of feedstuffs (physically and chemically) which derived in part from the physical effects that they elicit in the rumen and on rumination rate. Ammonia-N concentration in this study was higher than those obtained by El-Emam *et al.* (2014) and Mehrez *et al*. (2001).

Table (3): Rumen liquor parameters of lambs fed the experimental rations.

Items	Sampling time	Experimental rations			SE ±
		D1	D2	D3	
pH	0	6. 80	7.03	7.05	0.08
	3	6.00[b]	6.26[b]	6.58[a]	0.10
	6	6.27[b]	6.48[b]	6.75[a]	0.08
Ammonia-N (mg/100ml)	0	13.12	16.28	15.62	1.75
	3	45.00	42.93	50.40	5.56
	6	20.21	25.62	22.15	3.49
Total VFA's (meq/100 ml)	0	7.95[b]	8.66[a]	8.10[ab]	0.18
	3	15.53	14.61	13.70	1.56
	6	10.61	11.72	11.22	2.81

[a and b] **Means in the same row with different superscripts are significantly (P< 0.5) differ.**

Blood serum constituents:

No significant differences were observed among treatments in blood serum constituents as total protein, globulin, urea, GOT, GPT, creatinine, total lipids and cholesterol, while albumin in D2 was significantly higher than that of D1 (control) and insignificantly higher than that of D3 as shown in Table 4. The obtained values of all blood constituents are within the normal range and agreed with those obtained by El-Emam *et al.* (2014) and Mohamed and Ibrahem (2003) for healthy growing lambs. Also, comparable results were obtained by Saleh *et al.,* (2003) who found no significant differences in all blood constituents when they feed buffaloes on rations containing different levels of watermelon vine.

Table (4): Blood serum constituents of lambs fed the experimental rations.

Items		Experimental rations			SE ±
		D1	D2	D3	
Total protein	(g/di)	7.07	7.56	7.32	0.15
Albumin	(g/di)	3.96[b]	4.32[a]	4.12[ab]	0.10
Globulin	(g/di)	3.11	3.24	3.20	0.06
Urea	(mg/di)	48.58	40.16	43.15	3.27
Got	(u/i)	60.66	57.55	55.19	4.51
GPT	(u/i)	16.73	15.86	14.93	1.26
Creatinine	(mg/di)	1.32	1.23	1.26	0.04
Total lipids	(g/di)	2.86	2.53	2.67	0.14
Cholesterol	(mg/di)	66.84	64.12	65.68	4.90

[a and b] **Means in the same row with different superscripts are significantly (P< 0.5) differ.**

Feed intake:

The differences of DM intake among treatments were not significant, while the TDN intake of D2 was significantly higher than those of D1 (control) and D3. On the other side, the DCP intake of D2 was significantly higher than D3 and insignificantly higher than D1 (control) as shown in Table 5. The increases in feed values intake (TDN, DCP) of D2 may be due to the improvement in digestibility of OM and other nutrients and consequently the feeding values as TDN and DCP.

Growth performance:

The average daily gain of D2 was significantly higher than that of D1(control) and D3, and also the daily gain of control group was significantly

higher than that of D3 as shown in Table 5. The improvement in daily gain of lambs fed D2 might be attributed to the more synergistic interactions amongst the ingredients of this ration that also has a more suitable portion of concentrates (52.5% of DM) in relation to the other tested ration D3 that have only 35% of concentrates. Consequently, these metabolic and physiological responses could effectively improve the digestibility and the productive performance of growing lambs. In supporting to this explanation, Huhtanen (1991) concluded that the utilization of dietary energy depends not only the profile of nutrients made available from a particular feed but also from nutrient made available from other combined feeds. The author added that the associative effects of feeds (a well balancing ration) on the efficiency of energy utilization and animal production should be considered as one of the most important factors that should be taken into consideration when formulating ruminant rations. The daily gain of lambs fed CFM plus strawberry vine hay in this study was higher than those fed CFM plus peanut tops hay as reported by Etman and Solmian (1999) and lambs fed CFM plus bean straw, corn stalks or rice straw as reported by El-Ayek *et al.* (2001). The feed conversion as kg DM intake per kg live body weight of D2 was significantly lower than D3 and insignificantly lower than D1(control), and the differences of feed conversion as kg TDN or DCP per kg live body weight among the three treatments were not significant as shown in Table 5. So, the ration of low level of SBV had the best feed conversion ratio among the experimental treatments. The present results are in harmony with those obtained by Mostafa *et al.,* (1993) and EL-Says *et al.* (1997) who found that feed conversion increased with increasing the level of concentrate mixture in the rations of cattle.

Table (5): Growth performance and feed conversion of lambs fed the experimental rations containing different levels of strawberry vine hay (SBV).

Items	Experimental rations			SE±
	D1	D2	D3	
Initial LBW (kg)	17	17	17	0.94
Final LBW (kg)	36.920^{ab}	39.320^{a}	34.400^{b}	0.99
Total gain (kg)	19.920^{b}	22.320^{a}	17.400^{c}	0.44
Daily gain (g)	166^{b}	186^{a}	145^{c}	3.65
Average LBW (kg)	25.44	26.42	24.12	1.01
Daily DM intake per head (g)				
Concentrate feed mixture (CFM)	786	624	380	-
Rice straw (RS)	359	217	75	-
Strawberry vine hay (SBV)	-	347	630	-
Total DM intake	1145	1188	1085	45.25
TDN intake	708^{b}	812^{a}	699^{b}	28.96
DCP intake	82.21^{ab}	91.95^{a}	79.20^{b}	3.31
Feed conversion :				
Kg DMI/kg gain	6.90^{b}	6.39^{b}	7.48^{a}	0.31
Kg TDNI/kg gain	4.27	4.37	4.82	0.20
Kg DCPI /kg gain	0.495	0.494	0.546	0.023

$^{a,\ band\ c}$ Means in the same row with different superscripts are significantly (P< 0.5) different.

Economical efficiency:

Total price of D2 and D3 were markedly lower than that of D1 as shown in Table 6, due to the high price of concentrate feed mixture compared with strawberry vine hay. Also, the cost of each kg gain of D2 was significantly lower than that of D1 (control) and insignificantly lower than that of D3. Therefore, the D2 treatment had the highest return and economical efficiency due to its highest daily body gain and the lowest feed cost. These results are in agreement with those obtained by Saleh *et al.* (2003) who indicated that inclusion of some vegetable vines hay in lactating buffaloe rations to replace berseem hay could reduce feed cost by 20% and improve economical efficiency by 27%. Generally, including local agricultural by-products into ruminants diets could markedly reduce the feed cost and in turn increasing the economical efficiency of live stock production (Borhami and Yacout, 2001).

Table (6) : Feed cost and economical efficiency of feeding growing lambs on the experimental rations.

Items	Experimental rations			SE ±
	D1	D2	D3	
Daily gain (g/ h)	166	186	145	-
Daily feed cost (LE* / h)				
CFM (LE)	2.155	1.710	1.043	-
RS (LE)	0.160	0.096	0.033	-
SBV (LE)	-	0.367	0.667	-
Total cost of feed (LE/h/d)	2.315	2.173	1.743	0.09
Cost of kg gain (LE)	13.95[a]	11.68[b]	12.02[b]	0.52
Cost of kg as% of the control	100[a]	83.73[b]	86.17[b]	2.49
Price of weight gain (LE)**/h/d	4.98	5.58	4.35	-
Economical efficiency	2.15	2.57	2.50	-

[a and b] Means in the same row with different superscripts are significantly (p< 0.5) different.
***Based on prices of year 2014 which were 2500, 400and 900 LE / ton for CFM ,RS and SBV as fed , respectively.**
****The price of live body weight were 30 LE per kg.**

CONCLUSION

It could be concluded that 25% of CP of lambs ration consisting of CFM and RS could be substituted from strawberry vines hay CP since this improved digestion coefficients and nutritive values, increased total body weight gain and daily gain and improved the economical efficiency without adverse effects on health of growing lambs.

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استخدام دريس عرش الفراولة فى علائق الحملان النامية

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أجريت هذه الدراسة في محطة بحوث الانتاج الحيوانى بسدس (محافظة بنى سويف) - معهد بحوث الإنتاج الحيواني، مركز البحوث الزراعية. تم اختيار عدد ١٢ من الحملان المتماثلة فى العمر والوزن (متوسط اوزانها ١٧ ± ٠.٩٤ كجم) وقد تم تقسيمها إلى ثلاث مجموعات متماثلة وفقا لأوزان أجسامهم (٤ حملان في كل مجموعة).

المجموعة الاولى D1 (الكنترول) التى غذيت على مخلوط العلف المركز وقش الأرز لتغطية الأحتياجات الغذائية للحملان النامية طبقا لـ NRC لسنة ١٩٨٥.

المجموعة الثانية (D2) غذيت *على عليقة غطت* ٧٥ % من احتياجات البروتين الخام من عليقة الكنترول + ٢٥% من عروش الفراولة الجافة.

المجموعة الثالثة (D3) غذيت *على عليقة غطت* ٥٠ % من احتياجات البروتين الخام من عليقة الكنترول + ٥٠% من عروش الفراولة الجافة,

وقدأجريت تجارب الهضم باستخدام ٩ حيوانات (٣ لكل مجموعة) لتقدير القيم الهضمية والغذائية لعلائق التجربة. تم أخذ عينات سائل الكرش قبل التغذية وعند ٣ و ٦ ساعات بعد التغذية. واجريت قياسات الرقم الهيدروجيني لسائل الكرش (pH)، تم قياس الأمونيا-N ومجموع الأحماض الدهنية الطيارة (VFA). وقدأخذت عينات الدم لتقدير البروتين الكلي والالبيومين والجلوبيولين واليوريا وGPT, GOT والكرياتينين والدهون الكلية والكوليسترول. ومن خلال تجربة النمو تم حساب متوسط الزيادة اليومية وإجمالي الربح و لكل مجموعة.

واظهرت النتائج أن نسبة البروتين الخام والكربوهيدرات الذائبة كانت أعلى فى عروش الفراولة من قش الارزفي حين ان الالياف الخام ونسبة الرماد كانت أقل من قش الأرز، وكانت والكربوهيدرات الذائبة فى عروش الفراولة مماثلة لمخلوط العلف المركز. كانت معاملات هضم المادة العضوية للعليقة الثانية (D2) أعلى معنويا من عليقة الكنترول (D1) أو العليقة الثالثة (D3) وكانت D3 اعلى معنويا من D1. وكانت معاملات هضم البروتين الخام ومستخلص الاثير والكربوهيدرات الذائبة فى D2 أعلى معنويا من D1 ومن D3. كان هضم الالياف الخام في D2 أعلى معنويا من D1 أو D3. كان مجموع المركبات الكلية المهضومة في D2 أعلى معنويا من D1 و D3، وكان البروتين الخام المهضوم في D2 أعلى معنويا من D1 ومن D3. وكان الرقم الهيدروجيني لسائل الكرش (pH) فى D3 أعلى معنويا من D1 و D2 عند ٣ و ٦ ساعات بعد التغذية، في حين كانت الفروق بين D1 و D2 ليست معنوية، وكانت الاختلافات فى الأمونيا-N ومجموع الأحماض الدهنية الطيارة بين الثلاث معاملات ليست معنوية. وأظهرت النتائج عدم وجود اختلافات معنوية بين المعاملات الغذائية في مكونات سيرم الدم (البروتين الكلي والجلوبيولين واليوريا وإنزيمات الكبد والكرياتينين والدهون الكلية والكولسترول). وكان متوسط الزيادة اليومية فى D2 أعلى معنويا عن D1 و D3 وكانتD1 اعلى معنويا عن D3. وكان معدل التحويل الغذائي على اساس كجم مادة جافة لكل كيلو جرام نمو الأحسن معنويا في D2 مقارنة بالمعاملات D3 و D1. كما كانت التكلفة الإجمالية للD2 و D3 أقل معنويا من D1 وكانت الكفاءة الاقتصادية فى D2 أعلى من كل من D1 و D3.

ويمكن أن نخلص إلى أنه يمكن استبدال ٢٥٪ (علي أساس البروتين الخام) من عليقة الحملان ذات المكونات العادية من العلف المركز وقش الأرز بعروش الفراولة الجافة حيث يؤدى ذلك الى زيادة معدلات النمو للحملان وتحسين الكفاءة الغذائية والاقتصادية ومن ثم زيادة الربح معنويا.