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Using of Dry Tomato Vines Hay in Growing Lambs Ration

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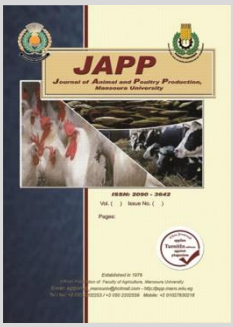

ABSTRACT

The objective of this study was to investigate the effect of partial substitution of clover hay by tomato vines hay (DTV) at three levels in lamb rations on their growth performance. Twenty-four Barki lambs with initial weight 28±1.5 kg and aged 6-7 months were randomly divided into four similar groups (6 lambs in each group) according to their LBW and were used in a feeding trial lasted 97 days. Lambs were fed with 0, 10, 20 and 30% of DTV as instead of CH in ration (T1) that served as control and the tested rations T2, T3 and T4, respectively. Results indicated that DM, OM and NFE digestibility did not differ significantly among all groups. Moreover, CP, CF and EE digestibility were decreased by increasing the levels of DTV in the tested rations. Feeding values of TDN were significantly (P≤ 0.05) decreased with increasing levels of DTV meanwhile, DCP values were not significantly differ among treatments. Daily gain was insignificant decreased with tested rations T2 and T3, but decreased (P≤ 0.05) significantly with tested ration T4, in comparison with those of control one (T1). All blood serum parameters were not significantly affected by the dietary treatments. The best economic efficiency was associated with tested ration (T3) that having 20% DTV in replacing with CH. It could be concluded that DTV can be used up to 20% as substitute of CH in lambs rations, without any adverse effects on productive performance, health status and reducing the environmental pollution.

Keywords: Lambs, tomato by-product, clover hay, digestibility, growth performance, economic efficiency

INTRODUCTION

In Egypt, the main problem facing livestock production is a chronic shortage in feedstuffs with highly cost of most rations optimally formulating for different classes of ruminant animals. The lake of feedstuffs is estimated by 3.1 million tons of TDN per year (Abou-Akkada, 1998). Although approximately 13.7 to 15.2 million tons of agricultural cellulosic wastes (Hathout and El-Noby, 1990) and about 32 million tons of industrial by- products are annually produced in Egypt (Agricultural Economics-Ministry, 2014), only less than one - thirds of these residues are used in ruminant feeding. So, the agricultural residues and agro-industrial by-products have been given greater attention by researchers and policy makers in Egypt (El-Ashry *et al.*, 2002). Therefore, the challenge for animal nutritionists, however, is to use such cheaper alternative feeds in livestock diets (Megersa *et al.*, 2013) without adversely affecting animal health, productive performance and minimized the environmental pollution by these residues (Ben-Salem and Znaidi, 2008; Vasta *et al.*, 2008; Abdel-Magid *et al.*, 2008). Furthermore, the increasing usage of agricultural or agro-industrial by-products for feeding livestock could be successfully reducing production costs and improve profitability of animal production projects (Asar *et al.*, 2010; Awawdeh, 2011; Oloche *et al.*, 2018).While under summer conditions, clover hay have been and still considering one of the most valuable feedstuffs used for rations formulation for dairy and beef animals. On the other hand, the annually production of fresh tomato in Egypt have been reached up to 8,625,219.00 tons (FAO, 2012) and most of the producing amount being directed for processing in tomato cannery factors, where significantly amount of beneficial tomato vines by-product are expelled. According to the findings that reported by Aziz *et al.*, (2020), demonstrated that the whole tomato plants after harvesting given a high quality crop by – product but had a lower nutritive value than that of alfalfa hay, despite such residue relatively had higher crude protein (13.2%), non fiber carbohydrates (23.5%) and lower NDF (38.1%) and ADF (26.1%) content. Moreover, Khogali *et al.*, (2010), concluded that tomato straw has considered good crude protein content (15.75%) and can be economically used as a ruminant feed.

The objective of this study is to maximize the utilization of agricultural waste of tomato (tomato vines) to reduce the environmental pollution and introduce it in the formation of an appropriate economic diets to reduce the cost of animals nutrition.

MATERIALS AND METHODS

The quantity of tomato vines which included leaves, stems, and some damaged fruits were collected from Nubaria area and immediately sun dried at the experimental site at Nubaria animal production research station, animal production research institute, arc, Egypt for a period up to 30 days by exposing the biomass to ventilation with continuing turning daily, then cutting by the machine into suitable length and then randomly samples were taken for chemical analysis and the dietary treatments of the feeding trial were prepared to be covering perfectly the nutritional requirements of lambs growth according to NRC (1990).

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Feeding trial:

Twenty four Barki lambs averaged 6-7 months age with an average live body weight of 28±1.5 kg were divided randomly into four similar groups (6 lambs in each). The feeding trial period was extended to 97 – days using the randomized complete block design. All groups fed according to NRC, (1990) allowances for sheep. The control group (T1) was fed on 60% conventional concentrate feed mixture (CFM) plus 40% clover hay (CH) as a sole roughage. Tomato vines hay (DTV) was used to replace CH at different levels of 10%, 20 and 30% for T2, T3 and T4, respectively as an experimental tested rations, all rations were formulated to be isonitrogenous state. Lambs were weighted biweekly after overnight withdrawal period of feed and water and their feed requirements were adjusted accordingly. The offered CFM and roughage either CH or DTV were adjust biweekly intervals, according to the body weight changes. Through the feeding experimental period, amount of offered feeds and its residues for each lamb, were recorded daily to determine the actual amount of feed consumed. Mineral blocks and fresh water were freely available during the day time. Animals were kept under routine veterinary supervision along the experiment and also they were injected with vitamins AD3E to cover their optimal requirements. Animals were fed twice daily at 8 am and 4 pm. Feed conversion was calculated and expressed as Kg DM, TDN and DCP required to one kg gain. Economic efficiency was calculated as the ratio between the price of live body weight and feed cost. Where, the feed cost, based on the current price (LE/ton) as CFM, CH and DTV were 3200, 1600 and 150 L.E. respectively and 1kg of live body weight of lamb=55 LE.

Digestibility experiment:

Four *in vivo* digestibility trials were carried out with mature rams (three for each) in order to determine the nutrient digestibilities and feeding values of the experimental rations. Rams were weighted at the start of each trial and placed in metabolic cages as well as weighted at the end of the trial. Each digestibility trial lasted 21-d including the first period 14-days were considered as a preliminary period and followed by 7- days as a collection period. Each group was fed one of the experimental rations that used in feeding trial. Rations were offered twice daily at 9am and 3pm for each lamb. During the collection period, samples of rations offered and leftover were daily weighed and representative samples were collected for chemical analysis. Feces were collected quantitatively once a day for each ram before the morning feeding. A representative sample (10% of the daily feces) of daily collected feces was taken and oven dried at 60^0C for 48 hr to determined the DM content. The dried samples of each ram were thoroughly mixed, grounded and kept for chemical analysis. Fresh water as well as mineral salt blocks was freely available for all time.

Blood samples:

Blood samples from the jugular vein were taken once from three lambs in each group before feeding in the morning at the end of experimental period and these samples were instantly centrifuged at 4000 rpm for 20 minutes. Blood serum was separated and stored at -25^0C until analysis.

Laboratorial analysis:

The samples of feeds and feces were analyzed for crude protein (CP), crude fiber (CF), ether extract (EE) and ash, according to AOAC, (1990) on dry matter basis. While nitrogen free extract (NFE) was calculated by difference. Total digestible nutrients (TDN) and digestible crude protein were calculated according to Maynard *et al.,* (1978) on dry matter basis. Cell wall was analyzed for neutral detergent fiber (NDF), acid detergent fiber (ADF) and acid detergent lignin (ADL) using TecatorFibretic system. Hemicellulose and cellulose were determined by difference according to Van Soest, (1982). Blood serum was separated from the whole blood to determine some blood serum parameters using commercial kits (Bio-Merieus, lab, France), following the same steps described by manufactories as the total protein according to Armstrong and Carr, (1964), albumin was determined according to Doumas, (1971) and globulin was calculated by subtracting the albumin value from the total protein one. The activities of aspartate aminotransferase (AST) and alanine aminotransferase (ALT) were determined according to Reitman and Frankal, (1957).

Pesticide residues analysis

The analytical standards of the tested pesticides were kindly provided by Central Laboratory of Residue Analysis of Pesticides, Heavy Metals and Food, Agricultural Research Center, Ministry Of Agriculture. The selected analytical standards are: (a)-Halogenated hypothyroids: Cypermethrin, lambda-cyhalothrin. (b)-Organophosphorus insecticides: Dimethoate, Malathion. (c)- Chlorinated hydrocarbon insecticides: HCB, lindane, p, p'-DDD, p-p' DDE and p-p' DDT. A simple multi-residue method according to Kadenczki et al., (1992) was applied to extract several pesticides (chlorinated hydrocarbon, halogenated pyrothriod insecticides and organophosphate) from tomato haulms. The principle of this method is based on having a homogenous sample pulp adsorbed on the surface of activated florisil to obtain a free-flowing powder, which is extracted in a glass column with methylene chloride-acetone (9+1, v/v). The gas chromatograph (GC) used was HP-5890 Series II.

Statistical analysis

Statistical analysis was carried out by General Linear Model procedures (GLM) described in SAS User's Guide SAS, (2003). Differences among treatment means were separated by Duncan's New Multiple-Range Test Duncan, (1955). The model used was: $Yij= \mu+Ti +eij$ where as Yij= the observation of the parameter measured ij, μ= the overall means of Yij, Ti= effect of i (treatments), eij =the experimental random error.

RESULTS AND DISCUSSIONS

Chemical composition of experimental rations and its ingredients'

The chemical composition of the CH, DTV CFM, and calculated chemical composition of the experimental rations are presented in Table (1).The chemical composition of DTV showed a markedly higher content of DM, CP, CF, EE, Ash and fiber fractionation and lower contents in OM and NFE than those of the corresponding values in CH. Concerning the CP content of DTV, its value was higher

than that of CH by 18.60%, while NFE content of DTV was lower than that of CH by 22.94 %.In comparisons with the previous studies, El-Sayed *et al.*,(2012) determined the chemical composition of tomato vines hay and found that DM, CP, EE, CF and NFE were 89.66, 14.88, 1.85 43.59 and 30.71%, respectively. While, Hassan *et al.,* (2010) mentioned that DTV contains low level of CP (7.83%) and high level of CF (42.75 %), which probably considered as limiting factors in animal feeding. On the other hand, Azizi *et al.,* (2020) reported that whole tomato plant (WTP) had similar values respectively CP and NDF contents to that of alfalfa hay, while the percentages of ADF% and non – fiber carbohydrates were markedly lower with alfalfa hay than those of (WTP), and the vice versa was occurred respecting lignin and ash contents. The nutritive value of crop residues depends on many factors such as type of soil and fertilizers used and other factors (Mahmoud *et al.,* 2003). Regarding the nutritive value of the CH in the present study,it had better quality than that used by (CLFF, 2001, Abdou, 2011 and Zedan and Khattab, 2017).Moreover, Fayed, *et al.*,(2019) reported that chemical composition of berseem hay on DM basis was 12.67, 24.81, 1.62, 53.48 and 7.73 for CP, CF, EE, NFE and Ash, respectively. Whereas, the corresponding values of clover hay were recorded by Rahmy *et al.,* (2019) as 16.80, 19.42, 4.25, 48.21and 11.32% on DM basis, respectively.

Concerning the chemical composition of the experimental rations ever so slightly differences among them in respect of all nutrient contents were observed (Table 1). Results indicated that slightly increases in CF,EE ,Ash and fiber fractionation contents with decreases in OM and NFE contents with increasing replacement level of DTV compared to control ration. These results may be due to higher content of CF and ash and lower NFE content in DTV compared with those of CH. On the other hand, according to the design of the trial, CP content showed slight change among rations due to amount of DTV intake. Crude fiber fractionation slightly increased due to the inclusion of DTV in the tested rations. On the other hand, in the experimental rations, NDF percent ranged from (36.78 to 39.22 %), which is consider good quality rations for lambs. This observation may be explained according to the findings of Van Soest, (1965) when the NDF concentration lies among 50 to 60% of the ration as DM, fiber mass appears to act as a limiting factor for production results in inhibit feed intake.

Table 1. Chemical analysis and cell wall constituents of the CFM, CH, DTV and experimental rations (% on DM basis).

Item	CFM	CH	DTV	T1	T2	T3	T4
DM	90.30	87.88	94.99	89.33	90.04	90.75	91.47
OM	93.80	92.30	86.13	93.20	92.58	91.97	91.35
CP	14.90	13.28	15.75	14.25	14.50	14.75	14.99
CF	15.86	30.75	32.22	21.82	21.96	22.11	22.26
EE	3.45	1.15	1.85	2.53	2.60	2.67	2.74
NFE	59.59	47.12	36.31	54.60	53.52	52.44	51.36
Ash	6.20	7.70	13.87	6.80	7.42	8.03	8.65
NDF	26.92	51.58	59.71	36.78	37.60	38.41	39.22
ADF	14.30	31.36	36.42	21.12	21.63	22.14	22.64
ADL	11.50	6.67	9.28	9.57	9.83	10.09	10.35
Hemicellulose	12.60	20.22	23.29	15.65	15.96	16.26	16.57
Cellulose	2.80	24.69	27.14	11.56	11.80	12.05	12.29

CFM: Concentrate feed mixture (37% yellow corn, 6% soyabean meal, 25% wheat bran, 25% undecorticated cotton seed meal, 4.50% molasses, 1.3 % limestone 0.7% salt, 0.5% mineral mixtures), CH (Clover hay) DTV (Dry Tomato vines) T1 (Ration contain 100% CH), T2 (Ration contain 10% DTV replaced from CH), T3 (Ration contain 20% DTV replaced from CH) and T4(Ration contain 30% DTV replaced from CH).

Nutrients digestibility and feeding values:

The results of nutrient digestibility and feeding values are given in Table (2). Results indicated that the digestibilities of DM, OM and NFE did not differ significantly among all the experimental rations. Digestibilities of CP, EE, CF and fiber fractionation were significantly (P<0.05) decrease with increasing the level of DTV in the tested rations. Similar findings were obtained by El- Sayed *et al.,* (2012) who reported that nutrient digestibilities of ration included tomato vines hay fed to dairy cows were significantly higher (P<0.05) compared with those fed rations contained tomato vines treated with fungi, but did not differ significantly with rations contained tomato silage either untreated or treated with bacteria or dried yeast. Khogali *et al.,* (2010) found that the CP and CF digestibilities were higher (P<0.01) while digestibilities of DM, OM, EE and NFE did not significantly affect by replacing tomato straw by groundnut hay in sheep rations. Hassan *et al.,* (2010) reported that all nutrient digestibilities and feeding values as TDN and DCP were improved with DTV ration compared with those of tomato fresh ration. On the other hand, Talha *et al.,* (2005) found that of CP digestibility was higher with control ration that included berseem hay ad lib compared with those of other rations that having groundnut vines hay ad lib which may be due to the botanical nature, stage of growth at harvest and other agronomical factors. In relation to this point, Botts *et al.,* (1979) reported that nitrogen digestibility was reduced from 72 to 63% by decreasing CP from 18 to 14%. On the other hand, the improvement of CP digestibility in clover hay ration (Table2) may be due to increasing of production rate of microbial protein in the rumen that enhanced by more degradable nitrogen in the form of NH3-N or to the complementary effect of undegradable dietary protein and microbial protein (Ørskov, 1982). The CF digestibility was significantly (P<0.05) decreased with increased DTV with (T3 and T4) rations than that of T1 and T2 in which significant difference between them. The decreasing in CF digestibility with increased DTV may be associated with increased the ether extract (EE) level in these rations. Similar observations were reported by Fouad *et al.,* (2003). Also, Mostafa *et al.,* (2020) reported similar observations about the factors that can be affected on CF digestibility. Results here are in agreement with the findings obtained by

these investigators who suggested that the decreases in ruminal digestions of NDF and ADF might be associated with reducing the activities of fiber degrading enzymes in ruminal digesta (Hussein *et al.,* 1995). Also, MacZulak *et al.,* (1981) stated that growth of major fiber degrading bacteria species was inhibited by increasing fat content in rations. Moreover, Palmquist, (1988) stated that increasing fat content of the ration is governed by its effects on rumen microbial activities and the digestibility of CF. In matching with this trend, El-Bedawi, (1995) found that digestion coefficients of cell wall contents were decreased significantly (P<0.05) with increased DTV in rations of lambs.

Table 2. Digestion coefficients and nutritive values of experimental rations fed to Barki lambs

Item	T1	T2	T3	T4	P-value
Digestion coefficients (%).					
DM	72.84±0.31	72.88±0.08	72.88±0.41	72.26±0.81	0.13
OM	74.49±0.41	74.58±0.14	74.83±0.28	74.58±0.61	0.72
CP	72.98±0.27[a]	71.76±0.41[b]	70.22±0.90[c]	69.44±0.48[d]	0.0001
CF	73.70±0.38[a]	73.61±0.22[a]	72.80±0.74[b]	72.14±0.37[c]	0.0001
EE	74.35±0.71[a]	70.44±0.10[c]	70.51±0.26[c]	70.96±0.27[b]	0.0001
NFE	72.46±0.81	71.87±0.38	72.30±0.68	71.87±0.51	0.42
Cell wall constituents' %.					
NDF	64.70±1.67[a]	63.90±0.10[b]	62.80±0.68[c]	61.90±0.60[d]	0.0001
ADF	65.77±.67[a]	64.87±1.11[b]	63.90±0.83[c]	62.80±0.64[d]	0.0001
ADL	8.54±.44[a]	7.98±0.40[b]	7.14±0.78[c]	6.68±0.40[d]	0.0001
Hemicellulose	77.90±.61[a]	76.89±0.80[b]	75.60±0.58[c]	74.18±0.70[d]	0.0001
Cellulose	78.10±.63[a]	77.90±0.16[b]	76.18±0.64[c]	75.19±0.68[d]	0.0001
Feeding values (%).					
TDN	69.65±0.18[a]	68.53± 0.13[b]	67.98 ±.63[c]	67.13±.63[d]	0.001
DCP	10.40±0.09	10.41±0.11	10.36±.63	10.41±0.11	0.93

Means within rows with different superscript are significantly different (P<0.05).

The feeding values (%) of the tested rations in term of TDN and DCP are presented in Table 2. The overall effect of different substitution levels of tomato vines hay on nutrient digestibilities were precisely reflected on the feeding values of the tested rations. Also, data of feeding value as TDN indicated that its value tended to significant (P<0.05) decreased with increasing the level of DTV (from zero up to 30%). While, Khogali *et al*., (2010) found that improvement of TDN as a result of sheep fed tomato straw vs. groundnut vines hay as a source of roughage in their rations. While, DCP value did not significant affected as inclusion the level of DTV in lambs' diets. This might be due to the isonitrogenous state where the experimental diets were formulated according to the experimental design. These results are matched with those suggested by El- Sayed *et al*., (2012) who reported that the digestibility and feeding values of rations that contained the tomato vines as fresh or hay had relatively lower values compared the corresponding values of the residual free one. On the other hand, the lowest nutrient digestibilities and feeding values of 30% tomato vines hay ration could be due to the negatively influences of pesticide's affect on alteration of the normal rumen bacterial population (Lowrey *et al.,* 1969), or the effect on metabolic hormones regulation that consequently interacted thoroughly with metabolic process (Rawlings *et al.,* 1998) and malabsorption of gastrointestinal tract nutrients by alternating motility or pathological lesions in the gastrointestinal tract.

Concentration of pesticides residue and total PCBs (ppb) of the ration feeding:

The concentration of pesticides residues in the rations are presented in Table (3). Results showed that no risks due to using the dried tomato vines in the tested rations as they were free from a toxic level of the pesticide residues, as shown in Table (3). Actually due to exposing tomato vines after harvesting the crop over relative long period for sun dried at a temperature degree more than 37C^{o}, where it could be sufficient to get rid of any pesticide residues. Also, pesticides can get rid of throughout many ways, including thermal collapse and by biological decomposition (Zeidan and Abd EL-Megeed 1995). Additionally, bacteria and fungi had the capability to produce a group of enzymes which can hydrolyse most of organophosphoric (Juliet *et al*., 1998).

Table 3. Concentration of pesticides residue (%) and total PCBs (ppb %) of the rations fed to Barki lambs (on DM basis).

Item	T4	T3	T2	T1
Cypermethrin	0.03	0.07	0.04	0.04
Dimethoate	0.001	0.01	0.01	0.001
Malathion	0.02	0.06	0.05	0.03
HCB*	N.D	N.D	N.D	N.D
Lindine	N.D	N.D	N.D	N.D
Total DDT	N.D	N.D	N.D	N.D
Total PCBs	0.06	0.1	0.05	0.1

HCB* *Hexachlorobenzene*

Blood serum constituents

Data in Table (4) revealed that different levels of DTV had no absolutely impact on total proteins, albumin and globulin concentrations. Serum TP and its fractions are considered as biological index reflecting health and productive performance of animal (Singh and Jha, 2009). These results are similar with those found with Hassan *et al.,* (2010) who indicated that blood metabolites of dairy cows did not affected with fed rations contained either DTV or tomato vines in fresh form respecting (total protein, albumin and globulin). On the other hand, normal physiological range of total protein and albumin according Puls, (1988) were (6-7.9 g/dl) and (2.3- 3g/dl), respectively. Regarding live measurements, results indicated that insignificant differences among groups respecting ALT and AST were observed. On other studies, Hassan *et al.,* (2010) and El-Sayed *et al.,* (2012) recorded that serum AST was significantly (P<0.05) lower and ALT did not affect with dairy cows fed of DTV ration in comparison with those fed

the tomato vines fresh ration. All of the blood parameters assessed in the present study were within the healthy normal ranges for sheep Kaneko *et al.,* (1997).

Table 4. Blood serum parameters of Barki lambs fed experimental ration.

Item	T1	T2	T3	T4
Total protein (g/dl)	7.33±0.41	7.11±0.27	6.86 ±0.29	6.68±0.36
Albumin (g/dl)	3.56±0.23	3.54±0.13	3.56±0.13	3.55±0.13
Globulin (g/dl)	3.77±0.13	3.57±0.05	3.30±0.05	3.13±0.05
AST (U/L)	33.01±2.54	33.01±2.72	33.11±2.72	33.00±2.72
ALT (U/L)	19.85±1.25	20.09±1.43	21.35±1.43	21.18±1.43

[abe]**Means within rows with different superscript are significantly different (P<0.05).**

Productive performance:

Data of daily feed intake, total live body gain, daily gain and feed conversion ratio of lambs fed the experimental rations are presented in Table (5).

Feed intake and feed conversion:

Results concerning the daily feed intake indicated that feed intake that expressed as DM, TDN and DCP of Barki lambs did not significantly affected (P<0.05) by the different levels of DTV in their rations. Inclusion of different levels of DTV in lambs rations led to slightly increase DMI and DCPI with increasing the levels of DTV, while TDNI being the vice versa trend. Improved intake and utilization of low-quality roughages in turn can be led to improve BW gain, body condition, reproductive efficiency, and weaning weight of calves (Clanton, 1982; Cochran *et al.*, 1986; DelCurto *et al.*, 1990). In relation to this point, Sarwar *et al.*, (1991) reported that dry matter intake has an inverse relationship with the digestibility of any feed for cattle. Also, some researchers demonstrated that consumption of feed was inversely linked to energy level in the ration (Sayed *et al.*, 2009 and Abbasi *et al.*, 2012). Similar results are reported by El-Sayed *et al.*, (2012) who found insignificant differences in DM intake among different rations which contained tomato vines in fresh form, untreated tomato vines hay or treated by fungi or tomato vines silage alone or with bacteria or with dried yeast in cows. While, Hassan *et al.*, (2010) stated that feed intake was higher (P<0.05) with cows fed DTV rations than those fed on tomato vines fresh form ration. Otherwise, these results are in disagreement with the findings obtained by Khogali *et al.*, (2010) who reported that tomato vines hay as a sole roughage source for lambs consuming 250 g of CFM had negative effect on DMI compared with those fed groundnut one.

Feed conversion that expressed as kg DM, TDN and DCP per kg gain are present in Table (5). Feed conversion as DM: gain was significantly (P>0.05) decreased with increasing levels of DTV in the lamb rations compared with those of control one. These results are inconsistent with those obtained by Khogali *et al.*, (2010) who found that feed conversion as kg feed/kg gain was 9.86vs 7.69 when Sudanese desert lambs fed on tomato fruitless dried plants or groundnut hay, respectively as roughage plus 250g CFM. On the other hand, there were no significant differences in feed conversion as kg TDN or DCP per kg gain compared to those of control ration.

Live body weight and live body gain

Data of initial live body weight, final live body weight, and daily weight gain are presented in Table (5). It could be observed that lambs fed ration contained 30% DTV (T4) was recorded the lowest total weight gain (p< 0.05), while, those fed the control ration (T1) showed the highest values. Whereas, there were intermediate values for lambs fed T2 and T3 rations. Also, results showed that daily weight gain were significantly (P<0.05) lower with lambs fed T4 than those of other rations (T1, T2 and T3), while the final body weight was only significant lower with the tested ration (T4) than that of control one (T1), being the differences were non significant among tested rations (T2 and T3) and T1 (control). Also, data showed that replacement DTV for CH at levels of 10 and 20% in lambs ration recorded in significant differences between them and control. All the previous characteristics of the tested experimental rations, i.e. chemical composition, digestibility, feeding values and feed consumption were closely reflected on the daily weight gain. In comparative study, Khogali *et al.*, (2010) reported that daily gain was significant (P<0.05) decreased when lambs fed rations containing DTV as a sole roughage in comparison with those fed groundnut vines ration. Also, El- Sayed *et al.*, (2012) showed that milk yield was significant (P<0.05) lower with dairy cows fed DTV as sole roughage than those fed tomato hay treated by fungi

Table 5. Feed intake, daily gain and feed conversion of Barki lamb fed on the experimental rations.

Item	Experimental rations				
	T1	T2	T3	T4	P value
Daily feed intake (g/d/h)					
CFM	611.33	611.33	611.33	611.33	
CH	404.25	303.19	202.12	101.06	
DTV	0.00	109.24	218.48	327.27	
T.DMI	1015	1023	1031	1039	
T.TDNI	706.95	701.06	700.87	697.48	
T.DCPI	105.56	106.49	106.81	108.16	
Growth performance					
Initial weight (Kg)	29±0.36	29±0.14	28±0.65	29±0.25	0.47
Final weight (Kg)	50±0.58[a]	49±0.58[ab]	48±0.28[ab]	47.50±0.29[b]	0.04
Total gain (Kg)	21±0.58[a]	20±0.58[ab]	20±.78[ab]	18.50±0.29[b]	0.05
Daily gain (g)	217±5.77[a]	206±1.73[a]	206±1.75[a]	191±0.58[b]	0.004
Feed conversion					
Kg DM/ Kg gain	4.70±0.034[c]	4.97±0.49[b]	5.00±0.05[b]	5.44±0.04[a]	0.001
Kg TDN/kg gain	3.26±0.14	3.40±0.07	3.40±0.04	3.65±0.07	0.18
Kg DCP/kg gain	0.49±0.01	0.52±0.02	0.52±0.02	0.57±0.02	0.10

[abe]**Means within rows with different superscript are significantly different (P<0.05).**

Economic efficiency:

Data related to economic evaluation are presented in Table (6). Results indicated that total daily feed cost was 2.90, 2.74, 2.57 and 2.40 LE for rations T1, T2, T3 and T4, respectively. The 30% DTV ration had the lowest feed cost by 17.24% compared with that of control group. The values for economic efficiency were 4.08, 4.14, 4.41 and 4.38 for T1, T2, T3 and T4 rations', respectively being the best efficiency was associated with the T3. Similarly, the results from previous studies Khogali *et al*., (2010) stated that feeding tomato straw or groundnut hay as a source of roughage in Sudanese desert lambs ration was economical Also, these findings are in agreement with the results of the previous economic evaluation by Abbas, (2013) who reported that tomato vines hay as a source of sole roughage for dairy cows could be used more economically compared with tomato vines in fresh form and tomato vines silage alone or treated with bacteria.

Table 6. Economical efficiency of the experimental ration fed to Barki lambs.

Item	Experimental ration			
	T1	T2	T3	T4
DM intake, (g/head/day) as fed:				
CH	460	345	230	115
DTV	0.00	115	230	345
CFM	677	677	677	677
Av. Daily gain (g)	217	206	206	191
Price of daily gain, L.E	11.88	11.33	11.33	10.51
Total daily feed cost (LE)	2.90	2.74	2.57	2.40
Net Revenue (LE/ head/ day)	8.98	8.59	8.76	8.11
Economic efficiency*(%)	4.10	4.14	4.41	4.38

The price of feedstuffs and products: CFM = 3200 L.E/ ton, DTV =150 L.E/ton, CH=1600 L.E/ ton, 1kg LBW=55 L.E.
Economic efficiency*= price /kg LBW/Feed cost (L.E/kg gain).

CONCLUSION

It could be concluded that, there are a good possibility of utilizing the DTV up to 20 % in substitution for clover hay as a cheap roughage source for feeding lambs without any negative effect on their growth performance.

REFERENCES

Abbas, H. S. (2013). Mitigation of environmental impact of pesticide residues in tomato vines and its impact on the productive performance of dairy cows. Unpublished of Ph.D. Thesis. Department of Agriculture Science, Institute of Environmental Studies & Research. Ain Shams University.

Abbasi, S. A; M. A. Vighio; S.A. Soomrol A. B. Kachiwal; J. A. Gadahi and G.L. Wang (2012). Effect of different dietary energy levels on the growth performance of kamori goat kids. IJAVMS, (6), Issue 6: 473-479.

Abdel-Magid Soha S.; H. H. Abd El-Rahman, M. I. Mohamed and I. M. Awadalla (2008). Utilization of chick pea straw and pea straw in feeding growing Rahmany lambs. American-Eurasian J. Agric. and Environ. Sci., 4 (2): 214-217.

Abdou, R. Ahlam (2011). Effect of energy level on digestion coefficients and performance of ewes during pregnancy and lactation in Southern Sinai. Egypt. J. Nutri. and Feeds, 14 (3): 349-358.

Abou-Akkada, A. R. (1988). For national strategic for increasing feedstuff in Egypt. 1st National Conf. on Role of Scientific Research in Developing Animal Health. Academy of Scientific Research and Technology. 25-29 Sep. Cairo, Egypt.

Agricultural Economics - Ministry (2014). Central administration Agricultural Economics, Yield and Production of different crops Economics Affairs Sector, Ministry of Agriculture in Egypt.

AOAC, (1990).Official Methods of analysis.15th Ed. Association of Analytical Chemists, Washington, DC.

Armstrong, W. D. and C. W. Carr (1964). Physiological Chemistry 3rd ed. P.75. burges publishing Co. Minneapolis /Minnesota.

Asar, M. A.; M. Osman; H. M. Yakout and A. Safoa (2010). Utilization of corn-cob meal and faba bean straw in growing rabbit's diets and their effects on performance, digestibility and economical efficiency. Egypt. Poult. Sci., 30 (2): 415-442.

Awawdeh, M. S. (2011). Alternative feedstuffs and their effects on performance of Awassi sheep: a review. Tropical Animal Health and Production, 43, 1297–1309.

Azizi, A.; Z. Aminifard; A. Sharifi; D.J. Meehan; A. Abraghni and A. Azarfar (2020). Whole tomato plant in ruminant nutrition: effect on vitro gas production, fermentation parameters and nutrient digestibility. J. of livestock Sci., and Techno. 8 (1): 29-36.

Ben - Salem, H.; and I. A. Znaidi (2008). Partial replacement of concentrate with tomato pulp and olive cake-based feed blocks as supplements for lambs fed wheat straw. Anim. Feed Sci. Technol., 147 (1-3): 206-222.

Botts, R. E.; R. W. Hemken and L. S. Bull (1979). Protein reserves in the lactating dairy cow. J. dairy Sci., 62: 433-440.

Clanton, D. C. (1982). Crude protein in range supplements. In: F. N. Owens (Ed.) Protein Requirements for Cattle: Symposium. Okla. Agric. Exp. Sta. MP 109:228-237. Oklahoma State Univ., Stillwater.

CLFF, (2001). Food Composition Tables For Animal and Poultry Feedstuffs Used In Egypt. Publ. By General Administration for agrarian. Culture, Ministry of Agriculture, Egypt.

Cochran, R. C.; D. C. Adams; P. O. Currie and B. W. Knapp (1986). Cubed alfalfa hay or cottonseed meal-barley as supplements for beef cows grazing fall-winter range. J. Range Manage. 39:361-364.

DelCurto, T.; R. C. Cochran; T. G. Nagaraja; L. R. Corah; A. A. Beharka, and E. S. Vanzant (1990). Comparison of soybean meal/sorghum grain, alfalfa hay and dehydrated alfalfa pellets as supplemental protein sources for beef cattle consuming dormant tallgrass-prairie forage. J. Anim. Sci. 68:2901-2915.

Doumas, B. (1971). Colorimetric determination of albumin. Clin. Chem. Acta, 31: 87.

Duncan, D.B. (1955). Multiple range and multiple F-test Biometrics,11.1.

El-Ashry M. A.; A. M. Kholif; H. M. El-Alamy; M. Fadel; H. M. El-Sayed and S. M. Kholif (2002). Effect of biological treatment on chemical composition and in vitro and in vivo digestibility of poor quality roughage. Egypt. J. Nutrition and Feeds. 5 (Special Issue): 435-436.

El–Bedawi, T. M. (1995). Preparation of sunflower oil calcium soap as a protected fat and its use in ruminant nutrition. J. Agric. Sci. Mansoura Univ. 20(1):231.

El-Sayed, H. M.; Z. H. Abd ELhamid, El-Sh. M. Ramdan; M. H. M. Yacout and H. El-S. Abbas (2012). Effect of using treated tomato vines on rumen fermentation6 and dairy cows performance. Egypt. J. Agric. Res., 90(4), 1687-1700.

FAO, (2012). FAOSTAT. Food and Agriculture Organization of the United Nations, Rome, Italy.

Fayed A. M. A; A. A. Hassan; M. S. Khalel and Afaf H. Zedan (2019). Microbial degradation of pesticide residues in watermelon vines and its effect on productive performance of lactating goats. Egypt, J. Sheep and Goat Sci., 14, No. 3, P: 1 -18.

Fouad, R. T.; O. Abdel-Salam and S. A Attia (2003). Effect of feeding canola meal on performance of Barki lambs. Agric. Sci., Mansoura Univ., 28(1):231-248.

Hassan, A. A.; M. S. Khalel; A. M. Shweerb; M. H. Yacout: B. E. E. Borhami and H. Z. Ibrahim (2010). Microbial degradation of pesticides in tomato Haulm and their effects on performance of dairy cows. Egypt, J. Nutri., and Feeds. 13(3):485-505.

Hathout, M. K.; and H. M. El-Noby (1990). Practical Champ On feed Manufac. and Quality Control. London and Hall. T.D. 3rd intern. Symp. pp 337.

Hussein, H. S.; N. R. Merchen and G. C. Fahey (1995). Effects of forage level and canola seed supplementation on site and extent of digestion of organic matter, carbohydrates and energy by steers. J. Anim. Sci., 73:2485.

Juliet, S.; T. K. Mandal; B. Mai; A. Chowdhury; A. Bhattacharyya and A. K. Chakraborty (1998). Metabolic study of isoproturon in goats following a single oral administration: toxicokinetics and recovery. J, Agric.Food Chem. 46,178-183.

Kadenczki, L.; Z. Arpad; I. Gardi; A. Ambrus; L. Gyorfi; G. Reese; and W. Ebing (1992). Column extraction of residues of several pesticides from fruits and vegetables: A simple multi residue analysis method. J. AOAC. 75: 53-61.

Kaneko, J. J.; J. E. Harvey and W. J. Sitelu (1997). Clinical Biochemical of Domestic Animals 5th ed. Harcourt Barce and Company Asia PTE. LTD. 989-899.

Khogali, H.; K. Faz; A. Gofoon and B. Ali (2010). Comparative study between tomato straw and groundnut hay for feeding male Sudanese desert sheep. Damascus Univ., for Agric., Sci. 26(2): 301-309

Lowrey, R. S.; M. C. Bowman and F. E Knox (1969). Effect of bidrin on the metabolism of dietary components by bovine. J. Dairy Sci.52: 1460-1463.

MacZulak, A. E.; B. A. Dehority and D. L. Palmquist (1981).Effects of long – chain fatty acid on growth of rumen bacteria. Appl. Environ. Microbial, 4:856.

Mahmoud, S. A.; G. A. El- Santeil; N. M. Eweedah; S. F. Kilany and H. K. El- Awady (2003). Efficiency of using groundnut vine hay in rations of growing Barki lambs under desert farming system. Egypt. J. Nutri. and feeds 6(Special Issue): 795-802.

Maynard, L. A., Loosli; U. K., Hintz; H. F. and R. G. Warner (1978). Animal Nutrition.(7th Ed.)McGraw. Hill Book Co., New York.

Megersa, T.; M. Urge and A. Nurfeta (2013). Effects of feeding sweet potato (Ipomoea batatas) vines as a supplement on feed intake, growth performance, digestibility and carcass characteristics of Sidama goats fed a basal diet of natural grass hay. Trop. Anim. Health Prod. 45:593–601.

Mostafa, M. R. M.; A. A. Abdou; H. A. Abo-Eid; H. S. Abbas; A. A. Elaidy and Walaa M. Abd El-Wahab (2020). Effect of inclusion of alfalfa cubes hay as a main source of protein in buffalo calves diet. J. of Animal and Poultry Production, Mansoura Univ., 1 (10): 524-432.

NRC (1990). Nutrient requirements of small ruminants sheep,goats,cervids, and new world camelides (National Academies press:Washington.DC).

Oloche J.; M. Z. Atooshi and M. U. Tyokase (2018). Growth performance and blood profiles of West African Dwarf (WAD) goats fed varying levels of treated sweet orange peels. Tropical Animal Health and Production, 51(1): 131-136.

Ørskov, E. R. (1982). Protein Nutrition In Ruminants. Academic Press Inc.,London.

Palmquist, D. L. (1988). The feeding value of fat. Feed science (E.R, Orskov Editor), pp. 293 –311, Elsevier Science Publ. B.V. Amsterdam, Netherlands.

Puls, R. (1988). Mineral levels in animal health. Published by Sherpa International P.O. Box 2256. Clear Book British Columbia, V2T4x2, Canada.

Rahmy, H. A. F.; H. M. El Bana; G. M. Abdul Aziz and A. E. M. Mahmoud (2019). carcass characteristics and meat quality of Barki lambs fed rations containing dried sugar beet pulp with or without fibrolytic enzymes. Egypt. J. Nutri., and Feeds, 22(2) Special Issues: 21-2.

Rawlings, N.C.; S.J. Cook and D. Waldbilling (1998). Effects of the pesticide carbofuran, chlorpyrifos, dimethoate, lindaine, triallate, trifluralin, 2, 4-D and pentachloropheno on the metabolic endocrine and reproductive endocrine system in ewes. J. of Toxicology and Environmental Health. 54:21-36.

Reitman, S. and S. Frankel (1957). Colorimetric methods for the determination of serum glutamic – oxaloacetic and glutamic – Pyruvate transminases. Amin. J. Clin., Pathol., 28: 56.

Sarwar, M.; J. L. Firkins; and M. Eastridge (1991). Effect of replacing neutral detergent fiber of forage with soy hulls and corn gluten feed for dairy heifers. J. Dairy Sci., 74:1006-1017.

SAS, (1999). SAS User's Guide Institute Inc. SAS Institute Inc., Cary, NC.

Sayed, A.B.N. (2009). Effect of different dietary energy levels on the performance and nutrient digestibility of lambs. Vet., World. 2(11):418-420.

Singh, A and S. K. Jha (2009). Development in Technology for Fodder Densification. In Walli K., ed. Proceeding of the national symposium on fodder block technology, pp93-98. Slovak J. of Animal Sci., 47:2 (2014) 90-99.

Talha, M. H;.A. A. Abou El-Ella and R. I. Moawed (2005). Effect of feeding diets containing different proportions from peanut vines hay on productive and reproductive performance of sheep. Egypt. J. Nutri. and feeds, 8(1) special issue: 379-403.

Van Soest, P. J. (1965). Symposium on nutrition and forage and pastures. New chemical procedures for evaluation forage. J. Anim. Sci. 23:838.

Van Soest, P. J. (1982). Nutritional ecology of the ruminant. O and B Books Inc., Corvallis, Oregon, Pp. 112, 126 and 127.

Vasta,V.; A. Nudda; A. Cannas; M. Lanza and A. Priolo (2008). Alternative feed resources and their effect on the quality of meat and milk from small ruminants Anim. Feed Sci. Tech 147 223 246.

Zedan, H. Afaf and A. R. Khattab (2017). Effect of replacement corn grains by orange pulp in dairy goat rations on their productive performance. Egypt, J. Nutri., and Feeds 20(3):403-412.

Zeidan, Abd El- Megeed, H. (1995). "Recent trends in pesticides and pest control" Arab House for publication and distribution. Cairo (Arabic Tex Book) pp 21:25 and 155: 165.

إستخدام عروش الطماطم الجافة فى علائق الحملان النامية

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أجريت هذه الدراسة بهدف دراسة تأثير الإستبدال الجزئى لدريس البرسيم بعروش الطماطم الجافة على معاملات الهضم وأداء النمو وبعض قياسات الدم للحملان البرقى. حيث أستخدم فى هذه الدراسة عدد 24 من ذكور الحملان البرقى النامية بمتوسط وزن 28 كجم ± 1.5 كجم بأعمار من 6-7 شهور. حيث قسمت هذة الحيوانات عشوائيا بالتساوى على حسب الوزن إلى أربعة مجاميع متشابهة (6 حيوانات لكل مجموعة) وأستمرت فترة التغذية لمدة 97 يوما. حيث تم تغذيتها على مستويات صفر و10و20و30% عروش طماطم جافة إستبدالا من دريس البرسيم . أوضحت النتائج أنه لاتوجد إختلافات معنوية بين المعاملات فى كلا من معاملات هضم المادة الجافة والمادة العضوية والمستخلص الخالى من الأزوت . علاوة على ذلك ، إنخفضت معاملات هضم البروتين والألياف الخام والدهن الخام معنويا مع زيادة مستويات عروش الطماطم . كما أنخفضت القيم الغذائية مثل مجموع المركبات الكلية المهضومة بشكل كبير مع زيادة مستويات عروش الطماطم . لوحظ أن البروتين المهضوم الكلى لم يختلف بشكل كبير بين المعاملات . أنخفض معدل النمو بزيادة مستوى الإستبدال معنويا مع المعاملة (T4) والمجاميع الأخرى والتى لم يوجد فروق معنوية بينها. لم تتأثر مقاييس الدم بالعلائق المختبرة. علاوة على ذلك ، كانت أفضل كفاءة إقتصادية بالعليقة المختبرة (T3) التى تحتوى على 20% عروش الطماطم الجافة. يمكن الإستنتاج أنه يمكن إستبدال عروش الطماطم الجافة بنسبة تصل إلى 20% من دريس البرسيم فى علائق الحملان، دون أى آثار سلبية على أدائها الإنتاجى وحالتها الصحية مع التقليل من التلوث البيئى.