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EFFECT OF DRIED *CASSAVA* (*MANIHOT ESCULENTA*) HAY LEVELS IN BARKI EWE'S RATIONS ON THEIR NUTRITIONAL AND PRODUCTION ASPECTS

M.M. El-Deeb[*1]; A.L.I. Desoky[2]; A.R. Khattab[2]; A.A. Elbadawy[2]; A.M. Saber[2] and M.M. Eissa[2]

[1]*Animal Nutrition Research Department, Animal Production Research Institute, Agriculture Research Centre, Dokki, Giza (Egypt).*

[2]*Sheep and Goats Research Department, Animal Production Research Institute, Agriculture Research Centre, Dokki, Giza (Egypt).*

***Corresponding author:** Mohamed M. El-Deeb, e-mail: deep121eg@yahoo.com; Mobile: 00201223652648

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SUMMARY

This study was conducted with the objective of evaluating the nutritional and production aspects of partially replacing berseem hay (BH) with *cassava* (*Manihot esculenta*) hay (CMH) "leaves and thin twigs" in Barki ewes' diets in terms of ruminal fermentation, milk production & it's composition, some serum characteristics and lambs' performance. Forty late pregnant Barki ewes with an average live body weight of 53.40±4.20 Kg were assigned to four experimental (n=10 each) diets, i.e. Control [40% berseem hay "BH" plus 60% Concentrate Feed Mixture "CFM"] or [25, 50 and 75% replacement of BH by CMH] plus the CFM for a period started 4 weeks before the expected lambing date and lasted post lambing until 8 weeks of lactation. The results showed that replacement of 75% BH with CMH resulted in increasing ($P<0.05$) the fractional volatile fatty acids; VFA (Acetate and propionate) and total VFA concentrations compared to other diets. Ruminal NH_3-N concentrations and total protozoa were decreased ($P<0.05$) with 50 and 75% CMH replacement compared with the control. Milk yield as well as milk fat, protein and lactose percentages were improved ($P<0.05$) by replacing 75% of BH with CMH rather than other treatments. Serum total protein, albumin, globulin and urea-N slightly decreased in CMH groups than those in the BH group, while creatinine and liver enzymes (AST & ALT) were slightly increased. Also, the level of 75% replacement of BH with CMH significantly improved lambs growth rate and weaning weight compared with other diets. Thus, using 75% CMH as a replacement of BH provides a promising source of forages for sheep with positive impacts on rumen fermentation and ewes' productivity.

***Keywords**: Cassava, ewes, rumen, milk, growth, blood, reproduction.*

INTRODUCTION

The consumption of animal food is expected to be 37 Kg/year by 2030 (FAO, 2009). Livestock production, particularly small ruminants, is an essential part of animal food production systems. For developing countries, the rapid population growth rates create a large increase in total demand for meat, milk and eggs as well as per capita intake for the next few decades (Delgado *et al.*, 2001). Global warming is a highly important issue which affects the environment and livestock production. Total emission of greenhouse gases (GHG) from livestock depends on the proportion of land conversion that is endorsed to livestock activities (USEPA, 2006). Goodland and Anhang (2009) reported that livestock production and its by-products contribute global warming (GHG) by about 51%, which consisted of Carbon dioxide (55-60%) and methane (15-20%) produced through fermentation in the rumen.

Cassava (*Manihot esculenta*) hay (CMH) considered a good source of small ruminant feeds in arid and semi-arid areas due to its nutritional value, since it contains a considerable contents of crude and digestible protein (22 & 25%, respectively) and total digestible nutrients (65%) according to Wanapat (2005) and Wachirapakorn (2006). Chanjula (2005) reported that cassava produces hay by about 5 tons/ha. In Egypt, cassava reported to has the ability to grow on already depleted soils, so it can be grown at the areas that hardly produce clover (the main fodder crop) in the rain-fed and deserts areas and the new reclaimed sandy soil where extreme weather conditions (Shams, 2010). Condensed tannins are secondary compounds present in the tropical plants normally at high to medium content, which found to exert a specific effect against rumen protozoa without altering the other rumen biomass (Wang *et al.*, 2000). Recent studies (Cotlle *et al.*, 2011 and Guglielmelli *et al.*, 2010) suggested approaches to mitigate rumen methane of livestock to avoid its contribution in global warming. Moreover, studies evidenced that some condensed tannins (CT) can reduce bloat and increase amino acid absorption in the small intestine and this improves feed utilization and save the environment via reducing methane emissions. Lower methane emissions are also common with increasing contribution of forage legumes in the diet which decrease fiber content, increased passage rate and the presence of condensed tannins in some plants (Beauchemin *et al.*, 2008 and Guglielmelli *et al.*, 2011). Wanapat *et al.* (2013) tested several methods to reduce rumen methane and concluded that among several approaches, nutritional manipulation using different feed formulation and feeding strategies, especially the use of plants containing secondary compounds (condensed tannins) could help in decreasing rumen protozoa and methanogens and mitigate methane production.

Berseem (Egyptian clover; *Trifolium Alexandrinum*) is the traditional winter forage in the Mediterranean-Middle East regions. In Egypt, berseem has achieved the distinction of being a base for livestock production due to its high nutritive value and easy cultivation. However, the absence of berseem during summer season considered a limiting factor for livestock production. In the developing countries with limited area for agriculture and the competition between animals and humans for some crops there is a serious need of searching for alternative feed resources. In addition, these alternative feeds should be friendly environment and have good impacts on animal production and quality, which will reflect on consumer's acceptance. Vast areas of Mediterranean-Middle East are characterized by high salinity arid and semi-arid zones, where halophyte forages are the most common plant species naturally grown (Ahmed *et al*., 2015). Many of these plant species yield high volumes of green biomass and contain substantial amounts of digestible protein (Morsy *et al*., 2018). In addition, they contain bioactive phyto-factors, such as tannins and cyanogenic glycosides which have shown to possess antimicrobial, anti-methanogenic, antioxidant, and immune-modulatory properties (Soltan *et al*., 2012, 2017 and Morsy *et al*., 2018). The use of dried berseem (Berseem hay; BH) during summer season with the rare availability of feed resources is a must and cost effective in these areas. Thus, the optimal use of forages grown in these areas during summer in feeding ewes may affect animal performance. Anjos *et al.* (2014) mentioned that cassava hay contains a good source of rumen undegradable protein that will be available to the animal post-ruminally in forms of tannin-protein complexes.

So, the objectives of this study were to evaluate Cassava (*Manihot esculenta*) hay "CMH" (dried leaves and thin twigs) to partially replace BH in the diet of late pregnant Barki ewes on nutritional and production aspects in addition to the performance of their offspring.

MATERIALS AND METHODS

Animals and management:

The present experimental work was carried out at Borg El Arab Animal Production Research Station; belongs to Animal and Poultry Production Research Institute, Agricultural Research Center, Egypt. Forty late pregnant Barki ewes similar in total account of parity, milk yield to previous lactation and body weight (53.40±4.20 Kg) were randomly assigned to one of 4 dietary treatments for a period started 4 weeks before the expected lambing date (pre-partum) and lasted post lamping (post-partum) until 8 weeks of lactation. Before starting the experiment, animals were treated against internal and external parasites and intro-toxemia. Ewes were kept in semi-open sheds and fed the tested diets twice daily, while had free access to fresh drinking water. After birth, all newly born lambs were allowed to suckle colostrum for about two hours. Lamb birth weight was recorded 24 h after birth and weaning weight at the 8th week of lamb age. Lambs were reared with their dams with free access to water, but had no reach to dams feed. Biweekly live body weight of ewes was recorded in the morning before feeding and their lambs were weighed at birth then biweekly until weaning.

Cassava (Manihot esculenta) hay (CMH) preparation:

Enough amounts of the fresh cassava (Manihot esculenta) foliage (leaves and twigs "CM") were chopped after being collected from the farm of Borg El-Arab Animal Production Research Station.

Chopped foliage was dried (air-drying) for 3–4 days by spreading on plastic sheets at shaded area. Samples of CM hay (CMH) were taken for subsequent proximate chemical analyses.

Experimental diets and formulation:

The ewes were grouped (10 ewes/group) for treatments into: Group 1 (Control) received a diet consisting of 40% berseem hay (BH) plus 60% concentrate Feed Mixture (CFM); groups 2, 3 and 4 received diets contained 25, 50 and 75% cassava (Manihot esculenta) (CMH) as a replacement of BH, respectively. The animal's feed consumption was determined and each ewe received its daily requirement from both forage and concentrate feed mixture according to NRC requirements (NRC, 2007) as presented in Table (1). The CFM consisted of (On DM basis) 40% ground yellow corn, 25% un-decorticated cotton seed meal, 25% wheat bran, 4% rice bran, 3% molasses, 2% limestone, 0.5% sodium chloride and 0.5% minerals & vitamins mixture. Representative samples of all diets were analyzed according to A.O.A.C. (1995) for dry matter (DM), organic matter (OM), crude protein (CP), crude fiber (CF), ether extract (EE) and ash. Ewes were fed the corresponding diets at the rate of 4% of their live body weight (LBW).

Table (1): Chemical analysis of the experimental ingredients and formulation of diets and its calculated chemical composition (% on DM basis).

Feedstuffs	**Chemical composition**						
	DM	**OM**	**CP**	**CF**	**EE**	**NFE**	**Ash**
Berseem hay (BH)	92.1	88.50	9.80	28.39	1.59	48.72	9.21
Concentrate Feed Mixture (CFM)*	89.1	91.00	13.46	9.40	4.68	63.46	5.84
Cassava Manihot esculenta hay (CMH)	86.78	91.59	22.27	28.55	3.72	37.05	7.46
Formulated diets	**Control (100% BH)**		**25% CMH**		**50% CMH**		**75% CMH**
CFM	60.0		60.0		60.0		60.0
BH	40.0		30.0		20.0		10.0
CMH	0.0		10.0		20.0		30.0
Calculated chemical composition of the tested rations:							
Control group	90.3	90.0	12.0	17.0	4.6	56.4	10.8
25% CMH group	89.8	89.8	11.8	16.8	4.6	56.6	11.2
50% CMH group	91.2	90.1	11.6	17.0	4.5	57.0	11.1
75% CMH group	91.1	90.3	11.9	15.7	4.6	58.1	10.8

DM= Dry matter; OM= Organic matter; CP= Crud protein; CF= Crud fiber; EE= Ether extract; NFE= Nitrogen Free Extract.

** CFM consisted of: 40% ground yellow corn, 25% un-decorticated cotton seed meal, 25% wheat bran, 4% rice bran, 3% molasses, 2% limestone, 0.5% sodium chloride and 0.5% minerals and vitamins mixture.*

Rumen liquor samples:

The rumen fluid was collected from 3 animals in each group at the last week of the experimental period via the stomach tube at 1.0, 3.0 and 6.0 h post feeding. The rumen fluid was separated from the feed particles through four layers of gauze and approximately 1 ml was taken for protozoa counts. The rest of rumen fluid was stored at –20°C for later analysis of NH3-N and VFA’s. Total volatile fatty acid (TVFA's) concentration was determined using the methodology of Warner (1964). Volatile fatty acids fractions were analyzed by GLC. The NH3-N concentration of rumen liquor samples was determined using the method of Conway (1957). Protozoa count test made according to Abou Akkada et al. (1969) descried method.

Milk yield and composition:

Milk yield was recorded twice weekly for 8 weeks of lactation, where animals were milked at 07:00 and 16:00 h as described by Morsy *et al.* (2016). Milk yield during the suckling period was determined using the weigh-suckle-weigh (WSW) technique of Ünal *et al.* (2007). Milk samples collected twice weekly and were analyzed for fat, protein, lactose and total solids using infrared method (EKOMILK-M ultrasonic milk analyzer, EON Trading INC, Bulgaria, 2000).

Ewe's performance:

Production traits in terms of initial and final body weights (Kg) were recorded and weight gain (Kg) as well as average daily gain (g/day) were calculated. Reproduction traits (Number of services per conception, conception rate, fertility rate (%), lambing rate (%), litter size and abortion rate) were also recorded.

Blood analysis:

Jugular vein collected blood samples were obtained before morning feeding from 3 animals in each group at the end of the experimental period. Blood samples were centrifuged for 20 min. at 4000 rpm and part of the separated serum used for enzymes (AST and ALT, IU/L) activity assay. The other part of serum was stored frozen at -20°C for further biochemical analysis of total protein (T.P., g/dl), albumin (AL., g/dl), Urea-N (mg/dl) and creatinine (mg/dl). While globulin (GL., g/dl) as well as AL/GL. ratio were calculated. For this purpose of biochemical serum analysis commercial kits (bio-Merioux, France) were used in spectrophotometer measuring technique.

Lamb's growth performance:

Lamb birth weight was recorded 24 h after birth and weaning weight at the 8th week of lamb age. Growth rate (g/day) of lambs was calculated.

Statistical analysis:

Data were statistically analyzed according to a completely randomized design using GLM procedure of SAS software 2002 (Version 9.2). Means were compared using Duncan multiple range test (Duncan, 1955).

RESULTS AND DISCUSSION

Rumen fermentation parameters:

The effects of partially replacing BH by CMH in Barki ewe's diets on ruminal fermentation parameters are shown in Table (2). The total (75%) replacement of BH by CMH resulted in increasing (P<0.05) individual (acetate and propionate) and total volatile fatty acids concentration compared with control treatments. Ruminal NH3-N concentration and total protozoa were decreased (P<0.02) with 50 and 75% cassava replacement compared with control.

Table (2): Effect of partial replacement of berseem hay by Cassava hay on ruminal fermentation parameters of Barki ewe's diets.

Parameters	Treatments				SEM	Probability
	Control (BH 100%)	Cassava hay % (CMH) 25	50	75		
Total VFA (mM)	79.01^{c}	89.31^{ab}	89.01^{ab}	94.00^{a}	5.18	0.055
Acetate, %	46.38^{b}	58.31^{a}	60.58^{a}	63.23^{a}	2.55	0.05
Propionate, %	11.28^{b}	12.00^{ab}	10.26^{b}	15.68^{a}	1.14	0.05
Butrate, %	15.74^{b}	19.19^{a}	18.64^{a}	14.35^{c}	0.90	0.03
NH_3-N (mg/100 ml)	19.81^{a}	18.74^{a}	16.12^{b}	15.11^{b}	0.67	0.02
Protozoa (10^5/ml)	7.01^{a}	6.51^{b}	6.60^{b}	4.80^{c}	0.45	0.02

a, b, c Means with different letters within the same row are significantly differed at P<0.05.
SEM =Standard error of mean.

The presence of plant bioactive phyto-factors like tannins and/or cyanogenic glycosides present in cassava might have a positive effect on animal productivity by affecting the ruminal microbial ecosystem (Soltan *et al.*, 2012 and 2017). The present results are in agreement with *Oni et al.* (2010) who concluded that inclusion of dried cassava leaves at 60% promotes good growth performance, nutrient digestibility and nitrogen utilization in West African dwarf goats and reduces feeding costs. The level of total VFA are in agreement with the range (70 to 130 m*M*/L) revised by Wanapat and Khampa (2007). In this concern, Suranindyah and Astuti (2012) concluded that fermented cassava peel had low potency to supply carbohydrate in the rumen. They also discussed and emphasized that carbohydrate degradation is responsible for most production of VFA which supports rumen microbe's growth. They added that the optimum concentration of rumen VFA to be effective in supporting rumen microbial growth was around 80 to 160 m mol/liter. Moreover, Wang *et al.* (2020) indicated that carbohydrates fermented by a various rumen bacteria are transformed into volatile fatty acids (VFAs) by certain corresponding enzymes. So, they concluded that diet's content of forage diet affects the metabolism of cellulose degradation and VFA production.

Table (3) presents the effect of BH replacement with CMH on Barki ewes' milk yield and composition. Milk yield was improved (P<0.02) when 75% CMH replaced BH compared to other dietary treatments. In addition, the same treatment (75% replacement rate) increased significantly (P<0.05) milk protein and lactose percentages, while reduced protein than the control and produced almost the same % of total solids. The enhancement of milk production by CMH inclusion could be attributed to the better fermentation and suitable condition in the rumen for better nutrient utilization, resulting in higher levels of individual and total VFAs reflected on milk production. In this concern, Hong *et al.* (2003) concluded supporting findings to those obtained herein which revealed the capability of cassava hay to reduce concentrate levels in dairy rations and resulting in increased economic returns. They added that cassava hay can be a considerable source of forage in reducing concentrate inclusion in the diets and improve milk quality. Anjos *et al.* (2014) suggested that supplementing dairy cattle by 1-2 kg/head/day cassava may reduce feeding costs on the long term and significantly increasing milk quality and quantity. Mulyati *et al.* (2015) concluded that 15% cassava leaves can be considered a good quality protein supplement to participate in concentrate of sheep diets that support low quality roughages in animal production system.

Table (3): Effect of partial replacement of berseem hay by cassava hay on milk yield and composition of Barki ewe's diets.

Parameters	Treatments				SEM	Probability
	Control (BH 100%)	Cassava hay % (CMH) 25	50	75		
Milk yield (g/d)	1008[c]	1143[b]	1150[b]	1261[a]	32.10	0.03
Fat (%)	6.60[a]	6.40[b]	6.30[b]	6.15[c]	0.08	0.001
Protein (%)	3.71[a]	3.56[b]	3.62[ab]	3.66[ab]	0.02	0.03
Lactose (%)	5.33[b]	5.36[b]	5.38[b]	5.64[a]	0.04	0.02
Total solids (%)	9.09	8.68	8.91	9.09	0.08	NS

a, b, c Means with different letters within the same row are significantly differed at P<0.05.
SEM =Standard error of mean.

Performance of ewes:

The results presented in Table (4) showed that ewes fed 75% cassava gained more weight significantly (P<0.05) compared to the other two groups. In the meantime, ewes in the 0% (control), 25 and 50% cassava hay replacement groups recorded the highest significant (P<0.05) loss % of pre-lamping weight. These positive results in live body weight and weight gain can be attributed to better feed utilization of diets contained cassava hay.

In support with the present study findings (Total weight gain and ADG), the results obtained by Khoung and Khang (2005) which reported that increasing levels of fresh cassava foliage increased total DM intake and rate of live weight gain. Moreover, similar positive results of feeding Barki ewes on cassava were recorded by Eissa *et al.* (2022). Fasae and Omosun (2013) reported that the use of forages containing tannin, e.g. cassava induced a positive effect on the growth performance (increased weight gain), but it reduced faecal egg count (FEC) of semi-intensively managed West African Dwarf sheep.

The current results indicated that all ewes came into heat and were mated by their assigned Barki rams during the first oestrus cycle. The estimate of the average gestation period was 143.7 days for the four studied groups.

The results of reproductive traits of the current study are shown in Table (5). In the meantime, ewes in the 0% (control) and 25% cassava hay replacement groups recorded the lower value than the other groups. No mortality was recorded from birth to weaning. These effects probably occur as a result of including tannins-rich plants in ewe's diets, which enhance the live body weight, body condition, and protein absorption from the small intestine (Min *et al.*, 2001).

Table (4): Effect of partial replacement of berseem hay by cassava hay in Barki ewe's diets on their performance.

Parameters	Treatments				SEM	Probability
	Control	Cassava hay % (CMH)				
	(BH 100%)	25	50	75		
Initial Body Wt. (Kg)	53.80±4.20	53.40±4.20	53.40±4.20	53.40±4.20	0.05	0.03
Final Body Wt. (Kg)	57.80±7.20^{d}	58.70±4.20^{c}	59.90±5.62^{b}	60.75±7.10^{a}	0.26	0.001
Total weight gain (Kg)	4.00±5.44^{d}	5.30±3.64^{a}	6.50±4.81^{b}	7.35±5.12^{a}	0.05	0.03
ADG (g/day)	71.43±4.30^{d}	94.64±6.20^{c}	116.07±5.60^{b}	131.52±6.50^{a}	0.38	0.02
Loss in body weight at lambing:						
Body Wt. after lambing (Kg)	45.30±6.20	48.20±4.20	50.10±5.62	52.85±7.10	0.07	0.03
Loss (Kg)	-12.50±0.43^{a}	-10.50±0.78^{b}	-9.50±0.62^{c}	-7.90±0.70^{d}	0.03	0.002
Loss as % of pre-lambing*	21.62±5.28^{a}	17.89±3.35^{b}	15.86±3.60^{c}	13.00±2.28^{d}	0.05	0.02

a, b, c Means with different letters within the same row are significantly differed at P<0.05.
SEM =Standard error of mean. ** Loss as % of pre-lambing = Loss (Kg) / Final body weight (Kg)*

Short periods of improved nutrient supply before and during mating have been known to affect ovulation rate along with the increased size and number of follicles (Bellows *et al.*, 1963), reduce follicular atresia, affect ovarian sensitivity to gonadotropin's (Downing, and Scaramuzzi, 1991) and altered plasma gonadotropin concentration (Smith, 1988). A large part of the dietary protein is hydrolyzed in the rumen to ammonia, some of which is reincorporated into microbial protein. Excess ammonia absorbed from the rumen and metabolized to urea in the liver (Min *et al.*, 2001) may increase the number of early embryonic losses (El-Zarkouny *et al.*, 2007).

Table (5): Effect of partial replacement of berseem hay by cassava hay in Barki ewe's diets on its reproduction traits

Parameters	Treatments				SEM	Probability
	Control	Cassava hay % (CMH)				
	(BH 100%)	25	50	75		
No. of ewes joined	10	10	10	10		
No. of ewes conceived	8^{b}	8^{b}	9^{ab}	10^{a}	0.08	0.001
No. of ewes lambed	8^{b}	8^{b}	9^{ab}	10^{a}	0.06	0.002
No. of lambs born alive	8^{b}	8^{b}	11^{a}	12^{a}	0.04	0.04
No. of lambs weaned	8^{b}	8^{b}	11^{a}	12^{a}	0.05	0.02
Conception rate (%)	80^{b}	80^{b}	90^{ab}	100^{a}	0.07	0.04
Lambing rate (%)	80^{b}	80^{b}	90^{ab}	100^{a}	0.06	0.01
Lambing percentage (%)	80^{b}	80^{b}	90^{ab}	100^{a}	0.08	0.001
Lambs weaned (%)	100^{a}	100^{a}	100^{a}	100^{a}	0.06	NS
Mortality rate (Birth-Weaning) (%)	0	0	0	0	0.04	NS
Kg of weaned lambs / ewe joined	8.65^{c}	8.65^{c}	10.80^{b}	12.11^{a}	0.05	0.02

a, b, c Means with different letters within the same row are significantly differed at P<0.05.
SEM =Standard error of mean. *NS = Not significant.*

Data of blood serum parameters shown in Table (6) revealed that the lowest concentrations of total proteins (T.P.), albumin (AL.), and globulin (GL.) were detected with 25% CMH group. These findings are in agreement with those reported by Eissa *et al.* (2015). Coles (1986) found that reduced absorption of dietary constituents from the intestinal tract leads to hypo-proteinemia. Higher concentrations of T.P., AL., and GL. in the BH, 50 and 75% CMH groups might be due to N concentration. The same trend was found in the serum urea-N levels. Generally, this can be attributed to the high protein content which is utilized efficiently by rumen microflora (Shaker *et al.*, 2014). Also, creatinine levels were significantly (P<0.05) increased in the three treatment groups. Concentrations of liver enzymes (AST and ALT) that are conventionally used for diagnosing hepatic damage recorded significant (P<0.05) higher values in CMH shrubs groups.

Table (6): Effect of feeding the experimental rations for Barki ewes on some blood serum traits.

Parameters	Treatments				SEM	Probability
	Control (BH 100%)	Cassava hay % (CMH)				
		25	50	75		
Total protein (T.P. g/dl)	8.11±0.50[a]	6.42±0.34[b]	7.06±0.46[ab]	7.45±0.25[ab]	0.05	0.02
Albumin (AL., g/dl)	4.61±0.38[a]	3.50±0.19[b]	3.87±0.23[ab]	3.90±0.29[ab]	0.26	0.01
Globulin (GL., g/dl)	3.60±0.14[a]	3.19±0.18[b]	3.35±0.24[ab]	3.56±0.10[a]	0.05	0.03
AL./GL. ratio	1.28±0.07[a]	1.10±0.05[ab]	1.16±0.04[ab]	1.10±0.10[ab]	0.38	0.02
Urea-N (mg/dl)	23.62±0.39[a]	19.99±0.20[c]	22.13±0.65[b]	24.10±0.52[a]	0.07	0.01
Creatinine (mg/dl)	1.13±0.11[d]	1.92±0.12[a]	1.61±0.18[b]	1.22±0.12[c]	0.03	0.02
AST (IU/L)	26.05±0.58[d]	33.49±0.30[a]	31.44±0.59[ab]	28.15±0.48[c]	0.05	0.02
ALT (IU/L)	16.28±0.29[d]	20.90±0.32[a]	19.46±0.32[b]	17.70±0.45[c]	0.07	0.01

a, b, c Means with different letters within the same row are significantly differed at P<0.05.
SEM =Standard error of mean.

Generally, the obtained results indicated that blood components measured showed slight variations due to the source of shrubs, but still all recorded levels in the present work are within the normal ranges reported by Silanikove *et al.* (1996).

Regarding lamb performance, cassava replacement resulted in increasing lamb growth rate and weaning weight as presented in Table (7). The increase of milk yield and enhancement of milk quality as presented previously could explain the superior weaning weight and growth rate of lambs produced from ewes fed on diets in which cassava replaced partially or totally the berseem hay. The concurrent results come in agreement with those obtained by Shetaewi *et al.* (2001) and El-Saadany *et al.* (2016) who recorded differences (P<0.05) between ewes fed Acacia, Atriplex and Cassava when compared with those fed Berseem hay in total gain and average daily gain of lamb's. On the other hand, these results are not in accordance with those obtained by Mohammady *et al.* (2014) who reported higher weaning weight and daily gain (P<0.05) in Barki lambs fed BH when compared with those fed tanniniferous plants shrubs.

Table (7): Effect of partial replacement of berseem hay by cassava in ewe's diets on lamb growth performance

Parameters	Treatments				SEM	Probability
	Control (BH 100%)	Cassava hay % (CMH)				
		25%	50%	75%		
Birth weight (Kg)	3.20	3.53	3.22	3.22	0.19	NS
Weaning weight (Kg)	12.40[b]	14.00[ab]	13.75[ab]	15.00[a]	0.82	0.03
Growth rate (g/day)	164[b]	187[ab]	188[ab]	210[a]	0.01	0.02

a, b, c Means with different letters within the same row are significantly differed at P<0.05.
SEM =Standard error of mean. NS = Not significant

The 75% cassava hay group gave the highest (P<0.05) total gain as well as daily body gain in the live weight of Barki lambs followed by the 50% and 25% cassava groups, while control group recorded the lowest (P<0.05) values. Moreover, El-Saadany *et al.* (2017) recorded better impact (growth rate or feed conversion efficiency and economic values) on growing Barki lambs fed cassava or prosopis (leaves & twigs) with ammoniated wheat straw and concentrate feed mixture. They concluded also that, under the semi-arid conditions, the complete diet of growing Barki lambs and contain up to 60% combinations of cassava and ammoniated wheat straw with *Prosopis juliflora* or *Acacia saligna* significantly (P<0.05) increased their daily body gain (DBG). Fasae *et al.* (2011) found that feeding the West African dwarf rams with 25, 50, 75 and 100% cassava (CH) hay as a replacement of maize hay improved their growth rate with increased CH in their diets.

CONCLUSION

Using 75% replacement of berseem hay (BH) by cassava hay (CMH) provides a promising source of forages for sheepwith positive impacts on fermentation and ewe's productivity.

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تأثير مستويات دريس الكسافا (*Manihot esculenta*) في علائق نعاج البرقي على خصائصها الغذائية والإنتاجية

محمد محمد الديب[1]، أحمد لولي إبراهيم دسوقي[2]، أحمد رجب خطاب[2]، عادل عبد العزيز البدوي[2]، عادل محمد صابر[2]، و محمد محمد عيسى[2]

[1] قسم بحوث تغذية الحيوان و [2] قسم بحوث الأغنام والماعز، معهد بحوث انتاج الحيواني والدواجن، مركز البحوث الزراعية ، الدقي ، الجيزة ، مصر.

أجريت هذه الدراسة بهدف تقييم الجوانب الغذائية والإنتاجية للإحلال الجزئي لدريس البرسيم بدريس عروش الكسافا (الأوراق والأغصان) في علائق الأغنام البرقي من ناحية تخمرات الكرش وإنتاج اللبن وتركيبه وبعض خصائص السيرم وآداء نمو الحملان. إختيرت 40 نعجة في نهاية فترة الحمل بمتوسط وزن حي 53.4 ± 4.20 كجم لإجراء التجربة (10 بكل مجموعة) غذائية :شملت مجموعة المقارنة (40% دريس برسيم + 60% عليقة مركزة) أو إحلال 25 ، 50 و 75% من دريس البرسيم بدريس الكسافا بالإضافة إلى العليقة المركزة لمدة 4 أسابيع قبل موعد الولادة المتوقع واستمرت حتى الأسبوع الثامن من موسم الحليب. أوضحت النتائج أن استبدال 75% من دريس البرسيم بدريس الكسافا قد سببت زيادة (P<0.05) في تركيز الأحماض الدهنية الطيارة المنفردة (الخلات والبروبيونات) وتركيز الأحماض الدهنية الكلي في المجموعات الأخرى ومجموعة المقارنة. انخفض معنوياً (P<0.05) تركيز نتروجين الأمونيا والعدد الكلي للبروتوزوا في مجموعتي الـ 50 و 75% دريس كسافا مقارنة بالمجموعة الضابطة. تحسن إنتاج وتركيب اللبن (نسب الدهن ، البروتين واللاكتوز) معنوياً (P<0.05) بإستبدال 75% من دريس البرسيم بدريس الكسافا عن المجموعات الأخرى. انخفض محتوى السيرم من البروتين الكلي والألبيومين والجلوبيولين ونتروجين اليوريا في مجموعات الكسافا عن المجموعة المغذاة على دريس البرسيم ، بينما إزداد قليلاً مستوى إنزيمات الكبد والكرياتينين. بالإضافة إلى ذلك ، فقد حسنت معاملة الإحلال بـ 75% معدلات نمو الحملان وأوزان الفطام مقارنة بالعلائق الأخرى. وبناء على ذلك فإنه يستنتج أن إحلال 75% من دريس البرسيم بدريس الكسافا قدم مصدر واعد لعليقة الأغنام الخشنة ذو مردود إيجابي على تخمرات الكرش وإنتاجية النعاج ومعدلات نمو المواليد.