GROWTH PERFORMANCE AND SOME BLOOD CONSTITUENTS OF BARKI LAMBS FED ON *PROSOPIS JULIFLORA* AND KOCHIA

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SUMMARY

This work was carried out on male Barki lambs to investigate the effect of substitution of berseem hay (Egyptian clover) with Prosopis Juliflora and Kochia, on growth performance and some blood constituents as well as economic efficiency. Twenty growing Barki males at 4-5 months with an average live body weight (LBW) (24.26 kg) selected from a herd of Borg El-Arab Station- Alexandria- Egypt APRI- ARC. The lambs.were randomly divided into 4 similar groups (5 animals each). The 1st group (Hay) was fed the control diet which consisted of 40% concentrate feed mixture plus 30% berseem hay (BH) plus 30% treated rice straw, while in the 2nd,3rd and 4th groups, Brseem Hay as percentage was replaced by Prosopis Juliflora, Kochia and mixture of Prosopis Juliflorar and Kochia respectively. Condensed tannins (CT) were determined according to the description of *Harinder et al.,* (1993). Blood samples was analysis. Commercial kits were used for all biochemical determination. Data was statistically analyzed by the GLM procedure of *SAS* (2003). The data indicated that the highest value of DM intake (971 g/h or 59.13 g/kgw0.75) was recorded with T1. However, the crud protein intake as g/d or g/kgw0.75 for growing lambs was not affected by the tested rations. During the whole period (14 weeks), Daily body gain was improved with T2 and T4 by 16.28 and 23.75%, respectively compared with T1. But, the obtained results detect slight differences between T1 and T3 without significance. The effect of replacing berseem hay with Prose in Juliflora alone or Kochia on total protein and urea-N without affecting liver function was significant with T2 and T4. Replacing BE with greenery, on the other hand, resulted in a lower feed coast and increased economic efficiency (T3, T4, and T2, respectively) compared with T1. In conclusion: feeding on Prosopis Juliflora or Kochia and mixing Prosopis Juliflora with Kochia, instead of clover hay may improve growth performance and some blood constituents of Bar**ki Lambs.**

Keywords: *Prosopis juliflora* - kochia -growing lambs- economic efficiency

INTRODUCTION

The shortage of green forages in the North-Western Coast of Egypt is considered the main constraint for increasing the animal such problem may be related to this this area harsh desert climate has scarce rainfall, especially during the summer season. Moreover, areas cultivated with green forage such as Berseem (Trifolium Alexandrinum) are diminishing due to the state trend to replace it with main crops such as Wheat and Barley. So, animals rely on supplementary feeding mainly with concentrates which increases feeding costs during that season. Trees and shrubs such as Prosopis Juliflora and Kochia survive under harsh climatic and has been suggested as a solution to feeding animals Abo-Donia et al., (2018). Feeding a mixture of these fodder shrubs could minimize or overcome the problems of palatability and toxic effects Lowry, (1990); Anbarasu *et al*. (2001); Patra *et al.* (2002). Some recent studies Alsheikh, (2012), Eissa *et al*., 2015a&b, Eissa *et al*., 2016, and Sadek *et al*., 2020) indicated that Such forage may improve ruminants performance particularly during summer months. Therefore, the main objective of this study was to evaluate the effect of substitution of berseem with Prosopis Juliflora, Kochia on growth performance and some blood constituents Barki Lambs.

MATERIALS AND METHODS

This study was carried out at Borg El-Arab Experimental Station (Alexandria Governorate), Animal Production Research Institute, Agricultural Research Center, Ministry of Agriculture, Egypt

Twenty Barki lamb males with an average age of 4-5 months and average body weight 24.26 kg. The animals were divided into 4 equal groups (5 each) to test:

1. Effect of replacing berseem hay with chopped foliage.
2. Effect of mixing of chopped foliage with ration contained 40% concentrate feed mixture (CFM).
   The experimental rations were therefore formulated as follow:

1. Ration (T1) : 40 % concentrate mixture plus 30% Berseem hay (BH) plus 30% TRS
2. Ration (T2): 40 % concentrate mixture plus 30% Prosopis Juliflora plus 30% TRS).
3. Ration (T3): 40 % concentrate mixture plus 30% Kochia plus 30% TRS .
4. Ration (T4): 40 % concentrate mixture plus 15% Prosopis Juliflora plus 15% Kochia plus 30% TRS

The four animal groups were assigned at random to receive the experimental rations. Foliages were cultivated in salt-affected soil in Borg El- Arab Alexandria Governorate. It was harvested within 45 min at 7:00 am, then plants sun-dried and separated leaves from wooden branches which were manually picked out then chopped into small pieces (5 mm). The used CFM contained, undecorticated cottonseed meal (25.0 %), yellow maize (38 %), wheat bran (25.0 %), soybean meal (5.0 %), molasses (3.0 %), limestone (2.5 %), common salt (1.0 %) and minerals (0.5 %). The chemical analysis of the dietary ingredients is shown in Table (1). Feed allowances were calculated according to NRC (1981). Neutral detergent fiber (NDF) and acid detergent fiber (ADF) analyzed according to method of Van Soest *et al.* (1991). Organic matter (OM) contents were calculated by difference (by subtracting ash from DM). Extractable condensed tannins (CT) in all ingredients and diets offered were estimated by Butanol-HCl method according to Makkar (2003)

Table (1): Chemical analysis of feed ingredients.

Item	DM	OM	CP	EE	Ash	NDF	ADF	CT
CFM	90.20	94.15	14.65	3.33	5.85	47.00	18.30	0
BH	88.93	88.10	13.78	2.09	11.90	49.20	27.60	0
TRS	90.73	83.90	10.09	1.40	16.10	62.02	40.01	0
Prosopis Juliflora	70.39	80.82	17.52	2.72	6.70	52.55	34.77	20.61
Kochia	91.0	92.55	12.5	2.0	17.2	57.6	40.2	24.03

Concentrate feed mixture (CFM), Berseam Hay (BH) and treated rice straw (TRS) and Extractable condensed tannins (CT).

The feeding experiment lasted 17 weeks; Barki lambs were fed for three weeks as a transitional period on the experimental rations before the start of the experimental work while the other 14 weeks were a feeding period, feeds were offered in two balanced meals at 07:00 and 18:00 h, respectively the animals were weighed at the beginning then biweekly from the fifth week to the seventeenth week. Samples of each ingredient and combined were dried in an oven with forced air circulation at 65°C for 48 hrs, then milled through a 1mm sieve prior to chemical analysis. The content of feeds was analyzed according to the procedures of AOAC (2000). Fiber fractions as neutral detergent fiber (NDF) and acid detergent fiber (ADF) were determined by the method of Van Soestet al., 1991). Condensed tannins (CT) were determined according to the description of Harinder et al., (1993). Blood samples (10 ml) were collected at 08:00 am from 12 h fasted animals using a sterile tube with anticoagula via the jugular venipuncture from three lambs within each group before feeding and at the end of the growing period to avoid any diurnal effect on the minerals levels. Samples were centrifuged at 4000 rpm for 20 min to separate serum then stored frozen at -20 C° till the biochemical analysis. Commercial kits were used for all biochemical determination.

Economic efficiency was calculated as total output/total input according to the local prices (where 1 ton of BH cost 700 LE, where one-ton CFM = 4500 L.E.; Prosopis Juliflora =550 L.E. Kochia = 550; and

Treated rice straw = 500 L.E.; Kg while live body weight of Barki lambs sold for = 65 L.E. (one United States Dollar (USD) = 15.64 Egyptian Pound (L.E.).

Data were statistically analyzed by the GLM procedure of SAS (2003). Statistical model applied for analysis was: $Y_{ij} = \mu + T_i + e_{ij}$

Where; Y = Observation of the tested factor, μ = Overall mean. T_i = Treatment effect, e_{ij} = Error.

RESULTS AND DISCUSSION

The chemical analyses of the experimental rations are presented in Table (2). It was clear that rations contained foliage or their mixture (T2, T3, and T4) showed higher ash content than the control ration. High ash content caused by foliage reflected a slight decrease in the organic matter (OM) content of these rations. The crude protein (CP %) content of the rations ranged within narrow limits as they were formulated to be iso-nitrogenous. The CTs concentration ranged from 9.18 to 12.31 g/kg DM in rations content foliage. The highest CTs concentration was recorded with T3 followed by T4 while the lowest value was recorded with T3. On the other hand, non-fiberous carbohydrates (NFC) content was approximately similar with rations ranged from 16.35 to 23.77% as shown in Table (2). The ratio between NFC and NDF was approximately similar in experimental rations. The chemical composition obtained in the present study was nearly similar to that obtained by Alsheikh , (2012) Eissa et al. a&b(2015), Eissa et al., 2016, Abo-Donia et al., (2018) and Sadek et al., (2020).

Table (2): Chemical composition (% on DM basis) of the experimental rations.

Item	Component							CT	NFC*	NFC/NDF
	DM	OM	CP	EE	Ash	NDF	ADF			
T1	91.69	91.35	12.84	2.27	8.65	52.47	27.35	0	23.77	0.45
T2	85.31	86.08	14.08	2.48	9.55	53.17	29.75	9.18	16.35	0.31
T3	89.89	90.03	13.80	2.56	9.97	53.98	30.00	12.31	19.69	0.36
T4	90.10	90.05	14.73	2.60	9.50	53.57	29.88	10.25	19.15	0.36

** Non fiberous carbohydrates%= OM% - (CP%+NDF%+EE%), Calsamiglia et al., 1995.*

T1: 40 % concentrate mixture and 30% Berseem hay (BH) plus 30% TRS, (T2): 40 % concentrate mixture and 30% Prosopis Juliflora plus 30% TRS. (T3) 40 % concentrate mixture and 30% Kochia plus 30% TRS and T4 : 40 % concentrate mixture and 15% Prosopis Juliflora plus 15% Kochia plus 30% TRS .

Dry matter (DM), Organic Matter (OM), crude protein (CP), Ether extract (EE), non-fiberous carbohydrates (NFC), Neutral detergent fiber (NDF), acid detergent fiber (ADF) and TMR is a mixture of roughage plus concentrated plus food additives.

Concerning daily feed intake, the animals consumed nearly similar quantity of DMI as shown in Table (3). The highest value of DM intake (971 g/h or 59.13 g/kgw$^{0.75}$) was recorded with T1. However, the crud protein intake as g/d or g/kgw$^{0.75}$ for growing lambs was not affected by the tested rations. This agrees with the reports of Mau et al. (2006) who stated that goats secrete proline-rich proteins constantly while sheep only produce when consuming tannin rich plants. Tannin-binding proteins in the saliva might be responsible for minimizing tannin related negative effects by forming soluble protein tannin complexes (Bartolom et al., (1998) and these are considered to be counter-defenses acquired in the course of evolution by animals whose natural forage contains such tannins Van Soest, (1991); Salem et al., (2006); Abo-Donia et al., (2018) and Sadek et al., (2020).

Performance of male growing Barki sheep in relation to different feeding schemes are presented in Table (4) and Fig (1). The obtained results revealed that replacing berseem hay with Prosopis Juliflora or Kochia, during the experimental period maintained (17 weeks) the same growth rate of lambs were significant increase in favor of feeding Prosopis Juliflora or Kochia. Daily body gain was improved with T2 and T4 by 19.44 and 31.14%, respectively compared with T1, such improvement is likely attributed to the positive effect of tannin content in foliage on digestibility and consequently the productive performance. Due to the lack of concentrated materials in the diet and the animal's need for protein at this stage, the presence of

tannin is complex with protein in the rumen to be digested later in the intestines and thus increases the amino acids available for absorption and representation in this group. The superiority of lamb daily weight gain of lambs born feed with Prosopis Juliflora or Kochia over control could be attributed to conversion ratio which in turn reflected for increasing waning weight.

Table (3): Dry matter intake* of Barki sheep as affected by experimental rations.

Items	T1	T2	T3	T4
Daily feed intake during growth period				
CFM	408	401	381	384
BH	340	0	0	0
TRS	223	286	287	289
Prosopis	0	0	287	144
Kochia	0	267	0	144
Roughage concentrate (R/C) ratio	58:42	58:42	60:40	60:40
Total DM intake, g/d	971	954	955	963
DMI g/kgw$^{0.75}$	59.13	58.27	57.42	58.74
CP intake g/d	124.68	134.32	131.79	141.85
CPI g/kgw$^{0.75}$	22.17	22.74	22.76	22.60
NFC/NDF	4.24	3.45	3.66	3.59

** Group feeding*

Table (4): Growth performance of Barki lambs as affected by experimental rations.

Item	T1	T2	T3	T4
No. of Lambs	5	5	5	5
W5	24.20±0.62	24.30±0.42	24.25±0.27	24.30±0.31
W7	25.15±0.70	25.60±0.51	25.36±0.33	25.94±0.37
W9	26.20±0.82	27.20±0.50	26.93±0.34	27.46±0.32
W11	27.33±0.97	28.80±0.67	28.19±0.42	29.40±0.34
W13	28.70±1.03^{b}	30.50±0.85^{ab}	29.61±0.17^{ab}	31.32±0.56^{a}
W15	30.38±0.88^{b}	32.48±0.40^{a}	31.63±0.61^{ab}	33.62±0.61^{a}
W17	32.58±0.69^{b}	34.31±0.62^{a}	33.92±0.38^{ab}	35.29±0.37^{a}
Total body gain, kg	8.38±0.70^{b}	10.01±0.68^{a}	9.67±0.49^{ab}	10.99±0.36^{a}
Daily body gain, g	85.51±6.70^{b}	102.14±6.44^{a}	98.67±4.65^{ab}	112.14±3.42^{a}
Economic efficiency				
Cost of feed consumed (E.P.)	2.818	2.150	2.071	2.088
Price of weight gain	5.558	6.639	6.413	7.289
Net Profile (LE./h/d	2.448	4.489	4.342	5.201
Economic efficiency %	86.87	108.79	109.66	249.06
Relative improvement	100	125.23	126.23	286.70

Means in the row with different superscripts differ significantly at ($P < 0.05$).

A similar result of increased post-ruminal digestion of protein due to tannins are published by Barry and McNabb (1999); Barry et al., 2001; Ben Salem et al., 2003; Alsheikh, (2012), Gemeda and Hassen (2015); and Sadek et al., (2020).

As for economic efficiency in Table (4), the results indicated that replacing BH with foliage tended to lower feed cost and higher economic efficiency (T2, T3, and T4, respectively) compared with T1. Moreover, using foliage in growing Barki lambs feeds lead to more increase in weight gain and increasing economic efficiency, as shown in Table (4).

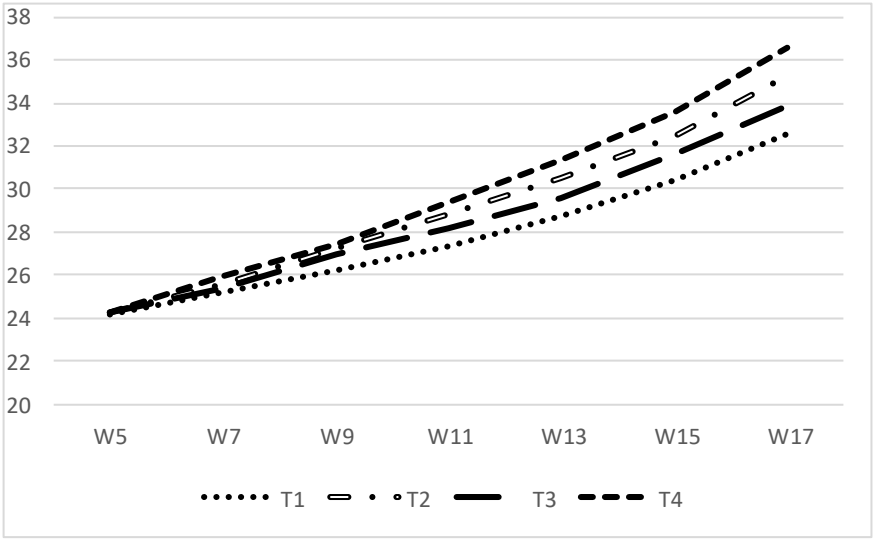

Fig (1): Performance of the growing Barki lambs in relation to different feeding schemes.

Blood plasma total proteins (TP) and their fractions, albumin (Al) and globulin (Gl) have great importance as good indicators of nutritional status. Feeding tanniniferous plants shrubs resulted in a significant increase in plasma concentration of total proteins and albumin as shown in Table (5). The increase in plasma total proteins in all treatments might be regarding the increased plant's crude protein. Kumar et al. (1980) reported a positive correlation between dietary protein and plasma protein concentrations. Another explanation could be an indication of the protein quality of the leaf Iheukwumere et al.,(2007). The highest mean albumin was recorded by lambs fed Prosopis Juliflora, and their mix with Kochia. In general plasma protein is increased by feeding tanniniferous plants through increasing albumin fraction. Albumin is known to play an important role in body fluids regulation hence coping with salt stress Abdel-Bary, (1990) Plasma globulin did not affect by feeding tanniniferous plants.Data presented in Table (5) shows the effects of experimental rations were feeding of growing Barki lambs on Blood plasma analysis (g/dl), creatinine (mg/dl), and liver function (u/l). The obtained results detect slight differences among T1 and T3 without significance, while the difference was significant with T2 and T4 that replacement of berseem hay by Kochia alone or with Prosopis Juliflora on total protein, and urea-N without negative effects on liver function (AST & ALT). In addition, the significant increase in total protein analysis on the plasma might be due to the increase in the crude protein in ration for the T2 and T4. An insignificant decrease in globulin of foliage treatment (T2, T3, and T4) compared with control might be due to the presence of a high level of CP and EE with diet reported. The result shows the Liver functions are normal as the liver enzymes are within normal range as well as albumin. Also plasma creatinine level is normal; this indicates that the feed materials used are apparently safe. Nearly similar results were observed with Alsheikh, (2012), Eissa et al., (2015a&b), Eissa et al., (2016) and Sadek et al., (2020).

Table (5): Effects of feeding experimental rations for growing Barki lambs on plasma protein analysis (g/dl), ceratinie (mg/dl) and lever function enzymes (u/l).

Item	T1	T2	T3	T4
Total protein, g/dl	6.7 ± 0.21[b]	7.6 ± 0.25[a]	6.5 ± 0.15[b]	7.4±0.22[a]
Albumin, g/dl	3.23 ± 0.19	4.17 ± 0.15	3.57 ± 0.15	4.20±0.17
Globulin, g/dl	3.47 ± 0.12	3.43 ± 0.15	3.17 ± 0.07	3.20±0.10
Urea-N, mg/dl	12.83 ± 0.73[b]	13.80 ± 1.36[a]	12.17 ± 1.42[b]	14.15±1.14[a]
Creatinine, mg/dl	1.53 ± 0.09	1.37 ± 0.12	1.43 ± 0.09	1.45±0.11
AST, u/l	44.0 ± 3.51	41.33 ± 2.60	45.67 ± 2.96	43.56±2.72
ALT, u/l	13.17 ± 1.30	11.83 ± 1.09	13.50 ± 1.26	12.11±1.24

Means in the same row with different superscripts differ significantly at (P < 0.05).

CONCLUSION

Ditry Prospois Julifora and Kochia istead or both of clover hay may improve economic efficiency and lamb performance without any deleterious effects on liver and kidney function.

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آداء النمو وبعض مكونات الدم لحملان البرقى المغذاه على البرسوس والكوخيا

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في ظل ارتفاع اسعارالاعلاف وعدم توافر المصادر العلفية الخضراء وارتفاع اسعارها مع وجود بعض البدائل العلفية التي يمكن استخدامها لتقليل الفجوه العلفيه بين ماهو متاح وما يمكن توافره صممت هذه الدراسة لمعرفة تأثير استخدام بعض الشجيرات ومخاليطهما مع قش الارز المعامل بالامونيا علي نمو الحملان البرقي وبعض مكونات الدم وقد إجريت هذه الدراسه على ذكور حملان الأغنام البرقى لمعرفة تأثير استبدال قش البرسيم (البرسيم المصري) بشجيرات البروسوبيس وشجيرات الكوخيا ومخلوطهما مع قش الأرز المعامل بالأمونيا ومعرفة الكفاءة الاقتصادية . استخدم في هذه الدراسة عدد عشرين ذكر , ًا غنم برقيى ناميًا من قطيع محطة بحوث الأنتاج الحيوانى ببرج العرب – بالإسكندرية- والتابعه لمعهد بحوث الأنتاج الحيوانى- مركز البحوث الزراعيه . يبلغ متوسط عمر هذه الحملان من 4-5 شهور ومتوسط وزن جسمه (26 و 24كجم). قسمت هذه الحيوانات إلى 4 مجموعات متساوية (5 لكل مجموعة) المجموعه الكونترول تتغذى على 40٪ من مخلوط العلف المركز + 30٪ قش برسيم+ 30٪ قش أرز معامل و المجموعه الثانيه تتغذى على40٪ من مخلوط العلف المركز +30٪ بروسوبس+ 30٪ قش أرز معامل و المجموعه الثالثه تتغذى على40٪ من مخلوط العلف المركز +30٪ كوخيا+ 30٪ قش أرز معامل و المجموعه الرابعه تتغذى على40٪ من مخلوط العلف المركز +15٪ بروسوبس+15٪ كوخيا + 30٪ قش أرز معامل.أشارت البيانات إلى أن إجمالي تناول العلف كماده جافه (971 جم / ساعة أو 59.13 جم / كجم وزن0.75) كانت تم تسجيله مع المجموعه الكونترول ومع ذلك ، فإن تناول البروتين الخام مثل جم / يوم أو جم / كجم / وزن0.75 للحملان النامية لم يتأثر بالمعاملات المختبرة.خلال فترة التجربه (14 أسبوعًا) بأكملها ، تحسن نمو الجسم اليومي للحملان مع المجموعه الثانيه و المجموعه الرابعه بنسبة 16.28 و 23.75٪ على التوالي مقارنة مع .المجموعه الكونترول كشفت النتائج المتحصل عليها عن اختلافات غير معنويه بين المجموعه الكونترول و المجموعه الثالثه ، بينما كان الاختلاف معنويا مع المجموعه الثانيه و المجموعه الرابعه .أن تأثير استبدال قشور البرسيم بواسطة البروسوبيس وحده أو مع الكوخيا وحدها على البروتين الكلي ، و يوريا N ليس له آثار سلبية على وظائف الكبد ، بينما أدى استبدال قش برسيم بأوراق الشجر إلى خفض تكلفة العلف وزيادة الكفاءة الاقتصادية ل المجموعه الثالثه و و المجموعه الرابعه و المجموعه الثانيه ، على التوالي) مقارنة مع المجموعه الكونترول . وفقًا لذلك ، فإن إطعام البروسوبيس أو الكوخيا أو مخلوطهما بدلاً من قش البرسيم + قش الأرز المعامل +40 مخلوط العلف المركز له تأثير أفضل على معدل النمو الحملان و الكفاءة الاقتصادية.