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EFFECT OF LEMONGRASS (*CYMBOPOGON CITRATUS*) AND ROSEMARY (*ROSMARINUS OFFICINALIS*) AS FEED ADDITIVES ON LAMBS PERFORMANCE.

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SUMMARY

Twenty- five growing males of Barki sheep (weighed 20.2kg and aged 3-4 months) were divided into five similar groups (5 males each). To study the effect of some medicinal plants such as lemongrass (*Cymbopogon citrates*, CC) and rosemary (*Rosmarinus officinalis*, RO) as feed additives on lambs performance. The first group (G1) was fed on a concentrate feed mixture (CFM) plus rice straw, RS (control). While, groups G2 and G3 were fed as G1 ration supplemented with 100 or 200 mg lemongrass /kg LBW/d respectively. Meantime, groups G4 and G5 were fed as G1 ration supplemented with 100 or 200 mg rosemary /kg LBW/d respectively. This experiment lasted for 160 days. The results indicated that dry matter intake (DMI) was not significantly different for G4 and G3 when compared with G1 (control) and significantly decreased in G5 and G2 compared with G1. The digestibility of DM, OM, CP, EE and NFE in the supplemented groups (G2, G3, G4 and G5) was not significantly different compared with G1. Regarding the digestibility of CF, it was significantly increased for G2 and G4 compared with G1 and there were no significant differences for G3 and G5 compared with G1. There were no significant differences in nutritive values as TDN, DCP and SV for among all supplemented groups compared with G1. Rumen liquor TVFA's were not significantly different at zero time, but at 3 hrs, there were decreased with all additives compared with the control but no significant differences among all groups. At 6 hrs, were not significantly different among all groups. The ruminal NH3-N concentration were not significantly different at zero time, while at 3 hrs treated groups were lower significantly ($P<0.05$) compared with the control group. At 6 hrs there were significant ($P<0.05$) increase in G4 and G5, while decrease in G2 and G3 respectively compared with the control group. Average daily gain were significantly increased for G3 and G5 being 205 and 180g respectively compared with control group (170g). Moreover, feed conversion were decreased for G2, G3 and G5 compared with control group. Also, the daily retained LE/ h were higher for high supplementation level from lemon grass and rosemary (2.2 and 1.95 for G3 and G5, respectively) than non-supplementation group (1.93 LE). The serum cholesterol was significantly decreased ($P<0.05$) by adding the

additives being 54.37, 57.82 mg/dl in G5, G4, respectively compared with G1 (control) being 73.83 mg/dl.
It could be concluded that using lemongrass and rosemary as feed additives in diets of growing Barki sheep with level of 200 mg/kg LBW improved the average daily gain, feed conversion, and economical efficiency.

***Keywords**: medicinal herbs, lambs, rumen activity, nutritive value, nutrient digestibility.*

INTRODUCTION

Many medicinal plants have some important properties being antiseptic, antibacterial activities, against harmful microorganisms, antispasmodic, treatment of gastro-intestinal complaints, tonic and anti-inflammatory, which are attributed to the different active materials (Mahran, 1967; Hmamouchi *et al*, 1992;El-Amary, 1993 and Tozyo. *et al*, 1994). Using medicinal plants with humans has been started since the old civilization. Inversely many synthesized chemicals caused many hazards to animal, plants and humans. The World Health Organization (WHO) encourages using medicinal plants to substitute or minimize the use of chemical compounds through the global trend to go back to nature (Allam *et al.*, 1999). Using of chemical products especially those of antibiotics and hormones may cause unfavorable side effects. Moreover, there are evidences indicating that these products could be considered as pollutants for human and threaten their health on the long-run (Magi and Sahk 2003). Attempts to use the natural materials such as medicinal plants could be widely accepted as feed additives to improve feed utilization and animal's performance. Several studies showed that adding medicinal plants to the diets of cows, buffaloes and sheep, improved their feed intake, nutrient digestibility and milk production (El-Saadany *et al.*, 1996.; Aboul-Fotouh *et al.*, 1999.; Allam *et al.*, 1999 and Salem and El-Mahdy, 2001).

Regarding the present plants which used in this study Hassanein (1982) found that the Egyptian rosemary contained 0.97% essential oil (on DM basis), which is consisted of alfa –pinene 37.25%, beta- pinene 3.5%, limonene 2.6%, phellandrene 3.4%, gama-terpinene 0.4%, camphene 11.2%, thymol 2%,thujone 4.3%, geraniol 0.7%, linalool 6.6%, borneol 0.45% and p-cymene 11.7%. Mean while Abou zeid, (1992) reported that the most important species of cymbopogon is *Cymbopogon citratus*. The fresh lemongrass (*C. citratus*) contains 0.3-0.6%volatile oil, which consisted of citral 65-90%, myrcene 10-25% and 1-4% other compounds including linalool, geraniol and nerol. El-Bordeny *et al* (2005) found that lemongrass improved feed conversion, economic efficiency and had no undesirable effects on general health of buffalo calves. Allam *et al* (2005) found that rosemary plants as additive showed good effects on Seadi lambs performance.

The objectives of this study was to evaluate effects of lemongrass and rosemary as feed additives on body weight gain, feed intake, nutrient digestibility, economical efficiency, some blood parameters and some rumen parameters of growing barki lambs.

MATERIALS AND METHODS

This experiment was carried out at the Experimental Farm Project , Nuclear Research Center, Atomic Energy Authority, at Inshas, Cairo, Eygpt to study the effect of supplementing lemongrass (CC) and rosemary (RO) as feed additives in rations of lambs

on feed intake, nutrient digestibility, some blood and rumen liquor parameters, body weight and economic efficiency.

1. Experimental animals:

Twenty five Barki male lambs their average live body weight was 20.2 kg and 3- 4 months of age were divided into 5 similar groups (5 lambs each) according to live body weight. The experiment lasted for 160 days. The experimental groups were fed on:-

G1: concentrate feed mixture plus rice straw (control).
G2: as G1 plus 100 mg/kg LBW/d lemongrass (CC).
G3: as G1 plus 200mg/kg LBW/d lemongrass (CC).
G4: as G1 plus 100 mg/kg LBW/d rosemary (RO).
G5: as G1 plus 200mg/kg LBW/d rosemary (RO).

Lambs were weighed directly before morning feeding every two weeks over the experimental period to record any change in body weight and to adjust their feed intake according nutrient requirements.

2. Rations and feeding:

The lambs were fed rations consisting of concentrate feed mixture at 3% of LBW and rice straw at 0.5% of LBW to cover the total requirements according to Tommi (1963) allowances for fat_ tailed coarse wool sheep. The daily ration was offered in twice a day at 9.00 and 15.00 hrs and fresh water was available all the day. The chemical composition of the experimental feeds is shown in Table (1).

Table (1): Chemical composition of experimental concentrate feed mixtures and rice straw (DM basis).

Item	CFM*	Rice straw
DM%	90.48	92.50
OM%	93.64	81.82
CP%	16.14	3.20
CF%	12.29	34.05
EE%	2.30	1.94
NFE%	62.91	42.63
Ash%	6.36	18.18

*CFM consisted of corn 26.4% +wheat bran 21% + sugar beet pulp 26% + Soya been meal 4%+undecorticated cotton seed meal 20% + NaCl1% + mineral mix 0.5%+ vit mix 0.1%+dicalcium phosphate1%

3. Digestibility trial:

Digestibility trial was carried out to evaluate the nutrients digestibility, nutritive value and rumen activity of the different experimental rations for using four animals from each group. The animals were individually placed in metabolic cages for 7 days as a preliminary period followed by 7 days as a collection period. The ration was offered daily and refusals if found were recorded every day. Total feces were daily collected and weighed. Feces samples (10%) were sprayed with 10% H_2SO_4 dried at 60^0c for 24 hours then it was ground and kept for chemical analysis. Total urine was individually collected in a glass bottle containing 100ml of diluted sulphuric acid (10%). Urine volume was recorded and a sample of 5% was taken and kept in the refrigerator until analysis. Samples of offered

feeds, refusals and feces were composite dried separately, finally ground and kept for chemical analysis according to the methods of the (A.O.A.C, 1996).

4. Rumen parameters:

Rumen liquor samples were taken from 3 animals in each group in end of the growth period. The experimental diets were offered once daily at 9.00 am and fresh water was offered to animals immediately after feeding. Rumen fluid samples were taken using stomach tube before feeding (0 time), at 3 and 6 hrs after feeding. The samples were filtered through 4 layers of cheese cloth. Rumen pH values were immediately determined after collection of rumen liquor using digital pH meter. Ruminal ammonia-N concentration was determined according to Conway (1963) method, and total VFA's concentration was determined according to Warner (1964).

5. Blood analysis:

Blood samples were taken at the end of the digestion trial before the morning feeding from the jugular vein. The samples were directly collected into vacuum tube and centrifuged at 3000 rpm for 15 min. Serum was separated into polypropylene tube and stored at -18^0 C until analysis for total proteins and albumin according to Weichselbaum, (1946) and Doumas *et al*, (1971), respectively. Globulin value was calculated by the difference between total protein and corresponding value of albumin. Urea concentration was determined by the method of Henry and Davidsohn (1974). Creatinine was measured as reported by Bartels,(1971). Glutamic Oxaloacetic transaminase (GOT) and Glutamic pyruvic transaminase (GPT) were determined as described by Reitman and Frankel (1957). The total lipids following method of Boutwell (1972), while cholesterol following Allain *et al*. (1974).

6. Statistical analysis:

Data of the feeding trial, digestibility trial, blood parameters and rumen liquor parameters were analyzed using general linear model procedure by computer program of SAS (1999),and the differences between means were tested using Duncans new multiple test (Duncan, 1955), and the statistical model was as follows:

$Xij = \mu + Ai + eij$

Where: Xij = represents observation, μ = overall mean, Ai = effect of treatment (rations), Eij = experimental error.

RESULTS AND DISCUSSION

1. Digestibility and nutritive values:

The results in Table (2) showed that digestion coefficient of dry matter was 70.13% in control ration (G1) and was 72.63% and 71.5% with adding either lemongrass (G2) or rosemary (G4) at 100 mg/kg LBW/day with no significant differences ($p>0.05$)among all the experimental groups supplement. Organic matter digestibility almost followed the same trend of DM digestibility. Digestion coefficient of CP was higher in G2 and G4 (69.24 and 67.22%) than the other experimental rations being 65.87, 64.19 and 64.17% for G5, G1 and G3 respectively. Digestibility of CF ranged between 51.86 to 60.45%; being significantly

Table (2): Digestion coefficient and nutritive values of the experimental Rations (DM basis, Mean ± Standard error)

Item	Experimental rations				
	G1	G2	G3	G4	G5
Apparent digestibility%:					
Dry matter	70.13	72.63	67.82	71.50	69.92
	±1.27	±0.75	±0.92	±1.83	±0.61
Organic matter	73.56	75.65	71.22	74.48	73.10
	±1.28	±0.93	±0.71	±1.89	±0.76
Crude protein	64.19	69.24	64.17	67.22	65.87
	±1.98	±0.64	±1.49	±1.90	±1.02
Crude fiber	55.60^{ab}	60.45^{a}	51.86^{b}	58.54^{a}	52.83^{b}
	±1.69	±1.81	±1.67	±2.36	±1.17
Ether extract	59.99	67.13	56.64	64.10	61.50
	±2.72	±2.24	±3.22	±4.52	±1.57
Nitrogen free extract	79.78	81.32	77.96	80.36	79.88
	±1.88	±0.82	±0.62	±1.80	±0.70
Nutritive value,%:					
Total digestible nutrients	67.26	71.56	67.09	70.18	68.99
	±2.68	±0.75	±0.79	±1.89	±0.82
Digestible crude protein	9.56	10.44	9.69	10.08	10.03
	±0.30	±0.18	±0.26	±0.31	±0.29
Starch value	58.91	63.40	58.92	61.93	60.95
	±2.64	±0.83	±0.88	±1.95	±1.00

^{a,b},.....Means on the same row with different superscript are significantly different($P<0.05$).

($P<0.05$) higher in G2 and G4 than those of G3 and G5; but insignificantly ($P>0.05$) higher than the control. Regarding EE digestibility, G2, G4 and G5 had higher values than the control group and G3 ($p>0.05$). Nitrogen free extract (NFE) digestibility was almost the same in all groups with no significant differences. The nutritive values of tested rations expressed as TDN were 71.56, 70.18 and 68.99% for G2, G4 and G5, respectively. While it was 67.26 for the control and the lowest with G3 being 67.09%. The DCP value was 10.44, 10.08, 10.03% in G2, G4 and G5, respectively, which were higher than those of G3 and G1 (9.69 and 9.56%). Starch values were higher with G2, G4 and G5, and lowest with G3 and G1. These results with low level (100mg/kg LBW) were agreement with those obtained by Gaber *et al.*, (1998), Abo-Donia *et al.*, (2000), Mohamed *et al.*, (2003) and Allam *et al* (2005) who noticed that medicinal plants addition in diets had higher value of DM, OM, CP, CF, NFE and EE digestibility than the control, while the results of high level (200mg/kg LBW) were in-agreement.

***2. Rumen activity*:**

The results in Table (3) showed that ruminal pH value didn't significantly differ ($p>0.05$) among all groups at zero time and 3 hrs except G4, which was significantly lowest ($P<0.05$) than other groups ($P<0.05$). At 6 hrs G1 and G4 were significantly lower ($P<0.05$) than G2, G3 and G5. These results agreed with those obtained by Mohamed *et al* (2003). The ruminal ammonia nitrogen concentrations (NH_3-N mg/100ml) were not

significantly different at zero time, while at 3 hrs treated groups were lower significantly (P<0.05) compared with the control. At 6 hrs there were significant (P<0.05) increase in G5 and G4, while decrease in G2 and G3 respectively compared with the control. These results agreed with those obtained by Aboul-Fotouh *et al.* (2000).

Table (3): Some rumen liquor parameters of lambs fed the experimental rations (Mean ± Standard error).

Item	Time of sampling (hrs)	Experimental rations				
		G1	G2	G3	G4	G5
Rumen pH	0	6.89	6.73	6.87	6.71	6.71
		±0.06	±0.13	±0.21	±0.15	±0.04
	3	6.27^{ab}	6.64^{a}	6.71^{a}	5.74^{b}	6.27^{ab}
		±0.11	±0.06	±0.17	±0.13	±0.26
	6	5.84^{b}	6.11^{ab}	6.19^{a}	5.84^{b}	6.03^{ab}
		±0.12	±0.03	±0.03	±0.10	±0.13
NH_3-N (mg/100ml)	0	15.27	20.66	21.56	15.27	17.97
		±0.89	±1.79	±1.55	±3.23	±1.79
	3	51.88^{a}	32.34^{bc}	28.30^{c}	39.08^{b}	35.04^{bc}
		±2.43	±2.33	±2.33	±1.35	±4.85
	6	25.15^{ab}	21.38^{b}	20.12^{b}	30.18^{a}	31.44^{a}
		±3.32	±1.25	±1.25	±2.17	±1.26
Total VFA (meq/100ml)	0	9.95	10.78	10.15	11.17	10.48
		±0.27	±0.75	±0.90	±2.14	±0.65
	3	17.33	12.20	11.75	14.73	13.38
		±0.96	±1.29	±0.66	±1.06	±2.33
	6	13.67	12.65	10.62	13.93	12.73
		±1.30	±0.39	±1.07	±0.29	±1.78

a, b and c.....Means on the same row with different superscript are significantly different (P<0.05).

The total VFA's concentrations were not significantly different at zero time, but at 3 hrs, there were decreased with all additives compared with the control but no significant differences among all groups. At 6 hrs, were not significantly different among all groups. These results agreed with those obtained by Allam *et al.* (2005) and El-Bordeny *et al* (2008).

3. Blood parameters:

The effects of medicinal plants supplementation on blood biochemical parameters are shown in Table (4). The values of total protein reflected no differences among all rations. Mohamed *et al* (2003) found that the concentration of blood total protein was 6.38 g/dl at 2 weeks and 5.78 g/dl at 8 weeks from the beginning of the experiment when they fed ewes on 150mg rosemary /kg LBW. The values of albumin decreased with the supplemented rations compared with control. Consequently globulin was high with all supplemented rations compared with control. Albumin/globulin ratio decreased with all additives compared with control. This may be due to that supplementation of lemongrass and rosemary to the ration of lambs stimulates the immune system. Also, the results showed that GOT decreased with all the additives compared with control. The GPT was

significantly less (p>0.05) in G4 and G5 than other groups. Mohamed *et al.*, (2003) found that GOT was 51.75 versus 27.51 u/dl for the control, and values of GPT were 10.1 versus 11.55 u/dl for the control group when they fed ewes, ration supplemented with rosemary (150 mg/kg LBW). Generally no abnormal values regarding the blood parameters were detected due to feeding medicinal herbs. However, the results showed no differences among all rations in blood urea and creatinine. These results agreed with that obtained by Mohamed *et al* (2003). No differences among all rations in blood total lipids but there was significant decrease (P<0.05) in cholesterol by adding the additives in G4 and G5 compared with G1. These results agreed with the results reported by Mohamed *et al* (2003).

Table (4): Some blood parameters of lambs fed the experimental rations (Mean ± Standard error).

Item	G1	G2	G3	G4	G5
T. Protein g/dl	6.48	6.58	6.97	6.48	6.10
	±0.23	±0.08	±0.43	±0.25	±0.27
Albumin g/dl	3.15	3.08	3.09	2.85	2.60
	±0.23	±0.16	±0.14	±0.11	±0.14
Globulin g/dl	3.33	3.50	3.87	3.63	3.50
	±0.13	±0.17	±0.53	±0.32	±0.31
A/G ratio	0.95	0.89	0.86	0.81	0.77
	±0.08	±0.08	±0.13	±0.09	±0.09
GOT U/l	63.56	56.03	57.35	42.19	47.59
	±6.31	±5.87	±12.60	±3.58	±2.83
GPT U/l	16.46	16.46	16.06	14.63	14.63
	±1.88	±1.56	±1.94	±1.81	±0.16
Urea mg/dl	63.48	52.33	59.31	60.00	59.59
	±3.13	±2.85	±5.29	±1.92	±6.05
Creatinin. g/dl	1.40	1.37	1.44	1.69	1.36
	±0.04	±0.02	±0.22	±0.21	±0.07
Cholesterol. mg/dl	73.83^{a}	65.43^{ab}	67.81^{ab}	57.82^{b}	54.37^{b}
	±0.12	±3.03	±6.52	±3.66	±5.22
Total lipids g/l	2.79	2.43	2.65	2.52	2.52
	±0.09	±0.14	±0.06	±0.12	±0.11

^{a,b},.....Means on the same row with different superscript are significantly (P<0.05) different.

4. Growth performance of lambs:

Regarding the body weight gain, results in Table (5) showed that diets supplementation with 200 mg CC /kg LBW/d (G3) or 200 mg RO /kg LBW/d (G5) increased the total body weight gain of lambs (being 32.8kg and 28.8 respectively) more than G1 (control), G4 (100mg/kg LBW/d RO) and G2 (100mg/kg LBW/d CC) being 27.2, 26.8 and 25.4kg respectively. The ADG of lambs was significantly (P<0.05) improved by 20.6% for lambs supplemented ration with 200 mg CC /kg LBW/d compared with non-supplemented ration, whereas, the lambs supplemented with 200 mg RO /kg LBW/d were non-significantly (p>0.05) improved by 5.8% compared with non-supplemented ration . These results agreed with those reported by Allam *et al.*, (2005) and Mohamed *et al.*, (2005). These results may be due to that supplementation of lemon grass and rosemary

with high level in lambs ration increased capitalization of protein in the rumen through decreased ammonia release in the rumen or decreased protein degradability and increased by-bass protein and consequently increased daily gain.

5. Feed conversion:

Also, Table (5) showed the results of dry matter intake (DMI) and feed conversion. It is of interest to note that results of feed conversion were improved by 6.45% and 6.95% for G3 and G5, respectively, compared with G1. These results were comparable with the results of daily gain of lambs.

6. Economic efficiency:

The results in Table (5) showed that the daily feed cost (L.E) decreased in G2 compared with the control, while G3, G4 and G5 were higher compared with control. This may be due to high price of lemon grass and rosemary which were 0.08, 0.22, 0.10 and 0.19 LE/day for G2, G3, G4 and G5, respectively. The results showed that price of daily gain L.E/h were higher for high supplementation level from lemon grass and rosemary compared with control group. These results agree with those obtained by Allam *et al* (2005). Also, the daily retained LE/ h were higher for high supplementation level from medicinal plant (2.2 and 1.95 for G3 and G5, respectively) than non-supplementation group (1.93 LE). Also due to high daily gain for G3 and G5, the total cost for fattening period will decreased due to short period required for obtained the same weight compared with control group.

Table (5): Performance of lambs fed the experimental rations.

Item	Experimental rations				
	G1	G2	G3	G4	G5
Concentrate feed mixtures intake, g/h/day					
Rice straw intake, g/h/day	876	792	990	927	865
Total dry matter intake g/h/day	149	135	169	158	147
Av. Initial body wt (kg)	1025	927	1159	1085	1012
Av. Final body wt (kg)	19.8	17.4	22	22.8	19
Total body weight gain, kg	47	42.8	54.8	49.6	47.8
Average daily body weight gain, g	27.2	25.4	32.8	26.8	28.8
	170^{b}	159^{b}	205^{a}	168^{b}	180^{ab}
Feed conversion:					
Feed kg/kg body gain	6.03	5.83	5.65	6.46	5.62
Daily feed costs L.E/h	1.30	1.26	1.69	1.48	1.47
Price of daily gain L.E/h	3.23	3.02	3.89	3.19	3.42
Daily retained L.E/h	1.93	1.76	2.2	1.71	1.95
Feed cost L.E /kg gain	7.65	7.92	8.24	8.80	8.17

a.b.....Means on the same row with different superscript are significantly ($P<0.05$) different.
The economic study was held using the market price at that time (2008).
The Price of one kilogram live body of sheep was 19 L.E .
The Price of concentrate feed mixture was 1300L.E/ton,
The Price of rice straw was 250L.E/ton.
The price of lemongrass and rosemary was 28L.E/kg, 13L.E/kg, respectively.

CONCLUSION

Using *Cymbopogon citratus* and *Rosmarinus officinalis* up to 200 mg/kg LBW as feed additives in rations of Barki growing lambs could improve the nutrient digestibility, nutritive value, daily gain, and decrease serum cholesterol concentration which are positively reflected on lambs performance and economic efficiency.

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تأثير إضافة حشيشة الليمون وحصا اللبان كاضافات غذائيه على الأداء الإنتاجى لحملان أغنام البرقى.

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استخدم فى هذه الدراسة ٢٥ حملاً من أغنام البرقى متوسط الوزن ٢٠.٢ كم ومتوسط أعمار ٣- ٤ شهور. قسمت الى خمس مجاميع متساويه (٥ ذكور لكل مجموعة) لدراسة تاثير اضافة كل من حشيشة الليمون و حصا اللبان على الأداء الانتاجى ومواصفات الدم وسائل الكرش. المجموعة الأولى كانت تتغذى على علف مركز بالاضافة الى قش الأرز(عليقة المقارنة) لتغطية الاحتياجات الغذائيه الكلية. أما المجموعة الثانية والثالثة فكانت تتغذى على نفس عليقة المقارنة ومزوده بمستوى ١٠٠ و٢٠٠ ملجم/كم وزن حى حشيشة الليمون على التوالى والمجموعة الرابعة والخامسة كانت تتغذى على نفس عليقة المقارنة ومزودة بمستوى ١٠٠ و٢٠٠ ملجم/كم وزن حى حصا اللبان.

أظهرت النتائج أن المادة الجافة المأكولة لم تتأثر معنوياً مع المجموعة الرابعة والثالثة وانخفضت مع المجموعة الخامسة و الثانية مقارنةً بمجموعة المقارنه. كذلك أظهرت نتائج تجربة الهضم أن معامل هضم المادة الجافة والمادة العضوية والبروتين الخام والرماد الخام والمستخلص الخالى من الأزوت لم يتأثر معنوياً مقارنةً بمجموعة المقارنه ولكن معامل هضم الألياف الخام زاد معنوياً مع المجموعة الثانية والرابعة على التوالى مقارنةً بمجموعة المقارنه ولم يتأثر معامل هضم الألياف الخام مع المجموعة الثالثة والخامسة. كما أظهرت النتائج أن التحسن فى القيمة الغذائية كمركبات كلية مهضومة وبروتين مهضوم ومعادل النشا لم يكن تحسناً معنوياً. كما أظهرت نتائج سائل الكرش أن تركيز الاحماض الدهنية الطيارة بعد ٣ ساعات من التغذية انخفض مع كل المجاميع مقارنةً بالمجموعة الشاهد وبعد ٦ ساعات من التغذية لم توجد فروق معنوية بين كل المجموعات . تركيز الأمونيا بعد ٣ ساعات من التغذية كان منخفض أنخفاض معنوى مع كل الاضافات مقارنةً بمجموعة المقارنه ولكن بعد ٦ ساعات ازداد التركيز مع المجموعة الرابعة والخامسة وانخفض مع المجموعة الثانية والثالثة مقارنةً بمجموعة المقارنة. كما أظهرت النتائج أن المجاميع الخامسة والثالثة والرابعة كانت أفضل تحويل غذائى مقارنةً بمجموعة المقارنه. كما أظهرت نتائج التغذية للحملان أنه بزيادة تركيز حشيشة الليمون وحصا اللبان فى المجموعة الثالثة والخامسة أدى الى تحسن معنوى فى معدل النمو اليومى فكان ٢٠٥و ١٨٠جم مقارنةً بمجموعة المقارنه ١٧٠جم. أظهرت النتائج أن الكفاءة الاقتصادية قد تحسنت معنوياً مع كلاً من المجاميع الثالثة و الخامسة مقارنةً مع مجموعة المقارنه.

ويمكن استنتاج أن اضافة حشيشة الليمون و حصا اللبان الى علائق ذكور حملان البرقى الناميه بمستوى ٢٠٠ ملجم/كجم وزن حى قد أثر ايجابياً على معاملات الهضم والتحويل الغذائى ومعدل النمو اليومى. وانعكس ذلك كله على تحسين الكفاءة الإقتصادية.