The effect of *Ocimum basilicum* and *Cuminum cyminum* seeds on the weight gain and rumen activity and fermentation in Awassi rams

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Accepted on: 8/6/2014

Summary

This study was carried out at Animal Farm, College of Veterinary Medicine, Baghdad University from April up to July 2013. The animals were fed on concentrate diet and freely grazed for 3-6 hours/ day at College Field. Rams were used in a Latin square design (4*4) and trans located biweekly intervals, respectively to different concentrate diets.The first diet 2% of the body weight was free from any addition and considered as a control, the second diet contained 3% *Cuminum cyminum* seeds (CU); and the third diet contained 3% of *Ocimum basilicom* seeds (B) and the fourth concentrated diet contained 1.5% of Cuminum cyminum and 1.5% *Ocimum basilicom* seeds (CU+B). Results revealed that there was significant (P<0.05) difference during the first two periods in the body gain compared with other periods. pH of rumen liquor of the control group 6.00±0.24 showed significantly (P<0.05) higher than all other animals during all periods 5.42±0.095, 5.40±0.14 and 5.65±0.11, while the volatile fatty acids were significantly lower in the control animal 8.25±0.75 compared with other animals. Ammonia concentration in the rumen liquor showed higher significant (P<0.05) difference 9.33±0.13 and 9.60±0.43 respectively in the third and fourth period than first period 7.52±0.28. On the other hand bacterial count of the control group was significantly (P<0.05) lower than other groups.

Keywords: *Ocimum basilicum* seeds, *Cuminum cyminum* seeds, weight gain, rumen fermentation, Awassi rams.

Introduction

***Ocimum bsilicum* is** a plant widely used in naturopathic medicine (1-3). It is used for a number of therapeutic purposes recently being validated scientifically including antihelminthic and antifungal (4 and 5), hypoglycemic, anti-diarrheal, anti-mutagenic, insecticidal, and anticonvulsant activities. The plant has been reported to contain terpenoids such as eugenol and thymol, saponins, and alkaloids (6-11). The genuse Ocimum (Lamiaceae) is used for their antioxidant and neuroprotective activity in various parts of the world, its antioxidant activities are comparable to those of the known antioxidants, α-tocopherol and butylated hydroxy toluene (BHT) (11and12). *Ocimum basilicum* has been used traditionally for the treatment of anxiety, diabetes, cardiovascular diseases, headaches, nerve pain, as anticonvulsant and anti-inflammatory, and used in a variety of neurodegenerative disorders (13 and 14). Also (14) reported that the plant has gastroprotective effects. The leaf extract of *Ocimum basilicum* also had been validated following the claim in folklore about its high efficacy against gastric ulceration (14 and 15). Anti ulcerogenic activities of three plant drugs were studied against aspirin-induced gastric ulcers in rats. In addition, their effects on output of gastric acid and pepsin and hexosamine concentrations in gastric fluid were recorded in ulcerated and non-ulcerated rats. The activity may be due to inhibition of acid and pepsin secretions and/or there is in vitro ability to bind these *Ocimum basilicum* (aerial parts) powders and its aqueous and methanolic extracts decreased the index (15). Moreover, the acid output was decreased by its methanolic extract while hexosamine secretion was enhancing (14 and 15). Also (16) proved that *Ocimum spp* have gastro protective property and studied the antiulcerogenic effect of *Ocimum* extract by enhance gastric mucosal strength. On the other hand *Cuminum cyminum* is commonly known by cumin which belongs to apiacea family. Cumin consists of carbohydrate 23%, protein 19%, and fat 10% and crude fiber 5.5% with vitamins (mg/100 ml) such as thiamin 0.05 riboflavin 0.28 and niacin 2.7. It is also a rich

source of minerals such as Fe and Zn (17). It is also used in veterinary medicine and traditional medicine as an appetizer stimulant, as a carminative and an astringent. Cumin is characterized by the antioxidant activity (18). *Cuminum cyminum* has strong antioxidant activity of their extracts and indicate that its intake may be beneficial as feed additives (19). Cumin improved digestibility and considered as a good nutrient composition source (17). The present study was designed to investigate the effect of *Ocimum basilicum* and/or *Cuminum cyminum* seeds on weight gain and rumen activity and fermentation in Awassi rams.

Materials and Methods

Awassi rams were kept in semi open shed at the Animal Farm / Veterinary College, Baghdad University. The experiment started from April up to the end of June/2013. Animals were fed on a concentrate diet and freely grazed for 3-6 hours/day at the College Fields. Animals were used as a Latin square design (4*4) and Trans located at biweekly intervals respectively to the different concentrate diets as follow: The first diet was fed at a rate of 2% of the body weight concentrate diet used free of feed additives as control diet. The second concentrated diet contained 3% of *Cuminum cyminum* seeds and was fed at 2% of body weight. The third concentrate diet contained 3% of *Ocimum basilicum* seeds and was fed at 2% of body weight. The fourth concentrate diet contained 1.5% of *Cuminum cyminum* seeds and 1.5% of *Ocimum basilicum* seeds and was fed at 2% of the body weight.In this study Parameters and measurements included the weights of animals which were taken at the end of the nutrition periods for each animal. The rumen liquor samples were collected at the last day after the end of each treatment by stomach tube 3 hour post feeding for measuring the pH value immediately and then analyzed for ammonia (20) and volatile fatty acids VFA (21) and ruminal bacterial count (22). The data were statistically analyzed by Latin square. Least significant difference was applied to compare the differences among different mean groups (23).

Results and Discussion

Table (1) showed that there are no significant differences in the total gain among different treatments at biweekly while significant differences ($p<0.05$) existed among different periods in their body gain. The first period showed significantly ($p<0.05$) higher than all other periods. All animals showed no difference in their gain during the whole studied period.

Table, 1: Effect of using *Ocimum basilicum* and/or *Cuminum cyminum* on rams body weight gain (Kg) during different period and Awassi ram individuality.

Trait description		Mean±SE	LSD
Overall mean		0.725±0.103	0.528
Treatment	control	0.843±0.273	
	B	0.705±0.204	
	CU	0.753±0.285	
	CU+B	0.600±0.077	
Period	1	1.315±0.217a	
	2	0.508±0.047b	
	3	0.515±0.070b	
	4	0.563±0.0625b	
Animal individuality	1	0.775±0.298	
	2	0.750±0.192	
	3	0.750±0.284	
	4	0.625±0.048	

The weight gain showed a significant difference ($p<0.05$) in the treated groups at the first two weeks which may be related to the feeding regime, or may be due to the seeds in the ration which improved the palatability and increased feed intake or may be due to the high nutrient content of carbohydrate, protein minerals and vitamin in the seeds of *Cuminum cyminu* and *Ocimum basilicum* of (1, 2, 18 and 9).The overall mean of rumen pH was 5.619±0.095; the control group (6.00±0.25) showed significantly ($p<0.05$) higher than other groups during the studied period (Table,2) while with progress of the experimental period the pH showed decline and was significantly ($p<0.05$) lower in the 3rd period (5.30±0.11) than the first period (5.90±0.27) then it gradually increased. In the meantime, no differences were shown among animals during the whole studied period.

Table, 2: Effect of using *Ocimum basilicum* and/or *Cuminum cyminum* on rumen pH during different periods and Awassi ram individuality.

Trait description		Mean±SE	LSD
Overall mean		5.619±0.095	0.319
Treatment	control	6.000±0.245a	
	B	5.425±0.095b	
	CU	5.400±0.147b	
	CU+B	5.650±0.119b	
Period	1	5.900±0.274a	
	2	5.650±0.132ab	
	3	5.300±0.108b	
	4	5.625±0.132ab	
Animal individuality	1	5.650±0.132	
	2	5.425±0.063	
	3	5.675±0.236	
	4	5.725±0.296	

The lower pH value in the ruminant fluid may be due to the effect of feed additive in concentrate diet which may affect the carbohydrate fermentation by the microorganisms of the rumen (24). These results were on the same trend with (25) who found that adding feed additive (Nigella sativa and Fenugreek seeds) caused a reduction in pH value of the rumen liquor. Also they agree with (26) who proved that pH value was affected by absorption of VFA production by the vili in the ruminal wall. In contrast, the control group showed the lowest production volatile fatty acids (8.25±0.75) than all other groups.The mixed group (11.50±1.71) showed a significantly ($p<0.05$) higher value than the control group; by time , the volatile fatty acids production declined gradually.

Table, 3: Effect of using *Ocimum basilicum* and/or *Cuminum cyminum* on rumen VFA during different periods and Awassi ram individuality.

Trait description		Mean±SE	LSD
Overall mean		9.563±0.806	2.625
Treatment	Control	8.25±0.75 b	
	B	9.00±1.47 ab	
	CU	9.50±2.33 ab	
	CU+B	11.50±1.71 a	
Period	1	12.75±2.14 a	
	2	9.00±0.71 b	
	3	8.50±1.44 b	
	4	8.00±1.08 b	
Animal individuality	1	12.00±1.41 a	
	2	8.75±1.11 bc	
	3	10.75±1.75 ab	
	4	6.25±1.18 c	

During the first period of the study, volatile fatty acids production showed significantly ($p<0.05$) higher than other studied periods. It was noticed that animal no.1 significantly recorded the highest VFA production in its rumen along the whole period, while the animal no.4 showed the lowest. (27) showed that an increase in the volatile fatty acid due to the ration contain high fermented carbohydrate and there is a negative relation between the increased volatile fatty acid and reduction of the pH or may be due to the effect of cumin and basilicom .The results agreed with (25 and 28-30) who found that the total VFA concentration increased up to four hour post feeding in ruminal liquor of the sheep when singal cell protein was replaced instead of soybean meal in ration. The mean total ammonia concentration in rumen liquor was 8.68±0.25. Animals were fed different feed additive and had no effect on the mean ammonia concentration in their rumen liquor, but with the progress of experiment, NH3-N increased. The third and fourth periods were significantly ($p<0.05$) higher than the value during the first period. No effect was on rumen ammonia of the rumen liquor because of animal individually.

Table, 4: Effect of using *Ocimum basilicum* and/or *Cuminum cyminum* on rumen NH_3-N (mg/dl) during different period and Awassi ram individuality.

Trait description		Mean±SE	LSD
Overall mean		8.68±0.254	1.186
Treatment	control	8.82±0.58	
	B	8.57±0.21	
	CU	8.32±0.67	
	CU+B	9.01±0.61	
Period	1	7.52±0.28 b	
	2	8.27±0.30 ab	
	3	9.33±0.13 a	
	4	9.60±0.43 a	
Animal individuality	1	8.81±0.58	
	2	8.34±0.34	
	3	8.85±0.63	
	4	8.73±0.63	

The results of NH_3-N (Table, 4) were on the same trend with the (30 and 31) who mentioned that ammonia concentration in the ruminal liquor was a good indication of microbial growth and metabolic efficiency in the rumen content. In vitro study (32) showed

that effect of adding cumin to the ruminant diet caused an increase in NH_3-N compared with the control group and these results agreed with the researches' (33-35). Bacterial count showed significant ($p<0.05$) differences among different treatments. Thus control group showed significantly ($p<0.05$) lower (11.30±0.023) in total bacterial count than other groups followed by the cumin group (11.693±0.080) while the mixed group showed significantly the highest count number (11.92±0.030) than all groups as a result of synergetic effect of both C+B.

Table, 5: Effect of using *Ocimum basilicum* and/or *Cuminum cyminum* on rumen Bacterial count (CFU/ml) during different period and Awassi ram individuality.

Trait description		Mean±SE	LSD
Overall mean		11.613±0.061	0.158
Treatment	control	11.310±0.023d	
	B	11.530±0.020c	
	CU	11.643±0.080b	
	CU+B	11.920±0.030a	
Period	1	11.608±0.121	
	2	11.525±0.136	
	3	11.645±0.139	
	4	11.675±0.136	
Animal individuality	1	11.580±0.128	
	2	11.630±0.131	
	3	11.643±0.153	
	4	11.600±0.132	

The ruminal bacterial count (Table, 5) of the treated groups increased significantly which they agreed with (33 - 36) and may be explained that the seeds of Ocimum basilicom and Cuminum cyminum were more easily degradable and thus increased the digestibility (17).Or it may due to improve the effect of seeds in the ruminal environment (37). (38) Mentioned that lower pH of ruminal liquor lead to increase in ruminal microorganisms count.

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تاثير استعمال بذور الريحان و/ او الكمون على الزيادة الوزنية وفعالية الكرش وتخمراته في الكباش العواسية

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الخلاصة

أجريت هذه الدراسة في الحقل الحيواني والتابع لكلية الطب البيطري ، جامعة بغداد للفترة من نيسان حتى تموز 2013. تم تغذية الحيوانات على العلف المركز بالاضافة الى الرعى بحرية لمدة 3-6 ساعات / يوم في حقل الكلية، حيث استعمل الكباش في تصميم المربع اللاتيني (4 * 4) اذ تم تغيير الاعلاف المركزة المختلفة المقدمة وبواقع كل أسبوعين على التوالي وكانت نسبة العلف المركز 2 ٪ من وزن الجسم بدون اضافات علفية واعتبرت كمجموعه السيطرة، في حين كانت العليقة الثانية مكونة من 2% العلف المركز والحاوي على 3 ٪ بذور الكمون CU)، اما العليقة الثالثة فاحتوت بالاضافة الى العلف المركز بذور الريحان وبتركيز 3٪ (B) اما العليقة الرابعة فقد احتوت على العلف المركز والمكون من 1.5٪ من بذور الكمون و1.5% الريحان (CU + B). أظهرت النتائج أن هناك فروق معنوية ($P < 0.05$) في الزيادة الوزنية خلال الفترتين الأولى والثانية مقارنة مع الفترات أخرى، اما قيمة الاس الهايدروجيني pH للكرش فقد اظهر ارتفاع معنوي ($P < 0.05$) لمجموعة السيطرة (6.00 ± 0.24) مقارنة مع المجاميع الأخرى خلال جميع فترات (5.42 ± 0.095 ، 5.40 ± 0.14 و 5.65 ± 0.11)، في حين أن الأحماض الدهنية الطيارة كانت أقل معنويا ($P < 0.05$) في حيوان السيطرة (8.25 ± 0.75) مقارنة مع الحيوانات الأخرى ، اما تركيز الأمونيا في سائل الكرش فقد أظهر فروقا معنوية كبيرة ($P < 0.0$) في الفترة الثالثة والرابعة (9.33±0.13, 9.60±0.43 على التوالي) مقارنة مع الفترة الأولى (7.52±0.28) على الجانب الآخر كان العد البكتيري لسائل الكرش أقل معنويا بكثير ($P < 0.05$) من المجاميع الأخرى.

الكلمات المفتاحية : بذور الريحان, بذور الكمون, الزياده الوزنية, تخمر المواد العلفية في الكرش, الاغنام العواسية.