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MISWAK AND KHELLA AS GROWTH PROMOTERS IN RABBITS PERFORMANCE AND SOME PHYSIOLOGICAL ASPECTS

By

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Abstract: *The role of miswak and khella as natural growth promoters was studied in 63 male growing New Zealand rabbits. Rabbits were classified into 7 equal groups. The first group was used as control that received free basal ration. Groups from two to five received free basal ration supplemented with either miswak or khella at the level of 1.0 and 2.0 %, respectively. The six and seven groups received 1:1 mixture of miswak and khella at the two levels of 1.0 and 2.0 %, respectively.*

Miswak at 2% level showed significant increase (P<0.05) in the daily gain by 6.9 %, *compared to the control group. Khella at 1 and 2% level or mixture at 2% level significantly (P<0.05) decreased the daily feed intake compared to the control group. The treatment groups of rabbits received a basal ration at 2 % level of either miswak or mixture showed the high economic efficiency values that increased by 5.7 and 5.6%, respectively compared to the control group.*

Miswak, khella and their mixture at 2% level significantly (P<0.05) decreased the total lipids by 6.9, 6.4 and 10.3%, respectively compared to the control group.

Dietary khella at the two levels used and mixture at 2% level significantly (P<0.05) decreased urea and creatinine values by (13, 23.7, and 21.6) and (28.9, 33.3 and 24.4%), respectively compared to the control group. Khella or mixture at 2% level showed the same significant (P<0.05) improvment for the activity of GOT and GPT enzymes by 11.8%, compared to the control group. Miswak, khella and mixture at 2% level significantly (P<0.05) increased the packed cell volume (PCV %) by 9.8, 11.4 and 11.3% respectively, compared to the control group. Mixture at 1 or 2% level significantly (P<0.05) decreased the abdominal fat weight by 14.9 and 18.3 %, respectively compared to the control group.

INTRODUCTION

Miswak used the dried steem of *Salvadora persica,. L*. Miswak oil included eugenol, thymol, isothymol, eucalyptol, isoterpinolene, and beta–caryophyllene (Alali and Al-Lafi 2003). Thin layer chromatographic analysis coupled with gas chromatography revealed the presence of myristic acid by 38.7% in oils of *S. persica* (Hosamani and Pattanashettar 2002). Eugenol and myristicin are some of a large number of natural compounds that are known to inhibit mutagenesis and carcinogenesis in *in vitro* and *in vivo* assay systems (Ramel et al., 1986; Selvi and Niranjali, 1998 and Tisserand and Balacs, 1995). Eugenol has a considerable antibacterial effect on several different oral aerobic bacteria with comparable results to known antibiotics (Alali and Al-Lafi 2003). *S. persica* used for bites of poisonous animals (Batanouny,1999). *S. persica* stem extracts showed protection against pentylenetetrazol-induced convulsion by increasing the latency period and diminishing the death rate (Monforte et al.,2002). *S.persica* possessed significant protective action against ethanol and stress-induced ulcers (Sanogo et al., 1999). *S. persica* decoction possesses significant antiinflammatory activity (Monforte et al., 2003). Miswak extract (200 mg/ml) had bactericidal, antimycotic or antifungal properties (Al-Samh and Al-Bagieh 1996).

Khella is the dried seeds of *Ammi visnaga, L.*In modern phytotherapy, Visnadin is being used in the treatment of cardiovascular diseases and urolithiasis. Visnadin might be a potent calcium channel blocker (Rauwald., et al 1994). Visnadin, is one of the main active principle extracted from fruits of *A. visnaga*, that has been used for the treatment of angina pectoris and preferentially inhibited the contractile responses (Duarte et al., 1997). The vasorelaxant properties of visnagin are responsible for its acute hypotensive effects (Duarte et al.,2000). Linalool is one of the major components of *A. visnaga,* have a narcotic effects, non-toxic, non-irritating and non-sensitising (Zrira et al.,2002), increase the activity of rat liver enzymes (Tisserand and Balacs 1995), and has been used for and urinary disorders as well as releases kidney, renal and bladder stones (Loutfy, B. 1983). and (Batanouny,1999). khellin and visnagin were 2.36 and 1.97 micro g/ml, respectively by using UV detection at 245 nm (Gunaydn and Erim 2003).Visnagin inhibited vascular smooth muscle contractility by acting at multiple sites (Duarte J, et al., 1995).

This work aimed to investigate the role of miswak or khella, as well as their mixture by adding to diet as natural growth promoters for the performance, and some metabolic changes of growing rabbits.

MATERIALS AND METHODS

A total number of 63 male weaning New Zealand White rabbits with an average body weight of 1060 ± 58 g, were divided into seven equal groups of 9 each. The basal experimental ration (Table 1) was formulated and pelleted to cover the requirements of rabbits according to NRC (1977).The experimental period lasted for 60 days and the experimental groups were classified as follow:

Group 1 was fed the basal diet only and served as control,
Group 2 was fed the basal diet + 1 % miswak,
Group 3 was fed the basal diet + 2 % miswak,
Group 4 was fed the basal diet + 1 % khella,
Group 5 was fed the basal diet + 2 % khella,

Group 6 was fed the basal diet + 1 % mixture of miswak and khella and

Group 7 was fed the basal diet + 2 % mixture of miswak and khella

New Zealand White rabbits were housed in galvanized cages provided with feeder and automatic drinkers. Rabbits of all groups were kept individually under the same managerial conditions. Live body weight was obtained and feed was offered *ad-libitum* and recorded biweekly during the experimental period.

At the end of the experiment, 3 males of each rabbit's treatment were kept in metabolic cages. Faeces were collected separately without urine. Feed and water were offered *ad-libitum*. Feed intake and excreted faeces were recorded daily for 5 days. The total excreted faeces during the 5 – day's period were pooled, well mixed, weighted and sampled for analysis. Chemical composition of feed and dried excreta was determined according to A. O. A. C. (1980), Table (2).

Blood samples at the end of experiment, were taken from the ear vein of three rabbits from each group for determination of plasma total protein (mg/ dl), total lipids (mg / dl), cholesterol (mg / dl), triglycerides (mg / dl), packed cell volume %, GOT and GPT (until / L), urea (mg / dl) and creatinine (mg / dl) by using reagent commercial kits purchased from Bio- Merieux (France) following to the same steps as described by manufactures.

At the end of the experiment, 3 males of each rabbit's treatment were randomly chosen for slaughter test, and carcass weights were calculated as percentage of live body weight.

Economical efficiency % (Y) was calculated according to the following equation: Y= [(A-B)/B] x100, where A is the selling price of one kilogram live body weight obtained gain (10.0 L.E.) and B is the feeding cost of this gain (1.20 L.E.), while the cost of one kilogram of both miswak steem was (6.00 L.E) or khella seeds were (8.00 L.E.).

Data were statistically analyzed using one-way analysis of variance and Duncan's multiple range test was used for comparison between means (SAS, 1998).

RESULTS AND DISCUSSION

Rabbits performance

However, final body weight for rabbits received a basal ration supplemented with 1 or 2% levels of miswak or khella showed insignificant increment ($P<0.05$), while the daily gain significantly ($P<0.05$) increased by 6.9 % in miswak at the level of 2%, compared to the control group (Table 3). Daily feed intake was significantly ($P<0.05$) decreased due to feeding diet supplemented with 1 and 2 % of khella or with 2 % of mixture by 10.3 and 12.3 or 8.6 %, respectively compared to the control group (Table 3). Feed conversion ratio showed significantly improvment ($P<0.05$) in miswak at 2 % level, and khella at 1 and 2% levels. the mixture at the level of 2% by 9.4, 9.7, 13.5 and 12.6%, respectively compared to the control group (Table 3).

The significant ($P<0.05$) increase in daily gain for rabbits received miswak at 2% level with no change in feed intake could be due to the better absorption of protein as cleared with the high insignificant value of crude protein digestability (Table 4). Also, it may be due to the bactericidal, antimycotic or antifungal properties of miswak as reported by Al-Samh and Al-Bagieh (1996). The significant ($P<0.05$) decrease in daily feed intake for rabbits received 1 or 2% Khella and mixture at the level of 2% may be due to the sever bitter taste of khella. On the other hand, these significant ($P<0.05$) values in better feed conversion ratio and lower feed consumtion with slightly high digestion of ether extract (table 4), may be attributed to the effect of linalool in khella that increase the activity of rabbit liver enzymes. Tisserand and Balacs (1995), reported that linalool increase the activity of rat liver enzymes. The bioactivity of linalool and their derivatives which are known for their effectiveness against microbial agents (Badr Satrani et al.,2004) observved that Aqueous extracts of *A. visnaga* was produced detectable antifungal activity (Maoz and Neeman 1998).

Economical efficiency (EE)%

The economic efficiency percent showed descending values for rabbit treatments that received mixture at the level of 2 %, miswak at 2 % level and khella at 1% level by 6.2, 4.6 and 1.1 % respectively compared to the control group (Table 3). These values were controlled by the relationship between feed conversion ratio and the price cost of miswak and khella with the lower final body weight. These results may highlight that mixture at the level of 2 %, miswak at 2 % level and khella at 1% can be used as an alternative growth promoters with favorite meat quality and or as enhanced the immune system as shown in lower values of abdominal fat % by 18.3, 9.1 and 8.3% and higher values of PCV% by 11.3, 9.8 and 9.2%, respectively compared to the control group (Table 4 &6).

Biochemical blood parameters

Total lipids significantly ($P<0.05$) decreased in rabbit groups that recived 2% level of miswak, khella and the mixture by 6.9, 6.4 and 10.3%, respectively compared to the control group (Table 4). On the other hand, there were no significant effects of miswak, khella or the mixture at the two levels used on triglycerides or total cholesterol (Table 4).

The significant ($P<0.05$) decrease in total lipids values in miswak treatments may be due to the main effective essential oil eugenol, that inhibits accumulation of lipid peroxidation products. Similar results obtained in rat by (Paraskty *et al*., 1996), who found that eugenol inhibits accumulation of lipid peroxidation products in RBC and maintains the activities of antioxidant enzymes. The significant ($P<0.05$) decrease of total lipids in khella treatments may be due to the quite current of blood flow induced by the effect of the main active principle visnagin, that has been used for the treatment of angina pectoris. Duarte J, et al., (1995), reported that visnagin inhibited vascular smooth muscle contractility by acting at multiple sites as well as preferentially inhibited the contractile responses. While (Harvengt and Desager 1983) in rat on khllen found that plasma total cholesterol and triglycerides concentrations remained unchanged.

Urea and the creatinine values significantly ($P<0.05$) decreased with dietary khella at two levels used and at 2% of mixture by 13, 23.7, 21.6 and 28.9, 33.3 and 24.4%, respectively compared to the control group (Table 4). The significant ($P<0.05$) decrease in urea and creatinine values in khella treatments may be due to the main effective essential oil visnagin, that has been used for and urinary disorders as well as releases kidney, renal and

bladder stones. Similar results in folk medicine reported by Loutfi, B. (1983) and Batanouny (1999).

The liver activity of GOT enzyme showed significant ($P<0.05$) improvment at the dietary level 2% of khella by 13.0% compared to the control group (Table 4). The liver activity of GPT enzyme showed equal significant ($P<0.05$) improvment at the dietary level 2% of both khella and the mixture by 13.2%. These result may be due to the effective essential oil linalool, that stimulate the activity of liver enzymes. Similar result reported in rat by (Tisserand and Balacs 1995).

The packed cell volume % significantly ($P<0.05$) increased with dietary miswak, khella and their mixture at the level of 2 % by 9.8, 11.4 and 11.3 %, respectively compared to the control group (Table 4).The improvement in PCV % in miwak treatment may be due to the eugenol and myristicin, that are known to inhibit mutagenesis and carcinogenesis as reported by (Ramel *et al*., 1986; Selvi and Niranjali, 1998 and Tisserand and Balacs 1995). The improvement in PCV % in khella treatment may be due to the bioactivity of linalool and their derivatives which are known for their effectiveness against microbial agents. Similar result reported by (Badr Satrani et al.,2004).

Digestibility

The apparent digestibility of the experimental diets is presented in Table (5). The overall trend of nutrients digestibility of dry matter, crude protein, crude fat and NFE indicated that there were no obvious differences with adding miswak, khella or their mixture. These results were showed that miswak, khella or their mixture as feed additives at the level of 2% had no beneficial effect on nutrient digestibility.

Carcass traits

Mixture at 1 or 2% level significantly ($P<0.05$) decreased the abdominal fat weight by 14.9 and 18.3 %, respectively compared to the control group (Table 6). These results in mixture may be due to the compination of sulphur, vitamin C, eugenol and linalool. Sulphur in miswak may be improved the bill secreation and fat metabolism. Al-otaibi et al., (2004) reported tha chemically stem bark of *S. Persica* extract composed of sulphur, vitamin C. It may be due to eugenol, that maintains the activities of antioxidant enzymes, as reported by (Paraskty *et al*., 1996). The same trend in khella may be due to linalool, that increase the activity of rat liver enzymes (Tisserand and Balacs 1995). Khella and Mixture at 2% level significantly ($P<0.05$) increased the kideny weight by 23.9, 12.4 and

19.5 %, respectively compared to the control group (Table 6). These results may be due to the highly potent diuretic activity. Khan et al., (2001) found that, daily oral (gavage) treatment with *A. visnaga* (500 mg/kg) highly reduced the incidence of nephrolithiasis (calcium oxalate deposition in the kidneys) as well as showed highly potent diuretic activity.

In conclusion, it appears that miswak or khella or their mixture at the level of 2% can be used as an alternative growth promoters with favorite meat quality and or as enhanced the immune system regardless the insignificant changes in final body weight in growing rabbits.

Table 1. The constituents of the basal ration.

Items	**%**
Soy-bean meal (44%CP)	16.00
Clover hay	30.00
Barley grain	23.00
Wheat bran	26.20
Molasses	3.00
Lime stone	1.00
Sodium chloride	0.50
Vit.& Min. Premix*	0.30
Total	100.0
Chemical composition as fed basis	
OM	93.04
CP	18.39
EE	3.25
NFE	57.02
CF	14.38
Ash	6.96
DE(kcal/kg)**	2490

* Vitamins and Minerals per one kilogram :
Vit. A. 4000000 IU, Vit. D3 50000 IU; Vit. E 16.7 g, Vit. K 0.67 g, Vit. B1 0.67 g, Vit. D_3 180000 IU, Coline chloride 400g, Pantothenic acid 6.67g, Niacin 1000 mg, Folic acid 1.67g, Biotin 0.07g, Manganese 10g, Zinc 23.3g, Iron: 25g, Calcium1.067g, Copper 600 mg, Selenium 0.033 g, Iodine 40 mg and Magnesium 133.4g.
** Calculated according to NRC (1977).

Table 2. The proximate analysis of miswak and khella % (on DM basis)

Item	OM	CP	EE	NFE	CF	Ash
Miswak	73.10	12.90	1.80	49.90	8.50	26.90
Khella	91.06	9.95	8.46	66.22	6.43	8.94

Table 3. Growth performance as affected by miswak or khella or their mixture supplementation to rabbit's ration, (Means ±SD).

Item	Control	Miswak		Khella		Mixture(1:1)	
		1%	2%	1%	2%	1%	2%
Intial live body weigh (g)	1052± 44	1083 ± 79	1066 ± 55	1029 ± 57	1041± 57	1075 ± 51	1075 ±66
Final live body weight (g	2484±84	2489±89	2491±86	2473±83	2491±76	2508±77	2537±82
Daily body weight gain (g)	23.3±0.7 ^{b}	23.3±0.5 ^{b}	24.9±1.1 ^{a}	23.2±0.8 ^{b}	23.6±0.6 ^{ab}	23.4±0.9 ^{b}	24.4±0.9 ^{ab}
Daily feed intake (g)	79.4±2.6 ^{a}	78.7±3.9 ^{a}	76.8±3.0 ^{ab}	71.2±3.0 ^{c}	69.6±2.0 ^{c}	74.0±3.6 ^{abc}	72.6±4.1 ^{bc}
Feed conversion ratio	3.41±0.2 ^{a}	3.38±0.2 ^{ab}	3.09±0.2 ^{bc}	3.08±0.2 ^{bc}	2.95±0.1 ^{c}	3.17±0.2 ^{abc}	2.98±0.2 ^{c}
Economic efficiency (%)	85.3	81	89.4	86.8	85.5	85.8	90.8

a.b.c Means in the same row bearing different letters, differ significantly *(P<0.05)*

Table 4. Blood paramaters as affected by miswak or khella or their mixture supplementation to rabbit's ration, (Means ±SD).

Item	Control	Miswak		Khella		Mixture(1:1)	
		1%	2%	1%	2%	1%	2%
Total lipids (mg/dl)	203±5.6 ^{a}	193± 2.2 ^{abc}	189± 4.9 ^{bc}	195± 3.3 **ab**	190± 4.7 ^{bc}	193± 1.1 ^{abc}	182± 1.8 ^{c}
Cholesterol (mg/dl)	177±2.9	171±4.4	170±4.0	173±3.1	173±2.2	173±1.1	178±2.2
Triglyceride (mg/dl)	88.5±1.6	85.4±0.3	84.6±1.3	85.1±2.4	84.5±0.6	85.5±2.7	85.5±3.0
Total protein (mg/dl)	9.4±0.3	9.4±0.6	9.1±0.4	9.3±0.1	9.8±0.3	9.2±0.6	9.1±0.4
PCV %	32.6±1.4 ^{b}	35.2±0.7 ^{ab}	35.8±0.8 **a**	35.6 ±0.3 ^{ab}	36.2±1.8 ^{a}	33.6±1.3 ^{ab}	36.3±1.3 ^{a}
Got (mg/dl)	115±2.2 ^{a}	110±1.1 ^{a}	109±6.2 ^{ab}	107 ±2.2 ^{ab}	100±1.3 ^{b}	112±1.5 ^{a}	108±3.3 ^{ab}
Gpt (mg/dl)	34.2±0.7 ^{a}	33.5±1.0 ^{ab}	32.4±1.1 **ab**	31.9 ±0.4 ^{ab}	30.2±1.0 ^{b}	33.4±1.1 ^{a}	30±0.4 ^{b}
Urea (mg/dl)	42.2±1.8 ^{a}	40.4±1.4 ^{ab}	40.5±0.7 **ab**	36.7±1.2 ^{bc}	32.2±1.1 ^{d}	39.2±0.7 ^{ab}	33.1±1.3 ^{cd}
Ceratinine (mg/dl)	4.5±0.3 ^{a}	4.6± 0.2 ^{a}	4.4± 0.3 ^{a}	3.2± 0.2 ^{bc}	3.0± 0.1 ^{c}	4.1± 0.4 ^{ab}	3.4± 0.1 ^{bc}

a.b.c.d Means in the same row bearing different letters, differ significantly (P<0.05)

Table 5. Digestion coefficients as affected by miswak or khella or their mixture supplementation to rabbit's ration, (Means ±SD).

Item	Control	Miswak		Khella		Mixture(1:1)	
		1%	2%	1%	2%	1%	2%
DM	65.3±1.5	66.3±1.6	66.7±2.5	68.9±0.7	69.7±0.8	67.2±1.3	68.7±1.2
CP	69.5±1.3	72.1±1.3	73.2±1.2	70.2±1.6	71.7±2.4	70.3±1.2	71.9±1.2
CF	37.5±0.7	39.6±0.1	39.5±2.4	38.7±0.7	39.0±0.9	38±0.3	38.2±0.8
EE	67.3±1.5	69.6±1.7	69.4±1.4	70.6±1.7	71.8±0.6	69.2±0.8	70.9±1.1
NFE	67.8±0.7	70.0±1.0	71.0±0.2	71.1±1.6	71.5±2.2	67.8±0.7	70.0±1.0

Table 6. Carcass characteristics as affected by miswak or khella or their mixture supplementation to rabbit's ration, (Means ±SD).

Item		Control	Miswak		Khella		Mixture(1:1)	
			1%	2%	1%	2%	1%	2%
Live body weight	(g)	2455±40	2440±56	2560±93	2501±34	2471±51	2468±144	2438±58
Dressing	%	57.9±1.3	57.6±0.8	57.9±0.8	58.4±2.1	59.6±1.5	59.6±0.9	60.8±1.1
Abdominal fat	%	12.1±0.4 ^{a}	11.6±0.9 ^{ab}	11.0±0.1 ^{abc}	11.1±0.7 ^{abc}	10.5±0.2 ^{abc}	10.3±0.5 ^{bc}	9.88±0.2 ^{c}
Liver weight	(g)	2.52±0.2	2.52±0.3	2.51±0.3	2.71±0.4	2.81±0.4	2.83±0.1	2.82±0.2
Heart weight	(g)	0.35±0.2	0.35±0.2	0.35±0.2	0.38±0.1	0.41±0.01	0.41±0.01	0.39±0.11
Kidney weight	(g)	1.13±0.06 ^{b}	1.14±0.07 ^{b}	1.12±0.13 ^{b}	1.28±0.02 ^{ab}	1.40±0.04 ^{a}	1.27±0.06 ^{ab}	1.35±0.03 ^{a}
Total giblets weight	(g)	4.67±0.2	4.58±0.1	4.70±0.4	4.48±0.4	4.04±0.1	4.09±0.4	4.08±0.2
Fur	(g)	15.4±0.7	15.3±1.2	15.3±1.2	15.8±1.3	15.0±1.0	15.9±0.6	12.4±0.8

a.b.c Means in the same row bearing different letters differ significantly (P<0.05).

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الملخص العربي

السواك والخلة البلدى كمنشطات لأرانب النمو وبعض التغيرات الفسيولوجية.

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أجريت هذه الدراسة لبيان التأثيرات الناجمة عن تغذية الأرانب فى مرحلة النمو على علائق مضاف إليها كل من السواك والخلة البلدى كمنشطات طبيعية وذلك على مظاهر النمو وبعض التغيرات التمثيلية، حيث استخدم فى هذا البحث ٦٣ أرنب نمو مقسمة إلى ٧ مجموعات متساوية. تمت التغذية على عليقه متوازنة واختلفت المجموعات باختلاف الإضافات حيث غذيت المجموعة الأولى بالعليقة الأساسية واعتبرت هى المجموعة القياسية أما المجموعات من الثانية حتى الخامسة فغذيت بإضافة كل من السواك والخلة البلدى بنسبة ١ ، ٢ % إلى العليقة الأساسية على الترتيب. وغذيت المجموعتان السادسة والسابعة بمخلوط السواك والخلة البلدى بنسبة ١ ، ٢ % على الترتيب. وتم الحصول على النتائج الآتية:

١- أدت إضافة السواك بمستوى ٢% إلى العليقة الأساسية إلى زيادة معنوية فى معدل الزيادة اليومية للوزن الحي بنسبة قدرها ٦,٩ % مقارنة بالمجموعة القياسية وذلك على الرغم من عدم وجود زيادة معنوية فى متوسط الوزن الحي النهائي لجميع المعاملات.

٢- أدت إضافة الخلة البلدي عند مستوى أي من ١ أو٢ % أو مخلوط السواك والخلة عند مستوى ٢% إلى انخفاض معنوي في كمية العلف المأكول يومياً بنسبة ١٠,٣، ١٢,٣، ٨,٦ % على الترتيب مقارنة بالمجموعة القاسية.

٣- أدت إضافة السواك عند مستوى ٢% أو الخلة البلدى عند مستوى أي من ١ أو ٢% وكذلك المخلوط عند مستوى ٢% إلى العليقة الأساسية إلى تحسن في قيمة معامل التحويل الغذائي بنسب قدرها ٩,٤ ، ٩,٧ ، ١٣,٥ ، ١٢,٦% على الترتيب مقارنة بالمجموعة القاسية.

٤- أدت إضافة مخلوط السواك والخلة عند مستوى ٢% ، السواك عند مستوى ٢% أو الخلة البلدي عند مستوى ١% إلى زيادة تصاعدية في النسبة المئوية للكفاءة الاقتصادية بمقدار ٦,٢ ، ٤,٦ ، ١,١ % على الترتيب مقارنة بالمجموعة القياسية.

٥- أدت إضافة السواك أو الخلة البلدي أو من مخلوطهما عند مستوى ٢% إلى انخفاض معنوي في كمية الدهون الكلية بالدم بنسبة ٦,٩ ، ٦,٤ ، ١٠,٣ % على الترتيب مقارنة بالمجموعة القياسية، في حين لم يتأثر مستوى الجلسريدات الثلاثية بأي من السواك أو الخلة أو مخلوطهما.

٦- أدت إضافة الخلة عند مستوى ١ أو ٢ % أو مخلوط السواك والخلة عند مستوى ٢ % إلى انخفاض معنوي لمستوى اليوريا فى الدم بنسبة ١٣ ، ٢٣,٧ ، ٢١,٦% على الترتيب مقارنة بالمجموعة القياسية.

٧-انخفض مستوى الكرياتينين في الدم لمجموعات الأرانب التي تناولت الخلة بمستوى ١ أو ٢ % أو المخلوط بمستوى ٢% بنسبة ٢٨,٩ ، ٣٣,٣، ٢٤,٤ % على الترتيب مقارنة بالمجموعة القياسية.

٨- أدت إضافة الخلة البلدي أو مخلوط السواك والخلة عند مستوى ٢% إلى تحسن معنوي في نشاط أنزيمات الكبد وبقدر متساوي بنسبة ١١,٨ % مقارنة بالمجموعة القياسية.

٩- أدت إضافة مستوى ٢% لأي من السواك أو الخلة البلدي أو مخلوط السواك والخلة إلى زيادة معنوية فى حجم كرات الدم الحمراء المضغوطة كأحد قياسات المناعة بنسبة ٩,٨ ، ١١,٤ ، ١١,٣ % على الترتيب مقارنة بالمجموعة القياسية.

١٠- أدت إضافة مخلوط السواك والخلة البلدي عند مستوى ٢ % إلى انخفاض معنوي لكمية دهن البطن بنسبة ١٤,٩ ، ١٨,٣ % على الترتيب مقارنة بالمجموعة القياسية.

١١- لم تظهر أي من الإضافات المستخدمة من السواك أو الخلة البلدي أو مخلوط السواك والخلة تأثير معنوي على أي من معاملات الهضم المختلفة.