EFFECT OF FORTIFICATION OF MALE LAMBS RATION WITH CAMPHOR LEAVES ON THEIR PRODUCTIVE PERFORMANCE AND SOME BLOOD SERUM CHEMICAL PARAMETERS

H.M. Saleh[1] and M. A. El-Ashry[2]

[1]Biological Applications Department, Nuclear Research Center, Atomic Energy Authority, Cairo, Egypt

[2]Animal Production Department, Faculty of Agriculture, Ain Shams Univ. Cairo, Egypt

(Received 8/8//2006, accepted 28/12/2006)

SUMMARY

Twenty-four male newly weaned lambs (local breed) were used in a feeding trial with average live body weight (LBW) of 19.9 kg and about three months of age. Animals were divided into three similar groups in live body weight (eight animals each). Lambs in the first group were fed a basal diet (T_1), which contain concentrate feed mixture (CFM) and wheat straw while animals in the second and third groups (T_2&T_3) were fed on the same ration plus either 100 or 150 mg/kg LBW ground Camphor leaves (GCL), respectively. The feeding trial was extended for 18 weeks. Also, three digestibility trials were carried out after eight weeks from the beginning of feeding trial. Four animals from each group were selected at random to study the effect of supplementing camphor leaves on nutrient digestibility and nutritive value. The results of digestibility trial indicated that apparent digestibility of DM, OM CP and NFE were significantly improved by adding (GCL). Also, the same trend was shown for the nutritive value of ration. The results of feeding trial cleared that daily gain for lambs in T_2 was improved by 8.9% but the difference was not significant whereas, the daily gain for lambs fed ration of T_3 was equal to control group. Also, the feed efficiency was improved by 4.8% for second group (T_2). Results of blood parameters showed that values of serum total proteins, albumins and Triiodothyronine were increased by adding GCL to the diet but the differences were not significant. Also, the A/G ratio was higher for lambs of T_2, whereas, the results of GOT and GPT did not significantly differ.

It is clear that adding GCL with level of 100mg/kg LBW improved the nutrients digestibility coefficients and consequently nutritive value of the ration and improved the daily gain of lambs.

Keywords: medicinal plants, camphor leaf, lambs, nutritive value, daily gain

INTRODUCTION

Feed additives are important materials that can improve feed efficiency and animal performance, however, the use of chemical products especially antibiotics and hormones may cause unfavorable side effects. (Abouel-Fotouh et al.1999). Using medicinal herbs and plants with human has been known since the old civilization. Old drugs industry depended upon the raw material of medicinal herbs, plants and their extracts which provide always safe. Inversely many synthesized chemicals caused many hazards to animals. (The world health organizations (WHO) encourages using medicinal herbs and plants to substitute or minimize the use of chemicals through the global trend to go back to the nature (Allam et al. 1999). Previous studies indicated that body weight gain of lambs was improved by adding *Cymbopogon citratus* and *Eucalyptuse globulus* to the diet (Aboul-fotouh, et al. 1999). Also, Allam et al. (1999) reported that digestibility coefficients of DM, OM and CP were improved when medicinal plants (Garlic cloves, *Nigella Sativa* Seeds, Fenugreek Seed and Chamomile Flowers or mixture from all these) were added to the ruminant rations. Moreover, Abu-Taleb, et al. (2003) found that the addition of camphor leaves to the diet of Japanese quails led to significant increase in body weights, also, increased the levels of the total protein and globulins in blood and decreased mortality. Also, Hekal, et al. (2005) found that adding Eucalyptus Globules (EG) leaves to the ration of growing calves significantly increased the digestibility coefficients of DM, OM and CF ($P \leq 0.05$) Also, addition of EG increased mean daily gain.

Moreover, Hmamouchi et al. (1992) indicated that oil of EG has antibacterial activities against 9 microorganisms (including salmonella type, *Klebsiella spp, Streptococcus A, Proteus sp, Staphylococcus aureus*) when they studied the composition of 16 essential oils from foliage of 15 species. Also, Medina et al. (1992 and 2001) found some antibacterial activities of eucalyptus species including EG against Escherichia coli.

The present study aimed to investigate the effect of camphor leaves (*EUCALYPTUS GLOBULES*) as feed additives to lambs ration on nutrient digestibility, feeding values and lambs growth performance.

MATERIALS AND METHODS

The field experiment was carried out at Experimental Farm Project (Sheep Farm), Nuclear Research Center, Atomic Energy Authority, at Inshas to study the effect of supplementing Ground Camphor leaves (GCL) (*Eucalyptus Globules*) as growth stimulant in the ration of male lambs on nutrient digestibility, growth performance and some blood parameters.

1-Growth performance and feeding trial:

Twenty-four male lambs (local breed) with average initial live body weight (LBW) of 19.9kg and about three month of age were divided into

three similar groups in live body weight and age (eight animals each). The first group was fed basal diets which composed of concentrate feed mixture (CFM) and wheat straw. The formulation of (CFM) and its chemical composition is given in Table (1). The animals were fed daily 3% (CFM) & 0.5% wheat straw of their LBW to cover the requirements according to Tommi (1963) allowances for fat-tailed coarse wool sheep. The daily diets were offered in two equal parts twice daily at 9.00 & 14.00 hr and water was available all the day (no feed refusals were found in the next day). The animals of the second and third groups (T_2&T_3) were fed on the ration of first group (T_1) plus either 100 or 150 mg\kg LBW (GCL) which was mixed with morning feeding of CFM, respectively. The animals were weighted biweekly to adjust the ration & calculate the average daily gain (ADG) till the end of the experiment, which extended for eighteen weeks.

2-Blood analysis:

Blood samples were taken every four weeks before morning feeding from the jugular vein. The samples were directly collected into vacuum tube and centrifuged at 500 g for 15 min. Serum was separated into polypropylene tube and stored at -18 °c until analysis for total proteins and albumin according to (Weichselbaum, 1946) and (Doumas et al, 1971) respectively. Globulin values were calculated by the difference between total protein and corresponding values of albumin. Urea concentration was estimated by the method of Henry & Davidsohn (1974). Glutamic-Oxaloacetic transaminase (GOT) and glutamic-pyruvic transaminase (GPT) were determined as described by Reitman & Frankel (1957). Triiodothyronine (T3) level was estimated by RIA technique using solid phase Coated tubes and the tracer was labeled with I^{125} (Diagnostic products corporation, Los Angeles, California).

3-Digestibility trials:

Three digestibility trials were carried out after eight weeks from the beginning of feeding trial. Four animals from each group were selected at random for evaluation of rations fed in feeding trial and study the effect of supplementing camphor leaves to the ruminant rations on nutrient digestibility and nutritive value. The animals were placed individually in metabolic cages for 10days as preliminary period followed by 7 days as collection period. The rations were offered daily and refusals if any were recorded every day. Total feces were collected daily and weight. Feces samples (10%) were sprayed with 10% H_2SO_4 and dried at 60°c for 24 hours. Then finally grounded 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 at the end of collection period, composite samples of feed offered and feces were mixed separately, finally grounded and kept for chemical analysis. Dried samples of offered feed, refusals, feces and urine were analyzed according to the methods of the (A.O.A.C, 1996).

4-Statististical analysis:

Data of the feeding trial, digestibility trials and blood parameter were analyzed using general linear models procedure by computer program of SAS (1995) and the statistical model was as follows:

$$X_{ij} = \mu + A_i + e_{ij}$$

Where: X_{ij} = represents observation, μ = overall mean, A_i = effect of treatment (rations), Eij = experimental error.

RESULTS AND DISCUSSION

Digestibility trials:

The results of intakes, nutrients digestibility and nutritive value are shown in Table (2). The results indicate that DMI from CFM when discussed as g/kg LBW was decreased by 6.6 % in the low supplementation treatment, but increased by 5.1 % in the high supplementation treatment. Also, Total DMI was decreased by 8.6% in the low supplementation treatment and increased by 3.1% in the high supplementation treatment. On the other hand, DMI from roughage (wheat straw) was decreased by 23.6 and 11.9% in the low and high supplementation treatments, respectively. The differences between treatment for DMI from roughage and concentrate were not significantly differ ($p>0.05$), also, differences between means for total DMI were not significance ($p>0.05$). Also, Hekal et al. (2005) found that feed intake from ration supplemented with Eucalyptus Globules (EG) was significantly ($p<0.05$) decreased when fed to cow calves. As shown in table (2) the apparent digestibility of DM, OM, CP and NFE were significantly increased by adding camphor leaves ($p<0.05$), but the differences between the two supplemented levels was not significance. These results are in agreement with those reported by Aboul-Fotouh et al. (1999). They found that the nutrient digestibilities were increased by adding (EG) to the rations of lambs. Also, as shown in table (2) the CF digestibility was improved by 21.8 and 17.2 %when Camphor leaves were added with levels of 100 and 150 mg/kg LBW, respectively, but the differences between the two levels of supplements were not significant ($p>0.05$), Also, El Ashry, et al. (2006) found that In vitro DM and OM disappearance were improved by 116.9% and 108.9%, respectively when Eucalyptus Globules leaves were added by level of 2%. Moreover, the EE digestibility was increased by 3.2 and 5.0% at the same level which was mentioned before. Also, results of digestibility trial indicate that nutritive value TDN and DCP were significantly ($p<0.05$) increased by adding GCL. The value of TDN was 64.19% for control ration and increased to 70.02 and 70.13% for first and second supplementation levels from GCL. Also, the DCP was increased from 10.46% to 11.51 and 11.49 %. The differences between values of the two supplementation levels were not significant ($p>0.05$). This improvement in nutrient digestibility and nutritive value may be due to the component of (GCL) from eucalyptol (1, 8 cineol). Also, Dethier et al. (1994) found that the oils of (EG) are potential source of 1, 8 cineol (eucalyptol) when they studied the essential oils of five Eucalyptus species. Moreover, Li and Madden (1995) observed that volatile oils of (EG) are rich in 1, 8 cineol and alpha-pinene.

Table (1): Formulation of concentrate feed mixture (CFM) and its chemical composition.

Ingredients	CFM	Wheat straw
Crushed yellow corn %	49.4	
Wheat bran %	13.0	
Sugar beet bulb %	20.0	
Soybean meal %	14.5	
Dicalcium phosphate %	1.5	
Sodium chloride %	1.0	
Mineral mixture* %	0.5	
Vitamin AD_3E %	0.1	
Chemical composition on DM basis		
DM	88.32	90.36
OM	87.09	88.60
CP	16.72	3.93
CF	7.45	36.66
EE	2.02	1.25
NFE	60.90	46.76
Ash	12.91	11.40

*Mineral mixture: each kg containing zinc7200mg, cupper 1800mg, iron 1800mg, manganese 3600mg, cobalt 18mg, iodine 110mg, selenium 18mg, sodium 74.3g, the carrier material (calcium carbonate) up to 1000g.

Table (2): Effect of supplementing ground camphor leaves in lambs diets on voluntary intake, nutrient digestibility and nutritive value. (mean ± SE).

Item	T_1 (Control)	T_2	T_3
No. of animal	4	4	4
DMI from CFM g/kg LBW	27.5± 1.3	25.7±2.1	28.9±0.3
DMI from Wheat straw g/kg LBW	3.7±0.6	2.8±0.22	3.3±0.4
Total DMI g/kg LBW	31.2±1.8	28.5±2.3	32.2±0.5
Digestion coefficient,%			
DM	71.5^b ± 0.9	78.8^a ± 2.28	78.3^a ± 0.74
OM	72.4^b ±0.88	79.1^a ±2.26	79.2^a ±0.78
CP	68.6^b ±1.0	74.6^a ±2.51	74.6^a ±1.08
CF	50.3 ±1.91	61.3 ±5.03	59.0 ±3.5
EE	69.2 ±2.05	71.4 ±2.49	72.7 ±1.36
NFE	77.4^b ±0.74	83.6^a ±1.80	84.1^a ±0.52
Ash	65.3 ±1.10	76.6 ±2.62	72.7 ±0.96
Nutritive value,%			
TDN	64.2^b ±0.8	70.0^a ±2.01	70.1^a ±0.71
DCP	10.5^b ±0.18	11.5^a ±0.38	11.5^a ±0.23

a,b Means in the same row having different superscripts per item differ significantly at ($P<0.05$).

Data of nitrogen metabolism for male lambs fed ration containing different levels of Camphor leaves are presented in Table (3).

The results indicate that values of nitrogen intake were not significantly different ($p>0.05$). Also, nitrogen excreted in feces, nitrogen excreted in urine and total excreted from nitrogen were not significantly differ ($p>0.05$) in all treatments. Also, values of apparent nitrogen balance did not significantly differ ($p>0.05$). Moreover, nitrogen excreted in feces as a percentage of nitrogen intakes were 32.3% for control treatment and decreased to 25.7, 25.9% for first and second supplementation level of GCL. These results were comparable with the results of nutrient digestibility. Also, total excretion from nitrogen as a percentage of nitrogen intake were decreased from 62.7%in control group to 58 and 58.7 % for first and second supplementation level of GCL, respectively.

Feeding trial:

Table (4) show the growth performance of male lambs fed rations containing different levels of camphor leaves.

The results of total gain and average daily gain was improved by 8.9% with the first supplementation level of GCL (100mg/kg LBW), but the difference was not significant ($p>0.05$). This result was in agreement with the result of nitrogen metabolism. Also, the feed conversion value as kg DM/ kg gain was decreased by 4.8%. This indicates that feed efficiency was improved with the first supplementation level of GCL (100mg/kg LBW). The same results were reported by Aboul-Fotouh et al. (1999). They reported that daily gain of male lambs was increased from 127.77 g/h/day for control group to 136.44 g/h/day in the group received GCL. Also, feed conversion improved from 6.2 DM/gain to 5.9; however the deference was not significant.

Blood parameter:

Data of Table (5) indicate that serum total proteins, albumin, globulin and blood urea values were increased by adding GCL to the lambs ration, but the differences were not significant ($p>0.05$). The same trend was reported by El Ashry, et al. (2006) and EL-Bordeny (2005). He found that serum total proteins of growing buffalo calves was increased from 6.95 to 7.22 g/dl with adding Eucalyptus globules leaves to the calves ration . Also, he found that albumin and urea-N concentrations were increased from 4.13 to 4.39 g/dl and from 20.34 to 23.27 mg/dl, respectively.

Moreover, Hekal, et al. (2005) reported that addition of Eucalyptus globules leaves to cow calves ration increased serum total proteins and albumin. Bush (1991) reported a positive correlation between plasma total proteins and albumin and protein absorbed and synthesized. Also, Ashour et al. (2004) reported that albumin level is a reflection of liver function, increasing albumin indicate that animal has higher ability to synthesize and store more protein. Moreover, Abu-Taleb et al. (2003) found that adding GCL to the Japanese quail diet increased serum total proteins and albumin.

Also, Table (5) showed that the data of GOT and GPT enzymes were

Table (3): Nitrogen metabolism for male lambs fed ration supplemented with different levels of Camphor leaves. (means ± SE).

Item	T_1 (Control)	T_2	T_3
No. of animal	4	4	4
Nitrogen intake g/d	27.1 ± 0.99	27.8 ± 1.18	27.5 ±2.03
Nitrogen excreted in feces g/d	8.8 ± 0.57	7.1 ±1.13	7.1 ± 0.20
Nitrogen excreted in urine g/d	8.2 ±0.42	9.0 ± 0.41	9.1 ± 1.07
Total excreted from nitrogen g/d	17.0 ± 0.87	16.1 ± 1.27	16.2 ± 1.23
Apparent nitrogen balance g/d	10.1 ±0.37	11.7 ±0.50	11.4 ±1.12

Table (4): Growth performance of male lambs fed rations supplemented with different levels of Camphor leaves. (means ± SE)

Item	T_1 (Control)	T_2	T_3
No. of animal	8	8	8
Initial body weight (kg)	19.9 ± 1.48	20.1 ± 1.03	19.7 ± 1.42
Final body weight (kg)	42.6 ± 2.02	44.9 ± 1.35	42.4 ± 2.71
Total gain (kg)	22.7 ± 0.97	24.7 ± 1.61	22.7 ±1.95
Average daily gain (g)	180.2 ± 8	196.2 ± 13	180.3 ± 15
Feed conversion (DM/gain)	6.2	5.9	6.1

Table (5): Some blood serum constituents of male lambs fed rations supplemented with different levels of Camphor leaves. (means ± SE).

Item	T_1 (Control)	T_2	T_3
Total protein (g/dl)	7.3 ± 0.26	7.4 ± 0.56	7.8 ± 0.51
Albumin (g/dl)	3.3 ± 0.14	3.4 ± 0.11	3.5 ± 0.10
Globulin (g/dl)	4.0 ± 0.31	4.0 ± 0.54	4.3 ± 0.55
A/G ratio	0.9 ± 0.15	1.0 ± 0.13	0.9 ± 0.13
Blood urea-N (mg/dl)	27.6± 1.26	30.3 ± 1.99	30.3 ± 2.00
GOT (U/L)	33.1 ± 3.21	32.2 ± 1.77	27.4 ± 4.35
GPT (U/L)	14.1 ±2.5	14.8 ±1.83	14.8 ± 2.14
T3 (ng/dl)	96.2 ±3.5	128.3 ±4.1	147.1 ±2.5

within the normal range and the differences between treatments were not significant ($p>0.05$). These values were in agreement with values reported by Saleh and Saleh (2003). Results showed also that level of Triiodothyronine (T3) increased by increasing level of GCL but the differences were not significant ($p>0.05$). The same trend was showed by Abu-Taleb et al. (2003). They found that T3 level was increased with increasing level of GCL in Japanese quail diet.

REFERENCES

A.O.A.C. (1996). Association of Official Analytical Chemists: Official Methods of Analysis 13th ED. Washington, D.C, USA.

Aboul-Fotouh, G.E.; Sabah M. Allam; E. Shehata; and S.N. Abd-ElAzeem (1999) . Effect of some medicinal plants as feed additives on performance of growing sheep. Egypt. J. Nutr. and Feeds. 2:79-87

Abu- Taleb, A. M.;H. M. Saleh; I. E. Ezzat; and E. EL-Barkouky (2003). Effect of feeding camphor (*EUCALYPTUS GLOBULES*) leaves on some immunity characteristics, growth and gut microflora of Japanese quails. ISOTOPE & RAD. RES., 35, 4: 701-711.

Allam, S. M. ; Hoda M. El Hosseiny; A. M. abdel Gawad; S. A. EL Saadany and A. M. M. Zeid (1999). Medicinal herbs and plants as feed additives for ruminant. 1. Effect of using some medicinal herbs and plants as feed additives on zaraibi goat performance. Egyptian Journal of nutrition and feeds (special issue: 349-365).

Ashour, G., S. A. Ibrahim., A. M. Ismaeal. and K. H. El Kholy (2004). Physiological reactions and biological performance of rabbits to summer heat stress 2th Sci. Conf. on physio Resp to Enviro. Condi 28-31 July 2004 El Arish. Egypt pp 165-186.

Bush, B. M. (1991). Interpretation of laboratory results for small animal clinicians. Oxford Black well scientific publications, London.

Dethier, M.; A. Nduwimana; Y. Cordier; C. Menut and G. Lamaty (1994). Aromatic plants of tropical central Africa. XVI. Studies on essential oils of five Eucalyptus Species grown in Burondi. J. of essential oil research. 6:5, 469-473.

Doumas , B.; W. Wabson and H. Biggs (1971). Albumin standards and measurement of serum with bromocresol green. Clin. Chem. Acta , 31 :87.

El Ashry, M. A.; N. A. El-Bordeny; H. M. Khattab and H.M. El-Sayed (2006). Effect of dietary supplemented with medicinal herbs on nutrient digestibility and some blood metabolites of buffalo calves. Egyptian Journal of nutrition and feeds 9:2,179-191.

El-Bordeny, N. Y.M. (2005). Effect of some natural supplements on calves performance. ph. D. Thesis, Fac. Of Agric. Ain Shams Univ.

Hamamouchi, M.; M. Bendai; M. Zouhdi; A. Agoumi and J. Peiccuer. (1992). Chemical and

microbiological studies of essential oils of Moroccan Eucalyptus species. Revue de Medecines et pharmacopees, Africaines. 6:2, 109-117.

Hekal, M. G.; N. E. EL-Bordeny and M. A. El-Ashry. (2005). Effect of feeding ration supplemented by Eucalyptus globules on calves performance. Egyptian Journal of nutrition and feeds. 8,1 (special issue:273-273).

Henry ,J.B. and T. S. Davidsohn (1974). Stanbio Enzimatico Urea Nitrogeno (BUN) procedimiento No. 1050. Clinical Diagnosis and Measurement by laboratory Methods. 16th ed., W. B. Saunders and Co., Philadelpia PA. P260

Li, H.; and J. Madden, (1995). Analysis of leaf oils from a Eucalyptus trial. Biochemical systematic and Ecology. 23:2,167-177.

Medina, I. D. de.; S. Pieretti; G. Salvatore; M. Nicoletti; P. Rasoanaivo and D. De. Medici, (1992) Chemical analysis of essential oils of Malagasy medicinal plants and NMR Spectroscopy. Flavor and Fragrance journal. 7:5, 275-281

Medina, -NP; JD. Viernes and RS. Gundran. (2001). Evaluation of some medicinal plants against Escherichia coli. Philippine journal of veterinary Medicine.38:1, 9-14.

Reitman, S. and S. Frankel (1957). Calorimetric determination of GOT and GPT activity. American Journal Clinical Pathology, 28:56.

Saleh, Safaa A. and H. M. Saleh (2003). Studies on performance of male lambs fed on ration containing AD_3E. Al-Azhar J. Agric. Res.37: 235-248.

SAS (1995) SAS user Guide: Statistics version Sedition, SAS institute inc. cary NC.

Tommi, E. F. (1963). Allowances and rations for farm animals. Sei- Khoz. Izdat. Moscow.

Weichselbaum TE. (1946). Quantitative colorimetric determination of total protein in serum. American Journal Clinical Pathology 7:40-45.

اثر تدعيم علائق ذكور الحملان النامية باوراق الكافور على آدائها الانتاجى وبعض القياسات الكيماوية لسيرم الدم

هشام صالح[1] و محمد العشرى[2]
١ـقسم التطبيقات البيولوجية – مركز البحوث النووية – هيئة الطاقة الذرية- القاهرة – مصر
٢- قسم الانتاج الحيوانى – كلية الزراعة – جامعة عين شمس- القاهرة – مصر

اجريت هذه الدراسة بمزرعة الأغنام بمشروع المزارع التجريبية بمركز البحوث النووية بهيئة الطاقة الذرية بقشاص لدراسة اثر اضافة اوراق الكافور لعلائق ذكور الحملان على آدائها الانتاجى ومعاملات الهضم وبعض القياسات لسيرم الدم. استخدم فى هذه الدراسة ٢٤ حمل ذكرسلالة محلية متوسط وزن ١٩,٩كجم ومتوسط عمر حوالى ثلاث شهورتم تقسيمهم عشوائيا الى ثلاث مجموعات متساوية حسب وزن الجسم (ثمانية حملان لكل مجموعة) غذيت المجموعة الأولى على العليقة الاساسية التى تكونت من العليقة المركزة وتبن القمح (المجموعة الضابطة) فى حين غذيت المجموعة الثانية والثالثة على نفس عليقة المجموعة الأولى مضاف اليها اوراق الكافور المطحون بتركيز ١٠٠ و ١٥٠ مجم/كجم من وزن الجسم الحى على التوالى. اظهرت نتائج تجربة النمو التى استمرت لمدة ١٨ اسبوع ان معدل الزيادة اليومى تحسن بنسبة ٨,٩% للمجموعة التى تناولت مستوى الاضافة الأول من ورق الكافور علما بان الفروق لم تكن معنوية وان معدل التحويل الغذائى تحسن بنسبة ٤,٨%.كما اظهرت نتائج تجربة الهضم التى اجريت بعد بداية تجربة النمو بثمانية اسابيع على اربع حيوانات من كل مجموعة ان معامل هضم كل من المادة الجافةوالمادة العضوية والبروتين الخام والمستخلص الخالى من الأزوت قد تحسنت معنويا باضافة اوراق الكافور المطحون كذلك تحسنت القيمة الغذائية كمركبات مهضومة كلية وبروتين خام مهضوم وكانت الفروق ايضا معنوية ولم يكن هناك فروق معنوية فى ميزان الأزوت. ايضا اظهرت نتائج قياسات سيرم الدم ان تركيز البروتين الكلى والألبيومين و هرمون الغدة الدرقية ثلاثى اليود قد زاد باضافة اوراق الكافور الى العليقة الأساسية فى حين ان الفروق بين المعاملات لم تكن معنويه ايضا لم تظهر نتائج قياسات نشاط انزيمات الكبد اى فروق معنوية بين المعاملات.