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DIFFERENT RATES OF LICORICE ROOT (*GLYCYRRHIZA GLABRA*) IN DIETS AND EFFECT IT IN SOME QUALITY OF CARCASS OF LOCAL GOAT MALES

M.A. Towaje[1], A.H. Kuttar[2], A.F. Abdulrahman[2], Mahmad D. Salman[2] and Bushra R.D.[2]

[1]Ministry of Higher Education and Scientific Research, College Veterinary Medicine, Univ. of Al-Qasim Green, Iraq

[2]Ministry of Science and Technology, Directorate of Agricultural Research, Iraq

Abstract

This study was conducted at the ruminants researches station in station breeding sheep and goat in Abo Ghraib/Agricultural Researches Directorate to investigate the effects of supplementing various levels of licorice root powder to local goat males fattening rations on the quantitative carcass traits. Twenty local goat males (4.0-4.5 months of age) with an average initial weight of 23.87±0.38 kg were used. The goat randomly assigned four equal groups. The first group was given a concentrate diet consists of 90% black barley, 8% soy bean meal and 2% salt and nutritional supplements and was considered as a control diet, other groups were given rations supplemented with 0, 2.5, 5 and 7.5% of licorice root powder in the rations, lamps weights were recorded weekly through the course of the experiments (90 days). All goat were slaughtered after the end of the experimental carcass were weighed before and after chilling. offal, the external and internal organs ,the main and secondary cuts weights and carcass measurements more also recorded.

The results obtained can be summarized as follows:

1. The average daily weight gain (gm/day) and total body weight gain (kg/animal) of the for third treatment lambs surpassed significantly (P<0.05) 157±0.41 kg and 14.15±1.13 kg that of other treatments, followed by fourth treatment as compared with other treatments. The same lambs third and fourth treatments showed a highest final body weights compared with lambs of other treatments, being 38.34±0.51 kg and 37.44±0.45 kg for the traits respectively.
2. Hot and chilled carcass weights for third treatment lambs surpassed significantly (P<0.05) other treatments, being 20.07±1.07 and 19.71±1.4 kg, respectively.
3. Significant differences between treatments concerning dressing% live body weight bases and empty body weight bases, that were showed a highest (P<0.05) in third or fourth treatments for concerning dressing % live body weight bases and empty body weight bases being (50.10±0.65, 51.52±0.65%) and (56.83±0.62, 56.79±0.80 %), as compared with other treatments.
4. Rib muscle area of the third treatment lambs was significantly (P<0.05) highest than that of the control treatment lambs (11.44±0.68 cm^2), however back-fat thickness of the same third treatment (2.97± 0.12mm) was highest significantly (P<0.05)), Which did not differ significantly from the fourth treatment (2.54 ± 0.19), That differences were not significant between the first and second treatment (2.1 ± 0.29 and 2.27 ± 0.22) mm, respectively.
5. The main and secondary cuts carcass between treatments experiment, that were significantly highest (P<0.05) in third treatment (85.16±0.80 %) followed by first treatment (84.11± 0.52%) as compared with other treatments experiment.

Keywords: Licorice Root, *Glycyrrhiza glabra*, goat

Introduction

Animal production has increased the use of synthetic chemicals as feed additives for animal feed (Balcells *et al.*, 2012) which improves growth and microbial metabolic processes (Zhong *et al.*, 2019) and improves milk production for ruminants (cattle, sheep, Goats), but recently there have been concerns about the use of these synthetic chemicals as food supplements in animal feed because of potential toxic hazards resulting from the use of these Artificial chemicals, Which increased the prediction of the risks of these chemicals to the environment and health associated with the use of these synthetic chemicals. All these obstacles made the governmental institutions and regulatory bodies, including the European Union in 2006, to consider limiting the use of some synthetic and chemical materials such as antibodies (Barton *et al*, 2000). This has prompting and interested in seeking more natural application adding to plant-extract as natural into solid alternatives feed additives for improvement rumen fermentation reduction the loss of energy (methane) and protein (NH_3-N) reduce the environment polluted and improve animals performance (Shujaa, *et al.*, 2003), One of those supplements is licorice root powder, which have a high protein content (15.0- 26.6 % in dry matter) and high (75-88 %) in vivo dry matter digestibility (Yacoub, *et al.*, 1986). Therefore, licorice root powder have a high potential as a protein-rich forage supplement for animal production. The licorice root powder can be used as the main feed for sheep and goats (Grieve, 1995). Moreover, they have been used to replace concentrates in dairy cattle, goat, sheep, and swamp buffalo diets (Musa *et al.*, 2002). Therefore licorice root powder have a high potential as a protein-rich forage supplement to be used in feed for monogastrics, ruminants (Jones *et al.*, 1984). Since licorice root powder are rich in nitrogen, sulphur and minerals (Hussein, 1979), they have the potential to be used as a supplementary feed for improving livestock productivity. The purpose of this study was to adding licorice root powder with different levels to the ruminants' diet a percentage, to effect on the average of total and daily weight gains and the concerning dressing and some of the carcass characteristics of local goat males.

Material and Methods

Experiment Aim

To determine the effect of adding different levels of licorice root powder in the diet on feed intake, weights gains and the efficiency of feed conversion, study of some of the carcass characteristics of local goat males.

Experiment Plan

This experiment was conducted in the ruminants researches station in Abo Ghraib/Agricultural Researches Directorate from 2017/2/17 to 2017/5/17 to study the possibility of using different levels (0, 2.5, 5 and 7.5 %) of local goat males in the rations and its effect on the growth performance of awassi male lambs which started at 8/6/2017 and continued for 90 days. animals weight 23.87±0.38 Kg and 4.0 - 4.5 months old the animals were randomly divided

into four group equal treatments, each involving four animals and two replicates / group. All experimental animals were fed on concentrated at 2.5% of body weight where the amount of feed per week can be adjusted per transaction Experiment based on the new weight of each animal. Ingredient and chemical of experimental diets presented in tables 1, 2 and 3.

Style of conducting the experiment

The animals feed treatments for 15 day as preliminary period and fed the concentrate once daily. The animals were weighted for three consecutive days at 8 am after cutting the feed for 12 hours to fixing their initial weights. the animals were fed once daily at 8 am (Forrest *et al.*, 1975) while concentrate diets was served free at 12 o'clock, As the quantity adjusts The feed consumed daily on the basis of the consumption of animals in each treatment. The concentrated diets and alfalfa hay remaining weighted at the morning to the amount of feed intake. And the duration of the experiment did not notice any cases or digestive disorders.

Growth Experiment

1. Daily and total weights (g/kg)
2. Initial and final weights (kg)
3. Calculation of food conversion efficiency Daily feed intake (g) / Daily weight gain (g)

Slaughter animals and study some carcass characteristics

Two males after the end of study from each treatment starved for 12 hours before slaughter. All males were weighed for the final weight before the slaughter date. After the random selection of the eight males killed in the slaughter of the station, the characteristics of the carcass were studied, which included the percentage of the dissolution, the weight of the carcass, the final weight of the carcass, the area of the ocular muscle, the thickness of the subcutaneous fat layer. The area of the ocular muscle and the thickness of the subcutaneous fat layer was measured after the left part of the sacral was cut between the lower edge of 12 ribs of the carcasses. The area of the ocular muscle was measured using trace paper to draw the area of the ocular muscle by a device used to measure irregular areas. Measured by the plane meter, and the measurement of the layer of fat above the 12 ribs of the left side of the whole carcass by the Vernia instrument(Hedrick,1983). For the calculation of the filtration rate and the concerning dressing, they were calculated based on the final weight of the awassi male lambs.

Table 1 : The components and proportions of materials used in the study.

Diets Additive*	Soybean Meal %	Barley Black %	licorice root powder %	Number Lamb	Treatment
2	8	90	0	5	T1
2	8	87.5	2.5	5	T2
2	8	85	5	5	T3
2	8	82.5	7.5	5	T4

*Calculated from the chemical analysis table for Iraqi feed materials (NRC, 1994) (on DM% basis)
T1: (control) without any adding, T2: diet adding licorice root powder with 2.5%, T3: diet adding licorice root powder with 5%, T4:diet adding licorice root powder with 7.5% .
*Diets Additive: Minerals, Vitamins, Salt and $CaHPO_4$.

Table 2 : The chemical composition of the ingredient of treatment of the diets%.

ME (MJ/Kg DM) *	NFE	EE	CF	CP	Ash	OM	DM	Items / Ingredient
11.544	65.549	1.679	8.910	11.678	2.615	87.816	90.431	T1
11.716	66.535	1.757	9.175	11.655	2.547	86.575	89.122	T2
11.743	67.245	1.690	8.959	11.302	2.661	86.535	89.196	T3
11.743	66.666	1.773	8.938	11.774	2.602	86.549	89.151	T4

T1:(control) without any adding, T2:diet adding licorice root powder with 2.5%, T3:diet adding licorice root powder with 5%, T4:diet adding licorice root powder with 7.5%.
NFE(Maff,1975) × 0.014 + CF × 0.005 +EE × + 0.031 CP×* ME(MJ/Kg DM)=0.012

Table 3 : The chemical composition of the ingredient of the diet (%).

ME (MJ/Kg DM) *	NFE	EE	CF	CP	Ash	OM	DM	Items / Ingredient
11.2965	62.749	3.059	8.410	12.678	3.535	86.896	90.431	Barley
10.1860	26.858	2.237	7.575	47.455	4.997	84.125	89.122	Soybean Meal
09.694	44.485	1.95	18.094	16.312	9.574	80.841	90.415	licorice root powder

NFE[13] × 0.014 + CF × 0.005 +EE × + 0.031× CP×* ME(MJ/Kg DM)=0.012

Statistical Analysis

Statistical analysis of all experimental data was performed using the statistical program available (SAS, 2012) to find the difference between transactions using full random design (C.R.D Completely Randomized Design) The significant exam between the mean of the coefficients were tested using the Duncan(1955) test to compare the averages of the multistage coefficients according to the following mathematical model:

Yij= μ +ti+£ij
Yij= measured viewing value
μ= The general mean of the studied objective
ti=Effect of treatment i
£ij= The random error, which is distributed naturally at an average of zero and a variation of $£^2$ e

Chemical analysis

Experimental diets were analyzed to determine Dry Matter, Ash Nitrogen and Ether Extract according to the (A.O.A.C, 2005).

Results and Discussion

Body weight and efficiency of food conversion

Table (4) shows The effect of the adding licorice root powder to the diet in the daily and total weight gain and conversion food efficiency may be due to the differences in the behavior of rumen microbial populations to different levels of licorice root powder (0, 2.5, 5 and 7.5%) in ration, through its increasing of disintegration on lignin, hemicellulose and cellulose, with increase microbial activity of protein composition, Food in the gastrointestinal tract (Wetzels *et al.,* 2015), The role of microorganisms in increasing digestibility, which helps maintain the microbial balance within the rumen and increase the efficiency of food metabolism and thus increase the response to growth. These results agree with the results of (Vaya *et al.,* 1997). when added at levels of mulberry wild leaves extract to feed ruminants refused increased the daily weight, crude protein intake and crude fiber and significantly improved conversion feed efficiency. This improvement may be due to an increase in the animal's palatable taste of the licorice root powder supplement, in addition to the fact that the bulk of the animal needs have been processed from the intensive diet, or may be due to the adaptation of the microorganisms to the different treatments of licorice root powder, especially T2 and T4, For microbial protein in rumen (Mohammed, 1988).

Table 4 : Effect of the adding of different levels (0, 2.5, 5 and 7.5%) of licorice root powder to ration, in the Initial, final weight and total and daily weight increases.

Levels of significant	T4	T3	T2	T1	Groups / Weight gain
N.S	24.40±0.05	24.80±0.05	24.23±0.05	24.45±0.05	Initial weight (kg)
**	37.44±0.45 a	38.95±0.51 a	35.48±0.44 b	34.35±0.21 b	Final weight (kg)
**	13.04±04 a	14.15±1.13 a	11.25±0.04 b	9.90±0.04 b	Total weight increase (kg)
**	144.6±0.39 a	157±0.41 a	125±0.40 b	111±0.16 b	Average daily weight gain (g/d)

T1: (control) without any adding,T2:diet adding licorice root powder with 2.5 % , T3:diet adding licorice root powder with 5 %, T4:diet adding licorice root powder extract with 7.5%,**indicates significant differences at the probability level (P <0.01), N.S indicates no significant.

Weight and carcass Characteristics

Table (5) shows the significant effect of adding licorice root powder to ration on the slaughter weight, the concerning dressing and the carcass characteristics by increasing of experimental treatments containing the licorice root powder with (0, 2.5, 5 and 7.5%) compared with T1,This is due to the fact that adding licorice root powder has increased the activity of microorganisms in the rumen, which in turn increases the efficiency of the intake of dry matter from animals experiment, that increasing the effectiveness of beneficial bacteria (Zhang, *et al* 2006). Food conversion efficiency and Role The best qualities of the studied carcass are obtained (Mahgoup,1997) indicated that It is that the active substance in this plant, which led to increased utilization of feed provided for animals and increased body weight before slaughtering carcass share of the weight gain was greater than the share of slaughtering residues, which led to an increase in the weight of hot and cold carcass in the carcasses of those groups.

Table 5: The effect of adding different levels (0, 2.5, 5 and 7.5%) of mulberry wild leaves extract to the ration, in empty body weight, Warm carcass weight, The percentage of concerning dressing based on live body weight, Empty body weight, Rib muscle area and back-fat thickness.

Levels of Significant	T4	T3	T2	T1	groups / Hems
**	37.44±0.45 a	38.95±0.51 a	35.48±0.44 b	34.35±0.21 b	Live body weight (kg)
**	0.84±33.01 a	1.67±35.34 a	0.92±31.72 ab	1.23±29.15 b	Empty Body weight (kg)
**	0.55±18.76 ab	1.07±20.07 a	0.81±17.71 ab	0.74±16.08 b	Hot carcass weight (kg)
**	0.50±18.87 ab	1.42+19.71 a	0.79±17.57 ab	0.69±15.73 b	Cold carcass weight (kg)
**	0.65±50.10 a	0.65+51.52 a	0.85±49.91 ab	0.16±46.81 b	Concerning dressing % on live body weight bases
**	0.84±56.83 a	0.63±56.79 a	0.66±55.83 ab	0.66±55.16 b	Concerning dressing % on empty body weight bases
**	0.32 ± 10.66 ab	0.68 ± 11.46 a	0.19 ± 10.08 b	0.28 ± 9.86 b	Rib muscle area cm^2
**	0.18 ± 2.56 ab	0.13 ± 2.95 a	0.20 ± 2.24 b	0.30 ± 2.11 b	back-fat thickness mm

T1: (control) without any adding,T2:diet adding licorice root powder with 2.5 % , T3:diet adding licorice root powder with 5 %, T4:diet adding licorice root powder with 7.5%,** indicates significant differences at the probability level (P <0.01).

Carcass cuts

Table (6) shows to significant effect of adding licorice root powder to ration on The main and secondary cuts carcass, that were significantly highest (P<0.05) in third treatment (85.16 ± 0.80 %) followed by first treatment (84.11± 0.52%) as compared with other treatments experiment, My be to increase in the number of pieces in the groups fed on diets containing different levels of mites compared to the control group may be due to the fact that Glycyrrhizin and Glycyrrhtic acid, a component of licorice that have a similar activity to the effectiveness of steroid hormones Steroid like action. Hormones are structural hormones that activate the formation of proteins and reduce their decomposition and thus increase the rate of growth by increasing the growth of muscles and bones as it also works to retain calcium in the body and lead to increase the rate of basic metabolism (Mtenga,1979) and (Utsunomiya, *et al* 1999).

Table 6: The effect of adding different levels licorice root powder extract in the diets on total carcass cuts of the carcass characteristics of awassi male lambs.

T4	T3	T2	T1	Groups / Hems
27.36±0.51	27.43±1.07	27.36+0.78	27.28±0.67	Leg %
14.44±0.43	14.86±0.40	14.55±0.05	14.37±0.46	Shoulder %
8.75±0.22	8.83±0.15	8.75±0.14	8.75±0.19	Racks %
9.64±0.21	9.64±0.26	9.93±0.13	9.57±0.19	Loin %
1.82±0.09	1.81±0.25	1.85±0.08	1.80±0.06	Flank %
11.83±0.37	11.82±0.39	11.49±0.25	11.62±0.27	Breast %
5.92±0.24	5.94±0.07	5.81±0.13	5.82±0.11	Fore Shank %
4.84±0.03	4.83±0.13	4.92±0.11	4.90±0.09	Neck %
84.60±0.53	85.16±0.80	84.66±0.53	84.11±0.52	Total
N.S	**	N.S	**	Levels of Significant

T1: (control) without any adding,T2:diet adding licorice root powder with 2.5 % , T3:diet adding licorice root powder with 5 %, T4:diet adding licorice root powder with 7.5%,**indicates significant differences at the probability level (P <0.01), N.S indicates no significant .

Conclusions

We can conclude from the results of this study.

1. The use of licorice as feed additives has had a positive effect on the studied qualities.
2. The addition of 7.5% of raw licorice powder to goats diets had a greater positive effect than other treatments in increasing production of meat, fat, bone and other qualities.
3. The use of 7.5% raw licorice powder improved the chemical analysis of meat by increasing the moisture content and reducing the fat content.

References

Balcells, J.; Aris, A.; Serrano, A.; Seradj, A.R.; Cresp, J. and Derant, M. (2012). Effect of an extract of plant Flavonoids (Bio flavet) on rumen fermentation and performance in heifers fed high- concentrate. J. Anim. Sci., 90(13): 4975 - 4984 .

Zhong, R.Z.; Xiang, H.; Cheng, L.; Zhao, C.Z.; Wang, F.; Zhao, X.L. and Fang, Y. (2019). Effects of Feeding Garlic Powder on Growth Performance, Rumen Fermentation, and the Health Status of Lambs Infected by Gastrointestinal Nematodes. J. Anim., 9: 102.

Barton, M.D. (2000). Antibiotic use in animal feed and Its impaction human health. NUTR, Res. Rev.,13: 279-299.

Shujaa, T.A.L.; Saleh, A.M. and Hamid, A.R.A. (2003). Effect of licorice residues on the performance of elderly goats. Journal of Iraqi Agricultural Sciences, 34(6): 9-1.

Yacoub, S.F.; Tobia, M.F. and Youssef, K.O. (1986). Effect of animal weight at slaughter on some carcass properties in ancora - like goats Iraqi. J. Agricul. Sci., 3(4): 63-72.

Grieve, M. (1995). Liquorice. Botanical Com. A. Modern Herbal Home Page. Electric Newt.

Musa, T.N.; Jabbar, A.; Al-Hadithi, H. and Nasser, K.A.H. (2002). Determination of the level of some mineral components and elements of the local roots of licorice powder. Glycrrhiza glabra. Journal of Agricultural Sciences, 36(4): 20-24 .

Jones, S.D.M.; Burgess, T.D.; Dupchak, K. and Pollock, E. (1984). The growth and performance and carcass composition of ram and ewe kambs fed on pasture or in confinement and slaughter at similar fatness. Cand. J. Anim. Sci., 64: 631-640.

Hussein, F.T.Q. (1979). Medicinal Plants Cultivation and Components, Mars Publishing House, 251-256.

Forrest, J.C.; Aberle, E.D.; Herdrick, H.B.; Judge, M.D. and Merkel, R.A. (1975). Principles of meat science. Schweigert, B.S.(Ed.).by Freeman, W.H. and company, San-Francesco.

Hedrick, H.B. (1983). Methods of estimating live animal and carcass composition. J. Anim. Sci., 57: 1316-1327.

NRC (1994). Nutrient requirement of sheep . National Res, Council . National Academy Press, Washington, DC.U.S.A.

MAFF (1975). Ministry of Agric., Fisheries and Food Dept., of Agric and Fisheries for Scotland energy allowances and feed system for ruminants, Technical Bulletin, 33.

SAS (2012). Statistical Analysis System, Users Guide. Statistical. Version 9.th ed. SAS. Inst. Inc. Cary. N.C. USA.

Duncan, D.B. (1955). The new multiple range and multiple F- test Biometrics.11:1-42.

A.O.A.C. (2005). (Association of Official Analytical Chemists). Official Of analysis. 18th Ed. AOAC International, Gaithersburg, Maryland, USA.

Wetzels, S.U.; Mann, E.; Metzler-Zebeli, B.U.; Wagner, M.; Klevenhusen, F.; Zebeli, Q. and Schmitz-Esser, S. (2015). Pyrosequencing reveals shifts in the bacterial

epidural community relative to dietary concentrate amount in goats. J. Dai. Sci., 98(8): 5572-5587.

Vaya, J.; Belinky, P.A. and Aviram, M. (1997). Antioxidant constituents from licorice roots: isolation, structure elucidation and ant oxidative capacity toward LDL oxidation. Fre. Rad. Biol. Medic., 23(2): 302-313.

Mohammed, S.T. (1988). Characteristics of local goat carcasses at different weights. Master Thesis, College of Agriculture, University of Basra.

Zhang, G.; Qin, L. and Hung, W.Y. (2006). Flavonoids derived from herbal *Epimedium brevicornum* Maxim prevent OVX-induced osteoporosis in rats independent of its enhancement in intestinal calcium absorption. Bone., 38(6): 818–82.

Mahgoub, O. (1997). Meat production from the Omani Dhofari goat 2.Distribution of carcass tissue. J. Anim. Sci., 12: 31-38.

Mtenga, L.A. (1979). Meat production from Sannen goats: Growth and development. Ph.D. Thesis, University of Reading, UK.

Utsunomiya, T.; Kobayashi, M.; Herndon, D.N.; Pollard, R.B. and Suzuki, F. (1999). Effects of glycyrrhizin, an active component of licorice root, on *Candida albicans* infection in thermally injured mice. Clin carcass traits. M.Sc. Thesis Faculty of Agriculture Ain Shams University, Cairo.