EFFECT OF DIETARY GUAVA *(Psidium Guajava L)* LEAF EXTRACT SUPPLEMENTATION ON PRODUCTIVE PERFORMANCE, BLOOD PARAMETERS AND CARCASS TRAITS OF GROWING RABBITS

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SUMMARY

The present study was designed to investigate the efficacy of different dietary levels of ethanolic guava leaf extract on growth performance, blood parameters, carcass traits, meat chemical composition and economic feed efficiency of growing rabbits. Eighty APRI line rabbits (5 weeks of age and average live body weight of 522±7.12 g) were divided and assigned randomly into four experimental groups of 20 rabbits in each (10 males +10 females). Rabbits in the 1st group were fed complete diet (basal diet) without any supplements (G1, control), while those in the 2nd (G2), 3rd (G3) and 4th (G4) groups were fed the same diet supplemented with guava leaf extract at levels of 1, 2 and 3 ml/kg diet, respectively. Results showed rabbits at the end of growing period (Final weight) were significantly (P<0.05) heavier in treatment groups than in control one. In this line, rabbits fed 1.0, 2.0 and 3.0 and 3.0 ml guava leaves extract/ kg diet (G3 and G4) had the highest final body weight were heavier by about 3.1, 7.7 and 8.5% than those in G1 (control diet). Daily feed intake was not significantly affect by supplementing guava leaves extract in diets. Feed conversion ratio was significantly improved with increasing guava leaves extract level in diets. Mortality rate was 10, 10, 0 and 0 in G1, G2, G3 and G4, respectively. Carcass percentage was significantly (P<0.05) higher in G3 and G4 than in G1 and G2. Rabbits in G3 and G4 showed the highest revenue (146.7 and 148.6%) relative to those in G1 (100%). In conclusion, guava leaves extract could be successfully incorporated into the diet of growing rabbits up to 3.0 ml/ kg diet, which improved production performance without adverse effects on health status during growing period, under Egyptian environmental conditions.

Keywords*: rabbit, guava, extraction, growth performance, carcass, blood.*

INTRODUCTION

Commercial rabbit production has been gaining much attention in recent years due to their high prolificacy, rapid growth rate, small body size and high meat yield. Rabbits can convert 20% of the dietary protein into edible meat, in comparing with 8-10% in beef (Basavaraj *et al.,* 2011). It is well known that feed additives could be used safely in rabbit diets to improve their performance. Dietary feed additives were used in very small quantities with the objective of obtaining some special effects.

Guava (Psidium guajava) is a small tropical tree that grows up to 35 feet tall; it is widely grown for its fruit in tropics. It is a member of the *Myrtaceae* family, with about 133 genera and more than 3800 species. Leaves and bark of Psidium guava tree have a long history of medicinal uses that are still employed today (Nwinyi *et al.,* 2008). The main chemical compounds in guava leaves volatile oils were; -pinene (11.77%), epi-bisabolol (10.85%), 1, 8-cineol (9.22%), 1-epi-cubenol (8.56%), globulol (5.88%), thujone (5.35%), hexenal (5.03%) and terpipineol (4.35%) (Ramadan *et al.,* 2009).

This supports the reported use of *P. guajava* in many countries as a traditional herbal medicine. In this respect, Richard *et al.* (2013) demonstrated that the leaves of the *P. guajava* plant solutions were effective for inhibiting the growth of bacteria (*S. aureus* and *S. epidermidis)*, and fungi (*M. gypseum* and *T. mentagrophytes*). The Egyptian guava had volatile extract exhibited in vitro a high antioxidant activity. The potential antioxidant and hypoglycemic activities of guava leaves extract, respectively, are attributed to the presence of relatively high percentage of phenolic compounds (456±10.4 mg gallic acid equivalent/L) and other active volatile compounds with high antioxidant activity (Ramadan *et al.,* 2009). The crude guajava extract (250, 500 and 750 mg/kg) provided protection from diarrhoea in guinea-pig, similar to loperamide, a standard antidiarrhoeal agent (Reynolds *et al.,* 1984) and, ethanol extract of guava leaf protected diarrhea up to level of 55.6% (Porwal *et al.,* 2012). The results of Ramadan *et al.* (2009) revealed that administration of

aqueous guava extract (1g/dl) to streptozotocin (STZ) induced diabetic rats for 4 weeks enhanced most of the endogenous antioxidant enzymes activity, as glutathione reductase, superoxide dismutase and total antioxidant capacity, and produced a pronounced hypoglycemic effect as well as the amelioration of most of the studied biochemical parameters in STZ- induced diabetic rats, which confirmed by histo-pathological examination of different body organs.. Several authors reported positively for *P. guava* leaf extract in hyperactive gut disorders (Lozoya *et al.,* 1994; De Wet *et al.,* 2010).

Results of the positive effects of Guava leaf extract on performance of growing rabbits are relatively rare. Therefore, the present study was designed to investigate the efficacy of different dietary levels of ethanolic guava leaf extract on growth performance, blood parameters, carcass traits, meat composition and economic efficiency of growing rabbits.

MATERIALS AND METHODS

The present study was carried out at rabbit farm of Sakha station, belonging to Animal Production Research Institute (APRI), Agricultural Research Center, Ministry of Agriculture, Egypt.

Eighty weaned APRI line rabbits (5 weeks of age and average live body weight of 522±7.12 g) were divided and assigned randomly into four experimental groups of 20 rabbits in each (10 males and 10 females). Rabbits in the 1st group were fed complete diet (basal diet) without any supplements (G1, control group), while those in the 2nd (G2), 3rd (G3) and 4th (G4) treatment groups were fed the same diet supplemented with guava leaf extract at levels of 1, 2 and 3 ml/kg diet, respectively. The basal diet was formulated to cover all essential nutrient requirements for growing rabbits according to De Blas and Mateos (1998) Ingredients and chemical analysis of the basal doet are shown in Table (1). All rabbits were kept under the same managerial conditions. Feed and water were offered *ad libitum* throughout the experimental period (5 to 13 weeks of age).

Table (1): Feed ingredients and calculated chemical analysis of the reference diet.

Ingredient	%	Calculated chemical analysis	%
Berseem hay (*Trifolium alexandrinum*)	30.05	Crude protein	17.75
Barley	24.60	Crude fiber	12.38
Wheat bran	21.50	Ether extract	2.27
Soybean meal (44% CP)	17.50	Calcium	1.24
Molasses	3.00	Total phosphorus	0.80
Di-calcium phosphate	1.60	Lysine	0.98
Limestone	0.95	Methionine	0.46
Sodium chloride (NaCl)	0.30	Methionine + Cystine	0.76
Vitamin & Mineral Mixture*	0.30	Sodium	0.16
DL-Methionine	0.20	Digestible energy (kcal/kg diet)	2500

**Supplied per kilogram of diet: Vitamin A, 6000 IU; Vitamin D_3, 9000 IU; Vitamin E, 40 mg; Vitamin K_3, 2 mg; Vitamin B_1, 2 mg; Vitamin B_2, 4 mg; Vitamin B_6, 2 mg; Pantothenic acid, 10 mg; Vitamin B_{12}, 0.01 mg; Niacin, 50 mg; Folic acid, 3 mg; Biotin, 0.05 mg; Choline, 250 mg; Fe, 50 mg; Mn, 85 mg; Cu, 5 mg; Co, 0.1 mg; Se, 0,1 mg; I, 0.2 mg and Zn, 50 mg.*

Guava leaves used in this study were collected during summer (September) from Borg El-Arab region, Alexandria governorate, Egypt. The collected guava leaves were cleaned from extraneous matter, shade-dried with passive ventilation and crushed into a fine powder. The air dried plant materials were ground in a blender with a particular size to ensure the plant powders in identical size. The powder (50 g) was macerated in 150 ml ethanol (75%) and allowed to extract for 48 h. The resultant (dark green-brown mixture) was filtered (Mazumdar *et al.,* 2015). The crude extract was kept in refrigerator in glass bottles until the further experiments.

Throughout the experimental period, live body weight, feed intake and number of dead rabbits were recorded. Daily weight gain, feed conversion rate and mortality rate were calculated. Economic efficiency

was calculated according to Raya *et al.* (1991). Also, relative growth rate and performance index were calculated on a group basis:

Relative growth rate = [(W2 - W1) x100]/ [1/2 (W2+W1)]

Where as: W1= the initial weight, and W2 = the final body weight

Performance index = (final live body weight (kg)/ feed conversion ratio) x 100 (North, 1981)

At the end of growing period (13 weeks of age), three male rabbits were taken randomly from each group, fasted for 12 h, weighed and slaughtered to estimate some carcass traits according to Blasco *et al.* (1993). Carcass parts were presented as a percentage of live body weight. Meat samples from each group were taken for chemical analysis. Samples of meat were taken from fore-Limb, Lumber region and Hind Limb, dried at 60^{o}C for 2 days, freed from any bones, and ground for analysis. Chemical analysis of meat (DM, ash and CP) was carried out according to A.O.A.C. (2005). Content of EE in meat was calculated by difference, while chemical composition of the basal diet was calculated.

During slaughtering (at 13 weeks of age), blood samples were taken from slaughtered rabbits of each treatment group to determine hematological and some biochemical constituents. Blood samples were aspirated in EDTA vacuum tubes. Blood was centrifuged at 2500 rpm for 10 min for plasma separation (Burnett *et al.*, 2006). Plasma was stored at -20 Ċ until assaying biochemical parameters

Hematological parameters, including red blood cells count (RBCs), white blood cells count (WBCs), differential of white blood cells (lymphocytes, heterophils, monocytes, eosinophils, and basophils), hemoglobin (Hb) concentration and package cell volume (PCV) were determined according to Drew *et al.* (2004).

Biochemical parameters, including total proteins, triglycerides, total cholesterol, high density lipoproteins (HDL) and low density lipoproteins (LDL) were calorimetrically determined in blood plasma by using commercial kits (Bio-Diagonosis Co., Cairo, Egypt), following the manufacturers. Also, total antioxidant capacity (TAC) and Malondialdehyde (MDA) were determined calorimetrically in blood plasma.

Data were statistically analyzed using the General Linear Model Program of SAS (2000). Duncan's multiple range tests was performed (Duncan, 1955) to detect significant differences among means.

RESULTS AND DISCUSSION

Growth performance parameters:

Data in Table (2) showed that rabbits at the end of growing period (Final weight) were significantly ($P<0.05$) heavier in treatment groups than in control one. In this line, rabbits fed 1.0, 2.0 and 3.0 ml guava leaves extract/kg diet were heavier by about 3.1, 7.7 and 8.5% than those in G1 (control diet). It is of interest to observe that the highest level of guava leaves extract/kg diet showed the significant ($P<0.05$) improvement in average daily gain (ADG), feed conversion ratio with insignificant change in feed intake as compared to other guava leaves extract/kg diet at 5-9 wk interval. Meanwhile, at 9-13 wk interval, rabbits in G3 fed diet supplemented with guava leaves extract at a level of 2 ml/kg diet. However, during the entire length of the growing period (5-13 wk) rabbits in G3 showed insignificant differences in all growth performance parameters as compared to those in G4. Based on the significant ($P<0.05$) effect of treatment on LBW, ADG and FCR with insignificant effect on feed intake at different levels and low mortality rate, rabbits fed diet supplemented with guava leaves extract at levels of 2 and 3 ml/kg diet showed significantly ($P<0.05$) the highest relative growth rate and performance index and the lowest mortality rate as compared to those fed low guava leaves extract (1 ml/kg diet) and control group.

In agreement with the present results on rabbits, Mahmoud *et al.* (2013) revealed that dietary supplementation of 1% dried guava leaves in diets had a significant improved effect on body weight, weight gain, feed conversion ratio and healthy status, but had no effect on feed consumption of broiler chicks. The obtained insignificant effect of guava extract on feed intake of rabbits was reported by Rahman *et al.* (2013), who found that inclusion of guava leaf meal (2.5, 3.5 and 3.5%) in broiler diets did not significantly affect feed intake, but mortality rate was decreased with increased level of guava leaf meal up to 4.5% in broiler diet.

Table (2). Effect of dietary guava extract level on growth performance of growing rabbits.

Parameter	G1	G2	G3	G4	SEM	P-value
No. of animals	20	20	20	20	-	-
Initial body weight (g)	553.5	552.0	551.3	552.3	7.119	0.9972
Final body weight (g)	2039^{c}	2103^{b}	2195^{a}	2212^{a}	10.84	0.0001
Daily weight gain (g):						
5-9 weeks	29.06^{b}	28.81^{b}	30.16^{ab}	30.88^{a}	0.388	0.0109
9-13 weeks	24.00^{c}	26.57^{b}	28.56^{a}	28.38^{ab}	0.646	0.0001
5-13 weeks	26.53^{c}	27.69^{b}	29.36^{a}	29.63^{a}	0.241	0.0001
Feed intake (g/ d):						
5-9 weeks	74.90	74.06	73.64	73.44	0.423	0.3994
9-13 weeks	107.71	106.07	105.31	104.87	1.048	0.3986
5-13 weeks	91.30	90.07	89.48	89.16	0.889	0.3538
Feed conversion ratio:						
5-9 weeks	2.584^{a}	2.583^{a}	2.455^{ab}	2.382^{b}	0.049	0.0045
9-13 weeks	4.510^{a}	4.030^{b}	3.715^{c}	3.721^{c}	0.086	0.0001
5-13 weeks	3.441^{a}	3.255^{b}	3.050^{c}	3.012^{c}	0.027	0.0001
Relative growth rate	114.6^{b}	116.9^{b}	119.7^{a}	120.1^{a}	0.807	0.0001
Performance index (%)	59.30^{c}	64.76^{b}	72.09^{a}	73.55^{a}	0.920	0.0001
Mortality rate (%)	10	10	0	0	-	-

SEM = Standard error of mean,
a, b, c, Means in the same row with different superscripts are significantly different at P<0.05.

Guava leaves extract has anti-inflammatory, antibacterial and antimicrobial activities that induce positive effects on broilers gut health (Pandey and Shweta, 2011; Ryu *et al.,* 2012). Guava leaves (*Psidium guajava* L) containing the active chemical compounds such as saponins, flavonoids, tannins, eugenol and triterpenoids. Polyphenolic compounds dominate guava leaves are flavonoids (>1.4%) and tannins (BPOM, 2004). Tannin compounds (polyphenols) can inhibit growth and kill bacteria by reacting with the cell membrane (Volk and Wheller, 1993). Tannins extracts from guava leaves can inhibit the growth of *E. coli*, *Pseudomonas aureginosa*, *Staphilococcus aureus*, *Aspergillus niger* and *Candida albicans* (Mailoa *et al.*, 2014).

Some authors reported positively for P. guajava leaf extract in hyperactive gut disorders which has been supported by the present study (De Wet *et al.,* 2010). In addition, it also reported that ethanol extract of guava leaf protected diarrhoea up to level of 55.6% (Porwal et al., 2012). These results agreed with similar reports which have established reduction in gastric motility as being the mechanism by which many anti-diarrheal agents act (Ezekwesili *et al.,* 2010).

On the other hand, some researchers Rattanaphol and Rattanaphol (2009) and Wedy (2012) declared that use of 0.04% or 0.06% of guava leaves extract in poultry ration didn`t have significant effect on BW and weight gain. This may be related to the low guava leaves extract or the type of extract.

Carcass traits:

Percentages of carcass and liver significantly (P<0.05) increased, while percentages of abdominal fat, stomach, small intestine and caecum by supplementing guava leaves extract at levels of 2 and 3 ml/kg diet in G3 and G4, respectively. Percentages of giblet and TEP significantly (P<0.05) increased, while GIT significantly (P<0.05) decreased in all treatment groups. However, percentages of kidney and heart were not affected significantly by treatment (Table 3).

Concerning the chemical analysis of meat, guava leaves extract at levels of 2 and 3 ml/kg diet in G3 and G4 significantly (P<0.05& P<0.01, respectively) increased DM and CP contents and decreased EE content, while ash content was not affected by treatment (Table 3). It is of interest to note that reducing EE content in rabbit meat was in association with decreasing abdominal fat percentage, reflecting positive effect of guava leaves extract on reducing body fat.

Table (3). Effect of dietary guava extract level on carcass traits of growing rabbits.

Parameter (%)	G1	G2	G3	G4	SEM	P-value
Carcass	50.1^{b}	51.2^{b}	53.7^{a}	54.4^{a}	0.382	0.0002
Liver	3.13^{b}	3.31^{b}	3.68^{a}	3.77^{a}	0.060	0.0008
Kidney	0.54	0.58	0.58	0.59	0.012	0.4318
Heart	0.69	0.74	0.74	0.74	0.046	0.8262
Giblets	4.36^{c}	4.63^{b}	5.01^{a}	5.10^{a}	0.062	0.0002
Total edible parts (TEP)	54.5^{c}	55.9^{b}	58.7^{a}	59.5^{a}	0.368	0.0001
Abdominal fat	1.22^{a}	1.10^{ab}	0.87^{bc}	0.65^{c}	0.068	0.0167
Gastrointestinal tract (GIT)	22.9^{a}	21.3^{b}	19.1^{c}	18.9^{c}	0.300	0.0002
Stomach	4.13^{a}	3.83^{ab}	3.51^{bc}	3.37^{c}	0.082	0.0041
Small intestine	3.81^{a}	3.72^{a}	3.52^{b}	3.41^{b}	0.040	0.0022
Caecum	4.72^{a}	4.54^{ab}	4.28^{b}	4.13^{b}	0.084	0.0355
Meat chemical analysis (%):						
Moisture	74.2^{a}	74.0^{ab}	73.5^{ab}	73.4^{b}	0.214	0.0477
Ash	1.59	1.55	1.53	1.50	0.030	0.3793
CP	21.1^{b}	21.6^{b}	22.4^{a}	22.5^{a}	0.180	0.0040
EE	3.09^{a}	2.80^{ab}	2.63^{b}	2.62^{b}	0.097	0.0201

SEM = Standard error of mean,
a, b, c, Means in the same row with different superscript are significantly different at P<0.05.

This was also observed by Rahman *et al.* (2013), who showed that fat content of broiler was decreased significantly by supplementation of guava leaf meal (2.5-4.5%) in broiler ration. Also, El-Deek *et al* (2009) noticed that broiler receiving 8% raw or treated guava by-product had significantly less abdominal fat than any other dietary levels or the control.

In accordance with the present results on meat composition, Medina *et al.* (2006) mentioned that 0.04% or 0.06% of guava leaves extract had significant effect on meat composition. Also, Mahmoud *et al.* (2013) revealed that dietary supplementation of 1% dried guava leaves in diets of broiler chicks significantly increased DM and decrease EE of both breast and thigh meat.

Blood parameters:

Plasma total proteins concentration was not affected significantly by guava leaves extract treatment. Both guava leaves extract levels in G3 and G4 significantly (P<0.05) decreased triglycerides, total cholesterol and LDL levels, while increased HDL level in blood plasma (Table 4). The observed reduction in plasma lipid profile in rabbits is in agreement with the results of Mahmoud *et al.* (2013), who revealed that dietary supplementation of 1% dried guava leaves in diets of broiler chicks significantly (P>0.05) decreased level of lipids metabolites except for LDL. Also, Crespo and Esteve-Garcia (2002) showed that *psidium guava* extract administration to broiler diet could decrease triglycerides, cholesterol, and LDL, while increased HDL. Triglycerides are secreted from the liver into the blood by triglyceride-rich lipoproteins. The pronounced effect of guava extract administration on lipid profile may be attributed to impaired hepatic lipogenesis leading to decreased triglycerides concentrations in blood plasma (Bölükbaş and Erhan, 2007).

Table (4). Effect of dietary guava extract level on blood biochemicals of growing rabbits.

Nutrient	G1	G2	G3	G4	SEM	P-value
Total proteins (g/dl)	5.52	5.72	6.03	6.16	0.164	0.0773
Triglycerides (mg/dl)	91.7^{a}	90.5^{ab}	88.9^{bc}	87.3^{c}	0.693	0.0121
Total cholesterol (mg/dl)	80.6^{a}	79.1^{ab}	77.3^{bc}	75.8^{c}	0.721	0.0039
HDL (mg/dl)	30.8^{b}	31.6^{ab}	33.4^{a}	33.5^{a}	0.500	0.0278
LDL (mg/dl)	44.8^{a}	43.7^{ab}	41.5^{bc}	40.6^{c}	0.889	0.0308
TAC (mmol/l)$^{(1)}$	1.23^{c}	1.35^{bc}	1.53^{ab}	1.65^{a}	0.071	0.0140
MDA (µmol/ml)$^{(2)}$	1.23^{a}	1.14^{ab}	1.04^{b}	0.99^{b}	0.046	0.0238

SEM = Standard error of mean
a, b, c, Means in the same row with different superscripts are significantly different at P<0.05.
(1) TAC=total antioxidants capacity,
(2) MDA= malondialdehyde

Results of antioxidant capacity (Table 4) revealed significant P<0.05) increase in total antioxidant capacity (TAC) and significant decrease in malondialdhyde (MDA) in G3 and G4, which may suggest antioxidant property of guava extract at these levels via increasing antioxidant defense system, decreasing lipoid peroxidation and reactive oxygen species (ROS) generation. Role of guava extract as a natural antioxidant was explained by Ramadan *et al.* (2009), who revealed that administration of aqueous guava extract (1g/dl) to streptozotocin (STZ) induced diabetic rats for 4 weeks, enhanced most of the endogenous antioxidant enzymes activity as glutathione reductase, superoxide dismutase and TAC. They added that the potential antioxidant and hypoglycemic activities of guava leaves extract, respectively, are attributed to the presence of relatively high percentage of phenolic compounds (456±10.4 mg gallic acid equivalent/l) and other active volatile compounds with high antioxidant activity.

Although, Mahmoud *et al.* (2013) revealed that dietary supplementation of 1% dried guava leaves in diets of broiler chicks significantly increased plasma total protein, the present results showed no effect of guava extract on total proteins concentration in rabbits.

Blood hematological values:

Haemoglobin (Hb) concentration, package cell volume (PCV) and count of red blood cells (RBC's) and platelets were not affected significantly by treatment. Only white blood cells (WBC's) significantly (P<0.05) decreased by all dietary guava leaves extract treatments as compared to control. Also, heterophils percentage was affected significantly by guava leaves extract treatment at levels of 2 and 3 ml/kg diet, being lower (P<0.05) in G3 and G4 than in G1 and G2. Reducing WBCs count may indicate improving immune response of rabbis as affected by treatment. However, decreasing heterophils percentage was in association with insignificant increase in monocytes, basophils and eosinophils percentage in G3 and G4 (Table 5).

Table (5). Effect of dietary guava extract level on hematological parameters of growing rabbits.

Parameter	G1	G2	G3	G4	SEM	P-value
Hemoglobin (g/dl)	10.9	11.1	11.4	11.4	0.379	0.4735
PCV (%)	35.0	36.1	37.2	37.4	0.578	0.0824
RBCs ($x10^6$/µl)	5.11	5.27	5.48	5.46	0.135	0.1096
Platelets ($x10^3$/µl)	412.0	439.7	459.0	482.0	15.50	0.0920
WBCs ($x10^3$/µl)	7.93^a	5.57^b	5.23^b	5.10^b	0.291	0.0119
WBCs fractionation (%):						
Heterphils	29.3^a	28.7^a	27.3^b	27.0^b	0.336	0.0113
Lymphocytes	62.7	62.0	60.7	60.0	0.577	0.0579
Monocytes	4.00	4.0	6.3	6.7	0.882	0.1009
Basophils	3.00	3.7	4.0	4.3	0.577	0.2970
Eosinophils	1.00	1.6	1.7	2.0	0.333	0.3493

SEM = Standard error of mean,
a, b, Means in the same row with different superscript are significantly different at P<0.05.

It is worthy noting that there was tendency of increasing Hb, PCV, RBCs and platelets in treatment groups, but all values are within the normal range of rabbits (Moore *et al.*, 2015). In accordance with improving haemaltological parameters of rabbits in treatment groups, Ali and Shamsuzzaman (1996) found positive effects of supplementing guava leaves on broilers immunity, which may be due to the presence of flavonoids, which derivatives have been found to inhibit the growth of Staphylococcus aureus.

The observed tendency of increase in PCV may suggest the save use of guava extract on health status of growing rabbits. Reduction in the concentration of PCV in the blood may suggest the presence of a toxic factor (e.g. haemagglutinin) which had adverse effect on blood formation (Oyawoye and Ogunkunle, 1998). Lectins in guava were shown to bind to E. coli preventing its adhesion to the intestinal wall and thus preventing infection (Okemo *et al.*, 2001). This was proved in term of decreasing mortality rate of rabbits in G3 and G4. Moreover, decreasing WBCs count may indicate decreasing stress condition of rabbits. The total count of WBCs may be increased by 15 to 30% in rabbits under stress conditions (Campbell, 2004 and Poljičak-Milas *et al.*, 2009).

Economic feed efficiency:

Although the price of supplemented diets increased, total feed cost slightly decreased in diets of treatment groups, as a result of decreasing average feed intake (kg/head) as compared to control. Selling price of supplemented groups increased due to increased average weight gain. Net selling price increased as a result of increasing viability rate in treatment groups. These findings were reflected in higher net revenue and relative revenue (Table 6). This means that diets by supplemented with guava leaves extract in diets showed higher economic feed efficiency, being the highest in rabbits fed diet supplemented with guava leaves extract at a level of 2 or 3 ml/kg diet.

Table (6). Effect of dietary guava extract level on economic feed efficiency of growing rabbits.

Parameter	G1	G2	G3	G4
Average feed intake (kg /head)	5.113	5.044	5.011	4.993
Price /kg diet (L.E.)	3.95	3.98	4.01	4.04
Total feed cost (L.E.)	20.20	20.08	20.09	20.17
Average weight gain (kg/head)	1.486	1.551	1.644	1.659
Selling price (L.E.)(1)	44.58	46.53	49.32	49.77
Viability rate	90	90	100	100
Net selling price (L.E.) (2)	40.12	41.88	49.32	49.77
Net revenue (L.E.)(3)	19.92	21.80	29.23	29.60
Relative revenue (%)	100	109.4	146.7	148.6

Other conditions like management are fixed.
(1) Price of kg live body weight was 30 L.E according to marketing price 2018..
(2) Net selling price = selling price x viability rate
(3) Net revenue = Selling price – total feed cost

CONCLUSION

Guava leaves extract could be successfully incorporated into the diet of growing rabbits up to 3.0 ml/ kg diet, which improved production performance without adverse effects on health status during growing period, under Egyptian environmental conditions.

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تأثير اضافة مستخلص أوراق الجوافة الى علائق الأرانب النامية على الاداء الانتاجى وقياسات الدم وصفات الذبيحة.

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تهدف الدراسة الحالية الي تقييم اضافة مستويات مختلفة من المستخلص الكحولى لأوراق الجوافة (ايثانول) فى العليقه على الاداء الانتاجى وقياسات الدم وصفات الذبيحة والتركيب الكيماوى للحم والكفاءة الاقتصادية للارانب النامية، تم تقسيم عدد 80 من الأرانب الأبرى عمر خمسة أسابيع إلى أربعة مجاميع متماثلة، 20 أرنب في كل منها بمتوسط وزن 7.12±552 جرام. تم تغذيه المجموعة الاولي على عليقه متكامله (17,75٪ بروتين خام و 2500 كيلو كالوري طاقة مهضومة /كجم علف) دون أي اضافات، في حين تم تغذية المجموعات الثانية والثالثة والرابعة على نفس العليقه للمجموعه الأولى مضافا إليها مستخلص أوراق الجوافه على مستويات 1 ، 2 ، 3 مل/كجم عليقه على التوالي. أظهرت الدراسه النتائج الأتيه:

1- الارانب المغذاه على 1 و 2 و 3 مل مستخلص أوراق الجوافه لكل كيلوجرام علف سجلت معنويا أعلى وزن جسم نهائى عن تلك المغذاه على العليقة الكنترول بمقدار 3.1 و 7.7 و 8.5 على الترتيب.

2- عدم وجود اختلافات معنوية فى العلف المستهلك (جرام/ يوم/ أرنب) نتيجة استخدام مستخلص أوراق الجوافه فى العليقة.

3- لوحظ تحسن معنوى فى معدل التحويل الغذائى بزيادة مستوى مستخلص أوراق الجوافه فى العلائق.

4- لم تسجل الأرانب المغذاة على المستويات المرتفعة من مستخلص أوراق الجوافه (2 و 3 مل لكل كيلوجرام علف) اى نفوق مقارنة بتلك المغذاة على العليقة الكنترول أو المضاف اليها 1 مل لكل كيلوجرام علف (10%).

5- تحسنت بشكل معنوى نسبة تصافى الذبيحة بزيادة مستوى مستخلص أوراق الجوافه فى العليقة.

6- سجلت الأرانب المغذاة على 2 و3 مل مستخلص أوراق الجوافه لكل كيوجرام علف أعلى عائد اقتصادى نسبى (146.7 و 148.6%) مقارنة بتلك المغذاة على العليقة الكنترول (100%).

خلصت الدراسه المقدمه الى أن اضافة مستخلص أوراق الجوافه الى عليقة الأرانب النامية حتى 3 مل لكل كيلوجرام علف يحسن من الاداء الانتاجى بدون اى تأثيرات سلبية على الحالة الصحية خلال فترة النمو وذلك تحت ظروف البيئية المصرية.