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EFFECT OF WATER THYME EXTRACT ON GROWING RABBITS PEFRORMANCE

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ABSTRACT

This study was carried out to evaluate the effect of different levels of water thyme extract (WTE) on New Zeland White (NZW) growing male rabbits performance. Thirty sex rabbits with average body weight of 830 ± 50 g were assigned to 4 groups (9 rabbits per each group). Rabbits in the first group drank tap water (control group), while rabbits of the 2nd, 3rd and 4th groups drank WTE on concentrations of 0.25, 0.50 and 0.75% (*W/V*), respectively. Gas chromatography-mass spectrometry (GC- MS) was used for determination the WTE constituents. Results showed that, 100 peaks were obtained when WTE was subjected to GC-MS. The peaks area more than 0.5% were 10 peaks which corresponding to 10 compounds. The best (P<0.05) average daily body weight gain and feed conversion for total period (8 weeks) were obtained when rabbits drank 0.25% WTE as compared to control and other treated levels. The daily feed intake of all levels of WTE significantly (P<0.05) reduced. The mortality rate (%), average water intake, digestibility of all nutrients, nutritive values and carcass traits did not significantly differ between all tested levels of WTE and control. Caecum parameters (total volatile fatty acids, ammonia-N and pH values) were significantly (P<0.05) decreased when rabbits drank all levels of WTE in comparison with control rabbits. Results of blood analysis showed that, all levels of WTE did not significantly affected on blood hematological parameters measured. Serum enzymes showed that activities of aspartate amino transferase did not significantly (P<0.05) differ between all treatments. The activity of alanine amino transferase, total protein and albumin values were significantly (P<0.05) higher with levels 0.75% WTE compared to control. The economical efficiency obtained in rabbits drank 0.25, 0.50 and 0.75% WTE were 152.67, 97.75 and 76.60%, respectively in comparison to 100% of control. Conclusively, most results indicated that rabbits drank 0.25% WTE (2.5 g/100 ml water) had the best performance and economical efficiency.

Key words: Water thyme extract, rabbits, body weight gain, feed conversion, digestibility, blood.

INTRODUCTION

Feed additives are important materials that can improve the efficiency of feed utilization and animal performance. Approximately up to 80% of domestic animals have been fed synthetic compounds for the purpose of either medication or growth promotion (Lee and Shibamoto, 2002). Recently, the concerns about possible antibiotics residues and disease resistance have aroused caution in the usage of antibiotics in the animal and fish industry (Jang *et al*., 2007 ; Rattanachaikusopon and Phumkhachorn, 2009). From 2006 the use of antibiotics and related drugs as growth promoting feed additives to livestock has been banned within the European Union because of the risks to human health. Therefore, demand for green or organic animal production has recently been increasing (Abdelhamid, 2015).

Intensive research has been started to develop possible alternatives to antibiotics. Old drugs industry depended upon the raw materials of medicinal plants (MP) and their extracts, which always proved safe. The World Health

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Organization encourages using MP to substitute or minimize the use of chemical compounds through the global trend to go back to nature (Allam *et al*., 1999). Many MP have some important properties being antiseptic, antibacterial activities against harmful microorganisms, antispasmodic, treatment of gastro intestinal complaints, tonic and anti-inflammatory, which are attributed to the active materials (Hmamouchi *et al*., 1992; El-Amary, 1993 ; Tozyo *et al*., 1994).

Attempts to use MP could be widely accepted as feed additives to improve the efficiency of feed utilization and productive performance of cows, buffaloes and sheep (El-Saadany *et al*., 1996; Aboul-Fotouh *et al*., 1999; Allam *et al*., 1999; Salem and El-Mahdy, 2001; Abdelhamid *et al*., 2004 a and b; El-Bordeny *et al*., 2005). Thyme (*Thymus vulgaris*) oil had the strongest ($P<0.05$) antibacterial activity against bacteria compared to ginger, black cumin, clove and watercress oil. It improves performance and health of rats (Abdelhamid *et al*., 2002) and Nile tilapia fingerlings (Shehata *et al*., 2013). Kassie (2009) reported that addition thyme oil to diet improved broiler performance. Bassiony *et al*., (2015) reported that addition of cinnamaldehyde or thymol to rabbit diet as bioactive compound had a positive effect on growth performance.

Data on phytobiotics in rabbit production are relatively poor. So, this work was carried out to study the effect of different levels of water thyme extract (WTE) on growing rabbit performance.

MATERIALS AND METHODS

The experimental work was carried out in Animal Production Department, Faculty of Agriculture, Zagazig University during 2013-2014, to evaluate the effect of different levels of WTE on New Zeland White (NZW) growing male rabbits performance for 8 weeks.

Animal Experiment

Thirty sex male rabbits with average body weight of 830 ± 50g were assigned to 4 groups (9 rabbits per each group). Rabbits in the first group drank tap water (control), while rabbits of the 2nd, 3rd and 4th groups drank 0.25, 0.50 and 0.75% (weight / volume) of WTE, respectively. The WTE was prepared as follows: 2.5, 5.0 and 7.5 g of thyme leaves was boiled in 300 ml tap water for 10 minutes, then filtrated on 2 layers of gauze, diluted with tap water to one liter to obtain 0.25, 0.50 and 0.75% WTE, respectively. Fresh tap water or WTE was offered *ad libitum* daily, then its daily intake was measured. Rabbits were fed *ad libitum* on commercial diet. The formulation and chemical analysis of basal diet are shown in Table 1. The rabbits were housed individually in galvanized wire cages provided with feeders. All groups were kept under the same managerial and hygienic conditions. Live body weight and feed consumption were biweekly individually weighed and feed conversion rate (g feed/ g gain) was calculated. The mortality rate was recorded throughout the experimental period.

Digestibility Trials

At the end of experimental period, digestibility trial was carried out to evaluate the effect of treatments on nutrients digestibility and feeding values as total digestible nutrients (TDN%) and digestible crude protein (DCP%) of the tested diets. Four rabbits from each group were housed individually in metabolic cages. Digestibility trials lasted 5 days as a collection period. Coprophagy was not prevented. Samples from both feed offered and dried feces of each animal were taken daily during the collection period for chemical analysis which was carried out according to AOAC (2000).

Blood, Carcass and Caecum Parameters

At the end of the digestibility trials, 4 rabbits were weighted and slaughtered. Blood samples with or without heparin were collected at slaughter time to estimate the blood parameters. Blood hematology were analyzed in private laboratory. Serum total protein, albumin, aspartate amino transferase (AST) and alanine amino transferase (ALT) were analyzed using commercial kits purchased from Diamond Diagnostics Company, Egypt. Also, the carcass traits, organs weight and economical efficiency were evaluated. The total volatile fatty acids (TVFA`s), ammonia-N and pH values in caecum were measured. The pH values were determined by using the consort pH meter model p 107 with

combined electrode. Ammonia-N concentration was estimated by distillation method according to AOAC (2000). Total volatile fatty acids concentration was determined by steam distillation as mentioned by Warner (1964).

Determination of Water Thyme Extract Constituents

A 7.5 g of thyme was boiled in 300 ml tap water for 10 minutes, then filtrated on 2 layers of gauze, extracted with equal volume of chloroform in separatory funnel, the chloroform layer was dried in water bath. The data of sample were determined in the Regional Center for Mycology and Biotechnology, Faculty of Pharmacy, Al- Azhar University. The dry film was dissolved in ethyl acetate and have been submitted for Chromatographic analysis in Gas Chromatography Unit. The Instrumentation and Chromatographic conditions: GC/MS System: Shimadzu GC/MS-QP5050A. Software: CLASS 5000. Searched Library: Wily Mass Spectral Data Base. Column: DB1, 30m; 1.5 um film (J&W scientific). Carrier gas: Helium. Ionization mode: Electric Ionization. Ionization voltage: 70 ev. Temperature program: 40^{o}C (1 min.) – 160^{o}C (1 min.) at 5^{o}C/min. 270^{o}C (2 min.) at 7.5^{o}C/min. Detector temperature: 300^{o}C. Injector temperature: 230^{o}C.

Statistical Analysis

Data of the trial were statistically analyzed using the General Linear Model Program of SAS (2002). New multiple range test (Duncan, 1955) was used to determine the significant differences among treatments.

RESULTS AND DISCUSSION

Proximate Analysis

The proximate analysis of basal diet is shown in Table 1.

Constituents of Water Thyme Extract

Results showed that, 100 peaks were obtained when WTE was subjected to GC-MS. The peaks area more than 0.5% was 10 peaks which corresponding to 10 compounds (Fig. 1). The compound name, peak area, retention time, molecular formula and molecular weight for compounds are listed in Table 2. Many of these compounds (1-hexadecene, 1-octadecene, 1-octadecanol, 1-dodecene, 1-docosene and tetradecane) are similar with results of Zekovic *et al.* (2003) on GC-MS analysis of thyme total extract with liquid carbon dioxide. The antimicrobial and antioxidant activity of 1-hexadecene, 1-octadecene and 1-docosene were obtained by Kumar *et al*. (2011). Similar results for nonadecane, heptadecane and 1-hexadecanol were reported by Al-Youssef and Hassan (2015).

Live Body Weight, Daily Body Weight Gain and Mortality Rate

The average daily body weight gain of rabbits for total period (8 weeks) was significantly (P<0.05) higher in rabbits drank 0.25% WTE in comparison to control and other levels (Table 3). These results agreed with those reported by (Ibrahim *et al.,* 2000) who reported that rabbit growth increased when diet contained 0.5% thyme. Also, Bassiony *et al.* (2015) reported that addition of 100 and 200 mg of cinnamaldehyde or thymol /kg diet as bioactive compound had a positive effect on growth performance of growing rabbits. The improvement in body weight gain by WTE may be due to its contents of bioactive compounds which have antimicrobial and antioxidant activity (Al-Youssef and Hassan, 2015), which improve each of feed conversion (Gerencsér *et al.,* 2014), digestibility of nutrients (Ibrahim *et al.,* 2000 ; Abdel-Samee, *et al.,* 2012) and some blood hematology (Bassiony *et al.,* 2015). The mortality rate (%) was similar in all treatment groups (Table 3).

Feed Intake

The average feed intake of rabbits significantly (P<0.05) reduced by all treatments (Table 4). Gerencsér *et al*. (2014), reported that addition of 5% spirulina and/or 3% thyme to rabbit diets had no effect on feed intake. Also, Bassiony *et al.* (2015) found that feed intake of rabbits received 100 and 200 mg cinnamaldehyde and thymol /Kg diet insignificantly reduced.

Feed Conversion Ratio

Generally, the feed conversion of rabbits drank all levels of WTE were better than control (Table 5). The best (P<0.05) feed conversion ratio

Table 1. Formulation and chemical composition (%) of basal diet

Ingredient	(%)
Yellow corn	17.00
Clover hay	35.00
Wheat bran	20.00
Barley	10.00
Soybean meal	13.00
Molasses	3.00
Sodium chloride	0.20
Methionine	0.20
Vitamin and minerals mixture	0.30
Bone meal	1.00
Limestone	0.30
Chemical composition (DM):	
Organic matter	84.56
Crude protein	15.58
Crude fiber	13.77
Ether extract	5.86
Nitrogen free extract	49.35
Ash	15.44

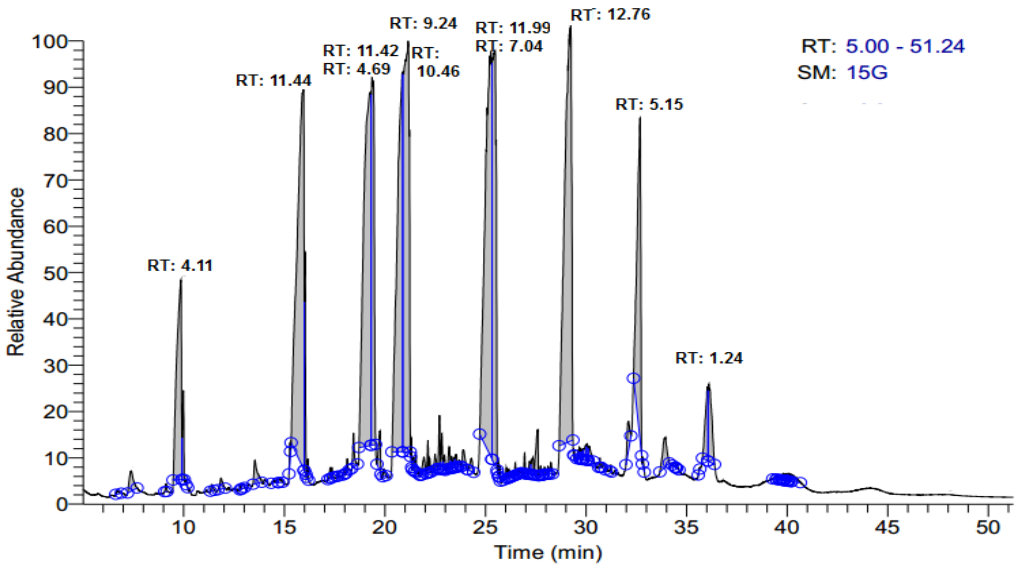

Fig. 1. Gas liquid chromatographic mass spectrometry of water thyme extract

Table 2. Identity of constituents determined by gas chromatography/mass spectrometry in the water thyme extract

No.	Compound name	Area (%)	RT	MF	MW
1	1-Hexadecene	31.14	15.96	$C_{16}H_{32}$	224
2	Behenic alcohol	17.91	29.24	$C_{22}H_{46}O$	326
3	1-Octadecene	11.99	25.27	$C_{18}H_{36}$	252
4	2-tert-Butyl-4-isopropyl-5-methylphenol	11.42	19.30	$C_{14}H_{22}O$	206
5	1-Octadecanol	7.04	25.48	$C_{18}H_{38}O$	270
6	3,4-Dihydro-2H-1,5-(3"-t butyl) benzodioxepine	4.69	19.36	$C_{13}H_{18}O_2$	206
7	1-Dodecene	4.23	9.86	$C_{12}H_{24}$	168
8	1-Docosene	2.11	36.02	$C_{22}H_{44}$	308
9	Tetradecane	1.41	9.98	$C_{14}H_{30}$	198
10	9-Octadecenoic acid	0.58	33.94	$C_{18}H_{34}O_2$	282
11	Others	7.48			

RT = retention time, min., MF=Molecular formula, MW= Molecular weight

Table 3. Effect of different levels of water thyme extract (WTE) on live body weight, daily body weight gain and mortality rate of rabbits

Item	Treatment			
	Control	0.25% WTE	0.50% WTE	0.75% WTE
Live body weight (g)				
Initial	810.83±39.12	825.00±47.52	850.00±37.57	845.00±82.35
2 weeks	1230.00±73.03	1259.83±70.94	1236.67±55.03	1192.66±101.20
4 weeks	1563.17±88.18	1621.33±68.62	1577.83±60.77	1561.33±84.96
6 weeks	1869.17±84.76	1978.00±58.90	1905.33±64.35	1883.33±95.17
8 weeks	2231.67±105.17	2373.83±64.60	2262.50±74.69	2218.00±103.26
Daily body weight gain (g)				
2 weeks	29.94^{a}±3.60	31.06^{a}±2.37	27.62^{ab}±2.01	24.83^{b}±2.44
4 weeks	23.80±3.51	25.82±2.73	24.37±2.26	26.33±2.99
6 weeks	21.86±2.61	25.48±2.24	23.39±0.71	23.00±2.64
8 weeks	25.89^{ab}±1.56	28.27^{a}±1.11	25.51^{ab}±0.99	23.91^{b}±0.69
Average	25.37^{bc} ±1.50	27.66^{a} ±1.13	25.22^{bc} ±0.82	24.52^{c} ±1.13
Mortality rate (%)	12.50	12.50	12.50	12.50

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

Table 4. Effect of different levels of water thyme extract (WTE) on daily feed intake (g) of rabbits

Item	Treatment			
	Control	**0.25% WTE**	**0.50%WTE**	**0.75%WTE**
2 weeks	82.83±7.78	76.00±3.47	78.17±2.77	73.83±5.36
4 weeks	93.50±7.25	82.50±7.66	87.33±2.98	91.67±4.84
6 weeks	94.67±3.63	91.83±2.78	92.50±2.62	92.33±3.20
8 weeks	115.26^{a}±5.00	84.17^{b}±1.90	85.50^{b}±2.11	83.33^{b}±3.75
Average	96.57^{a}±3.03	83.63^{b}±2.42	85.88^{b}±1.63	85.29^{b}±2.56

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

Table 5. Effect of different levels of water thyme extract (WTE) on feed conversion ratio (g feed/ g gain) of rabbits

Item	Treatment			
	Control	**0.25% WTE**	**0.50% WTE**	**0.75% WTE**
2 weeks	2.77^{ab}±0.10	2.45^{b}±0.11	2.83^{ab}±0.12	2.97^{a}±0.28
4 weeks	3.93 ±0.36	3.20±0.49	3.58±0.24	3.48±0.36
6 weeks	4.33±0.46	3.60±0.37	3.95±0.07	4.01±0.46
8 weeks	4.45^{a}±0.13	2.98^{b}±0.12	3.35^{b}±0.07	3.48^{b}±0.14
Average	3.87^{a}±0.19	3.06^{b}±0.18	3.43^{b}±0.11	3.49^{b}±0.18

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

were obtained when rabbits drank 0.25% WTE which was 3.06 kg diet/kg weight gain in comparison to 3.87 of control. These results agreed with those of Gerencsér *et al.* (2014) who reported that 3% thyme addition to rabbit diets had significantly (P<0.05) improved feed conversion ratio than control one (3.39 kg *vs* 3.54). Also, Bassiony *et al.* (2015) reported that rabbits received 100 and 200 mg cinnamaldehyde and thymol /kg diet significantly improved feed conversion ratio. The improvement in feed conversion ratio by thyme due to improve growth rate which reflect the improvement of the digestibility, absorption of nutrient and function of organs (Ibrahim *et al.,* 2000; Abdel-Samee *et al.,* 2012; Dalle Zotte *et al.,* 2013 ; Bassiony *et al.,* 2015).

Daily Water Consumption

The average daily water consumption (ml) during the total period (8 weeks) was insignificantly affected by all tested levels (Table 6).

Digestibility of Nutrients and Nutritive Values

The digestibility of nutrients and nutritive values as total digestible nutrients (TDN) and digestible crude protein (DCP) did not significantly differ between control rabbits and those consumed all levels of WTE and control (Table 7). These results agree with results of Dalle Zotte *et al.* (2013) who reported that addition 2.5% thyme to diet of dwarf rabbits insignificantly affected nutrients digestibility.

Table 6. Effect of different levels of water thyme extract (WTE) on daily water intake (ml) of rabbits

Item	Treatment			
	Control	0.25% WTE	0.50% WTE	0.75% WTE
2 weeks	202.50±17.02	212.50±27.80	175.50±15.88	192.50±20.56
4 weeks	340.00±40.82	305.00±47.69	265.00±15.54	267.50±21.75
6 weeks	375.00^{a}±25.62	285.00^{b}±22.17	292.50^{b}±21.74	252.50^{b}±17.01
8 weeks	267.50±25.62	270.00±38.73	290.00±15.81	282.50±14.93
Average	296.25±21.46	268.13±18.19	255.00±14.83	251.25±10.28

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

Table 7. Effect of different levels of thyme water extract (WTE) on digestibility of nutrients and nutritive values

Item	Treatment			
	Control	0.25% WTE	0.50% WTE	0.75% WTE
Digestibility of nutrients (%)				
Dry matter	72.27 ±2.14	71.68 ±0.25	72.90 ±3.41	73.19 ±1.07
Organic matter	76.81 ±1.76	76.21 ±0.29	76.94 ±2.71	73.19 ±1.07
Crude protein	82.99 ±0.51	82.60 ±0.50	82.65 ±1.55	86.06 ±1.34
Ether extract	80.09 ±1.90	82.44 ±0.77	79.67 ±3.30	78.96 ±1.05
Crude fiber	33.43 ±5.55	35.39 ±2.33	34.64 ±7.44	35.46 ±3.08
Nitrogen free extract	82.44 ±2.25	80.48 ±1.36	81.48 ±2.77	82.47 ±1.19
Nutritive values (%)				
TDN	68.77 ±1.75	68.33 ±0.32	68.36 ±2.69	69.40 ±0.76
DCP	12.93 ±0.08	12.87 ±0.08	12.88 ±0.24	13.41 ±0.21

TDN= Total digestible nutrients, DCP= Digestible crude protein

Also, similar results were obtained by Abdel-Samee *et al.* (2012). On the other hand, Ibrahim *et al.* (2000) reported that addition of thyme to rabbit diet improved protein digestion. Also, Bassiony *et al.* (2015) reported that digestibility of CP, CF and EE significantly improved by addition of thymol and cinnamaldehyde at level of 100 and 200 mg/kg diet of growing rabbits.

Caecum Parameters

The total volatile fatty acids, ammonia-N and pH values of ceacum content were significantly (P<0.05) decreased in rabbits drank all levels of WTE in comparison with control (Table 8). These results agree with results of Bassiony *et al.* (2015) who reported that total volatile fatty acids and ammonia concentration significantly (P<0.05) decreased in caecum content as affected by cinnamaldehyde and thymol

Table 8. Effect of different levels of water thyme extract (WTE) on caecum content parameters of rabbits

Item	Treatment			
	Control	0.25% WTE	0.50% WTE	0.75% WTE
TVFA (ml eq./100ml)	4.10^{a}±0.10	3.50^{b}±0.05	3.50^{b}±0.11	3.75^{b}±0.13
Ammonia-N (mg/100ml)	29.63^{a}±2.20	21.46^{b}±2.69	24.96^{b}±3.14	24.96^{b}±2.07
pH	6.41^{a}±0.05	5.51^{b}±0.07	5.79^{b}±0.00	5.80^{b}±0.15

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

supplementation. The decrease in total volatile fatty acids and ammonia concentration may be related to inhibition of bacteria in the caecum by thyme. Nevas *et al.* (2004) and Nezhadali *et al.* (2014) reported that thyme has high ability for inhibition of many strains of bacteria.

Carcass Traits

The dressing, viscera, liver, kidney, heart, fat deposited, caecum and testis as (%) of live body weight (Table 9) did not significantly differ between all tested levels of WTE and control. However, significantly decrease (P<0.05) was found only in lung (%) of rabbits drank 0.5% WTE compared to the other levels and control. These results agree with results of Bassiony *et al.* (2015) who reported that carcass traits, caecum weight and length insignificantly affected by the cinnamaldehyde and thymol supplementation.

Blood Constituents

All tested levels (0.25, 0.50 and 0.75%) of WTE did not significantly affect rabbits blood hematology measured (red blood cells count and indices, platelet count (10^3/µl) and total leucocytic count and differential leucocytic count (%) (neutrophils, lymphocytes, monocytes, eosinophils, basophils) (Table 10). Bassiony *et al.* (2015) reported that white blood cells, red blood cells, hemoglobin and lymphocytes significantly improved by cinnamaldehyde and thymol addition. The activity of ALT was significantly (P<0.05) higher in rabbits drank 0.50 and 0.75% WTE compared to control (Table 11). However, activities of AST did not significantly (P<0.05) differ between rabbits drank all levels of WTE and control. These results agreed to some extent with those reported by Shehata *et al.* (2013) who reported that AST and ALT activities did not significantly affected between Nile tilapia fish fed diet supplemented with 0.0, 0.1 and 0.25% thyme oil. The total protein and albumin values were significantly (P<0.05) with levels 0.50 and 0.75% WTE compared with levels 0.25% WTE and control. On the other hand, globulin concentration did not significantly (P<0.05) affected by all levels of WTE.

Economical Efficiency

The economical efficiency results (Table 12) improved by 0.25% WTE where the relative profit were 152.67% in compared to 100% of control. The economical efficiency was bad in rabbits drank 0.75 and 0.50% WTE which the values were 76.60 and 97.75%, respectively in compared to 100% of control. Abaza *et al.* (2003) and Ragab *et al.* (2013) reported that medicinal plants improved the economical efficiency of broiler.

Conclusion

Most results indicated that rabbits drank 0.25% WTE (2.5 g/100 ml water) have the best performance and economical efficiency.

Table 9. Effect of different levels of water thyme extract (WTE) on carcass traits (%) of rabbits

Item	Treatment			
	Control	0.25% WTE	0.50% WTE	0.75% WTE
Dressing	58.34 ±0.38	62.13 ±2.96	58.31 ±1.74	58.51 ±1.80
Viscera	17.19 ±1.48	14.69 ±0.26	16.53 ±1.65	17.21 ±2.07
Liver	2.56 ±0.02	2.78 ±0.35	2.79 ±0.15	2.89 ±0.31
Kidney	0.78 ±0.07	0.68 ±0.05	0.76 ±0.03	0.75 ±0.05
Lung	0.89 ^{a}±0.09	0.67 ^{ab}±0.01	0.54 ^{b}±0.06	0.75 ^{ab}±0.12
Heart	0.27 ±0.00	0.28 ±0.03	0.30 ±0.02	0.32 ±0.01
Fat deposited	0.53 ±0.14	0.74 ±0.15	0.68 ±0.03	0.50 ±0.12
Caecum	0.53 ±0.08	0.50 ±0.03	0.46 ±0.05	0.53 ±0.00
Testis	0.31 ±0.03	0.28 ±0.01	0.35 ±0.04	0.28 ±0.01

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

Table 10. Effect of different levels of water thyme extract (WTE) on blood hematology of rabbits

Item	Treatment			
	Control	0.25% WTE	0.5% WTE	0.75% WTE
Red blood cells count and indices				
Red blood cell (10^6/Ml)	5.64 ± 0.014	6.10 ± 0.112	5.54 ± 0.028	6.10 ± 0.089
Hemoglobin concentration (g/dl)	11.80 ± 0.057	12.65 ± 0.433	11.50 ± 0.057	12.50 ± 0.173
Packed cell volume (fl)	38.25 ± 0.259	41.65 ± 1.068	38.15 ± 0.490	41.50 ± 0.346
Mean cell volume(pg)	67.80 ± 0.288	68.15 ± 0.490	68.85 ± 0.548	68.00 ± 0.404
Mean cell hemoglobin(g/dl)	20.90 ± 0.057	20.70 ± 0.346	20.75 ± 0.202	20.54 ± 0.028
Mean cell Hb conc. (g/dl)	30.85 ± 0.086	30.35 ± 0.259	30.15 ± 0.548	30.10 ± 0.173
Platelet count (10^3/Ml)	209.50±40.703	205.00±25.980	234.50 ± 4.907	242.50±17.031
Total leucocytic count, WBC (10^3/Ml)	9.60 ± 0.519	9.75 ± 1.241	7.50 ± 0.346	7.85 ± 0.663
Neutrophils (%)	19.50 ± 0.866	27.00 ± 1.732	28.00 ± 1.732	21.50 ± 2.020
Band (staff)	1.50 ± 0.288	2.00 ± 0.000	3.00 ± 0.000	1.00 ± 0.000
Segmented	18.00 ± 1.154	25.00 ± 1.732	25.00 ± 1.732	20.50 ± 2.020
Lymphocytes	76.00 ± 0.000	70.50 ± 1.443	68.50 ± 0.866	76.50 ± 2.598
Monocytes	2.50 ± 0.288	1.00 ± 0.000	2.00 ± 0.577	1.50 ± 0.288
Eosinophils	1.50 ± 0.288	1.50 ± 0.288	1.50 ± 0.288	0.50 ± 0.288

Table 11. Effect of different levels of water thyme extract (WTE) on serum enzymes of rabbits

Item	Treatment			
	Control	**0.25% WTE**	**0.5% WTE**	**0.75% WTE**
ALT (u/l)	$16.53^{c}\pm 0.063$	$17.18^{bc}\pm 0.298$	$17.90^{ab}\pm 0.43$	$19.00^{a}\pm 0.520$
AST (u/l)	31.53 ± 0.088	32.56 ± 0.296	31.90 ± 0.871	33.03 ± 0.569
Total protein (g/dl)	$4.31^{b}\pm 0.101$	$4.28^{b}\pm 0.044$	$4.24^{b}\pm 0.030$	$4.50^{a}\pm 0.057$
Albumin (g/dl)	$3.07^{b}\pm 0.035$	$3.22^{b}\pm 0.109$	$3.24^{b}\pm 0.107$	$3.56^{a}\pm 0.069$
Globulin (g/dl)	1.216 ± 0.044	1.206 ± 0.052	1.236 ± 0.055	1.326 ± 0.043

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

Table 12. Effect of different levels of water thyme extract (WTE) on economical efficiency of rabbits

Item	Treatment			
	Control	**0.25% WTE**	**0.50% WTE**	**0.75% WTE**
Initial rabbit weight (kg)	0.810	0.825	0.850	0.845
Initial rabbit price (LE) [a]	20.250	20.625	21.250	21.125
Average daily feed intake (g) [b]	96.57	83.63	85.88	85.29
Total feed intake (kg) [c]	5.407	4.683	4.809	4.776
Total feed cost [d]	20.547	17.795	18.274	18.149
Water or extract intake (ml) [e]	296	268	255	251
Medicinal herbs (g) [f]	0.000	0.670	1.275	1.883
Daily plant extract price [g]	0.000	0.020	0.038	0.056
Total plant extract price [h]	0.000	1.126	2.142	3.163
Total cost (LE) [i]	40.797	39.546	41.666	42.437
Final weight (kg)	2.232	2.374	2.263	2.218
Selling price (LE) [J]	49.104	52.228	49.786	48.800
Profit [k]	8.307	12.682	8.120	6.363
Relative profit % [L]	100	152.67	97.75	76.60

a= initial weight x 25 LE(cost of one Kg rabbit=25)
c=b x total period (56 days)
d=c x 3.8 LE(cost of one Kg diet =3.8 LE)
f= e x (0.25, 0.50, 0.75/100)
g=f x (30 LE thyme /Kg diet)
h=g x total period (56 days)
i= a + d + h
J= final weight x 22 LE (cost of one Kg rabbit=22 LE)
k= J - i
L= profit of treatment / profit of control x 100

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تأثيـــر المستخلـص المـائـــي للـــزعتـــر علـــى أداء الأرانب النـــاميـــة

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أجريت هذه الدراسة لتقييم أثر المستويات المختلفة من المستخلص المائى للزعتر على أداء ذكور الأرانب النيوزيلندى البيضاء، ٣٦ أرنب متوسط الوزن الحى لها ٨٣٠ جم ± ٥٠ تم توزيعها على ٤ مجموعات (٩ أرانب فى كل مجموعة)، شربت أرانب المجموعة الأولى ماء صنبور (مجموعة الكنترول)، شربت أرانب المجموعات ٢ ، ٣ ، ٤ المستخلص المائى للزعتر بتركيزات ٠.٢٥ ، ٠.٥ ، ٠.٧٥% على التوالي، استخدم جهاز الطيف الكتلى للكروماتوجراف الغازى لتقدير مكونات المستخلص المائي للزعتر، أوضحت النتائج أن تحليل المستخلص المائى للزعتر بجهاز الطيف الكتلى للكروماتوجراف الغازى وجود ١٠٠ قمة طيف. قمم الطيف التي تزيد مساحتها عن ٠.٥ % كانت ١٠ يقابلها ١٠ مركبات، أظهرت النتائج أن أفضل (معنوية على مستوى ٥%) متوسط عائد النمو اليومي وكفاءة تحويل غذائى طول مدة التجربة (٨ أسابيع) كان للأرانب التى شربت تركيز ٠.٢٥% مستخلص مائي للزعتر مقارنة بأرانب الكنترول وأرانب التركيزات الأخرى من المستخلص المائى للزعتر، النسبة المئوية للنفوق، الماء المشروب، معاملات هضم المركبات الغذائية المختلفة، القيم الغذائية (مجموع المركبات الغذائية المهضومة والبروتين الخام المهضوم)، قياسات الذبيحة لم تختلف معنويا بين الأرانب التى شربت التركيزات المختلفة من المستخلص المائى للزعتر والكنترول، وجد انخفاض معنوي في قياسات الاعور (الأحماض الدهنية الطيارة، نيتروجين الأمونيا ورقم الحموضة) للأرانب التى شربت المستويات المختلفة من الزعتر بالمقارنة بالكنترول. اظهرت نتائج تحليلات الدم عدم وجود فروق معنوية في هيماتولوجى الدم بين الأرانب التى شربت كل مستويات المستخلص المائى للزعتر والكنترول، أظهرت إنزيمات السيرم عدم وجود فروق معنوية بين كل المعاملات فى نشاط انزيم الاسبرتيت أمينو ترانزفيريز، ارتفع معنويا نشاط إنزيم الألانين أمينوترانزفيريز، قيمة البروتين الكلى والألبيومين فى الأرانب التى شربت ٠.٥ ، ٠.٧٥% مستخلص مائي للزعتر مقارنة بالكنترول، الكفاءة الاقتصادية المتحصل عليها للأرانب التى شربت ٠.٢٥ ، ٠.٥٠ ، ٠.٧٥% مستخلص مائي للزعتر كانت ١٥٢.٦٧ ، ٩٧.٧٥ ، ٧٦.٦٠% على التوالى مقارنة ١٠٠% للكنترول، فأشارت معظم النتائج إلى أن أفضل أداء وكفاءة اقتصادية كان للأرانب التى شربت ٠.٢٥% مستخلص مائى للزعتر (٢.٥ جم / ١٠٠ مل ماء).

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