

Effect of Dietary Supplementation with Fenugreek, Marjoram and Their Combination on Performance and Carcass Traits of NZW Growing Rabbits

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ABSTRACT

A study was conducted to investigate the effect of two dietary herbal plants (fenugreek seeds (F), marjoram leaves (M) and their combination (F+M)) supplementation on productive performance and carcass traits of New Zealand White rabbits (NZW). The herbal plants were dietary added for 8 weeks at the following levels: T1 (0% F+0% M), T2 (0.25%F), T3 (0.25%M), T4 (0.50%F), T5 (0.50%M), T6 (0.25% F+0.25% M), T7 (0.50% F+0.25% M), T8 (0.25% F+0.50% M) and T9 (0.50% F+0.50% M). Ninety unsexed rabbits at 6 week of age (750-775g initial body weight) were divided into 9 treatment groups. Each treatment had 10 rabbits. At the end of the feeding traits, no significant differences were observed in LBW of rabbits comparing with the control group. However, group 4 which fed fenugreek (0.50%) achieved the highest final LBW at 14 weeks of age. During the whole period, means of feed consumption of rabbits were not significantly different among experimental groups. Concerning feed conversion ratio (FCR) for the whole experimental period, there were no significant differences among all groups. Herbal plants supplementation had no significant effect on relative weights of carcass yield, liver or heart. Generally, the present study concluded that the consumption of fenugreek and marjoram had positive effects on rabbit's performance and carcass traits of growing NZW rabbits.

Keywords: Rabbit, herbal plants, fenugreek, marjoram, production, carcass yield.

INTRODUCTION

Feed additives are a group of nutrient and non-nutrient compounds which helps in improving the efficiency of feed utilization and thus reducing the high cost of food. In the past, antibiotics were the most routinely used feed additives. Nowadays, use of antibiotics has been banned in many countries due to their alteration of gut microbiota and drug resistance of bacteria in humans. The global trend to go back to nature had enforced to use fenugreek seeds and marjoram leaves as natural growth promoters. Fenugreek has been used as a spice and a native medicine for many years. It has possessed antibacterial, antifungal, antiviral, and antioxidant activities. Fenugreek seeds are rich in protein, fat, total carbohydrates and minerals such as calcium, phosphorus, iron, zinc and magnesium (Gupta *et al.*, 1996), and contains active constituents such as alkaloids, flavonoids, steroids, saponins and phenolic (kor and Zadeh 2013) which help to enhance antioxidant capacity (Srinivasan, 2006). Fenugreek seeds in the diet significantly improve the body weight of broiler chicken (Yatoo *et al.*, 2012 and Qureshi *et al.*, 2015). In addition, Zewel *et al.* (2015) observed that feed additives fenugreek at 0.6% to rabbit diets significantly improved final body weight, body weight gain, feed intake, feed conversion ratio and performance index as compared to the control group. While Feeding diet supplemented with 0.3% fenugreek significantly increased dressing % and the absolute and relative weight of spleen, kidneys, liver, heart and lungs of Californian rabbits (Seleem, 2008). Oregano leaves (*Origanum vulgare* L.) essential oil is one of many plant extracts that are used at present as supplements in animal's diets. It contains mainly carvacrol, thymol and their precursors (terpinene and p-cypene) and it possesses intense *in vitro* antimicrobial (Dorman and Deans, 2000), antifungal (Daouk *et al.*, 1995) and

antioxidant (Cervato *et al.*, 2000) properties, making it an appropriate candidate as a replacement for antibiotic growth promoters and also a promising food additive in order to prevent meat lipid oxidation. Oregano aids nutrient digestion and absorption, it displays antibacterial properties and prevents gut imbalances (De Koning *et al.*, 1993). Untea *et al.* (2011) considered that oregano stabilizes the gut microflora and increases nutrient digestibility. Amount of volatile oil from the *Origanum vulgare* L is varying from 0.18-0.45% and 0.32-1.02% in fresh and dried plant (Robu and Milica, 2004). The present study was carried out to evaluate the beneficial effect of fenugreek seeds and marjoram leaves alone at two levels (0.25 and 0.50%) and in combination at different levels on performance and carcass traits of NZW rabbits.

MATERIALS AND METHODS

Experiments of the present study were carried out at the Rabbits Farm of Abo- Greada at Damietta Governorate that follows Faculty of Agriculture, Damietta University.

Experimental Design

Ninety unsexed NZW rabbits at 6 weeks of age were divided into 9 treatment groups, each treatment had 10 rabbits. The mean average weight of rabbits in all groups ranged from 750 to 775g.

Experimental diets:

Nine diets were made from different local materials. All diets were formulated to meet all the essential nutrient requirements of growing rabbits (De Blas and Mateots, 1998). The ingredients and chemical composition of experimental diets are shown in Table 1. All the diets were pelleted (3.5 mm diameter). Feed and fresh water were offered *ad libitum* to the experimental groups.

Animal housing:

All rabbit were housed individually in galvanized wire cages provided with feeders and automatic nipple

drinkers. Cages were kept in an open side well ventilated pen.

Growth trail:

A comparative feeding experiment was carried out to the study the effects of adding fenugreek seeds and/or marjoram leaves at different levels to the rabbit's diets on growth performance and carcass traits. Feed consumption was recorded weekly during the 8- week experimental period. Rabbits were individually weighed each week from weaning (at 6 week of age) to slaughter (at 14 week of age) to obtain live body weight and body weight gain.

Slaughter test

At the end of the feeding trial (14th week of age), three rabbits from each group were selected for slaughter test. Just prior to slaughter and again after complete bleeding, the rabbits were individually weighed, and their fur and legs were plucked and then eviscerated. Records on individual weights of eviscerated carcass and giblets (including heart, liver and kidney) were done. Carcass yield was calculated as eviscerated carcass plus giblets. All carcass traits were expressed as % of live body weight at slaughter.

Table 1: Ingredients and chemical analysis (%) of the experimental pelleted rations

Items	Experimental diets								
	T1	T2	T3	T4	T5	T6	T7	T8	T9
Ingredients %:									
Clover hay	38.4	38.15	38.15	37.9	37.9	37.9	37.65	37.65	37.4
Yellow maize	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1
Wheat bran	32.4	32.4	32.4	32.4	32.4	32.4	32.4	32.4	32.4
Soybean meal	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8
Molasses	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Salt	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Vitamins & Minerals permix*	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
DL-Methionine	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
DL .Lysine	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Cholin Chlorid	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Anticoccidia	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Fenugreek	-	0.25	-	0.50	-	0.25	0.50	0.25	0.50
Marjoram	-	-	0.25	-	0.50	0.25	0.25	0.50	0.50
Total	100	100	100	100	100	100	100	100	100
Chemical analysis (as fed):									
DM%	89.05	89.14	90.12	90.45	90.83	89.62	89.50	89.87	86.45
OM%	81.28	81.5	82.54	82.48	84.23	81.81	83.12	81.93	78.77
CP%	17.21	17.90	17.16	17.22	17.16	17.19	17.22	17.19	17.22
F%	11.21	9.37	11.69	12.26	10.90	10.56	11.26	9.72	11.43
EE%	1.50	1.07	2.97	2.34	1.33	1.83	1.97	2.03	1.13
NFE%	50.97	53.16	50.72	50.57	54.84	52.23	52.67	52.99	48.99
DE(Kcal/kg)	2877	2830	3031	2904	3062	2850	2924	2893	2820

* Each kilogram contains: Vit A 2000000 IU, Vit. D₃ 150000 IU, Vit. E 8.33g, Vit. K 0.33g, Vit. B₁ 0.33g, Vit. B₂ 1.0g, Vit. B₆ 0.33g, Vit. B₁₂ 1.7 mg, Vit. B₅ 8.33g, Pantothenic acid 3.33g, Zn 11.7g, Fe 12.5, Cu 0.5g, Co 1.33 mg, Se 16.6

Statistical analysis:

Statistical analysis for the obtained data was performed by analysis of variance using the method of least square analysis of Co-variance (SAS, 1996). Duncan's multiple range tests was used to separate significant differences among means (Duncan, 1955).

RESULTS AND DISCUSSION

Table 2 shows the effect of different levels of fenugreek (F), marjoram (M) and their combination (F+M) on LBW of rabbits during the whole experimental period (6-14 week of age). No significant differences were observed in LBW of rabbits throughout the whole experimental period between each treatment and the control. However, group 4 which fed fenugreek (0.50%) achieved the highest final LBW at 14th week of age. Means of final LBW at 14th week of age were 2.501, 2.492, 2.442, 2.522, 2.371, 2.464, 2.487, 2.464 and 2.477 kg for rabbit's groups fed T1 (0% F+0% M), T2(0.25% F), T3 (0.25% M), T4 (0.50%F), T5 (0.50% M), T6 (0.25% F + 0.25% M), T7 (0.50% F + 0.25% M), T8 (0.25% F + 0.50% M) and T9 (0.50%F+0.50%M), respectively. These results are in

agreement with the findings of Abdelatif *et al.* (2012) who found slight gradual increase in LBW of rabbits supplemented with fenugreek. Similarly, other researchers such as Zeweil *et al.* (2015) indicated that different supplementation of fenugreek powder to growing rabbit's diets improved the performance of the experimental rabbits compared to un-supplemented group. Also, the results are in agreement with findings of Rayes *et al.* (2009) who mentioned that improvement of body weight gain of rabbits fed fenugreek diets might be attributed to increase in feed intake or to the fenugreek contents of active compounds such as antibacterial, antifungal, anti-inflammatory, carminative and antioxidant activities. Also, Hernandez *et al.* (2004) found that the improvement due to fenugreek diets might be due to presence of the fatty acids or due to stimulating effect on the digestive system. In addition, Botsoglou *et al.* (2004) observed that dietary inclusion of 100 and 200mg/kg diet with an essential oil from oregano (marjoram) exerted no growth promoting effect in rabbits. However, Ibrahim *et al.* (2000) found that dietary supplementation with 0.5% oregano extract significantly increased LBW compared to a control group.

Table 2: Effect of dietary supplementation with fenugreek, marjoram, and their combination on live body weight of rabbits from 6th to 14th week of age.

Age (wk)	6 th	7 th	8 th	9 th	10 th	11 th	12 th	13 th	14 th
Treatments	$\bar{X} \pm SE$	$\bar{X} \pm SE$	$\bar{X} \pm SE$	$\bar{X} \pm SE$	$\bar{X} \pm SE$	$\bar{X} \pm SE$	$\bar{X} \pm SE$	$\bar{X} \pm SE$	$\bar{X} \pm SE$
T ₁ (Control)	845.5±36.2	1117.5±26.1	1415.5±39.5	1693.0±36.8	1822.0±38.8	2015.0±57.9	2208.5±80.2	2372.0±85.5	2501.5±83.5
T ₂ (0.25% F)	845.5±29.6	1104.5±21.5	1362.5±32.6	1579.5±31.5	1788.5±30.0	1985.0±31.7	2200.0±39.3	2380.5±46.8	2492.0±45.2
T ₃ (0.25% M)	887.5±26.2	1124.5±26.0	1382.5±36.0	1603.5±43.6	1794.5±42.7	1992.0±54.5	2161.5±63.9	2328.5±65.7	2442.5±63.9
T ₄ (0.50% F)	887.0±33.8	1111.0±20.1	1328.5±19.5	1556.5±22.0	1758.5±27.7	1998.0±23.9	2209.0±23.6	2399.5±31.7	2522.0±31.6
T ₅ (0.50% M)	885.0±18.4	1131.5±15.8	1396.5±31.3	1567.5±31.4	1743.5±32.4	1906.0±31.0	2056.0±42.4	2248.0±67.6	2371.0±75.0
T ₆ (0.25% F+0.25% M)	887.0±12.7	1128.0±19.9	1390.0±22.4	1624.5±25.6	1851.0±33.4	2047.0±41.4	2206.0±57.9	2352.5±61.8	2464.5±66.5
T ₇ (0.50% F+0.25% M)	888.5±8.0	1210.5±27.8	1447.0±30.5	1696±41.8	1865.5±47.2	2029.5±60.4	2119.5±63.3	2357.0±66.0	2487.0±74.7
T ₈ (0.25% F+0.50% M)	896.0±11.7	1123.0±14.0	1388.0±40.3	1627±39.3	1847.5±38.8	1998.5±43.9	2146.0±47.6	2343.0±40.1	2464.5±48.6
T ₉ (0.50% F+0.50% M)	885.5±16.3	1148.5±25.4	1392.5±37.5	1635±50.7	1825.0±50.6	1994.5±53.6	2138.0±60.1	2335.5±62.3	2477.5±63.2
Significant	NS	NS	NS	NS	NS	NS	NS	NS	NS

NS: Not significant at P≥0.05.

Body weight gain (BWG):

Results in Table 3 show that different dietary supplementation of fenugreek, marjoram and their combination had insignificant effect on BWG during the experimental period, except at the 9th, 10th and 12th weeks of age. The group 5 (0.50% M) of rabbits exhibited significantly lowest BWG compared with the other groups from the 9th week of age. During the period from 9 to 10 weeks of age, body weight gains of

rabbits were significantly affected by dietary supplementation with F+M, where group 6 (0.25%F+0.25%M) gained more weight than the other groups. The group 7 (0.50%F+0.25%M) of rabbits less improved BWG compared with the other groups from 12th week of age. Means of body weight gain of NZW rabbits during the whole period were 1656, 1646, 1555, 1635, 1486, 1577.5, 1598.5, 1568 and 1592g for groups 1, 2, 3, 4, 5, 6, 7, 8 and 9, respectively.

Table 3: Effect of dietary supplementation with fenugreek, marjoram, and their combination on weight gain of NZW rabbits from 7th to 14th and 6-14 week of age.

Age (wk.)	7 th	8 th	9 th	10 th	11 th	12 th	13 th	14 th	6-14 wk
Treatments	$\bar{X} \pm SE$	$\bar{X} \pm SE$	$\bar{X} \pm SE$	$\bar{X} \pm SE$	$\bar{X} \pm SE$	$\bar{X} \pm SE$	$\bar{X} \pm SE$	$\bar{X} \pm SE$	$\bar{X} \pm SE$
T ₁ (Control)	272±29.4	298±28.6	278±18.5 ^a	129±10.7 ^c	193±25.1	194±26.0 ^{ab}	164±19.0	130±11.3	1656±102
T ₂ (0.25% F)	259±23.6	258±24.5	217±12.0 ^{bc}	209±11.8 ^{ab}	197±16.7	215±15.0 ^a	181±11.0	112±6.06	1647±62
T ₃ (0.25% M)	237±18.7	258±27.5	221±13.9 ^b	191±12.8 ^{ab}	198±20.4	170±16.0 ^{ab}	167±24.0	114±8.49	1555±67
T ₄ (0.50% F)	224±19.7	218±13.0	228±15.0 ^{ab}	202±18.2 ^{ab}	240±14.8	211±17.4 ^a	191±16.5	123±6.38	1635±46
T ₅ (0.50% M)	247±27.0	265±24.8	171±20.1 ^c	176±26.7 ^{abc}	163±17.6	150±16.7 ^b	192±40.0	123±15.8	1486±73
T ₆ (0.25% F+0.25% M)	241±20.9	262±16.3	234.5±11.0 ^{ab}	227±15.9 ^a	196±23.6	159±24.0 ^{ab}	147±15.4	112±9.04	1578±59
T ₇ (0.50% F+0.25% M)	322±28.2	237±16.1	249±18.3 ^{ab}	170±22.0 ^{bc}	164±22.5	90.0±18.8 ^c	238±14.0	130±10.0	1599±71
T ₈ (0.25%F+0.50% M)	227±14.0	265±36.0	239±13.3 ^{ab}	221±11.0 ^{ab}	151±18.5	148±10.0 ^b	197±18.6	122±11.5	1569±49
T ₉ (0.50% F+0.50% M)	263±18.3	244±20.7	243±22.0 ^{ab}	190±7.78 ^{ab}	170±18.3	144±16.0 ^b	198±21.0	142±8.04	1592±64
Significant	NS	NS	**	**	NS	**	NS	NS	NS

^{a-b-c}: Means in the same column with different superscripts differ significantly P≤0.05, NS: Not significant at P≥0.05, **: Significant at P≤0.01.

Feed intake (FI)

Data of the effect of different levels of fenugreek, marjoram and combined dietary supplementations on weekly feed intake of rabbits are presented in Table 4. During the 7th week of age, means of feed intake were significantly different among treatments, being 625.5, 596.5, 578, 580, 492, 646, 642.5, 642 and 632 g/head for groups 1, 2, 3, 4, 5, 6, 7, 8 and 9, respectively. Rabbits given 0.50% M (T5) consumed significantly less feed compared with other groups. The feed

consumption of rabbits during the period from 7th to 9th weeks of age was not significantly different among groups. During the 10th week of age, FI was significantly lowest for group 5 (0.50% marjoram). The feed consumption of NZW rabbits during the 11th, 13th and 14th weeks of age was not significantly different among groups. However, during the 12th week of age, rabbits fed 0.50% fenugreek plus 0.25 % marjoram consumed significantly less feed compared with other experimental groups. During the whole period (6 to 14

weeks of age), means of FI of rabbits were not significantly different among experimental groups in agreement with the findings of El-Kloub (2006) who indicated that fenugreek seeds at level of 0.05 % revealed no significant effect on feed intake as compared to the control group. The improvements of feed conversion ratio might be related to the development of rabbit gut morphological changes of gastrointestinal tissues that can be induced by

differences in gut-fluid microbial content including their metabolites; the result was in line with finding of Amal et al. (2013) and Mamoun et al. (2014). Gomez et al. (1998) indicated that the improvement in performance characteristics in broilers may be due to antibacterial related to flavonoids in fenugreek that led to maintaining normal intestine microflora by competitive exclusion and antagonism, altering metabolism and increased liver muscle glycogen.

Table 4: Effect of dietary supplementation with fenugreek, marjoram, and their combination on feed intake of NZW rabbits from 6th to 14th and 6-14 week of age.

Age (wk.)	7 th	8 th	9 th	10 th	11 th	12 th	13 th	14 th	6-14 wk.
Treatments	$\bar{X} \pm SE$	$\bar{X} \pm SE$	$\bar{X} \pm SE$	$\bar{X} \pm SE$	$\bar{X} \pm SE$	$\bar{X} \pm SE$	$\bar{X} \pm SE$	$\bar{X} \pm SE$	$\bar{X} \pm SE$
T ₁ (Control)	626±27 ^a	669±15	947±25 ^a	766±34 ^{bc}	829±91	794±66 ^{ab}	764±47	726±28	6119±268
T ₂ (0.25% F)	597±33 ^a	668±32	870±14 ^{ab}	818±38 ^{bc}	933±23	905±16 ^a	813±21	725±27	6327±92
T ₃ (0.25% M)	578±37 ^{ab}	699±42.8	869±32 ^{ab}	812±26 ^{bc}	839±46	792±60 ^{ab}	751±40	644±29	5983±146
T ₄ (0.50% F)	581±22 ^{ab}	688±28	845±24 ^{ab}	790±33 ^{bc}	937±10	918±29 ^a	819±20	712±28	6288±121
T ₅ (0.50% M)	492±55 ^b	715±30.8	823±46 ^b	719±77 ^c	887±28	832±41 ^a	710±83	688±58	5866±230
T ₆ (0.25%F+0.25%M)	646±20 ^a	704±23	864±24 ^{ab}	882±32 ^{ab}	896±67	646±41 ^{cd}	762±46	699±29	6098±208
T ₇ (0.50%F+0.25%M)	643±27 ^a	726±19	883±53 ^{ab}	789±60 ^{bc}	785±72	532±69.5 ^d	824±26	742±21	5922±177
T ₈ (0.25%F+0.50%M)	642±37 ^a	748±60	935±19 ^{ab}	952±24 ^a	812±50	671±13 ^b	808±14	707±47	6275±92
T ₉ (0.50%F+0.50%M)	632±17 ^a	726±22	836±48 ^{ab}	836±21 ^{abc}	855±67	677±42 ^{bc}	849±15	762.5±18	6173±129
Significant	*	NS	*	**	NS	**	NS	NS	NS

^{a-b-c-d}: Means in the same column with different superscripts differ significantly (P≤0.05), NS: Not significant at P≥0.05, *: Significant at P≤0.05, **: Significant at P≤0.01.

Feed conversion ratio (FCR):

Effects of dietary supplementation of fenugreek and/or marjoram on weekly feed conversion ratio of rabbits are presented in Table 5. During the period from 6th to 8th weeks of age, FCR of rabbits was not significantly affected. However, during the 9th week of age, significantly worst mean of FCR was achieved by the group 5 fed the 0.50% marjoram as compared with other groups. Also, during the 10th week of age, significantly better mean of FCR was achieved by the

group 7 fed 0.50% fenugreek plus 0.25% marjoram as compared with other groups. However, during the 11th, 13th and 14th weeks of age, there were no significant effects on FCR among all groups, except during the 12th week of age, since there was significantly worst mean of FCR achieved by group 7 fed 0.50%F plus 0.25%M as compared with other groups. The FCR of rabbits for the whole experimental period had no significant differences among groups.

Table 5: Effect of dietary supplementation with fenugreek, marjoram, and their combination on feed conversion ratio of NZW rabbits from 7th to 14th and 6-14 week of age.

Age (wk.)	7 th	8 th	9 th	10 th	11 th	12 th	13 th	14 th	6-14 wk.
Treatments	$\bar{X} \pm SE$	$\bar{X} \pm SE$	$\bar{X} \pm SE$	$\bar{X} \pm SE$	$\bar{X} \pm SE$	$\bar{X} \pm SE$	$\bar{X} \pm SE$	$\bar{X} \pm SE$	$\bar{X} \pm SE$
T ₁ (Control)	2.55±0.27	2.46±0.26	3.55±0.24 ^a	6.12±0.3 ^c	4.52±0.32	4.67±0.51 ^a	5.24±0.58	5.97±0.53	3.74±0.10
T ₂ (0.25% F)	2.51±0.28	2.82±0.33	4.11±0.20 ^a	4.07±0.36 ^{ab}	5.01±0.35	4.41±0.32 ^a	4.68±0.35	6.61±0.28	3.89±0.14
T ₃ (0.25% M)	2.52±0.19	2.88±0.21	4.04±0.24 ^a	4.39±0.27 ^{ab}	4.71±0.62	4.92±0.42 ^a	5.09±0.41	5.79±0.27	3.88±0.10
T ₄ (0.50% F)	2.75±0.22	3.24±0.16	3.83±0.25 ^a	4.13±0.31 ^{ab}	4.04±0.24	4.57±0.35 ^a	4.57±0.41	5.89±0.23	3.86±0.09
T ₅ (0.50% M)	2.11±0.27	2.87±0.25	5.66±0.58 ^b	4.46±0.35 ^{ab}	6.14±0.77	5.95±0.45 ^{ab}	4.92±0.71	5.93±0.42	3.98±0.13
T ₆ (0.25%F+0.25 M)	2.87±0.26	2.77±0.18	3.73±0.12 ^a	3.99±0.19 ^a	4.96±0.38	4.88±0.64 ^a	5.65±0.49	6.54±0.46	3.87±0.05
T ₇ (0.50%F+ .25% M)	2.20±0.27	3.16±0.17	3.62±0.15 ^a	4.93±0.26 ^b	5.27±0.43	6.92±0.58 ^b	3.57±0.24	5.89±0.31	3.73±0.09
T ₈ (0.25%F+ .50% M)	2.90±0.20	3.08±0.24	3.99±0.16 ^a	4.41±0.20 ^{ab}	5.69±0.30	4.84±0.48 ^a	4.52±0.53	6.09±0.43	4.02±0.09
T ₉ (0.50%F+0.50%M)	2.49±0.15	3.09±0.17	3.63±0.24 ^a	4.45±0.16 ^{ab}	5.35±0.34	5.14±0.46 ^a	4.73±0.49	5.52±0.33	3.91±0.10
Significant	NS	NS	**	**	NS	**	NS	NS	NS

^{a-b}: Means in the same column with different superscripts differ significantly (P≤0.05).

Carcass traits:

Results given in Table 6 show the effect of fenugreek and/or marjoram on carcass traits of NZW rabbits at the 14th week of age. The results showed that dietary supplementation of fenugreek, marjoram and their combination had no significant effect on relative weights of carcass yield, liver or heart. Results of

carcass weight were in harmony with final live body weight. This result was in line with finding of Zeweil *et al.* (2015) indicate that diets containing 0.6% fenugreek seeds had no significant effect on carcass weight percent and organs relative weights as compared with the control group

Table 6: Effect of dietary supplementation with fenugreek, marjoram, and their combination on carcass traits (% of live body weight at slaughter) of NWZ rabbits.

Age (wk.)	LBW (g)	carcass wt. (%)	Heart wt. (%)	Liver wt. (%)	Dressed carcass wt. (%)
Treatments	$\bar{X} \pm SE$	$\bar{X} \pm SE$	$\bar{X} \pm SE$	$\bar{X} \pm SE$	$\bar{X} \pm SE$
T ₁ (Control)	2519.3±51.2	59.78±2.75	0.32±0.05	2.72±0.12	62.81±2.86
T ₂ (0.25% F)	2521.5±26.3	60.03±0.29	0.34±0.02	2.85±0.17	63.21±0.30
T ₃ (0.25% M)	2501.5±33.6	59.26±0.45	0.33±0.02	3.05±0.26	62.64±0.41
T ₄ (0.50% F)	2506.8±32.7	58.77±0.82	0.35±0.02	3.23±0.24	62.36±0.70
T ₅ (0.50% M)	2609.8±71.4	59.19±0.77	0.34±0.02	3.16±0.18	62.71±0.80
T ₆ (0.25% F+0.25% M)	2499.5±34.3	59.87±1.07	0.33±0.02	2.71±0.23	62.91±1.21
T ₇ (0.50% F+0.25% M)	2569.0±73.5	59.12±0.43	0.29±0.02	2.81±0.28	62.22±0.36
T ₈ (0.25% F+0.50% M)	2473.0±19.6	58.28±1.05	0.31±0.03	2.99±0.31	61.57±0.88
T ₉ (0.50% F+0.50% M)	2559.8±62.6	58.77±0.72	0.34±0.01	3.66±0.27	62.78±0.53
Significant	NS	NS	NS	NS	NS

NS: Not significant at P≥0.05.

CONCLUSION

The consumption of fenugreek and marjoram had positive effects on rabbit's performance and carcass traits of growing NZW rabbits.

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تأثير اضافة الحلبة والبردقوش ومخالطهما علي الاداء الانتاجي وصفات الذبيحة للارانب النيوزلاندي النامية تاج الدين حسن تاج الدين^١، فوزى صديق عبد الفتاح إسماعيل^٢، محمد رأفت الجوجري^١ و مصباح حسني عبد الحميد^١ قسم إنتاج الدواجن – كلية الزراعة – جامعة دمياط – مصر^١ قسم إنتاج الدواجن – كلية الزراعة – جامعة المنصورة – مصر^٢

أجريت هذه الدراسة لدراسة تأثير إضافة مسحوق بذور الحلبة ومسحوق أوراق البردقوش عند مستويات 0.25% و 0.50% ومخالطهم مع كمنشطات نمو طبيعية على معدل أداء النمو و صفات الذبيحة. استخدم 90 أرنب نامي من كلا الجنسين عمر 6 أسابيع ومتوسط وزنها الإبتدائي من 750 إلى 775 جراما، تم توزيعها عشوائيا على 9 معاملات وبكل معاملة 10 أرانب. وقد استمرت التجربة لمدة 8 أسابيع. المجموعة الأولى من الأرانب تناولت عليقة أساسية خالية من الإضافات الغذائية واستخدمت كمجموعة مقارنة. المجموع من 2-9 تناولت عليقة أساسية مضاف لها مسحوق بذور الحلبة ومسحوق أوراق البردقوش المطحونة عند مستويات 0.25% و 0.50% ومخالطهم معا. كانت جميع العلائق التجريبية متساوية في البروتين والطاقة، والمجاميع التجريبية كانت على النحو التالي:- المجموعة (1): غُذيت على العليقة الأساسية واستخدمت كمجموعة كنترول (T₁) - المجموعة (2): غُذيت على العليقة الأساسية + 0.25% مسحوق بذور الحلبة (T₂) - المجموعة (3): غُذيت على العليقة الأساسية + 0.25% مسحوق بذور الحلبة (T₃) - المجموعة (4): غُذيت على العليقة الأساسية + 0.50% مسحوق بذور الحلبة (T₄) - المجموعة (5): غُذيت على العليقة الأساسية + 0.50% مسحوق أوراق البردقوش (T₅) - المجموعة (6): غُذيت على العليقة الأساسية + 0.25% مسحوق بذور الحلبة + 0.25% مسحوق أوراق البردقوش (T₆) - المجموعة (7): غُذيت على العليقة الأساسية + 0.50% مسحوق بذور الحلبة + 0.25% مسحوق أوراق البردقوش (T₇) - المجموعة (8): غُذيت على العليقة الأساسية + 0.25% مسحوق بذور الحلبة + 0.50% مسحوق أوراق البردقوش (T₈) - المجموعة (9): غُذيت على العليقة الأساسية + 0.50% مسحوق بذور الحلبة + 0.50% مسحوق أوراق البردقوش (T₉). ويمكن تلخيص النتائج المتحصل عليها كالتالي: لم تكن للمعاملة الغذائية أي تأثير معنوي على وزن الجسم طوال فترة التجربة من 6-14 أسبوعاً. ومع ذلك حققت مجموعة الأرانب التي غُذيت على 0.50% حلبة أعلى وزن جسم نهائي وذلك في عمر 14 أسبوعاً (عمر التسويق). لا توجد هناك فروق معنوية في معدل استهلاك العليقة بين المعاملات الغذائية خلال فترة التجربة. لم يكن هناك أي تأثير معنوي على الوزن النسبي للذبيحة والكبد والقلب في المعاملات الغذائية التي مضاف إليها الحلبة والبردقوش ومخالطهما. توصي هذه الدراسة بأن إضافة الحلبة والبردقوش الي علائق الأرانب النامية بمعدلات 0.25% و 0.50% لها تأثير إيجابي على الأداء الإنتاجي وتحسين صفات الذبيحة.