INFLUENCE OF USING PLANT FEED ADDITIVES AS GROWTH PROMOTERS ON PRODUCTIVE PERFORMANCE OF GROWING RABBITS

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SUMMARY

The present study aimed to investigate the effect of dietary supplementation with rocket (Eruca Sativa) seeds, carrot (Daucus Carota L.) seeds or bay laurel leaves (Laurus Nobilis L.) and their mixtures on productive performance of growing rabbits. Ninety six male growing New Zealand White (NZW) rabbits (five weeks old) with an average live body weight of 512 g were chosen and randomly divided into 8 equal groups. The Control group (T1) was fed free basal diet. The other experimental groups received the basal diet and over top were fed on 1.0% rocket seed (T2), 1.0% carrot seed (T3), 1.0% bay laurel leaves (T4), 0.5% rocket seed+0.5% carrot seed (T5), 0.5% carrot seed+0.5% bay laurel leaves (T6), 0.5% rocket seed+0.5% bay laurel leaves (T7) and 0.33% rocket seed+0.33% carrot seed+0.33% bay laurel leaves in diet (T8), respectively. The growth trial lasted for 8 weeks. The results showed that only at 9 week of age, rabbits of T2, T5, T6 and T7 followed by T8 tested diets gave significant (p=0.0026) higher live body weight compared with T1 which disappeared at 13 weeks of age. Total body weight gain significantly (p=0.0035) improved for tested groups at 5-9 weeks of age, however, the total growth (5-13 weeks) rabbits received 0.33% rocket seed+0.33% carrot seed+0.33% bay laurel leaves (T8) gave significantly (p=0.0395) the highest total body weight gain compared to control group. At 5-13 week, the control group had the highest feed consumption (p=0.0517) compared to all tested groups. Feed conversion ratio was significantly affected by dietary treatments during experimental intervals. The control group recorded the worst FCR during 5-13 weeks of age (p=0.0124). Digestibility coefficients of crude protein (p=0.05) and crude fiber (p=0.004) were significantly improved as a response to feeding tested materials except in case of 1% carrot seeds compared to the control. Further improvements in digestibility coefficients of EE (p=0.0001) and NFE (p=0.01) for all tested diets against the control were recorded. Nutritive values of the experimental diets in terms of TDN (p=0.04) and ME (p=0.05) were significantly influenced, while DCP was not affected. At the same time, T8 appeared to the highest TDN value (57.81%), while T7 tended to the highest ME value (2406.8cal/kg) compared to the others. N balance was significantly greater (p=0.05) in rabbits fed rocket seeds or carrot seeds or bay laurel leaves supplemental diets than those fed control. The highest value (2.30) was recorded with group feeding T8 diet. Rabbits fed diets contain feed additives as rocket seed, carrot seed or bay laurel leaves recorded significantly decreased (P=0.004) values of glucose concentration for all supplemented groups except for T8 compared with control group. Total lipids (p=0.0001), total cholesterol (p=0.001) and triglycerides (p=0.05), LDL cholesterol (p=0.05) and VLDL cholesterol (p=0.05) were significantly affected by dietary treatments. Regarding antioxidant activities, there were significant increases in TAC (p=0.05) and a decrease in lipid peroxidation upon feeding the tested groups in contrast to the control. Favorably, dressing % for group received T8 diet significantly (P=0.001) increased (69.10%) followed by the other tested diets compared to the control. On contrary, NH3-N concentration was significantly (p=0.01) decreased while VFA’S concentrations significantly (p=0.05) increased in all groups of rocket seeds or carrot seeds or bay laurel leaves supplemental diets compared with control. The experimental groups recorded lower feed cost/rabbit values than control group. So, the experimental groups had higher values of economic efficiency and relative economic efficiency compared control. T8 diet achieved the highest values of economic efficiency and relative economic efficiency being 1.129 and 138%, respectively.

Keywords: Rocket seeds, carrot seeds, bay laurel leaves, productive performance, digestibility, blood parameters, antioxidant, growing rabbits.
INTRODUCTION

Cost of feeding is the most significant expensive item in animal production and reaches 60-70% of the total cost in rabbit's production. To reduce the rabbit production cost, it is necessary to improve the feed efficiency and increase the growth rate (Abedel-Azeem et al., 2012). Feed additives are important materials that can improve the efficiency of feed utilization, animal performance and enhance immune response. The possibility of using new natural additives instead of antibiotics and hormones in animals' diets is being recently used. Herbal feed additives comprise of a wide variety of herbs, spices and essential oils have been aspects as alternatives by some researchers (Ceylan et al., 2003). Some of the important aspects associated with herbal additives are the prevention of digestive disturbances improve feed conversion ratio, increase carcass quality, decrease the market age of animal and reduced their rearing cost (Javed et al., 2009 and Krieg et al. 2009). Rocket, carrot and laurel are rich sources of vitamin A. Vitamin A is considered the most important vitamin in the body for normal growth, protective mucous membranes, reproduction, immune functions and sight. Vitamin A is found in variety of dark green leaves and deep orange color seeds (F.A.S.B, 1995). In latest years, Rocket plant (Eruca sativa) has gotten more value as a vegetable and spice around the world, further it is considered to be an important chemoprotective plant. The rocket belongs to the family Brassicaceae which is consists of Eruca sativa mill, Bunias and orientalis Diploptaxis. The beneficial and positive usefulness of the phytochemicals existing in rocket on health have been notified by a numeral of scientific research studies. These advantageous effects have been linked to the variety of phytochemicals they consist of, such as vitamins C and A glucosinolates and flavonoids, all of which are found in large quantities in Brassicaceae crops (Jin et al., 2009 and Bell and Wagstaff 2014).The rocket is believed to be an extremely good resource of antioxidants, as it includes phenolic compounds, glucosinolates carotenoids and degradation products like isothiocyanates (Villaroro, et al., 2012). Moreover, Eruca sativa Mill has cytoprotective, anti-inflammatory, anti-ulcer and anti-secretory action. Heimler et al., (2007), Alqasoumi et al. (2009) and Khan and Khan (2014). Glucosinolates were found to have several biological activities including anticarcinogenic, antifungal and antibacterial plus their antioxidant action (Kim et al., 2004). The major glucosinolate in seeds of rocket which is potentially capable of protecting cells against oxidative stress. In addition, rocket contains Zn, Cu, Fe, Mg, Mn and other elements (Abdo and Zeinab, 2003) which increase immune response. Rabbits are unique in that they can convert 100% of dietary betacarotene into retinol (Frater, 2001). Rocket (Eurica Sativa) seeds locally know as jarjeer, it is a good source of beta-carotene (Rinzler, 1990). Rocket contains a number of health promoting agents including carotenoids, vitamin C, fibers, glucoerucin and flavonoids (Barilliari et al., 2005). The major constituent of Eurica Sativa volatile oil was isothiocyanates which has antioxidant, antimicrobial, antifungal and anticarcinogen activity (Badee et al., 2003, Haristory et al., 2005 and Barilliari et al., 2005). Rocket contain flavonoids such as appin and luteolin, volatile oils like myristicin, apirole and B-phellandrene, fat as the furocoumarin bergapten, polyenes protein, sugars and vitamin A&C (Bradley, 1992 and Leung and Foster, 1996). Flavonoids have antiviral activity (Hertog et al., 1993). Carotenoids can protect phagocytic cells from antioxidative damage enhance T&B lymphocyte proliferative responses and increase the production of certain interleukins (Bendich, 1989). Also, they increase plasma IgG concentration (Chew, et al.,2000). It is known as diuretic, anti-inflammatory and affects blood circulation. Eurica seeds have high oil protein glucosinolate and Eurica acid contents and commonly used an animal feed in Asia particularly in India and Pasiskan (Kim and Ishil, 2006). El-Nomeary et al (2016) who found that growth performance was improved significantly when rabbits fed on diet supplemented with black cumin (Nigella sativa), mustard (Sinapis alba), sesame (Sesamum indicum) and rocket (Eruca sativa) seeds meals as feed additives for 68 days. In carrot (Daucus Carota L) seeds the benefit predominant fatty acids are oleic, linoleic and palmitic fighting infection. Vitamin A keeps cell membranes healthy, making them stronger against disease causing by microorganisms (Prasad, et al., 1987). Carotol is the strongest antifungal activity constituent of carrot seeds oil (Jasicka et al., 2004). Glycosides in carrot may be responsible for the blood pressure lowering effect of
The hypertension and exerts anti hyperglyceremic effects (Gilani et al., 2000 and Suzuki et al., 2005). One hundred gram dried leaves of bay laurel leaves (Laurus nobillis L.) provides 10715 I.U of vitamin A (Rinzler, 1990). Laurus nobillis leaves are considered as natural antioxidants (Gomez et al., 2004). The primary constituents of laueus oil eugenol, elemicin, spathulenol, and beta- eudesmol (Rinzler, 1990 and Diaz et al., 2002). Carvacrol, 1-8- cineole, fenchone, trans- antethole, phenols and linalool were the predominant constituents in bay laurel essential oils (Dadioghlu and Evrendilek 2004 and Kilic et al ., 2004). The leaf essential oil of Laurel has anti-inflammatory activities and anticancer therapy in mice and rats (Sayyah et al., 2003 and Huang et al., 2004). Laurus nobillis oil showed inhibition against all the microorganisms tested (Baratta et al., 1998).Ibrahim (2005) reported that 1 % rocket, 1% bay laurel leaves or 0.5% rocket respectively can be individually used as natural feed additives which can improve the growth performance, digestion coefficient, biochemical blood parameters and economic efficiency in growing rabbits. Therefore, this study aimed to compare more correctly the single effects on performance, digestibility, carcass characteristics, some blood parameters and economic efficiency of growing rabbits, as well as, antioxidant activities during experimental period of commercially available natural feed additives as Rocket (Eruca Sativa) seeds and carrot (Daucus Carota L) seeds or bay laurel leaves (Laurus nobillis L.) and their mixed between them under the same conditions.

MATERIALS AND METHODS

The present study was carried out at Noubria Experimental Station, belonging to Animal Production Research Institute, Agriculture Research Center, Ministry of Agriculture, Egypt. Ninety six male growing New Zealand White (NZW) rabbits at five weeks old, with an average live body weight of 512 g were chosen and randomly divided into eight groups (twelve rabbits each). Each group was divided into three replicates, (four rabbits each) provided with feeders automatic drinkers. All rabbits were fed on a basal pelleted ration formulated to meet rabbit's requirements according to NRC (1977) Table (1). Rocket and carrot seeds or bay laurel leaves were used on air dried basis. The experimental period lasted for 60 days and the experimental groups were classified as follow:T1: Rabbits received a basal diet.T2: Rabbits received supplemented basal diet with 1.0 % of rocket seeds.T3: Rabbits received supplemented basal diet with 1.0 % of carrot seeds.T4: Rabbits received supplemented basal diet with 0.5 % of rocket seeds+0.5% of carrot seeds.T6: Rabbits received supplemented basal diet with 0.5 % of carrot seeds+0.5 % of bay laurel leaves. T7: Rabbits received supplemented basal diet with of 0.5 % rocket seeds+0.5% of bay laurel leaves.T8: Rabbits received supplemented basal diet with mixture (0.33 % of rocket seeds + 0.33% carrot seeds + 0.33% bay laurel leaves). All the experimental diets were formulated to be isonitrogenous and isoenergetic containing approximately 17.18% CP and 2539.6 DE kcal/ kg (Table 2).

All animals were kept under the same environmental and management conditions. The rations were offered ad libium. The samples of pelleted rations were analyzed for crude protein (CP), crude fiber (CF), ether extract (EE) and ash according to A.O.A.C. (2000), while organic matter and nitrogen free extract (NFE) were calculated. Feed intake, body weight, body weight gain and feed conversion ratio were recorded weekly. At 13 weeks of age, twenty four rabbits were randomly taken after the termination of the fattening period to conduct the digestibility trails. Rabbits within each treatment were randomly housed individually in metabolic cages (n=3) that allowed the separation of feces and urine to determine the digestibility coefficients of the nutrients. Representative samples of feed offered and feces of each rabbits were chemically analyzed for determine of dry matter (DM), crude protein (CP), crude fiber (CF), ether extract (EE), nitrogen free extract (NFE) and ash according to A.O.A.C. (2000) organic matter and nitrogen free extract (NFE) were calculated, Total digestible nutrient (TDN) was calculated according to Cheeke (1987).
Table (1): Ingredients composition of the experimental diets.

| Ingredient              | T1     | T2     | T3     | T4     | T5     | T6     | T7     | T8     |
|-------------------------|--------|--------|--------|--------|--------|--------|--------|--------|
| Berseem hay             | 30.20  | 30.20  | 30.20  | 29.20  | 30.20  | 30.20  | 29.20  | 29.21  |
| Barley                  | 20.00  | 20.00  | 20.00  | 20.00  | 20.00  | 20.00  | 20.00  | 20.00  |
| Rocket seed             | 0.00   | 0.00   | 1.00   | 0.00   | 0.00   | 0.50   | 0.50   | 0.33   |
| Carrot seed             | 0.00   | 0.00   | 1.00   | 0.00   | 0.50   | 0.50   | 0.00   | 0.33   |
| Bay laurel leaves       | 0.00   | 0.00   | 0.00   | 1.00   | 0.00   | 0.50   | 0.50   | 0.33   |
| Yellow corn             | 14.80  | 13.80  | 13.80  | 14.80  | 13.80  | 13.80  | 14.80  | 14.80  |
| Wheat bran              | 10.00  | 10.00  | 10.00  | 10.00  | 10.00  | 10.00  | 10.00  | 10.00  |
| Soybean meal 44%        | 19.60  | 19.60  | 19.60  | 19.60  | 19.60  | 19.60  | 19.60  | 19.60  |
| Molasses                | 3.00   | 3.00   | 3.00   | 3.00   | 3.00   | 3.00   | 3.00   | 3.00   |
| Limestone               | 1.00   | 1.00   | 1.00   | 1.00   | 1.00   | 1.00   | 1.00   | 1.00   |
| Di-Calcium phosphate    | 0.30   | 0.30   | 0.30   | 0.30   | 0.30   | 0.30   | 0.30   | 0.30   |
| Salt                    | 0.50   | 0.50   | 0.50   | 0.50   | 0.50   | 0.50   | 0.50   | 0.50   |
| Vit-min premix*         | 0.30   | 0.30   | 0.30   | 0.30   | 0.30   | 0.30   | 0.30   | 0.30   |
| Lysine                  | 0.15   | 0.15   | 0.15   | 0.15   | 0.15   | 0.15   | 0.15   | 0.15   |
| Methionine              | 0.15   | 0.15   | 0.15   | 0.15   | 0.15   | 0.15   | 0.15   | 0.15   |
| Total                   | 100.0  | 100.0  | 100.0  | 100.0  | 100.0  | 100.0  | 100.0  | 100.0  |

* Provided per kilogram diet: vitamin A, 6000 IU; vitamin D3, 450 IU; vitamin E, 40 mg; vitamin K3, 1 mg; vitamin B1, 1 mg; vitamin B2, 3 mg; niacin, 180 mg; vitamin B6, 39 mg; vitamin B12, 2.5 mg; pantothenic acid, 10 mg; biotin, 10 mg; folic acid, 2.5 mg; choline chloride, 1200 mg; manganese, 15 mg; zinc, 35 mg; iron, 38 mg; copper, 5 mg; selenium, 0.1 mg; iodine, 0.2 mg; selenium, 0.05 mg.

T1: Control T2: Control + 1.0% Rocket seed. T3: Control + 1.0% Carrot seed. T4: Control + 1.0% Bay laurel leaves. T5: Control + 0.5% Rocket seed+0.5% Carrot seed. T6: Control + 0.5% Carrot seed+0.5% Bay laurel leaves. T7: Control + 0.5% Rocket seed+0.50% Bay laurel leaves T8: Control + 0.33% Rocket seed+0.33% Carrot seed+0.33% Bay laurel leaves.

Table (2): Chemical analyses of the experimental diets.

| Chemical analysis (%) | T1       | T2       | T3       | T4       | T5       | T6       | T7       | T8       |
|-----------------------|----------|----------|----------|----------|----------|----------|----------|----------|
| Dry matter            | 89.19    | 89.11    | 89.21    | 88.47    | 89.13    | 89.12    | 89.16    | 89.13    |
| Organic matter        | 81.56    | 81.41    | 81.54    | 82.00    | 81.36    | 81.43    | 81.48    | 81.38    |
| Crude protein         | 17.20    | 17.18    | 17.17    | 17.23    | 17.11    | 17.17    | 17.16    | 17.19    |
| Crude fiber           | 12.34    | 12.39    | 12.41    | 12.30    | 12.51    | 12.40    | 12.80    | 12.11    |
| Ether Extract         | 2.60     | 2.82     | 2.82     | 2.61     | 2.83     | 2.81     | 2.75     | 2.73     |
| Ash                   | 7.63     | 7.70     | 7.67     | 6.47     | 7.77     | 7.69     | 7.68     | 7.75     |
| NFE*                  | 49.42    | 49.02    | 49.14    | 49.86    | 48.91    | 49.05    | 48.77    | 49.35    |
| NDF                   | 36.37    | 36.41    | 36.42    | 37.01    | 36.49    | 36.41    | 36.68    | 36.88    |
| DE**kcal/kg           | 2541.8   | 2540.2   | 2539.5   | 2543.1   | 2536.3   | 2539.8   | 2526.9   | 2549.2   |

*NFE = OM- (Crude protein+ Crude fiber+ Ether Extract)
**Digestible energy (DE) of the experimental diets was calculated according to the equation described by Cheeke (1987) as follows: DE (Kcal) = 4.36-0.0491×NDF%, NDF= 8.92+0.657×CF%.

T1: Control . T2: Control + 1.0% Rocket seed. T3: Control + 1.0% Carrot seed. T4: Control + 1.0% Bay laurel leaves. T5: Control + 0.5% Rocket seed+0.5% Carrot seed. T6: Control + 0.5% Carrot seed+0.5% Bay laurel leaves. T7: Control + 0.5% Rocket seed+0.50% Bay laurel leaves T8: Control + 0.33% Rocket seed+0.33% Carrot seed+0.33% Bay laurel leaves.

At the end of experiment, blood samples were taken from ear vein of three rabbits from each group, allowed to flow into heparinized tubes, immediately centrifuged at 4000 rpm for 20 minutes to separate the plasma, which stored at -20 °C for subsequent analysis. Blood plasma was analyzed using special kits to determine total protein as described by the Buiet method according to Henry and Todd (1974), albumin
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determined according to Doumas et al. (1971), globulin calculated as the difference between total protein and albumin. Creatinine determined using the method of Henry et al., (1974), urea (Fawcett and Soctt, 1961), glucose (Tinder, 1969) and Cholesterol (Allian et al., 1974). Total lipids and triglycerides were measured according to Zollner and Kirch (1962) & (Schalim et al., 1975), respectively. High density lipoprotein (HDL) and low density lipoprotein (LDL) were determined according to the method of Warnick et al., (1983) and Bergmenyer (1983), respectively. Very low density lipoprotein (VLDL) was calculated by dividing the values of triglycerides by factor of 5. Uric acid determined according to the method of Bhargava et al., (1999). Total antioxidant capacity (TAC) was determined according to Diamond Biodiagnostic, Egypt. Lipid peroxides was determined according to Yagi, (1984). For slaughter trial, at the end of 13 weeks of age rabbits, 3 males of each treatment were randomly chosen for slaughter test, and carcass weights were calculated as percentage of live body weight. Dressing percentage was calculated according to Steven et al., (1981). Cecum characteristics (total volatile fatty acids were determined according to Eadie et al., (1967) and ammonia was determined by applying Conway method (1958).

**Statistical Analyses:**

Data were analyzed by Completely Randomized Design according to Snedecor and Cochran (1982) using the General Linear Models of SAS (2001) as following statistical model:

\[ Y_{ij} = \mu + T_i + e_{ij} \]

Where, \( Y_{ij} \) is the value measured, \( \mu \) is the overall mean effect, \( T_i \) is the \( i \)th diet effect and \( e_{ij} \) is the random error associated with the \( j \)th rabbits assigned to the \( i \)th diet. Significant differences of \( P<0.05 \) among means were determined using Duncan's Multiple Range Test (Duncan, 1955).

**RESULTS AND DISCUSSION**

**Rabbits Performance:**

Data of body weight, feed consumption and feed conversion of growing New Zealand rabbits during the different experimental period are presented in Table (3). At 9 week, the rabbits received the experimental diets showed significant (\( p=0.0026 \)) increment in body weight T2, T5, T6 and T7 followed by T8 compared with T1. At 13 week, all experimental groups fed supplemental diets recoded insignificant increased values of final body weight compared with control. T8 had highest value (1622 g) of final body weight compared with the other experimental groups. Total body weight gain had significant (\( p=0.0395 \)) increment by (14.37, 8.52 and 11.49%) for T8 at different experimental periods, compared with control group. The other experimental groups fed supplemental diets recorded insignificant increased values of total body weight gain compared with control one. At 5-13 week, T1 had significant increased (\( p=0.0517 \)) value of feed consumption. There were no significant differences among the other experimental groups. All experimental groups recorded significantly lower (\( p=0.0124 \)) value of feed conversion during different periods except for T5 at 9-13 weeks, it could be observed that the fed conversion value recorded the highest value (5.42) compared with others. T8 had the best one (lowest value). Ibrahim (2005) showed that the performance of growing rabbits that fed diets including 0.5% and 1% rocket seed or 1% bay laurel leaves appeared to significantly (\( P<0.05 \)) increase in comparison with control group. These improvements may be attributed to the properties of these materials that act not only as antibacterial, antiprotzoal and antifungal but also as antioxidant (Bradley, 1992; Leung and Foster, 1996 and Zeweil et al 2008). El-Tohamy and El-Kady (2007) found that the replacement of rocket meal to 50% crude protein level of soybean meal showed significant augmentation in the performance of rabbits. El-Nomeary et al. (2015) who found that growth performance was improved significantly when growing rabbits fed on diet supplemented with 3% rocket seeds meal for 68 days.
**Table (3): Growth performance of the experimental groups.**

| Item                        | Experimental diets | P value |
|-----------------------------|--------------------|---------|
| No of rabbits               | T1     | T2     | T3     | T4     | T5     | T6     | T7     | T8     | SEM   |
| Body weight, g              |        |        |        |        |        |        |        |        |       |
| At 5 week                   | 538    | 517    | 508    | 514    | 506    | 500    | 514    | 506    | 11.75 | 0.5180 |
| At 9 week                   | 1046c  | 1108ab | 1056c  | 1069bc | 1140a  | 1119ab | 1134a  | 1087b  | 17.70 | 0.0026 |
| At 13 week                  | 1539   | 1557   | 1593   | 1581   | 1578   | 1597   | 1592   | 1622   | 27.20 | 0.7049 |
| Live body weight gain, g    |        |        |        |        |        |        |        |        |       |
| 5 – 9 week                  | 508b   | 591ab  | 548b   | 555b   | 634c   | 619ab  | 620b   | 581b   | 21.75 | 0.0035 |
| 9 – 13 week                 | 493b   | 449b   | 537b   | 512b   | 438b   | 478b   | 458b   | 535ab  | 29.09 | 0.05   |
| 5 – 13 week                 | 1001b  | 1040b  | 1085b  | 1067ab | 1072b  | 1097b  | 1078b  | 1116a  | 31.00 | 0.0395 |
| Feed consumption, g         |        |        |        |        |        |        |        |        |       |
| 5 – 9 week                  | 1692a  | 1601b  | 1545bc | 1547bc | 1483c  | 1535bc | 1492c  | 1547bc | 25.16 | 0.0001 |
| 9 – 13 week                 | 2327b  | 2232b  | 2325b  | 2256c  | 2375c  | 2270c  | 2230c  | 2379a  | 35.57 | 0.0397 |
| 5 – 13 week                 | 4019b  | 3834b  | 3870b  | 3803b  | 3858bc | 3805b  | 3722b  | 3783b  | 55.86 | 0.0517 |
| Feed conversion ratio       |        |        |        |        |        |        |        |        |       |
| 5 – 9 week                  | 3.33c  | 2.71b  | 2.82b  | 2.79b  | 2.33c  | 2.48c  | 2.41c  | 2.68bc | 0.12  | 0.0001 |
| 9 – 13 week                 | 4.72b  | 4.97b  | 4.33b  | 4.41b  | 5.42c  | 4.75b  | 4.87b  | 4.40b  | 0.28  | 0.051  |
| 5 – 13 week                 | 4.01a  | 3.69b  | 3.56b  | 3.57b  | 3.60b  | 3.47b  | 3.45b  | 3.39b  | 0.10  | 0.0124 |

* means in the same row having different superscripts differ significantly.

T 1: Control, T 2: Control + 1.0% Rocket seed, T 3: Control + 1.0% Carrot seed, T 4: Control + 1.0% Bay laurel leaves, T 5: Control + 0.5% Rocket seed + 0.5% Carrot seed, T 6: Control + 0.5% Carrot seed + 0.5% Bay laurel leaves, T 7: Control + 0.5% Rocket seed + 0.50% Bay laurel leaves, T 8: Control + 0.33% Rocket seed + 0.33% Carrot seed + 0.33% Bay laurel leaves.

**Digestion coefficient:**

The data presented in Table (4) observed that the digestion coefficients of both CP and CF with diets T2, T4, T5, T6, T7 and T8 showed significant (P=0.05 and 0.004) higher values compared with control group. There is no significant difference between T3 and control group. Ibrahim (2005) showed that crude fiber digestion for rabbits received diets supplemented with either rocket or carrot at the rate of 1% was significantly increased compared control group. Also, it may be due to the effect of fiber and associated antioxidants as observed in rat by Nicolle et al., (2003). Ibrahim (2005) observed that in rocket treatment the significant increase in crude fiber digestibility may be due to the effect of flavonoids essential oils which possesses beneficial effect for stimulation and activity of digestive system. Close results are observed in rat by Namur et al., 1988 and Bradley, (1992) who postulated that carrot seeds rich in beta-carotene thus improved metabolism of caecal microorganisms on fiber digestion in rabbit. Gronowska et al., (1986) found that the chemical composition of fiber in diet significantly affects the process of beta-carotene absorption and conversion in the digestive tract of the rat. Digestibility coefficients of EE and NFE for all experimental groups had significantly (P=0.0001 and 0.01) increased than control one, respectively. The nutritive values of the experimental treatments (T2, T4, T5, T6, T7 and T8) recorded a significant (P=0.04 and 0.05) values of TDN and ME. These improvements tend to that rocket seed and carrot seed or laurus leaf micro components to stimulate and activate the digestive system by improving the diet palatability and enhancing appetite. Basyony and Azoz (2017) conducted that rocket seed and carrot seed or bay laurel leaves in rabbit diets caused an improvement in production performance, However, T3 had insignificant value of TDN compared with control group. On the meantime, there was no significant difference among the experimental groups for DCP value. N balance was significantly greater (p=0.05) in rabbits fed all experimental diets than those fed control. N balance as % of nitrogen intake was significantly (p=0.01) affected by tested diets, the
highest value was shown with T8 diet and the lowest was with the control diet. Ibrahim (2005) showed that supplemented diets with 0.5% and 1% rocket seed or 1% bay laurel leaves for growing rabbits tended to significantly (P<0.05) increase growth performance. Basyony and Azoz (2017) conducted that rocket seed and carrot seed or bay laurel leaves in rabbit diets caused an improvement in production performance.

Table (4): Digestibility coefficients, nutritive values and nitrogen balance of the experimental diets.

| Item                      | T1       | T2       | T3       | T4       | T5       | T6       | T7       | T8       | SEM  | p value |
|---------------------------|----------|----------|----------|----------|----------|----------|----------|----------|------|---------|
| Digestibility coefficients (%) |          |          |          |          |          |          |          |          |      |         |
| DM                        | 66.74    | 64.13    | 65.72    | 65.72    | 64.03    | 64.03    | 64.05    | 66.02    | 5.27 | 0.423   |
| OM                        | 65.38    | 67.71    | 65.94    | 65.49    | 65.68    | 66.70    | 66.81    | 65.64    | 5.46 | 0.667   |
| CP                        | 76.63a   | 77.95a   | 76.35a   | 77.16a   | 77.82a   | 77.81a   | 77.23a   | 78.01a   | 2.89 | 0.05    |
| CF                        | 40.83b   | 48.11b   | 42.76b   | 48.95b   | 49.57b   | 47.96b   | 49.00b   | 48.91b   | 2.11 | 0.004   |
| EE                        | 56.03c   | 67.98c   | 64.98c   | 66.98c   | 66.58b   | 67.83c   | 67.92c   | 67.81c   | 3.76 | 0.001   |
| NFE                       | 70.84ab  | 75.97ab  | 72.27ab  | 73.85ab  | 73.96ab  | 73.94ab  | 73.19ab  | 75.20ab  | 4.89 | 0.01    |
| Nutritive value (%)       |          |          |          |          |          |          |          |          |      |         |
| TDN                       | 53.80b   | 57.04a   | 54.12b   | 55.98ab  | 55.55ab  | 56.04ab  | 57.51a   | 57.81a   | 2.01 | 0.04    |
| DCP                       | 13.18    | 13.39    | 13.11    | 13.29    | 13.32    | 13.36    | 13.25    | 13.41    | 1.19 | 0.576   |
| ME                        | 2251.5a  | 2387.1a  | 2264.9b  | 2342.8ab | 2324.8ab | 2345.3ab | 2406.8a  | 2393.8a  | 25.36| 0.05    |
| Nitrogen balance           |          |          |          |          |          |          |          |          |      |         |
| N - intake (g/d)           | 3.03     | 3.1      | 3.11     | 3.13     | 3.19     | 3.14     | 3.14     | 3.20     | 0.11 | 0.123   |
| Faecal–N (g/d)             | 0.977    | 0.991    | 0.897    | 0.988    | 0.899    | 0.901    | 0.994    | 0.898    | 0.09 | 0.461   |
| Urinary–N (g/d)            | 0.703*   | 0.641b   | 0.701*   | 0.712*   | 0.689ab  | 0.701*   | 0.711*   | 0.692ab  | 0.01 | 0.05    |
| N - absorbed (g/d)         | 2.05     | 2.11b    | 2.21ab   | 2.14b    | 2.29a    | 2.24b    | 2.15a    | 2.30a    | 0.14 | 0.05    |
| N – balance (NB; g/d)      | 1.35     | 1.47b    | 1.51ab   | 1.43b    | 1.60a    | 1.54ab   | 1.44a    | 1.61a    | 0.075| 0.05    |
| NB as % of N - intake      | 44.55b   | 47.42b   | 48.55ab  | 45.69b   | 50.16b   | 49.04ab  | 45.86b   | 50.31a   | 1.66 | 0.01    |

*ab means in the same row having different superscripts differ significantly.

T DN: Total digestible nutrients.
D CP: Digestible crude protein
ME: Metabolisable energy ME was calculated according to Forbs (1985). ME = TDN × 41.85.
T 1: Control, T 2: Control + 1.0% Rocket seed. T 3: Control + 1.0% Carrot seed. T 4: Control + 1.0% Bay laurel leaves. T 5: Control + 0.5% Rocket seed+0.5% Carrot seed. T 6: Control + 0.5% Carrot seed+0.5% Bay laurel leaves. T 7: Control + 0.5% Rocket seed+0.5% Bay laurel leaves T 8: Control + 0.33% Rocket seed+0.33% Carrot seed+0.33% Bay laurel leaves.

Blood plasma constituents:

The effect of experimental rations on some blood plasma parameters are presented in Table (5). Results indicate that no significant differences observed among the experimental treatments concerning total protein, albumin and globulin concentrations compared to the control group. Results obtained in this study are in match with findings of Melby and Altman (1974) who found that the normal range values of some blood components in rabbits such as total protein (g/dl) from 4.49 to 7.20, Albumin, (g/dl) from 3.3 to 5.1 and globulin, (g/dl) from 1.85 to 2.7 or 1.9 to 3.6. Similar results were obtained by Ibrahim (2005) who showed that rabbits fed diets contain feed additives; rocket seed, carrot seed or laurus leaf had no significant effect on blood total protein, albumin and globulin. Abdel- Azeem et al., (2012) reported that rabbits group received
diets supplemented with 7.5 or 15 g of rocket seeds (Eruca Sativa) or harmala seeds /Kg diet or mixture of two herbs in diet recorded insignificant values of plasma concentrations total protein, albumin, globulin and creatinine compared with control group. The same trend was noticed for urea, uric acid and creatinine concentrations, this result disagreed with Ibrahim (2005) who observes that rabbits fed diets contain feed additives: rocket seed, carrot seed or laurels leaf recorded significant (P<0.05) decreased in values of urea and creatinine concentrations compared to the control group. He mentioned that diet supplemented with rocket seeds reduced significantly urea and creatinine concentrations as this may be due to the effective role of rocket isothiocyanates volatile oil as diuretics. Gilani et al., (2000) reported that carrot seeds possess glycosides that acting through blockade of calcium channels and this effect may be responsible for the blood pressure lowering effects of the hypertension. In this study, rabbits fed diets contain feed additives as rocket seed and carrot seed or bay laurel leaves recorded significantly decreased (P=0.004) values of glucose concentration for all supplemented groups except for T8 compared control group. Abdel- Azeem et al., (2012) showed that the same blood parameters were not significantly affected when rabbits fed diets contained rocket seeds (Eruca Sativa) and harmala seeds or mixture of two herbs in diet by different levels (7.5 or 15 g). Khalil et al., (2015) showed that rocket seeds are rich source of vitamin A which is considered the most important vitamin in the body for normal growth, protective mucous membranes, reproduction and immune functions (Kim et al., 2004). Also, results are in agreement with Salem (2012) who concluded that RSM improved blood parameters in Nile tilapia may be due to increase of immunity and reduce the negative effect of aflatoxin B1 on fish.

**Blood plasma lipid profile and antioxidants’ activities:**

Blood plasma lipid profile and antioxidants' activities of rabbits are presented in Table (6). Total lipids, total cholesterol and triglycerides levels for rabbits groups received different feed additives (rocket seed, carrot seed or bay laurel leaves) supplementation showed significant (P=0.0001, 0.001 and 0.05) decreased compared to the control group, respectively. T8 recorded the lower values compared with the other experimental groups. LDL cholesterol (p=0.05) and VLDL cholesterol (p=0.05) had the similar trend. Kucuk et al., (2003) showed that the significant decrease in values of total lipids, cholesterol and triglycerides which may be due to the high diversity of vitamins A in the daily diets which allows a sufficient nutrient intake and an important approach for health promotion. Nicolle et al., (2003) found that carrot consumption modifies cholesterol absorption and bile acids excretion as well as increases antioxidant status and these effects could be interesting for cardiovascular protection. El-Gengaihi et al., (2004) found decreased values in total lipids, cholesterol and triglycerides of hyperlipemic rats receiving the rocket oil as compared with control, in carrot; it may be due to its ability on modifying cholesterol absorption. Similar results obtained by Ibrahim (2005) who showed that total lipids, cholesterol and triglycerides levels for rabbits groups received rocket and carrot at the levels of 0.5 and 1% and bay laurel leaves at the level of 1% were significant (P<0.05) decreased compared with control group. Khalil et al., (2015) indicated that total cholesterol was significantly decreased by increasing the levels of rocket (Eruca Sativa) seeds or leaves. In the present study, an opposite effect was noticed regarding TAC (Total antioxidant capacity) where the values were significantly (P=0.05) increased with supplementation different feed additives levels during the experimental period in comparison with the control group but the highest value concerning T8 compared with the other supplemented groups. These results confirm that the antioxidant activity of phenolic compounds in feed additives (rocket seed and carrot seed or bay laurel leaves) is mainly due to their reduction–oxidation (redox) reactions and chemical structure (Hanafi et al., 2010; Da Silva Dias 2014 and ChaHal et al., 2017). Also, Dhar, (1990) observed that carrot seeds may have benefit predominant fatty acids oleic, linoleic and palmitic in boosting immunity, similar result in human (especially among older people). De et al., (2004) reported that in laurel, it may be due to flavonoids in bay laurel leaves which are antiviral activity, or may be due to the antioxidant effect that can prevent oxidation of harmful LDL cholesterol as well as preventing the build-up of atherosclerotic plaque as reported by Hertog et al., (1993). There was no significant difference between the experimental groups for HDL value. Lipid peroxides values significantly (P=0.01) decreased for all dietary supplemented groups especially T8 which had lowered one compared to the control group. Ibrahim (2005) observed that
laurel had the essential oil eugenol that inhibits accumulation of lipid peroxidation products and maintains the activities of antioxidant enzyme. Eruca sativa leaves and seeds have a strong free radical scavenging antioxidants and protected from damage caused by oxidation through maintaining or rising the levels of antioxidant molecules and antioxidant enzymes.

**Table (5): Blood biochemical metabolites of the experimental diets.**

| Item                | Experimental diets | SEM  | P value |
|---------------------|--------------------|------|---------|
| Item                | T1 | T2 | T3 | T4 | T5 | T6 | T7 | T8 |
| Total Protein, (g/dl)   | 6.39 | 6.20 | 6.54 | 6.16 | 6.01 | 6.06 | 6.54 | 6.41 |
| Albumin, (g/dl)            | 3.67 | 3.36 | 3.81 | 3.50 | 3.26 | 3.10 | 3.85 | 3.54 |
| Globulin, (g/dl)           | 2.72 | 2.84 | 2.73 | 2.66 | 2.75 | 2.96 | 2.69 | 2.87 |
| Glucose, (mg/dl)          | 95.77 | 87.1 | 88.06 | 88.01 | 87.48 | 87.49 | 86.53 | 94.98 |
| Kidney function | Implies that the same row having different superscripts differ significantly (p<0.05). |
| Urea Nitrogen, (mg/dl)     | 62.22 | 63.94 | 64.63 | 61.01 | 62.26 | 63.67 | 62.31 | 62.98 |
| Uric acid, (mg/dl)         | 0.48 | 0.53 | 0.58 | 0.52 | 0.47 | 0.46 | 0.45 | 0.47 |
| Creatinine, (mg/dl)        | 0.61 | 0.57 | 0.62 | 0.59 | 0.59 | 0.54 | 0.53 | 0.60 |

*Carcass characteristics:*

Carcass characteristics and chemical composition of meat of rabbits as affected by dietary treatments are shown in Table (7). Dressing % for group received T8 significantly (P=0.001) increased by 19.51% followed by 9.84, 9.02, 9.01, 8.06, 5.83 and 5.43 for T3, T2, T7, T6, T4 and T5 respectively compared with control group. Ibrahim (2005) found that dressing percentage of rabbits fed different levels of rocket seeds, carrot seeds or bay laurel leaves recorded significantly (P<0.05) higher values than control one. Nicolle et al., (2003) and Ibrahim (2005) reported that, in carrot significantly increased of dressing % may due to the ability of carrot as a professional diet as modifies cholesterol absorption and bile acids excretion and increases antioxidant status. The same trends were observed for total edible parts percentage (P=0.01) and Empty carcass with head (g) (P= 0.05). For edible giblets percentage there were no significant differences among the experimental groups compared with control one. The experimental groups fed rocket seeds or carrot seeds or bay laurel leaves supplemental diets had significantly lower values of total non edible parts % compared control. Chemical composition of rabbit’s meat is shown in Table (7). The rabbits fed rocket seeds, carrot seeds or bay laurel leaves supplemental diets had no significant content of moisture, crude protein, ether extract or ash compared control group. The same results obtained by Ibrahim (2005). Abdel- Azeem et al., (2012) showed that the dressing percentage and hot carcass percentage were improved but not significantly by adding rocket seeds (Eruca Sativa) and harmala seeds or mixture of two herbs in diet by different levels (7.5 or 15 g) into rabbits diets. El-Nomeary et al., (2015) found that growth performance was improved significantly when growing rabbits fed diet supplemented with 3% rocket seeds meal for 68 days.

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*Means in the same row having different superscripts differ significantly (p<0.05).*

T 1: Control. T 2: Control + 1.0% Rocket seed. T 3: Control + 1.0% Carrot seed. T 4: Control + 1.0% Bay laurel leaves. T 5: Control + 0.5% Rocket seed+0.5% Carrot seed. T 6: Control + 0.5% Carrot seed+0.5% Bay laurel leaves. T 7: Control + 0.5% Rocket seed+0.5% Bay laurel leaves T 8: Control + 0.33% Rocket seed+0.33% Carrot seed+0.33% Bay laurel leaves.
Table (6): Blood lipid profile and antioxidants activities in rabbits fed different feed additives.

| Item | T1 | T2 | T3 | T4 | T5 | T6 | T7 | T8 | SEM | P-value |
|------|----|----|----|----|----|----|----|----|-----|---------|
| Lipid profile | | | | | | | | | | |
| Total lipids, (mg/dl) | 399.25<sup>a</sup> | 388.75<sup>b</sup> | 374.75<sup>b</sup> | 345.50<sup>b</sup> | 335.00<sup>c</sup> | 334.00<sup>c</sup> | 340.00<sup>c</sup> | 329.39<sup>c</sup> | 10.72 | 0.0001 |
| Triglycerides, (mg/dl) | 57.26<sup>a</sup> | 40.19<sup>b</sup> | 44.08<sup>b</sup> | 39.30<sup>b</sup> | 40.01<sup>b</sup> | 39.18<sup>b</sup> | 37.61<sup>b</sup> | 35.03<sup>b</sup> | 2.40 | 0.05 |
| Total Cholesterol, (mg/dl) | 85.33<sup>a</sup> | 76.40<sup>b</sup> | 77.01<sup>b</sup> | 77.40<sup>b</sup> | 77.11<sup>b</sup> | 78.14<sup>b</sup> | 76.45<sup>b</sup> | 75.11<sup>b</sup> | 4.22 | 0.001 |
| HDL, (mg/dl) | 45.87 | 46.41 | 45.68 | 47.41 | 46.58 | 47.62 | 44.32 | 45.6 | 0.09 | 0.461 |
| LDL, (mg/dl) | 36.21<sup>a</sup> | 22.95<sup>b</sup> | 17.51<sup>b</sup> | 20.13<sup>b</sup> | 19.14<sup>b</sup> | 15.26<sup>b</sup> | 16.12<sup>c</sup> | 13.62<sup>c</sup> | 0.34 | 0.05 |
| VLDL, (mg/dl) | 11.45<sup>a</sup> | 8.04<sup>b</sup> | 8.82<sup>b</sup> | 7.86<sup>b</sup> | 8.00<sup>b</sup> | 7.84<sup>b</sup> | 7.52<sup>b</sup> | 7.01<sup>b</sup> | 0.14 | 0.05 |
| TAC, (mmol/l) | 1.13<sup>c</sup> | 1.740<sup>c</sup> | 1.583<sup>c</sup> | 1.557<sup>c</sup> | 1.730<sup>c</sup> | 1.701<sup>c</sup> | 1.705<sup>c</sup> | 1.801<sup>c</sup> | 0.075 | 0.05 |
| Lipid peroxides, (mmol/ml) | 2.356<sup>a</sup> | 1.886<sup>b</sup> | 1.786<sup>b</sup> | 1.451<sup>c</sup> | 1.429<sup>c</sup> | 1.446<sup>c</sup> | 1.455<sup>c</sup> | 1.397<sup>c</sup> | 0.36 | 0.01 |

<sup>a</sup> means in the same row having different superscripts differ significantly. 

Table (7): Carcass characteristics and chemical composition of meat rabbits.

| Item | T1 | T2 | T3 | T4 | T5 | T6 | T7 | T8 | SEM | P-value |
|------|----|----|----|----|----|----|----|----|-----|---------|
| Pre-slaughter weight (g) | 1590 | 1585 | 1575 | 1610 | 1600 | 1595 | 1580 | 1600 | 33.6 | 0.697 |
| Empty carcass weight with head (g) | 919.3<sup>c</sup> | 999.11<sup>b</sup> | 1000.3<sup>b</sup> | 985.1<sup>b</sup> | 975.3<sup>b</sup> | 996.5<sup>b</sup> | 995.8<sup>b</sup> | 1105<sup>b</sup> | 25.7 | 0.05 |
| Dressing% | 57.82<sup>a</sup> | 63.04<sup>b</sup> | 63.51<sup>b</sup> | 61.19<sup>b</sup> | 60.96<sup>b</sup> | 62.48<sup>b</sup> | 63.03<sup>b</sup> | 69.10<sup>a</sup> | 13.9 | 0.001 |
| Edible Giblets % | 3.24 | 3.20 | 3.61 | 3.25 | 3.57 | 3.20 | 3.24 | 3.22 | 1.96 | 0.379 |
| Total edible parts % | 61.06<sup>b</sup> | 66.24<sup>b</sup> | 67.12<sup>b</sup> | 64.44<sup>b</sup> | 64.53<sup>b</sup> | 65.68<sup>b</sup> | 66.27<sup>b</sup> | 72.32<sup>a</sup> | 3.67 | 0.01 |
| Non edible parts % | 38.94<sup>c</sup> | 33.76<sup>b</sup> | 32.88<sup>b</sup> | 35.56<sup>b</sup> | 35.47<sup>b</sup> | 34.32<sup>b</sup> | 33.73<sup>b</sup> | 27.68<sup>c</sup> | 1.19 | 0.05 |
| Chemical composition (%) | | | | | | | | | | |
| Moisture | 74.95 | 75.01 | 74.69 | 74.98 | 75.20 | 74.31 | 74.024 | 75.01 | 1.88 | 0.0879 |
| Crude protein | 23.56 | 23.01 | 23.14 | 22.97 | 22.70 | 23.50 | 23.47 | 23.70 | 1.81 | 0.106 |
| Ether extract | 3.94 | 3.80 | 3.56 | 3.50 | 3.41 | 3.87 | 3.26 | 3.47 | 2.79 | 0.289 |
| Ash | 1.59 | 1.68 | 1.78 | 1.60 | 1.89 | 1.90 | 1.68 | 1.61 | 0.91 | 0.316 |

<sup>a</sup> means in the same row having different superscripts differ significantly.

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Caecum characteristics:

Results of Caecum activity including the Caecum weight, Caecum length, pH values, ammonia nitrogen (NH3-N) and total volatile fatty acids (VFA’S) concentration of caecal contents are presented in Table (8). The experimental groups recorded significantly (P=0.004) higher values of Caecum length.
compared with control groups. No significant differences were observed in Caecum weight, caecal pH values among the feeding groups. Results were agreement with those of Youssif et al. (1998), Allam et al., (1999) and Ali et al., (2005) who reported that value of rumen liquor was not significantly affected by medicinal plants supplementation. On the contrarily, NH3-N concentration was significantly decreased (p<0.01) while VFA’s concentrations showed significantly increased (p<0.05) with all experimental groups compared to control. These results were in accordance with those reported by Allam et al., (1999) with goats, Mohamed. and. Ibrahim (2003) with sheep, Maged (2004) and Ali et al., (2005) who revealed that VFA’s concentrations was significantly increased while NH3-N concentration reduced in rumen fluid of sheep fed diets supplemented with medical plants as chamomile compared with control group. Lower NH3-N concentrations might be attributed to the action of medicinal herbs (Chamomile, Nigella sativa and Fenugreek) as buffers or regulators in absorbing and releasing NH3-N in the rumen (Zeid, 1998) and Ali et al., (2005). These advantages may give a favorable condition in the caecum for useful microorganisms’ activity for best utilization of caecal ammonia to be converted into microbial protein for rabbits in the tested diets. Also, improvement of VFA’s obtained in supplemental groups might indicated action in a stimulating caecum micro-flora activity which agrees with Ali et al., (2005), who found that VFA’s concentration increased (P<0.05) in sheep fed diets supplemented with medical plants as chamomile compared with control group.

Table (8): Cecal morphological, ammonia and volatile fatty acids activity.

| Item                | Treatment                                | SEM | P-value |
|---------------------|------------------------------------------|-----|---------|
| Caecum weight, g    | T1: Control, T2: Control + 1.0% Rocket seed, T3: Control + 1.0% Carrot seed, T4: Control + 1.0% Bay laurel leaves, T5: Control + 0.5% Rocket seed + 0.5% Carrot seed, T6: Control + 0.5% Rocket seed + 0.5% Bay laurel leaves, T7: Control + 0.33% Rocket seed + 0.33% Bay laurel leaves, T8: Control + 0.33% Rocket seed + 0.33% Carrot seed + 0.33% Bay laurel leaves |     |         |
| Caecum length, cm   | 158.27, 160.73, 161.43, 164.20, 163.80, 164.89, 163.12, 164.32 | 33.35 | 0.847   |
| Caecum pH           | 12.38, 13.22, 13.46, 13.16, 13.27, 13.18, 13.20, 13.60 | 1.16 | 0.004   |
| NH3-N (mg/l00 dl)   | 6.14, 6.11, 6.17, 6.13, 6.15, 6.22, 6.31, 6.15 | 1.33 | 0.372   |
| TVFA ml eq/100ml    | 33.91, 30.12, 30.21, 31.01, 29.78, 29.77, 30.14, 30.44 | 2.35 | 0.01    |
| T1: Control, T2: Control + 1.0% Rocket seed, T3: Control + 1.0% Carrot seed, T4: Control + 1.0% Bay laurel leaves, T5: Control + 0.5% Rocket seed + 0.5% Carrot seed, T6: Control + 0.5% Rocket seed + 0.5% Bay laurel leaves, T7: Control + 0.33% Rocket seed + 0.33% Bay laurel leaves, T8: Control + 0.33% Rocket seed + 0.33% Carrot seed + 0.33% Bay laurel leaves | 5.18, 6.10, 6.09, 6.15, 6.11, 6.12, 6.08, 6.17 | 0.91 | 0.05 |

Economic efficiency:

Data presented in Table (9) showed that the experimental groups recorded lower feed cost/rabbit values than control group. They were decreased by (3.8, 2.7, 4.9, 3.0, 4.7, 6.8 and 4.9%) for T2, T3, T4, T5, T6, T7 and T8 respectively, compared by T1. The experimental groups had higher values of economic efficiency and relative economic efficiency compared control one, Leung and Foster, (1996) found that, in broiler chicks the rocket cakes is cheap untraditional source of protein. It could be noticed that, T8 (0.33% rocket seed+0.33% carrot seed+0.33% bay laurel leaves) tended to higher economic efficiency and relative economic efficiency with rate of 1.129 and 138% respectively, followed by T7 (0.5% rocket seed+0.50% bay laurel leaves) and T6 (0.5% carrot seed+0.5% bay laurel leaves) 1.098 and 1.089 for economic efficiency and 135% and 133% for relative economic efficiency respectively. Generally, It can be noticed that, the findings of this study demonstrated that dietary supplementation of feed additives such as rocket (Eruca Sativa) seeds, carrot (Daucus Carota L) seeds or bay laurel leaves (Laurus Nobilis L.) at different levels had the best economic return over the control group. This improvement based on the higher body weight and better feed conversion ratio. The result of performance index (PI) indicated that the experimental
groups received diets containing feed additives such as rocket (Eruca Sativa) seeds, carrot (Daucus Carota L) seeds or bay laurel leaves (Laurus Nobilis L.) at different levels gave better values especially for T8 which had the highest one. Ibrahim (2005), found that the growing rabbits received either rocket or bay laurel leaves at the level of 0.5 and 1 %, achieved good economical efficiency compared to the control group and El-Nomeary et al (2016) found that growth performance was improved significantly when rabbits fed on diet supplemented with black cumin (Nigella sativa), mustard (Sinapis alba), sesame (Sesamum indicum) and rocket (Eruca sativa) seeds meals as feed additives for 68 days.

Table (9): Economic efficiency of growing rabbits fed the experimental rations.

| Item                              | T1  | T2  | T3  | T4  | T5  | T6  | T7  | T8  |
|-----------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|
| Total average weight gain (g)     | 1001| 1040| 1086| 1067| 1072| 1097| 1078| 1116|
| Price of 1kg body weight          | 35  | 35  | 35  | 35  | 35  | 35  | 35  | 35  |
| Selling price/rabbit (LE) (A)     | 35.04| 36.40| 38.01| 37.35| 37.52| 38.40| 37.73| 39.06|
| Total feed intake (g)             | 4019| 3834| 3870| 3803| 3858| 3805| 3722| 3783|
| Price/kg feed (LE)                | 4.80| 4.84| 4.85| 4.82| 4.85| 4.83| 4.83| 4.85|
| Total feed cost/rabbit (LE) (B)   | 19.29| 18.56| 18.77| 18.33| 18.71| 18.38| 17.98| 18.35|
| Net revenue (LE).1                | 15.75| 17.84| 19.24| 19.02| 18.81| 20.02| 19.75| 20.71|
| Economic efficiency.2             | 0.816| 0.961| 1.025| 1.038| 1.005| 1.089| 1.098| 1.129|
| Relative Economic efficiency.3    | 100 | 118 | 126 | 127 | 123 | 133 | 135 | 138 |
| Performance index.4               | 38.38| 42.20| 44.75| 44.29| 43.83| 46.02| 46.15| 47.85|

(1) Net revenue = A – B
(2) Economic efficiency = (A-B/B).
(3) Relative Economic Efficiency= Economic efficiency of treatments other than the control/ Economic efficiency of the control group
(4) Growth performance index (P1) = Live body weight (kg)/feed conversion *100.

T 1: Control. T 2: Control + 1.0% Rocket seed. T 3: Control + 1.0% Carrot seed. T 4: Control + 1.0% Bay laurel leaves. T 5: Control + 0.5% Rocket seed+0.5% Carrot seed. T 6: Control + 0.5% Carrot seed+0.5% Bay laurel leaves. T 7: Control + 0.5% Rocket seed+0.50% Bay laurel leaves T 8: Control + 0.33% Rocket seed+0.33% Carrot seed+0.33% Bay laurel leaves.

CONCLUSION

Generally, it can be noticed that, the findings of this study demonstrated that using dietary supplementation with some of feed additives such as rocket seeds, carrot seeds or bay laurel leaves individually or in combinations as natural growth promoters improved productive performance of growing rabbits. These improvements based on the higher body weight and better feed conversion ratio, performance index, digestion coefficient, biochemical blood parameters and the economic efficiency. Supplementation of feed additives rocket (Eruca Sativa) seeds and carrot (Daucus Carota L) seeds or bay laurel leaves (Laurus Nobilis L.) at different levels had the best economic return over the control group, Moreover, feed additives have a high antioxidant capacity or are good antioxidant properties.

In the present study, the best results were obtained with supplementing 0.33% rocket seed+0.33% carrot seed+0.33% bay laurel leaves in diet of growing rabbits.
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تأثير استدامة بعض الإضافات الغذائية الطبيعية كمنشطات نمو على الأداء الإنتاجي للأرانب النامية

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جديرًا بالذكر، في دراسة عبده المغنية(2008)، تأثر استدامة بعض الإضافات الغذائية مثل كلا من بذور الزيتون بذور الجرذان، بذور الجثرة و بذور اللوز في مجموعة من المكونات المغذية مثل أكرام بنكع، مركب إفراز النبات. الاعتماد على عصير بذور الزيتون كجزء من الإضافات الغذائية يمكن أن يؤدي إلى تحسين الأداء الإنتاجي للأرانب.

سموح بتحديث المحتوى، كما هو الحال في الأدب الإنتاجي النباتي، على أن تكون الإضافات النباتية متاحة فوراً.

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