

EFFECT OF *NIGELLA SATIVA* AND *THYMUS VULGARIS* ON DIGESTIBILITY, NITROGEN BALANCE AND PERFORMANCE OF NEW ZEALAND WHITE RABBITS

B.M. Ahmed, S. S. Omar, Elham M. Ghoneim and A. S. Khalifa

Department OF Animal Production, Fac. of Agric., Minufiya University

(Received: May. 31, 2009)

ABSTRACT: A study was carried out on forty growing NZW rabbits to test the effect of *Nigella sativa* and/or *Thymus vulgaris* as feed additives. Rabbits were fed on a control diet (C) and 3 experimental diets containing the medical herbs *Nigella sativa* seeds (NS) or *Thymus vulgaris* herb (TV) or mixture of both (MIX) for the experimental period of 10 weeks. Parameters studied included digestibility, N balance, growth performance.

The results obtained showed that supplementing the basal diet with herbs did not affect the digestion coefficients. The diet containing the mixture of NS and Tv were higher in their DCP. The MIX group recorded the best value TDN. Rabbits received the MIX ration retained more nitrogen (1.37g/d) than the other three groups. Rabbits in all the experimental groups grew at almost the same rate. The highest performance index was recorded with group fed diet MIX.

Key words: *Nigella sativa* seeds, *Thymus vulgaris* herb, rabbits, digestibility, performance.

INTRODUCTION

Using chemical products especially hormones and antibiotics as feed additives may cause unfavorable side-effects. There are evidence indicating that those products could be considered as pollution for human and threaten their health on the long-run. Yet, feed additives are important materials that can improve feed efficiency and animal performance (Salem and El-Mahdy, 2001). Magi and Sahk (2003) and Musa (2008) indicated that the medicinal plant is a growing area of alternative medicine nowadays. It is believed that plants are more natural, less toxic, and safer than chemical preparations. The use of natural products is becoming more popular, since drugs of synthetic origin may have a negative impact on the environment and parasite resistance to poisonous chemicals can develop after repeated applications. Using medicinal herbs and plants have been known since the old civilizations (Allam et al., 1999). Old drugs industry depended upon the raw material of medicinal herbs and plants and their extracts, which proved safe always. Attempts to use natural materials such as medicinal plants could be widely accepted as feed additives. However, little information is available about using medicinal plant by-products in rabbit diets. Recently, Musa (2008) reported the possibility of using medicinal plants by-products in rabbit

feeding. The natural materials as alternative growth promoters such as medicinal plants are widely accepted (Aboul-Fotouh *et al.*, 1999; Abou-sekkin *et al.*, 2008; Musa 2008). These medical plants have some properties as antiseptic, antibacterial activities against harmful microorganisms, treatment of gastro-intestinal complaints and tonic (Hmamochi *et al.*, 1992; El-Amary, 1993 and Tozyo *et al.*, 1994). Also, some studies indicated that such plants have favorable effects on live weight gain and feed efficiency with broiler chicken (Fritz *et al.*, 1992 and Fritz *et al.*, 1993) and with cows (Singh and Tapparia, 1992).

Therefore, the present study was carried out in order to investigate the effectiveness of *Nigella sativa* and *Thymus vulgaris* meals in growing rabbit diets on nutrients digestibility, feeding values, nitrogen balance, productive performance, carcass traits.

MATERIALS AND METHODS

Forty weaning growing NZW rabbits of both sexes at 4 weeks of age \pm 2 days (with an average weight about 476.2 ± 28.4 g) were kept under the same managerial and hygienic conditions. Rabbits were individually weighed and randomly distributed into four groups of ten rabbits in two replicates; under each group 5 males and 5 females. The rabbits were housed and fed for 10 weeks (2 weeks as a preliminary period and 8 weeks as the experimental period) in galvanized wire cages (50 x 60 cm) provided with feeds and automatic nipple drinkers. Feed and water were offered *ad libitum*. Four experimental diets were formulated according to National Research Council (NRC, 1977) to cover the nutrient requirements of growing rabbits. The first group was fed the control diet (c) (basal diet contained yellow corn, 10; wheat bran, 25; barley grain, 14.6; soybean meal, 15.5; berseem hay, 30; molasses, 3; salt, 0.4; permix, 0.5 and limestone, 1%); the other three rations were the control diet supplemented with different sources of medical herbs; 2kg *Nigella sativa* seeds/ton, NS; 2Kg *Thymus vulgaris* herb/ton, TV; or a mixture of 1Kg *Nigella sativa*+1Kg of *Thymus vulgaris*/ton. MIX. diets were manufactured in pellets shape 4mm diameter at El- Safwa Factory – Meet Ghamr, Dakahleia.

The experimental diets and fresh water were available all the time during the preliminary- (2 weeks) and the experimental-period (8 weeks). Rabbits were individually weighed at weekly intervals. The traits under study included live body weight, daily weight gain, feed intake, feed conversion (g feed/g gain) and mortality rate.

The digestibility trial of the present study took place at the end of the experiment (at 10 weeks). three male animals from each experimental treatment were chosen randomly and housed individually in metabolic cages and were given *ad libitum* the experimental diet for 2 weeks as an adaptation period. after which the total fecal excretions were collected daily in plastic

Effect of *nigella sativa* and *thymus vulgaris* on digestibility,.....

bags for 7 days and stored at -10°C. For nitrogen balance, urinary excretions during the same collection period were also collected daily in plastic bottles containing 0.1N H₂SO₄ and kept frozen up to the chemical analyses. Feed intakes were determined daily by subtracting the residual feeds from the daily allowance.

Growth performance index (PI) was calculated according to the equation described by North (1981) as the percentage of final body weight of feed conversion.

Samples of the ingredients, experimental diets and remainder feed (if any) were ground and subjected in duplicate to proximate analysis. Meet Samples and Samples of daily output of feces were taken after drying at 60 °C for 24 hr and then they were also ground. Dry matter (DM), crude protein (CP), ether extracts (EE), crude fiber (CF) and ash of the feedstuffs and feces samples were determined according to A.O.A.C. (1990). The nitrogen free extract (NFE) was calculated by difference.

Data were statistically analyzed according to SPSS (1997). The statistical model used was the one way analysis of variance as follows:

$$Y_{ij} = \mu + A_i + e_{ij}$$

Where: Y_{ij} = the observation on the ij^{th} rabbit. μ = Overall mean, A_i = the effect of the i^{th} diet ($i = 1, 2, \dots, 4$), e_{ij} = experimental random error.

The significant differences between means were tested using Duncan's multiple range test (Duncan, 1955).

RESULTS AND DISCUSSION

The chemical composition of the raw medical herbs under study (*Nigella sativa* seed and *Thymus vulgaris* herb) is presented in Table (1). Values obtained here are within those reported in the literature (Nasr *et al.*, 1996; Sharobeem, 1996; Zeweil, 1996; Gabr *et al.*, 1998; Youssef *et al.*, 1998; El-Ayek *et al.*, 1999 and 2000; Abaza, 2001; Daadar *et al.*, 2002). Data in Table (1) also present the proximate analysis of the experimental diets. All diets contained almost similar contents of CP, NFE, CF and ash; that was mainly due to the same ingredients used in the formulation of the experimental diet. The low level of supplementation of the medical herbs did not affect the proximate analysis. However, contents of EE were a little higher in the treated diets due to the content of the supplements of the oils.

Table 1: Chemical composition of the experimental rations

| Item | Raw materials | | | Dietary treatments* | | |
|-------------------------|---------------|-------|-------|---------------------|-------|-------|
| | NS | Tv | C | NS | TH | MIX |
| DM. % | 93.00 | 89.1 | 89.75 | 89.32 | 89.17 | 88.3 |
| ----- on DM basis ----- | | | | | | |
| OM. % | 91.40 | 84.69 | 91.57 | 91.68 | 91.29 | 91.90 |
| CP. % | 27.31 | 14.21 | 13.77 | 14.33 | 13.98 | 14.75 |
| EE. % | 7.11 | 4.10 | 3.44 | 3.99 | 3.95 | 4.22 |
| NFE. % | 47.97 | 49.18 | 54.66 | 52.31 | 52.86 | 52.24 |
| CF. % | 11.10 | 17.2 | 11.25 | 12.74 | 11.78 | 12.61 |
| Ash. % | 6.51 | 15.31 | 8.43 | 8.32 | 8.71 | 8.10 |
| DE** Mcal/kg DM | 2.59 | 2.39 | 2.63 | 2.91 | 2.61 | 2.59 |

*Raw materials are *Nigella sativa*, NS; *Thymus vulgaris*, Tv; dietary treatments are control, C; *Nigella sativa* supplemented ration, NS; *Thymus vulgaris* supplemented ration, Tv; ration supplemented with a mixture of both herbs, MIX.

** Digestible energy, DE (Mcal/kg) = 4.36 - 0.049 x NDF, NDF% = 28.924 + 0.657 x CF% according to Cheeke (1987).

It could be observed Table (2) that supplementing the basal diet with either herb (*Nigella sativa* and *Thymus vulgaris*) either alone or as a mixture did not affect the digestion coefficients of almost all nutrients. Nasr *et al.* (1996) and Taha (1997) working with rabbits, Zeweil (1996) working with Japanese quail and El-Ayek *et al.* (1998) working with sheep reported that supplementing diets with NS improved the digestibility of OM, CF and NFE. In general the improvement in digestibility could be attributed to the improvements in digestive tract environment due to herbal content of biological constituents such as antioxidants (Bennett, 1992 and Aii *et al.*, 2007). Oil of thyme has phenolic components which are primarily responsible for its anti-oxidative activity (Farag *et al.*, 1994).

The nutritive values of the experimental diets are presented in Table (2) The results indicated that the diet containing the mixture of NS and Tv were significantly ($P < 0.05$) higher in their digestible crude protein (DCP) being 12.34% than control diet (10.48%). The other two groups were intermediates being 11.37 and 11.42 for NS and Tv, respectively. The MIX group recorded the best value ($P < 0.05$) of total digestible nutrients (TDN, 68.42%); the other groups had TDN values of 62.57, 66.84 and 66.61 for C, NS and Tv groups, respectively. The digestible energy values were 2772, 2961, 2951 and 3031 kcal/kg for groups C, NS, Tv and MIX, respectively. The higher feeding values were mainly due to the higher digestibility rather than the chemical

Effect of *nigella sativa* and *thymus vulgaris* on digestibility,.....

composition which was almost equal in all rations. These results indicated that, using medical herbs, especially in a mixture form in growing rabbit diets causes improvement in the digestion coefficients and feeding values more than using each alone. Similar trend was reported by Abousekken *et al.* (2007) using a dietary mixture of *fennel* and *marjoram* hay in growing rabbit diet. Also Musa (2008) using a mixture of parsley and basil came to a similar conclusion. These significant improvements in the digestion coefficients and nutritive values may be due to the effect of some flavonoids and essential oils which had beneficial effect for stimulation and activity of cecum fermentation (Ibrahim, 2005).

Table 2: Digestibility and nutritive values% of the experimental rations as affected by the tested medical herbs supplementation (Means \pm SE)

| Item** | Dietary treatments* | | | | Sig |
|--------|---------------------|---------------------|--------------------|---------------------|------|
| | C | NS | Tv | MIX | |
| OM | 68.67 ^a | 72.90 ^b | 73.65 ^b | 76.55 ^c | 0.05 |
| | \pm 1.74 | \pm 1.41 | \pm 1.47 | \pm 1.56 | |
| CP | 76.09 | 79.32 ^{bc} | 81.72 ^b | 83.65 ^{ab} | 0.05 |
| | \pm 1.82 | \pm 1.06 | \pm 1.81 | \pm 1.09 | |
| CF | 52.75 | 53.47 | 52.39 | 53.19 | NS |
| | \pm 3.44 | \pm 2.98 | \pm 2.21 | \pm 2.42 | |
| EE | 72.59 ^a | 78.52 ^b | 78.85 ^b | 81.82 ^c | 0.05 |
| | \pm 2.18 | \pm 2.96 | \pm 2.66 | \pm 2.07 | |
| NFE | 74.17 ^a | 79.54 ^b | 78.53 ^b | 79.65 ^b | 0.05 |
| | \pm 2.40 | \pm 1.86 | \pm 2.31 | \pm 2.67 | |
| DCP | 10.48 ^b | 11.37 ^b | 11.42 ^b | 12.34 ^c | 0.05 |
| | \pm 0.43 | \pm 0.48 | \pm 0.51 | \pm 0.21 | |
| TDN | 62.57 ^a | 66.84 ^b | 66.51 ^b | 69.42 ^c | 0.05 |
| | \pm 2.52 | \pm 2.64 | \pm 2.32 | \pm 2.85 | |
| DE | 2772 ^a | 2961 ^b | 2951 ^b | 3031 ^c | 0.05 |
| | \pm 97 | \pm 115 | \pm 119 | \pm 108 | |

*Dietary treatments are control, C, *Nigella sativa* supplemented ration, NS, *Thymus vulgaris* supplemented ration, Tv ration supplemented with a mixture of both herbs, MIX.

**OM, organic matter; CP, crude protein; CF, crude fiber; EE, ether extract; NFE, nitrogen-free extract

***DCP, digestible crude protein %; TDN, total digestible nutrients %, DE (kcal/kg DM) = TDN x 44.3

****Means in the same row with different superscripts differ significantly

Table (3) presents the nitrogen balance data. Nitrogen intake was 2.64, 2.79, 2.95 and 3.02 g, for groups fed C, NS, Tv and MIX diets, respectively. It was higher for diets MIX and Tv than diets C and NS.

The treated rations excreted significantly ($P < 0.05$) less N in feces (0.59, 0.54 and 0.49 g/d, for groups NS, Tv and MIX, respectively) than the control ration (0.63 g/d). The higher N intake with the lower FN led to a better N digestibility. The N excreted in urine followed the opposite pattern being higher for groups Tv (1.18g/d) and MIX (1.16g/d) than C (0.92g/d) and NS (1.03g/d). Rabbits received the MIX ration retained more nitrogen (1.37g/d) than the other three groups which retained almost equal amounts of N being 1.09, 1.17 and 1.23g/d for C, NS and Tv fed groups, respectively.

El-Manyawi (2005) illustrated that the nitrogen balance for rabbits fed on diets containing *Geranium* by-product at 6 or 9% increased significantly ($P < 0.05$) compared with the control group. Abousekken *et al.* (2007) using a dietary mixture of *fennel* and *marjoram* hay in growing rabbit diet and Musa (2008) using a mixture of parsley and basil came to a similar conclusion.

Table 3: Nitrogen balance as affected by the dietary medical herbs supplementation (Means \pm SE)

| Item** | Dietary treatments* | | | | Sig. |
|---------|---------------------|--------------------|--------------------|--------------------|------|
| | C | NS | Tv | MIX | |
| NI(g/d) | 2.64 ^a | 2.79 ^a | 2.95 ^b | 3.02 ^b | 0.05 |
| | \pm 0.15 | \pm 0.13 | \pm 0.24 | \pm 0.17 | |
| FN(g/d) | 0.63 ^a | 0.59 ^{ab} | 0.54 ^b | 0.49 ^b | 0.05 |
| | \pm 0.02 | \pm 0.03 | \pm 0.04 | \pm 0.04 | |
| UN(g/d) | 0.92 ^a | 1.03 ^a | 1.18 ^b | 1.16 ^b | 0.05 |
| | \pm 0.12 | \pm 0.10 | \pm 0.11 | \pm 0.13 | |
| NB(g/d) | 1.09 ^a | 1.17 ^a | 1.23 ^a | 1.37 ^b | 0.05 |
| | \pm 0.38 | \pm 0.10 | \pm 0.24 | \pm 0.21 | |
| BV% | 41.29 ^a | 41.94 ^a | 41.69 ^a | 45.36 ^b | 0.05 |
| | \pm 7.06 | \pm 4.98 | \pm 5.53 | \pm 3.34 | |

* Dietary treatments are control, C; *Nigella sativa* supplemented ration. NS; *Thymus vulgaris* supplemented ration, Tv; ration supplemented with a mixture of both herbs, MIX.

** NI, nitrogen intake; FN, fecal nitrogen; UN, urinary nitrogen; NB, nitrogen balance; BV, biological value.

^{a, b}, Means in the same row with different superscripts differ significantly.

Effect of nigella sativa and thymus vulgaris on digestibility,.....

The biological value of the dietary protein (BV) was calculated (NB/NI %) and presented in Table(3). It was significantly ($P<0.05$) higher (45.36%) for group of rabbits received MIX ration than the other three groups which was almost equal being 41.29, 41.94 and 41.69% for groups received C, NS and Tv. respectively; differences were significant ($P<0.05$). Musa (2008) reported that rabbits fed dietary mixture of parsley and basil recorded significantly ($P<0.05$) the best values of nitrogen balance as % of N intake compared to the other experimental diets or the control group. These results indicated that, using mixtures of such medicinal plants in growing rabbit diets causes improvement in digestion coefficients and feeding values more than using each alone.

Animal performance:

Results in Table (4) present the overall rabbit performance as affected by the dietary treatments. The initial body weight was almost equal in all groups (avg. 472g) in both sexes. Sex had no effect on the change in body weight at any interval of the experimental period. Data of change in body weight illustrated that rabbits fed the MIX diet recorded markedly heavier BW (2236g) than the other groups. Average daily gain (ADG) as affected by the dietary medical herbs is presented in Table (4) All animals in all the experimental groups grew at almost the same rate. During the experimental intervals, rabbits on the MIX ration revealed markedly but non-significantly better rate of growth. Values of ADG during the whole period of the experiment were 29.85, 29.62, 29.01 and 30.45g for both sexes of rabbits on diet C, NS, Tv and MIX, respectively.

It is worthy to note that rabbits receiving the MIX ration had better digestion coefficients, retained more N, and higher protein BV which should lead to a faster growth rate; differences in ADG, however, failed to reach a significant level. Data in Table (4) present the total feed intake of growing NZW rabbits as affected by dietary treatments. Total feed intake during the whole experimental period was similar with all the experimental groups. The average daily feed intake during the whole experimental period was 106.0, 106.8, 103.4 and 103.7g for the experimental groups of C, NS, Tv and MIX, respectively. Total feed intake during the whole experimental period ranged between 5.79 and 5.98 kg.

Feed conversion (kg feed/kg gain;) during the period of the study was not affected by the dietary treatments under which the experimental animals were kept. This was due to the equality of feed intake with the equality of ADG. The ratio of feed/gain was 3.55, 3.60, 3.54 and 3.42 kg feed/kg gain for the groups C, NS, TH and MIX, respectively.

Table 4: Overall growth performance of NZW rabbits as affected by dietary medical herbs (Means \pm SE)

| Item | The dietary treatments* | | | | Sig. |
|---------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|------|
| | C | NS | Tv | MIX | |
| Initial weight (g) | 474 \pm 32 | 479 \pm 26 | 461 \pm 34 | 477 \pm 29 | NS |
| Final weight (g) | 2147 \pm 110 | 2138 \pm 99 | 2100 \pm 121 | 2176 \pm 89 | NS |
| Total BWG (g) | 1673 \pm 97 | 1659 \pm 99 | 1639 \pm 94 | 1699 \pm 95 | NS |
| Total FI (kg) | 5.94 | 5.98 | 5.79 | 5.81 | ND |
| Avg. FC (kg feed/kg gain) | 3.55 | 3.60 | 3.54 | 3.42 | ND |
| PI (%) | 60.48 ^d \pm 3.19 | 59.39 ^a \pm 2.75 | 59.32 ^a \pm 3.41 | 63.63 ^b \pm 2.61 | 0.05 |

*Dietary treatments are control, C; *Nigella sativa* supplemented ration, NS; *Thymus vulgaris* supplemented ration, Tv; ration supplemented with a mixture of both herbs, MIX

^{a, b} Means in the same row with different superscripts differ significantly.

NS: not significant.

ND, not determined

PI, performance index: percentage of final BW relative to feed conversion (North, 1981)

No consistent effect of the medical herbs on animal performance was found in the literature. Amber *et al.* (2001) reported that *Nigella sativa* cake (NSC) reduced significantly the rabbit performance. Final live weight, daily live weight gain, feed intake and feed conversion ratio were significantly reduced by 13.2, 18.3 and 5.19% respectively, as the level of *Nigella sativa* cake increased from 0 to 25% in the diets. While, El-Wafa *et al.* (2002) showed that body weight, daily live weight gain and feed conversion were improved significantly by the addition of black seed *Nigella sativa* (BS). Radwan (2002) studied the effects of replacing soybean meal by *Nigella* seed meal for growing rabbits on growth performance and reported that the addition of NSM did not have beneficial effects on growth performance of growing rabbits. The use of *Thymus vulgaris* as feed additive increase significantly

Effect of *nigella sativa* and *thymus vulgaris* on digestibility,.....

($P < 0.01$) the feed intake, live weight, live weight gain in New Zealand White rabbits (Ibrahim *et al.*, 2000). In this connection, El-Manylawi *et al.* (2005) reported that the final body weight and weight gain of growing rabbits fed diets containing 3, 6 or 9% of *Geranium* by-products were significantly ($P < 0.05$) higher than the control group. Earlier study on growing pigs (Teodorovic *et al.*, 1990) showed higher daily weight gain when thyme was added to pigs diets at 1-2 kg/ton diets than the control. Musa (2008) reported that rabbits on a mixture of parsley and basil revealed significantly ($P < 0.05$) the heaviest body weight. He also reported that feed intake was almost equal with the control. Rawiha (1994) stated that using mixtures of medicinal herbs was preferable than using each alone.

The results of performance index (Table 4) indicated that the highest PI value was significantly ($P < 0.05$) recorded with group fed diet MIX (63.63%); the other three groups had similar PI being 60.48, 59.39 and 59.32% for C, NS and Tv groups, respectively. It is obvious from the data presented herein that the best performance could be reached using a mixture of medical herbs rather than using each one alone (Rawiha, 1994). Abousekken *et al.* (2007) reported that growing rabbits fed mixture of medicinal plants recorded significantly ($P < 0.05$) better PI value than each alone. Musa (2008) came to the same conclusion. On the other hand, Radwan (2002) reported that replacing soybean meal by *Nigella* seed meal for growing rabbits resulted in significantly ($P < 0.05$) decreased in performance index.

CONCLUSION

Conclusively, from the results obtained in this study, it could be stated that *Nigella sativa* seeds and *Thymus vulgaris* herb as medical herbs either alone or as a mixture are good supplements for growing rabbits without any adverse effect on nutrient digestibility, feeding value or growth performance and blood constituents of rabbits. It is worthy to note that it is better to use the mixture of both herbs rather than using each one alone in order to obtain the best productive performance of growing NZW rabbits.

REFERENCES

- A.O.A.C. (1990). Official methods of analysis (15th Ed). Association of Official Analytical Chemists. Washington, D.C., U.S.A.
- Abaza, I.M.K. (2001). The use of some medicinal plant as feed additive in broiler diets. Ph.D thesis, Faculty of Agriculture, Alexandria.
- Aboul-Fotouh, G. E., S. M. Allam, E. Shehata and S. N. Abd El-Azeem (1999). Effect of some medicinal plants as feed additives on performance of growing sheep. *Egypt. J. Nutr. and Feeds* 2 (2):79-87.
- Abousekken, M. S. M., A. A. Fahmy and S. Z. S. Ahmed (2007). Performance of growing rabbits fed different levels of Fennel and Marjoram by-products and their mixture under desert environmental conditions. 9th Internat. Conf. Nutr. and Feeds. 12-15 Nov., Luxor, Egypt.

- Ali, M. N., M. S. Hassan and F. A. Abd El-Ghany (2007). Effect of strain, type of natural antioxidant and sulphate ion on productive, physiological and hatching performance of native laying hens. *Internat. J. Poultry Sci.*, 6: 539-554.
- Allam, S. M., Hoda M. El Hosseiny, A.M. Abdel Gawad, S.A. El Saadany and A.M.M. Zeid (1999). Medicinal herbs and plants as feed additives for ruminant 1. Effect of using some medicinal herbs and plants as feed additives on Zaraibi goat performance. *Egypt. J. Nutrition and Feeds* . 2 (Special Issue) : 349
- Amber, K., A.E. Abou-Zeid, M. Osman (2001). Influence of replacing *Nigella sativa* cake for soybean meal on growth performance and caecal microbial activity of weanling New Zealand White rabbits. *Egypt. J. Rabbit-Science*. 2001; 11(2): 191-206.
- Bennett, C.D. (1992). The influence of shell thickness on hatchability in commercial broiler breeder flocks. *J. App. Poultry Res.*, 1:61-65.
- Cheeke, P. R. (1987). *Rabbit Feeding and Nutrition*. Academic Press.
- Daadar, A. H. and T. S. T. Seleem (1999). Recent trends in rabbit Production. Proc. of 1st Inter. Conf. on Indigenous Versus Acclimatized Rabbits. PP. 23. El-Arish, Egypt.
- Duncan, D.B. (1955). Multiple range and multiple F-test. *Biometrics*, 11:1-42.
- El-Amary, N. A. (1993). *Egyptian medicinal plants: An overview 1*, Assiut J. Env. Studies, overview series. Number 1:30.
- El-Ayek, M. Y., A. A. Gabr and A. Z. Mehrez (1999). Influence of substituting concentrate feed mixture by *Nigella sativa* meal on: 2. Animal performance and carcass traits of growing lambs. *Egypt. J. Nutri. and Feeds* 2 (special Issue): 265-277.
- El-Ayek, M.Y., A.A. Gabr, A.Z. Mehrez, (1998). Utilization of diets supplemented with untreated or formaldehyde treated soybean, *Nigella sativa* meals and concentrate feed mixture by sheep. First-international-conference-on-animal-production-and-health-in-semi-arid-areas,-El-Arish,-Egypt.-1-3-September.-1998. 1998: 273-281
- El-Ayek, M. Y., M. A. El-Harairy and M. O. Mousa (2000). Influence of substituting concentrate feed mixture by *Nigella sativa* meal on the performance of growing rabbits. 3rd Sci. Conf. on Rabbit Prod. Hot Climates, 8-11 Oct: 569-577.
- El-Manylawi, M. A., M. R. M. Ibrahim, Fatma G. Ahmed and Walaa A. Salama (2005). Performance of growing rabbits fed diets containing Geranium and spearmint by-products. *Egypt. J. Rabbit Sci.*, 15(1) : 13-26
- El-Wafa, S.A., A.A. Sedki, A.M. Ismail (2002). Response of growing rabbits to diets containing black seed, garlic or onion as natural feed additives . *Egyptian-Journal-of-Rabbit-Science*. 2002; 12(1): 69-83
- Fritz, Z., A. Schleicher and S. Kinal (1993). Effect of substituting milfoil, St. Jonswort and lovage for antibiotics on chicken performance and meat quality. *J. Anim. and Feed Sci.* 2(4), 189-195.

Effect of nigella sativa and thymus vulgaris on digestibility,.....

- Fritz, Z., A. Schleicher, S. Kinal, L. Jarosz and F. Majdanski (1992). Substitution of antibiotics by herbs in feed mixtures for broiler chicken. Roczniki-Noukowe. Zootechniki, Monografie-Rozprawy, No. 31, 314-325.
- Gabr, A. A., S. A. El-Ayouty, A. A. Zaki, Faten F. Abou-Ammo and E. S. I. El-Gohary (1998). Productive performance of lambs fed diets containing *Nigella sativa* meal. Egypt. J. Nutr. and Feeds., 1 (2): 97-107.
- Hmamochi, M., M. Bendai, M. Zouhdi, A. Agoumi and J. Y. Pelecuer (1992). Chemical and microbiological studies of essential oils of Moroccan *Eucalyptus* species. Revue- de-Medicines- el- Pharmacopees Africaines, 6: 2, 109-117.
- Ibrahim, Sh. A. M. (2005). Effect of some medicinal plants as feed additives on growth and some metabolic changes in rabbits. Egypt. J. Nutr. and Feeds, 8: 207-219.
- Ibrahim, S.A.M., A.A. El-Ghamry, G.M. El-Mallah (2000). Effect of some medicinal plants of Labiatae family as feed additives on growth and metabolic changes of rabbits. Egypt. J. -Rabbit-Sci. 2000; 10(1): 105-120
- Magi and Sahk (2003). Use of herbal medicine principles in local condition. Agraarteadus. 14 (3), 172.
- Musa, A.M.Z. (2008). The nutritive value of some common plants growing in the arid area. M.Sc. Thesis. Menoufiya University.
- Nasr, A. S., A. I. Attia, A. A. Rashwan and A. M. M. Abdine (1996). Growth performance of New Zealand White rabbits as affected by partial replacement of diet with *Nigella sativa* or soybean meals. Egypt. J. Rabbit Sci. 6(2), 129-41.
- North, M. O. (1981). *Commercial Chicken Production. Manual* 2nd Edition. , ANI publishing Company ING, USA.
- NRC (1977). National Research Council. *Nutrient Requirements of Rabbits*. Washington, DC., U. S.A.
- Radwan, M.S.M. (2002). Effects of replacing soybean meal by nigella seed meal for growing rabbits on digestibility coefficients, growth performance, carcass traits and economic efficiency under hot climatic conditions. Egypt. J. -Rabbit-Sci. 2002; 12(1): 13-25
- Rawiha, A. (1994). *Medicate by herbal*. Text book. Dar El-Kalem, Lebanon.
- Salem, F.A. and M.R. El-Mahdy (2001). Effect of some medicinal plants as feed additives on nutrients digestibility , rumen fermentation blood and carcass characteristics of sheep . 2 nd conf. of Animal prod. & Health in Semi Arid area.
- Singh, B. and A. L. Taparia (1992). Effect of ammoniation of hill grasses on nutrient utilization by crossbred heifers. India J. Anim. Nutr. 9:1, 47-51.
- SPSS, (1997). (*Statistical Package for Social Science*)
- Taha, E. A. T. (1997). Physiological studies on mammals, effect of *Nigella sativa* (seed and cake) on the performance of New Zealand White rabbits. M. Sc. Thesis. Fac. of Agric. Alex. Univ

- Teodorovic, M., A. Sreckovic, J. Tot, F. Kajari and L. Dragic (1990). Efficacy of fito-diaro-stop in treating and preventing diarrhoea in piglets. *Veterinarski-Glasnik*. 44 (8):681-687.
- Tozjo, T., Y. Yoshimura, K. Sakurai, N. Uchida, Y. Takeda, H. Naki and H. Ishii (1994). Novel antitumor sesquiterpenoids in *Achillea millefolium*. *Chemical and pharmaceutical Bulletin*, 42: 5, 1096-1100.
- Yousef, M. M., A. M. Abdiene, R. M. Kattab and S. A. Darwish (1998). Effect of feeding *Nigella sativa* cake on productive and reproductive performance of buffaloes. *Egyptain Journal of Nutrition and Feeds*, 1: 73-85.
- Zeweil, H. S. (1996). Evaluation of substituting *Nigella* seed oil meal for soybean meal on the performance of growing and laying Japanese quails. *Egypt. Poul. Sci.* 16 (2) 451-477.

تأثير كل من حبة البركة والزعتر على الهضم والاتزان النيتروجيني والاداء
الانتاجي للأرانب النيوزيلندية البيضاء

بركات محمد احمد ، سعيد سعيد عمر، إلهام محمد غنيم ، علاء سعيد خليفة
قسم الإنتاج الحيواني-كلية الزراعة -جامعة المنوفية

الملخص العربي

استخدم في هذه الدراسة عدد أربعون أرنباً نيوزيلندي أبيض من الجنسين عند عمر ٥ أسابيع (بوزن متوسط 476.2 ± 28.4 جم) - تم تربية الأرانب تحت نفس الظروف الرعائية والصحية وقسمت بشكل عشوائي إلى ٤ مجموعات مقارنة، بكل منها ١٠ أرانب (٥ ذكور و ٥ إناث). غُذيت الأرانب على عليقة مقارنة (م) و ثلاثة علائق تجريبية تحتوي على الاعشاب الطبية (حبة البركة - زعتر أو مخلوط منهما). لفترة تجريبية مدتها ١٠ اسابيع.

تمت دراسة تأثير هذه الإضافات على أداء النمو - تبعها تجربة هضم تم خلالها دراسة معاملات الهضم والقيمة الغذائية وميزان النيتروجين. اشارت نتائج الدراسة الى عدم تأثير معاملات الهضم معنوياً نتيجة المعاملة. كانت كلاً من العليقة المحتوية على الاعشاب الطبيه وحدها أعلى في محتواها من البروتين الخام المهضوم حيث كان (١٢.٣٤%) من العليقة المقارنة (١٠.٤٨%). المجموعة المخلوطة سجلت أفضل قيمة للمركبات المهضومة الكئييه (٦٨.٤٢%). الأرانب المغذاة على عليقة المخلوط احتجزت نيتروجين بكمية أكبر (١.٣٧ جم/ايوم) من المجموعات الثلاثة الأخرى التي احتجزت بكميات متساوية تقريباً. تمت كل الحيوانات في كل المجموعات التجريبية بنفس المعدل تقريباً. كان دليل الاداء الاعلى للمجموعة المغذاة على المخلوط (٦٣.٦٣%) .

يمكن استخلاص أن إضافة الأعشاب الطبية والعطرية تؤدي إلى تحسن معاملات الهضم - القيمة الغذائية - الاتزان النيتروجيني - وكذلك أداء الأرانب النيوزيلندية دون حدوث اية آثار جانبية ضارة على وظائف الجسم.

واستخدام هذه الإضافات العشبية مخلوطة أعطت أفضل النتائج عن كونها منفردة.