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EFFECT OF DIFFERENT LEVELS OF GARLIC AND LEEK AS ADDITIVES TO RABBIT RATIONS ON PRODUCTION AND REPRODUCTIVE PERFORMANCE

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ABSTRACT

The current study was conducted to investigate the effect of garlic and leek on rabbit productive and Reproductive performance. A total number of 63 growing V-line rabbits were randomly divided into seven groups which were fed diets containing 0.5, 1.0, 1.50% dried garlic and 0.5, 1.0, 1.5% dried leek (G4, G5, G6) and the control G7.

The results showed that DM, OM, CP and NFE digestibility and DCP and TDN were improved by adding of dry leek.

Dry garlic (G1, G2 and G3) groups had higher ($P<0.05$) values of serum total protein and globulin. Adding of garlic and leek caused an improvement in thyroidal hormones (T3, T4) and cholesterol levels in blood.

Rabbit in G6 has the highest live body weight at 8-10 week while G5 was the highest at 11-13 week. Litter weight and size at birth, after 7 days, after 14 days and after 21 days was higher in G1. Mortality rate was lowest in G5 treatment group..

Adding of garlic and leek improved all semen quality parameters and blood sex hormones. Dressing percentage was not differed between groups.

Keywords: Garlic, Leek, growing rabbit, hormones, digestibility

INTRODCTION

Herbalists routinely claim that garlic (Allium sativum) is the world's longest-used medicinal food. The therapeutic use of garlic predates written history by several millennia, with the earliest mention dating back more than 5.000 yeas ago to Sanskrit records in India. Garlic was already along. Favored remedy in ancient medicine 1.000 years before the birth of Christ. Ancient Egyptians worshipped the spice as a god, valuing it so much that 15 pounds of garlic would purchase a healthy male slave. Adding garlic to rabbit diets resulted in improving body weight and better feed conversion ratio (Abou-El-Wafa *et al.,* 2002).

Inspect of that leek is relatively the cheapest plant in genus Allium species which has been received the least attention. Didry *et al* (1987) reported that shallot (type of leek) has antimicrobial properties. Aqueous Extract of Chinese leek was more effective in inhibiting campylobacter bacteria than that of aqueous extract of garlic (Lee *et al.,* 2004).

Hlousek-Radojcic *et al.* (1998) reported that the role of acyl-COA synthetase in providing the primer for acyl elongation in leek and garlic Epidermal microsomes to be a COA independent and that COA-free Malonyl-COA preparations were able to support high rates of fatty acid elongation.

This study aimed therefore to investigate the effect of garlic and leek supplementation on growth performance, carcass characteristics, some blood constituents and some physiological parameters.

MATERIALS AND METHODS

The experimental work of the present study was carried out in the Rabbitary Farm of El-Gemeza Research Station, El-Gharbiya Governorate, Animal Production Research Institute, Agricultural Research Center, Ministry of Agriculture, Egypt, from April 2005 to April 2006.

Sexisty-three growing V-line rabbits at 6 weeks of age and average weight about (790± -g) were randomly divided into seven experimental groups (q rabbits/group). Each group was subdivided into three replicates, each of 3 rabbits in a cage, and the initial live body weights of all experimental groups were almost equal.

I. Growing stage:

Three experimental similar groups, group 1 (G1), group2 (G2) and group 3 (G3) were fed diets containing 0.5, 1.5% dried garlic (DG) respectively, while group 4 (G4), group 5 (G5) and group 6 (G6) were fed diets containing 0.5, 1.0, 1.5% dried leek (DL) respectively and the group 7 (G7) was fed the control diet (Table 1).

The experimental rabbits were housed in galvanized metal wire cages. Each cage was 60x50x10 cm for length, width and height, respectively, and provided with feeders and automatic watering system. The cages were located in a naturally ventilated and lighting building. The experimental diets were offered *ad libitum* and fresh water was available all the time during the experimental period. Rabbits were individually weighed at the beginning of the experiment, then at weekly intervals until the end of the experiment. Daily weight gain, daily feed consumption, feed conversion ratio and mortality rate were recorded. The feeding trial was continued for 7weeks and the reproductive performance for 4 month after the animal reached puberty at age 6 month.

At the last week of the experiment (13 weeks of age), a digestibility trial was conducted using 21 rabbits (3 rabbits from each treatment group), which were housed individually in metabolism cages that allow faeces and urine separation for 3 days. Feed intake was exactly determined. Faeces were collected daily, weighted and dried at 60-70°C for 24 hours, bulked, finely ground and stored for chemical analysis. The apparent digestibility coefficients of DM,OM,CP CF,EE and NFE for experimental diets were estimated.

Carcass characteristics and blood samples:

At the end of the growth trial, three randomly chosen rabbits (13 weeks of age) representing each group were slaughtered according to the standard technique of Cheeke, (1987).

Dressing percentage included relative weights of carcass, and head were recorded.

Blood samples were collected at slaughtering time in heparinized glass tubes (3 samples per each treatment group). Blood plasma was separated by centrifugation at 3000 rpm for 15 minutes.

The collected plasma was stored at -20°C until assay. Values of total proteins, albumin, total cholesterol concentrations urea, creatinine, plasma transaminase enzyme GOT, GPT and thyroid activity (T3 and T4) were estimated by using commercial kits. The globulin values were obtained by subtracting the values of albumin from the corresponding values of total proteins.

Table (1A): Chemical analysis of dry garlic or leek

Items	**Garlic**	**Leek**
Moisture	8.38	8.68
DM	91.62	91.32
OM	96.29	86.82
CP	18.12	10.20
EE	0.57	1.40
CF	1.75	13.34
NFE	75.85	61.88
Ash	3.71	13.18

Table (1B): Composition and calculated analysis of the control diet.

Ingredients	%
Wheat bran	30.00
Berssem hay (12%)	25.00
Yellow corn	20.60
Soy bean meal (44%)	20.00
Molasses	1.30
Limestone	0.85
Bone meal	1.55
Salt	0.30
Premix	0.30
DL-Methionine	0.10
Total	100.00
Calculated analysis:	
Digestible energy (DE) Kcal/k	2501.2
Crude protein (CP)%	18.2
Crude fiber (CF) %	14.4
Calcium (Ca), %	1.13
Phosphorus (P), %	0.82
L-lysine, %	1.0

*** Vitamins and minerals premix per kilogram contains: vit. A, 6000 IU; vit. D, 900 IU; vit E, 40 ng; vit k3, 2 mg; vit B1, 2ng; vit B2, 4 mg; vit B6, 2 mg; vit B12, 10 ucg; Nicotinic acid 50 mg; Biotin, 50 ucg; Folic acid, 10 mg; choline chloride, 250 mg; zinc, 50 mg; Msngsnese, 85 mg; Iorn, 50 mg; Copper, 5 mg; Iodine, 0.2 mg; selenium, 0.1 mg; cobalt, 0.1 mg.**

Chemical analysis:

The chemical composition of diets and faeces were analyzed according to AOAC (1990). The total digestible nutrients (TDN) were calculated according to the classic formula (Cheeke *et al.,* 1982).

II. Reproductive stage:

A total number of 27 V-line doe rabbits and 27 bucks representing all groups were used for studying the reproductive performance..

Does and bucks were randomly divided into seven experimental groups (3 does and 3 bucks/group) and fed the same diets as in the growing stage.

Reproductive and productive performance:

Does:

Number of parities per doe, number of services per conception, litter size at birth (LSB), litter weight at birth (LWB, gm), litter size and weight at 7, 14, 21 and 28 days were recorded. Also, number of still birth, number of pre-weaning mortality and milk production were recorded.

Bucks:

Three semen samples were collected from each group by using an artificial vagina. The gel mass was removed from semen samples before examination. Ejaculate volume and sperm motility was estimated just after semen collection. Advanced motility was expressed as a percentage of the actual progressive motion. Sperm cell concentration was estimated by using haemocytometer. Total number of spermatozoa per ejaculate was calculated by multiplying ejaculate volume by sperm cell concentration. The percentage of dead sperm was detected by using Eosin + Nigrosin stain as described by Salisbury *et al.* (1985).

Blood:

Blood samples were collected from (3 does/group) before mating and at 15 and 28 days of pregnancy to measure progesterone (P4) and estrogen (E2) concentration. Also, blood samples were collected from (3 bucks/group) to determine testosterone concentrations at 6 months of age.

Statistical Analysis:

Statistical analysis was conducted by analysis of variance using SAS Package (1998). The means and standard error of all parameters were estimated by Duncan. Multiple range test (Duncan, 1955) to detect significant differences among means of the experimental groups.

RESULTS AND DISCUSSION

Growth performance:

The effect of different levels of dry garlic and leek supplementation on growth performance of growing rabbits (6-13 weeks of age) is presented in Table (2). The results showed that adding of garlic and leek to rabbit diets had significant effect on live body weight (LBW) and body weight gain.

Table (2) Effect of different levels of dry garlic or Leek on growth performance of growing rabbits.

Treatment / Weight	Week (6)	Week (7)	Week (8)	Week (9)	Week (10)	Week (11)	Week (12)	Week (13)	Total body gain (TBG)
G1	791.67	922.22	983.89	1065.56	1234.44	1355.56	1486.67	1621.11	829.44
G2	791.11	911.67	1042.22	1186.67	1192.22	1360.00	1485.56	1634.44	843.33
G3	788.33	915.56	1058.89	1108.89	1101.11	1245.56	1370.11	1467	678.67
G4	800.00	916.11	1051.67	1094.44	1208.89	1318.89	1413.67	1522.78	722.78
G5	787.78	906.11	1030.56	1176.67	1318.89	1467.77	1615.56	1741.11	953.33
G6	788.33	921.11	1060.00	1210.00	1355.56	1345.56	1481.11	1605.56	817.23
G7	791.11	915.00	1054.44	1046.67	1182.22	1302.22	1437.78	1564.44	773.33
±SE	±141.08	±141.08	±141.08	±141.08	±141.08	±141.08	±141.08	±141.08	

The enhancement in body weight gain may be related to stimulate growth-related factors such as insulin-like growth factor, I (Helal and Mohamed, 2001) or by improving the immune responses (El-Afifi, 1997). Immune response (El-Afifi, 1997)

Results in Table (3) show the digestibility coefficients of DM were insignificantly increased for treated groups with supplementing dietary level 0.5, 1.0, 1.5% leek dry and control (G4, G5, G6 and G7) while OM, CP and NFE were significantly increased.

Table (3): Effect of feeding rations containing dry garlic or leek on nutrient digestibility.

Item	G1	G2	G3	G4	G5	G6	G7	±SE
Apparent digestibility:								
DM	65.33	71.67	56.00	78.67	78.33	82.33	82.67	±7.84
OM	53.33^{c}	71.00^{abc}	61.00^{c}	81.000^{ab}	79.00^{ab}	83.67^{a}	85.33^{a}	±6.30
CP	58.66^{b}	76.33^{ab}	65.33^{ab}	83.00^{a}	81.33^{a}	83.33^{a}	80.33^{a}	±5.57
EE	75.00^{a}	81.00^{a}	60.33^{b}	78.33^{a}	88.67^{a}	82.33^{a}	85.66^{a}	±4.45
CF	42.33^{b}	63.00^{a}	47.00^{b}	70.33^{a}	70.67^{a}	77.00^{a}	71.00^{a}	±8.04
NFE	59.33^{b}	72.33^{ab}	58.00^{b}	79.60^{a}	79.33^{a}	83.33^{a}	84.00^{a}	±5.77
Nutritive value:								
DCP	8.00^{b}	11.67^{a}	9.33^{ab}	11.67^{a}	11.00^{a}	11.33^{a}	10.67^{ab}	±0.86
TDN	53.67^{b}	69.33^{a}	5300^{b}	70.67^{a}	73.00^{a}	76.00^{a}	77.33^{a}	±4.78

a, b, c means in the same raw with different superscripts are significantly different (P<0.05)

Results in table (2) show also that, rabbits received diets supplement with 1.5% dry garlic (G3) gave the lowest (P<0.05) EE digestibility coefficient. While CF digestibility was low (P<0.05) for G1 and G3 groups.

These results are in agreement with that of Gamal El-Dein *et al.* (2006). Addition of garlic and leek into low protein diet was more effective in improving feed conversion ratio than their addition into high protein diet. DCP value was highest significantly for all groups compared with the other G1 and G3 groups.

TDN values were highest in rabbits that fed on dry leek and the control group compared with those fed on dry garlic.

The significant improvement in feed conversion ratio of birds fed leek or garlic may be attributed to their contents of allicin which have bacteriostatic effect against harmful microflora which retards nutrients absorption causing malabsorption and finally improvements in feed conversion ratio (Horton *et al.,* 1991: El-Afifi 1997)

Blood Plasma metabolites:

Results in Table (4) illustrate that the total protein of 1% dry garlic (DG) was significantly (P<0.05) higher from that of all other treatments. Globulin of 1% DG, 1.5% DG and control were higher than the other groups. Total protein, albumin and globulin significantly improved by addition of garlic to rabbit diets (Abdel-Azeem and Abdel-Rehem 2006, Abou-El-Wafa *et al.,* 2002 and Ismail *et al.,* 2003).

A decrease in albumin/globulin ratio was found, to be a good indicator for immunoglobulin, subsequently, the immunity responsiveness was considerably higher with treated groups (Ismail *et al.,* 2003). GOT and GPT levels were not different between groups.

Table (4) Effect of feeding rations containing dry garlic or leek on blood biochemical components of growing rabbits.

Parameter	G1	G2	G3	G4	G5	G6	G7	±SE
Protein fraction:								
Total protein (g/dl)	5.94^{abcd}	7.71^{a}	7.25^{ab}	5.15^{cd}	4.94^{d}	5.36^{abd}	7.05abc	±0.622
Albumin (g/dl)	3.01	3.76	3.20	2.59	3.14	3.05	3.13	±0.427
Globulin (g/dl)	2.93^{ab}	3.95^{a}	4.05^{a}	2.56^{ab}	1.80^{b}	2.22^{ab}	2.92^{a}	±0.577
A/G ratio	1.26	0.96	0.81	1.15	2.33	1.42	0.93	±0.484
Liver function:								
GOT (µ/ml)	45.33	41.83	36.17	48.50	55.77	48.50	54.17	±22.89
GPT (µ/ml)	27.00	29.66	27.00	22.67	72.6	20.67	29.67	±15.67
Kidney function:								
Urea (mg/dl)	45.86^{b}	48.40^{b}	47.77^{b}	59.99^{ab}	85.05^{a}	82.31^{a}	86.17^{a}	±10.38
Creatinine (mg/dl)	2.66	3.04	3.32	3.31	3.99	4.41	2.80	±0.536
Thyroid activity:								
T3 (ng/dl)	2.70	2.00	2.02	1.69	2.63	2.77	2.22	±0.92
T4 (ng/dl)	33.77	69.14	61.29	34.07	67.62	36.21	46.25	±28.57
Cholesterol (mg/dl)	59.70^{a}	71.82^{a}	76.21^{a}	41.97^{b}	78.34^{a}	78.37^{a}	81.67^{a}	±23.00

a, b, c means in the same raw with different superscripts are significantly different (P<0.05)

Data in Table (3) demonstrated that urea of 1%, 1.5% dry leek (DL) and control significantly (P<0.05) higher than those of other treatment. The results were higher than results by Abdel Azeem and Abdel-Rehem (2006).

Creatinine values were not influenced by adding garlic or leek into diets.

Plasma T3 (thyroxine) levels of all groups insignificantly, affected while T4 (triiodothyronine) recorded higher values 69.14, 61.29, 67.62 µg/dl in 1%, 1.5% dry garlic (DG) and 1% dry leek (DL) groups fed diet supplements.

The group (4) was diet on 0.5% DL decreased (best) significantly than other groups in cholesterol value.

This result disagree with the finding of Chowdhury *et al.*(2002) who concluded that garlic and leek have an inhibitory effect on cholesterol synthesis. This disagreement may be related to the tested materials used in both experiments. The current study used dry garlic which contains less allcinin than those of fresh garlic or leek

Reproductive performance:

The reproductive parameters as affected by garlic (DG) and Leek (DL) are presented in (Tables 5, 6). There was significant (P<0.05) increase in litter size of G1 and the control (G7) groups. Also litter weight was highest in the same groups diet in all ages.

Table (5): Effect of different dietary levels of garlic or leek on reproductive and productive of rabbits.

Treatment	At Birth		After 7 days		After 14 days		After 21 days		After 28 days		
	Litter size Live	Litter weight	Litter size	Litter weight	Litter size	Litter weight	Litter size	Litter weight	Litter size	Litter weight	Mortality rate %
G1	9.70^{a} ±1.00	425.00^{a} ±43.85	9.40^{a} ±0.90	960.00^{a} ±99.52	8.50^{a} ±0.85	1602.50^{a} ±151.74	8.50^{a} ±0.85	2251.00^{a} ±219.87	8.20^{a} ±0.83	2715.00^{a} ±306.44	15.14^{ab} ±4.21
G2	6.18^{c} ±0.95	265.45^{bc} ±41.81	5.82^{b} ±0.86	625.45^{cd} ±94.89	5.55^{b} ±0.81	1010.91^{bc} ±144.68	5.55^{b} ±0.81	1550.91^{ab} ±209.65	5.27^{b} ±0.79	2073.64^{a} ±292.18	5.55^{b} ±4.02
G3	7.64^{abc} ±0.95	340.00^{abc} ±41.81	7.10^{ab} ±0.86	736.36^{abc} ±94.89	6.73^{ab} ±0.81	1170.00^{ab} ±144.68	6.73^{ab} ±0.81	1655.45^{ab} ±209.65	6.64^{ab} ±0.79	2523.64^{a} ±292.18	9.64^{ab} ±4.02
G4	7.63^{abc} ±1.12	323.75^{abc} ±49.03	7.38^{ab} ±1.01	788.75^{abc} ±111.2	7.00^{ab} ±0.95	1278^{ab} ±169.65	7.00^{ab} ±0.95	1904.38^{ab} ±245.85	7.00^{ab} ±0.93	2550.00^{a} ±342.61	11.50^{ab} ±4.71
G5	2.71^{b} ±1.97	118.57^{d} ±52.41	2.57^{c} ±1.07	321.43^{d} ±118.95	2.57^{c} ±1.01	607.14^{c} ±181.37	2.57^{c} ±1.01	862.86^{c} ±262.81	2.57^{c} ±1.00	1030.00^{b} ±366.26	4.00^{b} ±5.03
G6	5.00^{bc} ±1.10	213.33^{cd} **±46.22**	4.78^{bc} ±0.95	482.78^{cd} ±104.90	4.56bc ±0.89	1000.56^{bc} ±159.95	4.56^{bc} ±0.89	1480.00bc ±231.77	4.56^{bc} ±0.88	2006.67^{a} ±323.61	20.67^{a} ±4.44
G7	9.27^{ab} ±0.95	387.27^{ab} ±41.81	8.91^{a} ±0.86	863.64^{ab} ±94.89	8.36^{a} ±0.81	1427.27^{ab} ±144.68	8.36^{a} ±0.81	2098.84^{ab} ±209.65	8.36^{a} ±0.79	2890.91^{a} ±292.18	5.64^{b} ±4.02

a, b, c, d means in the same column with different superscripts are significantly different (P<0.05)

Moreover, the effect of treatments on total mortality showed that G5, G2 and control groups recorded significantly the lowest rate.

The great role of the supplemented DG and DL on decreasing mortality rate can be due to their components which have a great effect on immune system which destabilizes the bacteria in the colon.

The milk yield, in (0.5% DG) rabbit does of G1 gave the best yield in most stages, the 0.5% DL group (G4) recorded the best yield in all stages

The milk yield increased in the treatment groups compared to the control one. These results are in accordance with those found by Ismail *et al*. (2003).

Table (6) Milk yield of rabbits as affected by garlic and Leek.

Parameters	G1	G2	G3	G4	G5	G6	G7
At birth gm/day)	75.00^{a} ±7.82	46.36^{bc} ±7.45	67.27^{ab} ±7.45	63.75^{ab} ±8.74	28.57^{c} ±9.34	47.22^{bc} ±8.24	77.27^{a} ±7.45
After 7 days	144.00^{ab} ±42.75	80.00^{b} ±40.76	105.45^{ab} ±40.76	236.25^{a} ±47.79	65.71^{b} ±51.09	66.11^{b} ±45.06	92.73^{b} ±40.76
After 14 days	141.00^{a} ±16.61	102.73^{ab} ±15.64	121.82^{ab} ±15.64	135.00^{a} ±18.57	74.29^{b} ±19.85	112.22^{ab} ±17.51	128.18^{ab} ±15.84
After 21 days	191.00^{a} ±20.86	133.64^{ab} ±19.89	147.27^{a} ±19.87	158.75^{a} ±23.32	78.57^{b}± 24.93	124.44^{ab} ±21.99	166.36^{a} ±19.89
After 28 days	135.00^{a} ±39.09	100.00 ^{a} ±37.27	116.36 ^{a} ±37.27	125.00 ^{a} ±43.71	171.43 ^{a} ±46.72	105.56 ^{a} ±41.21	136.36 ^{a} ±37.27

a, b, c means in the same raw with different superscripts are significantly different (P<0.05)

Semen Characteristics:

The average ejaculate volume were given in Table (7). The difference between groups were not significant.

The values of G3, G4, G1 and both G2 and G7 were the highest in semen volume. Also Similar trend in live sperm (%) was also obsetued while G1, G2 and G3 which fed (DG) diets recorded lower values than other groups. Also trend in abnormalities.

The results were in agreement with those obtained by Nofal *et al.* (2001)

Table (7): Semen characteristics for rabbits fed ration containing dry garlic and leek

Treatment Items	Volume (ml)	Concentration mm^3 $X10^6$	Out put $X10^6$	Motility Score	Live %	Dead %	Abnormal alities
G1	0.733	367.66	276.00	3.333	81.666	7.666^{bc}	10.666
G2	0.7000	352.00	246.33	2.833	78.333	8.333^{abc}	13.333
G3	0.8000	321.666	258.00	3.167	82.333	6.666^{c}	11.000
G4	0.800	390.000	312.333	4.000	76.666	9.000^{ab}	14.333
G5	0.567	318.333	182.666	3.000	76.339	9.000^{ab}	14.666
G6	0.666	313.333	210.000	2.666	77.666	10.000^{a}	12.333
G7	0.700	331.000	232.666	3.500	78.000	9.330^{ab}	12.666
±SE	±0.130	±24.870	±51.615	±0.413	±2.093	±0.629	±1.718

a, b, c means in the same column with different superscripts are significantly different (P<0.05).

Motility score based on 1-5 scale where 1 means poor motility and 5 means vigorus motile sperms.

Blood Hormones:

Table (8) shows that progesterone level at 28 days pregnancy was significantly higher in G3 than the other groups. While G3, G1 and G2 which diet DG recorded remarkable increase in estradiol hormone at 28 days of pregnancy.

The average of testosterone hormone in rabbit bucks blood fed diets containing 1% and 0.5% DG was significantly (P<0.05) higher compared to other groups.

Table (8):Effect of feeding rations containing garlic and leek on some hormones of rabbits

Parameter	Progesterone			Estradiol			Testsoterone
Treatment	Before pregnancy	15 day (mid) pregnancy	28 days pregnancy	Before Pregnancy	15 days Pregnancy	28 days Pregnancy	At 6 monthe
G1	1.010	5.30	1.40^{b}	0.521	26.29	47.46	5.61^{b}
G2	0.001	2.30	5.40^{ab}	10.321	32.75	44.47	12.57^{a}
G3	0.003	4.30	13.12^{a}	10.71	47.93	51.04	1.23^{d}
G4	0.003	1.01	4.04^{ab}	14.90	31.23	49.35	2.24^{bcd}
G5	ND	6.60	7.32^{ab}	13.41	21.37	22.13	1.33^{cd}
G6	0.280	4.22	2.00^{b}	11.33	47.41	27.45	4.47^{bc}
G7	0.98	3.30	5.00^{ab}	10.79	52.49	27.99	3.70^{bcd}
±SE		±3.10	±2.90		±11.67	±8.99	±1.04

a, b, c means in the same column with different superscripts are significantly different (P<0.05)

Carcass traits:

Dressing percentage and hot carcass weight (%) were insignificantly increased with addition of garlic and leek to growing rabbit diets (Table 9). Also, the relative weights of giblets, heart and Kidney of the experimental diets were not different significantly, while liver relative weight was significantly-defferent (P<0.05). These results are in agreement with those obtained by (Abdel-Azeem and Abdel-Rheem, 2006) who reported that garlic supplementation improved dressing percentage and hot carcass weight%.

Table (9): Carcass characteristic of rabbits fed with different levels of dry garlic or leek.

Treatment	Live body weight	Dressing %	Reference carcass weight	Fore carcass part % (FP)	Intermediate carcass part % (IP)	Hind carcass part % (HP)	Liver %	Heart %	Kidney %	Head %
G1	1853.33	56.22	840.00	28.67	50.33	31.00	3.05^{bc}	0.32	0.69	6.83
G2	1923.33	55.94	880.00	27.00	40.33	32.00	3.00^{bc}	0.37	0.62	6.25
G3	1896.67	56.39	865.00	27.33	41.00	30.33	4.27^{a}	0.34	0.70	5.74
G4	1750.00	54.60	763.33	26.67	43.33	30.00	3.74^{ab}	0.42	0.73	6.13
G5	1753.33	52.53	758.33	26.33	41.67	32.00	2.56^{c}	0.34	0.63	5.75
G6	1893.33	54.65	851.67	29.00	40.33	30.67	2.88^{bc}	0.34	0.60	6.00
G7	1960.00	56.97	916.67	26.67	41.60	32.00	2.93^{bc}	0.44	0.63	6.15
±SE	±85.93	±1.18	±48.98	±0.80	±3.79	±1.03	±0.29	±3.05	±0.04	±0.37

a, b, c means in the same column with different superscripts are significantly different (P<0.05)

Dressing percentage included relative weights of carcass, giblets and head. Reference carcass weight was higher in the control (G7) group compared with the other treated ones. However, (G6) group of rabbit fed 1.5% dry leek recorded the highest percentage if the fore part (FP) followed by (G1) group of rabbit which fed 0.5% dry garlic (28.67%) then the other groups. Also G1 has the highest value for intermediate carcass part percentage (IP) while the being other groups similar.

Results in table (9) showed also that the hind carcass part percentage (HP) in G2, G5 and G7 were higher followed by G1, G3, G4 and G6.

These results agreed with those of (EL-Afifi, 1997) who reported nonsignificant differences between body weights of chicks fed fresh or dry garlic diets.

These results are in agreement with those obtained by Abdel-Azeem and Abdel-Reheem (2006) who reported that dressing percentage were insignificantly affected ($P<0.05$) by dry garlic and leek, supplementations. Moreover, Abou EL-Wafa *et al.* (2006) results showed that adding garlic to rabbit diets caused significant effects upon live body weight, dressing percent age, liver and abdominal, fat.

REFERENCES

A.O.A.C. (1990). Association of official analytical chemists official methods of analysis, 15th Edition, Washington, USA.

Abdel-Azeem, F. and Abdel-Reheem, M.A.T. (2006). Effect of supplemental copper and fresh Garlic on performance and some biochemical changes in growing rabbits. Egyptian Journal of rabbit-Science, 16 (2) 341-366.

Abou-EL-Wafa, S.A.; Sedki, A.A. and Ismail, A.M. (2002). Response of growing rabbits to diets containing black seed, garlic or onion as natural feed additives. Egyptian Journal of Rabbit-Science, 12 (1):69-83.

Cheeke, P.R. (1987). Rabbit Feeding and Nutrition. Academic press, New York.

Cheeke, R. R; Patton, N.M and Tempelton, G.S (1982). Rabbit production. 5th Edition, Interstate Printers and Publishers Danville II., US.A.

Chowdhury, S.R., Chowdhury, S.D. and Smith, T.N. (2002). Effects of dietary garlic on cholesterol metabolism in laying hens. Poult. Sci. 81:1856-1862.

Didry, N.; Pinkas, M. and Dubreuil, L. (1987). Anitibacterial activity of species of the species of the genus Allium. Pharmazie., 42:(10) 687-688.

Duncan, D. (1955). Multiple rang and multiple F test. Biometric., 11: 1-42. Edition Assoc. Office. Anal. Chem., Arlington.

EL-Afifi, S.F. (1997). Nutritional Studies on onion and garlic supplementation to poultry feed. Ph.D. Thesis, Anim. Prod. Dep., Fac of Agic., Ain-Shams Univ.

Gamal El-Dein. Hala M; S.F. El-Afifi; Yousef, Nabed S. (2006). Evaluation of Laying Qualil Characteristics fed on diets supplemented with leek and garlic. Al-Azhar Journal of Agric. Research., Vol (43). 25-41.

Helal, F.L.S. and Mohamed, R.S. (2001). Influence of garlic oil and some of its sulfur containing constituents on some biochemical changes in milk, blood and feed utilization in rabbits, with especial rerence to hypocholesrolemic activity. Egypt. J. Nutr. and Feeds.4:909-919.

Hlousek-Radojcic, A.; Evenson, K.J.; Jaworski, J.G and Post-Beittenmiller, D. (1998). Fatty acid elongation is independent of acyl-coenzyme a synthetase activities in leek and Brassica napus plant physiol., 116 (1): 251-258.

Horton, G.M.; Fenell, M.J. and Prasad, B.M. (1991). Effects of dietary garlic (Allium sativium) on performance. Carcass composition and blood chemistry changes in broiler chickens. Con. J. Anim. Sci., 71:939-942.

Ismail A.M.; A.A. Sedki and A.G. Abdallah, (2003). Influence of Black seed, Garlic and onion supplementation on reproductive performance in rabbits. Egypt. J. Agric. Res., 81 (3). 1193-1207.

Lee, C.; Chienkuo, H.; Jyali, T. (2004). Effect of feed antibiotic avoparcin on organ morphology in broiler chickens. Poult. Sci., 75: 705-710

Nofal, N.E., Amina, A. Salem and Eman, A. Abo-Etta (2001). The influence of garlic and nigelia sativa seeds on reproductive, physiological and immunological traits of cocks. Second Inter. Conf. on Anim. Prod. And Health in Semi-Arid Areas. Al-Arash

Salisbury, G.W., N.L. Vand emrk and J.R. Lodge (1985). Physiology of reproduction and artificial insemination of cattle. Pub. By S.K. Jain for CBS pub. And distributors, Delhe. 32. Schirmetister., J. (1964). Dtsch.med wschr 89:1940.SAS Institute (1995). SAS USERS guid. SAS. Inst. Inc. Cary. NC.

Tietz, NM(ed); Fund amentals of clinical 3rd ed. WB saunders Co., Philadelphia 1987, P. 1851.

تأثير أستخدام مستويات مختلفة من الثوم والكرات كأضافات فى علائق الارانب على الاداء الانتاجى والتناسلى لها

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أجريت هذه التجربة لدراسة تأثير الثوم والكرات على الاداء الانتاجى والتناسلى للارانب استخدم فى هذه التجربة 63 ارنب قسمت الى 7 مجموعات واضيف للعلائق 0.5%، 1%، 1.5% ثوم مجفف وكذلك 0.5%، 1%، 1.5% كرات مجفف بالاضافة للمجموعة المقارنة.

أظهرت النتائج ما يلى:

1- اضافة الكرات بنسب 0.5%، 1%، 1.5% أدت الى تحسين معنويا فى هضم المادة الجافة والمادة العضوية والبروتين والكربوهيدرات الذائبة والرماد. كذلك ادت الى تحسين معنويا كلا من مجموع المركبات الغذائية المهضومة والبروتين المهضوم.
2- اضافة الثوم المجفف بنسب 0.5%، 1%، 1.5% أدت الى تحسن معنويا فى البروتين الكلى والجلوبيولين.
3- اضافة الثوم خفض اليوريا
4- اضافة الثوم والكرات حسنت قيم T4, T3 وحسنت نسبة الكوليسترول
5- سجلت المجموعة السادسة التى غذيت 1.5% كرات اعلى معدلات النمو من الاسبوع الثامن الى الاسبوع العاشر
6- سجلت المجموعة الخامسة التى غذيت على 1% كرات اعلى معدلات النمو من الاسبوع الحادى عشر الى الاسبوع الثالث عشر، كذلك سجلت اعلى معدل فى زيادة الجسم الكلية تلتها المجموعة الثانية التى غذيت على 1% ثوم
7- زادت المجموعة الاولى التى غذيت على 0.5% ثوم مجفف زيادة معنوية فى متوسط وزن الخلفة فى البطن خلال الميلاد ثم بعد 7 ايام ثم بعد 14 يوم ثم بعد 21 يوم تم احتلت المركز الثانى بعد مجموعة المقارنة فى عمر 28 يوم وكذلك بالنسبة لحجم البطن.
8- سجلت المعاملة الخامسة اقل نسبة نفوق ثم تلتها المعاملة الثانية ثم المقارنة
9- المجموعة الرابعة التى غذيت على 0.5% كرات كانت اعلى فى حجم السائل المنوى وفى التركيز وعدد الحيوانات المنوية فى القذفة.
10- المجموعة الى غذيت على 1.5% ثوم سجل اعلى نسبة احياء واقل نسبة ميت واقل نسبة شواذ فى السائل المنوى.
11- كانت المجموعة الثالثة التى غذيت على 1.5% ثوم اعلى مستوى هرمون البرجسترون عند 28 يوم من الحمل وكذلك هرمون الاستروجين
12- اما هرمون التستسترون كان اعلى فى الذكور الذى غذيت على 1% ثوم
13- ليس هناك فروق معنوية فى نسبة التصافى وسجلت المجموعة الاولى اعلى نسبة فى الربع الامامى والربع الخلفى.
14 -اضافة الثوم خفضت نسبة الدهن فى المجموعة الثانية بينما المجموعة الخامسة التى غذيت 1% كرات سجلت اعلى نسبة فى البروتين فى اللحم.