

Egyptian Journal of Rabbit Science, 23 (1): 55- 75(2013)

EFFECT OF ADDING NATURAL MIXTURE JUICE OF ONION; GARLIC AND LEMON(NMJ) IN FILTER DRINKING WATER ON 1-PERFORMANCE OF GROWING RABBITS.

Azza M. M. Badr^{*}; Neamat I. Bassuony^{*}; Fadila M.Easa^{} and M. F.S.Hanna^{**}**

** Regional Center for Food and Feed (Animal Nutrition),*

** Regional Center for Food and Feed (Microbiology Department),*

*** Animal Production Research Institute, Agriculture Research Center, Giza, Egypt
Azzabadr805@yahoo.com*

A total number of two hundred twenty hybrid rabbits with an initial live body weight, 751.8±22.4 g at 33 days of age, were allotted at random to four similar experimental groups (55 rabbits each). All rabbits were fed similar concentrate feed mixture (CFM) pelleted diet (16.72% crude protein and 13.07% crude fiber on average.). The first group (D¹, control) free additive (NMJ), while groups (D², D³ and D⁴) were supplemented with 1, 2 and 3 ml natural mixture juice (NMJ)/L of garlic, onion and lemon filter drinking water, respectively. The feeding trail extended for 4 weeks. The aim of this study was to evaluate the effect of natural mixture of garlic, onion and lemon juice as feed additive on daily feed intake and weight gain, feed conversion ratio and efficiency, dressing percentage and internal organs weight and post weaning mortality rate of growing rabbits.

***Results indicated that,** daily feed intake of rabbits increased significantly ($P < 0.05$) by increasing NMJ in filter drinking water. Also, introducing different levels of (NMJ) significantly increased daily weight gain. Rabbits received 3 ml/L, 2 ml/L or 1 ml/L grew faster than control, respectively. Final body weight of rabbits supplemented with 2 and 3 ml/L (NMJ) recorded the highest values than those supplemented with 1 ml/L (NMJ) or control diets through the 4 weeks of the experiment. There were significant ($P < 0.05$) differences among treatments in feed conversion ratio through the first 3 weeks (Table 4). A relatively low mortality rate (10.90 and 12.73%) was observed in rabbits with adding 3 and 2 ml/L (NMJ) in filter drinking water, while rabbits of control recorded the highest mortality rates (21.818%) during the whole*

*experimental period. Hot carcass weight and dressing percentages were significantly ($P < 0.05$) higher in the 1, 2 and 3 ML/L natural juice of (NMJ) groups than those of the control group. For the microbiological quality of used additive to drinking filter water, the increasing level of supplementation decreased aerobic bacterial, coliform; faecal coliform; enterobacteria; yeast and fungi counts while *E. coli* was not detected. It could be concluded that supplementation of natural mixture juice of garlic, onion and lemon (NMJ) up to 3 ml /L in the filter drinking water of hybrid rabbits had good results without adverse effects on growth performance.*

Key words: Rabbits, Juice garlic, lemon & onion, growth performance, microbiological quality of the drinking water.

Feed additives are important manipulators that can be used to improve the efficiency of feed utilization and animal productivity. The World Health Organization (WHO) encourages the acceptance of feed additives (Line-Eric *et al.*, 1998 and Aboul-Fotouh *et al.*, 1999). Antioxidants, antibiotics, flavouring agents, coccidiostat, antimolds and anticaking agents are synthetic feed additives used to improve the quality of feed for our livestock and their performance. However, current research is looking for natural alternatives to synthetic feed additives. Medicinal herbs such as garlic (*Allium sativum*), onion (*Allium cepa*) and lemon (*Citrus limon (L.) Burm*) have been reported to possess antibacterial, antiseptic, anti-inflammatory, antiparasitic and immunomodulatory properties (Muhammad *et al.*, 2009 and Thomson *et al.* (2007). To ensure more net return and to minimize expenditure on feed are the main challenges, for which many research strategies have been practiced such as introducing feed additives (Pervez, 1992).

Garlic (*Allium sativum*) is one of the most popular herbs used world wide to reduce various risk factors associated with several diseases (Thomson *et al.*, 2007). Actually, garlic contains a variety of effective compounds that exhibit anticoagulant (Augusti, and Sheela, 1996), antioxidant (Anwar and Meki 2003), antibiotic (Rees *et al.*, 1993), hypocholesterolaemic (Ali, and Thomson 1995) hypoglycaemic, as well as, hypotensive activities (Ali, *et al.*, 2000). Banerjee and Maulik (2002) showed freshly crushed garlic contains allicin, alliin, ajoene, diallylsulfide, dithiin and S-allylcysteine (Onu, 2010 and Mahmoud *et al.*, 2010) reported that the levels of 0.25, 0.50 and 1% of garlic juice in layer hens improved performance characteristics, egg quality and showed lower bacterial count of the

E. coli. Garlic extract contributes to the alleviation of gastrointestinal infections in goats by reducing the coccidian burden and may enhance animal performance in adult goats (Mulumeb *et al.*, 2009).

Garlic has been used to treat animals that suffer from gastrointestinal parasitism (Guarrera, 1999). The efficacy of garlic on coccidian infections has been reported in rabbits (Toulah and Al-Rawi, 2007). There were significant increase in life body weight and life body weight gain and feed conversion rate of Muscovy ducks which fed rations supplemented with 3% garlic and 3% garlic with 1% onion, respectively (Ibrahim *et al.*, 2004). Ahmed *et al.* (2009) recommendation is that the optimal additive level based on animal health, nutrient digestibility and daily gain was 2.5%. Thereby, natural additive of juice of lemon, onion and garlic could be used successfully and safety in rations to improve the performance of growing calves. Onions contain chemical compounds such as phenolics and flavonoids that basic research shows to have potential anti-inflammatory, hypocholesterolaemic, anticancer and antioxidant properties. Also, quercetin (Slimestad *et al.*, 2007) and its glycosides quercetin 3, 4'-diglucoside and quercetin-4'-glucoside (Williamson *et al.*, 1997 and Olsson *et al.*, 2010) are present in onions. The citrus lemon juice (1 ml /kg /day) revealed a significant reduction in serum cholesterol, triglycerides; low density lipoprotein levels and resulted in an increase in high density lipoprotein. These results suggest that the hypocholesterolemic effects of citrus lemon juice may be due to its antioxidant effect (Yasmin, *et al.*, 2010). The active antioxidant compounds are flavonoids, isoflavones, flavones, anthocyanins, coumarins, lignans, catechins and isocatechins. In addition, some compounds found in natural foods such as, vitamins C and E, b-carotene and a-tocopherol are known to possess antioxidantial (Prior 2003).

On the other hand, Gupta *et al.* (2005) found that mixture improvement in the digestibility coefficients of different nutrients is probably due to improved gross activity of rumen microflora, increased immunity alternation in numbers and species of microorganisms in the rumen on inclusion vegetable and fruits increase in cellulolytic bacteria, increased total volatile fatty acids (TVFA's) high DM, and their TDN intake and high gain rate

Therefore, the aim of this study was to evaluate the effect of natural mixture (vegetables and fruits), garlic, and onion and lemonade juice on daily feed intake and weight gain, feed conversion ratio and efficiency, dressing percentage and internal organs weight and post- weaning mortality. Also, determinations of microbial counting drinking filter water.

MATERIALS AND METHODS

This work was carried out at privet farm belonging to IBEX company and the laboratory part of fungi, yeast count and bacteria estimation were conducted at Regional Center for Food and Feed (RCFE), Agriculture Research Center. In this study two hundred twenty growing rabbits with an initial live body weight 751.8 ± 22.4 g at 33 day of age. The experimental rabbits were divided randomly into four groups (55 rabbits in each). Animals were allotted randomly into four groups. The 1st group (as control) reared on concentrate feed mixture (CFM), while the 2nd, 3rd and 4th groups supplemented with natural mixture juice of garlic, onion and lemon in drinking water by 1, 2 and 3 ml / L. water / day, respectively. The Juice was prepared by Neamat (2004) and modified by Mahesar *et al.* (2010), where fresh garlic bulbs, onion, and Limon were obtained from the local market and cut into small pieces. About 250 ml of distilled water per 100 g of peeled onion/ or garlic and Limon were added and crushed in a mixing machine in the presence of some crushed ice. The resultant slurry of every one was squeezed and filtered 3 times through a fine cloth. The aqueous extract of 3 materials was stored in dark brown bottle with scrow cap at 4 °C until use.

All rabbits reared on concentrate feed mixture (CFM). Feed ingredients and chemical analysis of the experimental diets are shown in Table 1. Fresh filter water and the natural mixture juice were automatically available at all times through stainless steel nipples for each cage. The experimental diets were offered to rabbits *adlibitum*. The rations were adjusted every week according to the average daily feed intake. Rabbits were weekly weighted in the morning before offering feed or water. Live body weight change and feed intake were recorded at weekly intervals. Feed conversion ratio was calculated as g feed/g gain. Performance index (PI%) was calculated (from 4th to 8th weeks of age) according to North (1981) as $PI = \text{Live body weight (kg)} \times 100 / \text{Feed conversion}$.

Hot carcass weight and dressing percentage: At the end of the feeding period (60 days), 10 rabbits were fasted for 16 hrs, weighted and slaughtered. Hot carcass weight and giblets (liver, heart and kidney) as a percentage of pre-slaughter weight was determined. The dressing percentage was calculated as the hot carcass weight in addition to giblets weight (dressed weight) divided by pre-slaughter weight.

Drinking filter water microbial determination: Appropriate dilutions prepared from each sample were used for inoculating different

Table 1: The ingredients and chemical composition of the pellet ration fed to rabbits, during the experimental period

Ingredients	(%)	Vitamins & Minerals premix per Kilogram.	
Clover hay	30.00	Vit.A (IU)	10,000
Wheat bran	26.20	Vit.D3 (IU)	2000
Barley	23.00	Vit.E (IU)	5000
Soybean meal (44%)	16.00	Vit.K (IU)	2
Molasses	3.00	Vit.B1 (IU)	2
Limestone	1.00	Vit.B2 (IU)	4
Sodium chloride	0.50	Vit.B6 (IU)	3
Vitamins & Mineral Premix	0.30	Vit.B12 (IU)	0.02
Total	100	Biotin (mg)	0.2
Calculated chemical composition *		Choline (mg)	1200
Crude protein (CP)%	16.72	Niacine (mg)	40
Ether extract (EE)%	2.95	Zn. (mg)	60
Crude fiber (CF)%	13.07	Cu. (mg)	0.1
Digestible energy (Kcal/Kg)	2490	Mn. (mg)	62
		Fe. (mg)	40
		Folic acid (mg)	1
		Pantothenic acid (mg)	15

* Calculated according to NRC (1977) for rabbits.

samples of water in selective media. The microbial determinations were applied as follows:

Total Aerobic Viable Counts: Aerobic bacterial counts were estimated on glucose yeast extract nutrient agar medium as the method reported by A.P.H.A. (2005) using pouring plate technique. Suitable plates were counted after incubation at 37°C for 48 hours.

Coliform and Faecal Coliform: Coliform and faecal coliform counts were estimated on Mac-Conkey agar (1905) using pouring plate technique. Suitable plates were counted after 24 hours at 37°C and 44.5°C for total coliform and faecal coliform counts, respectively.

Enterobacteriaceae Counts: Violet red bile glucose agar medium plates (European Directorate for the Quality of Medicines and Healthcare, 2008) were incubated with 1 ml of the appropriate dilutions and incubated overnight at 37°C. After incubation on clearly visible purple colonies surrounded by a purple halo were estimated as enterobacteriaceae counts (Difco, 2000).

Detection of *Salmonella*: The methods of Goorgola and Boothroyd (1965) and Khan and Mcaskey (1973) was applied by adding 225ml peptone water as preen richment medium to twenty-five g. of each sample and incubated at 37°C for 24 hours. After incubation the culture was streaked on difco brilliant green agar plates and examined after 25-28 hours (on this medium presumptive salmonella appears as pink colonies surrounded by brightred medium).

Enumeration of *Escherichia coli* 0157: H7: Culturemedia and imurogenetic separation reagents, the enrichment medium was modified tryptone soya broth (MTSB=N) containing novobiocin solution 20 mg/liter of MTSB (Bolton, *et al.* 1995 and ISO 6887, 2001) and the subculture on medium sorbitol Mac-Conkey agar (1905) containing defixime 1ml/ liter and potassium telluride 1 ml/ liter of sorbitol Mac- Conkey agar (Cefixime etlluritesorbitol Mac-Conkey agar (CT-SMAC) (Zadik *et al.*, 1994).

Total counts of yeast: were determined in a ruse-bengle chloramphenicol agar according the methods described in (Oxpoid Manual 2000). Plates were incubated at 22-25°C for 7 days.

Determiration of total count of fungi:Total counts of fungi were determined on petato dextrose agar (PDA) medium (Christensen, 1957).

pH Values:The value of pH was measured according to (Ling, 1963). pH values of samples were estimated by means of anelectric pH-meter (Wissenschaftlich-technic werkstatten D 8120 Weilheimp H40).

Statistical analyses: The data were statistically analyzed using GLM produces of SAS (1992). Duncan's test was applied in experiment when ever to test differences (Duncan, 1955). The following model was used:

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

Where: Y_{ij} = An observed trait, μ = Overallmean, T_i = Effect of treatment, e_{ij} = Random error.

RESULTS AND DISCUSSION

Body weight:

Data present in Table 2 indicated that, body weight of rabbit's supplemented with 2 and 3 ml/L. NMJ in drinking filter water recorded the highest values than those supplemented with 1 ml/L. NMJ or control diets through the 4 weeks of the experiment. Ibrahiem, *et al.*,(2004) showed that The

live body weight gain was increased by the addition of fresh onion and / or garlic at different inclusion rate.

Table 2. Initial and final body weight of growing rabbits as affected by supplemented with different levels of natural mixture juice (NMJ).

Traits	Growing periods (Weeks)	NMJ * levels in drinking filter water (ml/ liter)				Means ± SE
		0.0	1.0	2.0	3.0	
Initial body weight at 33 days age (gm)		742.1 ±12.52	761.9 ±18.41	753.5 ±14.65	749.8 ±16.73	751.8 ±17.4
Body weight weekly (gm)	1 st week	932.6 ±12.4 ^c	963.3 ±11.6 ^b	955.8 ±13.4 ^a	952.5 ±13.2 ^a	951.19 ±19.3
	2 nd week	1111.4 ±17.3 ^c	1181.3 ±16.8 ^c	1151.5 ±14.3 ^b	1149.5 ±14.6 ^a	1148.4 ±19.8
	3 rd week	1283.8 ±14.5 ^d	1356.7 ±15.1 ^c	1334.2 ±14.2 ^b	1341.3 ±14.6 ^a	1329.0 ±14.8
	4 th week	1445.6 ±19.6 ^d	1527.0 ±10.2 ^c	1511.3 ±15.9 ^b	1526.5 ±15.7 ^a	1502.6 ±17.1
Means ± SE		1193.4 ±13.8 ^d	1257.3 ±16.6 ^c	1238.2 ±17.3 ^b	1242.4 ±19.1 ^a	1232.8 ±17.1

- Means bearing different letter superscripts (a, b, c and d) within the same row are significantly ($P \leq 0.05$) different.

- NMJ = Natural mixture juice garlic, onion and lemon.

The obtained results and recorded observation clearly focused in group received ration supplemented with 3% garlic and 1% onion plus 3% garlic in feed boiler Muscovy duck. Similar finding were reported by El Afify (1997) who found that live body weight and live body weight gain were significantly improved in broilers chickens when fed diet containing onion or garlic extract or garlic residue. El Nawawy (1991) who reported that body weight gain of boiler chickens were improved when adding 1% fresh onion or garlic to their rations, also El Nahla (1983) who stated that adding 2% dry onion or garlic into broilers improved their live body weight gain. Garlic registered a statistically significant increase in body weight of chicken in comparison to the control group (Kumar, *et al.*, 2010). Ahmed *et al.* (2009) showed that, natural feed additive of 2.5%, significant ($P < 0.05$) increasing body weight compared with the control group in colves. On the contrary, Yalcin *et al.* (2007) reported that the body weight of chicken was unaffected by the dietary Garlic powder.

Feed intake:

Results of the feeding trial Table 3 indicated that there were an increase in daily feed intake with increasing the level of NMJ from 1st week to 3rd week of feeding, but the differences were significant. In the 4th week, the rabbits

received 3 ml NMJ/L in drinking water recorded the highest value of feed intake followed by 2 ml/L and 1 ml/L, while rabbits of control recorded the lowest value. These results were in close agreement with finding of Onu and Aja (2011), who showed that the Garlic and Ginger supplementation produced significant ($P < 0.05$) effects on feed intake of the rabbits. Also, agreement with Alm EI-Dien (1999) found that Isa-Brown and Fayoumi hens fed garlic in diets their consumed significantly more feed than control. Feed consumption was significantly more when hens fed garlic for 6 than for 3 days/week in diet. This effect was disappeared directly after feeding the basal diet. The present Our results also, agree with that obtained by EL Afify (1997), El Nahla (1983). Also, El Nawawy (1991) reported that feed consumption of broiler chickens fed garlic diet was higher by about 6% than the control. Also Ahmed *et al.* (2001) mentioned that juice of lemon, onion and garlic supplemented with different levels (0, 2.5, 5.0 and 7.5%) did not significantly affect the feed consumption of growing buffalo calves along the feed trial compared with the control, but animal which fed on diet of 2.5% natural juice tended to be good with the highest value. Also, Zaki *et al.* (2001) found similar results. On the other hand, The present Our results disagree with Ibrahiem, *et al.* (2004) observe a decrease in feed consumption in all supplemented groups and especially in groups received diet supplemented with 3% garlic or 1% onion + 3% garlic (5.2% - 4.6%) respectively. Horton *et al.* (1991a) found no obvious effect in feed consumption, when broilers fed powder garlic at the level of 0.1, 1.0 or 10.0 g/kg diet during 1-35 days of age and El-Habbak *et al.* (1989) who reported a significant decrease in feed consumption at the 3rd week of age when Japanese quail were fed garlic cloves in diet. Yalcin *et al.* (2007) reported that feed consumption of chicken was unaffected by the dietary garlic powder. They explained that the strong odor of garlic does not act as a deterrent of feeding. In another hand, Ali Nobakht (2013), Mourao *et al.* (2008) and Rizal *et al.* (2010) showed that the starter period adding 4.5% Dried Lemon Pulp and in grower and whole periods inclusion 1.5 to 4.5% Dried Lemon Pulp increased significantly the amounts of daily feed intake ($P < 0.05$) and agreement with report of Chaudry *et al.* (2004).

Daily weight gain:

Data in Table 3 cleared that daily weight gain of rabbits received 3 ml/L, 2 ml/L or 1 ml/L grew faster than control, respectively. These incorporation of such vegetable and fruitage juice mixtures had no adverse effect on palatability

and voluntary feed intake in rabbits. So, introducing different levels of NMJ significantly increased daily weight gain. In this respect, Ahmed *et al.* (2009)

Table 3. Daily feed intake and weight gain of growing rabbits as affected by supplemented with different levels of natural mixture juic (NMJ).

Traits	Growing periods (Weeks)	NMJ * levels in drinking filter water (ml/ liter)				Means ± SE
		0.0	1.0	2.0	3.0	
Daily feed intake (gm)	1 st week	77.14 ±4.13 ^{ab}	78.23 ±3.96 ^b	79.94 ±3.81 ^a	80.62 ±4.57 ^a	78.98 ±2.61
	2 nd week	80.79 ±4.72 ^c	84.31 ±6.01 ^b	87.39 ±5.82 ^a	88.52 ±4.95 ^a	85.25 ±3.41
	3 rd week	85.82 ±3.99 ^c	87.59 ±3.57 ^b	90.68 ±5.82 ^a	91.59 ±5.76 ^a	88.92 ±3.64
	4 th week	101.52 ±5.92 ^c	104.92 ±6.48 ^c	116.81 ±8.69 ^b	119.37 ±9.92 ^a	110.66 ±4.02
Means ± SE		86.32 ±3.41 ^d	88.76 ±3.41 ^c	93.71 ±4.18 ^b	95.03 ±4.71 ^a	90.96 ±3.42
Daily weight gain (gm)	1 st week	27.21 ±1.23 ^c	28.77 ±1.82 ^b	28.90 ±1.54 ^a	28.95 ±1.87 ^a	28.46 ±1.62
	2 nd week	25.54 ±1.11 ^c	27.14 ±1.03 ^b	27.96 ±1.64 ^a	28.15 ±1.91 ^a	27.20 ±1.53
	3 rd week	24.63 ±1.05 ^b	25.06 ±1.72 ^a	26.10 ±1.58 ^a	27.40 ±1.14 ^a	25.80 ±1.67
	4 th week	23.11 ±1.44 ^c	24.35 ±1.97 ^b	25.30 ±2.07 ^a	26.45 ±1.99 ^a	24.80 ±2.01
Means ± SE		24.37 ±1.86 ^c	26.33 ±1.92 ^b	27.07 ±1.98 ^a	27.74 ±2.01 ^a	26.38 ±1.69

- a, b, and c = Means within the same row bearing different letter superscripts are significantly (P ≤ 0.05) different.

pointed that, natural feed additive of 2.5%, significantly (P<0.05) increased daily weight gain compared with the control group. These results might be due to the effective to improve immunity and decreased ability incidence. Onu and Aja (2011) showed that garlic and ginger supplementation produced significant (P<0.05) effects on weight gain of the rabbits. Also, Ibrahiem, *et al.* (2004) mentioned that the daily weight gain of broiler Muscovy duck was increased by the addition of fresh onion and / or garlic at different rate in group received ration supplemented with 3% garlic and 1% onion plus 3% garlic. Similar finding were reported by El Afify (1997) who found that live body weight and live body weight gain were significantly improved in broilers chickens when fed diet containing onion or garlic extract or garlic residue. El Naway (1991) who

reported that body weight gain of boiler chickens were improved when adding 1% fresh onion or garlic to their rations, also, El Nahla (1983) who stated that adding 2% dry onion or garlic into broilers improved their daily weight gain. Ali Nobakht (2013), showed insignificantly increased the amount of daily weight gain in starter period adding dried lemon pulp whole experimental periods ($P < 0.05$). Whereas they had no significant difference among groups about daily weight gain in grower period the result agreement with Rizal *et al.* (2010), whereas not in agree with Mourao *et al.* (2008).

Feed conversion ratio:

There were significant ($P < 0.05$) differences among treatments in feed conversion ratio through the first 3 weeks Table 4. Rabbits supplemented with 1, 2 and 3 ml/L. NMJ recorded better FC than the control. The difference was not significant among the experimental tested groups at 4 weeks of age. These results were similar to those obtained by Ahmed *et al.* (2009) who revealed that, growing buffalo calves supplemented with 2.5% natural juice showed the best feed conversion, but the differences among all groups were not significant. Ibrahiem, *et al.* (2004) Showing that the supplementation of different levels of fresh onion and/or garlic to diets of broiler Muscovy duck (12th week) are improved that feed conversion ratio. Group fed supplemented diet with 3% garlic or 1% onion + 3% garlic showed the better feed conversion ratio (2.99 or 3.05) at 10th week and more economically while it was (3.67 or 3.74) at 12th week respectively. Bidura (1999) found that there is increase significantly ($P \leq 0.05$) in feed conversion ratio with increasing levels of garlic leaf meal in growing duck diet aged 0 – 8 weeks. The results might be due to the improve immunity and decrease debility incidence, which agree with the finding of Aboul-Fotouh *et al.* (1999) and (2000), Safaa (1999) who reported that, nutrition plays important role in diminishing growth rate. Abdo (1998) observed better feed conversion by using garlic in broiler diet, feed conversion was 1.61, 1.79 and 1.81 for 6, 3 and 0% garlic groups respectively. Onu and Aja (2011) showed that garlic and ginger supplementation produced significant ($P < 0.05$) effects on feed conversion ratio of the rabbits. These improvements may be attributed to the properties of this material that act not only as antibacterial, antiprotozoal and antifungal but also as antioxidant (Bradley, 1992 and Anwar and Meki, 2003). These results are in agreement with Dafwang *et al.* (1985) who demonstrated improvement in feed conversion ratio of chicks due to decrease in small intestine thickness resulted from feeding dietary antibiotics.

Table 4. Feed conversion ratio and performance index of growing rabbits as affected by supplemented with different levels of natural mixture juice (NMJ).

Traits	Growing periods (Weeks)	NMJ * levels in drinking filter water (ml/ liter)				Means ± SE
		0.0	1.0	2.0	3.0	
Feed conversion	1st week	2.83 ±0.15 a	2.72 ±0.13 b	2.77 ±0.14 bc	2.78 ±0.15 c	2.78 ±0.07
	2nd week	3.16 ±0.21 a	3.12 ±0.23 b	3.13 ±0.19 b	3.14 ±0.19 c	3.14 ±0.10
	3rd week	3.48 ±0.19 a	3.50 ±0.21a	3.47 ±0.22 a	3.34 ±0.24 b	3.45 ±0.12
	4th week	4.39 ±0.24 c	4.31 ±0.20 c	4.61 ±0.23 a	4.51 ±0.25 b	4.46 ±0.19
Means ± SE		3.49 ±0.41b	3.41 ±0.26 ab	3.50 ±0.18 ab	3.44 ±0.17 b	3.45 ±0.14
Performance index%	1st week	31.83 ±1.86 b	35.44 ±2.02 a	34.51 ±2.05a	34.26 ±2.01a	34.22 ±1.76
	2nd week	35.17 ±1.53 b	37.86 ±1.48 a	36.79 ±1.56 a	36.60 ±1.84 a	36.57 ±1.25
	3rd week	36.89 ±1.19 c	38.74 ±2.31b	38.45 ±2.24 b	40.15 ±1.46 a	38.52 ±1.09
	4th week	32.93 ±1.92 b	35.43 ±1.88 a	32.78 ±1.96 b	33.85 ±1.84b	33.69 ±0.92
Means ± SE		34.18 ±0.84b	36.87 ±1.11a	35.38 ±1.53 a	36.12 ±1.74 a	35.63 ±1.07

- a,b,c,d = Means within the same row bearing different letter superscripts are significantly (P ≤ 0.05) different.

.- Feed conversion= Feed intake/ weight gain - Performance index%= (Body weight (kg)/ Feed conversion ratio)

On the contrary, Yalcin *et al.* (2007) reported that feed consumption and feed efficiency of chicken were unaffected by the dietary garlic powder. While El Afify (1997) who found slight insignificant improvement in feed conversion ratios associated with adding garlic or its fractions into chick's diets, the value of feed conversion ratio for entire experiments periods (0 – 5 weeks) were 1.83, 1.88, 1.86, 1.89 and 1.91, respectively for minced garlic, garlic juice, garlic residue, garlic oil and control group. Improvement in feed conversion rate attributed to the reduction of small intestine thickness since the nutrient absorption is more efficient through thinner intestinal wall that reflected on the improvement of absorption which translated to improvement in feed conversion.

Performance index (PI%):

The performance index results of rabbits supplemented with 2 or 3 ml natural juice in drinking water showed significantly (P < 0.05) higher values than those supplemented with 1ml and control Table 4. Performance index values were increased by (28.38, 62.42 and 35.15%) for 1, 2 and 3 ml /L. drinking

filter water natural juice, respectively than those of the control. Ibrahiem *et al.*,(2004) reported that the better performances were obtained when broiler Muscovy duck were fed a diet supplemented with 3% garlic(104.9%) or 1% onion +3% garlic(101.6 %) as both of them consumed less feed and achieved high final live body weight than other groups.

Carcass characteristic:

Table 5 showed the carcass characteristics of slaughtered rabbits. The differences in carcass weight traits as a result to the effect of adding natural juices of vegetables (garlic and onion) and fruitage (limon) mixture to rabbit diets were significant ($P < 0.05$). Under the condition of this experiment, it appears that, the highest values for dressing % was recorded with rabbits in groups of 3 and 2 ml/L./NMJ in drinking filter water compared to those had 1 ml/L NMJ. Or the control.

The results of offals (spleen, two kidneys, liver, heart and lung weight) of rabbits supplemented with 3 and 2 ml/L. in drinking filter water NMPJ have the same trend of the previous results. The data were in agreement with those reported by Raeesi *et al.* (2010) who reported that, carcass yield was higher in birds fed 1% garlic powder than those received 0.5 and 3 %. On the contrary EL Afify, (1997) showed that liver weight of broiler were decreased by feeding onion and/or garlic supplemented rations with 11%, 6%, 8% and 11% for groups of chicks fed fresh garlic, fresh onion, dry garlic and dry onion respectively. kamal, (2011) mentioned that, supplementation of Garlic powder had non significant effect on broilers carcass weight or dressing percentages. On other hand, these results disagreements with those obtained. This may be due to inhibition of fatty acids synthesis and other lipid components in liver and reduce the level of fat accumulation in liver, which leads to a decrease in liver weight.

Mortality rates:

Table 6 represents the results of supplemental NMJ treatments on mortality percentage of growing rabbits. No significant differences among the different treatments were found in the mortality percentage of growing rabbits from 1 to 4th weeks of age. However, adding 3 and 2 ml/L NMJ in drinking water improved viability of growing rabbits. On the other hand, a relatively low mortality rate (10.90 and 12.73%) was observed in rabbits with 3 and 2 ml/L.NMJ in drinking filter water, while rabbits in control group recorded the highest mortality rates (21.818%) during the whole experimental period. Similarly in

Table 5. Dressing percentage and internal organs weight of growing rabbits as affected by supplemented with different levels of natural mixture juice (NMJ).

Traits	NMJ * levels in drinking water (ml/ liter)			
	0.0	1.0	2.0	3.0
<i>Alive pre-slaughter body weight (g)</i>	1485.8 ±45.2 ^d	1510.3 ±47.1 ^c	1525.4 ±47.9 ^b	1531.5 ±51.3 ^a
Carcass weight(g)	879.2 ±29.4 ^d	910.6 ±32.7 ^c	947.4.7 ±34.4 ^b	963.3 ±36.0 ^a
Dressing weight(%)	59.17 ±1.01 ^c	60.29 ±1.11 ^b	62.11 ±1.27 ^a	62.90 ±1.18 ^a
<i>Spleen weight:</i>	1.11 ±0.14 ^c	1.49 ±0.21 ^b	1.99 ±0.26 ^a	2.04 ±0.25 ^a
Absolute (g)	0.075 ±0.01 ^c	0.09 ±0.010 ^{bc}	0.11 ±0.011 ^a	0.11 ±0.013 ^a
Relative (%)				
<i>Kidneys weight:</i>	13.24 ±0.98 ^b	14.17 ±1.02 ^{ab}	15.23 ±1.12 ^a	15.84 ±1.24 ^a
Absolute (g)	0.89 ±0.002 ^d	0.851 ±0.001 ^c	0.86 ±0.001 ^b	0.87 ±0.001 ^a
Relative (%)				
<i>Liver weight:</i>	36.25 ±2.61 ^b	35.41 ±3.01 ^{ab}	37.39 ±3.11 ^a	37.71 ±3.24 ^a
Absolute (g)	2.44 ±0.11 ^c	2.34 ±0.13 ^{bc}	2.45 ±0.10 ^b	2.46 ±0.12 ^a
Relative (%)				
<i>Heart weight:</i>	7.54 ±0.86 ^b	7.13 ±0.91 ^{ab}	8.19 ±1.02 ^a	8.32 ±1.13 ^a
Absolute (gm)	0.47 ±0.017 ^b	0.47 ±0.022 ^{ab}	0.46 ±0.022 ^a	0.46 ±0.021 ^a
Relative (%)				
<i>Lungs weight:</i>	7.12 ±1.02 ^b	8.03 ±1.13 ^{ab}	9.25 ±1.26 ^a	9.51 ±1.35 ^a
Absolute (gm)	0.48 ±0.036 ^b	0.48 ±0.033 ^{ab}	0.52 ±0.033 ^a	0.53 ±0.035 ^a
Relative (%)				

a,b,c,d = Means within the same row bearing different letter superscripts are significantly (P ≤ 0.05) different.

Table 6: Post weaning mortality rate of growing rabbits as affected by filter water supplemented with different levels of NMJ * (Means ± SE).

Traits	Growing periods (Weeks)	NMJ * levels in drinking filter water (ml/ liter)			
		0.0	1.0	2.0	3.0
Number of Rabbits at end of experimental	1 st week	50	51	52	52
	2 nd week	46	47	49	50
	3 rd week	44	46	48	49
	4 th week	43	45	48	49
Mortality rates	1 st week	9.091 ^a	7.273 ^b	5.455 ^c	5.455 ^c

(%)	2 nd week	8.000 ^a	7.843 ^a	5.769 ^b	3.846 ^c
	3 rd week	4.348 ^a	2.128 ^b	2.041 ^b	2.000 ^b
	4 th week	2.273 ^a	2.174 ^a	0.000 ^b	0.000 ^b
Total post weaning mortality rate		21.818 ^a	18.182 ^b	12.727 ^c	10.909 ^d

a,b,c,d = Means within the same row bearing different letter superscripts are significantly ($P \leq 0.05$ or 0.01) different

broilers, it was reported that garlic as a natural feed additive decreased mortality rate (Tollba and Hassan, 2003 and Kamal, 2011).

Microbiological quality of supplemented drinking water:

Table 7 showed the mean of aerobic plate count, total fecal coliform, total coliform and total Enterobacteria count in drinking filter water with or without natural additive. The mean aerobic plate count of water was (105×10^3) before addition, while it was (24×10^5 , 6×10^5 and 16×10^4) with adding 1, 2 and 3%, respectively of the natural additive. Total aerobic counts were not higher than the recommended safety. The mean total aerobic count for water analyzed is 7.3×10^{-3} (cfu/g). For instance, all samples having total aerobic counts (T.A.B.C.) less than the recommended safety limit of 10^4 cfu / g proposed by the International Dietetics of Association of European Community (IDAEC) and the Egyptian Organization for Standardization. (2004). Ahmed *et al.* (2009) pointed that, the mean aerobic plate count of water was (90×10^{-2} , 320×10^{-2} , 36×10^{-2} and 77×10^{-2}), respectively before addition of the natural additive. These findings are consistent with the quality of water reexamined in drinking filter water, where the mean total aerobic count obtained in various concentration levels were less than that without additive. The highest concentration level was the least than other concentration levels. The growth of the bacterial strains in different supplemented water was less or not detected after the inhibition effect of the juice at various concentrations. The three levels of juice inhibited the bacterial growth and total coliform; total fecal coliform counts; total enterobacteriaceae counts and *E.coli* 01507. Natural additive contains garlic, onion and lemon juice, garlic contains 0.3-0.5 allicin and antimicro component (Shelef, 1993). According to Kumar and Berwal (1999) and Zaika and Kissinger, 1983) the gram-positive are generally more sensitive to allicin than gram-negative bacteria. Acetic acid bacteria are the most resistant among the gram positive bacteria. Abdou *et al.* (1972) concluded that 5-10% fresh garlic was sufficient to inhibit the growth of *E.coli*. The same trend was observed in onion. Total yeast count were increased with increasing the level of supplementation of natural juice but the total fungi counts were

decreased. Also, natural juice did not show any other antimicrobial effect on

Table 7: The effect of different levels feed additive NMJ on determined growth microbial strain of drinking filter water on growing rabbits.

Items	T.A.B.C.	T.C.C.	F.C.C	T.Y.C.	T.F.C.	T.E.B.C	E. coli
Filter water (control)	31x10 ⁻³	74x10 ⁻²	49x10 ⁻²	20x10 ⁻²	5x10 ⁻⁵	34x10 ⁻³	+
Filter water + (1ml NMJ/L.)	41x10 ⁻⁴	55x10 ⁻²	37x10 ⁻²	27x10 ⁻²	2x10 ⁻⁵	9X10 ⁻³	+
Filter water+ (2ml NMJ/L.)	8X10 ⁻³	41X10 ⁻³	20X10 ⁻²	30x10 ⁻²	1x10 ⁻⁵	7X10 ⁻³	-
Filter water+ (3ml NMJ/L.)	12x10 ⁻³	18x10 ⁻³	13x10 ⁻²	35x10 ⁻²	0x10 ⁻⁵	15x10 ⁻²	-

T.A.B.C.=Total aerobicbacterialcounts, T.C.C.= Total Coliform counts; F.C. C= feacal coliform counts; T.Y.C. = Total yeast count; T.F.C. = Total fungi counts; Total EnterobacteriaceCounts = T.E.B.C

Salmonella and *E. coli*. The present results agree with Gherbawy, (1989). Shiva Kumar, *et al.* (2010) observed the supplemented of garlic active based growth promoter to broiler diets was able to reduce the *Salmonella* and *E. coli*. counts in the intestine when in compersion to the negative control and improve growth performance of broiler.

Conclusively, the results obtained can be recommended that supplements of natural additive mixture of juice, garlic, onion and lemon (NMJ) can be used up to 3ML / L. in filtered drinking water, which gave good results without any adverse effects on growth performance and the best decrease mortality rate of rabbits. Can be used as additives, natural lemon juice, onion, garlic successfully and be safe in drinking water filtered to further improve the performance of rabbits. This study demonstrates that the must be many of the additional studies to further studies are required to more investigate the effect of the natural additive.

REFERENCES:

Abdo, Z. M. A. (1998). The effect of using some natural growth promoter and fats on broiler performance and immunity. Ph. D. Thesis, Faculty Of Agriculture, Animal production department, Cairo University, Giza, Egypt.

Abdou, I. A., A. A. Zeid, M. R. El-Sherbeeney and Z. H. Abou-El-Gheat (1972). Antimicrobialactivitiesof *Allium sativum*, *Allium cepa*, *Raphanus sativus*, *Capsicum frutescens*, *Eruca sativa*, *Allnom kurral* on bacteria. *Qualitus plantarum et. Materiae vegetables*,**22**: 29-35.

Aboul-Fotouh, G. E., S. M.Allam,E. I. Shehata and Abd El-Azeem, S. N. (2000).Effectofsomemedicinal plants as feed additives on milk production and

- composition of lactating buffaloes. *Egyptian J. Nutrition and Feeds*, **3**(1): 31-41.
- Aboul-Fotouh, G. E., S. M. Allam, E. I. Shehata and Abd El-Azeem, S. N. (1999).** Effect of some medicinal plants as feed additives on performance of growing sheep. *Egyptian J. Nutrition and Feeds*, **2**(2):79-87.
- Ahmed, A. A.; I. Neamat Bassuony; Set El-Habiab S. Awad; A. M. Aiad and S. A. Mohamed (2009).** Adding Natural Juice of Vegetables and Fruitage to Ruminant Diets(B) Nutrients Utilization, Microbial Safety and Immunity, Effect of Diets Supplemented with Lemon, Onion and Garlic Juice Fed to Growing Buffalo Calves. *World Journal of Agricultural Sciences*, **5** (4):456-465.
- Ali Nobakht(2013).** Evaluation the effects of different levels of dried lemon (*Citrus aurantifolia*) pulp on performance of broilers and laying hens. *International Research Journal of Applied and Basic Sciences* © 2013 Available online at www.irjabs.com ISSN 2251-838X / Vol, **4** (4): 882-888 Science Explorer Publications.
- Ali, M. and Thomson M. (1995).** Consumption of a garlic clove a day could be beneficial in preventing thrombosis. *Prostaglandins Leukot Essent Fatty Acids*; **53**:211–2.
- Ali M., Al-Qattan K. K., Al-Enezi F., Khanafer R. M. and Mustafa T. (2000).** Effect of allicin from garlic powder on serum lipids and blood pressure in rats fed with a high cholesterol diet. *Prostaglandins Leukot Essent Fatty Acids*; **62**:253–9.
- Alm E I-Din, A. K. (1999).** Physiological studies on cholesterol in laying hens. M.Sc. Theses, Faculty of Agriculture Animal Reproduction Department, Cairo Univ. Giza , Egypt.
- Anwar, M. M. and Meki, A. R. (2003).** Oxidative stress in streptozotocin- induced diabetic rats: effects of garlic oil and melatonin. *Comp. Biochem Physiol A Mol Integr Physiol.*, **135**:539–547.
- A.P.H.A. (American Public Health Association), AWWA (American Water Works Association), WEF. (2005):** *Standard Methods for the Examination of Water and Wastewater*. 21th ed. Washington, DC.
- Banerjee S. K, Maulik S. K. (2002).** Effect of garlic on cardiovascular disorders: a review. *Nutr. Journal*; **1**:4.
- Bolton, F. J., L.Croziev and J. K. Wiliamson, (1995).** Optimization of methods for isolation of *Escherichia coli* 0157:H7 from beef burgers PHL Smicrobiol. *Digest*, **12**:67-750.
- Bradley, P.R. (1992).** British herbal medicine association. *British herbal compendium, Rolnic zych.*, **1**(434): 395-399.
- Bidura, I. G. N. G. (1999).** The effect of garlic (*Allium sativum*) leaf meal in diets on performance of growing indonesian ducks. *Majalah Ilmiah Peternakan(Indonesia)*, **2**(6):48-53.

- Christensen, G.M.,(1957).** Deterioration of stored grous fungi. *Botan. Rev.*, **23**: 108-134.
- Chaudry M. A.; Badshan A.; Bibi N., Zeb A.; Ahmed T.; Ali S.and Termeulen U. (2004).** Citrus waste in poultry rations. *Arch Geflu'gelk.*, **68**: 206-210.
- Difco, (2000).** Difco manual of dehydrated culture media and reagents for microbiological and clinical laboratories products. Ninth Edition Difco Laboratories, Detroit Mi.: Change, USA.
- Duncan,D.B., (1955).** Multiple Range and Multiple- Test. *Biometrics*,**11**:142
- El-Habbak, M. M.; Saleh, K.; Arbid, M. S.; Hegazi ,A. G. and Sofy ,H. (1989).** Influence of garlic (*Allium Sativum* L.) on some biological and biochemical changes in Japanese quail with special reference to its hypocholesterolemic activity. *Archive-fur Gefluelkunde.* (53)2: 73.
- El-Nahla, A. M. M. (1983).** Effect of some feed additives on blood constituents and growth rate in chickens. M. Sc. Thesis, Faculty of Veterinary Medicin, Cairo University Egypt.
- El-Nawawy, G. H. (1991).** Some of non conventional ingredients in broiler ration. M. Sc. Thesis, Ainm. Prod. Dep. Fac., Agric., Ain-Shams Univ.
- El-Afify, S. F. (1997).** Nutritional studies on onion and garlic supplement to poultry feed Ph. D. Thesis, Anim., Prod. Dep. Faculty Agriculture, Ainshams Uuiv.
- European Directorate for the Quality of Medicines and Healthcare (2008).** The *European Pharmacopoeia*, 6th ed., Supp. 1, 4-1-2008, online. European Directorate for the Quality of Medicines and Healthcare, Council of Europe, 226 Avenue de Colmar BP907-, F-67029 Strasbourg Cedex 1, France.
- Gherbawy,Y. A. M. H.,(1989).** Studies on the mycoflora of pens and feedstuffs of cattle and chickens in Upper Egypt. M.Sc. Thesis, Bot. Dept., Fac. Sci. Qena. Assuit Univ., Egypt. *Egypt. J. Microbial. Sci.*, **75**(1):52-55.
- Goorgola, D. L. and M. Boothroyd, (1965).** A system for detection salmonella in meat and meat product. *J. Appl. Bacteriol.*, **28**:206.
- Guarrera, P. M. (1999).** Traditional antihelmintic, antiparasitic, and repellent uses of plants in central Italy. *J. Ethnopharmacol.*, **68**,183-192.
- Horton, G.M.I.; Fennell, J. and Prasad, B.M. (1991a).** Effects of dietary garlic (*Allium Sativum*) on performance, carcass composition and blood chemistry changes in broiler chicken. *Can.J. Animal Science*, **71**: 939 – 942.
- Ibrahiem, A. Ibrahiem; Talib A. Elam; Fathi F. Mohamed; Sabry A. Awadalla; Yousif, I. Yousif (2004).** Effect of onion and / or garlic as feed additives on growth performance and immunity in broiler Muscovy ducks. 1st *Ann. Confr. , FVM.*, Moshtohor, Sept, 2004, 236-247.
- ISO- 6887 (2001).** Microbiology of food and animal feed ingredients preparation of test samples, initial suspension and decimal dilutions for microbiological examination.

- Kamal, J.(2011).** Performance and lipid profile of broilers fed two medicinal plants. Master in Animal Production, Faculty Of Graduate Studies, An-Najah National University, Nablus, Palestine.
- Kumar, M. and Berwal, J. S. (1999).**Sensivity of food pathogens to garlic (*Allium sativum*). *3rd of Appl. Microbiol.*, **84**: 213-215.
- Kumar S, Sharadmma KC, Radhakrishna PM (2010).** Effect of a garlic active based growth promoter on growth performance and specific pathogenic intestinal microbial counts of broiler chicks. *Int. Journal Poult Sci.*, **9**: 244-246.
- Khan, N. A. and A. D. Mcaskey, (1973).** Incidence of salmonella in commercially prepareds and wiches for the vending trades. *J. Milk Food Technol.*, **39**:315.
- Line-Eric, J. J. Stan Bailey, C. A. Nelson, S. J. Norman and T. Thomas, (1998).** Effect of yeast supplemented feed on *Salmonella* and company lobacter population in broilers. *Poultry Sci.*, **77**:405.
- Ling, E. R., (1963).** *In a Text Book of Dairy Chemistry*. Vol.2 Practical 3rdEd. Chapman and Hall.Ltd London, UK.
- MacConkey, A. (1905).** Lactose-fermenting bacteria in feces. *J. Hyg.*. 5:333-378.
- Mahesar H.; Bhutto M. A.; Khand A. A., Narejo N. T.(2010).** Garlic used as an alternative medicine to control diabetic mellitus in alloxan-induced male rabbits. *Pak. J. Physiol*; **6** (1).
- Mahmoud. K.; Gharaibeh , S. and Qatramiz K. (2010).** Effect of garlic (*Allium sativum*) supplementation on egg quality and yolk cholesterol in layer hens. *Asian-Aust. J. Anim. Sci.*, **23** (11): 1503.
- Mourao J. L., Pinheiro V. M., Prates A.M., Bessa R. J. B., Ferreira L. M. A. (2008).** Effect of dietary dehydrated pasture and citrus pulp on the performance and meat quality of broiler chickens. *Poult Sci.*, **87**: 733-743.
- Muhammad J., Durrani F., Hafeez A., Khan R.U. and Ahmad I. (2009).** Effect of aqueous extract of plant mixture on carcass quality of broiler chicks *Journal of Agriculture and Biological Science*, **9**: 56-59.
- Mulumbet Worku, Franco R., Baldwin K. (2009).** *Arch. Biol. Belgrade*, **61**(1), 135-140.
- Neamat I. Basuony (2004).** Microbial contamination of fresh meat and poultry during home handling. Thesis D. Ph., Faculty Of Agriculture Alexandria University, Egypt.
- North, M. O. (1981).** *Commercial Chicken Production*. Animal 2nd Edition, AV., Publishing Company I.N.C., Westpost Connecticut, USA.
- Olsson, M.E.; Gustavsson, K.E.; and Vågen, I.M. (2010).** "Quercetin and isorhamnetin in sweet and red cultivars of onion (*Allium cepa* L.) at harvest, after field curing, heat treatment, and storage". *Journal of Agricultural Food Chemistry*, **58** (4): 2323–2330.
- Onu P. N. and Aja P. M. (2011).** Growth performance and haematological indices of weaned rabbits fed garlic (*Alium sativum*) and ginger (*Zingiber officinale*) supplemented diets. *International Journal of Food, Agriculture and Veterinary*

Sciences ISSN: 2277-209X (Online) An Online International Journal Available at <http://www.cibtech.org/jfav.htm> 2011 Vol. 1 (1) October-December, pp.51-59/Onu and Aja Research Article, 51.

- Onu, P.N., (2010).** Evaluation of two herbal spices as feed additives for finisher broilers. *Biotech. In anim. Husb.* 26(5-6), p 383-392. Onu P. N and P. M., Aja (2011). Growth performance and haematological indices of weaned rabbits fed garlic (*Allium sativum*) and ginger (*Zingiber officinal*) supplemented diets. *Journal Food, Agric. and Veter. Science*, **1**(1), pp.51-59.
- Oxoid Manual (2000).** *Oxoid Manual of culture Media Ingredients and other Laboratory Services*. 4th Oxoid Ltd).
- Prior, R.L., (2003).** Fruit and vegetables in the prevention of cellular Oxidative damage. *Am. J. Clin. Nutr.*, **78**: 570S-578S.
- Pervez A (1992).** Response of broiler chicks to different feed additives. M.Sc Thesis NWFP Agricultural University, Peshawar, Pakistan.
- Raeesi, M., Hocini-Aliabad, S.A., Roofchae, A., Zare Shahneh, A. and Pirali, S. (2010).** Effect of periodically use of garlic (*Allium sativum*) powder on performance and carcass characteristics in broiler chickens. *World Academy of Science, Engineering and Technology*, **68**: 1213- 1219.
- Rees LP, Minney SF, Plummer NT, Slater JH, Skyrme DA.A. (2005).** quantitative assessment of the antimicrobial activity of garlic (*Allium sativum*). *World Journal Microbiol Biotechnol*; **9**:303–7.
- Rizal Y., Mahata M. E., Andriani M., Wu G. (2010).** Utilization of juice wastes as replacement in broiler diet. *Int. Journal Poult Sci.*, **9**: 886-889.
- Safaa Nadi, (1999).** The use of some medicinal plants in ruminant nutrition. Ph.D. Thesis, Faculty of Agriculture, Fayoum, Egypt
- SAS, (1992).** User's guide: *Statistics.*, SAS Inst., Inc., Cary, Nc.
- Shelef, I. A., (1993).** Antimicrobial effect of spices. *J. of Food Safety*, **6**:29-44.
- Shiva Kumer, K. ; C. Sharadamma and P. M. Radhakrishna (2010).** Effect of a garlic active based growth promoter on growth performance and specific pathogenic intestinal microbial counts of broiler chickens. *International Journal Of Poultry Science*, **9**(3):244-246.
- Slimestad, R.; Fossen, T.; Vågen, I. M. (2007).** "Onions: a source of unique dietary flavonoids". *Journal of Agriculture and Food Chemistry*, **55** (25): 10067–80.
- Thomson M., Al-Amin Z. M., Al-Qattan K. K., Shaban L. H., Ali M. (2007).** Anti-diabetic and hypolipidaemic properties of garlic (*Allium sativum*) in streptozotocin-induced diabetic rats. *Int. Journal Diabetes Metabolism*, **15**:108–15.
- Toulah, F. H. and M. M. Al-rawi (2007).** Efficacy of garlic extract on hepatic coccidiosis in infected rabbits (*Oryctolagus cuniculus*): Histological and biochemical studies. *J. Egypt. Soc. Parasitol.*, **37**(3), 957-968.

- Tollba, A.A.H. and M.S.H. Hassan, (2003).** Using some natural additives to improve physiological and productive performance of broiler chicks under high temperature conditions. Black cumin (*Nigella sativa*) or Garlic (*Allium sativum*). *Poult. Sci. Journal*, **23**; 327-340.
- Yasmin Khan, Rafeeq Alam Khan*, Syeda Afroz and Afshan Siddiq(2010)** .Evaluation of hypolipidemic effect of citrus lemon. *Journal of Basic and Applied Sciences* Vol. 6, No. 1, 39-43.
- Williamson, Gary; Plumb, Geoff W.; Uda, Yasushi; Price, Keith R.; Rhodes, Michael J. C. (1997).** "Dietary quercetin glycosides: antioxidant activity and induction of the anticarcinogenic phase II marker enzyme quinone reductase in Hepalcl7 cells". *Carcinogenesis*,**17** (11): 2385–2387.
- Zadik, P. M.; P. A. Chapman and C. A. Siddons, (1994).** Immunomagnetic separation as a sensitive method for isolating *Escherichiacoli*0157:H7 from food samples. *Epidemiol. Infection*, **113**:31-39.
- Zaiaka, L.A. and J.C. Kissinger, (1983).** Inhibitory and stimulatory effects of oregano on *Lactobacillus planetarium* and *Pediococcus cerevisiae*. *Journal of Food Sci.*, **46**:1205-1210.
- Zaki, A. A., M. R. Mostafa, R. T. Fouad and Z. M. Marei (2000).** Teosint (*Zeamexicanal*) forage productivity quality and its feeding effect on performance of buffalo calves) *Proc. Conf. Anim. Growth Prod. In 21th Centurysakha*, 18-20 Apri., pp:1737-244.
- Yalcin, S., L. Onbaşilar, A. Şehu, and S. Yalcin. (2007).** The effects of dietary garlic powder on the performance, egg traits and blood serum cholesterol of laying quails. *Asian-australas. J. Anim. Sci.*, **20**:944–947.

تأثير اضافة مخلوط العصير الطبيعي للبصل و الثوم و الليمون فى ماء الشرب المفلتر على أداء الأرانب النامية

- د.عزة محمد محمد بدر^١ و د.نعمات بسيونى^١ و د.فضيلة محمد عيسى^٢ و د.مجدى فؤاد سليمان حنا^١
 ١- المركز الأقليمي للأغذية والأعلاف بمركز البحوث الزراعية – ٩ شارع الجامعة - جيزة - مصر
 ٢- معهد بحوث الانتاج الحيوانى – الدقى – جيزة - مصر

أجريت هذه الدراسة على ٢٢٠ أرنب نامى مطلى خليط وكان وزن الجسم الحى فى بدايه التجربه ٧٥١,٨ + ٢٢,٤ جرام و عند عمر ٣٣ يوم . قسمت الأرانب الى أربع مجموعات تجريبية عشوائيا (كل مجموعه ٥٥ أرنب). غذيت المجموعات التجريبية على مخلوط علف مركز (١٦,٧٢% بروتين خام و ١٣,٠٧% الياف خام). المجموعه الاولى (الكنترول¹ D¹) غذيت بدون اضافة MNJ (مخلوط العصير الطبيعي المكون من الثوم والبصل و الليمون)، بينما أضيف للمجموعات الثانية (D²) و الثالثة (D³) و الرابعة (D⁴) ١ & ٢ & ٣ مل/ لتر ماء شرب مفلتر على التوالى. استمرت تجربه التغذية ٤ أسابيع ، وكان الهدف من الدراسة هو تقييم اضافة مخلوط العصير

USING NATURAL MIXTURE JUICE IN FILTER DRINKING WATER ON RABBITS 75

الطبيعى الى ماء الشرب المفلتر اليومى على الزيادة الوزنية و كفاءة التحويل الغذائى ووزن الذبائح والتصافى ونوعية الميكروبات فى ماء الشرب.

أشارت النتائج الى أن العلف المأكول اليومى للأرانب قد زاد بزيادة وجود العصير الطبيعى فى ماء الشرب المفلتر أكثر من مجموعة الكنترول. الأرانب التى أضيف لها مخلوط العصير الطبيعى الى ماء الشرب مفلتر بواقع ٣ & ٢ & ١ مل/لتر قد سجلت نموا أسرع بالمقارنه بالكنترول على و سجل وزن الجسم النهائى للأرانب التى أضيف اليها ٢ & ٣ مل / لتر ماء الشرب المفلتر نفس النتائج السابقة.

كانت هناك اختلافات معنويه(٥%) بين المعاملات التجريبية فى معدل التحويل الغذائى خلال الاربع اسابيع الاولى من التجربة سجل وزن الذبائح و%التصافى للارانب التى اخذت عصير طبيعى فى ماء الشرب اعلى قيمه معنوية(٥%) عن مجموعة الكنترول. بالنسبة الى نوعيه الميكروبات فأن زيادة مستوى مخلوط العصير الطبيعى فى ماء الشرب المفلتر قد قلل من اعداد البكتيريا الهوائية والكوليفورم الكلى والانتيروبيكتيريا والخمائر والفطريات كما لا توجد بكتيريا الاشيرشيا كولاى فى ماء الشرب المفلتر.

التوصية : النتائج المتحصل عليها يمكن التوصية بأن المكملات الغذائية من خليط من عصير المضافة الطبيعية والثوم والبصل والليمون (NMJ) يمكن استخدامه حتى ٣ مللى / لتر من ماء الشرب المفلتر، والتي أعطت نتائج جيدة من دون أي آثار سلبية على اداء النمو وأفضل انخفاض فى نسبه النفوق الأرانب. يمكن استخدام إضافات، عصير الليمون الطبيعى، والبصل، والثوم بنجاح وتكون آمنة في مياه الشرب المفلتر لزيادة تحسين أداء الأرانب. وتوضح هذه الدراسة أن متوسط الزيادة اليومية كان أكثر مما كان متوقعا ويجب أن يكون العديد من الدراسات الإضافية لمزيد من دراسة تأثير المادة المضافة الطبيعية.