Egypt. Poult. Sci. Vol. (38)(III): (877-893) (2018) (**1805-1032**)

Egyptian Poultry Science Journal

http://www.epsj.journals.ekb.eg/

ISSN: 1110-5623 (Print) – 2090-0570 (Online)

INFLUENCE OF SPRAYING GARLIC OIL ON EMBRYONIC DEVELOPMENT, HATCHABILITY, PHYSIOLOGICAL PARAMETERS, POST-HATCH CHICK GROWTH AND BACTERIAL CONTAMINATION OF FERTILE QUAIL EGGS

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Received: 05 / 07 /2018 Accepted: 12 / 09 /2018

ABSTRACT: Garlic oil has a strong antibacterial activity against a wide range of gram-negative and gram-positive bacteria as well as, antifungal properties. This study aimed to assess the effects of spraying fertile hatching eggs of Japanese quail with garlic oil solution on embryonic development, hatchability, physiological parameters, post-hatch chick growth and bacterial load on eggshell surface. Four hundred hatching eggs of Japanese quails were equally divided into four treatment groups. Eggs of the first group served as a control group without any treatment. Also, eggs of the second group served as a control but sprayed only with distilled water. Eggs of the third and fourth groups were sprayed by 1ml/liter and 2ml/liter garlic oil solution, respectively. Embryo weight, shank length, body length as well as, chick weight, chick shank length, chick body length and hatchability tended to be higher significantly ($P<0.05$) in eggs treated with garlic oil solutions when compared with control eggs. While hatch time, embryonic mortality, egg albumen weight ratio, egg shell thickness and egg weight loss ratio at 14 days of incubation were significantly ($P<0.05$) decreased in eggs sprayed with garlic oil solutions when compared with control eggs. Blood hematological parameters (RBCs, Hb and PCV), plasma total protein, albumin, total lipids, hormones, immunoglobulin G (IgG) were significantly increased ($p<0.05$), while plasma glucose was decreased. There was no effects on plasma cholesterol compared to control. WBCs count was slightly increased in number in response to spraying with garlic oil solution. Carcass constituents of chicks at hatch and growth performance (body weight, feed intake and body weight gain) of chicks at 14 days of age recorded significant higher values and improved feed conversion in response to spraying with garlic oil solutions. In contrast, yolk residual of chicks at hatch was lower than control group. Application of garlic oil had significant influence on TBC on the surface of egg shell either at one week or after two weeks of incubation compared to control groups. Intestinal total aerobic, anaerobic micro-flora counts and the count of total coliform of chicks were decreased.

In conclusion, Spraying Japanese quail eggs with garlic oil solution as natural disinfectants (pre-incubation) is a good way to improve embryonic development, hatchability, blood constituents, hormones and immunity of hatching chicks and lowering the bacterial contamination of eggshell surface of quail eggs.

Keywords: garlic oil - embryonic development - blood constituents - hatchability

INTRODUCTION

Hatching eggs are exposed to microbial contamination, causing poor hatchability and bad chick performance. Hatching eggs are contaminated by many infectious organisms before and after laying. Staphylococcus, *E. coli* and Salmonella species are the main accusatorial for this problem. Where, they can infect the eggs through several ways; from an infected reproductive tract of the hen, dirty nests and cages can serve as sources of contamination of eggs. Thus, infectious organisms can penetrate through the eggshell (Williams et al., 1968).

So, sanitation is essential for successful production of hatching eggs. There are several methods for controlling this bacterial contamination of egg shell; spraying, fumigation, UV light and washing with appropriate disinfectants (Proudfoot et al., 1985; Kuhl, 1989; Sacco et al., 1989; Whistler and Sheldon, 1989; Coufal et al., 2003). If sanitation of hatching eggs was neglected before incubation, excessive bacterial contamination and subsequent growth can lead to reducing hatchability, poor chick quality, poor growth and performance (Scott and Swetnam, 1993) and increasing mortality (Reid et al., 1961). However, the use of chemical and ultraviolet disinfecting methods for hatching eggs – no doubt, these methods have an excellent antimicrobial effect-but it may have several disadvantages. A toxic or residual effects, can cause serious harm to the embryo. In addition, it irritates the eyes and nose and may characterized by a harmful odor (Whistler and Sheldon, 1989). Natural biologically active herbal compounds (from plants) are generally thought to be more acceptable and less hazardous than synthetic compounds and represent a rich source of potential disease-control agents. As a result, increased interest is being shown in developing alternative methods to control microbial contamination; either by reducing or eliminating at all instead of the reliance on synthetic pesticides.

These method involves the use of plant-derived-products, such as plant essential oils and propolis, which possess bacteriocidal effects (Aygun et al., 2012).

Garlic (*Allium sativum* L) is bulbous vegetable, well known spice and medicinal plant, which belongs to the family Liliaceae and genus Allium (Simon and Jenderek, 2003). The most important components of garlic are the organic sulphurous compounds (aliin, ajoene, allicin and allylpropyl disulphide, sallilcisteine, diallyl trisulphide and others) (Freeman and Kodera, 1995; Kemper, 2000; Mansoub, 2011).

Garlic also contains several beneficial compounds such as: enzymes (α-allinase, myrosinase and peroxydase, etc), amino acids and their glycosides (arginine and others), vitamins (E, D, A, C and B complex vitamins) and minerals (calcium, phosphorus, magnesium, potassium, sodium, iodine, selenium, silicon) (Grela and Klebaniuk, 2007; Popić, 2009). Also, its action was manifested in a reduced-expanding range of pathogenic micro-organisms in the digestive tract, which resulted in rapid growth of poultry, efficient digestion, increased immunity and improvement of poultry health (Kumar et al., 2010).

The main purpose of this study was evaluating spraying fertile quail eggs with garlic oil solution as natural disinfectants to controlling the microbial activity, physiological changes in the embryonic development, hatchability, blood

constituents, hormones, immunity, the bacterial load on eggshell surface of quail eggs and the growth and development of chicks till 14 days of age.

MATERIALS AND METHODS

this experimental was conducted at Poultry Experimental Station, Faculty of Agriculture, New Valley University.

Preparation of Solutions

Garlic oil solution 1ml/l or 2ml/l by using magnetic stirrer was prepared by mixing 1000 ml distilled water with 1ml or 2 ml garlic oil respectively. Garlic oil was obtained from a Elmasrayia company, Egypt.

Application of Solutions

Four hundred hatching quail eggs were obtained from of a flock of Japanese quail aged 13 weeks and grew up in a commercial farm, Egypt.

The eggs of Japanese quail were randomly and equally divided into 4 groups; 100 eggs in each group. Eggs of the first group were served as a control group (non–treated eggs, A). The second group was sprayed with water because the garlic oil was dissolved in water. The third group was sprayed with 1ml/l while the fourth group was sprayed with 2ml/l garlic oil solution.

The solutions sprayed on the eggs, using a hand sprayer, to cover the whole surface. The eggs were allowed to dry at 22°C for 10 minutes. 30 eggs from each group was labelled, then weighed at the beginning and on day 14 of incubation to estimate egg weight loss ratio. Eggs containing dead embryos and unfertile eggs were excluded from the calculation percentage of egg weight loss.

Incubation Management

Eggs were incubated in a commercial incubator under controlled condition from relative humidity (RH) was 65% and the temperature was 37.5°C until day 14 then, were changed to 75% RH and 37.2°C. Eggs were automatically turned every 2 hours through 90°.

Bacteriological count

Five eggs per each group were taken for bacteriological examination at 7 and 14 days of incubation. Each egg was placed immediately in sterile bag containing 10 ml of sterile phosphate buffered saline (PBS) (pH7.2). A whole- egg washing technique was carried out to recover the shell-associated bacteria for estimating the total viable bacterial count (TBC) by using plate counting agar (PCA); (Conda lab., Spain). Serial dilutions were made in PBS and then were cultivated into sterile petri plates (Gentry and Quarles, 1972; Jones et al., 2002). The plates were incubated at 37°C for 24 hours. Bacterial colonies were counted and multiplied by the dilution factor. Colonies were measured as cfu/egg (Özelik, 1992).

Estimation protocol

5 eggs from each group were taken for embryonic development examination at 14 day of incubation. The percentages of embryo weight, albumen weight were estimated in relation to the egg weight. Embryonic shank length, embryonic length, shell thickness (mm) and egg weight loss at 14^{th} day of incubation were measured using sensitive balance and metal caliper digital. Body weight of hatched chick, chick body length and shank length were measured.

After hatching of chicks, six-randomly selected- chicks per each group were slaughtered for obtaining blood samples. The internal organs were extracted and weighted (residual yolk sac, intestine, liver, gizzard and heart) and were expressed as a percentage of live body of hatched chick.

A portion of the fresh blood was used to determine red blood cells (RBCs),

hemoglobin (Hb), packed cells volume (PCV), white blood cells (WBCs). Serum was obtained from the blood samples by centrifugation for 15 minutes at 3000 rpm and stored at – 20 Cº until used in further analysis of blood constituents; blood biochemical parameters (total protein, albumin, total lipids, cholesterol, and glucose concentration) in blood serum were determined by using the commercial kits (Biolabosa As. Frances).

Blood hormones (thyroxine hormone (T4) and growth hormone (GH)) and immunity parameter; Immunoglobulin G (IgG) were determined by enzyme immunoassay using commercial kits (Monobind As. USA America).

Hatching parameters

During 360 and 425 hour of incubation, eggs were checked individually every 8 hours for recording hatched chicks. After 17.6 day of incubation, all hatched chicks were removed from each hatch basket and weighted. Un-hatched eggs were opened to determine the embryonic mortality. Hatchability of fertile eggs was calculated. Hatch time was monitored after the hatch of first chick.

Chick Performance Procedure

At the end of incubation period, 21 chicks per each group (7 chicks/pen) were kept till 14 days of age. Chicks were weighed and identified with a wing ring number. Chicks were raised (3 pens/group). A starter diet (24 % CP and 2,900 kcal of ME/kg) was provided *ad libitum* (Table 1). Temperature was set at 33°C and the lighting period was 23 hours and darkness for one. At the end of 14 days, all chicks were individually weighed (without wing ring). For each chick, live body weights at days 1 and 14 were recorded.to calculate the body weight gain (BWG). Feed intake (FI) was recorded for each replicate and thereby feed conversion ratio (FCR) as g feed/g BWG was calculated. Intestinal aerobic and anaerobic microflora counts were determined. Total anaerobic count, aerobic plate count (APC) and total coliform count were carried out according to American Public Health Association (A.P.H.A, 1985).

Statistical Analysis

Data obtained from this study were statistically analyzed using one-way ANOVA. Differences between treatments were evaluated according to procedure out lined by Gomez and Gomez (1983). Significant of differences between means was defined at 5 percent level compared using the Duncan's multiple range test (Duncan, 1955).

RESULTS AND DISCUSSION

Percentages of embryo weight, shank length, embryo length at the 14th days of incubation, as well as chick weight, chick body length, chick shank length at hatch tended to be higher ($P < 0.05$) for eggs treated with garlic oil solution than those of control eggs. Eggs sprayed with 2ml/l garlic oil solution showed the highest records at the 14th day of incubation and at hatch (Tables 2 and 3). There was a significant rise in the consumption of albumen by embryo where there was significant decrease in albumen at 14 days of incubation (Table 2). The lowest albumen percentage was determined in the eggs sprayed with 2ml/l garlic oil solution treatment then in eggs sprayed with 1ml/l garlic oil solution respectively compared to untreated groups.

Garlic extract and / or garlic components were able to prevent acute toxic effects of chemicals. The potential for chemical protection of garlic has been attributed to the presence of many biologically active organic sulfur compounds. These compounds may act as antioxidants

(Fanelli et al.,1998; Siegers et al.,1999). The properties of antioxidant stress of garlic might result from its sulfur component in different steps. These results might be due to the good health status of embryos which may be caused by treatment with garlic oil solution as reported by (Fadlalla et al., 2010).

Egg weight loss

Egg weight loss was determined during the incubation period from 0 to 14 day of embryonic development, as shown in (Table 2). Egg weight loss rates ranged between 9.62 and 10.87 % among all groups. The egg weight losses of the treated groups were significantly lower ($P< 0.05$) when compared with those of untreated groups. This can be explained by a reduction in water loss through coating of egg pores after spraying with garlic oil solution. There were no significant differences ($P< 0.05$) in loss of egg weight between concentrations of two groups of garlic oil solution.

Egg weight loss is an important factor of incubation. Loss of moisture was undesirable for normal embryonic development (Geng and Wang 1990). Egg weight loss rate due to the treatment of eggs with disinfectants is reasonable because antiseptics may affect the cuticle layers and porosity of shell. This view was confirmed by Brake and Sheldon (1990) who noted that any change or removal of the cuticle by antiseptics may have a significant impact on egg weight loss and hatchability. This result can be explained by the light of occluded egg pores due to the oily nature of these disinfectants, which reduced the evaporation of water vapor and egg weight loss percentage (Shahein and Eman 2014).

Egg shell thickness (mm) of eggs treated with garlic oil solution were significantly declined at the 14^{th} day of incubation in compared with untreated (Table 2). This is may be due to the interaction between the garlic oil solution with the egg shell that changes its properties, which may have some physical changes in morphology or cause a thinner eggshell.

Eggs of treated groups by garlic oil solution had significantly ($P <0.05$) shorter hatching periods than that of untreated eggs (Table 3). The quail eggs sprayed by 1ml/l and 2ml/l of garlic oil solution groups recorded shorter periods (416.66, 415 hours respectively), followed by eggs sprayed by water (420.33 hours), finally eggs of the control group had the longest time (420.67 hours).

Hatch time is an important indicator for chick distribution in the hatcher and it is preferable to decrease this range and shorten the staying of chicks in the hatcher to avoid chick dehydration. The results of the reduction of range period for both sprayed with 1ml/l and 2ml/l garlic oil solution groups are in accordance with those previously reported by Mona (2011) and Fouad and Abdel-Hafez (2017). They reported that chicks produced from eggs treated with natural disinfectants recorded short hatch time.

Hatchability of fertile eggs

hatchability of fertile eggs was significantly increased in treated groups with garlic oil solution in comparison with untreated ones (Table 3). The highest rate was observed in eggs sprayed by 2ml/l garlic oil solution versus the lowest one in control. Spraying fertile eggs with either 1ml/l or 2ml/l garlic oil solution led to an increase in hatchability of fertile eggs by 10.7 and 14 % of the control value, respectively. Consequently, embryonic mortality had significant

difference between treated groups with garlic oil solution and untreated eggs (Table 3). The lowest mortality was estimated in eggs sprayed by 1ml/l and 2ml/l garlic oil solution compared to untreated groups.

Improved hatchability may be due to decline the embryonic mortality, where garlic oil solution can be considered an anti-stress agent. Reuter et al., (1996) reported that garlic as a plant with antibiotic, antioxidant, anticancer, anti-inflammatory and cardiovascular-protecting effects. Also garlic has been shown to have strong antimicrobial action (Iwalokun et al.,2004; Gbenga et al., 2009).

Gulsen et al., (2011) reported that the control group had the lowest hatching value among fertile eggs treated with allicin. Improved hatchability of fertile eggs may be a direct result of decreased microbial contamination of the eggs.

Blood constituents

Results in Tables (4 and 5) showed significant ($P<0.05$) increase of hematological parameters and hormones together with immunity parameter in chicks of treated groups. Spraying fertile eggs with either 1ml/l or 2ml/l garlic oil solution led to an increase in RBCs by 10.11 and 13.09 %, Hb by 29.65 and 40.33%, PCV% by 20.19 and 31.18 %, growth hormone by 27.03 and 52.70 % and T4 by 10 and 19.67 %, IgG by 0.76 and 2.08%, of the control value, respectively.

There was non-significant difference in counts of different white blood cells (%) in hatched chicks as in Table (4). Also the results showed that; Lymphocytes (%), Neutrophils (%), Monocytes (%), Eosinophils (%) did not differ significantly as a result of treatment by live yeast solution.

Biochemical constituents (Table 5) revealed significant differences ($P<0.05$) in response to spraying with garlic oil solution. Values of blood biochemical constituents (total protein, albumin and total lipids) for chicks of treated groups were greater than those of the control group. There was non-significant difference in cholesterol while glucose significantly decreased for all treated groups.

Reuter et al, (1996) reported that garlic acts as cardiovascular-protecting effects. Inclusion of garlic led to the best rate of blood constituents, which might be due to the optimum low density cholesterol and Low Density Lipids (LDL) (Fadlalla et al., 2010).

Khan et al, (2012) reported that, garlic (Allium sativum) stimulates the immune system and lowered blood cholesterol levels in poultry, as well as it is one of the most potential feed supplement which has recently been reported as having a wide range of beneficial effects on the physiological biochemistry of broilers.

Carcass constituents

Relative weights of intestine, liver, gizzard, heart and for chicks of Japanese quails are presented in Table (6). Intestine, liver, gizzard and heart relative weight for chicks of treated groups were higher than those of eggs sprayed with water or control group, while yolk residual relative was the opposite. These results are in agreement with the finding of Fouad and Abdel-Hafez, (2017).

Growth performance

Growth performance (body weight, body weight gain, feed intake and feed conversion) of chicks of Japanese quails are presented in Table (7). Body weight, body weight gain and feed intake for chicks of treated groups were higher ($P<0.05$) than those for eggs sprayed with

water or control groups. There was an improvement in feed conversion rate. Spraying fertile eggs with either 1ml/l or 2ml/l garlic oil solution led to an increase in body weight by 23.1 and 32.54%, body weight gain by 27.04 and 37.96%, feed intake by 10.58 and 18.21 %, of the control group, respectively.

Tekeli et al., (2006) has been reported that the contribution of other plant extracts such as garlic improves live weight gains and feed conversion rate of broilers, also increasing the number of intestinal lactic acid bacteria.

Fadlalla et al., (2010) reported that using garlic in broiler chicks feed resulted in a significant positive effect on carcass yield and increasing the vitality of chickens.

Khan et al., (2012) reported that, garlic is a potential feed supplement which has recently been reported to produce beneficial effects on the production performance of broiler chickens and laying hens. Useful effects have been seen on growth, feed efficiency, as well as immune stimulation.

Microbiological study

Garlic oil solution had significant influence on TBC compared to control group after one and two weeks of incubation (Table 8). The best significant results of TBC after one week of incubation was observed for eggs sprayed with 2ml/l garlic oil solution as it decreased from 32.80 X 10^3 cfu/egg for control to about one half (15.69 X 10^3 cfu /egg) for treated group. Data in Table 8 show that, as the concentration of garlic oil solution increased from 1ml/l to 2ml/l, TBC decreased from 19.11 to 15.69 X 10^3 cfu /egg. Similar trend of decreasing TBC count was observed for spraying eggs by garlic oil solution after two week of incubation. Total bacterial count on eggshell surface was increased in control untreated group from 32.80 X 10^3 cfu /egg at one week of incubation to 50.15 X 10^3 cfu/egg after two week of incubation. However, mode of action of garlic oil solution products is less clear.

Allicin and its derivatives have been shown to be a bacteriostatic, active against both gram negative or gram positive organisms (Chang and Cheong,2008).

The intestinal microbial counts of chicks of Japanese quails are presented in (Table 9). The intestinal anaerobic, total aerobic and total coliform counts decreased for chicks of treated eggs in comparing with the control group.

Masaadeh et al.,(2006) reported that garlic extracts had significant inhibitory effects against harmful microorganisms. Garlic products and garlic oil are effective against many species of bacteria (Rahman et al., 2006).

CONCLUSION

It could be concluded that, using garlic oil solution (1ml/l or 2ml/l) as natural material for spraying Japanese quail eggs may be a good way to improve embryonic development, hatchability, chick performance, chick body weight, blood constituents, hormones and immunity of hatching chicks and lowering the bacterial contamination of eggshell surface of quail eggs.

Table (1): Ingredients and chemical analyses of the starter diet

Ingredients	%
Ground yellow corn	57.83
Soya bean meal (44%)	32.94
Fish meal (60%)	3.50
Corn gluten (60)	3.48
Dicalcium phosphate	0.33
Limetone	1.16
DL-Methionine	0.09
L-Lysine	0.07
Iodized sodium chloride	0.30
Minerals and vitamins premix	0.30
Calculated composition	
Crude protein (%)	24
ME (kcal/kg)	2900
Calcium (%)	0.80
Available Phosphorus (%)	0.30

Table (2): Effect of spraying Japanese quails eggs by garlic oil on percentages of embryo weight , albumen weight and embryonic length, egg shell thickness(mm) and egg weight loss at 14th day of incubation

Traits / Treatments	Initial egg weight	Embryo weight % (14 d)	Albumen weight % (14 d)	Shank length cm (14 d)	embryonic length cm (14 d)	Egg shell thickness(mm)	Egg weight loss %
Control	11.56	36.44 c	1.29 a	0.90 b	6.67 c	19.11 a	10.87 a
Spraying by water	11.56	37.12 c	1.27 a	0.97 b	6.80 c	18.67 a	10.83 a
Spraying by garlic oil (1ml/l)	11.55	42.93 b	0.16 b	1.27 a	7.10 b	17.89 b	9.67 b
Spraying by garlic oil (2 ml/l)	11.54	44.31 a	0.09 b	1.40 a	7.40 a	16.22 c	9.62 b
Pooled SEM	0.03	0.21	0.02	0.05	0.05	0.21	0.05

A,b,c. Means with the different letters in the same column are significantly different ($P \leq 0.05$).

Table (3): Effect of spraying Japanese quails eggs by garlic oil on chick body weight , chick body length ,chick shank length, hatchability , embryonic mortality and hatch time**.**

Traits / Treatments	Chick body weight (gm)	Chick body length (1 d)	Chick shank length (1 d)	Hatchability of fertile eggs (%)	Embryonic mortality of fertile eggs (%)	Hatch time (hourrs)
Control	8.69 c	10.13 c	1.63 c	80.01 b	19.99 a	420.67 a
Spraying by water	8.70 c	10.17 c	1.67 c	81.00 b	18.99 a	420.33 a
Spraying by garlic oil(1ml/l)	8.88 b	11.07 b	1.90 b	88.60 a	11.40 b	416.66 b
Spraying by garlic oil (2ml/l)	9.02 a	11.40 a	2.07 a	91.26 a	8.74 b	415.00 c
Pooled SEM	0.01	0.05	0.04	0.68	0. 67	0.39

A,b,c. Means with the different letters in the same column are significantly different (P≤0.05).

Table (4): Effect of spraying Japanese quails eggs by garlic oil on blood hematological traits of hatched chicks**.**

Traits / Treatments	RBC (10^6/mm^3)	HB (g/dl)	PCV%	WBC (10^3/mm^3)	Lymphocytes (%)	Neutrophils (%)	Monocytes (%)	Eosinophils (%)
Control	1.68 c	8.43 c	14.56 c	45.24	53.07	42.41	3.22	1.30
Spraying by water	1.69 c	8.50 c	14.60 c	45.25	53.11	42.40	3.21	1.26
Spraying bygarlicoil(1ml/l)	1.85 b	10.93 b	17.50 b	45.26	53.12	42.39	3.23	1.25
Spraying bygarlicoil(2ml/l)	1.90 a	11.83 a	19.10 a	45.31	53.18	42.38	3.23	1.21
Pooled SEM	0.01	0.08	0.19	0.02	0.02	0.010	0.010	0.03

A,b,c. Means with the different letters in the same column are significantly different (P≤0.05).

Table (5): Effect of spraying Japanese quails eggs by garlic oil on blood biochemical constituents, hormones and immunity parameter of hatched chicks.

Traits / Treatments	biochemical constituents					hormones		immunity parameter
	Total protein (g/dl)	Albumin (g/dl)	Total lipids (mg/dl)	Cholesterol (mg/dl)	Glucose (mg/dl)	T4 (ng/ml)	GR .H (ng/ml)	IgG (mg/100 ml)
Control	2.24 c	0.80 c	283.00 c	142.67	201.67 a	9.30 c	0.74 c	925.00 c
Spraying by water	2.28 c	0.83 bc	284.33bc	142.66	200.00 a	9.47 c	0.77 c	927.00 c
Spraying by garlic oil(1ml/l)	2.76 b	1.00 b	287.00 b	142.33	188.00 b	10.23 b	0.94 b	932.00 b
Spraying by garlicoil(2ml/l)	2.88 a	1.23 a	292.33 a	141.66	179.00 c	11.13 a	1.13 a	944.33 a
Pooled SEM	0.02	0.04	0.81	0.41	0.65	0.01	0.01	0.79

A,b,c. Means with the different letters in the same column are significantly different (P≤0.05).

Table (6): Effect of spraying Japanese quails eggs by garlic oil on some relative carcass characters of hatched chicks **.**

Traits / Treatments	Yolk residual %	Intestine %	Liver %	Gizzard %	Heart %
Control	9.44 a	2.64 c	2.51 b	4.38 b	0.60 c
Spraying by water	9.31 a	2.66 c	2.49 b	4.39 b	0.62 c
Spraying by garlic oil (1 ml/l)	8.48 b	2.71 b	2.58 a	4.47 b	0.75 b
Spraying by garlic oil (2 ml/l)	7.91 c	2.75 a	2.59 a	4.70 a	0.86 a
Pooled SEM	0.06	0.01	0.01	0.02	0.01

A,b,c. Means with the different letters in the same column are significantly different (P≤0.05).

Table (7): Effect of spraying Japanese quails eggs by garlic oil on body weight at day 14, feed intake, body weight gain and feed conversion .

Traits / Treatments	Initial chick weight (g)	Final body weight at 14 d (g)	Feed intake (g)	Body weight gain (g)	Feed conversion (g feed/g gain)
Control	8.81	61.54 c	78.67 c	52.73 c	1.49 a
Spraying by water	8.81	61.94 c	80.33 c	53.13 c	1.51 a
Spraying by garlic oil (1ml/l)	8.81	75.80 b	87.00 b	66.99 b	1.29 b
Spraying by garlic oil (2ml/l)	8.82	81.57 a	93.00 a	72.75 a	1.28 b
Pooled SEM	0.01	0.15	0.45	0.17	0.01

A,b,c. Means with the different letters in the same column are significantly different (P≤0.05).

Table (8) : Effect of spraying Japanese quails eggs by garlic oil on total bacterial counts (X 10^3 cfu /egg) after 1st and 2nd weeks of incubation.

Traits / Treatments	T.B.C. 1 week	T.B.C. 2 week
Control	32.80 a	50.15 a
Spraying by water	32.77 a	47.69 b
Spraying by garlic oil (1 ml/l)	19.11 b	21.68 c
Spraying by garlic oil (2 ml/l)	15.69 c	14.11 d
Pooled SEM	0.403	0.467

A,b,c. Means with the different letters in the same column are significantly different (P≤0.05).

Table (9): Effect of spraying Japanese quails eggs by garlic oil on anaerobic, aerobic and total coliform bacteria in intestine of post-hatched chicks.

Treatments \ Traits	Total anaerobic count	Total coliform Count	Aerobic plate count
Control	0.467 x10^3 a	22.66 x10^3 a	7.66 x10^3 a
Spraying by water	0.433 x10^3 a	21.33 x10^3 b	7.333 x10^3 a
Spraying by garlic oil (1 ml/l)	0.037 x10^3 b	0.123 x10^3 c	0.233 x10^3 b
Spraying by garlic oil (2 ml/l)	0.023 x10^3 b	0.053 x10^3 c	0.023 x10^3 b
Pooled SEM	0.017	0.168	0.175

A,b,c. Means with the different letters in the same column are significantly different ($P \leq 0.05$).

REFERENCES

A. P. H. A. American Public Health Association, 1985. Standard Methods for the Examination of Water and Wastewater, 16th Ed. APHA, Washington, D.C.

Aygun.A, D. Sert and G. Copur.2012. Effects of propolis on eggshell microbial activity, hatchability, and chick performance in Japanese quail (Coturnix coturnix japonica) eggs. Poultry Science 91:1018–1025.

Brake, J.; and Sheldon, B.W. 1990. Effect of a quaternary ammonium sanitizer for hatching eggs on their contamination, permeability, water loss and hatchability.Poult.Sci., 69:517 -525.

Coufal, C. D., C. Chavez, K. D. Knape, and J. B. Carey. 2003. Evaluation of a method of ultraviolet light sanitation of broiler hatching eggs. Poult. Sci. 82:754–759.

Duncan, D. B., 1955. Multiple range and multiple F test. Biometrics. 11: 1-42.

Fadlalla,I.M.T., Mohammed B.H. and Bakhiet A.O. 2010. Effect of feeding garlic on performance and immunity of broilars.Asian Journal of Poultry Science 4(4): 182-189.

Fanelli, S.L., G.D. Castro, E.G. De Toranzo and J.A. Castro, 1998. Mechanisms of the preventive properties of some garlic components in the carbon tetrachloride-promoted oxidative stress. Diallyl sulfide; diallyl disulfide; allyl mercaptan and allyl methyl sulfide. Res. Commun.Mol.Pathol.Pharmacol.,102 :163-174.

Fouad and Mohamed S. Abdel-Hafez. 2017. Effect of spraying hatching eggs of Japanese quailby live yeast on physiological changes in the embryonic development, hatchability and total bacterial count. Egypt.Poult. Sci.Vol(37)(IV): (1303-1321).

Freeman, F., Y. Kodera, 1995. Garlic chemistry: stability of S-(2-propenyl) 2-propene-1-sulfinothioate (allicin) in blood, solvents, and stimulated physiological fluids. J. Agric. Food Sci. 43, 2332-2338.

Gbenga, O. E., Adebisi, O. E., Fajemisin, A. N., & Adetunji, A. V. 2009. Response of broiler chickens in terms of performance and meat quality to garlic Allium sativum upplementation. African Journal of Agric. Res., 4, 511-517.

Geng, Z. Y., and Wang, X. L. 1990. Relationship of hatchability and the percentage of egg weight loss and shell pore concentration during incubation. Chin. J. Anim. Sci., 26:12–14.

Gentry, R. F., and Quarles, C. L. 1972. The measurement of bacteial contamination on eggshells. Poult. Sci. 51:930–933.

Gomez, K.A. and Gomez, A.A. 1983. Statistical procedures for Agriculture research.A Wiley-Inter Science Publication, John Wiley and sons, Inc. New York, USA

Grela, R.R., R. Klebaniuk, 2007: Chemical composition of garlic preparation and its utilization u piglet diets. Medycyna Wet. 63, 792-795.

Gulsen Copur, Arslan M., Baylan M. and Canogullari S. 2011. Use of allicin as an alternative hatching egg disinfectant versus fourmaldehyde fumigation in broilar haching eggs. Biotechnology and Biotechnological Equipment, 25:3, 2494-2498

Iwalokun, B.A., A. Ogunledun, D.O. Ogbolu, S.B. Bamiro and J. Jimi-

Omojola, 2004. In vitro antimicrobial properties of aqueous garlic extract against multidrug-resistant bacteria and Candida species from Nigeria. J. Med. Food, 7: 327-333.

Jones, D. R., K. E. Anderson, P. A. Curtis, and F. T. Jones. 2002. Microbial contamination in inoculated shell eggs: I. Effects of layer strain and hen age. Poult. Sci. 81:715–720.

Kemper, K.J., 2000. Garlic (Allium sativum) Longwood Herbal Task Force: http://www.mcp.edu/herbal/default.htm.

Khan R.U.;Nikousefat Z.;Tufarelli V. And Naz S. 2012. Garlic (Allium sativum) supplementation in poultry diets: effect on production and physiology. Published online: 31 July 2012. https://doi.org/10.1017/S0043933912000530

Kuhl, H. Y. 1989. Washing and sanitizing hatching eggs. Int. Hatchery Pract. 3:29–33.

Kumar, S., K.C. Sharadamma, P.M. Radhakrishna, 2010. Effects of a Garlic Active Based Growth Promoter on Growth Performance and Specific Pathogenic Intestinal Microbial Counts of Broiler Chicks. International Journal of Poultry Science 9, 244-246.

Mansoub, N.H., 2011. Comparative Effects of Using Garlic as Probiotic on Performance and Serum Composition of Broiler Chickens. Annals of Biological Research 2, 486-490.

Masaadeh, H.A., W.A. Hayajneh and N.M. Momani, 2006. Microbial ecology of dental plaques of Jordanian patients and inhibitory effects of Allium sativum and Allium cepa L. extracts. J. Medical Sci., 6: 650-653.

Mona, R.M., 2011. Effect of egg disinfection on embryonic development,hatchability characteristics and post-hatch productive performance in local chickens.Ph.D.Thesis,Fac.of Agric (Saba-Bacha) Anim.and Fish Production Department, Alex. Univ., Egypt.

Özçelik, S., 1992. Food microbiology laboratory manual. F. Univ. Publications of Faculty of Arts and Sciences, Publication. 1:s.135.

Popić, M., 2009. Hemijski sastav belog i crnog luka. Tehnologija hrane 2, 42-47.

Proudfoot, F. G., D. M. Nash, and H. W. Hulan. 1985. Effects of glutaraldehyde surfactant solution on the hatchability of the hen's egg. Poult. Sci. 64:2400–2402.

Rahman, M.S., Al-Sheibani, H.I., Al-Riziqi, M.H., Mothershaw, A., Guizani, N. and Bengtsson, G. 2006. Assessment of the anti-microbial activity of dried garlic powders produced by different methods of drying. International Journal of Food Properties, 9: 503–513.

Reid, W. M., T. A. Maag, F. M. Boyd, A. L. Kleckner, and S. C. Schmittle. 1961. Embryo and baby chick mortality and morbidity induced by a strain of Escherichia coli. Poult. Sci. 40:1497–1502.

Reuter, H.D., H.P. Koch and L.D. Lawson, 1996. Therapeutic Effects and Applications of Garlic and its Preparations. In: Garlic: The Science and Therapeutic Application

of Allium sativum L. and Related Species, Koch, H.P. and L.D. Lawson (Eds.). Williams and Wilkins, Baltimore, MD.,pp:135-213.

Sacco, R. E., P. A. Renner, K. E. Nestor, Y. M. Saif, and R. N. Dearth. 1989. Effect of hatching egg sanitizers on embryonic survival and hatchability of turkey eggs from different lines on eggshell bacterial populations. Poult. Sci. 68:1179–1184.

Scott, T. A., and C. Swetnam. 1993. Screening sanitizing agents and methods of application for hatching eggs I. Environmental and user friendliness. J. Appl. Poult. Res. 2:1–6.

Shahein E.H.A and Eman K. Sedeek .2014. Role of spraying hatching eggs with natural disinfectants on hatching characteristics and eggshell bacterial counts.Egypt. Poult. Sci. Vol (34) (I): (213-230).

Siegers, C.P., B. Steffen, A. Robke and R. Pentz, 1999. The effects of garlic preparations against human tumor cell proliferation. Phytomedicine, 6: 7-11.

Simon, P.W., M.M. Jenderek, 2003. Flowering, Seed Production, and the Genesis of Garlic Breeding. Plant Breeding Reviews 23, 211-244.

Tekeli, A., L. Celik, H.R. Kutlu and M. Gorgulu, 2006. Effect of dietary supplemental plant extracts on performance, carcass characteristics, digestive system development, intestinal microflora and some blood parameters of broiler chicks. Proceedings of 12th European Poultry Conference, September 10-14, Verona, Italy, pp: 307-308.

Whistler, P. E., and B. W. Sheldon. 1989. Biocidal activity of ozone versus formaldehyde against poultry pathogens inoculated in a prototype setter. Poult. Sci. 68:1068–1073.

Williams JE, Dillard LH, Hall GO. 1968. The penetration patterns of salmonella typhimunium through the outer structure of chicken eggs. Avian Dis; 12:445-466.

الملخص العربى

تاثير رش محلول زيت الثوم على التطور الجنينى ونسب التفريخ والعوامل الفسيولوجيه ونمو الكتاكيت الفافسه والتلوث البكتيرى لبيض السمان المخصب

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زيت الثوم ، لديه نشاط مضاد للبكتيريا قوي ضد مجموعة واسعة من البكتيريا السالبة والموجبه الجرام وله خصائص مضادة للفطريات.وكان الغرض من هذه الدراسة هو دراسه تاثير رش بيض التفريخ بمحلول زيت الثوم على التطور الجنيني، معدلات الفقس،وبعض الصفات الفسيولوجيه و الحمل البكتيري على سطح قشر البيض وأداء الكتاكيت الفافسه . تم استخدام أربع مائة بيضة تفريخ للسمان اليابانى و قسمت إلى أربع مجموعات . المجموعة الأولى هي المجموعة الكنترول و المجموعة الثانية تم رش البيض بالماء المقطر و تم رش بيض المجموعتين الثالثة والرابعة بمحلول زيت الثوم 1 مل / لتر و 2 مل / لتر على التوالي

لوحظ زياده معنويه فى وزن وطول الجنين وطول عظمه الساق للجنين وايضا وزن الكتاكيت الفافسه وطول الجسم و عظمه الساق ، كما زادت نسبه التفريخ من البيض المخصب فى حين انخفض كل من وقت الفقس ونسبه الاجنه الميته وزن الالبيومين كنسبه مئويه من وزن البيضه وقل سمك قشره البيضه للبيض ونسبه الفقد المائى عند عمر 14 يوم من التفريخ للبيض المعامل برش محلول زيت الثوم بالمقارنه بالبيض الغير المعامل .

كما تحسنت معنويا صفات الدم الهيماتولوجيه (عدد كرات الدم الحمراء واليموجلوبين و pcv) وبروتينات الدم الكليه والالبيومين والدهون الكليه والهرمونات والمناعه بينما لم تتاثر نسبه الكوليسترول وانخفضت نسبه جلوكوز الدم للكتاكيت الفافسه من البيض المعامل برش محلول زيت الثوم وتحسنت كرات الدم البيضاء ولكن بصوره غير معنويه للبيض بالمقارنه بالكنترول

كما تحسنت مكونات الذبيحة للكتاكيت الفافسه وتحسنت صفات النمو للكتاكيت (وزن الجسم ووزن والعلف المستهلك ووزن الجسم المكتسب ومعدل التحويل الغذائى) عندعمر 14 يوم ، في حين وجد انخفاض معنوى فى نسبه وزن الصفار المتبقى للكتاكيت الفافسه للبيض المعامل بالمقارنه بالكنترول

كان لرش البيض بزيت الثوم تأثير كبير حيث انخفض العدد البكتيرى الكلى بعد أسبوع و اسبوعين من وضع البيض بالمفرخه للبيض المعامل برش محلول زيت الثوم بالمقارنه بالكنترول وانخفض عدد البكتيريا الدقيقة في الأمعاء الهوائية واللاهوائية وعدد البكتيريا الكلى للكتاكيت عند عمر 14 يوم .

من كل ما سبق يكون رش بيض السمان الياباني بمحلول زيت الثوم كمطهر طبيعي (1 مل / لتر او 2 مل / لتر) قبل وضع البيض بالمفرخه وسيلة جيدة لتحسين التطور الجنيني ونسبه الفقس وصفات الدم والهرمونات والمناعه للكتاكيت الفاقسه وخفض التلوث البكتري على سطح قشره بيض التفريخ للسمان اليابانى .