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EFFECT OF SPRAYING HATCHING EGGS OF JAPANESE QUAILS BY LIVE YEAST ON PHYSIOLOGICAL CHANGES IN THE EMBRYONIC DEVELOPMENT, HATCHABILITY AND TOTAL BACTERIAL COUNT

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ABSTRACT: The present experiment was carried out to study the role of spraying hatching eggs with live yeast (Saccharomyces cerevisiae) (YC) on physiological changes in the embryonic development, hatchability rates and the bacterial load on eggshell surface of quail eggs, and post hatch chicks performance. Four hundred and twenty hatching eggs of Japanese quails were divided into four treatment groups. Eggs of first group was the control group without any treatment. Eggs of the second group was sprayed by water. Eggs of the third and the fourth groups were sprayed by 2.5% and 5% yeast solution respectively.

Results obtained are summarized as follows:

1-Embryo weight, body length, shank length as well as, chick weight, chick body length, chick shank length and hatchability of fertile eggs ratio tended to be higher significantly ($P<0.05$) for eggs treated by spraying with live yeast solution than those of control eggs. Hatch time, embryonic mortality decreased in eggs sprayed by live yeast solution compared to untreated.

2- The egg albumin weight ratio at ages of 10 and 14 days of incubation, egg weight losses ratio and egg shell thickness at the 14th day of incubation were significantly ($P<0.05$) decreased in eggs sprayed by live yeast solution compared to those for untreated.

3- Blood hematological parameters (RBCs, Hb, and PCV), hormones and calcium represented significant improve while WBCs improvement numericly response to spraying with live yeast solution.

4- Carcass constituents (liver, gizzard, heart and intestine) of chicks at hatch and growth performance (body weight, body weight gain, feed intake and feed conversion) of chicks at 21 d of Japanese quails revealed significant higher values in response to spraying with live yeast solution while yolk residual for chicks at hatch of eggs sprayed by 2.5 and 5% live yeast solution was lower than control group.

5- Application of yeast had significant influence on TBC and TSC compared to control untreated either at one week or after two weeks of incubation.Spraying Japanese quail eggs with live yeast solution (5%) pre- incubation may be a good way to improve embryonig development, hatchability, blood hematology and hormones of hatch chicks and lowering the bacterial load on eggshell surface of quail eggs.

Keywords: yeast, total bacterial count, blood hematology, hormones, hatchability.

INTRODUCTION

Various infectious microorganisms can invade the egg before and after laying. In addition to surface contamination, a freshly laid egg is wet and warm, and the cuticle is immature and some pores may be open, thus susceptible to be attacked by microorganisms (Bruce and Drysdale, 1994). The standard environment for growth of the embryo is the same needed for microorganism multiplication. Therefore, contaminated eggs will disseminate microorganisms in incubators and hatchers and in turn will reduce hatchability and produce low quality chicks (Bramwell, 2000) Bacteria multiplying rapidly in one hour after the egg was laid (North and Bell, 1990). The most common contaminants are Salmonella, Pseudomonas (Jones et al., 2004), and Escherichia coli (Singh et al., 2009).

Egg contamination occurs most frequently after oviposition and contaminants may be classified into pathogens (e.g., Salmonella enteritidis) or spoilage bacteria (e.g., Aeromonas, Enterobacter, Proteus, and Pseudomonas). Some infectious organisms can penetrate through the eggshell in contact with feces or bedding. so, sanitation is very necessary and fundamental in successful hatching egg production. Several sanitary applications are available. Fumigation, spray method, UV light, and washing with effective sanitizer are common work (Kuhl, 1989; Sacco et al., 1989; Coufal et al., 2003). Sanitation procedures depend on the size of operation, history of the disease outbreaks in the location, and the capacity of the equipment. If hatching eggs were not sanitized before incubation, several pathogen contamination and subsequent growth can lead to reduced hatchability, poor chick quality, and impaired growth and performance (Scott and Swetnam, 1993) as well as, elevating mortality (Reid et al., 1961). Eventually, microorganisms penetrate the shell and attack the embryo, causing losses in hatchability, therefore an effective hatchery sanitation program is critical to achieve a high level of hatchability and ensure the production of high quality chicks (Sacco et al., 1989).

Application of traditional sanitizers has been the method used by most producers to achieve that, but the implication of the control of substances harmful hazardous to health legislating is causing many procedures sanitizing techniques (Sparks and Burgess, 1993). Although this method is efficient in keeping incubation with low levels of contamination with extreme levels of hatchability, it is important to highlight that the possible toxic effects, not only to birds but also to human beings (Hayretda and Kolankaya, 2008).As a result, major interest is being seen in developing alternative methods to minimize microbial contamination reducing or eliminating reliance on synthetic pesticides. One such method involves the use of plant-derived-products; such as plant essential oils which contain microbicidal effects. Effects of yeast products on production and their mode of action in monogastrics have been reported in poultry (Stanley et al., 2004; Zhang et al., 2005) However, mode of action of yeast products is less clear. Some studies have confirmed the effects of yeast culture (YC) in increasing concentrations of commensal microbes or suppressing pathogenic bacteria (Stanley et al., 2004). However, these effects were not reported by others (Mathew et al., 1998; White et al., 2002; Van Heugten et

al., 2003). Other theories may responsible for effects of YC in monogastrics other than modulation of microbial ecology; Mannan-oligosaccharide and 1,3/1,6 β-glucan are components of the yeast cell wall that modulate immunity (Shashidhara and Devegowda, 2003), promote growth of intestinal microflora (Stanley et al., 2000), and improve growth (Parks et al., 2001). In a recent in vitro study (Jensen et al., 2008), the addition of a soluble fraction of YC showed an antiinflammatory effect in conjunction with activation of natural killer cells and B lymphocytes. In addition, others have reported that yeast products affect nutrient digestibility (Bradley and Savage, 1995; Shin et al., 2005) and intestinal mucosal development (Zhang et al., 2005). Therefore, the objective of this study was to evaluate effects of spraying YC on physiological changes in the embryonic development , hatchability and the bacterial load on eggshell surface of quail eggs, and chicks performance.

MATERIALS AND METHODS

Preparation of Solutions

A 5% live yeast solution was prepared by mixing 100 mL of water and 5 g of yeast and 5 g sugar. A 2.5% live yeast solution was prepared by mixing 100 mL of water and 2.5 g of yeast and 2. 5 g sugar at 37.5°C

Application of Solutions

Four handered and twenty haching edds were obtained from flock of Japanese quail aged 13 week and raised in commercial farm at new valley. The eggs of Japanese quail were randomly divided into 4 groups of 105 eggs. Eggs of the first group were served as a control group (non –treated eggs, A). The second group was sprayed with water because the yeast was dissolved in water. The other two groups were sprayed with live yeast at 2 doses: 2.5 g/100 mL solution (LY 2.5%) and 5 g/100 mL solution (LY 5%) respectively.

The solutions were taken and sprayed on to the eggs, using a hand sprayer, to cover the whole surface. After applications, the eggs were allowed to dry at 22°C for 10 minutes. A total of 30 eggs from each group was numbered and weighed at the beginning and on day 14 of incubation to calculate 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 with a drybulb temperature of 37.5°C and 65% RH until day 14 of incubation when incubator conditions were changed to 37.2°C and 75% RH. Eggs were turned through 90° once every 2 hours at the Department of Poultry Production ,Faculty of Agriculture, New Valley Branch, Assiut University, Egypt.

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) and total Staphylococcus count (TSC) spp. by using plate counting agar (PCA); (Conda lab., Spain) and Baired Parker agar (BPA) (Lab M, UK), respectively. 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 and at the end of incubation, the plates were removed and colonies

were counted and multiplied by the dilution factor. Colonies were measured as cfu/egg (Özelik, 1992)

Total bacterial count:

Total bacterial count was carried out on plate counting agar according to standard methods of BAM. (2005).

Total Staphylococcus count:

Dilutions made for TBC were pour-plated on Baired Parker agar (BPA) (Lab M, UK). Typical colonies were counted after 24 hours of incubation at 37°C. Suspected Staphylococcus spp colonies were confirmed by coagulase activity and confirmed by other biochemical reactions.

Traits measured

The ratios of embryo weight, albumen weight were estimated in relation to the egg weight. Shell thickness (mm) , embryonic length at 10^{th} or 14^{th} day and egg weight loss at $14t^{h}$ day of incubation were recorded.Hatched chick body weight, chick body length and shank length were measured. Eviscerated carcasses were individually weighed. The percentages of yolk sac residual, liver, gizzard, heart and intestine were calculated in relation to the live body weight of hatched chick.

At hatch, blood samples were collected from randomly five chicks per treatment. A portion of the fresh blood was used to investigate; red blood cells (RBCs), hemoglobin (Hb), packed cells volume (PCV) , white blood cells (WBCs) and differential counts. Serum was obtained from the blood samples by centrifugation for 15 minutes at 3000 rpm and stored at – 20 C^{o} until to be used in further analysis of blood constituents; calcium (Ca), blood hormones, thyroxine (T4) hormone and growth hormone (GH). These constituents were determined by enzyme immunoassay using commercial kits.

Hatching parameters:

During the end period of incubation of quail eggs; between 360 and 420 hour of incubation, transferred eggs were checked individually every 8 hours and hatched chicks were recorded. After 17.5 day of incubation, all hatched chicks were removed from each hatch basket and weighted. Unhatched 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

After the end of incubation period, 21 chicks per group (7 chicks/pen) were randomly allowed to be grown to determine their performance for 21 days. Chicks were weighed and identified with a leg ring number. Chicks were raised (3 pens/group) in different pens with 7 chicks, a grower diet (2,900 kcal of ME/kg and 24 % CP) was provided ad libitum. Temperature was set at 33°C and the lighting period was 23 hours and darkness for one. At the end of 21 days, all chicks were individually weighed (without leg ring). For each chick, the BW of day 1 (BW1) and the BW of d 21 (BW21) were recorded to calculate the body weight gain (BWG). Feed intake (FI) was reported for each replicate and thereby feed conversion ratio (FCR) as g feed/g BWG was calculated.

Statistical Analysis

Data obtained from this study were statistically analyzed using one-way ANOVA. Differences among 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, body length, shank length at the 10th and 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 by spraying with live yeast solution than those of control eggs, especially eggs sprayed with 5% live yeast solution showed the highest records at the 10th and 14th day of incubation and at hatch (Tables 3 and 4). There was a significant rise in the consumption of albumen by embryo where there was significant decrease in albumen at 10 and 14 days of incubation (Table 3) The lowest albumen percentag was determined in the eggs sprayed with 5% live yeast solution treatment then in eggs sprayed with 2.5% live yeast solution respectively compared to untreated groups. Live yeast, such as Saccharomyces cerevisiae, might be contains various enzymes that could be released into the intestine and help existing enzymes in the digestive tract in the digestion of feed. As well as, Kornegay et al. (1995) reported that yeast contains vitamins and other nutrients that may produce beneficial production responses.

Several studies have indicated that; all yeast products or yeast cell wall components have been used to influence physiology, morphology and microbiology of the intestine and to improve the growth of turkeys (Rosen, 2007b; Solis De Los Santos et al., 2007; Huff et al., 2010) and broiler chicks (Rosen, 2007a; Morales-Lopez et al.,2009; Adebiyi et al., 2012). Beneficial effect of yeast is due to many reasons, where yeast cell contains some nutrient materials such as proteins, vitamins and minerals (Amata, 2013) and the yeast cell wall contains manu-oligosaccharides (MOS) and 1, 1-6, D glucan, which help to improve growth and increase growth rate due to its positive effect on the intestinal mucosa.

During incubation from 0 to 14 d, the egg weight loss was determined as shown in Table (3). Egg weight loss rates significantly ranged between 9.38 and 10.65 % among all groups. The egg weight losses of the treated groups were lower compared with those of untreated groups. This may be explained by minimizing water loss through coated egg pores after spraying with live yeast solution. There were no significant (P > 0.05) differences in egg weight loss among the two concentrations of live yeast solution groups. Egg weight loss is an important parameter of incubation. Geng and Wang (1990) reported that very rapid moisture loss was undesirable to normal embryonic development. Egg weight loss ratio due to egg processing with disinfectants is reasonable because disinfectants may affect the cuticle layers and porosity of shell. This opinion was confirmed by Brake and Sheldon (1990) who recorded that any change or removal of the cuticle by antiseptics may have a significant effect on egg weight loss and hatchability.

Egg shell thickness (mm) of eggs treated by spraying with live yeast solution were similar to those untreated ones at the 10th day of incubation. However, it showed a significant decline at the 14th day of incubation in eggs sprayed by live yeast solution compared to untreated (Table 3), due to the interaction between the yeast solution with the egg shell that changes its properties, which may have some physical changes in morphology or cause a thinner eggshell. Therefore, supplemental live yeast solution rising calcium and P digestion. In this respect , Kornegay et al. (1995) reported that the yeast contains

1400 units / kg of phytase. Consequentely , The improvement in the use of calcium or P can be attributed in part to the phytase activity of yeast.

Eggs of treated groups by live yeast solution had significantly (P<0.05) shorter hatching periods than that of untreated eggs (Table 4). The quail eggs sprayed by 2.5 and 5%, the solution of live yeast groups recorded a shorter period (418,416 hours) respectively, and then spray water (419.67 hours), compared to the longest time in the control group (420.33 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 2.5 and 5% live yeast solution groups are in accordance with those previously reported by Mona (2011) who mentioned that the shortest range of hatch time was recorded for chicks produced from eggs treated with natural disinfectants.

Hatchability of fertile eggs

Ratio of hatchability of fertile eggs was significantly increased for all treated groups by spraying with live yeast solution in comparison with untreated one (Table 4). The highest ratio was observed in sprayed eggs by 5% live yeast solution versus the lowest one in control. Spraying fertile eggs with either 2.5 or 5% live yeast solution led to an increase in hatchability of fertile eggs by 5.70 and 8.57 % of the control value, respectively.Consequently, embryonic mortality had significant difference between treated groups with live yeast solution than that of untreated eggs (Table 4), the lowest mortality was estimated in eggs sprayed by 2.5 and 5% live yeast solution compared to untreated groups. The improvement of hatchability may be due to decreasing the embryonic mortality where live yeast solution may be regarded as an anti-stress agent.

Saccharomyces cerevisiae one of the probiotics that can replace antibiotics and have biologically valuable proteins, vitamin B-complex, important trace minerals and improved availability of phosphorus (Moore et al., 1994), increasing immunity and reduction in cases of disease infection (Line et al., 1997), moreover, enhancement of feed efficiency and growth performance (Day, 1997). In addition, Saccharomyces cerevisiae cells responds to oxidative stress by altering its transcriptional system in a complex manner (Saleh et al., 2013).

The superiority of the spray method in improving hatchability may be due to the high effect of the yeast solution on egg shell conductance, which is necessary for the exchange of respiratory gases during incubation. Moreover, the improvement of hatchability ratio may be due to the increasing in eggshell conductance as a result to the interaction between live yeast solution with eggshell cuticle that changes its properties, which may have some physical changes in their morphology or cause a thinner cuticle. These findings were in the same line with those of Bradley and Savage,(1995) ; Kornegay et al. (1995) ; Bradley and Savage, (1995); Shin et al., (2005) and Jensen et al.,(2008) .

Blood constituents:

Results in Table(5) showed significant (P<0.05) increase of hematological parameters, growth and T4 hormones beside calcium level for chicks of groups sprayed with live yeast compared with those for control and water spraying groups. Blood hematological parameters, hormones and calcium traits showed in

(Table 5) revealed significant differences ($P<0.05$) in response to spraying with live yeast solution. Values of blood hematological parameters, hormones and calcium of quail (Red Blood Cell, RBCs), Hemoglobin (Hb), Packed cell volume (PCV), Growth hormone, T4 and Ca, for chicks of eggs sprayed with 2.5 and 5% live yeast solution were greater than those of eggs sprayed with water or eggs of the control group. Results cleared that spraying with live yeast solution had a significant effect on all the studied traits. Spraying fertile eggs with either 2.5 or 5% live yeast solution led to an increase in RBCs by 7.51 and 12.72%, Hb by 18.03 and 30.75%, PCV% by 18.75 and 31.04 %, growth hormone by 22.85 and 52.86 % and T4 by 1.96 and 3.2 %, Ca by 17.67 and 29.44%, of the control value, respectively.

There was non-significant difference in counts of different white blood cells (%) in hatched chicks as in Table (5). Also the results showed that; Lymphocytes (%), Neutrophils (%), Monocytes (%), Eosinophils (%) did not differ significantly as a result of treatment by live yeast solution.

Our results agree to some extent with, Onifade (1997) and Onifade et al. (1999) who recorded that, a positive correlation between dietary levels of Saccharomyces cerevisiae with the hematological indices like RBC, WBC and PCV in broiler chickens, while not at the line of Yalçın et al (2013) who proposed that, the decrease in WBC of blood might be due to the reduction of the pathogenic bacterial load in the intestine with application of yeast.

Carcass constituents

Relative weights of liver, gizzard, heart and intestine for chicks of Japanese quails are presented in Table (6) . Liver, gizzard, heart and intestine relative weight for chicks of eggs sprayed by 2.5 and 5% live yeast solution were higher than those of eggs sprayed with water or control group, while yolk residual relative weight for chicks of eggs sprayed by 2.5 and 5% live yeast solution was lower than control group. Our results agreed with those of Onifade et al. (1998) .

Growth performance

Growth performance (body weight, body weight gain, feed intake and feed conversion) of chicks of Japanese quails are presented in Table (7). Final body weight, body weight gain and feed intake for chicks of eggs sprayed by 2.5 and 5% live yeast solution were higher ($P<0.05$) than those for eggs sprayed with water or control group beside, there was an improvement in feed conversion for chicks of eggs sprayed by 2.5 and 5% live yeast solution in comparing with the control group. Spraying fertile eggs with either 2.5 or 5% live yeast solution led to an increase in body weight by 38.59 and 52.72%, body weight gain by 44.11 and 60.20%, feed intake % by 6.20 and 7.75 %, of the control, respectively

Live yeast, such as Saccharomyces cerevisiae, contains different enzymes that could be produced in the gut and help existing enzymes in the digestive tract in the utilization of feed, also, yeast contains vitamins and other nutrients that may induce beneficial production responses (Kornegay et al., 1995). Here too, Ignacio, 1995 reported that receiving yeast to chicks improves feed gain ratio and body weight gain . Morever , Spring (2002) and Santin et al., (2003) reported that yeast can improve immune response of birds. Whole yeast cell wall components or yeast products have been used to improve growth and affect the morphology, physiology and microbiology of the intestinal tract of

turkeys (Rosen, 2007b; Solis De Los Santos et al., 2007; Huff et al., 2010) and broiler chicks (Rosen, 2007a and Morales-Lopez et al.,2009 ; Bradley et al. 1994) . In addition, Zhang et al. (2005) estimated that greater villus height and improved performance in birds with supplementation of yeast cell wall or whole yeast. Cell wall components of YC (β-glucans and α-mannans) may allowing fewer antigens to be in contact with the villi and provide a protective function to mucosa by preventing pathogens from binding to villi . Also , they showed the positive role of yeast cell wall in ileal mucosal development of broiler chicks. Gao et al. (2008) revealed that Saccharomyces cerevisiae would be more effective in improving performance because the demand for immune response is minimal. Greater levels of Saccharomyces cerevisiae could direct energy to prime the immune system and compromise potential growth performance. Pelicia, et al., (2010) also recorded that fermented yeast extracts are rich in mannan-oligosaccharides, β-gluccans and other nutritional metabolites that may optimize intestinal health and immunity, which translates to better growth performance and lower risks of disease-borne pathogens.

Microbiological Activity

Application of yeast had significant influence on TBC and TSC compared to control untreated either at 1st week or after two weeks of incubation (Table 8). The best significant results of TBC after one week of incubation is observed for eggs sprayed with 5% yeast as it decreased from 31.47 X 10^3 cfu/egg for control untreated to 18.86 X 10^3 cfu /egg for treated group. Apparently, data of this table showed that as the concentration of yeast increased from 2.5% to 5%, TBC decreased from 25.11 to 18.86 X 10^3 cfu /egg. Similar trend of decreasing TBC and staphylococcus count was observed for spraying eggs by yeast after two week of incubation. Total bacterial count on eggshell surface was increased in control untreated group from 31.47 X 10^3 cfu /egg at one week of incubation to 50.81 X 10^3 cfu/egg after two week of incubation. However, mode of action of yeast products is less clear. Some studies have confirmed the effects of yeast culture in increasing concentrations of commensal microbes or suppressing pathogenic bacteria (Stanley et al., 2004). However, these effects were not reported by others (Mathew et al., 1998; White et al., 2002; van Heugten et al., 2003).

CONCLUSION

It could be concluded that using live yeast solution (2.5% or 5%) as natural material for spraying Japanese quail eggs may be a good way to improve embryonic development , blood hematology; immunity, hatchability, chick body weight, chicks performance and provide an alternative treatment option for controlling microbial load on eggshell surface of quail eggs during the incubation periods . Also,this material could be used as safe disinfectant for hatching eggs .

Table (1): Composition and calculated analysis of the experimental diet- through the growing period

Ingredients	%
Ground yellow corn	57.83
Soya bean meal (44%)	32.94
Fish meal (60.05%)	3.50
Corn gluten (62)	3.48
Dicalcium phosphate	0.33
Limetone	1.16
DL-Methionine	0.09
Lysine	0.07
Iodized sodium chloride	0.30
Minerals and vitamins premix	0.30
Calculated composition	
Crude protein (%)	24.00
ME (kcal/kg)	2900.00
Calorie/protein ratio (C/P	120.83
Calcium (%)	0.80
Phosphorus (%)	0.30

Table (2): The chemical composition of yeast (*Saccharomyces cerevisiae*).

Composition	
Dry matter%	93
ME(kcal/kg)	1990
Crude protein%	44.4
Crude fat%	1
Crude fiber%	2.7
Ca%	0.12
P%	1.4

Table (3): Effect of spraying Japanese quails eggs by live yeast on embryonic and albumen weight, egg shell thickness, embryonic length at 10th or 14th days of incubation and egg weight loss (0-14d)

Traits / Treatments	Initial egg weight	Embryonic weight % (10 d)	Albumen weight % (10 d)	Egg shell thickness(mm) (10 d)	Embryonic weight % (14 d)	Albumen weight % (14 d)	Egg shell thickness(mm) (14 d)	Egg weight loss % (0-14d)
Control	10.86	9.58 c	21.43 a	19.66	34.09 d	1.34 a	18.89 a	10.65 a
Spraying by water	10.86	9.66 c	20.89 b	19.56	35.09 c	1.18 b	18.78 a	10.59 a
Spraying by live yeast (2.5%)	10.85	10.60 b	19.35 c	19.33	39.25 b	0.34 c	17.67 b	9.38 b
Spraying by live yeast (5%)	10.84	11.04 a	18.60 d	19.33	41.69 a	0.14 d	16.56 b	9.42 b
Pooled SEM	0.031	0.068	0.087	0.288	0.175	0.034	0.327	0.060

Embryonic length (cm)				
Traits	Body length (10d)	Shank length (10d)	Body length (14d)	Shank length (14d)
Control	3.20 c	0.63 b	6.43 c	0.90 c
Spraying by water	3.30 c	0.67 b	6.53 bc	0.90 c
Spraying by live yeast(2.5%)	3.80 b	0.83 a	6.67 ab	1.17 b
Spraying by live yeast(5%)	4.10 a	0.87 a	6.80 a	1.27 a
Pooled SEM	0.058	0.033	0.039	0.017

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 live yeast on hatched chick body weight , body length , shank length, hatchability , embryonic mortality and hatch time.

Traits / Treatments	Chick body weight (gm)	Chick body length (1d)	Chick shank length (1d)	Hatchability of fertile eggs (%)	Embryonic mortality of fertile eggs (%)	Hatch time (hrs)
Control	8.08 c	9.23 d	1.40 c	81.40 d	18.59 a	420.33 a
Spraying by water	8.11 c	9.50 c	1.70 b	82.55 c	17.45 a	419.67 ab
Spraying by live yeast(2.5%)	8.20 b	9.77 b	1.97 a	86.04 b	13.96 b	418.00 b
Spraying by live yeast (5%)	8.27 a	10.03 a	2.03 a	88.38 a	11.62 c	416.00 c
Pooled SEM	0.007	0.048	0.046	0.631	0.631	0.455

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

Table(5): Effect of spraying Japanese quails eggs by live yeast on blood constituents and hormones of hatched chicks. .

Traits / Treatments	RBC(106/ mm3)	HB(g/dl)	PCV %	WBC(10^3/mm3)	Lymphocytes (%)	Neutrophils (%)	Monocytes (%)	Eosinophils (%)
Control	1.73 c	9.43 c	14.40c	44.85	50.33	43.67	3.33	2.67
Spraying by water	1.74 c	9.50 c	14.57c	44.90	50.33	43.33	3.67	2.66
Spraying by live yeast (2.5%)	1.86 b	11.13 b	17.10b	44.87	50.66	43.33	4.00	2.00
Spraying by live yeast (5%)	1.95 a	12.33 a	18.87a	44.96	50.67	43.00	4.00	2.33
Pooled SEM	0.012	0.149	0.114	0.021	0.333	0.333	0.167	0.249

	HORMONS	biochemical blood
Traits	Growth hormone(ng/ml)	Thyroxine (T4) (ng/ml)	Ca (mg/100ml)
Control	0.70 c	9.67 c	8.32 c
Spraying by water	0.74 c	9.71 c	8.34 c
Spraying by live yeast (2.5%)	0.86 b	9.86 b	9.79 b
Spraying by live yeast (5%)	1.07 a	9.98 a	10.77 a
Pooled SEM	0.022	0.020	0.021

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

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

Traits / Treatments	Yolk residual %	Liver %	Gizzard %	Heart %	Intestine %
Control	10.23 a	1.84 d	3.90 d	0.65 c	2.54 d
Spraying by water	10.20 ab	1.97 c	3.98 c	0.65 c	2.73 c
Spraying by live yeast (2.5%)	9.99 b	2.21 b	4.14 b	0.75 b	2.83 b
Spraying by live yeast (5%)	9.67 c	2.47 a	4.25 a	0.89 a	2.91 a
Pooled SEM	0.056	0.024	0.017	0.016	0.017

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 live yeast solutions on post-hatched chicks growth .

Traits / Treatments	Initial chick weight (g)	Final body weight at 21 d (g)	Body weight gain (g)	Feed intake (g)	Feed conversion (g feed/g W)
Control	8.14	67.38 c	59.15 c	129.00 c	2.18 a
Spraying by water	8.13	68.14 c	60.01 c	131.33 b	2.19 a
Spraying by live yeast (2.5%)	8.14	93.38 b	85.24 b	137.00 a	1.61 b
Spraying by live yeast (5%)	8.14	102.90 a	94.76 a	139.00 a	1.47 c
Pooled SEM	0.003	0.385	0.187	0.733	0.007

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 with live yeast solutions on total bacterial and total staphylococcus counts on the eggshell surface (X 103 cfu /egg) of 1st and 2nd weeks of incubation**.**

Traits / Treatments	T.B.C		T. Staph. C.	
	T.B.C. 1 week	T.B.C. 2 week	T. Staph. C. 1 week	T. Staph. C. 2 week
Control	31.47 a	50.81 a	3.49 a	10.49 a
Spraying by water	31.11 a	49.49 b	3.45 a	10.37 a
Spraying by live yeast (2.5%)	25.11 b	23.68 c	2.79 b	2.19 b
Spraying by live yeast (5%)	18.86 c	17.78 d	2.04 c	1.93 c
Pooled SEM	0.138	0.110	0.049	0.058

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

T.B.C. =Total bacterial count of quail eggs – T. Staph. C.= Total staphylococcus count of quail eggs.

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yeast, total bacterial count, blood hematology, hormones, hatchability.

الملخص العربى

تاثير رش بيض تفريخ السمان اليابانى بمحلول الخميره الحيه على التغيرات الفسيولوجيه فى التطور الجنينى والتفريخ والعد البكتيرى الكلى

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أجريت هذه التجربة لدراسة دور رش بيض التفريخ للسمان الياباني بمحلول الخميره الحيه على التغيرات الفسيولوجية في التطور الجنيني، معدلات الفقس ، الحمل البكتيري على سطح قشر البيض وأداء الكتاكيت. تم استخدام أربعمائة وعشرين بيضة تفريخ للسمان الياباني و قسمت إلى أربع مجموعات . المجموعة الأولى هي المجموعة الكنترول و المجموعة الثانية تم رش البيض بالماء و تم رش بيض المجموعتين الثالثة والرابعة بمحلول الخميرة الحيه بنسبة تركيز 2.5٪ و 5٪ على التوالي.

وفيما يلي اهم النتائج التي تم الحصول عليها:

1- 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 للبيض المعامل برش محلول الخميره بالمقارنه بالكنترول

2- انخفض معنويا وزن الالبيومين كنسبه مئويه من وزن البيضه عند عمر 10 و14 يوم من التفريخ وانخفضت نسبه الفقد المائى للبيضه وسمك قشره البيضه للبيض المعامل برش محلول الخميره بالمقارنه بالبيض الغير المعامل

3- كما تحسنت معنويا صفات الدم الهيماتولوجيه (عدد كرات الدم الحمراء واليموجلوبين و pcv) وبعض الهرمونات وكالسيوم الدم ، وتحسنت كرات الدم البيضاء ولكن بصوره غير معنويه للبيض المعامل برش محلول الخميره بالمقارنه بالكنترول

4- تحسنت مكونات الذبيحة (الكبد والقونصه والقلب والأمعاء) للكتاكيت الفافسه وتحسنت صفات النمو للكتاكيت (وزن الجسم ووزن الجسم المكتسب والعلف المستهلك ومعدل التحويل الغذائى) عندعمر 21 يوم ، في حين وجد انخفاض معنوى فى نسبه وزن الصفار المتبقى للكتاكيت الفافسه للبيض المعامل برش محلول الخميره بنسبة 2.5 و 5٪ بالمقارنه بالكنترول

5- كان لرش البيض بالخميرة تأثير كبير حيث انخفض العدد البكتيرى الكلى وعدد بكتيريا الاستافيلى كوكس (TSC) بعد أسبوع او اسبوعين من وضع البيض بالمفرخه للبيض المعامل برش محلول الخميره بالمقارنه بالكنترول

واخيرا قد يكون رش بيض السمان الياباني بمحلول الخميرة الحية (5 %) قبل وضع البيض بالمفرخه وسيلة جيدة لتحسين التطور الجنيني ومعدلات الفقس وصفات الدم الهيماتولجيه والهرمونات والمناعه للكتاكيت الفقسه وخفض الحمل البكتري على سطح قشره بيض التفريخ للسمان الياباني