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EFFECT OF YEAST AND DATE WASTE MEAL SUPPLEMENTATION ON PRODUCTIVE AND REPRODUCTIVE PERFORMANCE, AND PHYSIOLOGICAL STATUS OF JAPANESE QUAIL DURING THE SUMMER SEASON

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SUMMARY

This trail was conducted to evaluate the nutritional value of date waste meal (DWM) supplementation with or without yeast administration in drinking water on quail performance, egg fertility and hatchability and physiological status during the summer season. One hundred and eight, 8 weeks old Japanese quails (*Coturnix coturnix japonica*) were randomly allocated into nine equal groups, 12 birds each (6 males and 6 females); each with three equal replications (2 males and 2 females). Birds received three doses of yeast (0.0, 1.0 and 2.0 g/L water) with three levels of dietary DWM supplementation (0.0, 10.0 and 15.0%). The monthly temperature-humidity index (THI) was estimated using daily records on ambient temperature and relative humidity rates. Body weight, weight gain, feed consumption and feed conversion ratio were positively affected by the added yeast and dietary enrichment of DWM. These enhancements were parallel to an increase in egg fertility and hatchability, and a decrease in non-pipping embryos and embryonic mortality. The hematological and biochemical parameters (kidney function, liver function, testosterone and tetra-iodothyronine hormones, oxidative status and immune indices) were significantly enhanced by the interactions between yeast and DWM supplementation compared with the control. In conclusion, adding yeast to drinking water or supplementing diets with DWM throughout the summer season might be an efficient way to reduce the detrimental effects of high ambient temperatures on hatchability and improve the performance of quail, as well as to adjust the parameters related to haemato-biochemistry.

Keywords: *Yeast, date waste meal, quail, hatchability, physiological status.*

INTRODUCTION

The key factor affecting the bird productivity in south Egypt's subtropical climate is the ambient temperature. In Upper Egypt, the summer and early fall (May to September) do not lie within the thermally neutral and comfortable zone (Attia *et al.*, 2011). When the lowest and maximum temperatures stay below 5 and 30°C, respectively, quail will lay a good rate of egg production (Albino and Barreto, 2012). El-Tarabany (2016) stated that laying quails are more comfortable at a temperature of 23.8°C. The comfortable range of ambient temperature for quails is between 18-30°C. However, with an optimal temperature (between 21-27°C), the cooling is important when temperatures exceed 30°C (Shanaway, 1994). Increases in respiration rates, decreases in activity, feed intake, feed conversion ratio, egg production, and egg weight are reported in animals and poultry exposed to heat stress (Sandikci *et al*., 2004). For many years, the *Saccharomyces cerevisiae* yeast strain has been primarily utilized as a natural growth promoter in the production of chickens (Al-Mansour *et al*., 2011). Among these natural enhancers, the addition of yeasts and antimicrobials for animal and poultry was applied (Aluwong *et al*. 2013). It has been demonstrated that adding live yeast to animal and poultry feed improves both the feed's quality and productivity of poultry and animals (Glade and Sist, 1988).

However, the date palm (*Phoenix dactylifera*) is a key component of the economics and social lives of the desert parts of North Africa and the Middle East, where its fruits form a staple diet (FAO, 2007). The largest producing nations of date fruits were Egypt, Iran, and Saudi Arabia, with respective output of 1.13 million tons, 1.0 million tons, and 983,000 tons, contributing to the worldwide date fruit production of almost 7 million tons in 2010 (FAO, 2010). In 2014, this amount of production rose to 7.5 million tons (GSR, 2015). Egypt is one of the largest palms producing countries in the North Africa where about 25% of the total production is unsuitable for human consumption and may be classified as a waste (Daghir, 2008). The date palm is characterized as a local product in large quantities is cheap and high in energy content (Al-Bowait and Al-Sultan, 2006). According to Kamel *et al*. (1981), chicks given control diets showed the same optimal performance when fed diets containing varying levels of date palm (5, 10 and 15%). Jumah *et al*. (1973) discovered, however, that as compared to the control group, broiler body weight gain decreased proportionately and gradually when fed diets containing graded amounts (0, 5 and 15%) of dates palm. According to Afzal *et al*. (2006), using date palm for up to 30% of the diet did not significantly affect feed intake, body weight, or feed conversion ratio of broiler chickens. A few research on the impact of date palm secondary products on the performance status of laying hens have been reported. According to El-Deek *et al*. (2008), laying hen diets may contain DWM as an alternative to dietary cereal up to 10% without any adverse effect on egg production. According to Ghasemi *et al*. (2014), date palm may be fed to laying hens at a level of 20% with no negative impact on their productivity. Therefore, the objective of this study was to determine the effect of yeast administration and dietary supplementation with DWM on performance, egg fertility and hatchability and physiological status of Japanese quail during the summer season.

MATERIALS AND METHODS

This research was conducted during the summer season (May to June, 2023) at a private poultry farm. The study adhered to the ethical guidelines established by the Animal Production Department, Faculty of Agriculture, Tanta University. These guidelines are aligned with the institutional ethical rules (No. AY 2019-2020 /Session 6/2020.01.13) set forth by the Agriculture College of Tanta University for the ethical treatment of animals in scientific research.

Experimental birds and management:

One hundred and eight Japanese quails at 8 weeks of age were assigned to similitude groups. Birds with nearly equal live body weights (229 ± 0.15 g) were randomly distributed among nine distinct treatment groups (12 birds each) with three equal replications, each has 2 males and 2 females. A 3x3 factorial arrangement of treatments was used, including three doses of yeast (*Saccharomyces cerevisiae*) [0.0 (Y0), 1.0 (Y1), 2.0 (Y2) g per liter drinking water], that were administered daily in fresh water. Another treatment with three levels of dates waste meal (DWM) [0.0 (D0), 10.0% (D1) and 15.0% (D2)] were included into diets. All birds were reared in wire battery cages under similar environmental conditions. Diet and water were provided *ad-libitum* and subjected to a 17 hours light program daily throughout the whole experimental period. Corn-soybean diet was used as a basal diet containing 20% crude protein (CP) and 2917 kcal/kg metabolizable energy (ME) or diets containing 10.0% and 15.0% DWM through the experimental periods (Table 1) and the chemical composition of yeast and DWM were recorded in Table 2.

Collection and analysis of DWM:

The DWM used in this study was collected from stores in New valley governorate, Egypt. It was incorporated into diets after natural solar drying; then, the dates were ready to be grinded via crushing and carefully milling to match the particle size suitable for feeding the quail birds, in a heavy-duty high rotation hammer mill to pass through mesh-sieve screen (Boubekri *et al*., 2009). The obtained DWM was suitable for quail nutrition and was subjected to the chemical analysis. The DWM contents of moisture, ether extract (EE), CP, crude ash and crude fiber (CF) were determined using standard analytical procedures described by the Association of Official Analytical Chemists (AOAC, 1995). The ME content of DWM was calculated by the equation of Carpenter and Clegg (1956) as follows: ME (kcal/kg) = –53 + 38 [(% CP) + (2.25×% EE) + 1.1 (% Nitrogen-free extract)]. Table 2 summarizes the chemical analysis of DWM used in the present study, its composition is typically in agreement with the findings of Najib and Al-Yousef (2012).

Table (1): Composition and calculated analysis of the experimental diets containing different levels of DWM for Japanese quails.

Ingredients (%)	Dietary level of DWM (%)		
	0.0	**10.0**	**15.0**
Yellow corn	60.05	49.30	43.00
Soybean meal (44% CP)	25.00	23.60	24.45
Corn gluten meal (60% CP)	5.70	7.05	6.70
Dicalcium phosphate	2.30	2.30	2.30
Limestone	4.80	4.80	4.80
Vit. + Min. premix[1]	0.25	0.25	0.25
NaCl	0.20	0.20	0.20
DL- Methionine	0.05	0.05	0.05
L-Lysine- HCl	0.15	0.15	0.15
Cotton seed oil	1.50	2.30	3.10
Date waste meal (DWM)	0.00	10.00	15.00
Total	100.00	100.00	100.00
Calculated analysis: As fed basis (NRC, 1994)			
Crude protein, %	20.03	20.02	20.02
ME (kcal/kg)	2917	2915	2915
Crude fiber, %	3.22	4.64	5.37
Crude fat, %	2.62	5.15	5.97
Calcium, %	2.51	2.42	2.41
Available phosphorus, %	0.55	0.52	0.51
Lysine, %	1.08	1.04	1.04
Methionine + Cystine, %	0.77	0.74	0.75

1: Layer Vit. + Min. premix: Each 2.5 kg of vitamins and minerals premix (commercial source Pfiezer Co.) consists of Vit. A, 12 MIU, Vit. E, 15 KIU, Vit. D_3, 4 MIU, Vit. B_1 1.0 g, Vit. B_2 8.0 g, Vit. B_6, 2.0 g, Vit. B_{12}, 10 mg, Pantothenic acid, 10.87 g, Niacin, 30 g, Folic acid, 1.0 g, Biotin, 150 mg, Copper, 5.0 g, Iron, 15 g, Manganese, 70 g, Iodine, 0.5 g, Selenium, 0.15 g, Zinc, 60 g and Antioxidant, 10 g.

Table (2): The chemical composition of yeast and dates waste meal (DWM) used in the present study.

Component:	Yeast	DWM
ME (kcal/kg)	1990	2699.5
Dry matter, %	93.00	97.45
Crude protein, %	44.40	6.40
Crude fat, %	1.00	5.58
Crude fiber, %	2.70	16.40
Ca, %	0.12	.....
P, %	1.40	.....
Nitrogen free extract	.....	46.08

Environmental conditions and temperature humidity index (THI):

An automatic temperature and hygrometer was used to measure temperature and relative humidity. The monthly mean was estimated using the total daily temperature and relative humidity averages from May to June. The following equation (Marai *et al.* (2003) was used to determine the THI. The THI was calculated as dbºC – [(0.31- 0.31RH) (dbºC-14.4)] where RH is the relative humidity percentage/100 and db°C is the dry bulb Celsius temperature. It is important to note that during the laying seasons, all of the experimental quail birds were reared in accordance with acceptable environmental, management, and sanitary guidelines. The calculated means of monthly ambient bulb temperature, relative humidity and THI monthly were 41.7ºC, 48.7% and 38.33 in May and 42.7ºC, 50.2% and 38.87 in June, respectively. According to Marai *et al*. (2003), the THI values were divided into four categories: absence of heat stress (<27.8), moderate heat stress (27.8-28.8), severe heat stress (28.9-29.9), and extremely severe heat stress (>30.0).

Productive traits of Quails:

For the birds in the experiment, the initial (ILBW) and final (FLBW) live body weights were recorded. The difference between the two body weights was used to compute the body weight gain (BWG). For each replication, feed intake (FI) was recorded, and this allowed for the calculation of feed conversion ratio (FCR) as g feed/g BWG.

Fertility and hatchability of eggs:

After recording, eggs from each experimental group were placed weekly in a single incubator tray and kept for seven days at a temperature of 15–18°C and 70–75% relative humidity before being incubated. The eggs that were deemed acceptable for brooding were placed in an incubator. The eggs were kept in an incubator with forced drying, in which the temperature was maintained at 99.5 °F and the relative humidity at 55–60%. After that, the remaining unhatched eggs were broken down to reveal the viable and infertile eggs, non-pipping embryos, and embryonic mortality. The number (No) of hatched chicks was recorded. The egg fertility and hatchability were calculated as follows: Egg fertility ═ No of fertile eggs/No of total eggs set into the incubator x 100. Hatchability of fertile eggs = No of hatched chicks/No of fertile eggs set into the incubator x100. The percentages of non-pipping embryos and embryonic mortality were also recorded.

Blood analysis of laying quails:

Six birds from each treated group were randomly selected at the end of the experiment (14 weeks of age), and blood samples were taken from the brachial vein at 8 a.m. in each treatment. Serum was obtained by centrifuging the blood at 4000 rpm for 15 minutes, and the serum was stored at -18°C until chemical analysis. Blood hematological characteristics, such as red blood cells (RBCs), hemoglobin (Hb), packed cell volume (PCV), and white blood cells (WBCs) and WBC differential count, were tested on a part of the fresh blood. The quantities (%) of lymphocytes, heterophils, monocytes, and eosinophils were determined as part of immunological assays (Feldman et al., 2000). The biochemical blood indicators, urea (mg/dl), creatinine (mg/dl), alkaline phosphatase (ALP) (U/L), aspartate aminotransferase (AST) (U/L), alanine aminotransferase (ALT) (U/L) were determined from serumusing commercial kits (Biolabosa As. Frances), testosterone and thyroxine (T4) (ng/ml) using commercial kits (Monobind As. USA America), glutathione peroxidase (GPX) (U/L), glutathione (GSH) (U/L), superoxide dismutase (SOD) (U/L), and total antioxidant capacity (TAC) (mg/dl), and IgM and IgG (mg/ dl), using commercial kits (Spectrum, Diagnostics, Egypt, Co. for Biotechnology, S. A. E.).

Statistical analysis:

The General Linear Model procedures `of the Statistical Analysis System (SAS, 2002) was used to statistically analyze the data of this investigation. According to Duncan's multiple range test (Duncan, 1955), significant differences between means were determined, with $P \leq 0.05$ considered to be significant.

RESULTS AND DISCUSSION

Productive pperformance of quails:

The effect of yeast and date waste meal (DSM) on productive performance parameters [live body weight (LBW), body weight gain (BWG), feed consumption (FC) and feed conversion ratio (FCR) of laying Japanese quails during the summer season were presented in Table 3. Averages of growth performance parameters at 14 weeks of age were improved by increasing the administration yeast doses. Results indicated that, the improvements reached 5.7 and 7.6% in final live body weight (FLBW), 12.4 and 16.0% in total FC and 19.5 and 23.8% in total FCR for Y1 and Y2, respectively compared with the control group (Y0). The beneficial effects of yeast (*Saccharomyces cerevisiae*) supplementation on growth performance metrics in Japanese quail may be attributed to improved nutrient utilization and a reduction in the development of harmful bacteria as a result of altered intestinal conditions. The yeast may potentially improve feed consumption by increasing enzyme activity in the digestive system.

Also, the dietary supplementation of 10 and 15% DWM brought about marked improvements in growth performance parameters. Such significant (P<0.001) improvements were observed in means of LBW by the value of 5.5 and 5.0%, FC by 11.3 and 9.7% and in FCR by 16.0 and 15.3%, respectively, compared with control group. The interactions between yeast and DWM were statistically significant (P<0.001) of FLBW, BWG, FC and FCR at 14 weeks of age in Table 3. The best means of FLBW, total BWG, total FC and total FCR at 14 weeks of age were observed in the experimental birds received 2 g of yeast per L of drinking water and 10% DWM (A3B2), than the other treatments.

It is clear that the effect of heat stress is evident through a general effect on growth performance, but yeast administration in drinking water and addition of DWM may successfully maintain the production efficiency under heat stress and had helped to reduce the effect of high ambient temperature and THI of quail hens. Similar results were noticed in broiler chickens by Haldar *et al.* (2011) and Al-Yasiri *et al.* (2013), who cited that the probiotic (yeast) and date flesh reduced the effect of heat stress and may be added to broiler diets to boost growth. Similar findings were published by Al-Mafragy (1999), who demonstrated that broiler diets supplemented with date extract resulted in a notable increase in BWG of birds.

Table (3): Effects of yeast (Y) and date waste meal (DWM) on productive performance parameters of Japanese quail during the summer season.

Main Effects	ILBW (g)	FLBW (g)	BWG (g)	FC (g)	FCR (g:g)
Yeast Level (A):					
Y0 (0.0 g/liter): A1	229.89	268.34^{c}	38.27^{c}	1400.93^{c}	36.71^{a}
Y1 (1.0 g/liter): A2	230.04	283.51^{b}	54.38^{b}	1574.53^{b}	29.54^{b}
Y2 (2.0 g/liter): A3	229.86	288.65^{a}	58.86^{a}	1624.47^{a}	27.98^{c}
SEM	0.155	1.160	2.334	26.390	0.966
P value	0.001	0.001	0.001	0.001	0.001
DWM Level (B):					
DWM 0 (0.0%): B1	229.87	270.66^{c}	41.30^{c}	1433.13^{c}	35.07^{a}
DWM 10 (10%): B2	229.98	285.63^{a}	55.83^{a}	1594.60^{a}	29.46^{b}
DWM 15 (15%): B3	229.95	284.23^{b}	54.37^{b}	1572.20^{b}	29.71^{b}
SEM	0.156	1.472	3.144	35.834	1.401
P value	0.001	0.001	0.001	0.001	0.001
AB Interactions:					
A1B1	229.73	261.86^{i}	32.70^{g}	1240.40^{h}	37.94^{a}
A1B2	230.03	272.76^{g}	41.40^{f}	1502.20^{f}	36.29^{b}
A1B3	229.92	270.41^{h}	40.70^{f}	1460.20^{g}	35.89^{b}
A2B1	230.13	273.62^{f}	43.50^{e}	1540.00^{e}	35.41^{b}
A2B2	229.99	287.74^{d}	59.60^{c}	1575.00^{d}	26.43^{de}
A2B3	230.00	289.18^{c}	60.03^{c}	1608.60^{c}	26.79^{d}
A3B1	229.77	276.49^{e}	47.70^{d}	1519.00^{f}	31.85^{c}
A3B2	229.91	296.37^{a}	66.50^{a}	1706.60^{a}	25.67^{e}
A3B3	229.93	293.09^{b}	62.37^{b}	1647.80^{b}	26.43^{de}
SEM	0.275	0.260	0.429	7.866	0.393
P value	0.001	0.001	0.001	0.001	0.001

a-c: For each of the main effects, means in the same column carrying different superscripts differ significantly at P ≤0.05. ILBW: Initial live body weight, FLBW: Final live body weight, BWG: Body weight gain, FC: Feed consumption, FCR: Feed conversion ratio and SEM: Standard error of the means.

According to Batal and Parsons (2004), a number of raw ingredients, including dates, provide highly digestible energy sources of glucose and its derivatives and which are thought to can improve broiler performance. When date sugar was added to diets of broiler chicks the dry matter digestibility of diets significantly increased. Hermes and Al-Homidan (2004) discovered that laying hens fed diets with 10% date pit meal had an improvement in the FCR (kg feed/kg egg). According to Hosseini *et al.* (2006), during the period from 25–78 weeks of age, feed conversion of laying hens was significantly impacted by the addition of live yeast in diets of laying hens. In order to boost growth performance, treated date pits at levels ranging from 5 to 27% might be added to broiler diets (Vandepopuliere *et al*., 1995).

Numerous studies have demonstrated that broilers performed well when fed diets supplemented with the whole or pulp dates (El-Deek *et al.*, 2008; Hussein *et al.*, 1998). Dizaji and Pirmohammadi (2009) discovered that adding *Saccharomyces cerevisiae* yeast at levels of 0, 200, 300, and 400 g/ton of laying hen feed significantly improved the feed conversion.

In addition, Najib and Al-Yousef (2012) noted that layer hens fed 10% date pits meal (DPM) without enzymes improved FCR and increased FI compared to those fed 15% DPM. Also it agrees with the findings of Mohammed (2013), who showed that broilers aged 22-56 days can efficiently utilize the diets of different levels of the whole Al-Zahdi dates. She also stated that FI, LBW and FCR were significantly affected by including whole dates in the diet. Al-Yasiri *et al.* (2013) reported that there was a significant increase in feed consumption, BWG and an improvement in FCR due to feeding diets enriched with Al-Zahdi date meat to broilers reared under heat stress. Ghasemi *et al*. (2014) found an increase in feed consumption of layer hens fed DPM. Hassan and Al Aqil (2015) showed that supplementing different dietary levels of DPM with β-mannanase supplements to Hisex layer chickens from 45 to 53 weeks of age had significant effects on FI and FCR.

It is important to note that the biological activities of the primary components of the residual sugar in dates palm meal may be responsible for the improvement in growth performance indicators that happened as a result of a reduction in the pathogenic bacterial load in the intestine and an improvement in the health of the intestinal lumen in quail birds fed on yeast and DWM. The components of the yeast cell wall known as mannan-oligosaccharide and 1,3 / 1,6 β-glucan have been shown to enhance immunity (Shashidhara and Devegowda, 2003), stimulate intestinal bacterial growth (Spring *et al*., 2000; Stanley *et al*., 2000), and improve growth performance (Parks *et al*., 2001).

Egg fertility and hatchability of quails:

The effects of different commercial yeast levels in water or dietary DWM in quail breeders on egg fertility and hatchability are shown in Table (4). The results showed that yeast supplementation to drinking water affected the percentages of egg fertility, hatchability, non-pipping embryos and embryonic mortality.

A key factor in flock management is the reproductive capacity of Japanese quail. Vital signs of chick production from a breeding flock include egg fertility, hatchability, embryo mortality and non-pipping embryos. Age of the parents, the ratio of mating to egg laying, the surroundings, feeding, climate, and other variables have an impact on egg fertility (Daikwo *et al*., 2011). According to several studies, Japanese quail breeders aged between 8 and 52 weeks have been reported to achieve a range of the fertile hatchability rate and egg fertility from (40.00 to 70.34%) to (69.44 and 74.42%), respectively. In this study, positive effect of commercial yeast or DWM on egg fertility and hatchability of fertile eggs set were determined. The average egg fertility and hatchability reached 7.7 and 15.3% and 11.4 and 14.5% for the treated groups with 1.0 and 2.0 g yeast/L water and were 8 and 7%, and 10.7 and 9.06% for groups fed diets containing 10 and 15% of DWM more than control treatment, respectively. Moreover, commercial yeast or DWM significantly decreased the percentages of non-pipping embryos and embryonic mortality (Table 4). As non- pipping embryos and embryonic mortality rates of the experimental groups given the two levels of commercial yeast (1.0 and 2.0 g/L drinking water) or fed the WWM-diets (10 and 15%) were lower by 21.9 and 26.8%, and 23.2 and 30.6%, or by 26.4 and 23.1% and 16.3 and 12.9% than control group, respectively.

The interactions between yeast and DWM positively affected the quail breeders reproductive performance; *i.e.* egg fertility and hatchability percentages. The highest means of percentages of egg fertility and hatchability were 87.78 and 85.56, 81.01 and 76.61) at A3B2 and A3B3, respectively. Also, the AB interaction was effective in minimizing the percentages of non-pipping embryos and embryonic mortality compared with control group. The lowest means of non-pipping embryos and embryonic mortality percentages were 11.40 and 7.60%, and 13.03 and 10.36% at A3B2 and A3B3, respectively.

During summer, quail chickens experience severe heat stress as evidenced by higher THI values (38.33-38.87 on average), increased respiratory rate, decreased activity, egg production, and egg weight (Manner and Wang, 1991). However, evident improvements in egg fertility, hatchability and oxidative status of quail were observed as a result of administration of yeast in water or dietary supplementation of DWM under heat stress. The improved hatchability rate in this study could be due to obtaining a better fertility rate than that reported by Farooq *et al*. (2001) and Khurshid *et al*. (2004). Similar results were found by Shashidhara and Devegowda (2003), who observed an increase in the percentages of fertile eggs and hatchability in broiler chickens fed diets enriched with 0.5 kg/ton mannan oligosaccharide (MOS). Guclu (2011) observed that dietary supplementation of 1 kg/ton probiotic and 0.5 kg/ton MOS for 18-weeks old Japanese quail breeders led to an increase in egg fertility by 12% and 15%, respectively, compared to control. Al-Yousef (1985) showed that feeding breeder quails on various levels of dates meal (8 to 24%) supported good egg fertility rates. As seen in previous studies, there was limited information in the literature about the effect of dietary supplementation of DWM on the hatchability of Japanese quail.

Table (4): Effects of yeast (Y) and date waste meal (DWM) on percentages of egg fertility (EF), fertile hatchability (FH), non-pipping embryos (NPE) and embryonic mortality (EM) of Japanese quail during the summer season.

Main Effects:	EF	FH	NPE	EM
Yeast Level (A):				
Y0 (0.0 g/liter): A1	72.59^{c}	66.27^{c}	18.93^{a}	14.80^{a}
Y1 (1.0 g/liter): A2	78.15^{b}	73.85^{b}	14.78^{b}	11.37^{b}
Y2 (2.0 g/liter): A3	83.71^{a}	75.87^{a}	13.86^{b}	10.27^{b}
SEM	1.20	1.21	0.96	0.72
P value	0.001	0.001	0.001	0.001
DWM Level (B):				
DWM 0 (0.0%): B1	74.45^{c}	67.55^{b}	18.99^{a}	13.46^{a}
DWM 10 (10%): B2	80.37^{a}	74.76^{a}	13.98^{b}	11.26^{b}
DWM 15 (15%): B3	79.63^{b}	73.67^{a}	14.61^{b}	11.72^{b}
SEM	1.77	1.54	0.96	0.92
P value	0.001	0.001	0.001	0.001
AB Interactions:				
A1B1	71.11^{d}	62.48^{e}	21.86^{a}	15.66^{a}
A1B2	74.44^{cd}	68.64^{cd}	16.46^{bc}	14.89^{ab}
A1B3	72.22^{d}	67.68^{d}	18.47^{b}	13.86^{abc}
A2B1	74.45^{cd}	70.19^{c}	17.94^{b}	11.87^{bc}
A2B2	78.89^{b}	74.64^{b}	14.07^{cd}	11.29^{bcd}
A2B3	81.11^{b}	76.72^{b}	12.33^{d}	10.94^{cd}
A3B1	77.78^{bc}	69.99^{c}	17.15^{bc}	12.86^{abc}
A3B2	87.78^{a}	81.01^{a}	11.40^{d}	7.596^{d}
A3B3	85.56^{a}	76.61^{b}	13.03^{d}	10.36^{cd}
SEM	1.23	0.52	0.81	0.95
P value	0.001	0.001	0.001	0.001

a-c: For each of the main effects, means in the same column carrying different superscripts differ significantly at P ≤0.05. SEM: Standard error of the means.

Hematological traits of laying quails:

The effects of administration of different levels of commercial yeast in drinking water or DWM on the hematological parameters of laying Japanese quail were shown in Table 5. The results showed that commercial yeast supplementation to drinking water affected significantly the hematological parameters (RBCs, Hb, PCV, WBCs and lymphocytes). Means of RBCs, Hb and PCV significantly (P≤0.001) increased with increasing quantity of yeast from zero to 1 and 2 g/ liter of drinking water by 29.2 and 48.8%, 14.4 and 20.5% and 13.0 and 23.4% relative to those of the control group, respectively. Also, WBCs (P≤0.001) and lymphocytes (P≤0.008) significantly increased with water administration of 2.0 g/L yeast, the relative increases were 1.3 and 2.1% of control group, respectively. Blood percentages of heterophils and eosinophils were not significantly affected by commercial yeast administration to quail breeders. However, blood monocytes (%) was slightly reduced (P≤0.05) compared with the control birds.

With regard to the effect of DWM on the hematological parameters of laying quails were shown in Table 5. Data demonstrated that feeding the DWM-containing diets had a significant effect on blood levels of RBCs, Hb, PCV, WBCs and lymphocytes but levels of heterophils, monocytes and eosinophils were not significantly affected in quail breeders. Results demonstrated that dietary inclusion of DWM to laying quails at levels of 10 and 15% led to increases in blood levels of RBCs, Hb PCV,and WBCs (26.0 and 20.15%), (11.0 and 10.2%), (13.8 and 11.9%) and (0.9 and 0.8%)

compared with control group, respectively. Also, results indicated that application of DWM by 10% in birds feed led to achieving the highest means of lymphocytes (1.5 and 0.7%) compared with its application at the highest level (15%) or the control group, respectively.

Significant interactions were observed between water yeast administration and dietar enrichment with DWM with regard to hematological parameters are shown in Table 5. Data indicated that group of (A3B2) scored the highest means of RBCs, Hb, PCV, WBCs and lymphocytes compared with other groups, respectively. But blood heterophils, monocytes and eosinophils were not significantly affected by the AB interactions in quail breeders. Blood hematological parameters serve as indicators of the physiological state of birds (Chowdhury *et al*., 2005).

These findings concur with those of Onifade (1997) and Onifade *et al*. (1999), who investigated the favorable correlation between dietary levels of *Saccharomyces cerevisiae* and hematological indices such RBCs, PCV%, and WBCs in broiler chickens. Huff *et al.* (2007) found that feeding yeast extracts to turkeys increased the number of leukocytes in whole blood. However, nothing is known regarding the influence of yeast derivatives on the number of monocytes, which are the progenitors of macrophages. Several reports, reviewed by Kogan and Kocher (2007), have demonstrated that yeast derivatives, such as ß-glucan fractions, boost the functional status of macrophages. In broiler chicks, Paryad and Mahmoudi (2008) found that adding 1.5 or 2% of *S. cerevisiae* yeast markedly raised leukocyte counts and lowered the heterophils to lymphocytes ratio.

Table (5): Effects of yeast (Y) and date waste meal (DWM) on hematological traits of Japanese quail during the summer season.

Main Effects:	**RBCs 10^6/ mm^3**	**Hb g/dL**	**PCV (%)**	**WBCs 10^3/ mm^3**	**Lym (%)**	**Het (%)**	**Mon (%)**	**Eos (%)**
Yeast Level (A):								
Y0 (0.0 g/liter): A1	2.50^c	13.23^c	31.15^c	45.05^b	50.44^b	43.33	4.00^a	2.22
Y1 (1.0 g/liter): A2	3.23^b	15.13^b	35.19^b	45.23^b	50.89^{ab}	43.56	3.44^{ab}	2.11
Y2 (2.0 g/liter): A3	3.72^a	15.94^a	38.44^a	45.64^a	51.51^a	43.08	3.34^b	2.07
SEM	0.112	0.257	0.732	0.092	0.237	0.254	0.164	0.220
P value	0.001	0.001	0.001	0.001	0.008	0.348	0.05	0.884
DWM Level (B):								
DWM 0 (0.0%): B1	2.73^c	13.79^c	32.17^c	45.05^b	45.05^b	43.56	3.67	2.22
DWM 10 (10%): B2	3.44_a	15.31^a	36.62^a	45.45^a	45.45^a	43.33	3.53	1.82
DWM 15 (15%): B3	3.28^b	15.20^b	35.99^b	45.41^a	45.41^a	43.08	3.58	2.36
SEM	0.181	0.411	1.076	0.107	0.107	0.254	0.190	0.209
P value	0.001	0.001	0.001	0.001	0.001	0.347	0.885	0.253
AB Interactions:								
A1B1	2.43^g	12.12^i	30.36^i	44.96^c	50.33^c	43.33	4.00	2.33
A1B2	2.57^f	13.86^g	31.77^g	45.18^{bc}	50.66^{bc}	43.66	4.00	1.67
A1B3	2.51^{fg}	13.71^h	31.32^h	45.00^c	50.33^c	43.00	4.00	2.66
A2B1	2.85^e	14.47^f	32.25^f	45.05^{bc}	50.66^{bc}	43.66	3.67	2.00
A2B2	3.37^d	15.17^d	35.88^d	45.26^{bc}	51.00^{bc}	43.67	3.33	2.00
A2B3	3.47^c	15.74^c	37.45^c	45.37^b	51.00^{bc}	43.33	3.33	2.33
A3B1	2.91^e	14.77^e	33.91^e	45.15^{bc}	50.67^{bc}	43.66	3.33	2.33
A3B2	4.39^a	16.88a	42.21^a	45.92^a	52.27a	43.67	3.27	1.80
A3B3	3.85^b	16.15b	39.20^b	45.85^a	51.60^{ab}	42.90	3.43	2.07
SEM	0.026	0.026	0.076	0.097	0.342	0.426	0.273	0.378
P value	0.001	0.001	0.001	0.001	0.03	0.488	0.499	0.747

a-c: For each of the main effects, means in the same column carrying different superscripts differ significantly at P ≤0.05. RBCs: Erythrocytes, WBCs: Leukocytes, Hb: Hemoglobin, PCV: Packed cell volume, Lym: Lymphocytes, Het: Heterophils, Mon: Monocytes, Eos: Eosinophils and SEM: Standard error of the means.

Comparable to the current investigation, El-Sheikh *et al.* (2009) discovered that hens treated with MOS had greater levels of hemoglobin, RBCs and WBCs than the control group. In this regard, compared to the control group, Riad *et al*. (2010) demonstrated a substantial rise in the counts of RBCs, WBCs, and lymphocytes due to dietary supplementation with biological additives (probiotic, prebiotic and/or yeast). There were no discernible variations between the treatment groups for means of Hb, RBCs, hematocrit, mean corpuscular volume, and mean corpuscular hemoglobin in the chicks given meals supplemented with yeast at a rate of 1.5 g/kg (Al-Mansour *et al*., 2011). Husseini (2011) demonstrated that, in contrast to the control treatment, yeast at 0.15% greatly enhanced WBCs. According to Czech *et al*. (2014), the addition of *Yarrowia lipolytica* yeast at a concentration of 6% boosted the immune defense systems of the body, as demonstrated by the decrease in monocyte counts and the rise in plasma antioxidant parameters in turkey hens. Attia *et al*. (2014) noticed comparable outcomes in broiler chickens. Fouad *et al*. (2017) showed that different treatments of yeast or date residues alone or in combination for growing quails produced significant variations in blood hematological and biochemical parameters compared with the control group. They found that increasing level of yeast from zero to 0.5 and 1.0 g/L water led to an increase in levels of RBCs, Hb, PCV (%), total protein, albumin and total lipids as compared to those of the control birds. They also indicated that in comparison to the untreated group, increasing quantity of yeast led to a decrease in WBCs counts, and in levels of cholesterol and glucose, and in activity of AST and ALT in blood growing.

Blood biochemical parameters of laying quail:

Kidney and liver profile:

Table 6 summarizes the effect of commercial yeast levels in drinking water or dietary enrichment with DWM on blood serum parameters (urea, creatinine, urea: creatinine ratio, ALP, AST, ALT and ALT: AST ratio at 14 weeks of age in laying quails. Results illustrates that serum levels of urea, creatinine, ALP, AST and ALT were significantly decreased with increasing quantity of yeast in drinking water compared with the control group, but, urea: creatinine ratio was significantly increased with increasing quantity of yeast in drinking water compared with control group. Also, the same trend of response was observed with increasing quantity of DWM levels on serum biochemical parameters, while the ALT: AST ratio did not affected by either commercial yeast administration or dietary inclusion of DWM. It can also be observed that the interactions between commercial yeast doses in drinking water or dietary DWM were significant among all the experimental groups.

Table (6): Effects of yeast (Y) and dates waste meal (DWM) on biochemical blood constituents of Japanese quail during the summer season.

Main Effects:	Ur (mg/dL)	Cr (mg/dL)	Ur/Cr	ALP (U/L)	AST (U/L)	ALT (U/L)	ALT/AST
Yeast Level (A):							
Y0 (0.0 g/liter): A1	2.49[a]	1.10[a]	2.29[c]	115.67[a]	45.60[a]	20.37[a]	0.447
Y1 (1.0 g/liter): A2	2.34[b]	0.86[b]	2.73[b]	111.67[b]	41.42[b]	18.58[b]	0.448
Y2 (2.0 g/liter): A3	2.29[c]	0.82[c]	2.81[a]	108.89[c]	39.94[c]	17.70[c]	0.444
SEM	0.025	0.027	0.041	0.783	0.580	0.274	0.002
P value	0.001	0.001	0.001	0.001	0.001	0.001	0.474
DWM Level (B):							
DWM 0 (0.0%): B1	2.47[a]	1.03[a]	2.46[b]	114.89[a]	44.21[a]	19.81[a]	0.449
DWM 10 (10%): B2	2.32[b]	0.87[b]	2.68[a]	110.22[c]	41.07[b]	18.33[b]	0.446
DWM 15 (15%): B3	2.32[b]	0.87[b]	2.70[a]	111.11[b]	41.69[b]	18.50[b]	0.446
SEM	0.031	0.044	0.081	1.039	0.915	0.419	0.002
P value	0.001	0.001	0.001	0.001	0.001	0.001	0.474
AB Interactions:							
A1B1	2.67[a]	1.31[a]	2.03[e]	117.00[a]	48.07[a]	21.50[a]	0.450
A1B2	2.39[bc]	0.99[b]	2.42[d]	114.67[c]	43.87[bc]	19.67[bc]	0.446
A1B3	2.40[b]	0.99[b]	2.43[d]	115.33[b]	44.87[b]	19.93[b]	0.447
A2B1	2.38[bc]	0.89[c]	2.68[c]	114.00[bc]	42.53[cd]	19.20[cd]	0.450
A2B2	2.33[d]	0.85[d]	2.73[b]	111.00[d]	41.50[de]	18.57[de]	0.446
A2B3	2.31[e]	0.83[e]	2.78[b]	110.00[d]	40.23[e]	17.97[ef]	0.446
A3B1	2.36[c]	0.89[c]	2.66[c]	113.67[c]	42.03[d]	18.73[d]	0.447
A3B2	2.24[g]	0.78[f]	2.89[a]	105.00[f]	37.83[f]	16.77[g]	0.443
A3B3	2.27[f]	0.79[f]	2.88[a]	108.00[e]	39.97[e]	17.60[f]	0.443
SEM	0.006	0.005	0.015	0.432	0.463	0.182	0.053
P value	0.001	0.001	0.001	0.001	0.001	0.001	0.911

a-c: For each of the main effects, means in the same column carrying different superscripts differ significantly at P ≤0.05. Ur: Urea, Cr: Creatinine, Ur/Cr: Urea/Creatinine, ALP: Alkaline phosphatase, AST: Aspartate aminotransferase, ALT: Alanine aminotransferase and SEM: Standard error of the means.

According to Yalcin *et al.* (2012), any abnormal rise in blood levels of AST, ALT, and ALP may indicate liver injury; as a result, the yeast probiotic's hepatoprotective benefits may be linked to the comparatively constant levels of AST. These results are consistent with those of Ghally and Abd El-Latif (2007), who discovered that Japanese quails fed diets containing yeast culture at levels of 1 or 2% improved in terms of glutamic oxaloacetic transaminase (GOT) and glutamic pyruvic transaminase (GPT) of blood plasma. Additionally, the reduction in ALP, AST, and ALT activity shown in this study is consistent with findings of Osman *et al*. (2007) that adding *Lactobacillus plantarum* and *Bifidobacterium infantis* to rat diets reduced AST and ALT activity. The impact of additional probiotic (yeast) preparation on serum biochemistry was studied by Aluwong *et al*. (2013). They demonstrated that all the probiotic (yeast) supplemented groups showed a reduction in the broiler chickens' serum ALT and ALP activity in comparison to the control group. When comparing turkey hens fed 3 and 6% yeast to the other experimental groups, the blood plasma of these birds showed noticeably reduced levels of the enzymes ALP, ALT, and AST (Czech *et al*., 2014). According to data from Elnaggar and Abdelkhalek (2017), supplementing Sasso chickens at 7 days of age with 0.1 and 0.2% of live *Saccharomyces cerevisiae* yeast or 0.25 and 0.50 g of Mannan oligosaccharide (MOS) per kg of diet reduced the levels of urea, creatinine, AST, and ALT in their blood. It could be revealed from the results that application of 1.0g yeast with 10% DWM scored the lowest values of AST and ALT compared to the control. Such findings are in accordance with those found by Gudev *et al*. (2008); Paryad and Mahmoudi, (2008) and Najib and Al-Yousef (2012).

Blood hormones, antioxidant and immune indices:

The data in Table 7 revealed that commercial yeast administrated on at the doses of 1 and 2 g/L drinking water for quail breeder resulted in significant increases ($P \leq 0.001$) in serum concentrations of testosterone and T4 hormones, antioxidant indices (GSH, SOD and TAC) and immune indices (IgM and IgG) than control group. The treatments with dietary DWM at the levels of 10 and 15% of Japanese quail had led to significantly higher means ($P \leq 0.001$) of serum testosterone and T4 hormones and antioxidant indices (GSH, SOD and TAC), and immunity indices (IgM and IgG) than the control group. The blood plasma haracteristics in Table (7) showed that there were significant ($P \leq 0.001$) effects of interactions between commercial yeast administration and dietary DWM especially in (A3B3) group than the other groups. The observed changes in the biochemical parameters of blood plasma reflect the ability of yeast or DWM to mitigate the harmful effects of heat stress during the summer season, facilitate further adaptation of birds to the hot climate and stimulate important physiological processes such as improving antioxidants and immune indicators, which led to an increase in the hatchability in the current study due to improved fertility and improved growth performance traits.

The ability of oligosaccharides presents in the cell wall of yeast (*Saccharomyces cerevisiae*) to bind to viruses and act as vaccine adjuvants to raise antibody titers in birds treated with yeast was shown by Newman (1994). A significant component of humoral immunity is mucosal immunity, which is mediated by secretory IgA. Studies have shown that yeast culture can decrease the pathogenic bacteria or increase commensal microbe populations (Stanley *et al*., 2004). Immune function could be modified with dietary yeast (2.5, 5.0 and 7.5 g/kg diet) supplementation in broiler chicks for 42 days of age (Gao *et al*., 2008). Another study by Jensen *et al*. (2008) showed that the yeast has a role in innate immune function. They stated that the addition of cell-wall-free soluble extract of yeast showed an anti-inflammatory effect in conjunction with stimulation of natural killer cells and B lymphocytes. In this connection, El-Sheikh *et al*. (2009) showed that in Mandarah chickens, antibody response against infectious bursal disease virus (IBDV) was increased in MOS treated group as compared to the control group. Elnaggar and Abdelkhalek (2017) revealed that all supplementations with 0.1 and 0.2% of either live yeast of *Saccharomyces cerevisiae* or 0.25 and 0.50 g of Mannan oligosaccharide (MOS) per kg diet increased blood concentrations of T4, TAC, GSH, GPX, SOD, IgM and IgG compared to control. This means that the yeast may trigger the humoral immune system to produce more antibodies. Increased antibodies cover the surface of the intestinal mucosa and can defend the villi from damage. This may be partly responsible for changes in bowel shape. Immune function could be modified and enhanced with drinking water yeast administration of quails.

According to Al-Farsi (2005), date palm meal is a good source of natural antioxidants. The primary phytoestrogen class found in palm dates is flavonoid. In both structure and function, it is comparable to the ovulation-regulating hormone estrogen (Breithofer *et al.* (1998). According to Arhaem (2004), there was a notable variation in egg production, egg weight, and ovarian tract weight when date palm pollen (DPP) water extract was used, as compared to the control group. Serum testosterone levels in the Japanese quail treatments with yeast administered in drinking water or dietary DWM were considerably higher. Although gonadotropic hormones from the pituitary stimulate the ovary to emit a portion of testosterone, which is commonly believed to be the male sex hormone, it should be noted that a female cannot synthesize estrogen in the absence of testosterone. A large portion of animal body's physiology, including the thyroid, adrenal, and reproductive systems, is influenced by its testosterone levels.

Table (7): Effects of yeast (Y) and dates waste meal (DWM) on hormones, antioxidant indices and immune indices of Japanese quail during the summer season.

Main Effects:	Hormones		Antioxidant indices				Immune indices	
	Tes (ng/ml)	T4 (ng/ml)	GPX (U/L)	GSH (U/L)	SOD (U/L)	TAC (mg/dl)	IgM (mg/dl)	IgG (mg/dl)
Yeast Level (A):								
Y0 (0.0 g/liter): A1	3.64^{c}	11.01^{c}	38.82^{c}	971.4^{c}	234.4^{c}	412.3^{c}	216.78^{c}	967.1^{c}
Y1 (1.0 g/liter): A2	4.51^{b}	11.99^{b}	41.77^{b}	982.0^{b}	243.0^{b}	418.1^{b}	228.00^{b}	973.9^{b}
Y2 (2.0 g/liter): A3	4.99^{a}	13.30^{a}	42.86^{a}	985.4^{a}	245.6^{a}	420.4^{a}	232.67^{a}	976.3^{a}
SEM	0.10	0.25	0.36	1.11	1.15	0.69	1.49	0.83
P value	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
DWM Level (B):								
DWM 0 (0.0%): B1	4.07^{c}	11.27^{c}	39.87c	975.6^{b}	236.7^{b}	414.7^{c}	220.3^{c}	969.6^{c}
DWM 10 (10%): B2	4.64^{a}	12.73^{a}	42.08^{a}	982.2^{a}	243.6^{a}	418.8^{a}	229.3^{a}	974.7^{a}
DWM 15 (15%): B3	4.44^{b}	12.30^{b}	41.50b	981.1^{a}	242.8^{a}	417.4^{b}	227.8^{b}	973.1^{b}
SEM	0.21	0.35	13.71	2.14	1.71	1.25	2.40	1.43
P value	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
AB Interactions:								
A1B1	3.44^{g}	10.70^{h}	37.50^{g}	969.0^{h}	230.7^{g}	410.0^{g}	214.0^{g}	964.0^{g}
A1B2	3.91^{f}	11.33^{f}	40.07^{e}	974.0^{f}	237.7^{e}	415.0^{e}	220.0^{e}	970.3^{e}
A1B3	3.58^{g}	11.00^{g}	38.90^{f}	971.3^{g}	235.0^{f}	412.0^{f}	216.3^{f}	967.0^{f}
A2B1	4.28^{e}	11.40^{f}	40.87^{d}	971.3^{e}	238.3^{e}	416.0^{e}	222.0^{e}	972.0^{d}
A2B2	4.50^{d}	11.93^{d}	41.97^{c}	983.7^{c}	244.7^{c}	418.7^{cd}	230.0^{c}	974.3^{c}
A2B3	4.76^{c}	12.63^{c}	42.47^{c}	985.0^{bc}	246.0^{bc}	419.7^{bc}	232.0^{c}	975.3^{c}
A3B1	4.48^{d}	11.70^{e}	41.23^{d}	980.3^{d}	241.0d	418.0^{d}	225.0^{d}	972.7^{d}
A3B2	5.51^{a}	14.93^{a}	44.20^{a}	989.0^{a}	248.3a	422.7^{a}	238.0^{a}	979.3^{a}
A3B3	4.99^{b}	13.27^{b}	43.13^{b}	987.0^{ab}	247.3^{ab}	420.7^{b}	235.0^{b}	977.0^{b}
SEM	0.05	0.08	0.17	0.57	0.47	0.46	0.61	0.44
P value	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001

a-c: For each of the main effects, means in the same column carrying different superscripts differ significantly at $P \leq 0.05$. Tes: Testosterone, T4: Tri-iodothyronine, GPX: Glutathione, GSH: Glutathione peroxidase, SOD: Superoxide dismutase, TAC: Total antioxidant capacity, IgM: Immunoglobulin M, IgG: Immunoglobulin G and SEM: Standard error of the means.

CONCLUSION

Among the obtained results, data indicate that administration of yeast and DWM for Japanese quail chickens aged 8 to 14 weeks exposed to heat stress during the summer months can beneficially affect growth performance and hatchability, can modify the hematological and biochemical blood parameters, perhaps by modifying Stress state. All the characteristics included in the study, beside the lack of side effects on quails health or their hatchability; therefore, we conclude that adding yeast at a level of 2 g/liter of water and DWM at 10% in the diet is safe and can achieve good benefits without any adverse effects on quail health.

REFERENCES

Afzal, N.; H. Nafemipou and A. Riasi (2006). The effect of different levels of surplus date in grower and finisher diets on broiler performance. In: Proceedings of the XII European Poultry Conference, Verona, Italy, World's Poultry Science supplements, 62: 372–373.

Albino, L.F.T. and S.L. Barreto (2012).. Criaçao de Codornas-Para Produçao de Ovos e Carne: Quail Farming For Egg and Meat Production, 3th ed. Aprenda F_acil Editora, Viçosa, MG, Brazil, p. 268.

Al-Bowait, M. and S.l Al-Sultan (2006). Aspects of the serum biochemistry, carcass quality and organoleptic characteristics of broilers fed alkali-treated date pits. Int J Poult Sci., 5(3): 284-288.

Al-Farsi, M; C. Alasalvar; A. Morris; M. Baron and F. Shahidi (2005). Comparison of antioxidant activity, anthocyanins, carotenoids, and phenolics of three native fresh and sun-dried date (*Phoenix dactylifera* L.) varieties grown in Oman. J Agric Food Chem., 53(19): 7592-7599.

Al-Mafragy, A. Y. (1999). The use of dibs in rearing broiler and its effects on some physiological and production parameters. M.Sc. Thesis. College of Veterinary Medicine, Baghdad University, Iraq.

Al-Mansour, S.; A. Al-Khalf; I.H. Al-Homidan and M.M. Fathi (2011). Feed efficiency and blood hematology of broiler chicks given a diet supplemented with yeast culture. International Journal of Poultry Science, 10(8): 603-607..

Aluwong, T.; F. Hassan; T. Dzenda; M. Kawu and J. Ayo (2013). Effect of different levels of supplemental yeast on body weight, thyroid hormone metabolism and lipid profile of broiler chickens. J. Vet. Med. Sci., 75(3): 291-298.

Al-Yasiri, T.H.J.; M.F. Mohammed and F.M.H. Alkhilani (2013). Effect of addition different levels of dates flesh (*Phoenix dactyliphera* L) to ration contain probiotic on boiler chickens performance reared under heat stress. I.J.A.B.R., 3(2): 306-311.

Al-Yousef, Y.M. (1985). Dates as feedstuff for poultry and the effect of alkali on date pit fiber. Ph.D. Thesis, Faculty of Graduate School of the University of Missouri, Columbia.

AOAC (1995). Official Methods of Analysis of the Association of Official Analytical Chemists. 16th Edition, AOAC International, Washington, USA.

Arhaem S.H. (2004). Effects of use different level from water extract of date palm pollen on ovary function and some production characteristics. Al-Furat Agriculture Science, 6(1): 98-103.

Attia, Y.A.; A.E. Abd Al-Hamid; M.S. Ibrahim; M.A. Al-Harthi, F. Bovera and A. Sh. Elnaggar (2014). Productive performance, biochemical and hematological traits of broiler chickens supplemented with propolis, bee pollen, and mannan oligosaccharides continuously or intermittently. Livest. Sci., 164(1): 87-95.

Attia, Y.A; R.A. Hassan; A.E. Tag El-Din and B.M. Abou-Shehema (2011). Effect of ascorbic acid or increasing metabolizable energy level with or without supplementation of some essential amino acids on productive and physiological traits of slow-growing chicks exposed to chronic heat stress. Anim. Physiol. Anim. Nutri., 95(6): 744–755.

Batal, A.B. and C.M. Parsons (2004). Utilization of various carbohydrate sources as affected by age in the chick, Poultry Science, 83(7): 1140-1147.

Boubekri, A.; H. Benmoussa and D. Mennouche (2009). Solar drying kinetics of date palm fruits assuming a step-wise air temperature change. J. Eng. Sci. Technol., 4(3): 292-304.

Breithofer A.; K. Graumann; M.S. Scicchitano; S.K. Karathanasis; T.R. Butt and A. Jungbauer (1998). Regulation of human estrogen receptor by phytoestrogens in yeast and human cells. J. Steroid Biochem. Mol. Biol., 67(5-6): 421-429.

Carpenter, K.J. and K.M. Clegg (1956). The metabolizable energy of poultry feeding stuffs in relation to their chemical composition. J. Sci. Food Agric., 7(1): 45-51

Chowdhury, S.R.; T.K. Smith; H.J. Boermans and B. Woodward (2005). Effects of feed-borne *Fusarium* mycotoxins on hematology and immunology of laying hens. Poult. Sci., 84(12): 1841-1850. .

Czech, A.; M. Merska and K. Ognik (2014). Blood immunological and biochemical indicators in turkey hens fed diets with a different content of the yeast *Yarrowia lipolytica*. Ann. Anim. Sci., 14(4): 935–946.

Daghir N.J. (2008). Feedstuffs used in hot regions. In: Poultry Production in Hot Climates. 2nd ed. Wallingford UK: CBI Publishing.

Daikwo, S.I.; N.I. Dim and M.O. Momoh (2011). Hatching characteristics of Japanese quail eggs in a tropical environment. Int. J. Poult. Sci, 10(11): 876-878.

Dizaji, S.B. and R. Pirmohammadi (2009). Effect of *Saccharomyces cerevisiae* and Bioplus 2B on performance of laying hens. Int. J. Agric. Biol., 11(4): 495-497.

Duncan, D.B. (1955). Multiple Range and Multiple F Tests. Biometrics, 11(1):1-42.

El-Deek, A.A.; M. Al-Harthi and H.M. Yakout (2008). Use of enzymes to supplement diets containing date waste meal for Lohmann white layers. International Journal of Poultry Science, 7(4): 397–407.

Elnaggar, Asmaa Sh. and Enass Abdelkhalek (2017). Productive performance, blood biochemical traits and immune response of Sasso chickens supplemented with *Saccharomyces cerevisiae* or mannan oligosaccharide as natural growth additives. Egypt. Poult. Sci., 37(2): 505-522.

El-Sheikh, A.M.H.; E.A. Abdalla and M.M. Hanafy (2009). Study on productive performance, hematological and immunological parameters in local strain of chicken as affected by mannan oligosaccharide under hot climate. Egypt. Poult. Sci., 29(I): 287-305.

El-Tarabany, M.S. (2016). Impact of temperature-humidity index on egg-laying characteristics and related stress and immunity parameters of Japanese quails. International Journal of Biometeorology, 60(7): 957-964. DOI: 10.1007/s00484- 015-1088-5.

FAO (2007). The State of Food aAnd Agriculture: Food and Agriculture Organization of the United Nations. Rome, Italy.

FAO (2010). Date Palm cultivation: Food and Agriculture Organization of the United Nations. Rome, Italy.

Farooq, M.; K. Aneela; F.R. Durrani; A.K. Muqarrab; N. Chand and A. Khurshid (2001). Egg and shell weight, hatching and production performance of Japanese broiler quails. Sarhad Journal of Agriculture, 17(3): 289-293.

Fouad, W.; Mona M. Ahmed and H. Ferweez (2017). Efficacy of yeast and date residues (hafsh) treatments on performance, some physiological parameters and meat quality of Japanese Quail: 1. Growing period). Egypt. Poult. Sci. Vol (37)(I):(251- 276).

Gao, J.; H.J. Zhang; S.H. Yu; S.G. Wu; I. Yoon; J. Quigley; Y.P. Gao and G.H. Qi (2008). Effects of yeast culture in broiler diets on performance and immunomodulatory functions. Poultry Science, 87(7): 1377–1384.

Ghally, K.A. and S.A.A. Abd El-Latif (2007). Effect of dietary yeast on some productive and physiological aspects of growing Japanese quails. In: Proc. the 8th African Crop. Science Society Conference, El-Minia, Egypt, 27-31 October 2007.

Ghasemi, R.; M. Torki; H.A. Ghasemi and M. Zarei (2014). Single or combined effects of date pits and olive pulps on productive traits, egg quality, serum lipids and leucocytes profiles of laying hens. J. Appl.Anim. Res. 42(1): 103–109.

Glade, M.J. and M.D. Sist (1988). Dietary yeast culture supplementation enhances urea recycling in equine large intestine. Nutr. Reprod. Int., 37: 11-17.

Global Statistical Review; GSR (2015). Nuts and dried fruits. Retrieved from http://www.nutfruit.org.

Guclu, B.K. (2011). Effects of probiotic and prebiotic (mannan-oligosaccharide) supplementation on performance, egg quality and hatchability in quail breeders. Ankara Üniv. Vet. Fak Derg, 58(1): 27-32.

Gudev, D.; S. Popova-Ralcheva; P. Moneva and M. Ignatova (2008). Effect of the probiotic "Lactina" on some biological parameters and nonspecific resistance in neonatal pigs. Biotechnology in Animal Husbandry, 24(1-2): 87-96.

Haldar, S.; T.K. Ghosh; Toshiwati and M.R. Bedford (2011). Effects of yeast (*Saccharomyces cerevisiae*) and yeast protein concentrate on production performance of broiler chickens exposed to heat stress and challenged with *Salmonella enteritidis*. Animal Feed Science and Technology, 168(1-2): 61-71.

Hassan, S.M. and A.A. Al-Aqil (2015). Effect of adding dietary date (*Phoenix dactylifer*a) pits meal with/or without β-mannanase on productive performance and eggshell quality parameters of layer hens. International Journal of Poultry Science, 14(11): 595-601.

Hermes, I.H., and A.H. Al-Homidan (2004). Effects of using date waste (whole dates and date pits) on performance, egg components and quality characteristics of Baladi Saudi and Leghorn laying hens. Egyptian Journal of Nutrition and Feeds, 7(2): 223–241.

Hosseini, S.A.;H. Lotfollahian; A. Kamyab and A. Mahdavi (2006). Study on the effect of yeast (Saccharomyces cerevisiae SC47) utilization on the commercial layer hen's performance. Pakistan Journal of Biological Sciences, 9(12): 2346-2349.

Hosseini, S.M. (2011). The effect of utilization of different levels of *Saccharomyces cerevisiae* on broiler chicken's performance, Global Veterinaria, 6(3): 233-236.

Huff, G.R.; W.E. Huff; N.C. Rath; F. Solis de Los Santos; M.B. Farnell and A.M. Donoghue (2007). Influence of hen age on the response of turkey poults to cold stress, *Escherichia coli* challenge and treatment with a yeast extract antibiotic alternative. Poult. Sci., 86(4): 636-642.

Hussein, A.S.; G.A. Alhadrami and Y.H. Khalil (1998). The use of dates and date pits in broiler starter and finisher diets. Bioresource Technology, 66(3): 219–223.

Jensen, G.S.; K.M. Patterson and I. Yoon (2008). Yeast culture has anti-inflammatory effects and specifically activates NK cells. Comp. Immunol. Microbiol. Infect. Dis., 31(6): 487-500.

Jumah, H.F.; I.I. Al-Azzawi and S.A. Al-Hashimi (1973). Some nutritional aspects of feeding ground date pits for broiler Mesopotamia. Journal of Agriculture, 8(2): 139-145.

Kamel, B.S.; M.F. Diab; M.A. Ilian and A.J. Salman (1981). Nutritional value of whole dates and dates pit in broiler ration. Poult. Sci., 60(5): 1005-1011.

Khurshid, A.; M. Farooq; F.R. Durrani; K. Sarbiland and A. Manzoor (2004). Hatching 24-28.

Kogan, G. and A. Kocher (2007). Role of yeast cell wall polysaccharides in pig nutrition and health protection. Livestock Science, 109(1-3): 161-165.

Manner K., Wang K. (1991). Effectiveness of bacitracin on production traits and energy metabolism of heat-stressed hens compared with hens kept under moderate temperature. Poult. Sci, 70, PP. 2139-2147.

Marai, I.F.M.; A.M. Habeeb and A.E. Gad (2003). Reproductive traits of male rabbits as affected by climatic conditions, in the subtropical environment of Egypt. Anim. Sci., 77(3): 451–458.

Mohammed, M.F. (2013). The influence of adding date to broiler diet on performance and blood characters. International Journal of Advanced Biological Research, 3(4): 540-544.

Najib, H. and Y.M. Al-Yousif (2012). Effect of enzymatic treatment of Saudi date pits on performance of Single Comb White Leghorn hens and the fatty acid profile of their eggs. International Journal of Poultry Science, 11(10): 624–629.

Newman, K. (1994). Mannan oligosaccharides: Natural polymers with significant impact on the gastrointestinal microflora and the immune system. In: Proceeding of Alltech's Tenth Annual Symposium: Biotechnology in the Feed Industry, edited by Lyons, T.P. and Jacques, K.A., Nottingham University Press, Nottingham, UK, pp. 167-175.

NRC; National Research Council (1994). Nutrient Requirements of Poultry, 9th revised edition, National Academy Press, Washington, DC, USA.

Onifade, A.A. (1997). Growth performance, carcass characteristics, organ measurements and hematology of broiler chickens fed a high fiber diet supplemented with antibiotics or dietary yeast. Food / Nahrung, 41(6): 370-374.

Onifade, A.A.; A.A. Odunsi; G.M. Babatunde; B.R. Olorede and E. Muma (1999). Comparison of the supplemental effects of Saccharomyces cerevisiae and antibiotics in low-protein and high-fiber diets fed to broiler chicken. Arch. Anim. Nutr., 52(1): 29-39.

Osman, N.; D. Adawi; S. Ahme; B. Jeppsson and G. Molin (2007). Endotoxin- and D-galactosamine-induced liver injury improved by the administration of *Lactobacillus*, *Bifidobactrerium* and blueberry. Digest. Liver Dis., 39(9): 849-856.

Parks, C.W.; J.L. Grimes; P.R. Ferket and A.S. Fairchild (2001). The effect of mannanoligosaccharides, bambermycins, and virginiamycin on performance of Large White male market turkeys. Poult. Sci., 80(6): 718–723.

Paryad, A. and M. Mahmoudi (2008). Effect of different levels of supplemental yeast (*Saccharomyces cerevisiae*) on performance, blood constituents and carcass characteristics of broiler chicks. Afr. J. Agric. Res., 3(12): 835-842.

Riad, S.; H.M. Safaa; F.R. Mohamed; Salwa S. Siam and H. A. El-Minshawy (2010). Influence of probiotic, prebiotic and/or yeast supplementation in broiler diets on the productivity, immune response and slaughter traits. J. Anim. Poult. Prod., 1(2): 45-60.

Sandikci, M.; U. Eren; A.G. Onol and S. Kum (2004). The effect of heat stress and the use of Saccharomyces cerevisiae or (and) bacitracin zinc against heat stress on the intestinal mucosa in quails. Revue Méd. Vét., 155(11): 552-556.

Shanaway, M.M. (1994). Quail Production System: A Review. Food and agriculture organization of the United Nations, Rome, Italy.

Shashidhara, R.G. and G. Devegowda (2003). Effect of dietary mannan oligosaccharide on broiler breeder production traits and immunity. Poultry Sci, 82(8): 1319–1325.

Spring, P.; C. Wenk; K.A. Dawson and K.E. Newman (2000). The effects of dietary mannan-oligosaccharides on cecal parameters and the concentrations of enteric bacteria in the ceca of salmonella-challenged broiler chicks. Poult. Sci., 79(2): 205–211.

Stanley, V.G.; C. Brown and A.E. Sefton (2000). Comparative evaluation of a yeast culture, mannanoligosaccharide and an antibiotic on performance of turkeys. Poult. Sci., 79(Suppl. 1): 117 (Abstr.).

Stanley, V.G.; M. Winsman; C. Dunkley;T. Ogunleye; M. Daley;W.F. Krueger and A. Hinton Jr (2004). The impact of yeast culture residue on the suppression of dietary aflatoxin on the performance of broiler breeder hens. Journal of Applied Poultry Research, 13(4):533-539.

Statistical Analysis System (SAS, 2002). SAS/STAT User's guide statistics. SAS institute INC., Cary. NC, USA.

Vandepopuliere, J.M.; Y. A1-Yousef and J.J. Lyons, (1995). Dates and date pits as ingredients in broiler starting and Coturinx quail breeder diets. Poultry Science, 74(7): 1134–1142.

Yalcin, S., S. Yalcin, K. Uzunoglu, H. M. Duyum, and Ö. Eltan. 2012. Effects of dietary yeast autolysate (Saccharomyces cerevisiae) and black cumin seed (Nigella sativa L.) on performance, egg traits, some blood characteristics and antibody production of laying hens. Livest. Sci. 145:13-20.

تأثير الخميرة والإضافة الغذائية لمسحوق نفايات التمر على الأداء الإنتاجي والتناسلي والحالة الفسيولوجية لطيور السمان الياباني خلال فصل الصيف

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أجريت هذه التجربة لدراسة القيمة الغذائية لمكملات وجبة مخلفات التمر مع وبدون إضافة الخميرة في ماء الشرب على أداء طائر السمان، الخصوبة، الفقس والحالة الفسيولوجية خلال موسم الصيف. تم توزيع مائة وثمانية طائر من طائر السمان الياباني (Coturnix coturnix japonica) بعمر 8 أسابيع وتم توزيعهم على 9 مجاميع عشوائياً ، كل منها 12 طائر (6 ذكور و 6 إناث) وكل مكررة تحتوي على 4 طيور (2 ذكور و 2 إناث). تلقت الطيور ثلاث جرعات من الخميرة (0.0، 1.0 و 2.0 جرام خميرة / لتر ماء) مع ثلاثة مستويات من مخلفات التمر (0.0، 10.0 و 15.0٪) اضيفت للعلف. تم تسجيل درجة الحرارة المحيطة والرطوبة النسبية يوميًا واستخدمت لتقدير مؤشر رطوبة درجة الحرارة (THI) شهريًا. أشارت النتائج إلى أن جرعات الخميرة وإدراج وجبة مخلفات التمر في النظام الغذائي كان لها تأثير معنوي على وزن الجسم ووزن الجسم المكتسب واستهلاك العلف ونسبة التحويل الغذائي. وكانت هذه التحسينات موازية لزيادة الخصوبة والفقس وانخفاض في الأجنة الغير ناقرة ووفيات الأجنة. تم تحسين المؤشرات الدموية الهيماتولوجية والبيوكيمائية للدم (وظائف الكلى، وظائف الكبد، هرمون التستوستيرون والثيروكسين رباعى الايوديد ، الحالة التأكسدية ومؤشرات المناعة بشكل ملحوظ من خلال التفاعل بين الخميرة ومكملات وجبة مخلفات التمر مقارنة مع المجموعه الكنترول. بأختصار فإن إدراج الخميرة فى ماء الشرب أو إضافة وجبة مخلفات بلح النخيل لعلف السمان اثناء فصل الصيف يمكن إستخدامها بفاعلية للتخفيف من الأثار السلبية لإرتفاع درجة الحرارة على أداء النمو والتفريخ ، وكذلك تعديل التقديرات الهيموبيوكيمائية.