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Effect of Adding Date Palm Pollen and Physical Diet Form on Productive Performance and Egg Quality of Female Quail

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Abstract

This experiment was conducted to estimate the main effect of adding Data palm pollen (DPP) and the form of diet on the productive performance of female quail compliant with: Hen day egg production (HD), Egg weight (EW), Egg mass (EM), Feed intake (FI) and Feed conversion ratio (FCR) and eggs quality of quail compliant with: Shape index (ShI %), shell weight (%), yolk weight (%), albumen weight (%), Yolk index (YI%), Albumen Index (AI%) and Hough unit (HU). For eight weeks, from February 14 to April 13, 2023. Two hindered fifty-two female quail with age about forty-seven days were divided into six treatments, each including forty-two birds with three replicates (four ten quail of each). The treatments were T1: 0% DPP with mash feed form, T2: 0% DPP with pellet feed form, T3: 0.5% DPP with mash feed form, T4: 0.5% DPP with pellet feed form, T5: 1% DPP with mash feed form and T6: 1% DPP with pellet feed form. The quail were fed a productive diet with 2794 kcal/kg energy and 18.39% crude protein, and similar rearing conditions. Results showed there were significant effects in the percentage of HD, EW., EM, and (FCR) in treatments with DPP and pellet feed form when compared with the other treatments, as well as an improvement in egg quality in treatments with DPP and pellet feed form when compared with the other treatments.

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Introduction

The economic importance of domestic birds comes from the fact that their meat and egg products are necessary for consumers because they are better than other animal products in terms of their content of nutrients such as vitamins and minerals (Abdulalwahhab *et al.*, 2020; Abbas *et al.*, 2023). The Japanese quail, *Coturnix japonica*, belongs to the order *Galiformes*, the family *Phasianidae*, and the genus *Coturnix*. and is characterized by a short generation period of 3-4 generations /year (Onyewuchi *et al.*, 2013). It is raised to produce eggs and meat and is characterized by its high egg production (Priti and Satish, 2014). It is used in experiments due to its small size, small breeding area, and low feed consumption (20-25 g/day) compared to other types of poultry birds (Hassan and Hassan, 2020). Studies have shown that the active components of medicinal plants can improve poultry health and performance (Harrington, 2020). The purpose of the new trend was to reduce the use of antibiotics and some drugs in bird breeding, so researchers and breeders have worked hard to find modern substances as growth stimulators and anti-inflammatories by containing active substances that can affect the health and vitality of birds (Hamody *et al.*, 2021). The Male gametophyte of the date palm (*Phoenix dactylifera* L.) is known as date palm pollens (DPP) and has an increasing effect on the rate of Egg production (EP), EW, and EM of quails, a strong antibacterial, anti-fungal, anti-parasitic, antiviral, antioxidants, anti-coccidian activity and anti-apoptotic agent and have hepatoprotective activities (Shanoon *et al.*, 2019; Refaie *et al.*, 2019). In addition, it contains oils, some vitamins and minerals. Sterols similar to the hormone estrogen (Abbas and Ateya, 2011; Hassan, 2011) and affect inducing ovulation by stimulating the secretion of Luteinizing hormone (LH) and Follicle stimulating hormone (FSH), which stimulate the growth of ovarian follicles and ovulation (AL-Salihi *et al.*, 2017). The feed form has an important role in reducing feed waste, ease of

transportation, condensing the feed, destroying anti-nutrient factors, and providing the bird with feed additives to improve its production by removing selectivity (Mehdil *et al.*, 2015; AL-Tamimy *et al.*, 2022). Feeding on pellet form is a modification of the mash diet, consisting of mechanical pressure on the feed and converting it into solid dry pellets, and the biggest benefit is that there is little loss in the feed, and it is believed that the size of large particles affects the performance of birds to a greater extent when the birds were fed with mash form compared to feeding on pellet form (Rezaeipour and Gazani, 2014). The study aims to determine the interaction effect of adding DPP and physical feed form on the performance productional and some egg qualities of female quail during egg production.

Materials and Methods

Ethical Approval

The Scientific Ethical Committee of the Department of Animal Production, College of Agriculture, University of Diyala, approved this study. All applicable national and international guidelines for the care and use of animals were followed.

Conduct the experiment

The experiment was conducted in the poultry field of the Department of Animal Production, College of Agriculture, University of Diyala for the period from (14 Feb to 13 April 2023), the experiment period was 60 days.

Birds, Experimental Design and Diets

Two hundred fifty-two female Japanese quails, aged 47 days, were used. The birds were divided into six groups, each including forty-two birds with three replicates (14 birds of each). The breeding system used is floor cages with dimensions of (1 x 1 x 1 m/cage) and a litter of soft hay 5 cm thick. The temperature is 24°±2, the relative humidity is 50-60%, and the lighting is 16 hours and 8 hours of darkness duration of the experiment. Water and diet were *libitum*. The birds were fed a productive diet with 2794 kcal/kg diet Metabolism energy and 18.39% crude protein, the treatments were as follows: T1: Mash form without adding DPP, T2: T1 in pellet feed form, T3: Mash form with addition of 0.5% DPP, T4: T3 in pellet feed form, T5: Mash form with addition of 1% DPP T6: T5 in pellet feed form, the diameter of pellet was 2.2 mm (Table 1).

Production Parameters

The productive performances were studied, compliant with: Hen day egg production (HD) % = ((eggs produced)/ (period hen days))*100., Average Egg weight (EW) (g) = (total grams of eggs weighed)/(number of eggs weighed)., the eggs produced were collected and weighed daily, Egg mass (EM) (g/hen) was calculated by multiplying the laid eggs numbers and weight (g) for all replicates within each treatment, the remaining diet was recorded weekly to determine the feed intake (FI) (g/birds/week) = (total grams of feed intake during the period)/(period hen days). Feed conversion ratio (FCR) (g diet/ g egg mass) was calculated by comparing the amount of consumed feed with the weights of eggs produced at a certain time. (Has *et al.*, 2021; Alig *et al.*, 2023).

Egg Quality Traits

The eggs quality of Japanese quail is compliant with the shape Index (ShI) % = (Egg width/Egg height)*100, Shell weight (%) = (Shell weight/Egg weight)*100., The eggshell was dried and weighed to the nearest 0.01 g after removal of the egg content, yolk weight (%) = (yolk weight/Egg weight)*100., and albumen weight (%) = (albumen weight/Egg weight) *100., Albumen Index (AI) % = (albumen height/ albumen diameter)*100, and Yolk Index (YI) % = (Yolk height/Yolk diameter)*100 (Mohamed *et al.*, 2023)., Hough unit (HU) = (100*log (H+7.57)-(1.7*W0.37), where H= Albumen height in mm, W= Egg wight in g. (Narushin *et al.*, 2021).

Statistical Analysis

The statistical analysis was performed by using SAS (SAS, 2012), and Completely Randomized Design (CRD) was used to analyze the averages of the studied traits, and the averages were compared according to Duncan

(1955) multinomial test and at the level of significance (P≥0.05).

Table 1. Composition of experimental diet

Ingredient / Treatment	T1	T2	T3	T4	T5	T6
Feed form	**Mash**	**Pellet**	**Mash**	**Pellet**	**Mash**	**Pellet**
Corn	59.4	59.4	59.4	59.4	59.4	59.4
Soybean meal (44%CP)	30	30	30	30	30	30
Premix**	2.5	2.5	2.5	2.5	2.5	2.5
DCP	1.6	1.6	1.6	1.6	1.6	1.6
Limestone	5	5	5	5	5	5
Oil	1.5	1.5	1.5	1.5	1.5	1.5
Total	100	100	100	100	100	100
DPP	0%	0%	0.5%	0.5%	1%	1%
Calculated nutrient content (NRC)						
Crude protein	18.39					
M.E Kcal\kg	2794					
Methionine	0.42					
Methionine, cysteine	0.8					
Lysine	1.01					
Calcium	2.75					
Available phosphor	0.65					

**Supplied/ kg diet: 100 mg of antioxidant; 0.2 mg of biotin; 12.8 mg of calcium pantothenate; 60 µg of cholecalciferol; 0.017 mg of cobalamin; 5.2 mg of folic acid; 4 mg of menadione; 35 mg of Nicotinic acid; 10 mg of B_6; 3.33 mg of trans-retinol; 12 mg of B_2; 3.0 mg B_1; 60 mg of dl-α-tocopherol; 638 mg of choline chloride; 0.3 mg of Co; 3.0 mg of Cu; 25 mg of Fe; 1 mg of I; 125 mg of Mn; 0.5 mg of Mo; 200 µg of Se; 60 mg of Zn.

Table 2. Chemical composition and proximate analysis of Date palm pollen

Ingredient	DPP
Humidity %	6.24
Protein%	37.187
CHO %	18.26
Fat%	13.42
Ash%	6.59
Nitrogen%	5.949
Potassium%	1.947
Tannic acid (mg)	0.2397
Phenol %	19.176

Source: AL-Salhie *et al.* (2017)

Result and Discussion

The results in Table 3 showed a significant effect (P≥0.05) in the H.D in treatments with DPP and pellet form (T5, T6) when compared with the treatments (T1, Y2). Data show significant different (P≥0.05) of treatments with pellet form (T6, T4) in E.W. when compared with mash form treatment (T1, T3), and not found any significant difference between other treatments. T6 significantly affected the weekly FCR during the study period when compared with another treatment, and T6 was significantly affected in EM when compared with (T1, and T2) when it did not differ with another treatment. The study did not record differences in the FI. There was a gradual increase in HD and EW, and the reason may be attributed to the integration of the reproductive system and the

advancement of its efficiency and specialization with age.

This finding agrees with Shanoon *et al.*, (2019) who showed that there were significant effects (P≥0.05) in the HD and E.W. when adding DPP to the diet of female quails at 0.5 and 1%. They also agreed with AL-Tamimy *et al.*, (2021) who showed a positive effect on the HD and EW of poultry birds when changing the Physical form from mash to pellet. The addition of DPP is that contains cholesterol and carotenoids, estradiol, and estrogen hormone Arhaem (2014), perhaps leading to the stimulation of Gonadotropin-Releasing Hormone (GnRH), which stimulates the pituitary gland to produce the follicle-stimulating hormone (FSH) and luteinizing hormone (LH). And lead to an increase in the number and maturation of ovarian follicles (Pineda and Dooley, 2008; Saleh *et al.*, 2021). As for weekly F.I results showed no difference between all treatments. As for EM and FCR, the data showed significant differences (P≥0.05) between treatments. Perhaps changing the form diet from Mash to pellet has achieved an ideal balance of amino acids for the body's proteins and thus enhanced growth performance by enhancing the efficiency of feed utilization, increasing protein synthesis, reducing fat synthesis, and increasing HD while obtaining an ideal EW, increasing its EM, and improving FCR (Mustafa, 2022). The results agreed with AL-Tamimy *et al.* (2022) who showed a change in feed form has a role in thickening the feed, increasing palatability, and destroying anti-nutrient factor, which had a positive impact on productive performance, and also agreed with (Shanoon *et al.*, 2019) who showed the positive role of adding DPP on the productive performance of quail. Moreover, Hilmi *et al.* (2015) mentioned that using phytogenic in quail nutrition had no effect on HD %, EM, and FCR.

Table 3. Effect of interaction between DPP and Physical feed form on productive performance of female quail (47-107day)

Treatment			Ingredient				
DP/ Kg		Feed Form	HD (%)	EW (g)	EM (g)	FI (g)	FCR g feed/g egg
0%	T1	Mash	80.79^{b}	12.59^{b}	10.21^{b}	31.11	3.04^{a}
	T2	Pellet	80.92^{b}	12.68^{ab}	10.30^{b}	32.54	3.15^{a}
0.5%	T3	Mash	84.79^{ab}	12.83^{b}	10.90^{ab}	31.01	2.84^{a}
	T4	Pellet	83.25^{ab}	13.27^{a}	11.04^{ab}	31.19	2.83^{a}
1%	T5	Mash	89.24^{a}	12.94^{ab}	11.44^{ab}	31.55	2.78^{ab}
	T6	Pellet	90.25^{a}	13.31^{a}	11.91^{a}	31.74	2.67^{b}
Mean±S.E			84.72±0.03	12.90±0.16	10.95±1.03	31.46±0.14	2.89±0.02
Significant			*	*	*	NS	*

^{ab}Different superscripts within a column show a significantly different (P≥0.05)

Results in Table 4 show improvement in eggs quality in addition to different levels of DPP and pellet form on most of the egg qualities studied. Treatments were superior on the percentage of shell weight, yolk weight, albumen weight, yolk index and haugh unit. On the other hand, Results showed there is no significant effect on the Shape index and albumen weight. Perhaps the improvement in some of the specific quality of eggs, as a result of improving the bird's state of Health, as DPP complements the variety, as well as the increase in the various choices of compounds, as none of them have a role in stimulating the genetic

hormones and for special purposes for females (Al-Salhie, 2012). The effect of estrogens on liver tissues to secrete fats and proteins, which cause an increase in the growth of epithelial tissue and ovarian activity, Walzem *et al.* (1999) also, the results concurred with Helmi *et al.* (2015) found that piperine as an additive to the Quail bird's hangover has a positive effect on the percentage of shell weight.

Table 4. Effect of interaction between DPP and Physical feed form on egg qualities of female quail (47-107day)

Treatment			Ingredient						
DP/ Kg		Feed Form	Shape Index (%)	Shell Weight (%)	Yolk Weight (%)	Albumen weight (%)	Yolk Index (%)	Albumen Index (%)	Haugh Unit (HU)
0%	T1	Mash	77.35	13.58^{a}	30.40^{b}	55.74	0.160 ^{b}	0.117 ^{ab}	85.37 ^{b}
	T2	Pellet	77.45	12.60^{ab}	31.58 ^{ab}	55.82	0.161^{ab}	0.119 ^{ab}	90.12 ^{ab}
0.5%	T3	Mash	77.39	12.69^{ab}	31.64 ^{ab}	55.67	0.167 ^{a}	0.114^{b}	87.14 ^{ab}
	T4	Pellet	77.64	12.73^{ab}	31.93^{a}	55.41	0.166 ^{a}	0.128^{a}	93.12 ^{a}
1%	T5	Mash	77.41	12.28^{b}	31.63 ^{ab}	55.62	0.162 ^{ab}	0.117 ^{ab}	90.92 ^{ab}
	T6	Pellet	77.46	13.32^{a}	31.59 ^{ab}	55.41	0.164 ^{ab}	0.129^{a}	91.79 ^{a}
Mean ±S.E			77.45 ±1.02	12.80 ±0.74	31.46 ±0.27	55.43 ±0.64	0.165 ±0.03	0.115 ±0.01	89.96 ±1.85
Significant			N.S	*	*	N.S	*	*	*

^{ab}Different superscripts within a column show a significantly different (P≥0.05).

Conclusions

Through the study results, we conclude that the findings that inclusion of 1% DPP with a diet of female quail has a significant difference (P≥0.05) in some of the productive performance and egg quality, there was also an improvement of the studied qualities of the coefficients of the pellet form when compared with the mash form. This study helps those interested to identify the critical area of their use that researchers have not been able to explore. Generally, a new theory can be found about the opinion that palm pollen is used as an ovarian stimulator in females and this study supports this opinion.

Conflict of Interest

The authors declare that they have no conflict of interest.

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