The Posibilities Using of Bee Pollen Powder on Breeding Japenese Quail (*Coturnix coturnix japonica*) Rations: II. Hatching Results

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ABSTRACT

In this study, it was aimed to determine the effects of supplementing breeding quail rations with different level concentrations (C: 0, BPP1: 1, BPP5: 5, BPP10: 10, and BPP20: 20 g/kg feed) of the bee pollen powder (BPP) on hatching results in Japanese quails. Hatching eggs used in the experiment; 9- week-old, including 105 females and 45 male were obtained from Japanese quail. After breeding quails feeding six weeks; for the determination of the results of hatching, from each of groups randomly 90 eggs selected (each of 30 sub-groups) and a total of 450 eggs were placed in the incubator. With regard to the hatching results, significant effects of BPP supplementation were detected on fertility (FE), fertile hatchability (FH), newly hatched chick weight (NHCW) ($P<0.05$), early period mortality (EPM), and external pip ratio (EPR) ($P<0.01$); however no significantly effect on egg weight loss (ELW), hatching performance (HP), middle and late period mortality (MPM-LPM) ($P>0,05$). When all of results are evaluated, bee pollen powder supplement is recommended for quail diets.

Keywords: Bee Pollen, Hatching Results, Japanese Quail, Breeding, Fertility.

Damızlık Japon Bıldırcını (*Coturnix coturnix japonica)* Rasyonlarında Arı Poleni Tozunun Kullanım Olanakları: II. Kuluçka Sonuçları

Öz

Bu çalışmada; damızlık bıldırcın rasyonlarına farklı düzeylerde arı poleni tozu (APT) (K: 0, APT1: 1, APT5: 5, APT10: 10 ve APT20: 20 g/kg yem) ilave edilmesinin japon bıldırcınlarında kuluçka sonuçları üzerindeki etkilerinin saptanması amaçlanmıştır. Kuluçkalık yumurtalar 9 haftalık yaştaki, 105 adet dişi ve 45 adet erkekten elde edilmiştir. Altı hafta süren besleme sonrasında, kuluçka sonuçlarının belirlenmesi için her bir gruptan rastgele seçilen 90 yumurta (her tekerrürden 30 adet yumurta) olmak üzere toplam 450 adet yumurta kuluçka makinesine yerleştirilmiştir. Kuluçka sonuçları incelendiğinde; APT ilavesinin döllülük oranı, çıkış gücü (ÇG), kuluçkadan çıkan civciv ağırlığı (KCS) ($P<0,05$), erken dönem ölümleri (EDÖ) ve dış pip oranında (DP) ($P<0,001$) önemli etkisinin olduğu, ancak; yumurta ağırlık kaybı (YAK), kuluçka randımanı (KR), orta-geç dönem ölümleri (ODÖ-GDÖ) ($P>0,05$) etkisinin önemsiz olduğu tespit edilmiştir. Tüm sonuçlar değerlendirildiğinde bıldırcın rasyonlarına farklı oranlarda APT ilave edilmesinin uygun olacağı önerilmektedir.

Anahtar Kelimeler: Arı Poleni, Kuluçka Sonuçları, Japon Bıldırcını, Damızlık, Döllülük

1. Introductıon

Consumers who become more susceptible about healthy and balanced nutrition have selected poultry products which are less fat and cheaper as an alternative to red meat. In parallel with this situation; in the last 20 years like in all over the world and in Turkey too, production of poultry products may be said to increasing production and consumption (Anonim, 2013). To show such a growth sector of poultry products in Turkey with a young population can be explained by the fact that potential. In order to produce healthy and reliable products in poultry farming, it is vital that the feed content contains natural raw materials.

For this purpose, maize, soybean and soy products are used as main feed raw materials, and feed additives are exploited to enrich the feed content. In the past, the companies which have intensive production have used antibiotics that accelerated development and growth in rations in order to get live weight gain from animals in short time. However, antibiotics, as well as the pathogenic microorganisms residing in the digestive tract of animals, prevent the proliferation of beneficial microorganisms.

Turkey and European Union countries, the long-term use of antibiotics as feed additives has been banned against the risk of creating microorganism strains with high antibiotic resistance in animals as well as in humans consuming these products (Jensen, 1998; Anonim, 2002; Anonymous, 2003;

Anonim, 2005; Nollet, 2005; Özen et al., 2005, Anonim, 2006). As a result of these developments; Producers and researchers have begun to use probiotics, prebiotics, essential oils, humates, and medicinal and aromatic plants in poultry production as feed additives, because they encourage growth and are not harmful to human health (Ball, 2000; Bach Knudsen, 2001; Yalçın et al., 2002; Güçlü, 2003; Kurtoğlu et al., 2004; Güler et al., 2005; Islam et al., 2005; Güçlü and İscan, 2006).

There are many studies on the use of bee pollen as a natural feed additive due to its medicinal and nutritional properties. Because bee pollen; antifungal, antiviral, antimicrobial, anti-inflammatory, local aneljez, free radicals have many features such as effacing (Nogueira et al., 2012; Da Silva et al., 2014; Komosinska-Vessey et al., 2015).

Bee pollen and pollen products contain significant amounts of polyphenol compounds with antioxidant potential. It is stated that pollen may be partly effective in the prevention of inflammation due to the fact that it contains some flanovids in the structure. Bee pollen is rich in proteins, carbohydrates and lipids, as well as the major and minor elements found in plant tissues. In addition, it contains organic substances, such as amino acids, nucleic acids, enzymes, vitamins, minerals and hormones (Stanley and Linskens, 1985; Genç, 1993; Orzaez et al., 2002; Karataş and Şerbetçi, 2008). Pollen has rich content can be not only a useful dietary supplement, in addition, but it is also determined may be used as a functional food supplement (Maruyama et al., 2010). It has been reported that the addition of 1.5% pollen to the broiler may have effect on the immune system and a stimulating the early development of the small intestine, and it is also effective against stress factor in poultry farming and decreases stres (Wang et al., 2007; Seven et all., 2011; Oliveira et al., 2013).

In addition, many studies have been carried out to determine the effects of pollen on oxidative status parameters, the chemical composition of the breast and breast muscle of broiler chickens, egg albumin quality parameters and microbiological characteristics of the laying hens, and the immune system and growth performance, egg quality characteristics of japanese quails (Capcarova et al.,. 2003; Tatlı Seven et al., 2016; Hascik et al., 2013; Arpasova et al., 2013; Babaei et al., 2016, Akın and Çelen, 2020).

When all these studies were examined, it was found that bee pollen had a significant effect on the mentioned parameters and the researchers shared a common opinion that pollen could be used as feed additive which could increase the performance of poultry. As a result of the literature review, no studies have been found on the effect of bee pollen on the hatching results. In this study, the effect of bee pollen with many organic matter on hatching results in breeding Japanese quails was investigated.

2. MATERIALS AND METHODS

2.1 Research Design

The feed for control group was obtained from a private commercial company that sells quail feeds. The feeds of the pollen groups were constituted by supplementing their basal diet with the Uşak-region bee pollen, which was obtained from a company that sells bee products. Bee pollen was pounded in a mortar and pulverized to provide a homogeneous mixture in groups with bee pollen supplement. In this study, the five-story threecompartment group cages (width-97 cm, depth- 63 cm, height-189 cm) with an automatic drinker system were used. During the experimental period, 8-h of darkness and 16-h of light were applied. Feed and water were provided ad-libitum to the experimental animals that were subjected to group feeding. In the preparation of the experimental ration, the 30-and 0.1-kg weighing scale were used.

In this study, 105 female, 45 male breeding japanese quail was used 9-week-old and quails were fed with pollen added and without pollen rations for six weeks. The experiment was composed of five groups (including a control group), which were feed diets supplemented with bee polen powder (BPP) at different concentrations (C: 0, BPP1: 1, BPP5: 5, BPP10: 10, and BPP20: 20 g/kg feed). While the control group (C: 0) consisted of only the basal diet, the other groups were determined by taking into account the previous studies (Canoğulları et all., 2009). Each group, had three replicates, with each replicate comprising 10 (7 female and 3 male) animals. The diets were formulated according to the National Research Council (NRC, 2001). The ingredients and chemical analyses of the diets fed to the Japanese quails used in this experiment are given in Table 1.

The experiment was conducted according to protocol number (2018/01-01) of the University Committee on Animal Use. The present study was carried out at Uşak University, Faculty of Agriculture and Natural Sciences, Animal Husbandry Experiment Unit (geographical coordinates: 38ºº -40"-05.7""-N, 29ºº-19"-40.0""-E).

2.2 Research Instruments and Procedures

The hatching machines with separate hatching and exit compartments were used as hatching equipment. To determine the hatching results, 90 randomly selected eggs from each group (30 eggs from each subgroup) (450 eggs in total) were placed in an incubator maintained at 37.5 ± 0.5°C dry bulb temperature and 55% RH and were turned twice per hour through d 15 of hatching.

The hatching unit in the incubator was operated at 37.1 ± 0.5°C dry bulb temperature and 65% RH. Firstly, before setting the eggs from the incubator into the hatching unit, the weight loss of eggs (ELW) was determined, and then after the completion of the hatching procedure, all eggs in which the chick could not be hatched were broken; finally, the hatching performance (HP); fertile hatchability (FH); fertility (FE) ; early- middle- and late- period mortalities (EPM-MPM-LPM); and external pip

ratio (EPR) were determined. The following formulas were used to determine the hatching results (Elibol, 2009).

Formula:

Fertility (FE): *(the number of fertilized eggs at hatch (NFE) / the number of eggs at hatch (NEH))*100*

Hatching Performance (HP): *(number of newly hatched chicks (NHC) / the number of eggs at hatch (NEH))*100*

Fertile hatchability (FH): *(number of newly hatched chicks (NHC) / the number of fertilized eggs at hatch (NFE))*100*

Early-period mortalities (EPM): *(number of early-period mortalities chicks / the number of fertilized eggs at hatch (NFE))*100*

Middle-period mortalities (MPM): *(number of middle-period mortalities chicks / the number of fertilized eggs at hatch (NFE))*100*

Late-period mortalities (LPM): *(number of late-period mortalities chicks / the number of fertilized eggs at hatch (NFE))*100*

External pip ratio (EPR): *(number of external pip mortalities chicks / the number of fertilized eggs at hatch (NFE))*100*

Formula:

$Yij = \mu + Pi + \Sigma ij,$

Yij*=Observation value,*

μ*= Population average,*

Pi*= Effect of " i'st" pollen contribution group,*

Σij*= Trial error*

The statistical analysis of the data was performed with a one-way analysis of variance (ANOVA) using the SPSS package program, and each group's averages were compared using Duncan's multiple comparison test (Düzgüneş et al., 1987). For the values determined as percentages, transformations were made to perform variance homogeneity tests. The data obtained at the end of the study were analyzed by the General Linear Model (GLM) method using the SPSS (ver: 16) package program.

3. Results And Dıscussıon

As a result of the literature review, no studies have been found on the effect of bee pollen on the hatching results. Therefore, the research results we have found regarding the effect of bee pollen on hatching results are the first data. In the hatching eggs, the weight loss values showed no statistically significant differences between the groups (P>0.05) (Table 2). In the hatching results, the hatching

performance and the number of newly hatched chicks, in the middle and late periods of mortality showed no statistically significant differences (P>0.05), whereas the fertility, fertile hatchability, newly hatched chick weight, early period mortality and external pip ratio values showed statistically significant difference between the groups (P<0.01), (Table 3).

It has been reported that the ideal hatching results in chickens are associated with the loss of weight (as water vapor) in an egg during the hatching period; this loss of weight is directly related to the number of pores in an egg shell. Based on these criteria, the eggs were found to have lost an average weight of 11.5% during hatching in chickens (Burton and Tullet, 1983; Reis et al., 1997; Peebles and McDaniel, 2004). In the present study, the BPP- supplemented groups were found to have lower egg loss weight values which were consistent with the previously stated values. In previous studies, egg weight has been shown to have significant effects on hatching. It was reported that the fertility ratio was 72.57% in the eggs weighing 7.01- 8.90 g and 83.24% in the eggs weighing 10.01-11.00 g, and the fertile hatchability was 74.08% in the eggs weighing 10.01-11.00 g, 84.28% in the eggs weighing 11.01-12.00 g (Sachdev et al., 1985).

In the present study, the average weights of the eggs placed in an incubator were 11.79-12.20 g, and this result was in compliance with the previously reported values. In the BPP-supplemented groups, significant fertility ratio and fertile hatchability values were observed compared to the control group (P<0.05). The hatching performance was found to be similar among all groups, and no significant difference was observed in the newly hatched chick numbers (P>0.05). In Japanese quails, the newly hatched chick weight is 6.69-8.03 g, accounting for 66.9% of the ideal average weight of a hatching egg (10-12 g) (Shanaway, 1987).

In this study, chick weights were statistically significant and the highest value (8.04) was observed in the BPP10-supplemented group (P<0.05). Significant results were obtained from the important criteria of the hatching results, in the early-period mortalities (EPM), middle-period mortalities (MPM), late-period mortalities (LPM), and external pip ratio (EPR) values. In this context, MPM was found only in the BPP20-supplemented group. While the EPM values significantly different between the groups (P <0.01), no statistically significant difference was found in the LPM values of all groups. In the EPR values, a statistically significant difference (P <0.01) was observed between the BPP5- and BPP10-supplemented groups.

4. Conclusıons

Consequently; when the results of hatching of eggs obtained from breeding quails fed with rations including different rates of pollen or without it; it occurs has a significant effect on hatching results such as fertile hatchability, increasing on fertility. Since BPP-20 group has got %97,87

fertility, %83,33 hatchability, %85,16 fertile hatchability, 75 numbers newly hatched chicks, minimum early-middle-late period mortalities, and external pip ratio with regards to it is recommended can be used on breeding quails 20g/kg bee pollen powder and it is thought that it can be used in other poultry in future studies.

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Statement of conflict of interest

We declare no conflicts of interest in this study.

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Table 1. Ingredients and chemical analyses of the diets

Feed Materials	**g kg^{-1} as fed**
Wheat	300
Maize	350
Soybean meal	165
Sunflower seed meal	86
Wheat bran	30
Calcium carbonate	43
Meat-bone meal	3
Vegatable oil	15
Monocalcium phosphate	1,5
Vitamin*	2,5
Mineral**	1,5
Salt	2,5
Total **1000**	
ME (kcal/kg)	2950
Crude protein (g kg^{-1} as fed)	190

**Each kg of vitamin mix. contains; 15.000.000 mg vit. A, 3.000.000 mg vit. D_3, 30.00 mg vit. E*

***Each kg mineral mix. contains;60.000 mg Mn, 60.000 mg Fe, 50.000 mg Zn, 15.000 mg Cu, 250 mg Co, 850 mg I, 500 mg Se.*

Table 2. Hatching egg weight loss values (%)

	GROUPS						
	C	BPP1	BPP5	BPP10	BPP20	SEM	SG
Egg weight loss	11.10	10.59	10.83	10.43	10.29	0.416	0.598

Table 3. Hatching results

	GROUPS						
	C	BPP1	BPP5	BPP10	BPP20	SEM	SG
Fertility (%)	87.78[b]	95.56[a]	97.78[a]	95.55[a]	97.78[a]	0.13	0.033*
Hatchability (%)	76.67	84.44	80.00	73.33	83.33	1.69	0.190
Fertile hatchability (%)	87.27[a]	88.33[a]	81.80 [ab]	76.75[b]	85.16[a]	1.46	0.043*
Newly hatched chick count (number)	69.00	76,00	72.00	66.00	75.00	0.51	0.191
Newly hatched chick weight. (g)	7.69[b]	7.89[ab]	7.76[b]	8.04[a]	7.74[b]	0.04	0.027*
Early period mortality (%)	7.63[a]	6.89[a]	0.00[b]	12.89[a]	10.23[a]	1.37	0.009**
Middle period mortality (%)	0.00	0.00	0.00	0.00	1.11	0.22	0.452
Late period mortality (%)	5.08	4.77	8.00	8.01	3.49	1.11	0.676
External pip ratio (%)	0.00[b]	0.00[b]	10.17[a]	2.30[b]	0.00[b]	1.12	0.001**

a, b, c: The difference between average values carrying different letters in the same order is statistically significant. (*) : P<0.05, (**) : P<0.01