

EFFECT OF FEED SUPPLEMENTATION ON CHEMICAL COMPOSITION OF DUCK EGGS IN COASTAL AREAS OF BANGLADESH

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Abstract

An experiment was conducted to investigate the effect of feed supplementation on chemical composition of Jinding duck's egg. A total of 180 physically sound eggs were randomly collected in each time at 50% and 75% level of egg production of the ducks. Significant difference was observed for dry matter content of egg albumen of ducks fed on different diets at 50% level of egg production ($P < 0.01$) but no significant difference was recorded for dry matter content of egg yolk at 50% level of egg production ($P > 0.05$). The CP contents of egg albumen and egg yolk differed significantly ($P < 0.01$) at 50% level of egg production but the difference was not significant ($P > 0.05$) for CP content of egg yolk at 75% level of production. There were significant differences ($P < 0.01$) on EE and TA contents of egg albumen and egg yolk at all levels of production. The results of the study demonstrated that the dry matter, as well as crude protein, ether extract and total ash content of eggs on dietary treatment T₁ (Scavenging + standard ration) was highest compared to the eggs on other treatment groups (T₀, T₂, T₃, T₄ and T₅).

Key words: Feed supplementation, Chemical composition, Jinding duck, Scavenging, Coastal areas.

Introduction

Duck keeping is one of the possible means of breaking out of poverty trap of resource-poor smallholder families in low income countries (Pym *et al.*, 2002). The duck eggs contain relatively less water and higher percentage of proteins and fats in the yolk, albumen and total contents of egg as compared to chicken eggs. Duck eggs served as a "current coin" to the poor farmers and house wives who can use it for education and health care of their children. Moreover, egg is the most inevitable animal protein source for the physical and mental development of children and helps to protect themselves from many other diseases. The quality of egg depends on physical make up and chemical composition of its constituent namely egg shell, albumen and yolk (USDA, 2002). The egg quality is the most important price contributing factor in table and hatching eggs. Therefore, the economic success of a

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laying flock solely depends on the total number of quality eggs produced (Monira *et al.*, 2003). Many factors are responsible for egg quality including the environmental factors, breed, type of bird, age or bird, nutrition level of the flock and season of the year (Card and Nesheim, 1966 and Naber, 1979). Egg quality is also influenced by genetic and non-genetic factors as season, environment and feed intake (Salahuddin and Howlider, 1991).

Variability in the composition of eggs due to the composition of the diet fed to the laying bird exists for a number of nutrients (Naber, 1979). Yin *et al.* (2000) observed that CP levels had no significant effect on egg quality but increasing dietary methionine had little effect on egg quality characteristics (He *et al.*, 2003). The fat content of the egg is easily changed by dietary manipulation of the laying bird (Naber, 1979). The nutrition of the bird does not appear to have any great effect on albumen quality (Naber, 1979) but the inclusion of fermentation residues such as brewer's grains or distiller's feed in the diet has been reported to improve egg albumen quality (Jensen *et al.*, 1978a). The maintenance of the egg quality from the time of their production till their delivery to the final consumer is of great importance. Information on chemical composition of eggs laid by Jinding ducks under scavenging condition is scarce. It is necessary to know the quality of duck eggs for consumer's satisfaction. Therefore, the present experiment was undertaken to study the effect of feed supplementation on chemical composition of eggs laid by Jinding ducks under scavenging system of rearing in coastal areas Bangladesh.

Materials and Methods

The experiment was conducted for a period between October, 2003 and August, 2004 in three villages of Ramgati upazilla viz., Purba Kolakupa, Char Kolakupa and Char Poragacha in the district of Lakshmipur. A total of one hundred forty four, 4-month old Jinding ducks were reared up to the age of 12 months.

Experimental design and treatments

The ducks were randomly assigned to 6 treatment groups having 3 replicates in each treatment. Each replicate consisted of 8 ducks. All the birds were supplied mash feed in addition to allowing them for scavenging.

Feeding and management

A standard ration was prepared using corn, rice polish, wheat bran, meat meal, soybean meal, mustard oil cake, common salt, vitamin-mineral premix, oyster shell and soybean oil, well mixed and supplied to the ducks belonged to treatment T₁ group. Similar quantity of rice polish, broken rice, a mixture of rice polish and broken rice (1:1) and rice polish, broken rice and wheat bran (5:3:2) were supplied to the ducks of T₂, T₃, T₄ and T₅ treatments, respectively. The amount of supplemental feeds were divided into two equal halves and were given twice daily (7.30 A.M. and at 5.30 P.M.). All ducks were vaccinated against Duck Plague and Duck Cholera. The experimental birds were allowed to scavenge freely in the agricultural fields, ponds and ditches near to farmer's house for 9 hours (8.00 A.M. to

5.00 P.M.). Feeds were supplied in the bowls in the form of wet mash and the bowls were cleaned properly before each feeding time. Sufficient clean drinking water was also supplied in bowls in each time of feeding. Proper care and management practices were followed by the researcher and farmers throughout the experimental period.

Collection of egg sample

The freshly laid eggs of Jinding ducks were collected from the farmers. The eggs were collected in two times, once at 50% and other at 75% level of egg production of Jinding ducks. Five numbers of eggs were taken from each treatment at each level of production. Each time of collection, all the eggs were identified properly with individual serial number. For this purpose, a total number of 180 eggs were collected randomly from 6 treatments groups at 50% and 75% level of egg production.

Chemical analysis

Dry matter (DM), crude protein (CP), ether extract (EE) and total ash (TA) content of eggs were done following the principles of AOAC (2004).

Statistical analysis

Data were analyzed statistically using analysis of variance technique for a completely randomized design and significant differences among the treatment means were identified by Duncan's Multiple Range Test (Steel and Torrie, 1980).

Results and Discussion

The dry matter, crude protein, ether extract and total ash contents of eggs (egg albumen) are given in Table 1. The highest DM content of egg albumen was found in T₁ group (12.67) followed by T₃ (12.04), T₄ (11.89), T₅ (11.61), T₂ (11.47) and T₀ (11.44) treatment groups at all levels of egg production. The difference in dry matter content of egg albumen among the treatment groups was not significant ($P>0.05$). The DM content of egg albumen found in the present experiment is in well agreement with the findings of Mountney and Parkhurst (2001); Li-Chang *et al.* (2002); Sreenivasaiah (1986) and Rose *et al.* (1966) but the present value was much lower than the values reported by Prasad (2000) and Das (1999). Higher percentage of albumen dry matter in T₁ group may be explained by the fact that large eggs tend to have a higher proportion of albumen (Marion *et al.*, 1964).

The CP content of egg albumen varied from 9.62 to 11.10. The highest CP content of egg albumen was found in T₁ group (11.10) as compared to other treatment groups at all levels of egg production. The difference in CP content of egg albumen between the treatment groups T₀ and T₂ was not significant ($P>0.05$) at 50% level of egg production. The CP content of egg albumen found in the present study is in well agreement with the observation of Stadelman and Cotterill (2002); Mountney and Parkhurst (2001); Cunningham *et al.* (1960)

and Leeson and Summers (1997). But the result was higher than the findings of Prasad (2000). Chung and Stadelman (1965) found that the protein content of albumen increased by 0.09g for each gram increase in egg weight, which partially support the present result and the differences were significant ($P < 0.05$) at 75% level of egg production.

The EE content of egg albumen on dietary treatment T_1 (standard ration) was highest compared to other treatment groups T_0 (only scavenging), T_2 (Scavenging with rice polish), T_3 (scavenging with broken rice), T_4 (Scavenging with rice polish and broken rice) and T_5 (Scavenging with rice polish, broken rice and wheat bran). The difference in EE content of egg albumen among the treatment groups T_0 , T_2 and T_5 was not significant ($P > 0.05$) at 50% level of egg production but it was statistically significant ($P < 0.01$) at 75% level of egg production. The EE content of egg albumen found in this experiment is almost similar to the findings of Cunningham *et al.* (1960), Stadelman and Cotterill (2002) and Mountney and Parkhurst (2001) but the result of the present findings is lower than the value reported by Sreenivasaiah (1986).

The content of inorganic elements in egg albumen as ash ranged between 0.49 and 0.71 and the variation observed in ash content of egg albumen was highly significant ($P < 0.01$) among the treatment groups at all levels of egg production. The TA content of egg albumen found in this experiment is in close association with the findings of Stadelman and Cotterill (2002, Mountney and Parkhurst (2001); Prasad (2000) and Leeson and Summers (1997). The dry matter, crude protein, ether extract and total ash contents of eggs (egg yolk) are given in Table 2.

The DM content of egg yolk on dietary treatment T_1 (standard ration) was highest compared to other treatment groups T_0 , T_2 , T_3 , T_4 and T_5 . There was no significant difference ($P > 0.05$) for DM contents of egg yolk of ducks fed on different diets at 50% level of egg production. The dry matter content of egg yolk is almost similar to the findings of Mountney and Parkhurst (2001) and Sreenivasaiah (1986).

The CP content of egg yolk ranged between 15.86 and 16.68%. The CP content of egg yolk varies significantly ($P < 0.01$) at 50% level of egg production but did not differ at 75% level of egg production ($P > 0.05$). There was no significant difference ($P > 0.05$) for CP content of egg yolk of ducks fed on different diets at all levels of egg production. The CP content of egg yolk found in this experiment is slightly lower than the findings of Mountney and Parkhurst (2001); Stadelman and Cotterill (2002) and Cunningham *et al.* (1960) but the present value was slightly higher than the findings of Prasad (2000). The CP content of egg yolk found in T_1 treatment group is in close association to the findings of Leeson and Summers (1997).

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The EE content of egg yolk on dietary treatment T₁ (standard ration) was highest (35.05) compared to other treatment groups T₀ (only scavenging), T₂ (Scavenging with rice polish), T₃ (scavenging with broken rice), T₄ (Scavenging with rice polish and broken rice) and T₅ (Scavenging with rice polish, broken rice and wheat bran). The EE content of egg yolk varied from 31.52 to 35.05% which is in well agreement with the finding of Sreenivasaiah (1986), Stadelman and Cotterill (2002) and Leeson and Summers (1997). Although significant difference (P<0.01) was observed for EE content of egg yolk of ducks but the difference in EE content of egg yolk between the treatment groups T₁ and T₃ was not significant (P>0.05) at 50% level of egg production. Similarly, no significant difference (P>0.05) was found between the treatment groups T₂ and T₅ at 75% level of production.

Table 1. Chemical composition of Jinding duck egg (egg albumen) in different treatment groups (g/100g DM)

Parameters	Level of egg prodn.	Dietary treatments [#]						SED	Level of Sig.
		T ₀	T ₁	T ₂	T ₃	T ₄	T ₅		
Dry matter	50%	11.43 ^a	12.65 ^a	11.45 ^a	11.99 ^a	11.88 ^a	11.60 ^a	0.69	**
	75%	11.45	12.69	11.48	12.08	11.89	11.62	0.49	NS
Average	-	11.44	12.67	11.47	12.04	11.89	11.61	-	-
Crude protein	50%	9.53 ^d	10.98 ^a	9.65 ^d	10.25 ^b	10.08 ^{bc}	9.82 ^{cd}	0.15	**
	75%	9.70 ^b	11.21 ^a	10.00 ^b	10.68 ^{ab}	10.43 ^{ab}	10.18 ^b	0.42	*
Average	-	9.62	11.10	9.83	10.47	10.26	10.00	-	-
Ether extract	50%	0.04 ^d	0.13 ^a	0.05 ^d	0.11 ^b	0.08 ^c	0.06 ^d	0.008	**
	75%	0.05 ^e	0.15 ^a	0.08 ^{de}	0.13 ^b	0.09 ^c	0.09 ^d	0.008	**
Average	-	0.05	0.14	0.07	0.12	0.09	0.08	-	-
Total ash	50%	0.47 ^d	0.69 ^a	0.52 ^{cd}	0.63 ^b	0.58 ^{bc}	0.55 ^c	0.03	**
	75%	0.51 ^e	0.72 ^a	0.55 ^{de}	0.68 ^{ab}	0.62 ^{bc}	0.58 ^{cd}	0.03	**
Average	-	0.49	0.71	0.54	0.66	0.60	0.57	-	-

[#] T₀ = Only scavenging, T₁ = Scavenging + standard ration, T₂ = Scavenging + rice polish, T₃ = Scavenging + broken rice, T₄ = Scavenging + rice polish and broken rice (1:1) and T₅ = Scavenging + rice polish + broken rice and wheat bran (5:3:2)

SED = Standard Error of Deviation

a, b, c, d, e Values having common superscripts in the same row did not differ significantly (P>0.05)

The TA content of egg yolk ranged between 1.03 and 1.20% and the variation observed in ash content of egg yolk was highly significant (P<0.01) at 50% level of egg production. The TA content of egg yolk found in this experiment is well agreed to the findings of Stadelman

and Cotterill (2002); Leeson and Summers (1997) and Prasad (2000) and lower than the values reported by Mountney and Parkhurst (2001).

Table 2. Chemical composition of Jinding duck egg (egg yolk) in different treatment groups (g/100g DM)

Parameters	Level of egg prodn.	Dietary treatments [#]						SED	Level of Sig.
		T ₀	T ₁	T ₂	T ₃	T ₄	T ₅		
Dry matter	50%	51.53	53.57	51.77	52.75	52.42	52.32	0.67	NS
	75%	51.59 ^b	53.64 ^a	51.80 ^b	52.79 ^{ab}	52.55 ^{ab}	52.41 ^{ab}	0.56	*
Average	-	51.56	53.61	51.79	52.77	52.49	52.37	-	-
Crude protein	50%	15.84 ^a	16.63 ^a	15.89 ^a	16.40 ^a	16.23 ^a	16.12 ^a	0.51	**
	75%	15.87	16.73	15.98	16.45	16.33	16.21	0.29	NS
Average	-	15.86	16.68	15.94	16.43	16.28	16.17	-	-
Ether extract	50%	31.48 ^b	34.98 ^a	31.95 ^b	34.15 ^a	32.46 ^b	32.34 ^b	0.70	**
	75%	31.56 ^d	35.12 ^a	31.98 ^{cd}	34.21 ^b	32.54 ^c	32.40 ^{cd}	0.41	**
Average	-	31.52	35.05	31.97	34.18	32.50	32.37	-	-
Total ash	50%	1.01 ^f	1.14 ^a	1.03 ^e	1.10 ^b	1.07 ^c	1.05 ^d	0.008	**
	75%	1.04 ^c	1.26 ^a	1.05 ^c	1.14 ^b	1.08 ^b	1.09 ^{bc}	0.03	**
Average	-	1.03	1.20	1.04	1.12	1.08	1.07	-	-

[#] T₀ = Only scavenging, T₁ = Scavenging + standard ration, T₂ = Scavenging + rice polish, T₃ = Scavenging + broken rice, T₄ = Scavenging + rice polish and broken rice (1:1) and T₅ = Scavenging + rice polish + broken rice and wheat bran (5:3:2)

SED = Standard Error of Deviation

^{a, b, c, d} Values having common superscripts in the same row did not differ significantly (P>0.05)

Conclusion

The results indicated that the dry matter, crude protein, ether extract and total ash contents of egg albumen and egg yolk are higher in 75% level of egg production over 50% level of egg production. The results of the study also demonstrated that the dry mater, as well as crude protein, ether extract and total ash content of egg albumen and egg yolk on dietary treatment T₁ (Scavenging + standard ration) was highest compared to the eggs of other treatment (T₀, T₂, T₃, T₄ and T₅) groups.

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