



Comparative evaluation of native breeds of chicken for persistency of egg production, egg quality and biochemical traits

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ABSTRACT

The experiment was conducted to study the egg production potential and persistency of egg production up to 44 weeks of age, egg weight, egg mass, biochemical parameters and egg quality traits in Aseel and Kadaknath breeds. Higher persistency of production was observed at 40 weeks of age in Aseel (50.81%) and at 44 weeks of age in Kadaknath (54.35%). Persistency of production in Aseel was relatively higher during initial stage of production (28–36 weeks) while it was higher in Kadaknath during later stage (40–44 weeks). Over all, higher 44 weeks egg production was observed in Kadaknath than in Aseel. Egg weight was significantly higher in Aseel as compared to Kadaknath. Egg mass recorded from 28 to 40 weeks of age was also higher in Aseel than in Kadaknath. Serum cholesterol levels at 20 and 32 weeks of age were significantly higher in Kadaknath as compared to Aseel while serum protein level (20 weeks) was significantly higher in Kadaknath. No significant difference was observed in antibody (HI) titre to New Castle disease virus between these breeds. Cage house survivability was similar in Aseel (97.53%) and Kadaknath (97.17%). Egg quality study revealed that yolk, albumen and shell weights were significantly higher in Aseel than Kadaknath, while shell percentage was significantly higher in Kadaknath. The study concluded that the persistency and number of egg production up to 44 weeks of age was relatively better in Kadaknath as compared to Aseel.

Key words: Aseel, Biochemical traits, Egg mass, Kadaknath, Persistency

Aseel and Kadaknath are two major native chicken breeds, which are being conserved, improved and utilized in developing improved varieties for rural poultry farming system. Often lower persistency of egg production in native chicken germplasm owing to broodiness or some other factors is being blamed for poor production potential in native breeds. Persistency of egg production is an important factor that determines total egg production (Grossman *et al.* 2000). Therefore, native chicken breeds need to be evaluated before being subjected to genetic improvement for egg production or utilizing them for developing new varieties or crosses. Egg weights and egg mass at various stages of production are other important parameters that need to be determined so that these traits can also be considered in the improvement programs. Various reports are available on the growth and production performance of these native breeds (Chatterjee *et al.* 2007, Mohan *et al.* 2008a and 2008b, Thakur 2009, Haunshi *et al.* 2011). However, little information is available in the literature about the persistency of egg production and egg mass at various stages of production in

these breeds. Further, it is important to evaluate these breeds for serum biochemical traits like serum cholesterol, protein levels and antibody titres so that one can keep track on changes in these traits over a period of time or generations owing to improvement in production traits in these breeds. Therefore, the present study was conducted to evaluate the persistency of egg production, egg weight and egg mass at various intervals and serum biochemical traits and also egg quality traits in Aseel and Kadaknath breeds.

MATERIALS AND METHODS

Experimental animals and management conditions: Chicks (973) of Kadaknath (using 42 sires and 125 dams) and chicks (716) of Aseel (Peela) (using 28 sires and 83 dams) were regenerated as pedigreed populations. Both the genetic groups were provided layer chick starter ration (2600 kcal/kg ME and 18% CP) up to 8 weeks of age and grower ration (2500 kcal/kg ME and 16% CP) from 9 to 20 weeks of age in *ad lib.* quantity. At about 21 weeks of age 178 pullets of Kadaknath and 162 pullets of Aseel were housed in individual (layer) cages, and layer ration (2600 kcal/kg ME and 16% CP) was provided from the onset of egg production till the completion of experiment. Light for 16 h (including natural

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day light) was provided during laying period. Management and rearing conditions during the period of experiment were kept identical for both the genetic groups. On the day of hatch chicks were vaccinated against Marek's disease and subsequently birds were protected against important diseases like RD and IBD using standard vaccination program.

Production traits: Age at sexual maturity was calculated by taking mean of age at first egg laid of all the birds housed in cages. Egg weight was measured to the nearest of 0.1g by taking average weight of eggs laid for 5 consecutive days by each hen at 28, 32, 36 and 40 weeks of age. Egg mass was calculated by multiplying average egg weight and number of eggs produced up to respective age. Egg production and persistency of egg production at 4 weeks interval was recorded by calculating percentage of hen day egg production and hen housed egg production up to 44 weeks of age.

Blood biochemical parameters: Blood biochemical parameters were estimated by collecting blood from brachial vein and subsequently serum was separated and stored till examination. For New Castle disease (ND) titres, birds were vaccinated against Lasota strain of ND virus on 7 day of age and estimation of antibody titre in serum sample against ND antigen was carried out in 30 hens at 32nd week of age by haemagglutination inhibition (HI) method using 4 HA units of ND virus and 1% chicken RBC. 4 HA units of ND virus was calculated by carrying out haemagglutination (HA) test using 1% chicken RBC. The end titres of HI were expressed as log 2 titres. Serum cholesterol level of 12 birds at 20 weeks and 30 birds at 32 weeks of age was determined using (Zlatki's) chemical method (Zak *et al.* 1954). The total plasma protein at 20 weeks of age was estimated as per Lowry *et al.* (1951).

Egg quality traits: External and internal egg quality traits of Aseel and Kadaknath were carried out at 56 weeks of age. Total of 59 eggs from Aseel and 103 eggs from Kadaknath were used for the study of egg quality traits. The external egg quality traits like egg weight and shape index were measured while internal egg quality traits like yolk index, Haugh unit, and yolk colour were recorded using standard procedures. Whole egg, albumen and yolk weight, yolk to albumen ratio, percent albumen, percent yolk and percent shell weights were also recorded. Length and breadth of eggs were measured using digital Vernier callipers (least count 0.01 mm).

The means and standard errors of various traits were calculated as per the standard statistical procedures using computer software. Means of various traits between 2 genetic groups were compared using 'F' test or students 't' test (Snedecor and Cochran 1994).

RESULTS AND DISCUSSION

Egg production and persistency of production: Age at sexual maturity in Aseel (174 ± 0.9) was significantly

($P < 0.001$) lower than that of Kadaknath (181 ± 1.2) breed. Age at sexual maturity of the present study was comparable with those reported in Aseel by Mohan *et al.* (2008a) but lesser than the reports for the same breeds at same location (Haunshi *et al.* 2011). The earlier sexual maturity observed might be due to increasing day length during later part of growing stage of birds.

Study of persistency of egg production measured using hen day egg production% (HDEP) and hen housed egg production% (HHEP) from 22 weeks of age to 44 weeks of age revealed interesting findings (Table 1). Persistency was better in Aseel during initial period of egg production (24 to 36 weeks) while it was higher in Kadaknath during later part of production (40 to 44 weeks). It started declining in Aseel at 40 weeks of age while it continued to increase in Kadaknath even after 40 weeks of age. Similar trend was observed with respect to egg production (part period from 22 to 44 weeks) indicating relatively higher egg numbers in Aseel in the beginning, while relatively higher egg numbers in Kadaknath during later part of cycle.

Peak daily egg production% (HDEP% averaged over particular week) was observed at 31st week in Aseel (67.57%) while it was at 35th week of age in Kadaknath (75.56%) (Table 2). The higher egg production recorded in Aseel during initial period was perhaps due to significantly early age at sexual maturity observed in Aseel as compared to Kadaknath breed. Overall relatively higher egg production up to 44 weeks was observed in Kadaknath as compared to Aseel. Similar observations were made by Haunshi *et al.* (2011). However, in present study, relatively higher egg production was recorded in both breeds as compared to earlier reports (Thakur *et al.* 2009, and Haunshi *et al.* 2011). Higher egg production in the present study might be due to early age at sexual maturity and partly due to better management practices. Few reports are available to compare the findings of persistency of egg production of these native breeds although Mohan *et al.* (2008a) reported total egg production of 160 eggs during a production period of 23 to 78 weeks in Aseel.

Table 1. Persistency and number of egg production in Aseel and Kadaknath breeds

Period (weeks)	Aseel			Kadaknath		
	HDEP* (%)	HHEP** (%)	Egg numbers	HDEP (%)	HHEP (%)	Egg numbers
22-24	6.65	6.64	0.81	3.00	3.00	0.62
22-28	31.64	31.63	12.18	20.91	20.91	7.63
22-32	43.96	43.95	28.74	38.34	38.34	25.10
22-36	49.17	49.12	45.73	48.10	47.97	44.81
22-40	50.81	50.51	59.53	52.54	52.22	62.39
22-44	49.80	49.68	73.21	54.35	53.89	80.31

* HDEP, Hen day egg production; ** HHEP, hen housed egg production.

Table 2. Weekly percentage hen day egg production for Aseel and Kadaknath

Age (week)	Aseel	Kadaknath	Age (week)	Aseel	Kadaknath
22	0.78	0.61	34	62.88	67.80
23	3.52	2.24	35	64.90	75.56
24	9.12	4.98	36	59.27	67.95
25	22.69	9.25	37	54.58	66.58
26	37.62	18.73	38	56.44	67.78
27	49.42	30.39	39	58.89	66.00
28	52.79	38.55	40	56.65	68.52
29	54.34	53.29	41	52.39	63.65
30	58.71	57.81	42	47.78	61.57
31	67.57	65.62	43	40.40	62.79
32	63.09	66.52	44	43.66	60.93
33	60.84	70.72			

Egg weight, egg mass and biochemical traits: Egg weights recorded at 28, 32, 36 and 40 weeks of age were significantly higher in Aseel as compared to Kadaknath (Table 3). There was an improvement of 5.00 and 5.54 g of average egg weight, respectively in Aseel and Kadaknath breeds from 28 to 40 weeks of age. However, improvement of average egg weight from 28 weeks to 56 weeks of age was slightly better in Aseel (9.04 g) as compared to Kadaknath (8.04 g). Egg mass was higher in Aseel as compared to Kadaknath recorded at 28, 32, 36 and 40 weeks of age. Improvement of egg mass from 28 weeks to 40 weeks of age in Aseel and Kadaknath was almost similar. Similar egg weight for Aseel and Kadaknath breeds at 40 weeks of age was reported by Haunshi *et al.* (2011). However, little information is available with respect to egg mass at various stages of production in the literature to compare with the present findings.

Cage house survivability from the day of housing in cages from 21 to 44 weeks of age was almost similar in both breeds (Table 3). Marginally high survivability was observed in Aseel as compared to Kadaknath breed however, survivability of native birds under intensive system (cage system of rearing) is impressive as it is well within the range of 1% mortality per month prescribed during laying period

With respect to serum biochemical parameters it was observed that the serum cholesterol level was significantly higher in Kadaknath as compared to Aseel both at 20 and 32 weeks of age (Table 3). Mohan *et al.* (2008a) reported that the serum cholesterol level in Aseel was 176.36 mg/dl at 78 weeks of age, which is lesser than the one observed in the present study at 32 weeks of age. The difference might be due to the different methods used in these two studies. Serum protein level was significantly higher in Kadaknath as compared to Aseel at 20 weeks of age. There was no significant difference in antibody titre against ND virus measured at 32 weeks of age but was relatively higher in both breeds as an indicator of better protection against New Castle disease.

Table 3. Egg weight, egg mass and biochemical traits of Aseel and Kadaknath (mean±SE)

Traits	Aseel	Kadaknath	P value
Egg wt. at 28 weeks (g)	42.57±0.30 ^a	36.02±0.33 ^b	***
Egg wt. at 32 weeks (g)	44.65±0.29 ^a	37.14±0.29 ^b	***
Egg wt. at 36 weeks (g)	45.84±0.27 ^a	40.09±0.38 ^b	***
Egg wt. at 40 weeks (g)	47.57±0.34 ^a	41.56±0.19 ^b	***
28 weeks egg mass (g)	518.50	274.83	-
32 weeks egg mass (g)	1283.24	932.21	-
36 weeks egg mass (g)	2096.26	1796.43	-
40 weeks egg mass (g)	2831.84	2592.93	-
Serum cholesterol level at 20 weeks of age (mg/dl)	120.24±4.90 ^a	147.06±9.84 ^b	*
Serum protein level at 20 weeks of age (g/L)	4.57±0.35 ^b	5.78±0.24 ^a	**
Serum cholesterol level in hens at 32 weeks of age (mg/dl)	209.55±9.98 ^b	277.13±17.14 ^a	**
ND (HI) titre level at 32 weeks	9.70±0.27	9.87±0.27	NS
Cage house survivability up to 44 weeks of age (%)	97.53	97.19	-

Mean figures bearing different superscript row wise differ significantly (***P<0.001, **P<0.01, NS, Nonsignificant).

Table 4. Egg quality traits of Aseel and Kadaknath breeds at 56 weeks of age (mean±SE)

Traits	Aseel	Kadaknath	P value
Egg weight (g)	51.61±0.61 ^a	44.06±0.34 ^b	***
Shape index	74.03±0.49	75.26±0.45	NS
Yolk colour	6.25±0.19	6.34±0.14	NS
Yolk index	0.44±0.005	0.44±0.003	NS
Yolk weight (g)	18.15±0.23 ^a	15.18±0.13 ^b	***
Albumen weight (g)	29.63±0.66 ^a	25.84±0.49 ^b	***
Shell weight (g)	4.75±0.08 ^a	4.21±0.05 ^b	***
Yolk percentage	35.21±0.37	34.52±0.29	NS
Albumen percentage	55.58±0.37	55.94±0.31	NS
Percentage of shell	9.20±0.10	9.57±0.11	*

Mean figures bearing different superscript row wise differ significantly (*** P<0.001, * P<0.05, NS, nonsignificant).

Egg quality traits: Egg quality traits studied at the age of 56 weeks in Aseel and Kadaknath are presented in Table 4. It was observed that the egg weight, albumen weight, yolk weight, and shell weight were significantly (P<0.001) higher in Aseel as compared to Kadaknath. However, percentage of shell was significantly (P<0.05) higher in Kadaknath as compared to that of Aseel. Reports in literature regarding comparative study on egg quality traits at 56 weeks of age in native breeds are scanty. However, similar trend was observed for egg quality traits measured at 40 weeks of age in Aseel and Kadaknath (Haunshi *et al.* 2011) although the differences

in yolk and albumen percentages were not significant in the present study.

The study concluded that the persistency and number of egg production up to 44 weeks of age was relatively better in Kadaknath as compared to Aseel.

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