Indian Journal of Poultry Science (2013) 48(1): 122-125; Short Communication

Effect of age on egg quality in chicken

M.K. PADHI*, R.N. CHATTERJEE, S. HAUNSHI AND U. RAJKUMAR

Project Directorate on Poultry
Rajendranagar, Hyderabad - 500 030 (A.P.)

(Received on September 19, 2012; accepted for publication on March 13, 2013)

ABSTRACT

Padhi, M.K., Chatterjee, R.N., Haunshi, S. and Rajkumar, U. 2013. Effect of age on egg quality in chicken. Indian Journal of Poultry Science, 48(1): 122-125.

Egg quality traits were measured at 28, 40, 52, 64 and 72 weeks of age in Vanaraja male line (PD1) utilizing 20 to 40 eggs at different ages. Egg weight, colour index, Haugh unit, yolk index, albumen index, shell thickness, yolk weight, albumen weight, shell weight, yolk %, albumen % and yolk to albumen ratio differ significantly ($P \leq 0.05$) at different age of measurements. Egg weight increases linearly upto 52 weeks of age and then it remain stable. Colour index significantly lower during beginning and end of the measurements. Shell thickness was lower during 28 and 40 weeks of age. Yolk weight increases as the age advances, whereas albumen weight decreased significantly at 72 weeks of age compared to 40, 52 and 64 weeks of age. Shell weight increases as the age advances. Yolk % and yolk to albumen ratio increases as the age of measurements increases. Egg weight was negatively correlated with yolk % and positively correlated with albumen % irrespective of age. Yolk to albumen ratio was negatively correlated with egg weight irrespective of age of measurements. Correlation coefficient between egg weight with yolk, albumen and shell weight were positive. Haugh unit and albumen ratio was negatively correlated with egg weight at 64 and 72 weeks of age. The results indicates that the age of the birds significantly affect different parameters of egg quality and as the age advances, at the end of cycle most of the quality parameters decreased in magnitude and the yolk content increases compared to the albumen content

Key words: egg quality, egg weight, Vanaraja, yolk to albumen ratio.

Backyard poultry farming with improved variety is gaining popularity in our country. The improved birds are mostly crossbred which are developed to perform better in the backyard system of rearing. The egg size and its quality is an important attributes in backyard poultry. The egg size and its component are influenced by a number of genetic and non genetic factors (Washburn, 1990). The yolk % is affected by breed or strain within a breed, age of hen and egg size (Campo, 1995; Suk and Park, 2001). So the present study was undertaken to see the effect of hen age on egg quality and also the correlation of egg weight with different egg quality parameters at different ages.

The breeds used for the study is Vanaraja male line (PD1) which is selected for higher shank length at six weeks of age since last five generation. The hens were reared in individual cages with standard meat type breeder management and feeding practices. Eggs for the present study were collected randomly (20 to 40 eggs) late afternoon at 28, 40, 52,64 and 72 weeks of age and were kept at room temperature overnight for evaluation in the next day. Eggs were weighed and length and breadth were measured in digital vernier callipers. Then the eggs were broken and different parameters like yolk height, albumen height, yolk width, albumen width and length were recorded. The yolk colour were measured as per the Roche yolk colour fan. Shell thickness was randomly measured from three different parts of eggs using a micrometer and averaged. Weight of yolk was recorded and the shell weight were recorded after drying the egg for 48 hours. Albumen weight was determined by subtracting the yolk and shell weight from the original egg weight. Shape index, albumen index, yolk index and Haugh unit were calculated using standard formulae. Yolk: albumen ratio and albumen, yolk and shell % were calculated. The data were analysed as per Snedecor and Cochran (1994).

The egg quality parameters at different ages are presented in Table 1. Correlation coefficients between egg weight and different egg quality parameters at different ages are presented in Table 2.

*Corresponding author : e-mail: padhi16@rediffmail.com

Table 1. Egg quality traits at different age of measurements

Trait	28 week (34)	40 weeks (40)	52 weeks (20)	64 weeks (21)	72 weeks (30)
Egg wt (g)	47.60±0.53[c]	55.19±0.61[b]	61.74±0.91[a]	60.42±0.72[a]	61.07±0.84[a]
SI	76.49±0.49	75.29±0.41	75.57±0.96	76.00±0.93	77.45±1.74
Yolk colour	6.71±0.16[c]	7.45±0.12[b]	7.40±0.17[b]	8.29±0.34[a]	6.77±0.14[c]
Haugh Unit	80.76±1.56[b]	81.38±1.48[b]	87.50±1.67[a]	78.43±1.70[bc]	75.49±1.52[c]
Yolk index	0.41±0.01[ab]	0.37±0.01[cd]	0.43±0.01[a]	0.39±0.01[bc]	0.35±0.01[cd]
Albumen index	0.1020±0.004[a]	0.0936±0.004[ab]	0.1062±0.005[a]	0.0826±0.004[b]	0.0617±0.004[c]
Shell thickness(mm)	0.34±0.004[c]	0.34±0.003[c]	0.37±0.007[ab]	0.35±0.005[bc]	0.38±0.004[ab]
Yolk weight (g)	13.05±0.19[e]	17.18±0.22[d]	18.48±0.27[c]	19.40±0.20[b]	20.81±0.44[a]
Albumen weight (g)	30.56±0.50[d]	33.53±0.49[c]	37.84±0.83[a]	36.01±0.75[b]	34.93±0.71[c]
Shell weight (g)	3.99±0.08[d]	4.48±0.07[c]	5.43±0.10[a]	5.01±0.08[b]	5.34±0.11[a]
Yolk %	27.50±0.44[c]	31.17±0.34[b]	30.01±0.51[b]	32.21±0.53[ab]	34.13±0.66[a]
Albumen %	64.10±0.49[a]	58.91±1.78[bc]	61.18±0.59[ab]	59.47±0.60[bc]	57.12±0.68[c]
Shell %	8.40±0.17	9.92±1.79	8.81±0.17	8.31±0.15	8.75±0.15

Values in parenthesis indicate number of eggs
Means bearing different superscripts in a row differ significantly ($P < 0.05$)

Table 2. Correlation coefficient (r) between egg weight and different egg quality traits at different age of measurements

Trait	28 week	40 week	52 week	64 week	72 week
Shape index	-0.25	-0.07	-0.31	0.39	0.14
Yolk colour	-0.06	0.00	-0.17	-0.17	0.34
Yolk index	0.21	0.14	-0.01	0.41	0.23
Albumen index	0.29	0.03	0.25	-0.40	-0.41
Haugh Unit	0.27	0.04	0.37	-0.31	-0.10
Yolk weight	0.23	0.60	0.31	-0.09	0.44
Albumen weight	0.93	0.92	0.94	0.96	0.82
Shell weight	0.20	0.44	0.38	0.23	0.55
Yolk %	-0.48	-0.32	-0.61	-0.80	-0.24
Albumen %	0.57	0.02	0.65	0.82	0.26
Shell %	-0.35	0.04	-0.43	-0.45	-0.14
Yolk : albumen ratio	-0.52	-0.35	-0.64	-0.81	-0.25
Shell thickness	0.02	0.25	0.27	0.27	0.43

Egg weight showed significant ($P \leq 0.05$) difference between different age of recording and the egg weight increases as the age of measurement increases. However, the results revealed that egg weight at 52, 64 and 72 weeks of age did not differ significantly ($P \leq 0.05$) indicating that in early period there was gain in egg weight and towards later part the egg weight remain static, Similar observation was reported by Suk and Park (2001). The egg weight observed in the present study at 40 weeks of age was lower than the report of Anonymous (2012) in PB1. Shape index did not showed any significant ($P \leq 0.05$) difference between different age of measurements. Tumova and Gous (2012) reported no significant effect of age on shape index in broiler breeder and laying hen. Haugh unit differ significantly ($P \leq 0.05$) at different ages. Decreases in Haugh unit towards later part of the laying cycle were reported by Niranjan *et al.* (2008) and Rajkumar *et al.* (2009). Decrease in Haugh unit score at later part of the egg laying in broiler breeder also reported by Tumova and Gous (2012).

Yolk colour showed significant ($P \leq 0.05$) difference between different age of measurement and more intense colour was observed at 64 weeks of age. Varaition in yolk colour at different ages were reported by Niranjan *et al.* (2008) and Rajkumar *et al.* (2009). Yolk index showed significant ($P \leq 0.05$) difference between different age of measurement. However, no specific trends was observed and the yolk index was not significant between 40 and 72 weeks of age. Yolk index values were higher than the report of Chatterjee *et al.* (2007 and Rajkumar *et al.* (2009). Albumen index differ significantly ($P \leq 0.05$) between different age of measurement and the lowest albumen index was observed at 72 weeks of age indicating the

poor quality of albumen at 72 weeks of age. Decrease in albumen height and increase in albumen width as the age advances also reported by Rajkumar *et al*. (2009).

Shell thickness differ significantly (P≤0.05) between different age of measurement. The shell thickness was higher at 52 and 72 weeks of age compared to other age of measurement indicating that the shell quality was better towards the end of the experiment. It was observed that as the egg weight increases with age the shell thickness increases. Shell thickness observed in the present study at 28 and 40 weeks of age was lower than the report of Rajkumar *et al*. (2009) in a naked neck population. Significantly lower shell thickness at 55 weeks of age than at 45, 50, 60, 70 and 80 weeks of age in Korean native fowl was reported by Suk and Park (2001) which is in agreement with the present study.

The yolk weight showed significant (P≤0.05) differences between different age of measurement and as the age advances along with egg weight the yolk weight increases. Increase in yolk weight with increase in age in chickens were reported by (Suk and Park, 2001; Silversides *et al*., 2006; Niranjan *et al*., 2008; Rajkumar *et al*., 2009). Albumen weight showed significant (P≤0.05) difference between different ages of measurement. Increase in albumen weight with increase in age was reported by Silversides *et al*. (2006) and decrease in albumen weight at 40 weeks compare to 28 weeks also reported by Rajkumar *et al*. (2009). Shell weight differ significantly (pd"0.05) at different age of measurement. As the age increases the shell weight increases compared to early age shell weight. Increase of shell weight with age advances reported by Rajkumar *et al*. (2009). Similar shell weight in Korean native chicken was reported by Suk and Park (2001), and in Naked neck birds by Rajkumar *et al*. (2009).

The percent of yolk differ significantly (P≤0.05) between different age of measurement and as the age advances the yolk % increases in the eggs. This indicates that in later part of egg laying the egg contain more yolk compared to albumen so the eggs are more useful for the product which needs more yolk. However, the lower yolk % at early ages may be suitable for the consumer who needs less yolk % and can be use for table purpose. Increase in yolk % compared to early ages is in agreement with the reports of Silversides and Scott (2001) and Tumova and Gous (2012). The percentage of albumen in the whole eggs showed significant (P≤0.05) difference between different age of measurement. The albumen % decreases as the age of measurement increases. Decrease in albumen % as age advances is in agreement with the report of Silversides and Scott (2001). However, the % of albumen was lower in the present findings. Tumova and Gous (2012) reported lower albumen % in broiler breeder than the laying hens. Shell % did not showed significant (P≤0.05) difference between different age of measurement.

Yolk to Albumen ratio differ significantly (P≤0.05) between different age of measurements and the ratio increases as the age advances indicating the yolk contents increases as the age advances compared to the albumen content. The present finding is in agreement with the report of Suk and Park (2001) in Korean native fowl. The eggs with heavier yolk and larger Yolk: albumen ratio are likely to contain more cholesterol, however these eggs on per gram of yolk basis may not differ in the levels of cholesterol in the yolk (Suk and Park, 2001).

The correlation coefficients between egg weight and shape index was negative upto 52 weeks of age and then it was positive at 64 and 72 weeks of age, however, the correlation coefficients were low in magnitude (Table 2). Yolk colour showed very low correlation coefficients with egg weight except at 72 weeks of age. Yolk index showed positive correlation with egg weight where as albumen index showed positive correlation with egg weight upto 52 weeks of age. Similar trend was observed for Haugh unit but the magnitude was low compared to albumen index. Yolk weight, albumen weight and shell weight showed positive correlation with egg weight. The correlation of egg weight with albumen % was higher than that with yolk and shell weight which is in agreement with finding of Suk and Park (2001) and Silversides and Scott (2008). Correlation of egg weight with % of albumen, shell and yolk revealed that egg weight negatively correlated with yolk % indicating higher egg weight has low yolk % in a particular age (Table 2). Similar trend was also observed for shell %. However, albumen % increases in bigger egg size at a particular age of measurements. Yolk to albumen ratio was negatively correlated with egg weight indicating in a particular age higher egg weight have lower ratio compared to lower egg weight. This is in agreement with the report of Suk and Park (2001).

The results revealed that most of the egg quality traits differ significantly at different ages of measurements in PD1and the internal quality of eggs decreases as towards the end of the experiments. It is also observed that the higher egg

size will give rise to lower yolk to albumen ratio and lower yolk % at a particular age.

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