EFFECTS OF SODIUM BICARBONATE SALT AND TURMERIC POWDER ON EXTERNAL EGG QUALITY OF ISA BROWN HENS

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ABSTRACT

A 112-day (16 weeks) study was carried out to investigate the effects of sodium bicarbonate salt and turmeric powder on external egg quality of Isa brown hens. The experiment was conducted at the poultry unit of Department of Animal Production Abubukar Tafawa Balewa University located in Gubi, Bauchi during the rainy season from July to October. A total of one hundred and eighty four (184) Isa Brown hens were used for the research. The result showed that increasing levels of sodium bicarbonate salt and turmeric powder had no significant effect on external egg quality. Egg weight (63.76± 0.19), egg circumference (14.30± 0.12) mm, egg diameter (4.53± 0.06) mm, shell thickness (0.46± 0.4) mm and shell egg proportion (8.46± 0.10) g. July and September recorded the highest value for egg weights which shows that there were significant variations among the months of the rainy season. From the observations of this study it was concluded that increasing levels of sodium bicarbonate salt and turmeric powder had no significant effect on external egg quality of Isa brown hens, however external egg quality was significantly ($P<0.001$) different among the months of the rainy season. It was also concluded that there exist a negative correlation between egg weight and shell thickness.

Keywords: Turmeric, Sodium Bicarbonate, Egg Quality, Isa Brown

INTRODUCTION

Currently poultry are domesticated birds used for both egg and meat production. This includes birds such as chicken, turkey, duck, goose, ostrich, quail, pheasant guinea fowl and peafowl .Chickens are the most popular worldwide irrespective of culture and religion (Al-nasser *et al.,* 2007). In a natural environment, the strength of the eggshell should be able to prevent cracking in order to preserve the embryo until hatching and also for better marketability of the eggs. The size, shape and weight of the eggs also influence the quality of chicks hatched and also consumer decision to buy or not to buy. While on the farm, eggshell is important to prevent breakage from handling and to preserve egg during transport from farm to the market (Mazzuco and Bertechini, 2014). Eggshell quality is a common problem in layer stock. The eggshell consists of 98% calcium carbonate. The necessary calcium for shell formation is derived from the feed and bone. During $CaCo_3$ synthesis in the shell gland, acidosis occurs until the twenty second hour after ovulation. Considering the adverse effect of acidogenic compounds on egg shell calcification, the utilization of alkaline salt as dietary supplements can be used to improve eggshell quality. Nirat and Ratana(2005) reported that the alterations of the dietary sodium/chlorine ratio could produce metabolic acidosis or alkalosis, regardless of the total quantities of these two ions in the diet. The requirement of sodium in laying hens for optimum performance has been a subject of investigation for a number of years. Sodium bicarbonate ($NaHC0_3$) is the sodium- containing mineral compound which is currently being used in poultry feeds. Greater shell thickness or shell strength has been reported if part of the dietary sodium was provided as $NaHCO_3$ salt rather than sodium chloride (Nirat and Ratana, 2005). Mancha *et al* (2004) reported that replacement of sodium chloride (NaCL) salt with sodium bicarbonate ($NaHCO_3$) salt resulted in a definite improvement in egg shell quality. This is because sodium bicarbonate provides sodium which favourably affects blood PH and supplies beneficial bicarbonate. Turmeric on the other hand is believed to posses antioxidant activities which might reduce oxidative stress. Therefore the objective of this research was to determine the effects of sodium bicarbonate and turmeric powder on external egg quality.

MATERIALS AND METHODS

The eggs used in this study were laid by Isa brown strain of chicken which were sourced from CHI farm and raised under similar management techniques. Isa brown is a hybrid brown egg layer being a cross between Rhode Island Whites and Rhode Island Red. Isa browns are hardy and they adapt themselves to all climates and environment. It has an egg production rate of approximately 300 eggs per hen in the first laying year (Bukunmi and Yusuf, 2015). The experiment was conducted at the

poultry house of Department of Animal Production Abubukar Tafawa Balewa University located in Gubi, Bauchi. A total of one hundred and eighty four (184) Isa Brown hens were used for the research which was conducted from July to October.

Determination of external egg quality

Egg Weight: The egg weight was measured with an electronic balance to the nearest 0.01 g. Each egg was placed on the sensitive flat surface of the electronic balance, and then the reading was taken

Egg Circumference: The egg circumference of each egg was obtained by placing a rope round the egg, and then stretching the rope on a rule to take the measurement.

Egg Diameter: The egg diameter was measured with the aid of pair of Vernier calliper (mm). The egg was placed horizontally between the outer dimension jaws of the Vernier calliper, which were moved together until they secured the egg. The screw clamp was tightened to ensure that the reading did not change while the scale was being read and recorded.

Egg shell Thickness: The eggshell thickness was measured after removing the internal content of the egg, using a micrometer screw gauge which has the precision of 0.01 mm. Measurement was taken at middle of the part of shell used.

Shell Weight/Proportion: To measure shell weight/proportion, the shell with membrane was placed on the electronic scale and the reading was obtained.

RESULTS AND DISCUSSION

Table: 1 Effects of Sodium Bicarbonate salt and Turmeric Powder on External Egg Quality

Variable (%)	N	Egg weight (g)	Egg circumference (cm)	Egg diameter (mm)	Shell thickness (mm)	Shell egg proportion (g)
Overall		63.76±0.19	14.30±0.12	4.53±0.06	0.46±0.4	8.46±0.10
Treatments		NS	NS	NS	NS	NS
Control	69	63.39±1.30	14.31±0.11	4.48±0.41	0.68±0.31	8.43±0.71
S30	99	65.24±1.30	14.25±0.11	4.54±0.39	0.36±0.30	8.29±0.68
S70	124	65.41±1.13	14.26±0.10	4.52±0.35	0.38±0,27	8.38±0.62
T30	115	66.01±1.24	14.28±0.11	4.54±0.39	0.36±0.29	8.07±0.67
T70	119	61.91±1.22	14.31±0.11	4.70±0.38	0.40±0.29	8.48±0.67
S30T30	108	62.67±1.23	14.38±0,11	4.40±0.39	0.40±0.29	8.48±0.67
S30T70	107	62.87±1.23	14.36±0.11	4.37±0.39	0.41±0.29	8.68±0.67
S70T30	116	65.00±1.23	14.24±0.11	4.55±0.39	0.43±0.29	9.00±0.67
S70T70	121	61.71±1.22	14.30±0.11	4.75±0.38	0.44±0.29	8.61±0.66
Months		***	***	***	NS	***
July	492	$64.59±0.24^{a}$	$14.38±0.02^{a}$	$4.48±0.08^{b}$	0.50±0.06	$7.96±0.13^{b}$
August	205	$63.12±0.38^{b}$	$14.28±0.03^{b}$	$4.42±0.12^{b}$	0.46±0.09	$8.48±0.21^{ab}$
September	194	$64.28±0.39^{a}$	$14.29±0.03^{b}$	$4.83±0.12^{a}$	0.45±0.09	$9.10±0.21^{a}$
October	152	$63.04±0.43^{b}$	$14.25±0.04^{b}$	$4.41±0.14^{b}$	0.41±0.10	$8.29±0.23^{b}$

***=P<0.001, NS=Not Significant. Means for groups with the same superscript (s) are statistically similar S30=0.30g, S70=0.70g $NaHCO_3$ salt, T30=0.30g, T70=0.70g Turmeric powder inclusions in the diet.

Table 1 shows the results for effects of Sodium Bicarbonate salt and Turmeric Powder on External Egg Quality. The results showed that increasing levels of sodium bicarbonate salt and turmeric powder had no significant effect on external egg quality. Egg weight (63.76± 0.19), egg circumference (14.30± 0.12) mm, egg diameter (4.53± 0.06) mm, shell thickness (0.46± 0.4)mm and shell egg proportion (8.46± 0.10)g. Grizzle *et al* (1992) reported that 1% of sodium bicarbonate salt supplementation did not alter external egg quality of Rhode Island Red. Egg weight, egg circumference, egg diameter and shell egg proportion were significant (P<0.001), among months (July to October). However, August and October (63.12±0.38 and 63.04±0.43), August-October (14.25±0.04-14.29±0.03), August and October (4.42±0.12 and 4.41±0.14) and July and October (8.29±0.23 and 7.96±0.13) for egg weigh, egg circumference, egg diameter and shell egg proportion are the parameters with the lowest value.

Table 2: Correlations among external egg quality parameters and body measurements

	1	2	3	4	5	6	7	8	9	10
HDP(1)										
F/E (2)	1.000**									
EW (3)	0.044	0.044								
EC (4)	0.052	0.052	0.853**							
ED (5)	-0.047	-0.047	0.079*	0.028						
ST (6)	0.012	0.012	-0.067*	-0.052	-0.006					
SEP (7)	0.000	-0.001	0.120**	0.090**	0.008	-0.011				
B W(8)	-0.211	-0.211	-0.123	0.003	-0.007	-0.106	-0.073			
F C R(9)	0.209	0.208	0.079	-0.047	-0.053	0.127	0.042	-0.976**		
S L (10)	0.347**	0.344**	-0.079	-0.030	-0.016	-0.081	-0.304*	-0.013	-0.033	
C L (11)	-0.025	-0.033	0.027	0.094	0.098	0.048	0.018	0.146	-0.168	0.169

HDP=Hen day production; FE=feed/Egg; EW=Egg weight; EC=Egg Circumference; ED = Egg Diameter; ST= Shell Thickness'; SEP=shell egg proportion; BW=body weight; FCR=feed conversion ratios; SL=shank length; CL=comb length

*Correlation significant at P<0.05 the level (2-tailed)

**Correlation significant at P<0.01 the level (2-tailed)

Table 2 shows the correlations among external egg quality parameters. There were positive and negative correlation between external egg qualities, shank and comb length by adding sodium bicarbonate salt and turmeric powder supplementation on the parameter. However, a strong positive correlation (r =1.000; P<0.001) was observed between %HDP and feed per egg. Similarly, very low negative correlation (r= -0.067 P<0.05) was observed between egg weight and shell thickness.

CONCLUSION

From the observations of this study it was concluded that increasing levels of sodium bicarbonate salt and turmeric powder had no significant effect on external egg quality of Isa brown hens, although external egg quality was significantly different among the months of the rainy season. It was also concluded that there exist a negative correlation between egg weight and shell thickness.

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