

EFFECTS OF SUPPLEMENTAL BIOTIN ON YOLK, ALBUMEN AND EXTERNAL QUALITY PARAMETERS OF NOILER HEN EGGS

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ABSTRACT

The study was carried out to evaluate the effects of supplemental biotin on yolk, albumen and external quality parameters of Noiler hen eggs. A total of one hundred and twenty Noiler hens were purchased from the bauchi state agricultural development project, they were housed in the poultry unit of Abubakar Tafawa Balewa University Teaching and Research Farm and were further designated into five treatments with each treatment having 24 hens. Five graded levels of supplemental biotin (0.00, 0.50, 1.00, 1.50, 2.00g) were administered to each treatment in drinking water. The results for yolk quality parameters indicate that there was significant difference ($p < 0.05$) among different levels of biotin tested, it was also deduced that treatment 4 with biotin level of 2.0g performed best, which was closely followed by treatment three with biotin level of 1.5g. The results also shows that albumen quality was significantly affected ($p < 0.05$) by treatment 4 (2.0g) which had the highest influence on the parameters. Results for effects of biotin on external egg quality parameters indicates that there was significant difference ($p < 0.05$) among the treatments with treatment 4 (2.0g) showing superior performance. From the results of this research it was concluded that biotin improved the performance of Noiler hens in all parameters studied. Therefore it is recommended that supplemental biotin should be administered at either 1.5g or 2.0g. Further research is also recommended so as to widen the use of biotin in poultry science.

Keywords: Biotin, Noiler, Albumen, Yolk.

INTRODUCTION

The chicken egg is naturally designed for reproduction, it is a veritable source of protein affordable to all classes of people. In addition to protein, the chicken egg also contains carbohydrate, vitamins and other nutrients. Among the economically important traits in egg production enterprise are egg size, shell thickness and internal qualities of egg as well as hatchability. The quality of chicken egg is influenced by age, breed and strain of the chicken, as well as nutrition. Thus, the internal and external egg quality traits are of major importance to the egg industry worldwide (Ahmadi and Rahimi, 2011). It has been reported that the quality of the chicken egg is influenced by genetic and non-genetic factors such as season, environment and feed intake (Ahmadi and Rahimi, 2011; Ojedapo, 2013; Burra, 2014). Egg quality traits had been reported to influence embryo development, hatchability, and growth performance of chicks (Khan et al., 2004; Onagbesan et al., 2007; Huwaida et al., 2015). The Noiler chicken breed is a hybrid developed in Nigeria which is rugged and can adapt to harsh conditions like local chickens, they have an excellent survival rate that matches that of local chicken they also grow faster and have better egg laying performance. Management practices, high stocking density and harsh climatic conditions result in poor egg quality such as thin egg shell, shell-less egg, low albumen and yolk quality which impacts negatively on the poultry industry. Biotin (vitamin H) which is also called vitamin B7 or B8 is a water soluble B-vitamin and an essential coenzyme that contributes an integral part of embryonic development. Its physiologically active form is linked to biotin-dependent enzymes (Chen *et al.*, 1994). Thus, it contributes to growth, bone development, reproduction, improving feed conversion in animals (McMahon, 2002) and improving the performance of breeder hens and chicks (Arends *et al.*, 1971; Watkins and Kratzer, 1987; Kruger and Brown, 1987 and Robel, 1989 & 1991). Birds do not have the capability to synthesize biotin, which is provided, under physiological conditions, by microbial synthesis of gut flora. Egg biotin is positively related to dietary biotin. Egg biotin content increases with incremental dietary biotin levels (Frigg *et al.*, 1984 and Robel, 1991). Hence the objective of the research was to determine the effects of biotin on yolk, albumen and external quality parameters of Noiler hen eggs.

MATERIALS AND METHODS

The study was conducted at Abubakar Tafawa Balewa University Teaching and Research Farm Bauchi, Bauchi state it is located in the north eastern part of Nigeria and has a tropical climate. One hundred and twenty Noiler hens were purchased from the Bauchi State Agricultural Development Project, they were designated to five treatments in a complete randomized design with each treatment having 24 hens. Biotin was administered orally in drinking water. The research work lasted a period of twelve weeks.

Treatment layout

Control (0.00)

Treatment 1 (0.5g)

Treatment 2 (1.0g)

Treatment 3 (1.5g)

Treatment 4 (2.0g)

Egg and shell weight

The eggs were collected within four hours of lay and weighted using a digital weighing scale and weights were recorded to the nearest 0.1mm.

Egg length and width

The egg length and width were measured with a vernier calliper to the nearest 0.1mm.

Egg shell thickness

The thickness of the shell with intact membrane were measured at three different points and the average of the broad, sharp and middle parts of the egg shell were obtained using micro screw gauge.

Albumen length, width and height

Albumen length, width and height were measured using vernier calliper to the nearest 0.1mm.

Yolk length, width and height

Yolk length, width and height were measured using vernier calliper to the nearest 0.1mm

Yolk colour

Yolk colour was measured using Roche Colour Chart.

Yolk and albumen weight

Yolk and albumen weight were measured using a digital weighing scale

Data analysis

Data obtained were analysed using General Linear Model Procedure of SAS (2015) and significant ($p < 0.05$) means differences among treatment means were compared using Duncan's Multiple Range Test (Duncan, 1995) of the SAS package.

RESULTS AND DISCUSSION

Table 1: Effects of Biotin on yolk quality parameters

Parameters	Yolk Length (mm)	Yolk Width (mm)	Yolk Height (mm)	Yolk Weight (g)	Yolk Colour
Treatments					
CC (0.0g)	3.98 ^b	3.98 ^{ab}	1.51 ^c	14.96 ^c	4.62 ^b
T1 (0.5g)	3.98 ^b	3.10 ^c	1.52 ^{bc}	15.02 ^c	4.71 ^a
T2 (1.0g)	4.04 ^b	4.02 ^a	1.54 ^b	15.56 ^b	4.74 ^a
T3 (1.5g)	4.06 ^a	4.05 ^a	1.55 ^b	15.78 ^b	4.47 ^c
T4 (2.0g)	4.05 ^a	4.05 ^a	1.71 ^a	16.47 ^a	4.76 ^a

Means within columns having different superscript are significantly different ($P < 0.05$)

The results for effects of biotin on yolk quality parameters are shown in table 1. The results shows that there exist significant difference ($p < 0.05$) among the treatments in all the parameters studied. It was also deduced that treatment 4 with biotin level of 2.0g performed best, which was closely followed by treatment three with biotin level of 1.5g.

Table 2: Effects of Biotin on albumen quality parameters

Parameters	Albumen Length (mm)	Albumen Width (mm)	Albumen Height (mm)	Albumen Weight (g)
Treatments				
Cc (0.0)	6.48 ^{bc}	4.42 ^d	0.60 ^c	22.44 ^d
T1 (0.5g)	6.38 ^c	4.72 ^c	0.60 ^c	23.84 ^c
T2 (1.0g)	6.59 ^b	4.75 ^c	0.66 ^b	24.76 ^{bc}
T3 (1.5g)	7.08 ^a	5.21 ^b	0.66 ^b	25.27 ^b
T4 (2.0g)	7.38 ^a	5.30 ^a	0.72 ^a	27.83 ^a

Means within columns having different superscript are significantly different (P<0.05)

The results for effects of biotin on albumen quality parameters are shown in table 2. The results shows that there was significant difference (p<0.05) among the treatments with treatment 1(0.5g) having the lowest influence on the parameters while treatment 4 (2.0g) having the highest influence on the parameters.

Table 3: Effects of biotin on external egg quality parameters

Parameters	Egg Weight (g)	Egg Length (mm)	Egg Width (mm)	Shell Weight (g)	Shell Thickness (mm)
Treatments					
CC (0.0)	50.24 ^d	5.27 ^d	4.07 ^c	5.73 ^b	0.37 ^b
T1 (0.5g)	51.40 ^{cd}	5.24 ^e	4.11 ^{bc}	5.84 ^b	0.38 ^{ab}
T2 (1.0g)	52.51 ^c	5.42 ^c	4.13 ^{ab}	5.79 ^b	0.38 ^{ab}
T3 (1.5g)	56.63 ^b	5.83 ^b	4.14 ^{ab}	5.89 ^b	0.38 ^{ab}
T4 (2.0g)	58.88 ^a	6.04 ^a	4.18 ^a	6.40 ^a	0.40 ^a

Means within column having different superscript are significantly different (P<0.05)

The results for effects of biotin on external egg quality parameters are shown in table 2. The results indicates that there was significant difference (p<0.05) among the treatments with treatment 4 (2.0g) showing superior performance.

CONCLUSION AND RECOMMENDATIONS

From the results of this research it was concluded that biotin improved the performance of Noiler hens in all parameters studied. Therefore it is recommended that supplemental biotin should be administered at either 1.5g or 2.0g, further research is also recommended so as to widen the use of biotin in poultry science.

REFERENCES

- Ahmadi, F., & Rahimi, F. (2011). Factors affecting quality and quantity of egg production in layers: a review. *World Applied Science Journal*, **12**(3), 372-384
- Arends, L. G.; E. W. Kienholz.; J. V. Shultze and D. D Taylor, (1971). Effect of supplemental biotin on reproductive performance of turkey breeder hens and its effect on the subsequent progeny's performance. *Poultry Science.*, **50**: 208-214.
- Burra, A. (2014). Egg size and shell quality: an overview. Amo Farm Hatchery Ltd Bulletin. www.afshltd.com/egg-size-andshell-quality-an-over-view. Retrieved on 7th April, 2017.
- Chen, F.; S. L. Noll and P. E. Waibel, (1994). Dietary biotin and turkey breeder performance. *Poultry Science.*, **73**: 682-686.
- Frigg M.; J. Broz and F. Streiff (1984). Studies on biotin deposition in hens' eggs. Proc XVII *World's Poultry Congress*, Aug 8-12, Helsinki, Finland.
- Huwaida, E. E. M., Ahmed, I. Y. S., Hind, A. A. E., Bakhiet, M. D., & Khalid, M. E. (2015). Effect of Egg Weight and egg Shell Thickness on Hatchability and Embryonic Mortality of Cobb Broiler Breeder Eggs. *Global Journal of Animal Scientific Research*, **3**(1), 186-190.
- Khan, M., Khatun, M., & Kibria, A. (2004). Study on the quality of eggs of different genotypes of chicken under scavenging system at Bangladesh. *Pakistan Journal of Biological Science*, **7**(12), 2163-2166.
- Kruger, W. F. and B. Brown, (1987). Effect of added biotin, vitamin E and bacitracin on hatch and early chick livability in broiler breeders. *Poultry Science.*, **66** (supplementary 1): 129 (Abstract.).
- McMahon, R. J., (2002). Biotin in metabolism and molecular biology. *Annual Review of Nutrition.*, **22**: 221-239.
- Ojedapo, L. O. (2013). Effect of age and season on egg quality traits of Isa Brown layer strain reared in derived Savannah zone of Nigeria. *Transnational Journal of Science & Technology*, **3**(7), 48-60.
- Robel, E. J., (1989). Increasing hatchability with biotin Int. *Hatchery Practice* **4**: 47-51.
- Robel, E. J., (1991). The value of supplemental biotin for increasing hatchability of turkey eggs. *Poultry Science.*, **70**: 1716-1722.
- Watkins, B. A. and H. F. Kratzer, (1987). Effects of dietary biotin and linoleate on polyunsaturated fatty acids in tissue phospholipids. *Poultry Science.*, **66**: 2024-2031.