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SHORT COMMUNICATION

Fertility and hatchability as affected by modifier genes in the Nigerian local chickens of the Guinea Savanna

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ABSTRACT

Eggs collected from 90 female Nigerian local chicken comprising of 30 of each of fully feathered, frizzle feathered and naked neck genotypes were artificially incubated in a cabinet-type electric incubator. Fertility was determined 7 days post incubation by candling while hatchability was calculated at the end of the 21 days incubation period. Fertility and hatchability varied significantly between the genetic groups. Percentage fertility and hatchability were respectively 69.46 and 75.0; 58.59 and 71.43 and 90.43 and 85.88 in the fully feathered, frizzle feathered and naked neck birds. The naked neck gene favoured increased fertility and hatchability in the indigenous chickens in the study environment. Thus, purposeful selection for the naked neck gene will increase the productivity of the local chickens of the guinea savanna region of Nigeria thereby further alleviating the already existing animal protein dearth especially among the rural poor in this agro ecological zone. Furthermore, the introgression of the naked neck gene into the fully feathered and frizzle feathered birds is recommended for investigation by poultry breeders

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Keywords: Fertility, Hatchability, Major genes, Indigenous chickens

INTRODUCTION

Fertility and hatchability are two important traits that enhances the efficiency and productivity of any poultry enterprise. While fertility determines the proportion of eggs set which are likely to hatch, hatchability provides the actual number of day old chicks available to the enterprise. Fertility and hatchability has been reported to be affected by the modifier genes of frizzling, and naked neck (Somes, 1990). In general, the frizzling gene has been shown to favourably increase egg number and egg mass alongside reducing mortality under hot conditions (Merat, 1990). The relevance of the naked neck gene in the tropics has been reviewed by several workers (Hanzi and Somes, 1993; Cahaner et al 1994 and Eberhart et al 1993). These reports demonstrate the advantage of the naked neck broilers over their normal feathered counterparts when reared at constant high ambient temperatures (AT). Yalcin et al. (1997) reported that the naked neck gene reduces feather mass by 20 and 40 per cent in the heterozygous and homozygous genotypes respectively. This reduction in plumage cover in the naked neck birds is believed to facilitate better heat dissipation and improve thermoregulation under high AT. Consequently, the naked neck birds have been variously reported (Horst, 1988 and Ibe, 1993) to have better productivity in terms of body weight gain, egg number and egg size over the fully feathered and frizzled birds under same stressing conditions usually imposed by high AT in the tropics. However, an increase in egg number and egg size without a corresponding increase in fertility and hatchability is of little profit to a breeding enterprise.

The current study was therefore undertaken to evaluate the effect of the major genes of frizzling and naked neck on fertility and hatchability of indigenous chickens of Nigeria in the guinea savanna which occur in pockets of small populations in rural communities in this region. These are of utmost importance to the rural farmer in choice of type and in designing poultry breeding programs involving indigenous chickens in this agro ecology.

MATERIALS AND METHODS

The experimental birds were made up of 30 each of fully feathered, frizzle feathered and naked neck genetic groups sourced within Makurdi and

its environs. Makurdi is located in the guinea savanna ecological zone of Nigeria. The co-ordinates, rainfall pattern, humidity and temperature variations in Makurdi have already been described by Dzungwe, (199). Breeding females of each genetic group were randomly distributed into experimental pens with a mating ratio of 1 cock to 10 hens respectively (Table 1). Eggs were collected daily, identified along sire lines and according to their genetic groups. Collected eggs were checked for defects. All cracked eggs were selected against. Eggs meant for setting were held in egg racks for a maximum of 7 days post oviposition before setting. Fertility was determined 7 days post incubation by candling. Fertility and hatchability were calculated for each genetic group as described by Msoffe et al. (2004).

% Fertility = (Te – Ie/Te) ×100

Where; Te is the total number of eggs incubated

Ie is the total number of infertile eggs.

Similarly, percentage hatchability was calculated as follows:

$$\% \text{ Hatchability} = (H_e/V_e) \times 100$$

Where; H_e is the total number of hatched eggs

V_e is the total number of fertile eggs determined by candling.

Data on traits studied were analysed using simple proportion as outlined in SPSS (2004).

Table 1: Mating arrangement for generating straight bred chicks

Breeding group	No.of males	No.of females	No.of pens (replicates)	Mating ratio	Genetic group
na x na	1	10	3	1:10	Normal feathered
ff x ff	1	10	3	1:10	Frizzled feathered
Na x Na	1	10	3	1:10	Naked necked

RESULTS AND DISCUSSION

Table 2 presents the variation between the genetic groups of the indigenous chickens studied for fertility and hatchability. Increasing trend of fertility was observed from frizzle feathered, normal feathered to naked neck birds. The observed percentage of 69.46 and 58.59 respectively for normal feathered (nana) and frizzle feathered (ff) in the current study are subnormal to the 92.3 and 80.5 per cent for same genotypes reported by Ajayi et al (2008) in the high rainforest zone of Nigeria. However, the percentage fertility of 90.48 per cent observed in the naked neck genetic group is higher than the value of 78.4 per cent reported for same genotype by Ajayi et al (2008). Environmental influence may have resulted in these variations. The trend observed in fertility in the current study may be connected to the varying degrees of heat tolerance/susceptibility by the different genetic groups under the prevailing considerations. The normal feathered birds due to the plumage density are less tolerant to high AT characteristic of the study environment. The stress imposed by high AT could lead to lowered frequency of mating and lowered viability of the sperm cells in the normal feathered than in the other genetic groups. Consequently, the result of this study reveal that the naked neck genotype is more tolerant under same stressing environmental conditions than the normal feathered and the frizzle feathered birds.

Table 2: Fertility and hatchability in the genetic groups of the Nigerian Local Chicken

Genetic group	No. of eggs set	No. of fertile eggs	No. of eggs hatched	% Fertility	% Hatchability
na x na	167	116	87	69.46	75.00
ff x ff	128	105	75	58.59	71.43
Na x Na	94	85	73	90.43	85.88
	389	306	235	78.66	76.80

The higher fertility of the normal feathered genotype over the frizzle feathered birds observed in this study environment is at variance with various contemporary literature (Peters et al. 2005). Further investigation is therefore required to render plausible explanation to the current trend. Percent hatchability recorded were 75.00, 71.43 and 85. 88 in the normal feathered, frizzle feathered and naked neck genotypes respectively. The observed trend for hatchability in this study may be a direct reflection of the fertility levels earlier observed in the genetic groups.

CONCLUSION AND RECOMMENDATION

Fertility and hatchability in the genetic groups of indigenous chickens in Nigeria studied were generally high. However, the naked neck birds had a relative superiority over the fully feathered and frizzle feathered birds for the traits considered. Purposeful selection for the naked neck gene will therefore increase the productivity of the indigenous chickens of the guinea savanna region of Nigeria thereby bridging the already existing protein gap in rural communities in this agro ecology. Furthermore, the introgression of the naked neck gene into the fully feathered and frizzle feathered birds is recommended for investigation by poultry breeders.

CONFLICT OF INTEREST

This study has no conflict of interest.

REFERENCES

Ajayi, F.O; B.O. Agaviezor and S. Torukuru 2008. Fertility and hatchability of indigenous chicken as influenced by major genes in the high rainforest zone of nigerian. Proc. 13th Annual Conf. ASAN Sept. 15-19, ABU Zaria. pp.81-83.

Cahaner, A., R. Yunis, and N. Deeb 1994. Genetics of feathering and heat tolerance in broilers. Pages 67–70 *in*: Proceedings of the 9th European Poultry Conference. Vol. 2. Glasgow, UK.

Dzungwe, T.A. (1991). The search for a viable Benue State. Benue State Gazette. pp.13

Eberhart, D. E., and K. W. Washburn, 1993. Variation in body temperature response of naked neck and normally feathered chickens to heat stress. Poultry Sci. 72. Pp.1385–1390.

Hanzl, C. J., and R. G. Somes, Jr., 1993. The effect of the naked neck gene, *Na*, on growth and carcass composition of broilers raised in two temperatures. Poultry Sci. 62. Pp.934–941.

Horst P, 1988. Indigenous fowl as reservoir for genomes and major genes with direct and indirect effects on productive adaptability and their potentials for tropically orientated breeding plans. *Proceedings of the 18th World's Poultry Congress*, (Nagoya), pp.99-104.

Ibe, S. N. 1993. Growth performance of normal, frizzle and naked neck chickens in a tropical environment. Nigerian Journal of Animal Production. 20. Pp.25 - 31.

Merat, P. 1990. Pleitropic and associated effects of major genes. In: Poultry Breeding and genetics, R.D Crawford, Ed. Elsevier Science publishers, the Netherlands. Pp.429-468

Msoffe, P L M, M M A Mtambo, U M Minga, J E Olsen, H R Juul-Madsen, P S Gwakisa , S K Mutayoba and A M Katule 2004. Productivity and reproductive performance of the free-range local domestic fowl ecotypes in TanzaniaLivestock Research for Rural Development 16 (9) 2004

Peters, S.O., C. O.N. Ikeobi, M.O, Ozoje and O.A. Adebambo (2005). Modeling growth in seven chicken genotypes. Nig. J. Anim. Prod. 23. pp.28-38

Somes RG, (1990). Mutations and major variants of muscle and skeleton in chickens (Chapter 76) In: Poultry Breeding and Genetics (Crawford RD, ed.). Elsevier, New York - Tokyo, 1723pp.

SPSS. 2004. Statistical Package for the Social Sciences. SPSS Inc., 444 Michigan Avenue, Chicago.

Yalcin S., Testik A., Ozkan, S., Settar P., Celen F. and Cahaner A., 1997. Performance of naked neck and normal broilers in hot, warm, and temperate climates. Poultry-sci.Savoy, IL: Poultry Science Association, Inc. Jul 1997. v. 76 (7) pp. 930-937