

Frequencies of Feet Feathering and Comb Type Genes in the Nigerian Local Chicken

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ABSTRAK

Kejadian pembuluan kaki, jenis balung yang berbeza dan frekuensi relatif baka yang mempengaruhi keadaan ini telah diuji pada 2,030 ayam tempatan. Kajian mendapati 14.78% ayam tempatan mempunyai kaki berbulu, manakala 85.22% tidak berbulu. Semasa kajian terhadap ayam dijalankan, jenis berbalung satu merupakan ayam jenis berbalung yang paling kerap diperhatikan. Didapati 94.73% ayam mempunyai balung satu manakala 3.20% dan 2.07% masing-masing mempunyai balung rose dan pea. Frekuensi baka bagi fsh alle yang dianggarkan mempengaruhi pembuluan kaki dalam pembiakbakaan ialah 0.08, sementara allele kemerosotan, fsh dianggarkan berfrekuensi 0.92. Allele P bagi balung pea dan allele R bagi balung rose masing-masing mempunyai frekuensi 0.02 dan 0.01, manakala bentuk kemerosotan, allele r dan p bagi balung satu masing-masing mempunyai frekuensi 0.99 dan 0.98. Anggaran frekuensi ini didapati akan menjadi bentuk yang berbeza daripada kadar yang dijangka berasaskan mod Mendelian warisan ciri-ciri ini.

ABSTRACT

Incidence of feet feathering condition, different comb types and the relative frequencies of the genes affecting these conditions were studied in 2030 local chickens. 14.78% of the local chicken surveyed had feathered feet, while 85.22% had non-feathered feet. The single comb type was the commonest of the comb type observed in the chickens surveyed. 94.73% of the chickens had single comb, while 3.20% and 2.07% had rose and pea combs respectively. The estimated gene frequency for fsh allele affecting feet feathering in the breed was 0.08, while its recessive allele, fsh an estimated frequency of 0.92. The P allele for pea comb and the R allele for rose comb had a frequency of 0.02 and 0.01 respectively, while the recessive forms, r and p alleles for single comb had frequencies of 0.99 and 0.98 respectively. These estimated frequencies were found to be significantly different from the expected ratio based on simple Mendelian mode of inheritance of these traits.

INTRODUCTION

Recent efforts to characterize the Nigerian local chicken and improve its productivity have involved mainly its health and nutritional status, its socio-economic potentials, and the optimum management approaches for increased productivity. Few reports have dealt with the occurrence of major genes influencing frizzling, naked neck, and dwarf condition in the breed (Ebozoje and Ikeobi 1995; Ikeobi *et al.* 1996) and of modifier genes influencing feet feathering and comb type in the breed (Ikeobi *et al.* 1997). These genes have been reported to be important in the adaptation and productivity of the breed in its native, hot humid environment, influencing

either the meat characters or its egg-laying performance. Hutt (1949) described feet feathering as a condition in which the hock, the tarso-metatarsus, and the outer toe of the chicken are feathered. It is, therefore, important that efforts to characterize and improve the Nigerian local chicken should entail the understanding of the roles of genes influencing the peculiar characteristics of the breed, their relative frequencies, and their possible utilization. Important in this regard are the genes controlling feet feathering and those influencing comb types in the breed. The present investigation was therefore carried out to determine the frequencies of these modifier genes in the

scavenging local chicken in South-Western Nigeria.

METHODOLOGY

The study was carried out in 1994 and 1995 and it involved 2030 local chickens reared under the predominant scavenging system of management in South-Western Nigeria. The study extended to eight states which were Lagos, Ogun, Oyo, Oshun, Ondo, Edo, Delta and Kwara. These areas are commonly characterized by high humidity, usually high bi-modal annual rainfall, and high temperature resulting from high solar radiation (Ebozoje 1992; Ikeobi 1994). Under the scavenging system of management, the chickens are exposed to extremes of weather conditions as they move about, feeding on crop residues, kitchen wastes, insects and leafy pastures. They, however, return to the homesteads at dusk where minimum shelters are sometimes provided.

Nine hundred and nine local cocks and one thousand one hundred and twenty one local hens were surveyed and classified on the basis of feet feathering as feathered and smooth, and on the basis of comb type as single, pea and rose. All these comb types were found in all the areas/states studied in trickles except the walnut. These birds are generally believed to be of European origin and they are dual-purpose breed. They are believed to have been imported by the first Portuguese settlers in Africa.

Estimation of the frequency of the feet feathering gene, *Fsh*, was based on the assumption that the feet feathering allele, *fsh* is dominant to the allele for smooth feet, *fsh*, as reported by Hutt (1949) and Shoffner *et al.* (1993). For the comb types, it was gene frequencies were estimated with the assumption

that the two genes at the 2 loci, R-r and P-p segregate in Mendelian fashion. While R allele marks the presence of rose comb, P allele produces the pea comb type. The recessive forms of the two genes, *rpp* mark the single comb. Gene frequencies were estimated by the Hardy-Weinberg procedure (Falconer 1989). The goodness - of - fit of the calculated values was tested against the expected Mendelian ratios using a simple chi-square test (Little and Hills 1978).

RESULT AND DISCUSSION

Feet Feathering

The percent incidence of the various conditions and the relative frequencies of the different genes influencing feet feathering and comb types are shown in Table 1. 14.78% of the local chickens surveyed had feathered feet while 85.22% had non feathered feet. Arising from that, the frequency of the *Fsh* gene influencing feet feathering was estimated from Hardy-Weinberg procedure to be 0.08, while the recessive allele, *fsh* had an estimated frequency of 0.92.

These values differed significantly from expected values (0.5 respectively). This was probably due to the combined inhibiting effects of social preferences, natural selection and adaptation. The local chicken with feathered feet are usually not as attractive as those with non-feathered feet as feathers appear on the hocks, the tarso-metatarsus, and on the outer toes. Hutt (1949) reported other conditions that would render the chicken with feathered feet very unattractive. These include the web of skin holding the middle and outer toes together and an unusual variation in the outer toe. It is, therefore likely that the scale of social preference

TABLE 1
Frequencies of the feet feathering and comb type in the local chicken

Trait	n	% Incidence	Gene Frequency	Phenotype Frequency
Feet Feathering				
Feathered feet	300	14.78	<i>Fsh</i> = 0.08	0.15
Smooth feet	1730	85.22	<i>fsh</i> = 0.92	0.85
Comb Type:				
Single	1923	94.73	$r = 0.99, p = 0.98$	0.95
Rose	65	3.20	$R = 0.01,$	0.03
Pea	42	2.07	$P = 0.02$	0.02
Walnut	0	0.00		0.00

n: Number of observations.

weight heavily against local chickens with feathered feet as people would shy away from maintaining them in their flocks. Furthermore, the hot humid conditions prevailing in South-Western Nigeria almost all the year round would entail a high heat load on the scavenging birds exposed to extremes of weather of weather conditions. In such situations, additional feathering on such normally smooth body parts as the hock, the tarso-metatarsus, and the outer toe would undermine efforts by the birds to dissipate excess body heat, thereby adversely affecting adaptation, survival and general performance of the birds. Ikeobi (1984) reported that sparse feathering was important for laying birds in Ibadan located in the same climatic zone as it enhanced production of significantly heavier eggs with thicker shells relative to fully-feathered birds. However, recent paper (Ikeobi *et al.* 1997) showed that while local birds with smooth feet had significantly higher egg production and hatching ability, those with feathered feet had better meat characters, including that the various genes could be utilized for various purposes in the Nigerian local chicken.

Comb Types

Of the 2030 birds surveyed in this study, 94.73% had single combs, 3.20% had rose combs, 2.07% had pea combs, while 0.00% had walnut combs. The single comb therefore is the commonest of the comb types in the Nigerian local chicken. Oluyemi and Roberts (1979) reported similar observations. The absence of the walnut comb type though very strange, could easily be accounted for by the societal preference attached to birds with so called strange comb for ritual purposes. In fact, most of the birds with peas and rose comb encountered in this study were found with traditional worshippers.

The frequency of the *R* allele for rose comb was calculated in this study to be 0.01 (Table 1). The recessive forms, *r* and *p* had frequency of 0.99 and 0.98 respectively. These estimates were found to be significantly different from the expected ratio under the Mendelian mode of inheriting these characters. The probable reason for this deviation may be adaptation and natural selection and social preference for these birds in the hot humid environment.

Combs are important avenues for heat loss in birds (Van Kampen 1974) and it is expected

that this expected thermo-regulatory role would be keyed up in warm wet climates as is the case in South-Western Nigeria. Larger sizes of combs would therefore be important in ensuring the survival and production of the breed in such climates. The size of the comb has also been shown to affect the frequency of agonistic behaviors in birds (Dawson and Siegel 1962) in addition to determine the results of such encounters (Collias 1943). In the present study, the single comb which is the largest comb type was the most predominant in spite of the recessive genes controlling it. In which case, local birds with single combs would be favored in such agonistic encounters in the flighty and highly temperamental local chicken. Ikeobi (1984) found that birds with large combs had significantly heavier body and egg sizes which would be important under conditions of natural selection and adaptation.

CONCLUSION

The percentage incidence of the feet feathering conditions and the different comb types and the relative frequencies of the genes affecting these conditions were estimated in 2030 local chickens. The frequency of the *Fsh* gene affecting feet feathering in the breed was estimated to be 0.08 while its recessive allele, *fsh* had an estimated frequency 0.92. The *p* allele for pea comb and the *R* allele for rose comb had a frequency of 0.02 and 0.01, while the *r* and *p* alleles for single comb had a frequency of 0.99 and 0.98 respectively. These frequencies highlight the important roles played by social preference, natural selection and adaptation in the survival and evolution of the breed and also indicate the possible ways the genes can be utilized in efforts to improve the Nigerian local chicken.

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