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Taxonomic Relationship of Hybrid Peafowl-Guineafowl: Preliminary Study of Serum Proteins

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ABSTRACT

Disc electrophoresis of serum proteins was conducted for the peafowl, guineafowl, peafowl-guineafowl hybrid, and domesticated chicken. The four birds analyzed are of the same order but family status has been questioned.

Serum protein patterns for all birds were similar in the anodic regions but different in the cathodic regions. The peafowl-guineafowl hybrid showed a pattern more similar to that of the peafowl than to that of the guineafowl. In morphologic characters the hybrid also was more similar to the peafowl than to the guineafowl. In the cathodic region the serum protein pattern of the guineafowl was more unlike the patterns of the other three birds.

INTRODUCTION

The consequence of one or more isolating mechanisms is that birds of different species or genera either do not mate or mate rarely (Dobzhansky, 1951). Ecologic and zoogeographic isolation has kept the peafowl (*Pavo cristatus*) and common guineafowl (*Numida meleagris*) apart in the wild as the guineafowl is native to the Ethiopian zoogeographical realm and the peafowl to the Oriental realm. However, under domestication these two species have been brought together by man. Both the common guineafowl and the peafowl belong to the order Galliformes, but usually they are classified as members of different families. The peafowl has been placed with the domesticated chicken (*Gallus gallus*) in the family Phasianidae, whereas the guineafowl is placed in the family Numididae (Storer, 1971; Wetmore, 1960). Mainardi (1959) in his paper on immunologic distances among gallinaceous birds recommended grouping of all species of the families Numididae, Meleagrididae, Tetraonidae, and Phasianidae into one family, namely Phasianidae. Mainardi's paper is in agreement with Yamashina's (1952) cytologic studies and Sibley's (1960) electrophoretic analysis of egg-white proteins. Storer's (1971) classification includes the grouse, quail, pheasant, turkey, peafowl, and chicken in the family Phasianidae but retains the family Numididae for the guineafowl. Wetmore (1960) has retained four families in the superfamily Phasianioidea — Tetraonidae, Phasianidae, Numididae, and Meleagrididae.

The objective of this study was to compare the blood serum proteins of a cross between a peacock and female guineafowl with the blood serum proteins of a guineafowl, peafowl, and domesticated chicken. These comparisons might indicate some basis for reclassifying these birds.

METHODS AND MATERIALS

About 4 cc of whole blood was drawn by hypodermic needle from the wing vein of each of the four birds: peacock, guinea, peafowl-guineafowl cross, and domesticated chicken. The blood was allowed to clot and was centrifuged for 5 min. The serum was removed by a transfer pipette and frozen. Two different samples were taken from each bird and four replicate electrophoretic separations for each sample were investigated.

Disc electrophoresis procedures followed those of Davis (1964). The analyses were performed with an eight-column electrophoresis apparatus utilizing graphite electrodes and two circular reservoirs (5 cm deep and 15 cm in diameter)



Figure 1. Peafowl-guineafowl hybrid.

constructed from 15-cm acrylic tubing. Acrylamide gels (0.8 cm wide by 5.5 cm long) and TRIS buffer at pH 8.3 were used. Separation of serum proteins was conducted at 25 C and 25 mA for 40 min. After separation had occurred, the gels were stained for 20 hr with amido Schwartz stain. Destaining was done by a current of 40 mA until the excess stain was removed (about 1 hr). Gels were stored in a solution of glacial acetic acid and water. The best electrophoretic patterns were obtained by using a serum sample of 5 μ l.

Blood samples were taken from only one of each of the birds and the hybrid cross for comparisons. A study by Snow et al. (1969) with three breeds of domesticated pigeons showed some individual differences among members of a particular breed. It was the writers' purpose to compare samples of serum proteins with those of the peafowl-guineafowl cross.

The hybrid peafowl-guineafowl cross (Fig. 1) was hatched from a guineafowl egg under natural conditions. This specimen was reported (Hanebrink, 1973) and behavioral and morphologic characters were described.

RESULTS AND DISCUSSION

Electrophoresis of proteins has not provided extensive information for avian systematics particularly at the generic and species levels because of much variability as to sex, age, health, or condition of the specimens (Baker and Hanson,

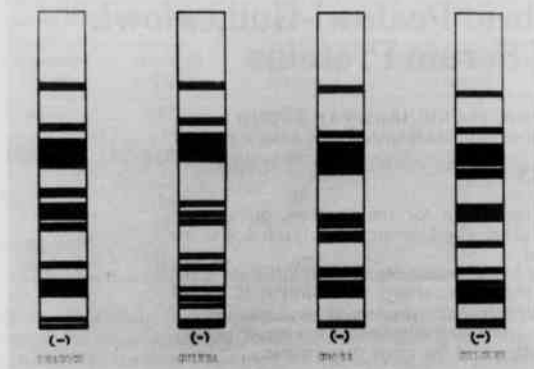


Figure 2. Electrophoregrams of the serum proteins of three species of gallinaceous birds and a hybrid.

1966; Perkins, 1964; Rylander, 1967; Sibley and Johnsgard, 1959; Snow et al., 1969). In retrospect, however, one can see that Sibley (1957, 1960, 1968), Sibley et al. (1969), Corbin (1967), Hendrickson (1969), and others have added much to knowledge in systematics by the use of starch-gel and acrylamide electrophoresis in studying bird relationships. Biochemical and immunologic techniques have become well established systematic tools used by many investigators in avian systematics (Selander, 1971).

The study results are shown best by the electrophoretic patterns in Figure 2. The peacock has a definite double starting band whereas the guineafowl and hybrid cross have narrow separations barely visible at this point. The domesticated chicken has a single starting band. The greatest difference in the serum protein bands of the four birds is in the region from 4 to 27 mm measured from the cathode end. The four birds have basically the same bands in the region from 27 mm to the bottom of the gel. A close analysis of electrophoretic patterns as shown in Figure 2 reveals more similarities in pattern for the peafowl, hybrid cross, and domesticated chicken than for the guineafowl which is generally placed in a different family. The pattern of serum protein bands of the hybrid is more like that of the peafowl than that of the guineafowl. Morphologic characters are intermediate for the hybrid but general appearance (Fig. 1) is more nearly like that of the hen peafowl (Hanebrink, 1972).

The ease with which some crosses naturally occur among the Phasianioidea at the family level suggests a regrouping of the four families into one, namely Phasianidae. However, serum protein patterns as shown are different and this lends support to Storer's (1971) recent classification in the retention of two distinct families in this superfamily. Additional research is needed to clarify this point.

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