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Inheritance of erythrocytic glutathione concentration in guinea fowl

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The endogenous antioxidant Glutathione (GSH) has a crucial importance in detoxification and cell protection. Present study in guinea fowl was undertaken to determine the genetic and non- genetic variations of erythrocytic glutathione levels. A total of 292 guinea fowl growers (8 wk) belonging to 19 halfsib families of Pearl, Lavender and White varieties maintained at this institute were used. Erythrocytic glutathione was estimated in freshly collected blood samples according to the method of Prins and Loos (1969). Precorrected data for hatch effect were analysed with a model containing sex, feathering phenotypes and variety as fixed effects and sire as random effect.

Erythrocytic glutathione levels among guinea fowl growers (8 wk age) was significantly influenced by all effects included in the model. Highest levels were observed at hatch in males (43.1±0.6) and females (40.0±0.6 mg/100 ml RBC) which gradually declined thereafter (Fig. 1). The mean red cell glutathione level (34.3±0.7 mg/100 ml red cell) observed in guinea fowl adults was quite comparable to that reported for Bantams and Bantam x White Rock crossbreds (Kolataj and Majewska, 1972) although relatively higher values were reported for purebred Plymouth Rock and White Rock birds (41.17 mg/100 ml RBC). The

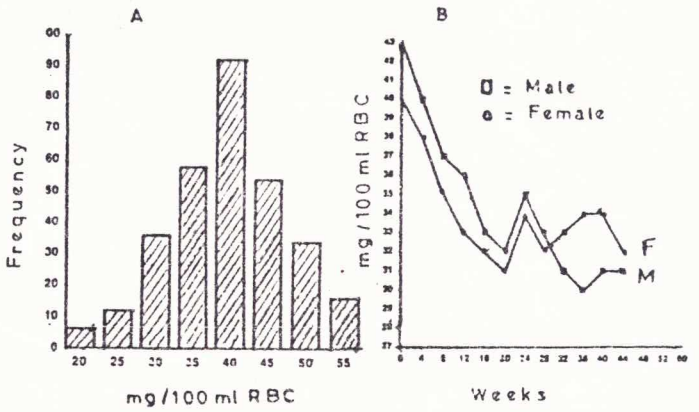

Fig. 1 : Guinea fowl red cell glutathione level :
A — Population distribution
B — Age trend

presently observed significant differences in glutathione concentration between sexes, varieties and feathering type of individual birds (Table 1) was also consistant with similar effects reported for chickens discrete polymorphism reported for chicken by Shablina and Icov (1967). The moderate heritability estimate (h^2 0.52±0.20) obtained for red cell glutathione level and segregation pattern observed among the limited

Table 1. Least square means for erythrocytic glutathione level (GSH) (mg/100 ml RBCs) in 8 wk growers of different genetic groups

Plumage type	N	GSH level	Feathering type	N	GSH level
White	94	33.8±1.2[a]	Slow feathering	122	34.7±0.9[a]
Lavender	46	34.4±1.7[a]	Rapid feathering	170	36.6±0.9[b]
Pearl	152	38.8±1.1[b]	Overall	292	35.7±0.8

Valueswith differentsuperscripts differ significantly.

Table 2. Distribution of GSH level among progeny obtained from the matings between parents with known GSH level (High 45.0, Medium 43.0-35.0, Low 35.0 mg/100 ml RBCs)

Parental phenotype		No. of	Phenotype (GSH level) of progeny (%)			Overall
Sire	Dam	Progeny	High	Medium	Low	mean
High (2)	x High	11	63.6	27.2	9.20	47.5
High (2)	x Low	12	—	83.4	16.6	38.0
Low (4)	x Low	15	—	26.7	73.3	26.7

and other poultry, avian species (Brown and Sharp, 1970; Kolataj and Majewska, 1972; Jain *et al.*, 1977; Stasko *et al.*, 1971; Enkvestchakul *et al.*, 1995). The relatively lower glutathione levels presently observed for guinea fowl growers might be related with slow growth rate and heavier feather cover as suggested by Enkvestchakul et al. (1995) for fowl.

The distribution pattern (Fig. 1) of glutathione concentration in the tested population indicated only a week expression of polymorphism for this trait in guinea fowl as compared to the progeny from the planned matings between parents (Table 2) with known phenotypes indicated existence of considerable genetic influences. Present observation of 63.3% high type and 73.4% low type progeny from high x high and low x low type matings respectively indicate involvement of dominant gene(s) besides the usual additive gene action in its determination. Genetic (r_g) and phenotypic correlations (r_p) between glutathione level and body weights at different ages were positive at hatch (r_p = 0.88, r_g = 0.03±0.03) at 4 wk (r_p = 0.34, r_g = 0.55±0.30) and at 12 wks

(r_p = 0.02; r_g = 0.06±0.40). These results were consistent with observations reported by Enkvestchakul and Bottje (1995) in chicken.

Guinea fowl is an important poultry alternative for production in semi extensive rearing system. Keeping in view the metabolic importance of glutathione as cystine reservoir for muscle growth and its antioxidant functions, it is desirable to undertake further research on the factors which influence glutathione levels in this species.

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