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Pleiotropic influence of plumage genes on performance traits in guinea fowl

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ABSTRACT

Influences of feather development rate and plumage colour genes on performance traits were investigated in 'Guncari' guinea fowl stock. Keets with rapid feathering genotypes were significantly heavier than the slow feathering ones. White and Lavender plumage birds were significantly heavier than the Pearl individuals at 8 and 12 wk of age. Significant differences were also observed for rate of lay, egg weight, and shell thickness.

Contains 2 tables.

Key words : Guinea fowl, plumage gene, feathering gane

The present study was considered to see the pleiotropic influences of the autosomal plumage colour genes and sex linked feathering alleles (Singh and Singh 1988, Pal and Singh 1997) on growth and biochemical traits in purebred Pearl, Lavender and White 'Guncari' guineafowl stocks of this institute. The plumage colour and feather development rate phenotypes were identified immediately at hatching. The feathering types were subsequent reconfirmed on 4th and 10th day respectively; While plumage colour was verified again at 10 weeks of age for absence of splashing gene(s). Information for economic traits was routinely collected; estimates for biochemical traits were made using standard methods (King and Wootton 1956).

The data were analysed using least squares technique with model containing sex, feathering phenotypes and variety as fixed effects and sire as random effect. The least squares means were compared by Duncan's multiple range test.

Present observations suggest existence of significant influences of these genes on growth rate as well as some other complex physiological tratis (Table 1, 2). Individual with rapid feathering genotypes (k^+k^+, k^+ -) were significantly heavier than the birds with slow feathering genotypes (KK; Kk^+). Predominatly high incidence of k^+ allele in all the three plumage varieties under selection for body weight at 12 wk age was identified. Existence of significant difference in k^+ gene frequency of selected (0.893) and unselected (0.491) stocks suggest correlated effects of selection for growth. Many studies in diversified chicken have also reported significantly heavier and more unifrom body weights for rapid feathering birds (Kumar and Acharya 1977). Guinea fowl results are also similar to the associations reported for egg related traits and feathering genotypes in both

Table 1. Least squares means for growth and performance traits for different effects

Plumage trait	Body weight (gm)			Age at 1st egg (days)	Egg weight (gm)	shell thickness (mm)
	0-day	4 wk	12 wk			
Feathering phenotypes :						
Slow	23.7±02 (332)	164.6±3.0^{a} (332)	803.6±7.8^{a} (332)	254.6±2.7 (74)	38.4±0.1 (74)	0.48±0.07 (74)
Rapid	23.9±0.2 (557)	175.5±2.2^{b} (557)	827.9±6.9^{b} (557)	253.3±2.7 (116)	37.9±0.4 (116)	0.46±0.06 (116)
Plumage colouration :						
White	24.4±0.3^{a} (241)	173.2±3.4 (241)	828.1±10.8^{a} (241)	251.5±4.4^{a} (40)	39.1±0.6 (26)	0.49±0.09 (124)
Lavender	23.6±0.3^{b} (253)	167.9±3.2 (253)	815.7±10.3^{b} (253)	250.0±4.9^{a} (40)	38.3±0.6 (26)	0.46±0.11 (124)
Pearl	23.8±0.2^{b} (395)	169.0±3.0 (395)	803.5±9.5^{b} (395)	260.6±2.63^{b} (40)	37.2±0.3 (26)	0.46±0.05 (124)

Numbers in parenthesis are numbers of observations.
Values with same superscript do not differ significantly ($P<0.05$)

Table 2. Least squares means for some biochemical traits

Plumage trait	Akp level 10 weeks (IU)	Akp level 26 weeks (IU)	Lysozyme 8 weeks (μgm/ml)	Egg white lysozyme (mg/ml)	Amylase 8 week (units)*	Glutathione 8 weeks (mg/ 100 ml RBC)	Postassium 12 weeks (meq/1 blood)
Feathering type :							
Slow	788.3±22.8 (144)	178.9±8.2[a] (158)	1.1±0.1 (121)	1.8±0.1 (74)	154.9±1.7 (84)	34.7±0.9[a] (122)	86.6±1.8 (138)
Fast	800.2±19.7 (235)	203.9±8.2[b] (170)	1.3±0.1 (149)	1.8±0.1 (116)	153.1±1.2 (189)	36.6±0.9[b] (170)	87.2±1.8 (136)
Plumage colour :							
White	803.3±16.4 (89)	232.9±11.6[a] (102)	1.1±0.1[a] (68)	1.8±0.1 (40)	152.9±1.7 (84)	33.8±1.2[a] (94)	87.0±2.2 (94)
Lavender	793.4±26.8 (112)	194.9±14.3[b] (54)	1.3±0.1[b] (88)	1.8±0.1 (36)	153.3±1.7 (76)	34.4±1.7[a] (46)	88.3±2.6 (78)
Pearl	785.9±22.7 (178)	146.5±10.2[c] (172)	1.2±0.1[c] (114)	1.8±0.1 (114)	155.7±1.4 (113)	38.8±1.1[b] (152)	85.5±2.3 (102)

Values with same superscripts do not differ significantly ($P<0.05$); numbers in parenthesis are number of observations
*1 Unit - the amount of starch in mg hydrolysed by 10 ml of serum in 30 minutes).

layer and meat-type populations (Lowe and Garwood 1981).

Dunnington and Siegal (1986) attributed the growth advantage for slow feathering genotypes; to their reduced feather cover and relatively more efficient heat desipiation. Individuals with white genotypes showed significantly better growth in comparison to the birds of other two genetic groups as also reported by Weitzman *et al* . (1970) for Siberian guinea fowl stocks. Similar differences were reported for plumage colour genes in domestic fowl also. Considering the complexity and range of phenotypic effects of polyallelic E-locus responsible for plumage colour variations, Symth (1990) compared it with the linked series of functional DNA units of Major Histocompatibility gene cluster. Possibly, all these observations represent the pleiotropic influences of feathering gene interactions with background genotypes (Chambers *et al* . 1993). Further investigations are needed for identification of important pleiotropic influences of plumage genes in guinea fowl.

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