STUDY ON SERUM ALKALINE PHOSPHATASE ISOZYMES, ITS LEVEL AND ITS ASSOCIATION WITH CERTAIN ECONOMIC TRAITS IN WLH STRAIN

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Multiple molecularforms of enzymes, "isozymes" are found in many organisms and Alkaline Phosphatase is one of them (Tamaki and Tanabe, 1970). Law and Munro (1965) and Wilcox (1966) reported the genetic control of AKP isozymes in chicken. Many workers have reported two mutually exclusive forms of serum AKP isozymes, one of which migrated decidedly faster than the other (Engh and Wilcox, 1971; Savage et al., 1971; Banerjee, 1973; Jain et al., 1976; Singh et al., 1976; Jain and Rawat, 1977). Further, higher plasma AKP activity has also been reported for AKP^F isozyme types (Wilcox, 1966a; Tamaki & Tanabe, 1970; Amin et al., 1980 and Rao et al., 1980a). A favourable association between serum AKP^F type and egg production have been reported by Wilcox (1966); Chaudhary et al. (1971) and Amin et al. (1980). However, Engh & Wilcox (1971); Csuka and Petrovski (1972) and Tamaki and Watanabe (1977) did not find any favourable association between AKP types and egg production. The present study was undertaken to estimate relationship between AKP type, their level of activity and some economic traits in WLH pullets maintained at Government Poultry Project, Makarba, Ahmedabad. The serum samples were collected at 10 weeks of age from 269 pullets belonging to 24 sire progeny groups. Horizontal starch gel electrophoresis technique as suggested by Smithies (1955) was used to identify AKP^F and AKP^S isozymes. The serum AKP activity was estimated as per method suggested by King and Armstrong (1934). The data on body weights at 8 weeks and 20 weeks of age (BW_8 and BW_{20}), Age at first egg (AFE), Egg weight (EW) and no. of eggs produced upto 280 days of age (EN) were collected from the farm records.

The gene frequencies of AKP^F and AKP^S alleles, considering complete dominance of AKP^F allele and population in Hardy Weinberg equilibrium, were found to be 0.21 and 0.79 respectively. Gene frequencies of AKP^F allele ranging from 0.17 to 0.37 have been reported by Wilcox (1966a); Tamaki and Tanabe (1970); Chaudhary et al.(1971); Amin et al. (1980) and Rao et al. (1980a) in different breeds of poultry. The Means along with their S.E.for all traits according to AKP types are given in Table-1. The birds with AKP^F isozyme showed significantly higher AKP activity

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TABLE 1 : MEANS + S.E. OF VARIOUS TRAITS ACCORDING TO FAST AND SLOW ISOZYME TYPES

AKP types Traits	Fast	Slow	Overall
AKP activity (KA units per 100 ml.)	157.99 + 8.80[b] (101)	92.96 + 4.95[a] (168)	117.38 + 4.91 (269)
BW_8 (g)	432.67 + 8.35 (101)	434.70 + 7.25 (168)	433.94 + 5.50 (269)
BW_{20} (g)	1061.63 + 10.01 (101)	1058.10 + 4.77 (168)	1059.42 + 4.79 (269)
AFE (days)	180.85 + 1.79 (101)	181.60 + 0.47 (168)	181.32 + 0.73 (269)
EW (g)	47.97 + 0.30 (101)	47.98 + 0.38 (168)	47.97 + 0.26 (269)
EN	59.69 + 2.44 (101)	59.52 + 1.62 (168)	59.58 + 1.36 (269)

Figures in the parentheses are the number of observations.

TABLE 2 : GENETIC AND PHENOTYPIC CORRELATIONS BETWEEN AKP ACTIVITY AND OTHER TRAITS

	r_p + S.E.	r_g + S.E.
AKP X BW_8	-0.06 + 0.06	-0.46 + 0.20*
AKP X BW_{20}	-0.74 + 0.04**	-0.11 + 0.22
AKP X AFE	-0.01 + 0.06	0.72 + 0.13**
AKP X EW	-0.79 + 0.04**	0.64 + 0.24**
AKP X EN	0.07 + 0.06	-0.39 + 0.31

* Significant at $P \leq 0.05$ ** Significant at $P < 0.01$

in comparison to AKP^S type. However, there were no significant differences between isozyme types for other traits. Wilcox (1966b); Tamaki and Tanabe (1970); Choudhary et al. (1971) and Amin et al.(1980) have also reported high AKP activity for AKP^F type birds.

The distribution of both the types of isozymes in above average and below average groups for each of the trait and their percentage deviation from the respective means of the population have been presented in Table-3. The distribution indicated a larger representation of AKP^S types in both the groups for all the traits except for AKP level, where in, above average group had 66.67 % AKP^F type birds as against only 20.59 % AKP^F type birds in below average group. It was interesting to note that, in above average group, except for EW, for other traits, AKP^F type birds have shown higher positive deviation from the population mean in comparison to AKP^S type birds. Such differences in average performance of birds with AKP^F and AKP^S types were not observed in below average group. Gahne (1970) has suggested that due to differences in either catalytic properties of enzyme molecules or quantity of enzyme present or in concentration ofsome activator or inhibitor affecting enzyme activity or combination of these effects may result in genetic difference in level of enzyme activity.

The estimates of heritability for AKP level BW_8, BW_{20}, AFE, EW and EN were found to be 0.52 + 0.27; 0.19 + 0.15 and 0.27 + 0.17 respectively. The present findings are in agreement with those reported by Tamaki et al (1975) and Rao et al (1980a).

The genetic and phenotypic correlations between AKP level and other traits have been presented in Table-2. AKP level showed negative and similar trend of associations with BW_8 and BW_{20} . However, Singh et al (1981) and Rao et al.(1981) have reported positive genetic associations between AKP type and BW_{20}. Chaudhary et al. (1971) have reported that body weights at early age has positive relationship with AKP level, but at later age, these triats show negative correlations. The r_g between AKP level and AFE is high and positive in present study, however, Chaudhary et al. (1971) have reported -ve r_g between the same. Similarly, the genetic relationship of AKP level with EW was also positive and high. Surprisingly enough the r_g between AKP level and EN was found to be negative. Chaudhary et al (1971) and Rao et al (1980b) have reported high and positive relationship between AKP and EN.

From the present study, it can be concluded that AKP type and AKP level at 10 weeks of age are highly associated. Further, high producing birds have higher percentage of birds with AKP^F type. As such, there may be some favourable association of high productivity wi th AKP type as well as AKP activity. A clear evidence of such a nature could only become available if flocks under selection for EN are also studied for simultaneous changes in gene pool for AKP locus as well as for changes in AKP activities, continuously for few generations.

TABLE 3 : DISTRIBUTION OF AKP^F AND AKP^S ISOZYME TYPES IN ABOVE AVERAGE AND BELOW AVERAGE GROUPS FOR EACH TRAIT AND THEIR % DEVIATIONS FROM FLOCK AVERAGE

Traits	Overall average	AKP^F			AKP^S		
		No. of birds	% of population	% of deviation from average	No. of birds	% of population	% of deviation from average
				ABOVE AVERAGE			
AKP	177.38	66	66.67	+11.45%	33	33.33	+0.52%
BW_8	433.94	50	34.25	+15.80%	96	65.75	+11.96%
BW_{20}	1059.42	46	38.66	+ 8.87%	73	61.34	+ 0.24%
AFE	181.32	45	35.43	+ 8.50%	82	64.57	+ 1.62%
EW	47.97	50	40.32	+ 4.86%	74	59.68	+ 5.75%
EN	59.58	52	37.68	+30.88%	86	62.32	+28.23%
				BELOW AVERAGE			
AKP	177.38	35	20.59	-53.13%	135	79.41	-59.35%
BW_8	433.94	51	41.46	-16.07%	72	58.54	-15.53%
BW_{20}	1059.42	55	36.67	- 7.03%	95	63.33	- 7.22%
AFE	181.32	56	39.44	- 7.30%	86	60.56	- 6.14%
EW	47.97	51	35.17	- 4.77%	94	64.83	- 4.50%
EN	59.58	49	37.40	-32.38%	82	62.60	-29.81%

mr/nddb.

SUMMARY

Serum samples were collected from 269 pullets of 10 weeks age belonging to 24 sire groups of a White Leghorn strain. Electrophoretic analysis to identify Alkaline phosphatase (AKP) phenotypes indicated frequency of AKP^F and AKP^S to be 0.38 and 0.62, respectively. Considering the population in H.W. Equilibrium the gene frequencies were found to be 0.79 and 0.21 for AKP^f and AKP^S alleles, respectively. AKP level was also estimated and the concentration of AKP differed significantly between fast and slow isozymes. However, body weights at 8 and 20 weeks (BW_8 and BW_{20}), average age at first egg (AFE), average egg weight (EW) and number of eggs produced upto 280 days of age (EN) did not differ significantly between AKP isozyme types. The heritability estimates for AKP level, BW_8, BW_{20}, AFE, EW, and EN were found to be 0.52 + 0.22, 0.97 + 0.29, 1.35 + 0.32, 0.84 + 0.27, 0.19 + 0.15 and 0.27 + 0.17, respectively. Genetic correlations of AKP level with AFE and EW were found to be positive and high. However, the same with BW_8, BW_{20}, and EN were found to be negative. Results did not indicate any definite trend. However, a detailed study involving large population may throw better light on usefulness of AKP studies in relation to economic traits.

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