ASSOCIATION BETWEEN SOME BLOOD BIOCHEMICAL VARIANTS WITH PRODUCTIVITY PERFOMANCE IN WEST AFRICAN DWARF GOAT

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ABSTRACT

The objective of the study was to evaluate the effect of albumin, transferrin, haemoglobin and carbonic anhydrases phenotypes on a production trait (birth type) in west African dwarf goat population reared under free range extensive management system in south western Nigeria. Twenty one west African dwarf does with recorded birth types were considered for the work. Blood samples were collected from seven does each with records of single, twin and triplet kids birth respectively. The birth types were analyzed according to the genotypes or phenotypes of the polymorph systems (haemoglobin, transferrin, albumin and carbonic anhydrase) of does. Result of electrophoresis show that three phenotypes (AA, AB and BB) were obtained from all the four proteins. Homozygosity in haemoglobin and carbonic anhydrase tend to align with single birth producing. The need for further study that will involve more number of goats covering larger areas, use of DNA markers and their relationship with economic traits as well as performance study for detailed understanding of breed characteristics, conservation and genetic improvement of WAD goats is required. The goat breeding field can benefit by the contribution of biochemical-genetic markers to optimize the selection criteria with a view to increasing the reproduction capacity of this species.

Keywords; West African dwarf goat, biochemical polymorphism, association and electrophoresis.

INTRODUCTION

The animal productivity depends on the reproductive efficiency and is often measured by the number of offspring per breeding animal per unit of time. In this process, the components of diet and their levels, manipulating the environment or its adjusting are useful conditions in enhancing productivity. But, the genetic selection of those individuals that are fit best into the mating variants is the most important factor in maximizing reproduction rates (Dziuk and Bellows, 1983).

Biochemical characterization based on protein polymorphism has been reported to be useful in genetic characterization and diversity measures between and within livestock breeds (Lee *et al.*, 2000; Yamamoto *et al.*, 1996). Blood proteins are reportedly associated with quantitative and adaptability traits and can be detected at or very shortly before birth (Dally *et al.*, 1980). They are inherited as co-dominant autosomal traits in accordance with simple Mendelian principles (Dogru *et al.*, 2008). Such polymorphic markers can be used as tools in animal husbandry for herd/flock registry, accurate paternal records, determine evolutionary relationship among different breeds, probing genealogical records, profiling breed origins, working out genetic distances, documenting variations in phenotypic frequencies and to make strategic decisions regarding future breeding goals (Dally *et al.*, 1980; Dayıoglu and Dogrul 1989; Dellal 2001; Mert *et al.*, 2003). The information on the association of blood polymorphism with the reproductive and productive traits of WAD goat are scanty and probably no information is available regarding the kidding pattern with the relationship of some blood polymorphism of WAD goat. These associations will provide insight into the underlying mechanism of these proteins and results may be used in future breeding program. Hence, the objective of this study was to determine the association of phenovariants of albumin, transferrin, haemoglobin and carbonic anhydrase on the different birth type trait of wad goat.

MATERIALS AND METHODS

Data for this study were collected using twenty-one West African dwarf goats reared extensively in Ogbomosho South Local Government of Osun State in humid South Western Nigeria, comprising seven does each that have records of giving birth to single, twins and triplets. 5ml of blood was collected from each of the sampled animals by jugular venipuncture into a test tube containing Ethylene Diamine Tetra Acetic acid (EDTA) as anticoagulant and properly labeled. Each blood sample was washed with saline and lysed using

distilled water. When the lysate was well separated after standing, it was stored at – 200C pending laboratory analysis. The red cell lysate was subjected to electrophoresis in a starch gel (STAGE) medium according to the standard procedure described by Smithies (1955) that was later modified by Boyer and Hiner (1963)

RESULTS AND DISCUSSION

Table 1 present blood biochemical variants, gene, genotypic frequencies and their association to birth types in the west African dwarf goat. The genotypic frequencies of the albumin variants distributed in the respective birth type were (00, 00, 42.9) for AA, (100, 42.9, 57.1) for AB and (00,57.1, 00) for BB distributed for does that had single, twin and triplet respectively. Similar varied distribution was also noticed for the gene frequencies (0.5, 0,2, 0,7) for A and (0.5, 0.8,0.3) for the B gene. No significant deviation from Hardy-Weinberg equilibrium was observed here similar to Gunney *et al.* (2003) obtained Damascus goat. Balakrishnan and Nair (1966) and Solanki and Shukla (1980) reported that albumin phenotypes do not correlate with production traits In transferrin high degree of heterozygosity is expressed by the phenotypic status of all the birth types with slight variation in the does producing single birth type an indication of non-affiliation of transferrin to birth type in WAD goat. The observance of two codominant allele A and B obtained here is at variance with what some other authors Turker and Clarke (1980) ; Guney *et al.* (2003) obtained. The frequency of Tf A and TfB seem to be equal in distribution agreeing with the findings of (Dogru *et al.*, 2008).

Haemoglobin phenotype distribution obtained here tend to have a dominance of the A gene in the pool population, similar to what Canatan and Boztepe (2000) and Elmaci (2003) obtained in Turkish goats. The absence or negligible presence of HbB allele in goats, indigenous as well as exotic, may be indicative of either adaptive preference of Hb A allele to Hb B allele or species characteristic .Two codominant allele were obtained alleles A and B for all the proteins in this study agree with what Turker and Clarke (1980) and Gunney *et al.* (2003) obtained but differed from what Yakubu *et al.* (2014) obtain for haemoglobin in WAD goat. Many authors reported the dominance of the AA phenotypes in goat, as reflected in the does that gave birth to single kid, The dominance of AB and BB phenotype in the twin and triplet producing does suggest it could be a marker for such traits. The B gene though rare and indicative of multiple birth as reported here was also noticed by Alsamarrae and Younis (2011) in sheep. In the test for carbonic anhydrase variation occur in the dominance of A and B gene frequencies, with homozygosity of AA phenotype tends toward single kid producing does and heterozygosity and and dominance of BB allele tends more to twin and triplet producing does. This also could suggest association of carbonic anhydrase variants to birth types. From this study it can be concluded that of the four blood proteins haemoglobin and carbonic anhydrases variants can be use as marker for improvement of kidding performance in WAD goat.

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Table 1. Association between birth type and blood biochemical variants and their distribution.

Protein	Birth type	N	Genotype			Gene Freq	
			AA (%)	AB (%)	BB (%)	A	B
Albumin	Single	7	0 (00)	7 (100)	0 (00)	0.5	0.5
	Twin	7	0 (00)	3 (42.9)	4 (57.1)	0.2	0.8
	Triplet	7	3 (42.9)	4 (57.1)	0 (00)	0.7	0.3
Transferrin	Single	7	2 (28.6)	5 (71.4)	0 (00)	0.6	0.4
	Twin	7	0 (00)	7 (100)	0 (00)	0.5	0.5
	Triplet	7	0 (00)	7 (100)	0 (00)	0.5	0.5
Haemoglobin	Single	7	7 (100)	0 (00)	0 (00)	1.0	00
	Twin	7	3 (42.9)	0 (00)	4 (57.1)	0.4	0.6
	Triplet	7	3 (42.9)	4 (57.1)	0 (00)	0.7	0.3
Carbonic anhydrase	Single	7	7 (100)	0 (00)	0 (00)	1.0	00
	Twin	7	2 (28.6)	5 (71.4)	0 (00)	0.6	0.4
	Triplet	7	2 (28.6)	1 (14.3)	4 (57.1)	0.4	0.6