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Phenotypic diversity and local adaptation of Sahelian goat populations in Niger

REGINA ROESSLER¹, ANDREAS BUERKERT²

¹*University of Kassel, Animal Husbandry in the Tropics and Subtropics, Germany*

²*University of Kassel, Organic Plant Production and Agroecosyst. Res. in the Tropics and Subtropics, Germany*

Abstract

Rapid population growth, climate change, and desertification continue to contribute to increasing pressure on populations of small ruminants in the West African Sahel. The most vulnerable breeds may be seriously threatened, calling for stepping up conservation efforts for well-adapted populations. Goats are essential for ensuring food security and resilient transformation of food systems in the region. As a first step in the planning of conservation efforts for goats in Niger, we phenotypically characterised Sahelian goat populations in oasis systems in northern Niger (O) and from contrasting systems in the northern and southern Niger (OT). We hypothesised that communities in oasis systems intentionally selected goats for high capability to survive under extreme environmental conditions and that all goats constitute distinct populations within the Sahelian goat breed. To test this hypothesis a total of 197 goats were characterised for body coat pattern and colour, hair type, ear orientation and absence/ presence of horns, wattles, and beard. Phenotypic frequencies were computed by direct count and phenotypes were classified into typical (occurrence $\geq 50\%$ of all goats), intermediate (occurrence 11–49%), and unusual (occurrence $\leq 10\%$). The allele frequency of the recessive allele was calculated for the horned, wattled, and bearded locus using the Hardy-Weinberg equilibrium. Observed allele frequencies were tested against their expected Mendelian allele frequencies using X^2 tests. The data show that typical phenotypes of goats in Niger are horns (98.5%), short body hair (96.6%), long pendulous ears (60.0%), and absence of both beard (60.4%) and wattles (58.7%). Unbearded goats tended to be more common in OT than in O. Similarly, spotted body coat was less frequent in O goats, while fawn and black goats and goats with long hair were more common in O. The dominant alleles for horns, wattles and beard were found to segregate at lower frequencies than expected, except for beard in female goats in OT. Research on the genetic differentiation between highly fragmented goat populations within the country is ongoing to confirm that goats in the oasis systems in northern Niger represent distinct populations within the local Sahelian goat breed.

Keywords: Goat diversity, Niger, oasis agriculture, selection pressure