

## **PHENOTYPIC VARIATIONS OF WEST AFRICAN DWARF GOAT IN AFIKPO NORTH, EBONYI STATE**

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### **ABSTRACT**

The study focused on elucidating phenotypic variations observed in West Africa Dwarf goats, specifically examining traits such as coat colour, horn characteristics, beard presence, and the development of wattles conducted in Afikpo North Local Government Area. The research involved a comprehensive analysis of 150 WAD goats, comprising 129 females and 21 males, originating from four distinct communities within Afikpo North. The parameters observed includes coat colour patterns, with variations such as brown, black, brown and white, brown and black, white, and mixed colours, alongside the evaluation of horns, beard presence, and wattle development. Notably, the prevalent coat colour was found to be black, with proportions of 36.00%, 34.00%, and 26.6% in Ndibe, Amasiri, and Enohia, respectively. Conversely, Unwana exhibited a dominance of brown and black colouration. Interestingly, white coat colour emerged as the least encountered, representing 6.67%, 10.00%, 15.00%, and 8.00% in Enohia, Ndibe, Unwana, and Amasiri, respectively. The study further revealed that 83.33% of the goats exhibited horns, while 34.67% possessed beards, and a substantial 97.33% lacked wattles. The overall level of phenotypic variation indicated a prevalence of traits such as black coat colour, the presence of a beard, horned individuals, and an absence of wattles. These findings underscore the importance of considering these traits in breeding programs, as they not only contribute to enhancing breeding efficiency but also play a crucial role in genetic control, mitigating aggressive behaviours, and aligning with market demands.

**Keywords:** WAD Goat, Phenotype, Breeding, Program

### **INTRODUCTION**

West African dwarf (WAD) goats represent a major livestock resource in the humid West and Central Africa where they are distributed across 15 countries. These goats are raised in low-input systems where they contribute to income and livelihoods of millions of people, with women playing key roles in local WAD goat value chains. These goats are renowned for their high fertility, multiple births, high twinning rates, all season breeding, in addition to variations in qualitative traits within populations, justifying further policies for their conservation and sustainable use. Their rusticity and adaptation to backyard systems, as well as their cultural significance, contribute to

their popularity. In spite of these attributes, severe constraints to production include absence of a policy-driven agenda for their sustainable production and utilization and no systematic long-term breeding programmes for their genetic improvement

Phenotypic traits are observable animal traits. They exhibit natural variability within populations (Vienne, 2022). Phenotypes can manifest as continuous, like shades of grey, or discontinuous, like black and white (Peterson et al 2016). Genes and environmental factors drive this phenotypic diversity. The reproductive success and transmission of advantageous genetic traits to future generations are influenced by the survival benefits associated with various phenotypes (Carja et al 2017). Qualitative traits in WAD goats, such as wattle presence or absence, showcase notable phenotypic variations (Nguluma et al., 2022). A key variation lies in coat colour, with WAD goats exhibiting diverse shades, including black, brown, white, and combinations (Idowu et al, 2018). Coat colour impacts thermoregulation and resistance to parasites and may align with farmer preferences for aesthetic or cultural reasons (Arenas-Baez et al., 2023; El-Sherbiny et al., 2023). Maintaining genetic diversity is crucial for breed survival, fostering adaptability to changing environments, and disease resistance. Breeding programmes considering traits like coat colour, body size, and genetic diversity can enhance productivity and herd adaptability for farmers (Birader, 2023).

The objective of the study was to assess phenotypic variations among the West Africa Dwarf goat population in Afikpo North, Ebonyi State, Nigeria. This would contribute valuable insights into breeding programs. Considering traits like coat colour and horn could enhance productivity and herd adaptability for farmers (Arenas-Baez et al., 2023).

## **MATERIALS AND METHODS**

### **Location of the Study**

The research was conducted in four communities in Afikpo North Local Government Area (LGA) of Ebonyi State (Ndibe, Enohia, Amasiri and Unwana). Afikpo North LGA is situated within the humid tropical rainforest zone. The geographic coordinates of the study area are Latitude 5.889455 and Longitude 7.9538378. The region experiences an average annual precipitation of 221.55mm and maintains a humidity level of 75.5%.

### **Experimental Animals and Management**

One hundred and fifty (150) goats were used for the experiment. The goats were randomly selected from different households in different communities. The parameters (traits) observed were the coat colour pattern, horn, beard and wattle. These goats were managed through traditional extensive and semi-intensive husbandry practices, with variations based on the owner's financial status. The availability of crop residues, grains, seasons, and kitchen wastes were used to supplement the main feed supply. The experiment was done by observing and recording the number of WAD goats that has the observable variations.

#### Duration of Data Collection

The research was carried out in six (6) weeks in order to access the phenotypic variations of WAD goats. Data on phenotypic variations among the West African dwarf goat population was taken from the coat colour, horn, beard and wattle.

#### *Data Analysis*

Phenotypic frequency was computed by direct count. The proportion (%) of individuals carrying the various traits was determined using the formula:

$$\text{Phenotypic frequency} = \frac{\text{number of individual animal having the trait}}{\text{Total number of animals sampled}} \times 100$$

**RESULTS**

The coat pigmentation patterns in WAD goats in Afikpo comprised of mixed colour; brown/black; brown; brown/white; black; white is shown in Table 1.

**Table 1: Coat pigmentation pattern of WAD Goats in Afikpo North**

Colour	Enohia		Ndibe		Unwana		Amasiri	
	Number of goats observed	Frequency (%)	Number of goats observed	Frequency (%)	Number of goats observed	Frequency (%)	Number of goats observed	Frequency (%)
<b>Mixed colour</b>	5	16.66	7	14.00	2	10.00	6	12.00
<b>Brown/ black</b>	8	26.67	11	22.00	5	25.00	12	24.00
<b>Brown</b>	4	13.33	6	12.00	3	15.00	4	8.00
<b>Brown/ white</b>	3	10.00	5	10.00	3	15.00	6	12.00
<b>Black</b>	8	26.67	16	32.00	4	20.00	18	36.00
<b>White</b>	2	6.67	5	10.00	3	15.00	4	8.00
<b>Total</b>	30	100	50	100	20	100	50	100

The phenotypic frequency of horns in WAD goat is shown in Table 2

**Table 2: Horn observation and phenotypic Frequency in Afikpo North**

	Genotype	Number of goats observed	Phenotypic frequency (%)
Enohia	Ho+	22	73.33
	Hop	8	26.67
<b>Total</b>		<b>30</b>	<b>100.00</b>
Ndibe	Ho+	44	88.00
	Hop	6	12.00
<b>Total</b>		<b>50</b>	<b>100.00</b>
Unwana	Ho+	16	80.00
	Hop	4	20.00
<b>Total</b>		<b>20</b>	<b>100.00</b>
Amasiri	Ho+	43	86.00
	Hop	7	14.00
<b>Total</b>		<b>50</b>	<b>100.00</b>

Ho+: Presence of horn; Hop: Absence of horn

The phenotypic frequency of beard in WAD goats is presented in Table 3.

**Table 3: Phenotypic frequency of beard in WAD goat in Afikpo North**

	Genotype	Number of goats observed	Phenotypic frequency (%)
Enohia	Br+	9	30.00
	Br-	21	70.00
<b>Total</b>		<b>30</b>	<b>100.00</b>
Ndibe	Br+	13	27.00
	Br-	35	73.00
<b>Total</b>		<b>48</b>	<b>100.00</b>
Unwana	Br+	11	55.00
	Br-	9	45.00
<b>Total</b>		<b>20</b>	<b>100.00</b>
Amasiri	Br+	19	36.53
	Br-	33	63.47
<b>Total</b>		<b>52</b>	<b>100.00</b>

Br+: Presence of beard; Br-: Absence of beard

The phenotypic frequency of wattle in WAD goat is shown in Table 4.

**Table 4: Phenotypic Frequency of wattle in WAD goat in Afikpo North**

	Genotype	Number of goats observed	Phenotypic frequency (%)
Enohia	Wa+	1	3.33
	Waw	29	96.67
<b>Total</b>		<b>30</b>	<b>100.00</b>
Ndibe	Wa+	1	2.00
	Waw	49	98.00
<b>Total</b>		<b>50</b>	<b>100.00</b>
Unwana	Wa+	0	0.00
	Waw	20	100.00
<b>Total</b>		<b>20</b>	<b>100.00</b>
Amasiri	Wa+	2	4.00
	Waw	48	96.00
<b>Total</b>		<b>50</b>	<b>100.00</b>

Wa+: Presence of wattle; Waw: Absence of wattle

## DISCUSSION

The coat pigmentation patterns represented in Table 1 showed that WAD goats in Afikpo are of mixed colour: brown/black, brown, black, brown/white, and white. The black coat emerged as the most prevalent phenotype sampled in Amasiri. This result agreed with that of Adedeji et al., (2006). While black/ brown was the most prevalent in Unwana. Conversely, the least encountered coat phenotype was white, representing Enohia 6.67%, Ndibe 10.00%, Unwana 15.00%, and Amasiri 8.00%. The phenotypic frequencies presented in Table 2 indicated that the WAD goats in the study population were predominantly horned. This suggested that the presence of horns is a predominant characteristic among WAD goats in the investigated area. The result aligned with Jeda and Asefa (2016), whom reported 100% horn in the sample population. Table 3 showed the presence and absence of beards in the examined WAD goat populations. The study revealed a low prevalence of beards among the goat populations. In this investigation, it was observed that 34.6% of the goats had beards. The outcomes suggest that beards are not a prevalent characteristic among

WAD goats in the study area. Wattle presence in the WAD goat populations under examination was depicted in Table 4. It was evident that the majority of WAD goats in the study area lacked wattles. Jeda and Asefa (2016) report 0% presence of wattle.

## **CONCLUSION**

In conclusion, the research on phenotypic variation of WAD goats reveals a predominant expression of black coat colour, along with distinctive features such as bearded and horned characteristics. These findings contribute valuable insights into the genetic makeup and physical traits of WAD goats, laying a foundation for further studies on breeding strategies, biodiversity conservation, and understanding the adaptability of these goats in various environments. Additionally, implementing selective breeding programs that capitalize on desirable characteristics could enhance the overall genetic quality of the WAD goat population. This could potentially lead to improved adaptability, disease resistance, and productivity in diverse environmental conditions. Collaborative efforts between researchers, farmers, and conservationists are encouraged to ensure the sustainable management and preservation of this valuable goat breed.



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