

## Phenotypic Diversity in Morphological Traits and Dimensional Characteristics of Locally Bred Ducks in Central and Southern Iraq

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### Abstract

This study conducted from October, 2023, to April, 2024, at Agriculture College/ University of Al-Qasim Green, aimed to characterize morphological and dimensional variations among local duck populations in central and southern Iraq. seventy ducks (18 males and 52 females) were randomly selected and bred for five months. Eight morphological traits ( eye colour, eyelid colour, feather colour, bill edge colour, body structure, bill colour, bill shape, and leg vein colour) were assessed, additionally, nine morphophonemic measurements (body weight, body length, body circumference, wing length, bill length, neck length, leg length, thigh length, and tarsus length) were analysed. Statistical and descriptive methods were employed to analyse the results. The findings revealed uniformity (100% similarity) in bill shape and eye colour across all individuals, characterized by a consistent black eye colour and regular bill shape throughout the flock. Feather colour exhibited approximately 58% similarity with eyelid colour. A greenish-yellow bill colour was predominant, with 40% similarity observed in leg vein colour (which also showed 40% in orange hue). Eyelid colour showed the highest similarity percentage after bill shape and eye colour, reaching 68% black in the flock. Statistical analysis comparing morphological dimensions between males and females within the flock revealed significant differences in body height, bill length, and trunk length (p-values ranging from 0.004% to 0.034% and 0.004%, respectively). This study contributes to understanding the morphological diversity and dimensional variations in local duck populations in Iraq, highlighting significant differences between genders in certain traits.

**Keywords: Duck Morphology, Dimensional Variations, Local Duck Populations, Morphophonemic Measurements.**

### Introduction

Protein consumption from animal sources in Iraq is considerably lower compared to many other countries [1]. Meeting the rising demand for animal protein requires a concerted effort to breed animals that are highly productive and have short generational

periods. Ducks, as a locally adapted poultry species in Iraq, are recognized for their efficient meat and egg production capabilities and their ability to thrive on simple [2], locally available feed materials [3]. Despite these advantages, ducks, like other indigenous livestock, have historically suffered from

neglect, hampering their improvement and conservation efforts and leading to declining population numbers [4]. Recent research highlights the neglect of Iraqi local ducks, particularly those found in southern regions and marshlands, by local breeders [5;6]. While ducks are integral to Iraq's poultry sector, they have been underserved in terms of research and enhancement efforts. Limited studies on their productivity, genetic diversity, and phenotype traits underscore the urgent need to understand inherent phenotype and genetic differences among duck populations in southern and central Iraq [7]. This knowledge is essential for creating successful breeding plans and initiatives at the local, state, and federal levels.

In order to selectively produce ducks with desired traits—which may appear seldom and rarely in wild populations—detailed morphological descriptions are crucial. It is essential to comprehend the body size and structural proportions of the local duck stocks since these factors might indicate genetic differences across populations and provide a foundation for genetic study. The continuous features provided by morphological dimensions, which characterize characteristics of body form, give short-term insights on flock structure and environmental adaptations [8]. As such, they are essential to the upkeep and development of well-known duck breeds. Thus, the purpose of our present research was to evaluate phenotype differences between populations of locally produced ducks in central and southern Iraq, with a particular emphasis on morphological characteristics and dimensional features in both sexes.

## Material and Methods

Research on forty randomly chosen local ducks of both sexes was carried out in the College of Agriculture, University of Al-Qasim Green, between November 1, 2023, and April 1, 2024. The objective was to describe the morphological variations and dimensions features of the local duck populations in the central and southern regions of Iraq.

According to Chia et al. (2012), a simple questionnaire was used for data collection in order to evaluate eight morphological traits: eye colour, eyelid colour, feather colour, bill edge colour, body structure, bill colour, bill shape, and leg vein colour.[9]. Additionally, nine morphometric measurements were taken, including body weight, body length, body circumference, wing length, bill length, neck length, leg length, thigh length, and tarsus length, following the methodologies outlined by [10] (Figure 1). Subsequently, both statistical and descriptive analyses were employed to analyze and interpret the results obtained from these comprehensive measurements and observations using SPSS [11].

### The statistical analysis

Descriptive statistics were employed to analyze the morphological characteristics, while dimensional aspects were statistically analyzed using SPSS [12] software, utilizing a completely randomized design (CRD). Significant differences between means were assessed using the T-test to compare males and females within the bred flock [13].

### Results and Discussion

Notable results were found when statistical analysis was performed to look for correlations between the attributes that were evaluated. In regard to body height, a significant negative association between trunk length and chest circumference was found, with a p-value of less than 0.01. Furthermore,

negative relationships between the length of the wings and trunk and the chest circumference were seen at a significance level of  $p < 0.05$ .



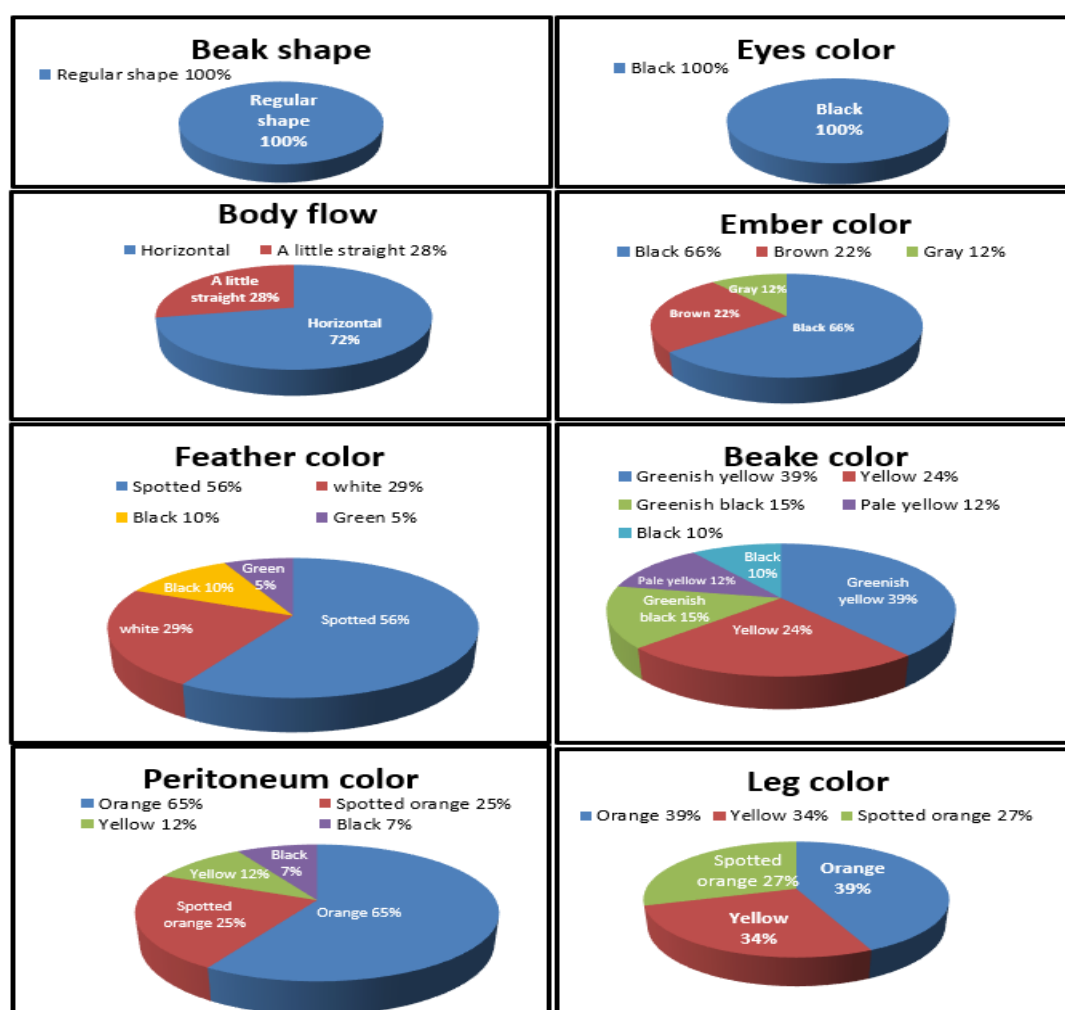
**Figure 1: Measurement of Some Morphological Dimensions of Local Ducks**

**Table1. Morphological Characteristics of Local Iraqi Ducks**

The studied morphological characteristic	Results	Repetition	Repetition % rate	The morphological feature studied	Results	Repetition	Repetition % rate
<b>The feather colour</b>	Black	4	10	<b>Leg colour</b>	Yellow	14	35
	White	12	30		Orange	16	40
	Green	2	5		Orange mottled	11	27.5
	Mottled	23	57.5	<b>Pomegranate colour</b>	Black	27	67.5
<b>Eye colour</b>	Black	40	100		Brown	9	22.5
<b>The colour of the bill</b>	Orange	23	57.5		Grey	5	12.5
	Yellow	5	12.5	<b>Body fluidity</b>	Horizontal	29	72.5
	Spotted orange	10	25		Slightly straight	11	27.5
	Black	3	7.5	<b>Beak shape</b>	Regular shape	40	100
<b>The colour of the bill</b>	Yellow	10	25		Convex	0	0
	Yellowish-green	16	40		Short	0	0
	Black	4	10		Concave	0	0
	Blackish-green	6	15				
	Pale yellow	5	12.5				

**Table 2: Comparison of morphological dimensions between male and female Iraqi local ducks**

Morphological dimension	Statistically significant differences at the level of $p \leq (0.05)$	Females Mean $\pm$ Standard Error	Male Mean $\pm$ Standard Error
Chest circumference	0.151	19.6 $\pm$ 0.294	20.53 $\pm$ 0.66
Body length	0.369	64.567 $\pm$ 0.712	65.8 $\pm$ 0.964
Body height	0.004	39.9 $\pm$ 0.333	42.0 $\pm$ 0.65
Wingspan	0.607	8.55 $\pm$ 0.13635	8.7 $\pm$ 0.29059
Beak length	0.034	6.117 $\pm$ 0.07460	6.45 $\pm$ 0.138
Wing length	0.783	37.517 $\pm$ 0.4	37.3 $\pm$ 0.616
Tail length	0.249	13.05 $\pm$ 0.121	13.35 $\pm$ 0.259
Leg length	0.279	19.567 $\pm$ 0.204	20.0 $\pm$ 0.298
Neck length	0.937	15.567 $\pm$ 0.202	15.6 $\pm$ 0.4
Trunk length	0.004	25.367 $\pm$ 0.217	23.6 $\pm$ 0.777
Weight	0.760	1638.333 $\pm$ 35.37	1660.0 $\pm$ 60.461



**Figure 2: Variation in morphological traits of local ducks**

**Table 3: Correlation coefficients among dimensional aspects for Iraqi local ducks**

Shape dimension	Body length	Body height	Diaphragm	Beak length	Wing length	Leg length	Comb	Weight	Neck length	Trunk length
Chest circumference	-0.222	0.255	-0.601**	-0.184	-0.386*	-0.215	-0.158	-0.013	0.319*	-0.368*
Body length		-0.023	0.595**	0.46*	0.23	0.599*	0.340*	0.305	-0.019	-0.085
Body height			0.063	-0.068	0.013	0.160	0.436*	-0.016	-0.019	-0.508*
Diaphragm				0.285	0.436*	0.623*	0.502*	0.209	-0.377*	-0.061
Beak length					-0.110	0.359*	0.167	0.131	-0.109	-0.047
Wing length						0.191	0.365*	-0.015	-0.125	0.180
Leg length							0.533*	0.129	-0.126	-0.203
Comb								0.039	-0.125	-0.315*
Weight									-0.066	-0.194
Neck length										0.074

At this level, other noteworthy inverse correlations between the chest circumference and the lengths of the neck, shoulders, and trunk were noted. Examining correlations with the analyzed morphological dimensions showed significant direct relationships

between body length and leg length and between body length and chest length at a level of  $p < 0.01$ . Furthermore, substantial direct correlations between shoulder length and body height as well as between leg, wing, and shoulder lengths were discovered at this

level in relation to chest length. At conclusion, a substantial direct link between body length and shoulder length, wing length and neck length, and chest circumference and neck length were found at a significance level of  $p < 0.05$ . These results highlight how crucial it is to choose leg, chest, and body lengths in breeding programs in order to successfully

improve morphological features and growth in local duck populations in the locations under study. As crucial phenotypic markers, these simple metrics have shown their importance as selection criteria for controlling and optimizing production in such flocks [14].

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