



Morphological Characteristics of Angut Pigeons (*Columba livia domestica*)

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ABSTRACT

This study was conducted to determine the phenotypic characteristics of the angut pigeon breed, which is native to Şanlıurfa, where pigeon breeding has been done traditionally for a long time and is also one of the domestication centers. In this study, we adopted 146 angut pigeons comprising 72 males and 74 females. Additionally, four different colour variations were determined: yellow angut (41.1%, n = 60), red angut (35.6%, n = 52), white angut (13.7%, n = 20) and black angut (9.6%, n = 14). All the colour variants had a peak crest (upright feathers) costume structure, which was at the back of the head, starting from the end of the neck and extending from ear to ear. Among the gender groups from the measurements obtained in this study; wing length, wingspan, tail length and head width ($P < 0.001$); shank length and head length ($P < 0.01$). Differences in beak length and beak width were also significant ($P < 0.05$). Moreover, the differences in beak length and beak width were significant ($P < 0.05$). Today, although anguts are morphologically similar to the Demkeş breed in Turkey, they do not have trumpeting sound ability. The trumpeter breeds of fancy pigeons are so named because of their unique vocalizations, which sound vaguely like low laughter. The data obtained on the morphological features of angut pigeons support the hypothesis that angut pigeons are a form pigeon and should be defined as a different breed.

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INTRODUCTION

Pigeons are considered symbols of peace and are worshipped as fertility goddesses. From their domestication since the dawn of humanity, they have been used as key communicators in warfare by every major historical superpower, from ancient Egypt to the Americas, and are believed to have saved thousands of lives. Charles Darwin relied heavily on pigeons to prove his theory of evolution (Blechman, 2022).

Pigeons are one of the most intelligent birds in the world. They are one of only six species and the only one non-mammal to pass the mirror test of being able to recognize their own reflection. Studies by the Keio University team has demonstrated that pigeons were able to differentiate between the paintings which is painting by Picasso and those of Monet (Allen, 2009).

The rock pigeon is the world's oldest domesticated

bird. Mesopotamian cuneiform tablets and Egyptian hieroglyphics mention the domestication of pigeons more than 5,000 years ago (Biray, 2019). Meanwhile, research suggests that the domestication of pigeons occurred as early as 10,000 years ago (Blasco *et al.*, 2014; Domestic pigeon, 2021; Yilmaz *et al.*, 2013).

All fancy pigeons descend from a common ancestor, the rock pigeon (*Columba livia*). They are incredibly diverse in shape and size due to genetic mutations. These mutations led to long legs, unusual beaks, large crests and bizarre flight displays (Allen, 2009). A typical pigeon has a compact body, short legs, small head and small beak. The bill usually has a horny distal part and a tumid basal part covered with soft skin and cere. Depending on the species, a ring of bare skin of various colours may protect the eye (Baptista *et al.*, 2009).

Pigeons, one of the animals that are a local gene source and a biodiversity element are frequently investigated in terms of genetic and various morphological characteristics, both to shed light on phylogenetic studies and to lead to the development of more efficient production systems and genetic improvement studies (Casanova, 2013). Since pigeons have been subjected to artificial selection throughout history, many breeds spread around the world have emerged with different morphological and behavioural characteristics from their ancestors (Bartels, 2003; Cobo-Simón *et al.*, 2020; Murton *et al.*, 1972; Stringham *et al.*, 2012).

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In general, the first step to study the genetic diversity is to determine the current situation and to determine the level of species, breed, and population. It is possible to achieve this by measuring and defining the morphological and other biological characteristics of the related species and breed (Soysal *et al.*, 2011). As a matter of fact, breed registration is realized by submitting an application file to be prepared within the framework of the relevant legislation (Breed Registration Regulation) to the relevant board (Domestic Animal Registration Committee) and publishing the board's approval in the official newspaper. In the registration application file in question, the breed should be characterized (identified) in terms of phenotypic (morphometric) and genetic aspects (Resmi-Gazete, 2022).

Angut pigeons have a mystical value among the people and have been the subject of many religious narratives. In other words, angut pigeons, whose roots date back to ancient times, have been bred for many years in Anatolia, especially in Şanlıurfa. You can undoubtedly see breeders all over Anatolia just like in Şanlıurfa, whose only concern is not fame or a little wealth, and who have special feelings and passions hidden in the joy in their demeanor and facial expressions while describing their relationship with pigeons. However, no reports have been published on this particular breed of pigeons. Therefore, this study is the first investigation into the morphological characteristics of the angut pigeon genotype.

MATERIALS AND METHODS

Pigeon

This research was conducted on 146 angut pigeons bred in Şanlıurfa, which comprised 72 males and 74 females from different age groups. The pigeons were classified according to their age as 06–12 months (Group 1), 13–24 months (Group 2), 25–36 months (Group 3) and >36 months (Group 4).

Phenotype characteristics

The morphological features of angut pigeons, such as head type, eye colour, feather colour (body colour), number of wing and tail feathers, wing and tail traces and existence of long trotters, were defined according to the common statements of the breeders. The wing feathers and the primary axial and secondary feathers were counted (Atasoy *et al.*, 2013; Balci *et al.*, 2018), (Table I).

To determine the head structure, eye color, beak type, beak tip color and nail color characteristics of angut pigeons, special boxes with a diameter of 60×50 cm which were illuminated with led lamps from the right, left and top were used. In addition, the boxes were covered with a 500×300 cm black cloth to avoid external stimuli to the

pigeons. Then the pigeons were photographed with the Canon EOS 650D camera.

The body length, wingspan, wing length, body length, tail length, and chest circumference were measured using a measuring tape, while chest width, head length and width, beak length and depth, and body diameter were measured using digital calipers (Atasoy *et al.*, 2013; Çelik, 2021; Özbaşer *et al.*, 2016).

Table I. Number of wing and tail feathers in angut pigeon.

Morphological characteristics	N	Ratio (%)
Number of wing feather		
10-1-10	82	56.2
10-1-11	37	25.3
10-1-9	27	18.5
Number of tail feather		
12 feathers	130	89.0
13 feathers	13	8.9
14 feathers	3	2.1

Statistical analysis

Statistical analysis was performed using SPSS ver. 22.0, in which the differences between the groups and genders were analyzed by one-way ANOVA and independent-sample t-test methods, respectively (Özdamar, 2001; Soysal, 2000). The conformity of the data to the normal distribution was examined using the homogeneity of variance test. The “Descriptors” method was followed, and factors with significant effects were compared using the Duncan test (Duncan, 1955).

RESULTS

Based on the breeder's statements and our observations, angut pigeons are a form pigeon. The main characteristic of these pigeons is that their colour and physical features are as desired. Compared to other pigeon breeds, angut pigeons have a medium-sized body structure (Fig. 1).

In this study, considering the evaluations of the breeders and our measurements and observations, four different colour variations were determined: Yellow angut (41.1%, n = 60), red angut (35.6%, n = 52), white angut (13.7%, n = 20) and black angut (9.6%, n = 14) (Fig. 1).

Angut pigeons have a medium size and a thin and elegant beak. Depending on the colour of the bird, the beak, nail and eye colours may change. All the colour variants have a peak crest (upright feathers) costume structure, which is at the back of the head, starting from the end of the neck and extending from ear to ear (Fig. 2).

According to the statistical analysis results, significant differences were found between the groups ($P < 0.05$) for the beak length of angut pigeons in terms of age groups. In terms of beak depth, chest circumference and wing length, these differences were significant ($P < 0.01$). When the differences between the groups at the level of ($P < 0.001$) were examined, it was understood that there were differences between the mean values of body weight, body length, shank length and chest width.



Fig. 1. Color variants of angut pigeons; yellow angut, red angut, white angut and black angut.



Fig. 2. Head structure, eye colors and beak types of angut pigeons; yellow angut, red angut, white angut and black angut.

Among the gender groups from the measurements obtained in this study; wing length, wingspan, tail length and head width ($P < 0.001$); shank length and head length

($P < 0.01$). Differences in beak length and beak width were also significant ($P < 0.05$). Moreover, the differences in beak length and beak width were significant ($P < 0.05$), (Table II).

DISCUSSION

Today, anguts do not have trumpeting sound ability, although they are morphologically similar to the breed known as Demkeş in Turkey. The trumpeter breeds of fancy pigeons are so named because of their unique vocalizations, which sound vaguely like low laughter. Levi described this trumpeting vocalization in his book "The Pigeon". Several domesticated varieties possess this trumpeting ability to various degrees (Trumpeter (pigeon), 2002). Demkeş (Güvercin bilgi kaynağı, 2022) are very similar to the breed known as Bokhara trumpeter. Apart from the Bokhara trumpeter breed, there are several trumpeter breeds in Europe, especially English trumpeter, and double-crested trumpeter breeds (Trumpeter-Pigeon, 2022). However, the most striking feature that distinguishes anguts from Bokhara trumpeter pigeons is that the ciga (bangs), called the front crown, does not have a fully round shape, just as in Demkeş, and is not long enough to cover their eyes and beak. However, the front crown of the Bokhara trumpeter pigeons is round and quite long, such that their eyes and beaks are not obvious. In addition, the rear hill is more ostentatious in the Bokhara trumpeter pigeons. Overall, angut pigeons have a characteristic body shape that distinguishes them from trumpeters.

Head crest, which can be of different structures in several wild and domestic bird species, has an important function in bird mate selection and is also preferred by breeders. By analysing the genomes of several pigeon breeds were discovered a mutation in the highly conserved intracellular kinase domain of EphB2, which was encoded by a single gene that was perfectly associated with inverted feather crests on the head (Price, 2002; Domyan and Shapiro, 2016). In angut pigeons, the rear hill (kepez) completely covers the neck, but it is not as majestic as in the Bokhara trumpeters (Fig. 2).

Anguts have a medium size, thin and elegant beak. Depending on the color of the bird, beak, nail and eye colors may change (Fig. 2). The wings are carried on the tail and never cross the tail. Also, they do not have as long a tail as Demkeş. They have a thick and short neck structure. The chest is slightly curved forward, round and broad.

In domestic pigeons, the epidermis of the ankle and foot may be completely scaly or covered with hair. Darwin's (1868) observations of the densely feathered pigeon's feet (trotters) postulate the anatomical structure of the transition from scaly to hairy epidermis, and his observations of the English trumpeter's feet assume a very

Table II. The statistical values of the morphometric characteristics detected from angut pigeons ($X \pm S_x$).

Angut	Group 1 (n=35)	Group 2 (n=47)	Group 3 (n=30)	Group 4 (n=34)	Total (n=146)	Age	Female (n=74)	Male (n=72)	Sex
Body weight (g)	349.14±3.45 ^a	358.62±3.22 ^b	369.67±2.85 ^c	370.88±2.91 ^c	361.47±1.74	***	358.58±2.59	364.44±2.27	-
Beak length (mm)	18.44±0.11 ^a	18.73±0.11 ^{ab}	18.86±0.10 ^b	18.88±0.08 ^b	18.72±0.05	*	18.62±0.08	18.83±0.07	*
Beak depth (mm)	8.31±0.08 ^a	8.59±0.08 ^b	8.68±0.07 ^b	8.74±0.09 ^b	8.58±0.04	**	8.47±0.06	8.69±0.06	*
Head length (mm)	34.20±0.11	34.30±0.09	34.36±0.08	34.40±0.09	34.31±0.05	-	34.17±0.06	34.46±0.07	**
Head width (mm)	22.86±0.11	23.02±0.07	23.04±0.09	23.13±0.08	23.01±0.04	-	22.85±0.05	23.17±0.06	***
Shank length (mm)	36.57±0.21 ^a	37.49±0.16 ^b	37.64±0.20 ^b	37.81±0.25 ^b	37.37±0.11	***	37.02±0.15	37.73±0.14	**
Wing length (cm)	28.74±0.21 ^a	29.19±0.18 ^{ab}	29.78±0.22 ^b	29.43±0.20 ^b	29.26±0.10	**	28.74±0.15	29.79±0.12	***
Wingspan (cm)	68.07±0.40	67.81±0.29	68.48±0.30	68.43±0.32	68.15±0.17	-	67.31±0.23	69.02±0.19	***
Tail length (cm)	13.17±0.14	13.16±0.12	13.40±0.14	13.53±0.17	13.30±0.07	-	13.05±0.09	13.55±0.10	***
Body length (cm)	32.89±0.31 ^a	33.43±0.22 ^a	34.80±0.27 ^b	34.96±0.25 ^b	33.93±0.15	***	33.66±0.21	34.22±0.21	-
Chest perimeter (cm)	20.52±0.06 ^a	20.66±0.05 ^{ab}	20.70±0.05 ^b	20.79±0.04 ^b	20.67±0.03	**	20.65±0.04	20.68±0.04	-
Chest width (cm)	5.50±0.03 ^a	5.60±0.02 ^b	5.61±0.02 ^b	5.61±0.02 ^b	5.58±0.01	***	5.58±0.02	5.58±0.02	-

-, $P > 0.05$; *, $P < 0.05$; **, $P < 0.01$; ***, $P < 0.001$; a-c, means within a column with different letters are significantly different ($P < 0.05$).

densely feathered structure such that they look almost like small wings. Although the feet of angut pigeons are similar to those of trumpeters, they are slightly shorter than normal and have a unique form and stance (Fig. 3). All angut pigeons have long backward curved legs, which are called reed trotters (Figs. 1 and 3).



Fig. 3. Examples of trotters in angut pigeons.



Fig. 4. Example of tails feather and wings in angut pigeon.

In pigeons, the genetic basis of pigmentation for aesthetic or practical reasons has been one of the most intensively researched areas. Pigeons display an enormous amount of colour variation. In addition to being a phenotype that appeals to the visual and aesthetic sense of the breeders, colour variations are also associated with differences in sexual preference, survival and predator avoidance for natural pigeon populations (Darwin, 1868).

Demçeş and other trumpeter pigeons have a great variety of colours (Trumpeter pigeon, 2022; Güvercin bilgi kaynağı, 2022). In addition to solid colours, such as white, black, red, blue, yellow and red brown, there are several varieties of mixed colours (variegated), ranging from white to black. However, anguts only consist of solid colour varieties, such as white, black, red and yellow. Furthermore, their short body hair forms a flat surface, and their feathers are not coarse, tangled and messy (Figs. 1 and 4).

As 361.47 g the average body weight of angut pigeons was determined to be lighter than squadron flyer pigeons 428.85 g (Özbaşer *et al.*, 2016) and then cakal pigeons 374.02 g (Özbaşer *et al.*, 2020). They are heavier than Şanlıurfa Yapışan pigeons 317.38 g (Çelik, 2022), than Alabadem pigeons 321.17g (Erdem *et al.*, 2021), than Tumbler pigeons in province of Ankara 321.62 g (Atasoy *et al.*, 2013), than Mülekat pigeons 328.96 g (Özbaşer *et al.*, 2020) and Trakya Makaracısı pigeons 335.58 g (Soysal *et al.*, 2011). In many breeds, (Yıldırım *et al.*, 2018; Atasoy *et al.*, 2013; Özbaşer *et al.*, 2020) there was a difference in body weight values (higher in males than females) in gender groups, but no difference was found in sex groups of anguts pigeons.

Head length and width were found to be significantly higher in males than females, and head length was found in Atasoy *et al.* (2013) were similar to their findings for Tumbler pigeons. Similarly, the fact that it is important in terms of wing length and wingspan (higher in males) and the difference between the sexes in terms of chest depth is insignificant Atasoy *et al.* (2013) and Balcı *et al.* (2018) were similar to their findings for tumbler pigeons and Bursa Oynarı pigeons, respectively.

Compared to their wild ancestors, domestic pigeons show considerable differences in morphological structure, especially the structure, colour, length and distribution of the feathers, as well as the anatomical structure of the head, beak and claws, which significantly affect their appearance (Parés-Casanova and Kabir, 2019; Özbaşer *et al.*, 2021; Shapiro *et al.*, 2013). This is because pigeons have been subjected to intense selective breeding throughout history, resulting in the emergence of many varieties around the world (Murton *et al.*, 1972; Johnston, 1990). The mature rock pigeon, which is considered the ancestor of domestic pigeons, is 29–37 cm in length, with a wingspan of 62–72 cm. According to standard measurements, the wing, tail, beak and shank lengths are generally 22.3, 9.5–11, 1.8 and 2.6–3.5 cm, respectively (Rock dove, 2022). When these values are compared to similar values for angut pigeons, it can be said that they still retain characteristics similar to those of their wild ancestors (Table II).

Şanlıurfa has an important place in pigeon breeding as it is a region where traditional pigeon breeding has been done for a long time and it is one of the pigeon domestication centers. The source of most of the pigeon breeds in Turkey is Şanlıurfa pigeons (Kürkçüoğlu, 2011; Özbaşer *et al.*, 2016). In this respect, this study was carried out within the scope of the preliminary studies required for the registration of the angut pigeon breed as a local gene source. After morphological measurements, genetic association and characterization studies will be supportive for breed identification.

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Ethical statement

This research was approved by the Harran University Animal Experiments Local Ethics Committee (Approval no: 2021.005.04).

Availability of data and materials

The datasets analysed during the current study are available from the corresponding author on a reasonable request.

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Statement of conflict of interest

The author has declared no conflict of interest.

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