Yuzuncu Yil University
Journal of Agricultural Sciences
(Yüzüncü Yıl Üniversitesi Tarım Bilimleri Dergisi)
https://dergipark.org.tr/en/pub/yyutbd

ISSN: 1308-7576 e-ISSN: 1308-7584

Research Article

Morphological and Morphometric Characterization of an Extremely Short-beaked Turkish Pigeon

Hakan ERDEM*[1], Türker SAVAŞ[2]

[1,2] Çanakkale Onsekiz Mart University, Faculty of Agriculture, Department of Animal Science, 17100, Çanakkale, Türkiye

[1]https://orcid.org/0000-0002-8757-4685, [2]https://orcid.org/0000-0002-3558-2296

*Corresponding author e-mail: hknerdem78@gmail.com

Article Info

Received: 13.04.2025
Accepted: 09.07.2025
Online published: 15.09.2025
DOI: 10.29133/yyutbd.1675061

Keywords

Frill,
Local pigeons,
Morphometry,
Owl,
Short beak

Abstract: This study examines the morphological and morphometric characteristics of the Mısıri pigeon, a unique short-beaked breed from Türkiye. Among Türkiye's local short-beaked breeds, the Mısıri pigeon stands out with its extremely short beak, cubic head, and prominent eyes. Despite Türkiye's long pigeon breeding history, limited scientific research has led to inconsistencies in breed classification. Morphological and morphometric traits were recorded in Mısıri pigeons. Analysis of variance and principal component analysis were applied to these traits. The three components explain 73.26% and 81.18% of the variation for head and body traits, respectively. The results showed that male Mısıri pigeons are larger than females, 275.59 g and 243.85 g respectively. However, significant differences were not found between color pattern varieties. Compared to other short-beaked breeds the Mısıri pigeon has the shortest beak ever recorded in Türkiye. Their beak lengths vary between 7.97-12.22 mm. Historical sources suggest that similar pigeons originated in Anatolia and were brought to Europe. However, the Mısıri pigeon's unique skull structure and short beak distinguish it from related breeds. This study emphasizes the need to document and conserve Türkiye's local pigeon breeds, which remain underrepresented in scientific registries. Despite their distinct traits, many breeds lack formal recognition due to the absence of studies. Identifying and preserving these genetic resources is crucial for maintaining Türkiye's rich pigeon heritage. In conclusion, the Mısıri pigeon is a genetically and morphologically significant breed. Its documentation contributes to the conservation of Türkiye's local breeds and the continuation of the country's historical pigeon breeding culture.

To Cite: Erdem, H, Savaş, T, 2025. Morphological and Morphometric Characterization of an Extremely Short-beaked Turkish Pigeon. *Yuzuncu Yil University Journal of Agricultural Sciences*, 35(3): 475-487. DOI: https://doi.org/10.29133/yyutbd.1675061

1. Introduction

Today's domestic pigeons (*Columbia livia domestica*) originated from wild pigeons (*Columbia livia*) and have spread all over the world except the polar regions. The domestic pigeon shows a great variation, differing morphologically and physiologically from the wild pigeons from which it originated. Pigeon breeders have developed and adopted various breeds according to their "personal preferences" by taking advantage of this variation. There are about 800 pigeon breeds, most of which are raised for hobby purposes (Vogel et al., 1998). This variation among pigeon breeds is greater than interspecific

variation in many bird and mammal species. Pigeons, probably because of their diversity, were used by Darwin as an example in his book in which he explained the principle of natural selection (Darwin, 1984). Although pigeon breeds in Türkiye are bred in almost every region, the intensity of breeding of some pigeon breeds is different according to the region. In the old references where pigeons of European origin are introduced, it is reported that the pigeon breeds recognized today originated from the East (Fulton, 1876; Lyell, 1881). Although pigeon culture in Türkiye dates back to ancient times, unfortunately, the number of studies carried out to identify local breeds of pigeons is limited. Perhaps for this reason, as reported by Savaş and Erdem (2021), there is a confusion between breed descriptions and naming among pigeon breeders. Short-beaked pigeon breeds which are local genetic sources of breeding in Türkiye are similar to each other in form and size (Hünkâri, Manisa Azman, Denizli Azman, Mısıri, Enice, Tokur, Baska). However, there are some significant differences that distinguish these breeds from each other. The most important of these are body ornaments and patterns. For example, the most distinctive trait that distinguishes Denizli Azman from Manisa Azman is that Manisa Azman has chest frill and foot feathers. On the other hand, Enice breed pigeons can share similar colors and patterns with Mısıri pigeons which are the subject of this article. However, Enice birds are larger than Mısıri pigeons. Apart from this, the most distinctive features are the differences in their head structure. The eyes of Mısıri pigeons are relatively larger, more pronounced and protrude a little from the eye socket, their beaks are shorter, and their heads are more cube-shaped and bony. The Mısıri pigeons, are also called as Istanbul Bango, Istanbul Mısırlısı and just Bango among pigeon breeders. However, the word Bango is a general name given to short-beaked breeds in Türkiye as the equivalent of the word owl pigeon breeds (Savaş and Erdem, 2021). There is some speculation about the use of the word Mısıri / Mısırlı. One of them is that the beak of the birds resembles a grain of corn, which is the Turkish word Mısır for corn. Another speculation is that these birds came from Egypt, and in Turkish the word Mısırlı is synonymous with Egyptian. However, there is no written reference in this sense.

It was not possible to find old written sources in Turkish or Ottoman Turkish regarding the short-beaked breeds bred in Türkiye. However, in the state archives, the following lines are mentioned in the document of the Directorate of State Archives (DSA), [HSD.AFT], File No: 9, Folder No: 16, 29.12.1341 (12.09.1923): " Pigeon with cravat; ... has curly feathers on its chest... is a beautiful breed of small size... its head is square, its beak is short and small, its eyes attract attention, it is elegant... the white French cravat with black or light wings, the yellow English cravat and the white cravat are the most favourable. We have the crested and cravat ones..."

However, when looking at old Western literature, it is possible to find information directly related to the short-beaked breeds currently bred in Türkiye, or to pigeons that are very similar to them. In old literature on short-beaked pigeons, there are notes that the short-beaked pigeons brought to Europe for the first time from the 'East' or even from Anatolia. The most frequently mentioned pigeon is the Hünkâri pigeon, which is referred to as Oriental Frill in these texts. In addition to Hünkâri pigeon, short-beaked breeds such as African Owl, Turbit, Tunisian Owl, English Owl, (Fulton, 1876; Lyell, 1881; Starr, 1886; Bungartz, 1890; Twombly, 1900) are also mentioned. Bungartz (1890) mentions short-billed pigeons from Anatolia in his article:

"The skull structure of the self-colored Anatolian Owl can be considered as an ideal Owl skull structure. The eyes are larger and more expressive, the beak is thicker, and the nose is more developed. It has a prominent neckline. The prominent chest further emphasizes the short beak and the strong neck. The richly feathered frill is bushy, the neck proportionally long, the nape beautifully curved and well connected to the head. The tail is of normal width and the carmine red legs are naked without any trace of feathering. These Owls come in all colors. There are white ones as well as tail-colored ones. In these birds, which are different from those known to us as shield Owls, not only the wing covers but also the tail is colored. Therefore, it would be more correct to call it wing-tail Owl. Although pied winged birds are also found in the East, Professor von Rozwadowski has blue and black wing-tails. Probably Anatolian Owls do not have red and yellow ones. The most common ones are blue, ash red, black and chocolate colored; there are also checkers".

Figure 1. From left to right self-colored Anatolian Owl, Anatolian Shielded Owl (Bungartz, 1890).

The self-colored Anatolian Bango and Anatolian Shielded Bango mentioned above are very similar in structure to the Mısıri pigeons, which we call tail and wing-tail, which are the subject of this study, except of the eye size and head shape.

In the case of local breeds that are readily distinguishable phenotypically and are bred by a particular group of breeders, molecular genetic analyses are not a prerequisite for classifying these pigeons as a breed. Description of these breeds is important for the conservation of local genetic resources. In this study, it was aimed to identify some characteristics of the Mısıri pigeon breed, which is known to have been bred in and around Istanbul for a very long time.

2. Materials and Methods

In the study, morphometric measurements of 37 male and 29 female Mısıri pigeons, which were randomly selected and brought to the "2021 Mısıri and Baska Pigeon Exhibition" in Istanbul, were utilized. The morphological traits body length (cm), right eye diameter (mm), left eye diameter (mm), beak length (mm), beak height (mm), beak width (mm), head length (mm), head height (mm), head width (mm), wingspan (cm), breast width (mm), leg length (tarsus+tibia length, mm), middle finger length (mm), tail length (mm) were measured with the help of calipers (Torq®, PRC, precision of 0.01 mm) and tape measure (precision of 1 mm), and live weights were measured with a scale (Tem® Eko, Türkiye) with a precision of 0.5 g. The pictures showing the technique of measurements are presented in Figure 3. Mısıri pigeons have two different color patterns. The first one is the called 'wing-tail' in which the feathers on the wing and tail feathers are covered with the same colour and the rest of the body parts and flight feathers are white. The second form is the so-called 'tail' form in which the rest of the body parts are white, except for the tail feathers. There are also Mısıri pigeons which are pure white (Figure 2). As seen in Figure 2A, coloration can be seen on the white body parts of Mısıri pigeons. However, this coloration is considered as fault and these spots on the white body parts are not desired.

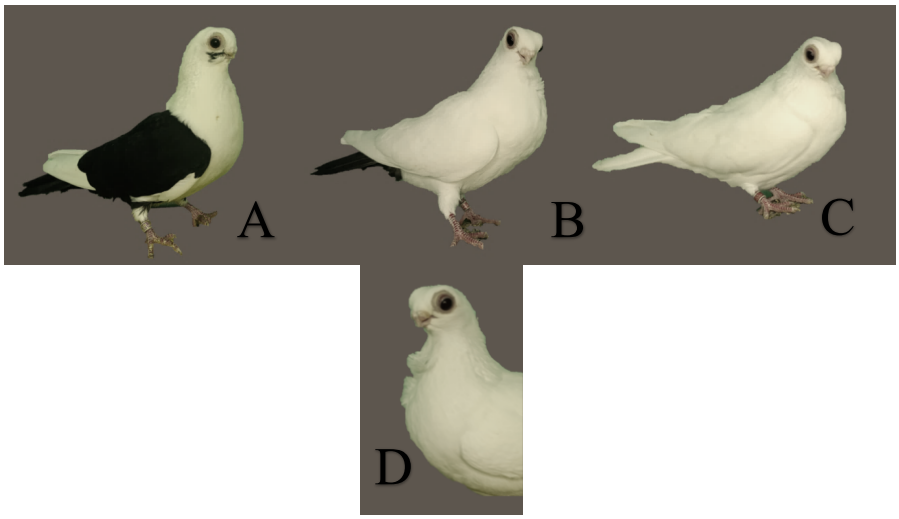

Figure 2. Pattern varieties and chest frill sample A: Wing-Tail pattern B: Tail pattern C: Self white D: Chest frill.

Literature was used to determine the morphometric measurements used to identify birds (Baldwin et al., 1931; Bourgeois et al. 2007; Carey, 2011; Pigot et al., 2020). For body length measurement, the pigeons were laid on a tape measure on a flat surface and the distance between the tail end and the tip of the beak was measured (Figure 3A). During this measurement, the neck of the bird was placed in a straight position and the beak was parallel to the ground. For the wingspan, the distance between the two wing tips was measured by the same method (Figure 3B). The eyeball of Mısıri pigeons is slightly protruding from the eye socket. Using this situation, the left and right eyeballs were measured with a caliper. As can be seen in Figure 3C, when the diameter of the eye is measured, it appears as if the featherless area around the eye is being measured because the eyeball extends into this area. However, the eyeball, which is slightly compressed with the caliper, is measured. Chest width was measured from the widest point of the chest, which begins at the end of the crop, just below the point where the humerus connects to the coracoid (Figure 3D).

Figure 3. Morphometric measurements: A: body length, B: wingspan, C: eye diameter, D: chest width, E: tail length, F: beak length, G: beak height, H: beak width, I: head height, J: head width, K: head length, L: tarsus length, M: tibia length, N: middle finger length.

Tail length was measured from the root of the tail feather in the middle of the tail to the end of the feather. (Figure 3E). The beak length was measured by measuring the distance from the root of the nose to the tip of the beak (Figure 3F). The beak height was determined by measuring the distance between the root of the nose, which is the widest part of the beak, and the end of the lower beak (Figure 3G). The beak width was determined by measuring the axis forming the mouth opening where the upper and lower beaks meet (Figure 3H). The head height was determined by measuring the distance between the end of the lower beak and the midpoint of the skull (Figure 3I). For the head width, the part between the eye frames was measured based on the midpoint of the eyes (Figure 3J). The head length was determined by measuring the distance between the end of the beak/ forehead and the back of the skull (Figure 3K). The tarsus length was measured from the end of the finger joints to the point where the tarsus meets the tibia (Figure 3L). For the tibia length, the point where the tarsus meets the tibia and the point where the tibia meets the femur were measured (Figure 3M). The length of the middle finger was determined by measuring the distance between the nail root and the point where the finger meets the wrist (Figure 3N).

In the statistical analysis of the traits, the analysis of variance method was used in a model in which pattern, gender, and their interactions were included with the software package SAS (2002).

Principal Component Analysis (PCA) was applied with the software package JMP 18 (2024) to reveal the differences or similarities between the design and genders. The main idea of principal component analysis is to reduce the size of a data set with a large number of interrelated variables into new variables that are not related to each other while preserving as much of the variation present in the data set as possible (Mishra et al., 2017). Principal component analysis can reveal previously unsuspected relationships and thus allow for the development of overlooked interpretations (Johnson and Wichern, 2007). In the study, head traits and body traits were subjected to principal component analysis separately. The most prominent trait that distinguishes the Mısıri pigeon from other pigeon breeds is the differentiation in the head structure. The beak length was not included in the analysis since it had a weak correlation with other traits (Table 2). The obtained scores were visualized separately for gender and pattern with the help of the JMP 18 (2024) package program. In addition, the obtained scores were subjected to analysis of variance in a linear model including pattern, gender, and their interactions.

3. Results

3.1. Qualitative description

The colors of the Mısıri pigeons are black, blue bar, spread brown, brown bar and their dilutes (Figure 4). Although the Mısıri pigeons do not have leg feathers and crests, they have an ornament called chest frill (Figure 2D). The frill is formed by the opening and curling of the feathers to the left and right in a line on the chest from the neck. Their eye colors are tones of brown to dark brown. The beak and nails are dark yellowish pink. The number of tail feathers is 12 and the breed has a preen gland (*Glandula uropygialis*).

The reproductive performance of these small and delicate pigeons is lower than that of long-beak pigeons. They incubate reliably, but hatch rates are low due to fertilization problems and the inability of the chicks to break the egg probably due to their short beaks (Savaş et al., 2025). The parents also have problems raising offspring due to their short beaks. For this reason, breeders raise the Mısıri squabs with medium-long beaks foster pigeons or hand feeding. The Mısıri pigeon is originally a diving breed that can fly at medium heights. However, due to the difficulty in the breeding of Mısıri pigeons, they are not taken flying by breeders today.

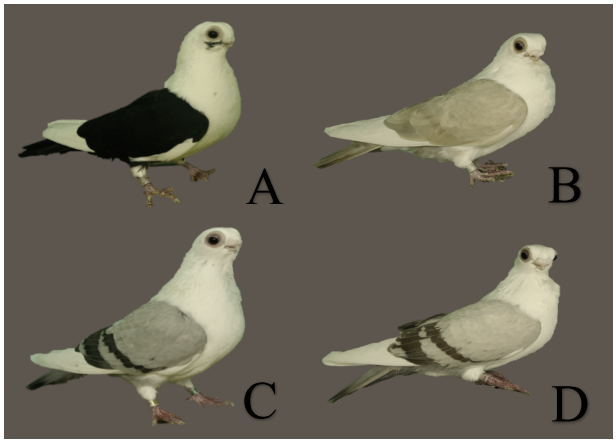

Figure 4. The Mısıri pigeon color varieties, A: Black; B: Dilute self-brown; C: Blue bar; D: Brown bar.

3.2. Quantitative description

There is no significant difference (P>0.05) between the pigeons in terms of pattern in all traits. Table 1 shows the comparison of the sexes according to their morphometric values. The live weight, body length, wingspan and tail length of male and female Mısıri pigeons were significantly different (P<.0001). These differences show that males are larger than females. Male and female pigeons had similar chest width values (P=0.1859).

Table 1. Least squares mean ($\bar{X}$), standard errors (SE), maximum (Max) and minimum (Min) values and significance levels (P) of the traits by gender

	Female				Male				*P value*
	$\bar{X}$	SE	Max	Min	$\bar{X}$	SE	Max	Min	
Live weight, g	243.85	5.037	304.00	170.00	275.59	4.459	318.00	231.00	<.0001
Body length, cm	29.50	0.164	31.50	27.50	31.11	0.145	33.50	29.50	<.0001
Right eye diameter, mm	16.16	0.221	19.27	14.05	16.44	0.195	19.03	14.10	0.3536
Left eye diameter, mm	16.82	0.264	20.27	14.65	17.11	0.234	20.42	13.99	0.4103
Beak length, mm	9.75	0.194	12.22	8.21	9.88	0.172	12.03	7.97	0.6290
Beak height, mm	10.53	0.212	13.20	8.73	11.45	0.188	13.93	9.26	0.0019
Beak width, mm	12.65	0.221	14.76	10.45	13.72	0.195	16.57	10.81	0.0006
Head length, mm	30.44	0.268	32.81	27.28	31.82	0.237	34.82	28.57	0.0003
Head height, mm	21.35	0.258	25.63	19.19	22.87	0.228	26.30	19.85	<.0001
Head width, mm	20.14	0.249	22.98	16.43	21.36	0.220	25.03	18.95	0.0005
Wingspan, cm	58.96	0.337	62.10	55.00	61.68	0.298	66.50	57.50	<.0001
Chest width, mm	49.34	0.644	56.64	39.55	50.49	0.570	57.11	45.85	0.1859
Middle finger, mm	22.62	0.783	25.44	19.77	25.41	0.693	56.53	20.47	0.0096
Tibia, mm	45.28	1.548	51.10	38.60	48.42	1.384	52.90	42.40	0.4807
Tarsus, mm	29.47	0.820	32.50	26.40	29.69	0.733	32.90	26.60	0.7374
Tail length, cm	10.59	0.086	11.80	10.00	11.37	0.076	12.30	10.40	<.0001

When the measurements of head structure were analyzed, it was observed that male Mısıri pigeons had a larger head structure than female pigeons (P≤0.0005). However, there was no statistical difference between male and female Mısıri pigeons in terms of eye diameter (P≥0.3536). While there was no statistical difference between males and females in terms of tibia and tarsus length (P≤0.7374), males had a longer middle finger (P=0.0200).

3.3. Principal component analysis

Table 2 shows the correlation coefficients between the traits. When the correlation coefficients are analyzed, it is seen that the beak length (BL) has a very weak relationship with the other traits except for the traits related to size (live weight, body length, wing and leg length). Probably for this reason, it was observed that the explained variation increased when the beak length was excluded from the PCA analysis.

Table 2. Correlation coefficients between the morphometric traits

	LW	BDL	WS	CW	LL	MF	TL	RE	LE	BL	BH	BW	HL	HH	HW
LW	1														
BDL	0.73	1													
WS	0.60	0.71	1												
CW	0.36	0.11	0.45	1											
LL	0.00	0.08	0.53	0.42	1										
MF	0.28	0.41	0.51	0.08	0.31	1									
TL	0.42	0.63	0.52	0.10	0.04	0.35	1								
RE	0.19	0.21	0.08	0.04	-0.07	-0.06	0.05	1							
LE	0.04	0.18	0.04	-0.03	-0.06	-0.15	0.08	0.72	1						
BL	0.26	0.22	0.34	0.15	0.30	0.07	0.05	-0.04	-0.06	1					
BH	0.39	0.49	0.06	-0.19	-0.33	-0.02	0.29	0.42	0.40	0.11	1				
BW	0.53	0.53	0.23	-0.08	-0.25	0.13	0.37	0.35	0.24	0.08	0.59	1			
HL	0.61	0.51	0.43	0.34	0.06	0.22	0.3	0.19	0.22	0.17	0.32	0.35	1		
HH	0.40	0.40	0.40	0.15	0.01	0.13	0.45	0.11	0.11	0.02	0.34	0.36	0.32	1	
HW	0.35	0.32	0.5	0.53	0.36	0.35	0.28	0.14	0.02	0.02	-0.06	0.14	0.27	0.25	1

LW: live weight; BDL: body length; WS: wingspan; CW: chest width; LL: Leg length; MF: middle finger; TL: tail length; RE: right eye diameter; LE: left eye diameter; BL: beak length; BH: beak height; BW: beak width; HL: head length; HH: head height; HW: head width.

The first three components of head traits explained 73.26% of the total variation (Figure 5). It is seen that the variation explained by the first 3 components progresses almost in a flat line in the other components after sudden drops (Figure 5). The summarizing components are those that lie before the kink, the so-called elbow (Figure 5), or have an eigenvalue greater than 1 (Brown, 2009; Greenacre et al., 2022). In this case, both criteria are fulfilled by the first three components. When the eigenvectors of the principal components are examined in Table 3, it is seen that the traits that contribute highly to the first component are eye diameters, beak height and beak width. Examining the traits contributing to the second principal component reveals that these are head length, head height and head width. The contribution of head width to the third principal component is high.

Table 3. Eigenvectors of principal components for head traits

	PC1	PC2	PC3
Right eye diameter	0.43	-0.41	0.33
Left eye diameter	0.40	-0.47	0.29
Beak height	0.46	-0.09	-0.44
Beak width	0.44	0.14	-0.32
Head length	0.35	0.35	0.09
Head height	0.32	0.46	-0.19
Head width	0.16	0.49	0.68

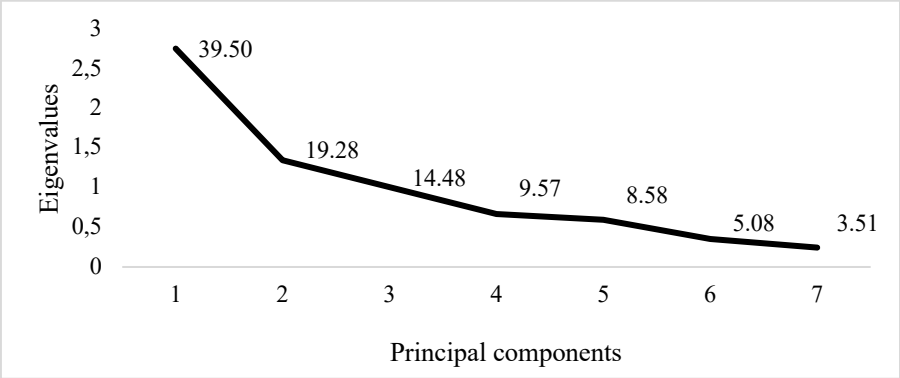

Figure 5. Eigenvalues and ratios of principal components of head traits.

The distribution of these first three principal component scores in the graph shows that females and males are clearly differently positioned at the intersections of the first principal component with components 2 and 3 (Figure 6). This clearly indicates that gender causes variation. However, when the intersections of the third and second principal components are examined, it is seen that females and males approach each other. However, when these three components are observed in the three-dimensional plane (Figure 6), it is seen that male and female pigeons are positioned differently in terms of the head features considered.

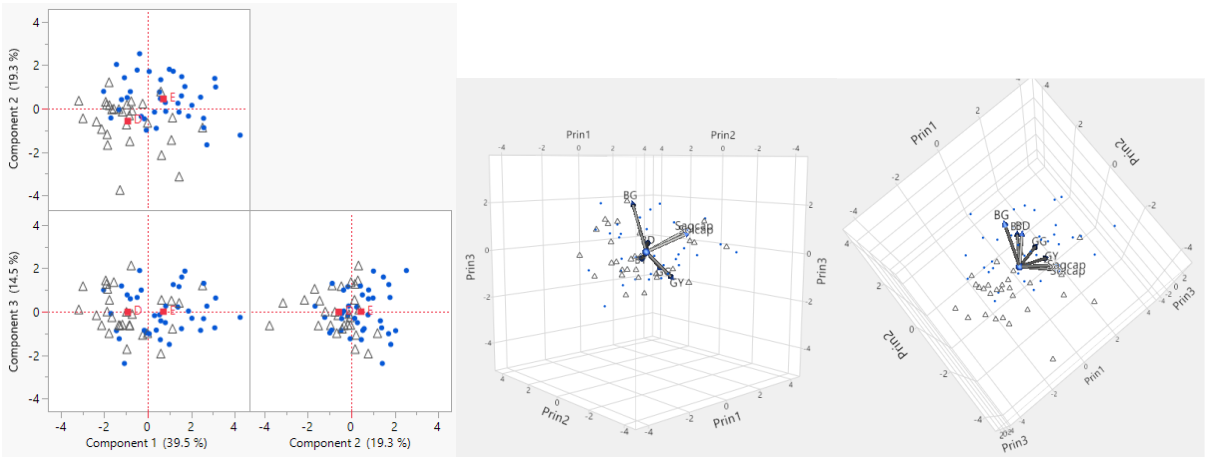

Figure 6. 2D and 3D distributions of the first three principal components of head traits by gender (•: Male Δ: Female).

When head traits are analyzed according to the patterns, it is seen that the principal component scores obtained are in similar regions, and birds with wing-tail and tail patterns do not differ from each other (Figure 7). When the three-dimensional plot of the scores in Figure 7 is analyzed, it is observed that there is no difference in terms of pattern.

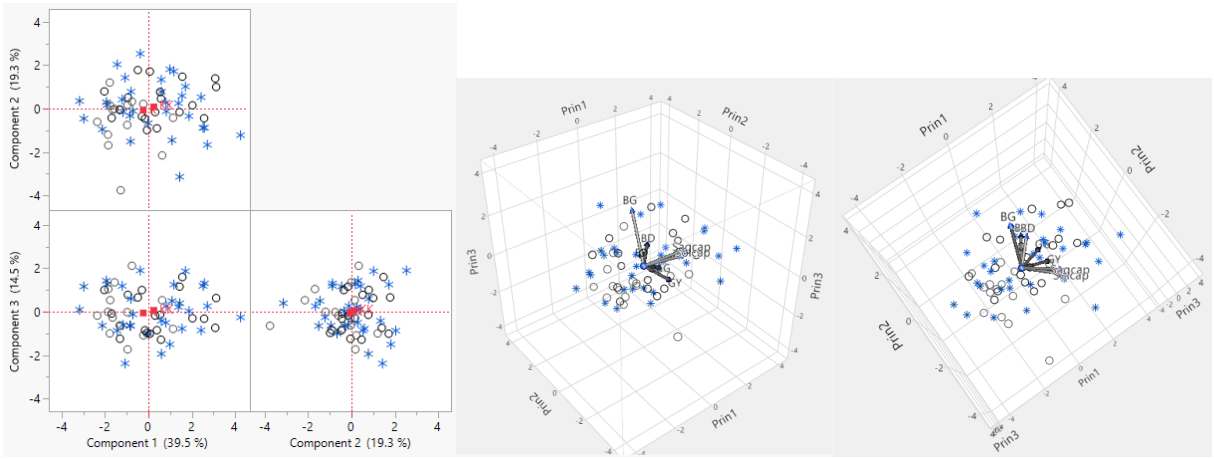

Figure 7. 2D and 3D distributions of the first three principal components of head traits according to the patterns (o: Wing, ∗: Wing-tail).

The first three principal components of body traits explained 81.18% of the total variation (Figure 8). When the eigenvectors are examined, it is seen that the traits contributing to the first component are live weight, body length, wingspan and tail lengths (Table 4). The second principal component is mainly contributed by leg length and chest width. It can be said that the length of the middle finger contributes mainly to the third component.

Table 4 Eigenvectors of principal components (PC) for body traits

	PC 1	PC 2	PC 3
Live weight	0.42	-0.23	-0.44
Body length	0.46	-0.33	-0.03
Wingspan	0.50	0.16	0.03
Chest width	0.25	0.51	-0.55
Leg length	0.22	0.67	0.27
Middle finger length	0.33	0.04	0.64
Tail length	0.37	-0.32	0.12

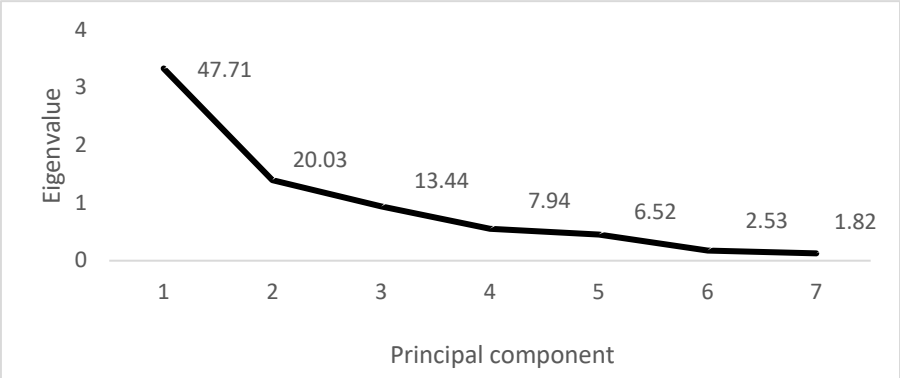

Figure 8. Eigenvalues and ratios of principal components of body traits.

When the principal component analysis results for the first three components according to the body traits subject to the research are examined, it is seen that the scores differ according to gender as in the head traits (Figure 9). However, when considered according to the patterns, it is seen that the patterns do not differ from each other as in the head traits (Figure 10).

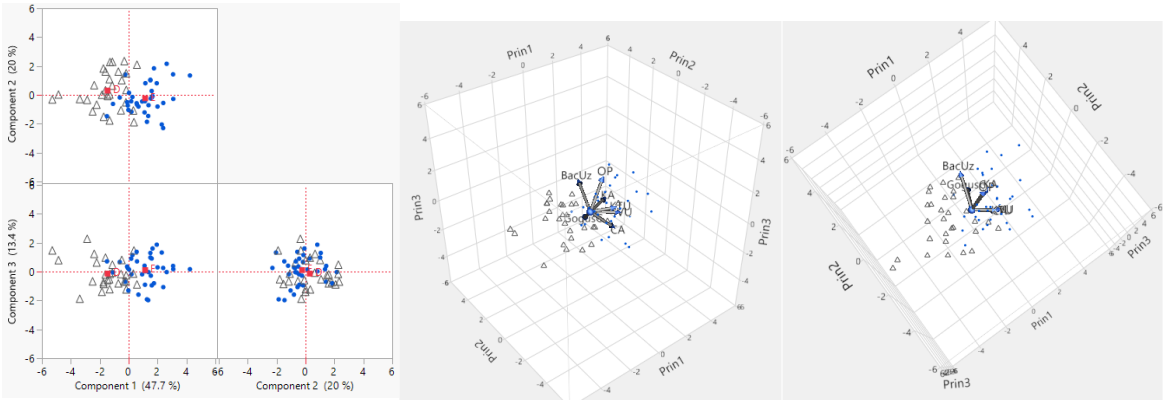

Figure 9. 2D and 3D distributions of the first three principal components of body traits by gender (•: Male Δ: Female).

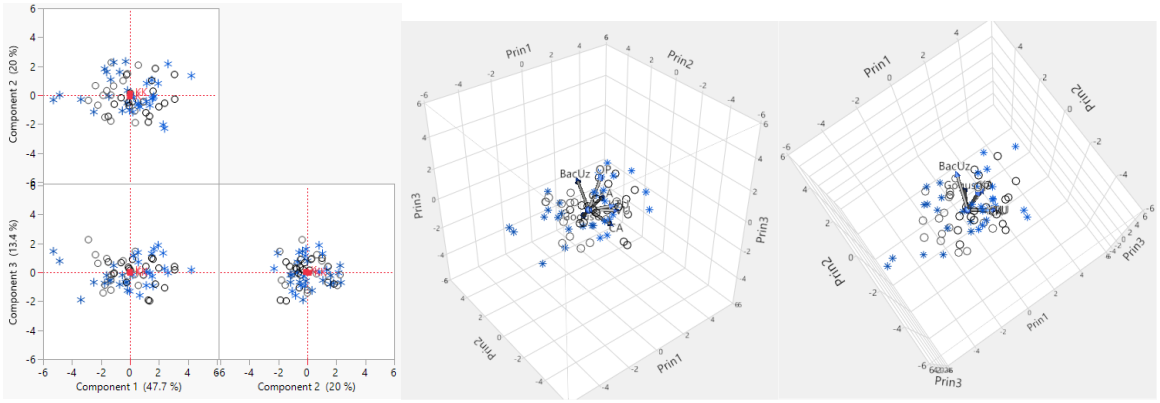

Figure 10. 2D and 3D distributions of the first three principal components of body traits according to the patterns (o: Wing, ∗: Wing-tail).

Table 5 shows the significance levels of the analysis of variance applied to the principal component scores obtained. Here, it is seen that pattern and pattern gender interaction are insignificant for the first three principal components. However, the significance level of pattern gender interaction in the 1st principal component for body traits is remarkable. For head traits, the first 2 components are

important for the gender factor, while for body traits, the first component is the main component that causes the difference. However, the importance level of the 2nd principal component is remarkable.

Table 5. Significance levels of principal component scores from the linear model

	Head traits			Body traits		
	PC 1	PC 2	PC 3	PC 1	PC 2	PC 3
Pattern	0.2013	0.6212	0.6713	0.8653	0.4229	0.6259
Gender	**<.0001**	**0.0002**	0.9526	**<.0001**	0.0686	0.2822
Pattern*Gender	0.8352	0.6165	0.9226	0.0612	0.4241	0.1044

4. Discussion

In previous sources, there is no mention of differences in eye and head structure when looking at short-beaked breeds said to originate from Anatolia (Fulton, 1876; Lyell, 1881; Starr, 1886; Bungartz, 1890; Twombly, 1900). Mısıri pigeons are distinctly differentiated from other similar local short-beaked breeds in Türkiye by their eye and head structure (Figure 11). The Mısıri pigeon stands out with its extremely short beak, cubic head, and prominent eyes. In terms of body structure and pattern, it is very similar to another local breed called Enice except for the head structure. In addition, although it is similar to Manisa and Denizli Azmans in terms of body structure and pattern, it differs from these breeds in terms of body ornaments. Although Manisa Azman and Mısıri have chest frills, Manisa Azman has foot feathers while Mısıri does not have a foot feathers. Denizli Azmans and Tokur do not have chest frills and foot feathers.

In a study involving our short-beaked genetic resources Baska and Mısıri pigeons, another local breed was introduced as Bango, probably as a result of breeders' misleading (Özbaşer Bulut et al., 2022). However, this breed, which is introduced as Bango, actually consists of Bulgarian Shield Owl and their crossbreds with Mısıri. The word Bango is the equivalent of the word "owl", which is used in many regions in Türkiye for short-beaked breeds such as Baska, Mısıri, Azman (Bungartz, 1890; Savaş and Erdem, 2021; Türkeş and Gündüz, 2021).

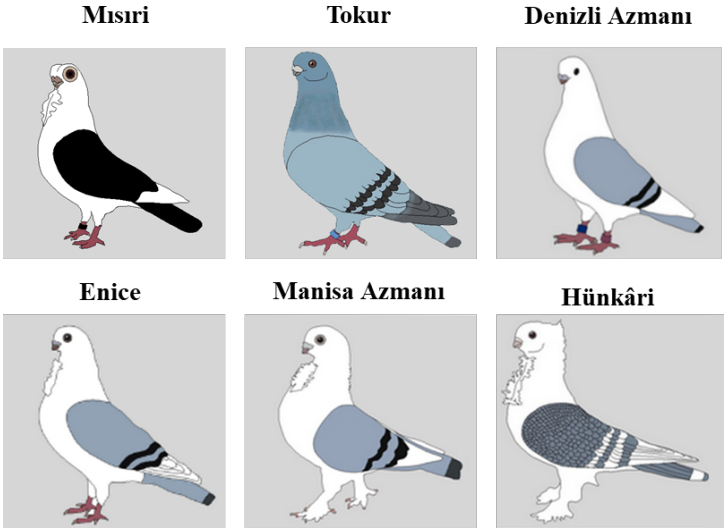

Figure 11. Some of our local short-beaked breeds (Illustrations by Serkan Gündüz).

When we look at the morphometric identification studies on local breeds in Türkiye, it is seen that Mısıri pigeons have a smaller body size than other pigeons (Soysal et al., 2011; Erdem et al., 2018; Erdem et al., 2021; Çelik, 2023; Savaş et al., 2023; Erdem et al., 2024; Şimşek et al., 2024; Türkeş and Gündüz, 2024). Furthermore, the beak length is shorter than the Hünkâri, Manisa Azman, and Denizli Azman breeds, which are defined as short-beaked pigeons (Savaş et al., 2023). The average beak lengths of these breeds are 15.2 mm, 15.3 mm and 13.3 mm, respectively (Savaş et al., 2023), while the average beak length of the Mısıri pigeon is 9.8 mm. In this respect, it is the pigeon breed with the shortest beak

structure identified so far in Türkiye. This short-beaked brings various problems and affects the reproduction and survival of these birds (Savaş et al., 2025). Savaş et al. (2007) reported that short-beaked pigeons consume feed more difficultly than normal-beak birds.

For morphometric measurements in birds, some studies include the beak length in the head length, while some studies consider only the length of the skull, as in this article (Karris et al., 2013; Joo et al., 2018). When the head length, head height and head width of the Mısıri pigeons are considered, it is seen that they have a cubic head structure compared to other pigeon breeds. This cubic structure is especially prominent due to the very short beak. It is observed that Mısıri pigeons have a similar body length to wingspan ratio (1:2) as pigeon breeds reported in the literature (Atasoy et al., 2013; Parvez et al., 2016; Erdem et al., 2018; Çelik, 2023). Measurements of leg (tarsus + tibia length), tarsus and tibia lengths were found only in Edremit Kelebek Roller and Thrace Roller pigeons among the local breeds of Türkiye (Soysal et al., 2011; Erdem et al., 2018). In this sense, it is predictable that Mısıri pigeons, which have a small body size, will have a shorter leg structure than these pigeons. However, when the body length and tarsus length are compared, it is understood that the body length of the Edremit Kelebek Roller pigeon is approximately 13 times the length of the tarsus. In Mısıri pigeons, the body length is 10 times the tarsus length.

The results of both the analysis of variance in Table 1 and the principal component analysis show that there is a sexual dimorphism in Mısıri pigeons. Differences in body length and live weight between sexes in pigeons are already know (Soysal et al., 2011; Erdem et al., 2018; Parés Casanova and Kabir, 2020; Savaş and Erdem, 2022). Principal component scores differed according to gender, indicating that sexual dimorphism is not only in terms of size, but also between proportions of body parts (Table 5). However, there is no differentiation between color patterns. In other words, colour patterns are not only mated among themselves. Therefore, there is no possible genetic segregation on the basis of the traits considered in this study.

When the correlation coefficients of the traits subject to the study are examined, it is seen that the traits related to the head have a moderate (0.30-0.40) positive correlation with each other (except beak length). Body traits were also positively correlated with each other at a moderate to high level (0.40-0.70%). The correlations between body and head traits show that some correlations are weak and some are moderate, indicating that both head and body traits alone are not sufficient for morphometric descriptions. If we look at the 2-D plots examined by gender (Figures 6 and 9), we see that the projections of the traits, especially in the 2nd and 3rd principal components, overlap and do not cause any differentiation. However, when these scores are examined in the 3D plots (Figures 6 and 9), it can be seen that the scores differ from each other. Therefore, evaluating these scores only in the 2D graphs may lead to overlooking possible differences. In this regard, it would be more useful to examine the intersections obtained when the number of principal components is 3 or more in the 3D graph. In conclusion, principal component analysis is a useful method to visualize the existing differences, but it should be used with caution

Conclusion

In the context of the diverse pigeon breeds that is Türkiye, the Mısıri pigeon breed is distinguished by its unique characteristics. These include a distinctive head morphology and an extremely short beak. The two-color variants of the breed are indistinguishable in terms of the characteristics examined in the study. On the other hand, there is a discrepancy in the proportions of the individual body parts between the genders; moreover, the males are also larger. These studies should continue at an accelerated pace in order to both protect local gene resources and to transfer the cultural heritage they create to the future.

Ethical Statement

Since no experimental intervention was performed on animals in the study, ethics committee authorization is not required.

Conflict of Interest

The authors declare that there are no conflicts of interest.

Funding Statement

This research received no specific grant from any funding.

Author Contributions

The authors of the study contributed equally to all stages of the research.

Acknowledgements

We would like to thank Serkan Gündüz for the pigeon illustrations.

References

Atasoy, F., Erdem, E., & Hacan, Ö. G. (2013). Ankara ilinde yetiştirilen taklacı güvercinlerde (*Columba livia domestica*) morfolojik özelliklerin belirlenmesi. *Ankara Üniv Vet Fak Derg*, *60*, 135-143. https://doi.org/10.30607/kvj.1098239

Baldwin, S. P., Oberholser, H. C., & Worley, L. G. (1931). Measurements of birds. *Scientific Publications of the Cleveland Museum of Natural History, 2*.

Bourgeois, K., Curé, C., Legrand, J., Gómez-Díaz, E., Vidal, E., Aubin, T., & Mathevon, N. (2007). Morphological versus acoustic analysis: what is the most efficient method for sexing yelkouan shearwaters Puffinus yelkouan?. *Journal of Ornithology*, *148*, 261-269. https://doi.org/10.1007/s10336-007-0127-3

Brown, J. (2009). Choosing the right number of components or factors in PCA and EFA. *JALT Testing & Evaluation SIG Newsletter*, *13*(2).

Bungartz, J. (1890). Neue asiatische Mövchen. *Mitteilungen des Ornithologischen Vereins in Wien*, *14*, 96-97.

Carey, M. J. (2011). Sexual size dimorphism, within-pair comparisons and assortative mating in the short-tailed shearwater (*Puffinus tenuirostris*). *Notornis*, *58*, 8-16. https://doi.org/10.63172//246834cdboxd

Çelik, R. (2023). Morphological characteristics of Şebap Pigeons (*Columba livia domestica*). *Journal of Istanbul Veterinary Sciences*, *7*(1), 27-33. https://doi.org/10.15312/EurasianJVetSci.2024.428

Darwin, C. (1984). Türlerin kökeni (4th Edition). Şahin Matbaası, Istanbul.

Drectorate of State Archives (DSA), Güvercin yetiştiriciliğe dair lahiya [HSD.AFT], File No: 9, Folder No:16, 29.12.1341(12.09.1923), https://katalog.devletarsivleri.gov.tr/Sayfalar/eSatis/BelgeGoster.aspx?ItemId=21216495&Hash=614AB80714072DA68CF98E773F0131B0B9EE674B758AC37916CDF2B7C70FDCEC&A=2&Mi=0. Access date: 31.07.2024.

Erdem, E., Özbaşer, F. T., Gürcan, E. K., & ihsan Soysal, M. (2024). Türkiye's indigenous genetic resource: Muradiye Kelebek pigeon. *Ankara Üniversitesi Veteriner Fakültesi Dergisi*, *71*(1), 41-49. https://doi.org/10.33988/auvfd.1060211

Erdem, E., Özbaşer, F. T., Gürcan, E. K., & Soysal, M. I. (2021). The morphological and morphometric characteristics of Alabadem pigeons. *Turkish Journal of Veterinary & Animal Sciences*, *45*(2), 372-379. https://doi.org/10.3906/vet-2005-58

Erdem, H., Konyalı, C., & Savaş, T. (2018). Morphological Characterization of Edremit Kelebek Roller Pigeons. *COMU Journal of Agriculture Faculty*, *6*(2), 93-100.

Fulton, R. (1876). Wright, L. (Ed.), & Ludlow, J. W. (Painter). *Illustrated book of pigeons, with standards for judging*. England: Cassel Company.

Greenacre, M., Groenen, P. J., Hastie, T., d'Enza, A. I., Markos, A., & Tuzhilina, E. (2022). Principal component analysis. *Nature Reviews Methods Primers*, *2*(1), 100. https://doi.org/10.1038/s43586-022-00184-w

JMP Statistical Discovery (2024). JMP Software Version 18.0.1. JMP Statistical Discovery, Cary, NC

Johnson, R. A., & Wichern, D. W. (2007). Applied multivariate statistical analysis (6th edition). Pearson Prentice Hall, USA.

Joo, E. J., Ha, M. R., Jeong, G., & Yoon, J. (2018). A non-invasive sexing method reveals the patterns of sex-specific incubation behavior in Saunders's Gulls (*Saundersilarus saundersi*). *The Ornithological Society of Korea, 25*(2), 69-76. https://doi.org/10.30980/KJO.2018.12.25.2.69

Karris, G., Thanou, E., Xirouchakis, S., Voulgaris, M. D., Fraguedakis-Tsolis, S., Sfenthourakis, S., & Giokas, S. (2013). Sex determination of Scopoli's shearwater (*Calonectris diomedea*) juveniles: a combined molecular and morphometric approach. *Waterbirds*, *36*(2), 240-246.

Lyell, J. C. (1881). *Fancy pigeons*. London, UK: The Bazaar Office.

Mishra, S. P., Sarkar, U., Taraphder, S., Datta, S., Swain, D. P., Saikhom, R., Panda, S., & Laishram, M. (2017). Multivariate statistical data analysis- Principal Component Analysis (PCA). *International Journal of Livestock Research*, *7*, 60-78. https://doi.org/10.5455/ijlr.20170415115235

Özbaşer Bulut, F. T., Erdem, E., Gürcan, E. K., & Soysal MI (2022). Genetic animal heritage of anatolia: short-beaked pigeon genotypes. *Kocatepe Veterinary Journal*, *15*(4), 450-459. https://doi.org/10.30607/kvj. 1181236

Parés Casanova, P. M., & Kabir, A. (2020). Bigger Males, Bigger Females? Pigeons' Sexual Size Dimorphism. *Annual Research & Review in Biology*, *35*(10), 20-24. https://doi.org/10.9734/arrb/2020/v35i1030286.

Parvez, M. N. H., Akter, M. T. D., & Sarder, M. J. U. (2016). Phenotypic characteristics and biometrical study on different breeds of pigeon in northern Bangladesh. *Bangladesh Journal of Veterinary Medicine*, 14(2). https://doi.org/10.3329/bjvm.v14i2.31382

Pigot, A. L., Sheard, C., Miller, E. T., Bregman, T. P., Freeman, B. G., Roll, U., ... & Tobias, J. A. (2020). Macroevolutionary convergence connects morphological form to ecological function in birds. *Nature Ecology & Evolution*, *4*(2), 230-239. https://doi.org/10.1038/s41559-019-1070-4

SAS Institute (2002). Statistical Analysis System SAS/STAT Software Version 9.0. SAS Institute, Cary, NC

Savaş, T., & Erdem, H. (2021). On the Problem of" Breed" in Pigeon Breeding. *International Journal of Poultry-Ornamental Birds Science and Technology*, *2*(1), 23-29.

Savaş, T., & Erdem, H. (2022). Sexual dimorphism in body size and some exterior traits of pigeon breed groups. *Journal of Poultry Research*, *19*(2), 68-77. http://doi.org/ 10.34233/jpr.1219731

Savaş, T., Erdem, H., & Tölü, C. (2025). Hatchability and nestling viability in an extremely short-beaked pigeon breed. (under review).

Savaş, T., Erdem, H., Gündüz, S., & Damgacı, İ. (2023). Morphometric Comparison of Three Short-Beak Pigeon Breeds from The Aegean Region (Turkey) By Discriminant Analysis. *International Journal of Poultry-Ornamental Birds Science and Technology*, *4*(1), 15-20.

Savaş, T., Konyalı, C., Das, G., & Yurtman, I. Y. (2007). Effect of beak length on feed intake in pigeons (*Columba livia f. domestica*). *Animal Welfare*, *16*(1), 77-83. https://doi.org/10.1017/S0962728600030955

Şimsek, U. G., Altundal, B., Akarsu, S., & Karadag, R. (2024). Morphometric identification of Bursa Oynarı pigeon varieties. *Eurasian Journal of Veterinary Sciences*, *40*(2).

Soysal, M. İ., Gürcan, E. K., Alter, K., Akar, T., & Genç, S. (2011). Determination of Various Morphological Characteristics of the Trakya Makaracı Pigeon Breed Raised in Thrace. *Journal of Tekirdag Agricultural Faculty, 8*(3), 61-68.

Starr, E. S. (1886). The breeding of fancy pigeons. *Cent Illus Mon Mag,* 32, 94–107.

Türkeş, M., & Gündüz, S. (2021). The classic Manisa hünkâri piegons: History and classification. *Kebikeç: İnsan Bilimleri İçin Kaynak Araştırmaları Dergisi*, (51).

Türkeş, M., & Gündüz, S. (2024). Introduction and Morphological Description of the Classic Hünkâri Pigeons in Türkiye. *Turkish Journal of Agriculture-Food Science and Technology*, *12*(1), 22-32. https://doi.org/10.24925/turjaf.v12i1.22-32.6314

Twombly, C. E. (1900). The Pigeon Standart. Boston, USA

Vogel, C., Vogel, M., Detering, W., & Löffler, M. (1998). *Tauben*. Berlin: Behtermünz Verlag.