



Morphometric and Phenotype Characteristics of Female Madura Cattle Sonok Type

Ayu Tri Ambarwati Rifai^{1,*}, Rizki Prafitri², and Kuswati²

¹ Student of Faculty of Animal Science, Universitas Brawijaya, Malang 65145, Indonesia

² Lecturer of Faculty Animal Science, Universitas Brawijaya, Malang 65145, Indonesia

*ambarwati5101@student.ub.ac.id

Abstract. This research aimed to determine the morphometric and phenotypes characteristic of Madura cattle Sonok type. This research was conducted in Waru District, Pamekasan Regency, September-October 2023. This research used a survey method with purposive sampling for location determination. In this study 140 female Madura cattle were used. The variables observed were body size such as withers height, body length, chest girth and body weight, and phenotypes characteristic of Madura cows Sonok type. The results show that the Sonok withers height's average are 116 ± 5.35 cm (PI0), 124 ± 3.49 cm (PI2), 130 ± 3.23 cm (PI4), 133 ± 2.32 cm (PI6) and 136 ± 1.75 cm (PI8). The Sonok body length's average are 116 ± 5.31 cm (PI0), 126 ± 3.69 cm (PI2), 131 ± 3.21 cm (PI4), 135 ± 2.06 cm (PI6), and 137 ± 1.41 cm (PI8). The Sonok chest girth's average are 136 ± 8.84 cm (PI0), 148 ± 4.03 cm (PI2), 159 ± 4.53 cm (PI4), 168 ± 3.11 cm (PI6), and 174 ± 2.94 cm (PI8). The Sonok body weight's average 199 ± 31.95 kg (PI0), 255 ± 17.67 kg (PI2), 303 ± 22.36 kg (PI4), 351 ± 17.08 kg (PI6), and 384 ± 15.50 kg (PI8). The results show that the cattle that meet the quantitative requirements of SNI 7651-2:2023 for Class I Madura cattle is 44.29%, Class II is 29.29%, and Class III is 5.71%, while the cattle that do not meet the SNI 7651-2:2023 requirements is 20.71%. The phenotypes characteristics of Sonok cows in Waru District are by the requirements of SNI 7651-2:2023 such as horns pointing upwards, a black line around the eyes, slanted eyes, small ears with a black line on the ears, reddish-brown body color, large hump, has muscle tissue in the front legs, a dewlap, a dorsal line, and long black tail fur. The productivity of Sonok cattle is considered good as it has met the requirements of SNI.

Keywords: Morphometric, phenotypes, Madura sonok cows.

1 Introduction

Madura cattle are one of the most famous local cattle in Indonesia, especially on the island of Madura. They are resulted from a cross between a Zebu cow (*Bos indicus*) and a bull (*Bos Javanicus*) [1]. Madura cattle are adaptive to tropical environments, have a high percentage of carcasses, and can grow well, although they are fed low-quality forage [2]. Pamekasan is a Madura cattle-breeding-center area and has 193,192 cattle [3]. One of the most recognizable types of Madura cattle is the Sonok, which has

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unique characteristics and high economic value. Sonok cattle are known for their large posture, dark brown or brick-red skin, and horns which rise upwards. The characteristics of Madura cattle are mainly brownish to brick-red hair, small-to-medium posture, short legs, and black muzzle [4].

In Madura, two well-known cultures are identical, namely the bull race and the Sonok cattle contest. The bull race is a traditional Madurese culture that prioritizes the running speed of bulls. Meanwhile, the Sonok cattle contest is a traditional Madurese art that the selected female cows' beauty, harmony, and skills [5]. In the Sonok cattle contest, the assessment of cows is inseparable from the morphometric and phenotypic aspects, the two primary indicators to identify animal quality. Morphometrics, which includes measurements of body size and proportions, significantly determines the judging in the contest arena. Meanwhile, the phenotype, which includes physical appearance and distinctive characteristics, provides an overview of cows' health and productivity potential. This contest is expected to encourage farmers to innovate in livestock management. It can be used as a medium to maintain the pure-breed Madura cattle population, preventing them from being eroded by cross-breed cattle. The assessment and selection of Sonok cattle are assigned based on the morphometrics and the exterior or phenotypic appearance.

The morphometrics of cattle include body size and proportions, which are important indicators in assessing the quality of livestock. Physical characteristics, such as withers height, body length, and chest girth, provide useful information for identifying cows' growth potential and productivity. In addition, the phenotype of Sonok cows is also seen in the dominant body color of brick-red or dark brown and the distinctive shape of the horns. All of these factors contribute to Sonok's attractiveness in terms of aesthetics and economic value. Madura cattle play an important role in the economy and socio-culture of farmers [6]. Accurate morphometric measurements assist farmers in selecting superior individuals for breeding programs. Breeding programs that measure birth performance to increase Madura cattle's genetic potential and performance, particularly to prevent their extinction as a local genetic resource in Indonesia [7]. Cows with ideal body proportions tend to have better performance in terms of growth and reproduction. Genetic and environmental factors influence the morphometrics and phenotypes of Sonok which vary in size. This emphasizes the need for a selective approach in cattle rearing to produce better offspring. Thus, this study aims to determine the morphometric and phenotypic characteristics of Sonok cattle which are included in the Sonok cattle contest.

2 Materials and Methods

The research was conducted in September-October in the Madura cattle-breeding area, Waru District, Pamekasan Regency. The writer carried out a purposive sampling to determine the research location. The materials used in this study were 140 female Madura cattle having participating in the Sonok cattle contest. The parameters observed in this study were morphometric characteristics, comprising withers height, body length, chest girth, body weight and phenotype of Sonok cattle in the P10-P18 age group. The

data were analyzed using Microsoft Excel software and presented in a descriptive analysis.

3 Results and Discussion

3.1 Morphometric Characteristics

In Table 1, PI0 has the smallest body size among the other age groups, while PI8 has the largest body size. This is due to an increased and Sonok cows' age. Livestock growth will reach its peak and will slow down when it reaches adulthood [8]. Table 1 indicates that Sonok cattle's withers height in this study has the lowest number in PI0 was 116 ± 5.35 and the highest in PI8 was 136 ± 1.75 . A study by [1] reported different results, in which the lowest withers height of Sonok cattle at PI0 and PI8 was 120.06 ± 8.73 and 120.22 ± 5.09 and the highest withers height at PI2 was 127.50 ± 4.28 . Growth in cattle lasts rapidly until puberty and tends to stabilize until the cattle are mature. However, there is a decrease in the average size of withers height in the PI6 and PI8 age groups due to the heavy use of pangonong; thus, there is a possibility that withers height in the adult-age groups decreases [9].

Table 1. Morphometric features of Sonok cattle.

Morphometric Parameters	Body Size				
	PI0 (30)	PI2 (23)	PI4 (26)	PI6 (32)	PI8 (29)
Withers Height (cm)*	116 ± 5.35	124 ± 3.49	130 ± 3.23	133 ± 2.32	136 ± 1.75
Body Length (cm)*	116 ± 5.31	126 ± 3.69	131 ± 3.21	135 ± 2.06	137 ± 1.41
Chest Girth (cm)*	136 ± 8.84	148 ± 4.03	159 ± 4.53	168 ± 3.11	174 ± 2.94
Body Weight (cm)*	199 ± 31.95	255 ± 17.67	303 ± 22.36	351 ± 17.08	384 ± 15.50

*numbers shown in the table are averages

Table 1 shows that the lowest average body length in the PI0 age group is 116 ± 5.31 , and the highest in the PI8 age group is 137 ± 1.41 . The results of this study were lower than the research conducted by [1] which reported that the body length of PI0 was 123.06 ± 11.49 and PI8 was 128.11 ± 7.99 . In the Sonok cattle contest, two female cows with nearly similar body sizes will be selected and paired during the contest. There is rapid growth in the early stages of growth until the cattle reach puberty [10]. Chest girth increases as the livestock ages. The chest girth increases as the cow grows. This study shows that the PI8 age group of 174 ± 2.94 has the largest chest girth, while PI0 is the lowest with a size of 136 ± 8.84 . This indicates that there is a growth in body size as the livestock ages. The larger the chest girth, the more the body weight of a cattle increases. Chest girth affects the total variation in livestock body weight by 65% [6]. Chest girth has been identified as an effective parameter for estimating a cow's body weight.

Furthermore, Table 1 also explains that the lowest average body weight is in the PI0 age group of 199 ± 31.95 , while the highest average body weight is in the PI8 age group

of 384 ± 15.50 . The results of this study were higher than [11], which explains that the average body weight in the PI0 age group is 106.3 ± 19.2 . The higher body weight in this study can be caused by the research location in the Madura cattle-breeding area Waru District, the site known as the Sonok cattle center. The cow's age is another factor that affects the difference in body weight in each age group. The difference in body weight in each age group is due to the cow's growth factor; the older the cow, the more its body weight increases [4].

The requirements for Madura cattle breeds have been regulated in SNI 7651-2:2023 and are used to select Sonok cattle breeds or type 1 female Madura cows. The percentage of Sonok cattle which meets the criteria of SNI 7651-1:2023 is presented in the table below.

Table 2. Percentage of Sonok cattle that meet the requirements for Madura cattle breeds according to SNI 7651-2:2023.

Age	Number of samples	Number of cows that meet the standard						Cows that do not meet the standards	Total (%)
		I		II		III			
		Frequency	%	Frequency	%	Frequency	%		
PI0	30	13	43.33	13	43.33	4	13.33	0	100
PI2	23	13	56.52	6	26.09	4	17.39	0	100
PI4	26	16	61.54	10	38.46	0	0	0	100
PI6	32	20	62.50	12	37.50	0	0	0	100
PI8	29	0	0	0	0	0	0	29	100

Table 2 reveals that of the 30 cows in the PI0 age group, 44.33% meet class I breed standards, 44.33% meet class II breed standards, and 13.33% meet class III breed standards. These indicate that in the PI0 age group, the differences between class I and class II cattle are visible as cows at those ages are still experiencing a growth process. Therefore, good maintenance management is required to grow the cows optimally. In addition to selection based on exterior appearance, good maintenance can also affect the body size of Sonok cows [12].

Results show that of the 23 cows in the PI2 age group, 56.52% meet the class I breed standard, 26.09% meet the class II breed standard, and 17.39% meet the class III breed standard. In the PI4 age group consisting of 26 cows, 61.54% of cows that meet the class I breed standard and 38.46% meet the class II breed standard. Cows in these age groups have been widely included in the contest since the selection was carried out. Therefore, the percentage of cows that meet SNI is relatively high. This is comparable to [9] which explains that the age groups of PI2 and PI4 do not have significant differences, as the beauty and behavior of Sonok cows at those ages have been formed, and they are the age groups which participate most in the Sonok cattle contests.

Table 2 shows that of the 32 cows, 62.50% that meet the Madura cattle breed standard class I and 37.50% that meet class II. The percentage of the cattle that meet class I breed standards is higher since the PI6 group selection has been carried out and will be used as prospective Sonok cows. This finding is by [9], which explains that good Sonok cows will be mated at the age of PI4 and begin to mate at the age of PI6. Sonok cattle

in the P18 age group do not meet the criteria of SNI 7651-2:2023 as they are considered too old to be used as Sonok cows; nevertheless, there are still many breeders who rear them as their body shape is still maintained and they need to obtain offspring from the cow. This is in accordance by [1] who explained that the body size of Sonok cows is relatively uniform; however, due to age limitations, not every Sonok cow with good body performance can meet breed standards.

According to the body size of individual livestock, compared to SNI 7651-2:2023 from the entire population without considering age, the results show that 44.29% meet and 55.71% do not meet the standard for female Madura cattle breeds class I. The percentage of female cows that meet the requirements of SNI 7651-2:2023 standard for female Madura cattle breeds class II is 29.29%, 5.71% in class III and the remaining 20.71% do not meet. This indicates that SNI's criteria in regulating Madura cattle breed standards are quite strict as the number of Sonok cattle that meet the Madura cattle breed standards class I, according to SNI, is less than 50%. The selection of Sonok cattle is carried out strictly, starting from the elder's records and performance selection, to the results of the heredity test. From the environmental aspect, it is seen from the maintenance pattern. The determination of Madura cattle breed standards regulated in SNI 7651-2:2023 is expected to be a guideline in selecting superior female Madura cattle to improve the quality of Madura cattle in the future.

3.2 Phenotype Characteristics

Female Madura cattle of the Sonok type have unique and interesting qualitative characteristics that distinguish them from the other cattle breeds. According to the results, several characteristics of Sonok cattle are obtained, encompassing horns, ears, eyes, body color, dorsal line, hump, muscle tissue between front legs, tail, and others as listed in the table below.

Table 3, shows that Sonok cattle are more dominant in having horns (98.57%) than those without horns (1.43%). This is by SNI 7651-2:2023 which explains that one of the qualitative requirements for Madura cattle is to have horns. The horn which points upwards is more dominant compared to the horn which is small and points inward (hump). According to [13] and [1], the upward-pointing Sonok horn is the most superior in the cattle group. This causes the farmers to form the direction of the horns deliberately. Apart from genetic factors, upward horns can be formed since cows are young.

Sonok cattle have very distinctive phenotypic characteristics, including the black circle around the eyes, the shape of the eyes and ears, and the black lines on the ears. Based on Table 3, all Sonok cows in the study have black eye circumference. This result is based on with SNI 7651-2:2023 which explains that one of the qualitative requirements of female Madura cattle is having a black circle on the eyes. Regarding eye shape, slanted eyes (67.86%) are more dominant over rounded eyes (32.14%). Sonok cows are more and more beautiful when they have black eye circles with slanted eyes [1]. In terms of the shape of the ears, small ears that resemble bamboo leaves (71.43%) are more dominant compared to wide ears (28.57%). Sonok cattle in this study are dominated by cows that have black stripes on the ears (64.29%) compared to those that do not have black stripes (35.71%).

Table 3. Phenotype Characteristics of Sonok Cattle.

No.	Phenotype characteristic	Frequency	Percentage (%)	
1	Horn	Exist	138	98.57
		None	2	1.43
2	Horn Direction	Point upwards	133	96.38
		Point inwards	5	3.62
3	Black Eye Circle	Exist	140	100.00
4	Eye Shape	Round	45	32.14
		Slanted	95	67.86
5	Ear Shape	Small (bamboo)	100	71.43
		Wide	40	28.57
6	Black Lines of Ears	Exist	90	64.29
		None	50	35.71
7	Body Colour	Red Brick	35	25.00
		Red Brown	66	47.14
		Ripe Rice	39	27.86
8	Hump Size	Big	87	62.14
		Medium	48	34.29
		Small	5	3.57
9	Muscle Tissue Between Front Legs	Exist	97	69.29
		None	43	30.71
10	Dewlap	Exist	98	70.00
		None	42	30.00
11	Dorsal Line	Exist	105	75.00
		None	35	25.00
12	Tail Colour	Black	140	100.00

Table 3 shows that the dominant color on the cow's body is dominated by red-brown (47.14%), followed by ripe-rice (27.86%) and brick-red (25.00%), with unclear color boundaries (smear). In Table 3, the Sonok cows in this study have a hump with a dominance of large humps (62.14%), followed by medium hump sizes (34.29%), and small humps (3.57%). One of the criteria in selecting female Madura cows to be used in the Sonok contest is having a large hump [14]. The hump on the cow functions as a pangonong holder during the contest [13]. Usually, Sonok cows have a dewlap and muscular tissue between the two front legs. The dewlap should have two to three folds, while too many folds are not expected [1]. The results of this study show that the number of cows

with a dewlap is 70.00%, while those without a dewlap are 30.00%. Dewlap in female Madura cows is one of the specific requirements for the Sonok contest. Sonok cattle that have two to three folds of the herd are the most superior in the group and this indicates that the cow will grow large as it has room for meat growth.

Furthermore, it is known that the cows with muscular tissue between the two front legs are 69.29%, while those that do not have muscular tissue are 30.71%. Female Sonok cows generally have a dorsal line. It is known that 75% of Sonok cows have a dorsal line, while the remaining 25% do not. Based on SNI 7651-2:2023 which has a qualitative requirement for Madura cattle to have a black dorsal line on the back. All cows in this study have black tail hair. The findings of this study are based on SNI 7651-2:2023 which has qualitative requirements for Madura cattle, namely a long black tail.

4 Conclusion

The morphometric characteristics of Sonok cattle that meet the requirements of SNI 7651-2:2023 regarding Madura cattle breeds class I are 44.29%, class II 29.29%, and class III 5.71%, while cows that do not meet the requirements of SNI 7651-2:2023 are 20.71%. In general, the phenotypic characteristics of Sonok cattle in Waru District are by the requirements of SNI 7651-2:2023, including having horns that point upwards, black eye circles, slanted eye shapes, small ear shapes and black ear lines, red-brown body color, a large hump, have muscular tissue on the front legs, a dewlap, and a straight back line, as well as black tail hair.

Disclosure of Interests. The authors have no competing interests to declare that are relevant to the content of this article.

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