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The Morphological Character of the "Bendi" Horse as Short Distance Urban Transport Modes that are Environmentally Friendly

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Abstract The purpose of this study was to search for and compare to the morphological characteristics of the minahasa horse which serves as a means of urban transport close range. Body measurements and live-weight were taken on 90 Minahasa horses (32 mares and 58 stallions). A multivariate approach was adopted to provide description of both body shape and body size of two Minahasa local horse populations, i.e. Manado and South Minahasa (Minsel). Statistical methods employed in this study were test of the difference between two means square and T student. The results showed that the average of body weight and body measurements, for example such as heart girth, chest width, chest depth, wither height, hip height, hip width, body length, thigh circumference and face width of the horse population in the two areas were not significantly different ($P<0.05$). Meanwhile character of the head lenght and neck lenght of the horse population in the two regions were significantly different ($P>0.05$), with the horses in Manado has a neck and head size is longer than the horses in South Minahasa. These results indicate that the population of horses in both regions have similarities in weight and body measurements, but have slight differences in the length of the neck and head were allegedly due to the dominating influence of gender differences in the two populations in the area.

Keywords morphological indices, local horses, fungtion

1. Introduction

Characterization of local breeds is very important in maintaining animal genetic resources [1]. Despite the modernization of agriculture, Minahasa local horse, in North Sulawesi plays an important role in the rural area. The horses are mainly used in agriculture, light traction, riding and leisure activities. In order to differentiate variation in both size and shape, body

measurements of animals were used to describe morphological differentiation in large animals [2, 3].

Nowadays body weight and body measurements are indispensable in the suspect animal breeds that have been able to adapt to the environment which would be characteristic of the animal. Obviously the necessary assessment of the properties of body size and body weight on the horse population in the city of Manado and South Minahasa Regency is to get an accurate picture about the type and what kind of horse that can work well and fit the surroundings.

2. Materials and Methods

2.1. Materials

City of Manado and Minahasa District is two coastal cities still take the horse as a mode of transport from downtown to the settlement in the range of 5 to 10 kilometers. A number of local horse called 'Bendi' randomly selected in this study were 32 mares and 58 stallions. Age was ranged between two and seven years old. The unhealthy and pregnant ones were excluded. Age was primarily determined by dentition as described by Owen and Bullock [4].

2.2. Methods

Eleven different body measurements were taken on each horse population. These include: wither height, body length, chest width, chest depth, heart girth, hip height, hip width, head length, collar length and face width. Height measurements were assessed by using a graduated measuring stick, the length and circumference used a flexible tape, meanwhile calibrated wooden caliper was used for the width measurements. The procedure and anatomical reference points for the respective body measurements with fewer modifications described elsewhere by Salako and Ngere [5]. Pregnant horse data were excluded as sample due to anatomical changes (thoracic size) which can mislead the measurement. Measurements were done by the same person to avoid from human error.

2.3. Statistic Analysis

The descriptive analysis such as mean, standard deviation and coefficient of variability of each body measurement were estimated using PROCMEANS procedure of the SAS package [6]. Test comparison of two means with unbalanced use of data and continued with the T test.

3. Results and Discussion

3.1. Results

Result of the descriptive analyses of live weight and body measurements of the Minahasa local horse for both sexes are presented in Table 1. It's showed that the Manado horses were slightly heavier than Minsel horses but T test result showed that the two populations have a body weight that is not significantly different (P<0.05). The same phenomena were found for heart girth, chest width, chest depth, wither height, hip height, hip width, body length, thigh circumference and face width measurements respectively. Considering quite a few measurements, the horse from Manado and South Minahasa has similar body size measurement except the head length and neck length.

Table 1. Descriptive statistics and morphological indices of the quantitative traits of Bendi horse

Variable (cm)	District	
	Manado (N=57)	Minsel (N=33)
Life Weight (kg)	201.26±40.44^{a}	191.09±20.40^{a}
Heart Girth	136.72±8.74^{a}	136.58±4.87^{a}
Chest Width	25.63±2.48^{a}	26.64±1.69^{a}
Chest Depth	50.63±3.95^{a}	52.03±2.97^{a}
Wither Height	116.54±6.12^{a}	116.06±4.56^{a}
Hip Height	117.49±6.47^{a}	117.64±4.63^{a}
Hip Width	33.91±5.17^{a}	38.55±2.03^{c}
Body Length	113.80±4.91^{a}	115.78±3.16^{ac}
Thigh Circumference	36.60±2.87^{a}	38.21±1.87^{ac}
Colar Length	53.68±4.25^{a}	50.61±4.50^{b}
Face Width	19.54±1.12^{a}	19.42±0.75^{a}
Head Length	47.26±3.07^{a}	45.00±1.84^{c}

Means in the same rows with different superscript differ significantly (P<0.05); (*) = significantly different (P<0.05); LW= live weight; HG= heart girth; CW= chest width; CD= chest depth; WH= wither height; RH= rump height; HW= hip width; BL= body length; RL= rump length; CL= collar length; FW=face width; FL= face length.

Figure 1. Right= Manado horse and Left= South Minahasa horse.

3.2. Discussion

The size is almost similar to the body size of pony breeds at the same age. However, some local horse populations in Minahasa were speculated that they are originated from the crossing of many breeds for centuries. Noor [7] affirmed that the adaptation to environment which yielded a fertilized offspring were good to develop as indigenous breeds since the ability to adapt to specific environmental pressure.

Size of body measurement variation indicates the existence of selection, and could be due to the influence of same environment. Although there is a noticeable difference in the length of the head and neck of the horse in the two populations but according Takaendengan [8] in particular, variations in length of head very slightly due to its close association with the bones of the skull. The possibility that the differences due to the influence of gender, where the most population of horses in Manado are male and the reverse in South Minahasa.

The high variability shown by the large standard deviation values associated with the measurements can also be a reflection of wide disparity among the sample size which can not identified yet. Similarities between the body measurements of males and females have been reported in cattle [5].

4. Conclusion

Based on this study concluded that the morphological characters of 'Bendi' horses in the city of Manado and South Minahasa Regency has the same size with a pony and suitable for use as a mode of short-distance transport of air pollution-free and environmentally friendly.

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