The effect of altitude on the exterior characteristic and growth of Bali calves in the Bali Province

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Abstract. The purpose of this study was to determine the effect of altitude on the exterior characteristic and growth of Bali calves in Bali province. The research location was conducted in two different places, Kintamani (Highlands) and Gianyar (Lowlands). The material used was 105 Bali calves consisting of 34 male calves and 71 female calves. The data is taken by one of the characters. The data obtained were descriptive qualitative. Qualitative descriptive statistical analysis was performed by calculating the average value and performance of the data including birth weight, weaning weight with a factorial analysis of variance. The results showed that the exterior of the Bali Calf has a character of brick red and yellow on the body and white on the buttocks and lower legs. As well as calves, male and female Bali calves have horns at the age of less than one year. The birth weight of highland calves (P<0.05) was higher than that in the lowlands. The weaning weights of male and female calves (P<0.05) were higher than those in lowlands.

1. Introduction

The Utilization of local cattle in Indonesia as a source of food intake of protein provides a large contribution. One of them is Bali cattle, which is germplasm to produce quality cow breeds because of its advantages that other cattle breeds in the world do not have, for example having the ability to utilize low quality, efficient feed, high fertility rates, resistance to various types of diseases, easily adaptable various environments, and a fast harvest. Geographically, Bali Province is located at 8° 25’23” South Latitude and 115° 14’55” East Longitude which reports a tropical climate like other parts of Indonesia. Bali Province consists of two parts, namely the highlands with an altitude of 1200 mdpl above sea level and lowlands of 200 - 250 mdpl [1]. The existence of this difference in terrain means that there is a difference in Bali calves. Characteristic of activities to identify important properties that are of economic value, or which are characteristics of a related family. Characteristic is an important step that must be achieved in managing genetic resources properly [2]. Characteristic can be done quantitative and qualitative [3]. Traits are productive and quantitative or measurable properties. The expression of this trait is determined by many people who are built and built by the environment, both internal (age and sex) and externally (climate, food, disease, and management) [4]. Meanwhile,
qualitative traits are those generally with words or pictures, for example, body color, fur or skin, color patterns, horned or hornless traits that can be distinguished without having to measure them. Qualitative traits are usually only controlled by genes and environmental factors do not affect. Apart from their qualitative and quantitative characteristics, Bali cattle also have high productivity advantages. The superiority of Bali cattle production can be seen from several indicators of characteristics such as birth weight, weaning weight, adult weight, body weight gain rate, carcass characteristics (carcass proportion, and carcass quality), as well as traits such as sexual maturity, puberty age, birth spacing. (delivery interval), and the proportion of births. Several production and survey characteristics are important characteristics that can be used as selection indicators [5]. So it can be seen by looking at the effect of altitude on the limit of demand and growth of Bali calves in Bali Province.

2. Materials and methods

2.1. Materials
The materials used are 105 Bali calves in Kintamai, Gianyar District, consisting of 34 male calves, 71 female calves.

2.2. Methods
The exterior characteristics data were analyzed descriptively qualitatively and quantitatively using the Microsoft Excel application. Quantitative descriptive statistical analysis was carried out by calculating the average value. Calf growth data were analyzed descriptively qualitatively. The statistical analysis of variance of the 2x2 factorial pattern of altitude was the first factor, sex the second factor, Statistical analysis using SPSS version 23.0 personal computer software.

3. Results and discussion
The exterior characteristics are a group of qualitative traits [6]. Qualitative traits are those with fewer discrete phenotypes that can be distinguished from visual observation [7]. The results of observations on the exterior characteristics of Bali cattle calves are presented in Table 1.

Exterior characteristics are characteristic of a breed and become an inherent reputation for the breeds. The exterior observed included body color, leg color, buttocks, dorsal line, tail tip color, lip border color, horn shape, nail shape, and head shape. At birth, male calves in the high and lowlands of Bali have a brick red and blackish brown body color, while female calves have a brick red and yellow body color where at birth, both males and females are brick red with a distinctive bright color. the back of the leg. The male and female calves in the highlands have very thick hair compared to the lowland calves. [8] also reported that Bali cattle have light brown, yellowish brown, dark brown to brick red colors. The color of male Bali cattle turns black at the age of 12-18 months and with age the black color gets darker [9]. The color of the lower legs of Bali cattle calves, both male and female at birth, has the same color as the body color with a little irregular white spot. At the age of less than one year, most of the lower legs are white in the form of socks, but a small part is white without socks. In this cross, the color trait of the lower leg that is owned by the Bali cattle is not passed on to the offspring of the cross or is not genetically heterozygous for this trait. The color of the leg of the parent Bali cattle.

Bali cattle calves, both male and female at birth and aged less than one year, most have white rump color, not mirror shape. At the age of 1 year Bali cattle, both male and female, mostly have a mirror shaped white rump color, and a small part is white without a mirror shape, Bali calves are the color of the buttocks from birth and the older they are showing the color pattern of the buttocks is more firmly forming a mirror, but it needs to be examined. further periodically in the same livestock. The exterior characteristics of the rump color are inherited from the genetics of Bali calves so that it produces the same phenotype, but different colors are caused by crosses between different colored parents. Most of Bali cattle, both male and female at birth, have a thick black backline, while a small proportion of
them are medium black. These results are the same as those of [10] explained that the offspring of the crossbreeds of Bali cattle with Simmental, Limousin, Ongole and Brahman males have exterior backline characteristics derived from Bali cattle.

Table 1. Exterior characteristics of male and female Bali cattle calves Highland and Lowlands.

| Variable                  | Highland |         | Lowland |         |
|---------------------------|----------|---------|---------|---------|
|                           | Male n=23| Female n=32 | Male n=10 | Female n=40 |
| **Body color**            |          |         |         |         |
| Tan (%)                   | -        | 62.50   |         | 250     |
| Yellowish (%)             | 4.30     | 25.00   | 20.00   | 17.50   |
| Brick red (%)             | 53.17    | 68.75   | 60.00   | 65.00   |
| Brick red (%)             | 43.47    | -       | 20.00   | 15.00   |
| **Leg color**             |          |         |         |         |
| White sock shape (%)      | 78.26    | 84.37   | 60.00   | 62.50   |
| White doesn't form socks (%) | 4.34   | 3.10    | 10.00   | 5.00    |
| Same as body color (%)    | 17.30    | 12.50   | 30.00   | 32.50   |
| **Buttocks**              |          |         |         |         |
| White mirror form (%)     | 21.70    | 18.75   | 90.00   | 67.50   |
| White does not form a mirror (%) | 69.50 | 81.25   | 10.00   | 27.50   |
| Mirror shape brown (%)    | 8.69     | -       | -       | 5.00    |
| **Dorsal line color**     |          |         |         |         |
| Thick black (%)           | 69.56    | 56.25   | 70.00   | 62.50   |
| Medium black (%)          | 30.43    | 43.75   | 30.00   | 37.50   |
| **Tail tip color**        |          |         |         |         |
| Black (%)                 | 100      | 100     | 100     | 100     |
| **Lip border color**      |          |         |         |         |
| White on the edge (%)     | 100      | 83.30   | 96.20   | 100     |
| White streak (%)          | -        | 16.70   | 3.80    | -       |
| **Hom shape**             |          |         |         |         |
| Looking Forward (%)       | 43.47    | 71.87   | 40.00   | 60.00   |
| Sideways (%)              | 30.43    | 28.12   | 5.00    | 30.00   |
| Going backwards (%)       | 26.08    | -       | 10.00   | 10.00   |
| **Nail shape**            |          |         |         |         |
| Normal (%)                | 100      | 100     | 100     | 100     |
| **Head shape**            |          |         |         |         |
| Wide with compact neck (%)| 47.8     | 62.5    | 40.00   | 55.00   |
| Wide with a slim neck (%) | 52.1     | 37.5    | 60.00   | 45.00   |

Bali cattle, both male and female at birth, less than one-year-old, have a black tail tip. The black color at the end of the tail is derived from the two elders who also have black tail hair, but the reddish-black color is a combination of the body color of the elder. These results are consistent with the research of explained that the offspring from crossing Bali cattle with Simmental, Limousin, Ongole, and Brahman have a dominant black tail hair color, but there are several colors of tail hair which are a mixture of elder colors including brown red and white. Male and female Bali calves have dominant white lip color. White color is the phenotype of Bali cattle. The similarity of phenotypes can show genetic identity even though there are limitations, among others: identical phenotypes can be caused by different alleles or genes at different loci [11].

Bali calves, both male and female at birth, both have no horns. At the age of less than one year, all Bali cattle have horns. Balicattle that have horns attached to the skull, are longer and point forward.
The nature of horns in Bali cattle is in accordance [12] reported that the hornbill in cattle began to appear during the first 2 months of life, floating freely in the skin over the skull, and then with age, the hornbill was attached to the skull precisely in the periosteum of the frontal bone covering the frontal sinuses and then the horn grew bigger. The Male Bali calves have a wide head shape with a slender neck, while female calves have a wide head shape with a compact neck. [13] explains that Bali cattle have a short and wide head, flat forehead, horns in males grow outward, while females are slightly inward so that they resemble buffalo.

The fastest growth of livestock is at the calf, weaning until the age of two years, then at the age of four it begins to decrease and after that, the growth starts to be constant. This variation in birth weight is thought to be due to variations in parentage and environmental factors. In addition, environmental influences such as cattle health and supply in the feed are very important because they have a direct effect on cattle performance, for example through food, disease, and management. The results of calf growth observations by looking at the effect of altitude on calf birth weight for Bali cattle are presented in Table 2.

| Sex   | Altitude     | Total average |
|-------|--------------|---------------|
|       | Highland     | Lowland       |               |
| Male  | 20.73 ± 1.44 | 20.66 ± 1.11  | 20.71 ± 1.32y |
| Female| 16.07 ± 2.35 | 16.63 ± 2.63  | 16.38 ± 2.50z |
| Total average | 18.02 ± 3.06ns | 17.52 ± 2.89ns |               |

| y,z: different superscripts on the same line indicate significant differences (P<0.05)
| ns: not real different

Based on the data in Table 2, it can be seen that altitude does not have a significant effect on the birth weight of Bali cattle calves. The mean birth weight of Bali cattle calves in the highlands and lowlands is 18.02 kg and 17.52 kg, respectively. Based on the data in Table 2, it is known that sex has a significant effect (P<0.05) on the birth weight of Bali cattle calves. Male calves have a higher birth weight value than female calves. This is thought to be due to different genetic factors between the two types of calves. Following the opinion [14] stated that the birth weight of male calves is greater than that of female calves.

The results of observing the effect of height and sex on weaning weight for 180 days of calf Bali cattle are presented in Table 3.

| Sex   | Altitude     | Total average |
|-------|--------------|---------------|
|       | Highland     | Lowland       |               |
| Male  | 78.01 ± 10.15| 73.74 ± 11.05| 76.62 ± 10.48y|
| Female| 74.46 ± 8.25 | 70.60 ± 9.17 | 72.34 ± 8.19z |
| Total average | 75.95 ± 9.17a | 71.29 ± 9.58b |               |

| ab: different superscripts on the same line indicate significant differences (P<0.05)
| y,z: different superscripts on the same line indicate significant differences (P<0.05)

Based on the data in Table 3, it is known that altitude has a significant effect (P<0.05) on the weaning weight of Bali calves. The 180 day weaning weight of male calves in the highlands is greater than that of female calves. The explains that the existence of environmental differences, including temperature and air, causes differences in weaning weight in calves.
Based on the data in Table 3, it is known that sex has a significant effect (P<0.05) on the birth weight of Bali cattle calves. Male calves have a greater weaning weight than female calves. This is presumably because the male calves have a large birth weight, which causes the weaning weight to be greater than the female calves. In accordance with [15] stated that high birth weight has a high weaning weight.

4. Conclusions

The exterior characteristics are the color of the dorsal line, the tip of the tail is the same, while specific differences are seen in the color of the body, lower legs, buttocks, nail shape, head shape, lip color, and horns. The sex affects calf birth weight and calf weaning weight. Highland calves have better growth than lowland calves.

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