Hematological profile of sumba ongole cattle extensively reared in semiarid land, Sumba, NTT based on age and sex

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Abstract. Hematological parameters have provided useful information about the animal health status. The main objective of the study was to measure the hematological profile of Sumba Ongole (SO) cattle extensively reared in semi-arid land in Sumba, NTT. Blood samples from seventy-five animals were examined to measure its hematological parameters based on age and sex. Animal were grouped based on sex into male and female in the age groups 1.5 to 3 years (n=42), 3.5 to 4 years (n=23) and ≥ 5 years (n= 10). Mean standard error values of all the hematological parameters for The SO cattle, both male and female cattle at different age of group were measured. Several hematological parameters, such as erythrocytes, platelets, hemoglobin, hematocrit and mean corpuscular volume (MCV) level were significantly different (p<0.05) between male and female, while erythrocyte, hemoglobin, hematocrit, MCV were significantly different (p<0.05) within 3 groups of age. These results would contribute to better understanding of the hematological indicators for estimating the physiological status of Sumba Ongole cattle in Sumba and it can be used as valuable information for beef cattle reared with similar environmental condition, especially in semi-arid tropical climate.

1. Introduction
The Sumba Ongole (SO) cattle are one of the Indonesian local beef cattle that have been imported from India in 1914 to Sumba Island, NTT. The SO cattle has been proved to be highly adaptable to harsh climatic condition, resistant to common diseases prevalent, highly meat production and low of carcass percentage [1]. Recently, farmers select the SO cattle based on the breeding value and performance test. However, up to present, almost no reports about hematological parameter of SO cattle, while the study of blood components in the SO cattle could provide valuable information about general health of local beef cattle.

The value of hematology as a diagnostic tool could provide supporting details to monitor animal condition, to assess general health and to observe stress and welfare of animals [2]. Moreover, it could assist farm management practices, nutritional and physiological status of animals and health condition [3]. The hematological parameters of cattle, such as red blood count cells (RBC) or erythrocytes counts, erythrocytes indices, leucocytes, platelets and platelets indices are affected by age, sex, seasonal variation, lactation, pregnancy, health and nutrition [4]. The erythrocytes count includes erythrocytes, hematocrit, hemoglobin, while erythrocytes indices includes mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH) and mean corpuscular hemoglobin concentration and mean platelet volume (MPV) that is an index for assessing platelet indices [5]. Therefore, the present
study was carried out in the SO cattle to determine any age and sex variation effect on hematological parameters for SO cattle.

2. Material and methods

While collecting blood samples, adequate precautionary measures were taken to minimize pain and discomfort to the animals. Sample collections were carried out in accordance with the guidelines laid down by the Animal Ethics Committees in Nusa Cendana University with the series number KEH/FKH/NEPH/2019/003. This study was undertaken in the Department of East Sumba’s Animal Husbandry in coordination with East Sumba’s Animal Quarantine, Breeding Center and local farm in East Sumba regency. A total of seventy-five animals were used in study. Animal were grouped based on sex into male and female in the age groups 1.5 to 3 years (n=42), 3.5 to 4 years (n=23) and ≥ 5 years (n= 10). About 3-5 ml of blood sample was collected aseptically from jugular vein of each of these animals in sterile vacutainer tube. Blood samples were subjected to hematological analysis, such as, erythrocyte, leucocyte, platelet, hemoglobin (Hb), hematocrit (HCT), mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), mean corpuscular hemoglobin concentration (MCHC) and mean platelet volume (MPV). These hematological parameters were calculated with the automatic hematology analyzer at General Health Laboratory. This result was analyzed by using student ‘t’ test and analysis of variance.

3. Results and discussion

A hematological change has become valuable indicators of the physiological and pathological manifestations of the animals [6]. The hematological values may vary depending on factors such as age, stage of growth, breed, season, stress, physical exercise and reproduction status [7,8]. For this study, hematological values based on age and sex is a fundamental requirement for determining the physiological status of the SO cattle. Metabolic, health, nutritional and physiological status of animal can be detected by analysis and monitoring the blood. However, interpretation of the results depends on the references values of each animals’ species, geographical and environment condition. This study could be used for estimating the physiological status of SO cattle in East Sumba and it can be used as valuable information for beef cattle reared with similar environmental condition, especially in semi-arid tropical climate.

Table 1. Hematological parameters in Sumba Ongole cattle based on the sex in comparison to the normal physiological range

| Blood parameters            | Normal physiological range [9] | Group (mean±SEM)          |
|-----------------------------|--------------------------------|---------------------------|
|                             |                               | male (n=49)               | female (n=26)             |
| Erythrocytes (10^6/µl)      | 4.9-7.5                       | 8.80 ± 0.189*             | 7.85 ± 0.327              |
| Leucocytes (10^3/µl)        | 5.1-13.3                      | 7.59 ± 0.331              | 6.92 ± .396               |
| Platelets (10^3/µl)         | 160-650                       | 335.02 ± 24.454*          | 251.50 ± 20.119           |
| Hemoglobin (g/dl)           | 8.4-12.0                      | 12.69 ± 0.198*            | 11.38 ± 0.385             |
| Hematocrit (%)              | 21-30                         | 45.96 ± 0.745*            | 42.04 ± 1.226             |
| Mean corpuscular volume (fl)| 36-50                         | 49.37±0.606               | 52.15 ± 1.053*            |
| Mean corpuscular hemoglobin (pg) | 14-19                     | 13.73 ± 0.179     | 14.00 ± 0.222             |
| Mean corpuscular hemoglobin concentration (g/dl) | 38-43                     | 28.02 ± 0.132*            | 27.42 ± 0.201             |
| Mean platelet volume (fl)   | 4.6 – 7.4                     | 4.31 ± 0.185              | 8.38 ± 2.858*             |

*Significant difference at p < 0.05
Table 2. Hemotological parameters in Sumba Ongole cattle based on the age in comparison to the normal physiological range

| Blood parameters          | Normal physiological range [9] | Group (mean+SEM)                      |
|---------------------------|---------------------------------|---------------------------------------|
|                           |                                 | Age 1.5 to 3 years (n=42) | Age 3.5 to 4 years (n=23) | Age ≥5 years (n=10) |
| Erythrocytes (10⁶/µl)     | 4.9-7.5                         | 8.83 ± 0.223*                     | 7.83 ± 0.342*                     | 8.40 ± 0.174*                     |
| Leucocytes (10³/µl)       | 5.1-13.3                        | 7.45 ± 0.348                      | 7.43 ± 0.448                      | 6.80 ± 0.772                      |
| Platelets (10⁹/µl)        | 160-650                         | 335.95 ± 28.636                   | 280.70 ± 22.163                   | 238.90 ± 18.270                   |
| Hemoglobin (g/dl)         | 8.4-12.0                        | 12.67 ± 0.223*                    | 11.39 ± 0.434*                    | 12.40 ± 0.371*                    |
| Hematocrit (%)            | 21-30                           | 45.79 ± 0.840*                    | 42.09 ± 1.387*                    | 45.40 ± 1.267*                    |
| Mean corpuscular volume (fl) | 36-50                           | 49.05 ± 0.655*                    | 51.91 ± 1.100*                    | 52.10 ± 4.795*                    |
| Mean corpuscular hemoglobin (pg) | 14-19                          | 13.60 ± 0.193                     | 14.04 ± 0.222                     | 14.30 ± 0.396                     |
| Mean corpuscular hemoglobin concentration (g/dl) | 38-43                          | 28.02 ± 0.150                     | 27.43 ± 0.197                     | 27.80 ± 0.327                     |
| Mean platelet volume (fl) | 4.6 – 7.4                       | 4.40 ± 0.199                      | 7.09 ± 2.686                      | 8.10 ± 4.446                      |

*Values within the same row differ significantly with different exponent (p<0.05).

In this present study, the erythrocyte, platelets, Hb and HCT values were higher in males compare to female cattle. The erythrocyte count is closely correlated on the Hb level and hematocrit value [10]. The Hb level is influenced by age, sex, season, species behavior, activity and disease [11]. As it is shown in Table 1, erythrocytes counts were higher in male compared to female (8.80 ± 0.189 10⁶/µl and 7.85 ± 0.327 10⁶/µl, respectively) and in Table 2 showed that its values were higher in age 1.5 to 3 years cattle group (8.83 ± 0.223 10⁶/µl and 7.83 ± 0.342 10⁶/µl, respectively). This observation agrees with the observation reported by [6] that bulls have higher erythrocytes counts than cows and erythrocytes counts might be higher in young calves compare to adult.

An elevated level of erythrocytes and Hb indicates hemoconcentration that occur in dehydrated animal, while an increasing level of HCT could be affected by dehydration, asphyxia and stress in animal. Based on age and sex, this study shown that the HCT level in both categories were higher than normal physiological blood parameter (21-30 g/dl). It is shown that the HCT level in both male and female SO cattle were (45.96 ± 0.745 g/dl and 42.04 ± 1.226 g/dl, respectively), while its level within 3 group categories were 45.79 ± 0.840 g/dl, 42.09 ± 1.387 g/dl and 45.40 ± 1.267 g/dl, respectively). However, physical examination should be conducted to measure its skin tension, dry mucous membrane and bulbar retraction [3].

Regarding the erythrocytes and platelet indices, the MCV and MPV were higher in female (52.15 ± 1.053 fl and 8.38 ± 2.858 fl, respectively) compare to normal range (36-50 fl and 4.6-7.4 fl, respectively). These two parameters, MCV and MPV have been associated with red blood cell disturbances and platelet production [12]. A high MPV in relation with thrombocytopenia indicates that megakaryocytes are attempting to respond to low platelet number, while an increasing MPV without thrombocytopenia show the presence of insufficient number of megakaryocytes that are failing to respond to the low platelet number [13]. However, MCH was lower in male (13.73 ± 0.179 pg) than normal range (14-19 pg). This study also shown that based on age, MCV level in 1.5-3 years was lower (49.05 ± 0.655 fl) than the other two groups, while the MCHC level in both categories was lower compare to normal range (38-43 g/dl). This study agrees with the observation reported by [14, 15] that MCV and MCHC might be lower in young calves than in adults.
4. Conclusion
In this study, it is concluded that the hematological values of SO cattle were affected by age and sex. Thus, the data presented in this study could be served valuable information for diagnosing other beef cattle hematological parameters in semi-arid tropical environment.

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