Haematological values of apparently healthy indigenous goats in Malaysia: A comparative study

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ABSTRACT

Objective of this study was to understand the changes that occur among several strains of goats in Malaysia by investigating the haematological values under the tropical climate to stand on the health level and immune system. Sixty adult goats were used. These goats comprised three indigenous breeds, namely, Kambing Katjang, Boer, and Jamnapari. Blood samples (n=618) were withdrawn for every 2 weeks. Complete blood picture was determined immediately after collection. ANOVA, (P < 0.05), was used to analyze data for the effects of sex and breed. Several of the analyzed parameters seem to be affected at the sex and breed.

Key words: Boer, Goats, Haematology, Jamnapari, Kambing Katjang.

INTRODUCTION

Blood composition of an animal may be influenced by certain factors, such as nutrition, management, sex, age, diseases, and stress (Schalm et al., 1975). A great variation exists in the haematological parameters, as observed among breeds of goats (Tambuwal et al., 2002). In this regard, formulating a universal metabolic profile test for goat may be difficult (Opara et al., 2010). The life of all flesh is blood, and its usefulness in assessing the health status, chemical evaluation for survey, physiological pathological conditions and diagnostic and prognostic evaluations of various types of diseases in animals cannot be overemphasized (Tambuwal et al., 2002). Blood also helps in distinguishing the normal state form of stress, which can be maturational, environmental, or physical (Aderemi, 2004). Haematological values are widely used to determine systematic relationships and physiological adaptations, including the assessment of the general health condition of an animal (Kamal Shah et al., 2007).

Although goats are prolific animals, which is a trait of major economic importance, their haematological analyses are not available extensively in animal breeding in Malaysia. Therefore, this study was designed to understand the haematological changes that occur among three indigenous breeds, namely, Kambing Katjang, Boer, and Jamnapari in Malaysia.

MATERIALS AND METHODS

Location and animals: This experiment was conducted at Alhilmi Farm, Slim River, under the control of University Pendidikan Sultan Idris, Perak, Malaysia. The animals were adjusted and supplemented with food for 2 months prior to the start of the experiment. A total of 60 adult goats were used, consisting of 30 bucks and 30 does (10 to each breed). The animals were apparently healthy. Pregnant and apparently sick animals were excluded. The age of the adults ranged from 8–12 months at the onset of the experiment. Weather temperature was 23°C–37 °C.

Experimental methodology: The animals were grouped in their respective cages and fed a pellet and green fodder (2 kg/goat/day and 4 kg/goat/day, respectively) and had access to mineral salt and water ad libitum.

Blood sampling: A total of 618 blood samples were collected from goats of different breeds. The blood was through their jugular veins with a syringe with 18G needle for every 2 weeks. The blood samples of 3.5 ml were collected into a plastic tube containing EDTA for haematological studies.

Haematology: Haematological tests included total red blood cell (RBC) count, hemoglobin (Hb), packed cell volume (PCV), mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), MCH concentration (MCHC), RBC distribution width (RDW), total white blood cell (WBC) count, polymorphs (Polys), lymphocytes (Lymphs), monocytes (Monos), eosinophils (Eos), basophils (Basos), and platelet count (PLT) were determined immediately after collection via microscopy and testing machine.

Statistical analysis: Two-way ANOVA was performed with SPSS to analyze the data, and the significance was at P<0.05 for blood parameters. The analysis determined the significant differences based on the blood constituents, which were influenced by breed and sex of the goats in Malaysia.

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RESULTS AND DISCUSSION
Several of the analyzed blood parameters seemed to be affected at the sex and breed. One or both of these factors revealed a steady state or a development of the haematological system for goats (Table 1, Fig. 1).

RBC: The RBC of female Jamnapari goats were high (P < 0.05) compared to other goats. The RBC count in all types of goats was lower than that reported in other works (Zumbo et al., 2011; Shaikat et al., 2013). The results disagreed with the findings of another study (Rice and Hall, 2007), which investigated mountain goats. The difference might be caused by the variation in the magnitude of their position or geographical variation. The results of the RBC count showed that does have higher RBC values than bucks. The difference may have caused by sex is a signal of the health status of the various sex groups among the investigated goat breed. The results disagreed with the findings in the other works (Schalm et al., 1975; Addas et al., 2010), which reported that bucks have higher RBC values than does.

Hb: A Hb of male Boer goats were high (P < 0.05) compared to other goats. The Hb concentration in males than in females. This characteristic is an advantage in terms of the oxygen carrying capacity of the blood. The results agreed with those reported in other workers Tambuwal et al., (2002), Rice and Hall, (2007), Piccione et al., (2010a). In this study, the Hb values in goats were higher than those reported in other works Kiran et al., (2012), Shaikat et al., (2013). The probable reason is the nutritional variation, strain, and sex of goats.

PCV: The PCV of female Jamnapari goats were higher (P < 0.05) than the other breeds. Also the level of PCV in does was higher than that in bucks. This result disagreed with that of Njidda et al. (2013), who claimed that bucks having higher PCV values than does is a likelihood of inherent sex differences between male and female (Addas et al., 2010).

Table 1: Haematological values of different breeds and sex of indigenous goat adults.

<table>
<thead>
<tr>
<th>Strain</th>
<th>Sex</th>
<th>Male</th>
<th>Female</th>
<th>St. Error</th>
<th>Male</th>
<th>Female</th>
<th>St. Error</th>
<th>Male</th>
<th>Female</th>
<th>St. Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>RBC</td>
<td>Male</td>
<td>3.3</td>
<td>3.5b</td>
<td>.09888</td>
<td>4</td>
<td>4.2b</td>
<td>.10483</td>
<td>3.2</td>
<td>4.8a</td>
<td>.27285</td>
</tr>
<tr>
<td></td>
<td>Hb</td>
<td>10.4b</td>
<td>10.4b</td>
<td>.08165</td>
<td>7.8</td>
<td>10.2b</td>
<td>.53401</td>
<td>9.6</td>
<td>.14667</td>
<td></td>
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<tr>
<td></td>
<td>PCV</td>
<td>27</td>
<td>111b</td>
<td>1.96356</td>
<td>40</td>
<td>107</td>
<td>1.19954</td>
<td>35</td>
<td>108</td>
<td>3.16228</td>
</tr>
<tr>
<td></td>
<td>MCV</td>
<td>81</td>
<td>100b</td>
<td>5.47925</td>
<td>45</td>
<td>107</td>
<td>2.81366</td>
<td>104</td>
<td>108</td>
<td>2.68845</td>
</tr>
<tr>
<td></td>
<td>MCH</td>
<td>32c</td>
<td>27c</td>
<td>1.86683</td>
<td>19</td>
<td>1.69476</td>
<td>32c</td>
<td>20</td>
<td>21</td>
<td>2.19848</td>
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<tr>
<td></td>
<td>MCHC</td>
<td>39c</td>
<td>17</td>
<td>2.08333</td>
<td>19.8</td>
<td>1.72240</td>
<td>30c</td>
<td>21</td>
<td>2.09497</td>
<td></td>
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<tr>
<td></td>
<td>RDW</td>
<td>22.1</td>
<td>23.6c</td>
<td>1.01994</td>
<td>24c</td>
<td>19.8</td>
<td>22.6c</td>
<td>21.1</td>
<td>21.1</td>
<td>1.01994</td>
</tr>
<tr>
<td></td>
<td>WBC</td>
<td>167</td>
<td>147</td>
<td>763.79898</td>
<td>177c</td>
<td>598.88786</td>
<td>103</td>
<td>122c</td>
<td>390.79691</td>
<td></td>
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<tr>
<td></td>
<td>Polys</td>
<td>36</td>
<td>68a</td>
<td>3.54018</td>
<td>75a</td>
<td>2.08535</td>
<td>28</td>
<td>52a</td>
<td>4.25898</td>
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<td></td>
<td>Lymphs</td>
<td>62c</td>
<td>29</td>
<td>40.5</td>
<td>20</td>
<td>1.54020</td>
<td>25</td>
<td>47a</td>
<td>2.97769</td>
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<tr>
<td></td>
<td>Monos</td>
<td>2a</td>
<td>1.5</td>
<td>3.65775</td>
<td>5a</td>
<td>2</td>
<td>1</td>
<td>5e</td>
<td>1</td>
<td>.18254</td>
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<tr>
<td></td>
<td>Eos</td>
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<td>0</td>
<td>.00000</td>
<td>0</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>.00000</td>
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<tr>
<td></td>
<td>Basos</td>
<td>810b</td>
<td>655</td>
<td>43652.4150</td>
<td>631c</td>
<td>31273.3468</td>
<td>521</td>
<td>49659.2836</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Means within the same row with different superscripts are significantly different (P < 0.05).

Fig 1: Haematological values of indigenous goat adults in Malaysia

Fig. 1 Indicates that the comparison among the blood values of adults.
The findings of this study indicated that PCV varies among sex and breed of goats. An increase in PCV values might be attributed to the increase in environmental temperature (Isidahomen et al., 2010). The increased PCV values observed in this study might probably be a sign of healthy goats.

**MCV:** The MCV of female Kambing Katjang (KK) goats were high (P < 0.05). The values of MCV were no differences exist among adults except in KK. However, the reference values determined in the present study disagreed with those of the described goats by other researchers, and the trend was higher to that reported in other studies (Addas et al., 2010).

**MCH and MCHC:** MCH and MCHC of male KK goats were high (P < 0.05). The MCH and MCHC in this study showed higher values than those recorded by Afyon (2012). MCH measures the amount or the mass of Hb present in one RBC, whereas MCHC measures the proportion of each cell taken up by Hb. An MCHC of less than 32% or an MCH under 27% indicates that the RBCs are deficient in Hb concentration. MCH has been decreased in the females of Boer and Jamnapari. MCHC is very significant in the diagnosis of anemia. It also serves as a useful index of the capacity of bone marrow to produce RBCs (Berger, 2003).

**Total WBC:** The WBC of female Kambing Katjang (KK) goats were high (P < 0.05). The values of total WBC count showed nonsignificant effect of sex, which indicates that the sex have little or no effect on the health status of these goat breeds; however, the obtained values in this study were higher than those obtained in other works Tambuwal et al., (2002), Zumbo et al., (2011), Shaikat et al., (2013). The results also disagreed with those reported in many works Piccione et al., (2010a), which reported that sex factors might affect these values. Differentials leucocyte counts were explained for all original breeds. The increased values showed in KK goats obtained in this study suggested that the immune system of this goat breed was well developed. Compared with other ruminants, more lymphocytes exist in circulation than neutrophils (Afyon, 2012). The increased values of the WBC observed may also be attributed to the extensively managed goats, thereby making them face challenges from microbes when on a free range. WBCs were the first line of defense of a body against invading bacteria and other harmful organisms. WBC count measured the total number of all types of WBCs. Further examination of the different types and numbers of cells present can present an information about the state of the defense system of a body. Thus, the female of KK have the strongest defense system among all other goats in this study.

**Polymorph and Lymphocytes:** Polymorphs of female Boer goats were high (P < 0.05). The lymphocytes of male KK goats were high (P < 0.05). The polys values in females of Boer were higher than those in males. The lymphs levels were comparable among the breeds and sex groups of the animals. In goats, similar to other ruminants, high levels of lymphs exist in circulation (Olusanya et al., 1976). Lymphs are the key elements in the production of immunity. However, sex, and breed significantly influence lymphocyte count. In the present study, the lymphocyte percentage was higher than the findings by many researchers Rice and Hall, (2007), Piccione et al., (2010b), Shaikat et al., (2013). It is also higher in male of KK compared with other sex and breeds. The reason may probably be the altitude variation and other factors.

**Monocyte:** Monocytes of female Boer goats were high (P < 0.05). The Monos percentage of adult goats was lower in the present study than that in the findings of Piccione et al., (2010a) for Girgentana goat and that in Rice and Hall (2007) for mountain goats. The reason might be caused by the prevalence of chronic infection exposure in plain land compared with those in the mountains.

**Eosinophils:** The values for eosinophils in this study were higher in adult males of Jamnapari than in other breeds. These results were lower than those in Njidda et al., (2013). However, the selectins and integrins have some selectivity in the way in which they respond and on the killing molecules they secrete (Ganong, 2005).

**Basophils:** A basophils values were generally not observed in all the breeds investigated. This result is similar to that of Njidda et al., (2013).

**Platelet count:** In the present study, the PLT counts are an important parameter because their count in the goat blood cannot be established easily and because of the change showed during the experimental period in adults. However, the PLT values of female Boer were higher than those of all the other breeds. These values were higher than those reported by Zumbo et al. (2011).

The results presented in this study contribute to the knowledge of adaptation process in breeds. A knowledge on the haematological values for the adults of this species provides a useful information for the diagnosis and treatment of some diseases.

**CONCLUSION**

Based on these findings, breed showed remarkable influence on the haematological values of goats studied in Malaysia. The values obtained are comparable to values recorded elsewhere. A fluctuation exists in all the haematological parameters of all the breeds of the animals. However, the cause of the fluctuation in various parameters may be undetected minor infections, weather extremities, and management in these areas.

For all values analyzed, KK animals performed better than other breeds in improving the immune system. Further selection for improved goats’ quality in Malaysia should be performed in KK. However, further studies on goats in Malaysia are required.
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REFERENCES