

**THE CAUSATIVE FACTOR DETECTION AND IDENTIFICATION OF
BOOPHILUS SP. INFESTATION IN BALI CATTLE IN BARRU REGENCY,
SOUTH SULAWESI**

**Deteksi dan identifikasi faktor penyebab timbulnya infestasi caplak *Boophilus sp.*
pada sapi bali di Kabupaten Barru Sulawesi Selatan**

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Abstract

In tropical climates such as Indonesia, the presence of ectoparasites occurs almost annually, which becomes one of the major problems due to ectoparasite infestations on ruminant farms. One problem occurred is the *Boophilus sp.* This study aimed to detect and identify causative factor in infestation of *Boophilus sp.* and correlation between tick infestation and incidence of blood parasite in Barru Regency. The study unit was the Bali cattle breeders spreaded in Mallusetasi District, Barru Regency. This study used a cross-sectional study to identify and determine the relationship between the causative factors of maintenance management and stock farmer knowledge level on the application of maintenance management in Bali cattle farms. The tabulated data of the maintenance management in Bali cattle breeding and breeder knowledge level causative factors against the tick ectoparasite infestation were descriptively analyzed and tested with a chi-square (χ^2) method to measure the relationship of these factors and *Boophilus sp.* tick infestation at 95% of confidence level. The magnitude of relationship strength was calculated by the odd ratio (OR) test at a 95% of confidence level. *Boophilus sp.* tick ectoparasite infestation occurred in Bali cattle farms in Mallusetasi District, Barru Regency with an incidence rate of 68,8%. The causative factors that influence the incidence of tick infestations included the farmer educational level, breeder experience, number of maintenance, maintenance pattern, poor cage condition, and breeder's knowledge. The infestation of *Boophilus sp.* tick had a very significant correlation on the incidence of blood parasitic diseases. Therefore, to reduce tick infestation and the incidence of blood parasitic disease, planning of integrated control measures to create awareness about the importance and control of tick for livestock farmers is required.

Keywords: blood parasite, *Boophilus sp.*, ectoparasite, tick

Abstrak

Keberadaan ektoparasit di daerah beriklim tropis seperti Indonesia hampir terjadi setiap tahun. Hal ini menjadi salah satu permasalahan besar akibat infestasi ektoparasit pada peternakan ruminansia. Salah satu permasalahan yang terjadi adalah infestasi caplak *Boophilus sp.* Unit penelitian adalah para peternak sapi Bali yang tersebar di Kecamatan Mallusetasi, Kabupaten Barru. Penelitian ini menggunakan metode *cross-sectional* untuk mengetahui hubungan antara faktor penyebab dan tingkat pengetahuan peternak terhadap penerapan manajemen pemeliharaan di peternakan sapi Bali. Data tabulasi manajemen pemeliharaan di peternakan sapi Bali dan tingkat pengetahuan peternak terhadap faktor penyebab infestasi ektoparasit caplak dianalisis secara deskriptif dan diuji dengan metode chi-square (χ^2) untuk mengukur hubungan faktor-faktor tersebut dengan infestasi caplak *Boophilus sp.* pada tingkat kepercayaan 95%. Besarnya kekuatan hubungan dihitung dengan uji *odds ratio* (OR) pada tingkat kepercayaan 95%. Tingkat kejadian infestasi ektoparasit caplak *Boophilus sp.* terjadi di peternakan sapi Bali di Kecamatan Mallusetasi Kabupaten Barru sebesar 68,8%. Faktor penyebab yang mempengaruhi timbulnya infestasi caplak antara lain tingkat pendidikan peternak, pengalaman peternak, jumlah pemeliharaan, pola pemeliharaan, kondisi kandang yang kurang baik, dan pengetahuan peternak. Infestasi caplak *Boophilus sp.* memiliki korelasi yang sangat signifikan terhadap timbulnya penyakit parasit darah. Oleh karena itu, untuk mengurangi tingkat kejadian infestasi caplak dan timbulnya penyakit parasit darah, diperlukan perencanaan Tindakan pengendalian secara terpadu untuk menciptakan kesadaran akan pentingnya pengendalian caplak bagi peternak.

Kata kunci: parasit darah, *boophilus sp.*, ektoparasit, caplak

INTRODUCTION

The need for food originating from animal protein continues to increase in South Sulawesi. This condition is driven by an increased population and high community purchasing power. Public awareness on the fulfillment of animal protein and high demand of beef encourages the government, community, and especially farmers to increase the cattle population. The government has designed various programmes to make Indonesia self-sufficient in beef by 2027 (Fuadi & Sugiarto, 2019). In general, the obstacles faced by farmers in an effort to increase the productivity of maintenance business includes maintenance and management, fulfillment of feed nutrients, and animal health security (Steensland and Zeigler, 2020).

Bali cattle is a germplasm with the widest distribution in several provinces in Indonesia (Sutarno and Setyawan, 2016). South Sulawesi is one of the distributing area of Bali cattle in Indonesia. There are three locations as the breeding center of Bali cattle, Barru, Bone, and Enrekang Regency. Barru Regency is one of the districts in South Sulawesi that has an important role on the Bali cattle purification in Indonesia based on the Decree of Indonesian Minister of Agricultural Affairs No. 4437/Kpts/SR.1203/2013 about the determination of Barru District as Bali cattle breeding source area (Mentan RI, 2013). In tropical climates such as Indonesia, the presence of ectoparasites occurs almost annually, which becomes one of the major problems due to ectoparasite infestations on ruminant maintenance. One problem occurred is the *Boophilus sp.* tick infestation. The presence of ectoparasites is increasingly detrimental when improperly controlled. It can make loss of selling value and decrease in meat production in beef cattle (Prihandono *et al.*, 2021). Ectoparasite also as a vector of many disease, especially blood parasite (Martins *et al.*, 2020). However, farmer's practices and knowledge of tick management remain poorly addressed. This study aimed to detect and identify causative factor in infestation of *Boophilus sp.* and correlation between tick infestation and incidence of blood parasite in Barru Regency.

RESEARCH METHODS

A design in good and representative sampling is an important component in the investigation and study of analytical epidemiology (Manja and Lakshminrusimha, 2015). This study used a Probability Proportional Sampling (PPS) sampling method at the selected village level to determine the number of selected Bali cattle breeders. In the selected villages, breeders were systematically sampled.

The research was carried out in Mallusetasi District, Barru Regency, South Sulawesi Province. This research stage was started by conducting site visit, observation, collecting samples, and interview using questionnaire with cattle breeders to obtain primary data. Secondary data was obtained from Animal Husbandry Department and BPS for Barru Regency.

The target population in this study was obtained from the population of Bali cattle breeders in Mallusetasi District, Barru Regency in 2013. A total 125 samples were taken from eight villages based on a comparison of the total population of the study. From each selected breeders, samples of ticks were taken which suspectively ectoparasite infected such as pale fur, skin damage, or growth disorder. Ectoparasite detection was obtained by the presence of *Boophilus sp.* infestation at Bali cattle farm level. Blood samples were taken to identify the relationship between tick ectoparasites infestation and the blood parasitic disease.

This study used primary and secondary data. Primary data were directly obtained and collected from Bali cattle farms such as tick ectoparasites and blood samples. Identification of ectoparasites was carried out at the Laboratory of Veterinary Medicine Study Program, Hasanuddin University, and blood samples were examined at the Maros Veterinary Center (BBVet Maros). Beside of that, answered questionnaires were obtained from interviews with farmers, and direct field observation to identify the causative factor of maintenance management and farmer knowledge level that influence the incidence of *Boophilus sp.* infestations. This study used a cross-sectional study to identify and determine the relationship between the causative factors of maintenance management and stock farmer knowledge level on the application of maintenance management in Bali cattle farms.

Variables

The ectoparasite identification test result was the dependent variable (Y) while the independent variable (X) was the cause of maintenance management including the basic information, maintenance factors, cage condition, and farmer knowledge. Questions for the maintenance management factor questionnaire was a dichotomous variable (1 score for correct answer and 0 score for incorrect answer), thus the questionnaire result against the maintenance management factors in Bali cattle farms could be grouped into two categories, namely breeders with poor maintenance management (the total score of respondents (x) > average total score of respondents) and breeders with good maintenance management (the total score of respondents (x) ≤ average total score of respondents) (Riwidikdo, 2009).

Data Analysis

After all data were collected, an examination was performed to correct and improve the data completeness, and then coding was performed on all the questionnaire data variables to facilitate analysis. Questionnaire data and ectoparasite test results of *Boophilus sp.* infestation were saved as a database in the *Microsoft Excel* program.

Tabulated data of the maintenance management in Bali cattle breeding and breeder's level of knowledge were analyzed descriptively and tested using the chi-square (χ^2) method to measure the relationship between these factors and *Boophilus sp.* infestation at 95% of confidence level.

The strength of the relationship strength was calculated by the odd ratio (OR) test at a 95% of confidence level.

RESULTS AND DISCUSSION

The distribution of *Boophilus sp.* on Bali cattle farms in Mallusetasi District, Barru Regency has spread to all villages. The results of observation, detection, and identification of *Boophilus sp.* infestation on Bali cattle farms in Mallusetasi District, Barru Regency, found that there were 86 Bali cattle farms were positively infested with *Boophilus sp.* (68.8%). The maintenance patterns were divided into extensive (36%), semi-intensive (45.6%), and intensive (18.4%). In general, the effect of implementing maintenance management was divided into poor (64.8%) and good maintenance management (35.2%). The poor maintenance management in Bali cattle farms were caused by two main groups, including maintenance factors (45.6%) and the cage condition factors (40%).

Identification of causative factors in the category of poor maintenance factors, including cattles were maintained by grazing (81.6%), cattles were grazed together with cattles from other breeders (58.4%). Extensive and semi-intensive maintenance pattern caused vulnerability and susceptibility to ectoparasite infestation, especially to *Boophilus sp.* (Urge *et al.*, 2020).

Another contributing factors were cattles that were rarely bathed (79.2%) or bathed together with other animals (19.2%), cattle that affected or infected by ticks were not separated from healthy animals (100%), ticks attached to the cattles body were rarely removed and eradicated (64%), farms were rarely visited by animal health officers (40%), the farmers or breeders did not live around the farming area (36%).

Identification of causative factors based on the category of good cage condition include the closest distance from cage to other farms <50 m (42.4%), the closest distance from cage to the grazing area <50 m (23.2%), and large grass area around the cage (28%). Other causative factors based on the cage condition category include grass being mowed irregularly (97.6%), absence of chickens or poultry in the farm area (94.4%), the grass or soil cage floor (44.8%) %, the cage area were rarely cleaned (36%), cage were cleaning not using disinfectan or detergent (100%).

Correlation Analysis of Causative factors in Maintenance Management and Breeder Knowledge.

We performed analyses to estimate correlation of causative factors in maintenance management and breeder knowledge variable. Individually (in bivariate way), the last educational level variable of breeders at primary school level had a very significant correlation ($\chi^2 = 7.28$; $P = 0.01$) to the insidence of tick ectoparasite infestation with the odd ratio (OR) of 2.94, indicating that the tendency of Bali cattle farm infested with tick ectoparasite had 2.94 times faster. The last educational level variable of breeders at the high school level had a significant correlation ($\chi^2 = 3.90$; $P = 0.05$) with the insidence of tick infestation. In addition, the breeder's experience variable in maintaining Bali cattle <5 years had a significant correlation ($\chi^2 = 5.67$; $P = 0.05$) to the insidence of tick infestation in Bali cattle farms. This was possible due to lack of experience in maintaining, so that the implementation of maintenance management was weak, as tick ectoparasites was easily occurred.

The variable of maintained ≥ 5 cattles had a very significant correlation ($\chi^2 = 55.72$; $P = 0.00$) to the insidence of tick infestation with the odd ratio of 30.88, so that the tendency of Bali cattle breeding with the number of cattles ≥ 5 had the possibility 30.88 times more likely to be infested with tick ectoparasites. The Bali cattle maintenance variable with extensive pattern had a very significant correlation ($\chi^2 = 19.72$; $P = 0.00$) on the insidence of tick infestation with the odd ratio (OR) of 11.45, therefore the tendency of Bali cattle maintenance with extensive

patterns had a 11.45 times more likely to be infested with tick ectoparasites. The Bali cattle maintenance variable with an intensive pattern had a very significant correlation ($\chi^2 = 62.15$; $P = 0.00$) on the incidence of tick ectoparasite infestation.

The causative factor in poor category of maintenance had a very significant correlation ($\chi^2 = 40.38$; $P = 0.00$) on the incidence of tick ectoparasite infestation. The variable factors that cause cattle to be maintained by grazing method had a very significant correlation ($\chi^2 = 62.15$; $P = 0.00$) on the incidence of tick infestation. The variable factors that cause cattle being separated from other breeder's cattles had a very significant correlation ($\chi^2 = 54.08$; $P = 0.00$) on the incidence of tick infestation with the OR of 35.51, so that the tendency of Bali cattle maintenance combined together with cattle from other breeders had a probability 35.51 greater risk of ectoparasites infestation.

The variable factor of cattle that rarely bathed cattle had a very significant correlation ($\chi^2 = 64.52$; $P = 0.00$) on the incidence of tick infestation with the OR of 151.79, so that the cattles that rarely bathed had 151.79 times more likely to be infested with tick ectoparasites. The variable factor of cattle bathed with the other had a very significant correlation ($\chi^2 = 57.82$; $P = 0.00$) on the incidence of tick infestation. Rarely removing ticks attached to the cattle's body had a very significant correlation ($\chi^2 = 31.89$; $P = 0.00$) on the incidence of tick infestation.

The variable that of sick or dead cattles rarely examined by animal health workers had a very significant correlation ($\chi^2 = 14.31$; $P = 0.00$) on the incidence of tick infestation with the OR of 5.76, so that the tendency of cattle that were rarely examined by animal health workers had 5.76 times greater for tick ectoparasite. The variable factors that caused breeders did not live around the farm had a very significant correlation ($\chi^2 = 19.72$; $P = 0.00$) on the incidence of tick infestation with the OR of 11.45, therefore the tendency of cattle breeders/managers who did not live around the farm had a 11.45 times more likely to be infested with tick ectoparasites.

The condition of cage had a very important role in identifying the causative factors. The result showed that the poor cage had a significant correlation ($\chi^2 = 4.87$; $P = 0.05$) on the incidence of tick infestation. The OR value was 2.52 means that the cattle farm with poor cage condition category had a 2.52 times more likely to be infested with tick infestation. The irregularly pruned grass around the cage had a very significant correlation ($\chi^2 = 6.78$; $P = 0.01$) on the incidence of tick infestation. The absence of chicken in the farm area had a significant correlation ($\chi^2 = 5.59$; $P = 0.05$) on the incidence of tick infestation with the OR of 6.18, so that the tendency their absence in farm area was 6.18 times more likely to be infested with tick.

Cage bedding made from grass or soil had a significant correlation ($\chi^2 = 4.51$; $P = 0.05$) on the incidence of tick infestation with the OR of 2.36. In this case, cage bedding made from grass or soil had tendency 2.36 times greater to be infested with tick. Cages that were rarely cleaned had a very significant correlation ($\chi^2 = 19.72$; $P = 0.00$) on the incidence of tick infestation with the OR of 11.45. It showed that rarely cleaned cages had 11.45 times more likely to be infested with tick. Potential risk factors associated with tick-borne diseases include the frequency of acaricide application (Miyama *et al.*, 2020; Wesonga *et al.*, 2014), distribution of tick vectors and infection rate of ticks (Ali *et al.*, 2021).

A better understanding of the livestock farmer's knowledge is an essential element in effective health protection (Hoischen-Taubner *et al.*, 2018). Overall, the total assessment of poor maintenance management had a very significant correlation ($\chi^2 = 67.15$; $P = 0.00$) on the incidence of tick infestation with the OR of 51.68, so that poor maintenance and cage condition had a 51.68 times more likely to be infested with tick infestation. In addition, the assessment of breeder's knowledge on ectoparasite infestation included in the bad category had a very significant correlation ($\chi^2 = 24.47$; $P = 0.00$) with OR of 34.62. This showed that cattle farm

with poor farmer's knowledge had a 34.62 times more likely to be infested with tick ectoparasites. This shows that the farmers have little knowledge about tick. Knowledge of tick infection present opportunities for strategic disease prevention and control (Oundo *et al.*, 2022).

The existence of ectoparasite infestations is caused by poor environmental, climatic, and maintenance management conditions. This is one of the important factors causing the high ectoparasite infestation in beef cattle (Prihandono *et al.*, 2021). There is a correlation between the perception of tick infestation and the implementation of management practices (Sylvain *et al.*, 2021).

This study also analyzed the correlation between the found of tick and the incidence of blood parasite (Table 1). In bivariate way, tick had a very significant correlation ($\chi^2 = 9.15$; $P = 0.01$) on the incidence of blood parasitic disease with an OR 5.93, so that the presence of tick ectoparasite in Bali cattle had 5.93 times more likely to be infested with the blood parasitic disease.

Ticks acquire pathogens by feeding on the blood of and infected host. These ticks carry the pathogens and transmit it to other hosts when feeding again (Eskezia and Desta, 2016). There are correlations between tick infestation and blood parasitic disease such as babesiosis and anaplasmosis (Dou *et al.*, 2022).

Tick infestation can reduce body weight, decrease milk and meat production, as well as causing the death of infected animals (Eskezia and Desta 2016). However, the most important role of tick is its potential as an infectious and disease transferring agent, including *Babesia bigemina*, *Babesia argentina*, *Anaplasma marginale*, *Coxiella burnetii*, *Borrelia theileri* (Gondard *et al.*, 2017). Disease prevention can be done by considering a good cage, cage floor, and contact with other sick cattles (Mandel *et al.*, 2016). The implementation of one health strategy can be method due to control tick borne disease (Meneghi *et al.*, 2016).

CONCLUSION AND SUGGESTION

Conclusion

Boophilus sp. infestation occurred in Bali cattle farms in Mallusetasi District, Barru Regency with an incidence rate of 68.8%. The causative factors that influence the incidence of tick infestations included the breeder's education level, breeder's experience, the number of cattle that maintenance, maintenance pattern, poor cage condition, and breeder's knowledge. The infestation of *Boophilus sp.* had a very significant correlation on the incidence of blood parasitic diseases.

Suggestion

The infestation of *Boophilus sp.* tick had a very significant correlation on the incidence of blood parasitic diseases. Therefore, to reduce tick infestation and the incidence of blood parasitic disease, planning of integrated control measures to create awareness about the importance and control of tick for livestock farmers is required.

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Table

Table 1. Correlations between tick ectoparasites found on the incidence of blood parasites in Mallusetasi District, Barru Regency.

| Variable | Ectoparasite Infestation | Blood parasite diagnose | | <i>Chi-Square</i> (χ^2) | P | 95% CI Low | OR | 95% CI Upp |
|---|--------------------------|-------------------------|-----|--------------------------------|------|------------|------|------------|
| | | Pos | Neg | | | | | |
| Correlation of tick infestation and incidence of blood parasite | 1. Tick | 26 | 57 | 9.15** | 0.01 | 1.68 | 5.93 | 20.96 |
| | 0. No tick | 3 | 39 | | | | | |

Note: **: Very significant ($P \leq 0.01$), *: Significant ($0.01 < P \leq 0.05$), ^{NS}: Non-significant ($0.05 < P$)