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Prevalence of helminthiasis and identification of worm species in buffaloes on smallholder farms in Jerowaru sub-district, East Lombok

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Abstract: Jerowaru sub-district is one of 21 sub-districts in East Lombok district. Many people raise buffaloes to fulfill their need for food of animal origin. However, the business is still hampered by diseases caused by worm infestation, which is economically detrimental. This study aimed to obtain data on the prevalence of helminthiasis in buffaloes and identify the types of worms that infest the animals. Fecal samples were collected from buffaloes kept in smallholder farms in several villages in the Jerowaru sub-district. Examination and identification of samples were conducted at the Microbiology and Biotechnology laboratory of the Faculty of Animal Science, University of Mataram, and the Banyumulek Animal Health laboratory. The results show that the prevalence of helminthiasis in buffaloes kept in smallholder farms in the Jerowaru subdistrict was 14.60%. The types of parasites infecting buffaloes consisted of Eimeria (13.48%) and Toxocara (1.12%). Although parasite infection intensity is categorized as mild, it is necessary to pay attention to the cleanliness of cattle pens, especially during the rainy season, so they are not wet and humid.

Keywords: Buffalo; Gastrointestinal parasites; West Nusa Tenggara; Smallholder farming.

Introduction

In addition to cattle, large ruminants that produce animal protein are buffaloes. Buffaloes come from the Bovidae subfamily, which consists of domestic and wild buffaloes. Domestic buffaloes are divided into two groups: river buffalo and swamp buffalo. In contrast, wild buffaloes are divided into tamaraw (*B. mindorensis*), anoa (*B. depressicornis*), and African buffalo (*B. caffer*) (Hasinah & Handiwirawan, 2006). The buffalo population in Indonesia is 95% mud buffalo (Alfiyati & Fauziah, 2010). East Lombok is one of the districts in West Nusa Tenggara (WTN) province with a reasonably high buffalo population. Based on data released by the Central Bureau of Statistics (Badan Pusat Statistik, 2020), the buffalo population in the East Lombok district amounted to 4960 heads. This number of livestock is expected to grow to meet the community's animal protein needs.

Similar to other ruminants, buffaloes are also susceptible to various diseases that can cause a decrease in productivity. Diseases affecting buffalo can be bacterial, viral, or parasitic infections such as worms and protozoa (endoparasites). Reported cases of helminthiasis in livestock on the island of Lombok in 2020 (Badan Pusat Statistik, 2020) were 6195 cases and reported cases of helminthiasis in the East Lombok district amounted to 3931 cases (63.45%). Helminth parasitic infestations in livestock and other ruminants cause diseases of great socio-economic importance worldwide. The current financial losses caused by helminth infestations significantly impact farm profitability. For example, losses caused by helminth infestations in the United States have resulted in approximately 330 million USD annually (Seo et al., 2015). Worldwide,

economic losses caused by liver fluke infections cost at least 3 billion dollars per year due to weight loss, reduced fertility, decreased milk and wool production, increased mortality, and high costs of treating infected animals and liver damage (Nyirenda et al., 2019; Arias-Pacheco et al., 2020). In tropical regions with poor management and poor nutritional practices, losses are expected to be even higher due to favorable environmental conditions for transmission of infection. Worm-infected livestock can also be a source of direct and indirect human disease transmission (zoonosis) that can cause public unease.

Worm infestations in livestock often do not show typical clinical symptoms, especially in the early phases of infection (Taylor et al., 2015; Vande et al., 2018). Clinical symptoms usually appear when the disease is chronic, or the quantity of parasitic agents significantly increases in the predilection area. Efforts made by the government so far have been to provide deworming drugs periodically to existing farmers. However, this program is still constrained by many things, including farmers' lack of awareness to follow the program. Another problem is the lack of knowledge of suitable farming methods (farm management) and the lack of data and information on the types of worms that attack farmed buffalo livestock. This study aimed to obtain data on the prevalence and types of worms that attack buffalo in several villages in the Jerowaru sub-district, East Lombok district, as a strategic first step in determining targeted control efforts.

Methods

This research was a type of descriptive research with a survey study type. A survey study classified as descriptive observational is a data collection research activity conducted on a population in a particular area at a specific time. The population in this study was buffaloes kept in three (3) villages: Sekaroh village, Wakan Mas village, and Pandan Wangi village in the Jerowaru sub-district of East Lombok district. The total buffalo population in East Lombok in 2020 was approximately 4960 heads (Badan Pusat Statistik, 2020). Samples in this study were individual buffaloes taken by purposive sampling in group pens and individual pens owned by residents in the villages that were the sampling locations.

Buffalo Fecal Sampling

Fecal samples were collected rectally or fresh feces with a total fecal sample of approximately 5-10 grams. Samples were then put into a 50 ml sample bottle, and 10% formalin was added at 2-3 ml volume. Samples were then stored in a cool box during sample collection in the field. The collected samples were then taken to the laboratory of the Livestock and Animal Health Service Office of NTB Province in Banyumulek for endoparasite examination. Sample collection was conducted for five months.

Sample Examination by Native and Sedimentation Methods

Examination by the native method (Taylor et al., 2015) was done by making a thin smear of fecal samples on the glass object's surface, adding 2-3 drops of distilled water, and then homogenizing. The sample was then covered with a cover glass and observed under a microscope from weak magnification (40x) to strong magnification (400x).

A saturated sugar solution was used for sifting samples by the flotation method. Fecal samples in the sample bottle were extracted and weighed as much as 3-5 grams, put into a test tube, and then added with distilled water until 2/3 of the test tube. The sample was then homogenized with a stirring spatula and centrifuged at 4000 rpm for 5 minutes. The supernatant formed was discarded, and the remaining sediment was added with saturated sugar up to 2/3 of the test tube, homogenized, and centrifuged at 2500 rpm for 10 minutes. The centrifuged sample was then added back with saturated sugar until the liquid surface in the test tube was convex. The centrifuge tube was then covered with a cover glass and allowed to stand for 3-5 minutes. After that, the cover glass was moved quickly to the surface of the object glass and observed under a microscope with weak magnification (40x) to strong magnification (400x). Worm eggs and larvae found in the examined samples were documented and identified.

Examination with the sedimentation method was carried out by weighing 3 grams of feces samples into a tube, adding water to 50 ml,

then stirring until homogeneous. The resulting suspension was put into a conical tube, and water was added to the brim. The samples were then precipitated for five minutes, and their supernatant was discarded. Clean water (up to 50 cc) was added to the sediment, stirred, and precipitated for 6 minutes. After 6 minutes, the supernatant was discarded, left with a sediment of 5 cc, and repeated three times. Two drops of 0.1% Methylene blue solution were added to the sediment and stirred until evenly distributed using a pipette. The solution was put into the counting chamber, followed by observation under a 100-times magnification microscope.

Data Analysis

The data used in this study were presented in images and the types of parasites found. The data obtained were analyzed descriptively. To calculate the prevalence, the formula according to Soulsby (1986) was used as follows:

$$\text{Prevalence} = \frac{\text{Number of buffaloes infected with parasites}}{\text{Number of buffalo samples examined}} \times 100\%$$

Results and Discussion

Prevalence of helminthiasis

This study collected fecal samples from buffaloes in individual and group farms in three villages: Sekaroh, Wakan Mas, Pandan Wangi, Jerowaru sub-district, East Lombok district (Figure 1). A total of 89 fecal samples were collected, with the age of the buffaloes ranging from 8 months to 10 years.

Figure 1. Collection of buffalo fecal samples

The fecal examination results show that the prevalence of helminthiasis in the sampled buffalo population was 14.60% (13 positives out of 89 samples examined). The observed disease incidence in the sampled buffalo population in this study was lower than the study on the prevalence of helminthiasis in buffaloes in the Sambelia sub-district reported by Baihaqi et al. (2015). The prevalence of helminthiasis in buffaloes in the Sambelia sub-district, East Lombok district, was reported at 78% (n = 50) (Baihaqi et al., 2015). Another study by Mursyid et al. (2020) on buffaloes in the West Praya sub-district, Central Lombok district, reported a higher prevalence rate (32.7%) than this study's results. The level of gastrointestinal parasitic infestation in ruminants, including buffaloes, is influenced by several factors. Those are the geographical conditions of an area, husbandry management, and environmental factors. The disease incidence rate will be higher in wet than dry geographical conditions (Khan et al., 2021). The feces samples in this study were taken during the dry season. Dry conditions in the dry season affect the ability of worm eggs or larvae in an atmosphere of dryness so that they die quickly. This condition causes the spread of disease to run slowly so that the incidence of disease in the population can be suppressed or relatively low.

Prevalence of helminthiasis by sex

One such that has garnered attention in recent research is the role of sex in determining the susceptibility and prevalence of helminth infections in buffalo herds (Deeba et al., 2019Akhter et al., 2000; Abdul et al., 2022). Emerging evidence suggests that sex may play a significant role in predisposing buffaloes to certain gastrointestinal parasites. This phenomenon stems from a combination of physiological, behavioral, and immunological differences between male and female buffaloes,

which can influence their exposure and susceptibility to helminth infections. In this study, when grouped by sex, 15 samples were collected from male buffaloes and 74 samples from female buffaloes. From this data, the prevalence rate of parasite infestation in males was 26.67%, while 12.16% in female buffaloes (Figure 2).

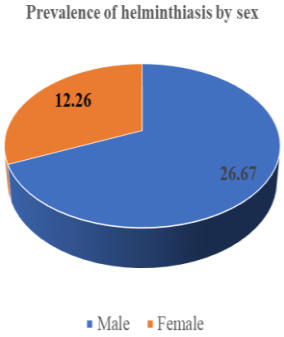

Figure 2. Prevalence of helminthiasis in buffaloes by sex

The results of this study were in line with the results of a survey conducted by Akhter et al. (2000). Furthermore, Akhter et al. (2000) explained that higher cases of helminthiasis in male animals are related to negligence and poor care of male animals compared to female animals. Hormonal conditions also affect the susceptibility of livestock to disease. The estrogen hormone in female cattle promotes reticuloendothelial system (RES) cells in forming antibodies against parasites. As a result, female livestock are relatively more resistant to various types of diseases, and female livestock are also rarely employed, especially in pregnant and lactating conditions.

Prevalence of helminthiasis by age

The distribution of helminthiasis cases in buffaloes by age in this study (Table 1) shows that the highest prevalence rate was found in the young buffalo group (1-3 years old). The prevalence rates in calves and adult buffaloes were 16.67% and 13.95%, respectively. Age is an essential factor in the prevalence of gastrointestinal parasitic infections. Young animals are relatively more susceptible to disease than adults (Nurhidayah et al., 2019; Al-Jubury et al., 2020). This is due to the well-developed immunity factor in adult livestock that can deal with disease attacks better than young livestock (Akhter et al., 2000; Deeba et al., 2019).

Table 1. Prevalence of helminthiasis in buffaloes by age

Group	Number of samples examined	positive	
		No	%
Calves (1 month -1 year)	12	2	16.67
Young (1 – 3 years)	34	5	20.83
Adult (> 3 years)	43	6	13.95
Total	89	13	14.60

In buffaloes, helminthiasis can be caused by various types of parasites, such as nematodes, trematodes, and cestodes, each with unique life cycles and modes of transmission (Ola-Fadunsin et al., 2020). Neglecting any of these parasite types can lead to incomplete control measures and persistent infections (Dafur et al., 2020; Bastakoti et al., 2023). Therefore, a comprehensive approach that addresses the diversity of parasites is essential for effective prevention and management strategies in buffaloes. Observations on the types of parasites that infect buffaloes in this study show that Eimeria was the dominant parasite found in the feces of collected samples (Table 2).

Table 2. Parasite type and degree of infection intensity (n = 89)

Type of parasite	Number of infected samples	Infection (%)	Intensity
Eimeria	12	13.48	50-650 oocytes/gram feces
Toxocara	1	1.12	150 eggs/gram feces
Total	13	14.60	

Eimeria belongs to the order Coccidia. There are 13 species of Eimeria (AL-Lahaibi et al., 2021; Bangoura et al., 2022). Among those 13 species, E. zuurnii is the most pathogenic,

while *E. bovis* is said to infect most ruminants (Fitriastuti et al., 2011). Eimeria oocysts circulate from a few days to several weeks, depending on humidity, temperature, species, and other environmental factors. Oocysts are highly resistant and can survive under unfavorable conditions, such as minus 4°C. Oocysts can persist throughout the seasons, so prevalence remains high throughout the year, as they are present throughout the seasons. In addition to Eimeria, the parasite species found in buffaloes in this study was Toxocara sp., which has a mild infection intensity (150 eggs/gram of feces). The infected animal was a one-year-old male buffalo. Toxocara mainly infects young cattle or calves but does not rule out the possibility of infecting adult cattle or mothers. Studies conducted by Estuningsih (2005) also showed that Toxocariosis infects more bulls than females because in female cattle, the L2 (larval stage 2) of *Toxocara sp* does not turn into L3 but experiences dormancy in the tissue (Estuningsih, 2005; Biswas et al., 2022).

Conclusions

The prevalence of helminthiasis in buffaloes kept in smallholder farms in the Jerowaru sub-district was 14.60%. The types of parasites infecting buffalo consisted of Eimeria (13.48%) and *Toxocara sp* (1.12%). Although parasite infection intensity is categorized as mild, it is necessary to pay attention to the cleanliness of cattle pens, especially during the rainy season, so they are not wet and humid.

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