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Identfication, Prevalence, and Degree of Digestive Tract Protozoa Infection in Dairy Cows at KUTT Suka Makmur, Grati, Pasuruan

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ABSTRACT

The aim of this research is to identify, determine prevalence, and degree infection of protozoa gastrointestinal tract in dairy cow at KUTT Suka Makmur, Pasuruan district. The research was conducted from July until September 2023 by taking 100 dairy cow faeces sample from 4 villages of KUTT Suka Makmur. The samples were examined by sedimentation and floating methods. Species are identified by looking at morphology of protozoa gastrointestinal. There were of 85 (85%) samples positively infected with protozoan. There were 3 species that infect the digestive tract, those are *Eimeria* sp., *Balantidium* sp., and *Blastocystis* sp. The highest infection of protozoa in this research was *Balantidium* sp. (54%) followed by *Eimeria* sp. (47%). In this study, we found that 54 samples (54%) infected by one kind of protozoa and 31 samples (31%) infected by mixed protozoa. The result of *Chi Square* showed no significant difference in the age on the prevalence of digestive tract protozoa. The result of *Kruskal Wallis* showed no significant difference in the age and degree infection of *Eimeria* sp.

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INTRODUCTION

Dairy cows are livestock that produce animal protein, milk and meat that can be consumed. One type of dairy cow that is capable of producing the highest amount of milk compared to other types is the Friesian Holstein (FH). Based on data from the East Java Province Livestock Service (2023), the Pasuruan region had a dairy cattle population of 94,101 head of cattle in 2020 and 97,101 head of cattle in 2021.

Milk production produced by dairy cows is influenced by various genetic and environmental factors. Genetic factors have an influence of 30% while environmental factors have an influence of 70%. This is because it is influenced by several things such as maintenance management, feed, temperature, reproductive management, and health (Christi and Tanuwiria, 2019).

Gastrointestinal parasitic infections can be caused by protozoa and helminths that live in the digestive tract. Protozoa that live in the digestive tract will interfere with the absorption of nutrients in dairy cows so that milk production decreases. Protozoan parasites cause damage to the intestinal epithelium so that the intestine's ability to digest food and produce enzymes decreases (Zalizar, 2017). This condition can have an impact on decreasing production and disrupting livestock growth. Infections caused by gastrointestinal protozoa can cause clinical symptoms such as diarrhea, weight loss, and dehydration. Gastro-intestinal protozoa that can be found in the digestive

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tract of cattle include *Eimeria* sp., *Balantidium* sp., *Giardia* sp., *Entamoeba* sp., *Cryptosporidium* sp., and *Blastocystis* sp. (Susana *et al*., 2019).

Research conducted by Hastutiek *et al*., (2019) showed a high prevalence rate of gastro-intestinal protozoa reaching 71.4%. Hastutiek *et al*., (2022) reported that there were 50 Madurese cattle samples positive for *Eimeria* spp oocyst. with a prevalence of 27.3% and an average OPG of 1686.1.

Research on digestive tract protozoa in dairy cattle is rarely carried out. Therefore, this research needs to be carried out in order to determine the types of digestive tract protozoan parasites that can be found in dairy cows. Protozoal infections of the digestive tract can cause harm in the form of decreased milk production. The data obtained from this research can provide an overview of the prevalence of digestive tract protozoan infections in dairy cattle at KUTT Suka Makmur, so that control and prevention can be carried out.

MATERIALS AND METHODS

This research used 100 dairy cow feces samples taken from 4 villages in the KUTT Suka Makmur working area, Pasuruan Regency. These samples were obtained from Sumur Waru Village with 19 feces samples, Sumber Dawe Sari Village with 10 feces samples, Semongkrong Village with 55 feces samples, and Panditan Village with 16 feces samples. Sampling in each village was determined randomly in stages, then the fecal samples were placed in 2% potassium dichromate solution. Stool examination is carried out using the sedimentation method, floating method, and calculating the degree of infection (Oocyst Per Gram)

Positive stool samples were then calculated for OPG (Oocysts Per Gram) using the McMaster method to determine the degree of digestive tract protozoan infection. The McMaster procedure is 4 grams of feces mixed with 56 mL of saturated sugar solution then filtered using a tea strainer and homogenized. The homogeneous solution was taken using a dropper pipette then put into a McMaster counting chamber with a volume of 2 x 0.15 ml and waited for 10-15 minutes then examined using a microscope with 100x magnification (Vadlejch *et al*., 2011).

The formula used to calculate Oocysts Per Gram (Jiang, 2012):

$$\text{OPG} = \frac{n}{Bt} \times \frac{Vt}{Vkh}$$

Information :

n : Number of oocysts identified
Bt : Feces weight (4gr)
Vt : Feces volume (60ml)
Vkh : Counting room volume (0.15)

The data obtained from the sample examination results are presented descriptively in the form of tables and figures. To determine the relationship between age and prevalence was analyzed using *Chi Square*. The degree of infection was analyzed using *Kruskal Wallis* while the prevalence was calculated using the prevalence formula according to Thomas (2004) :

$$\frac{Number\ of\ positive\ samples}{Total\ samples} \times 100\%$$

RESULTS AND DISCUSSION

The results of examination of 100 samples of dairy cow feces in 4 villages in the KUTT Suka Makmur working area found 3 types of gastrointestinal protozoa, namely *Eimeria* sp. (47%), *Balantidium* sp. (54%), and *Blastocystis* sp. (18%) (Figure 1).

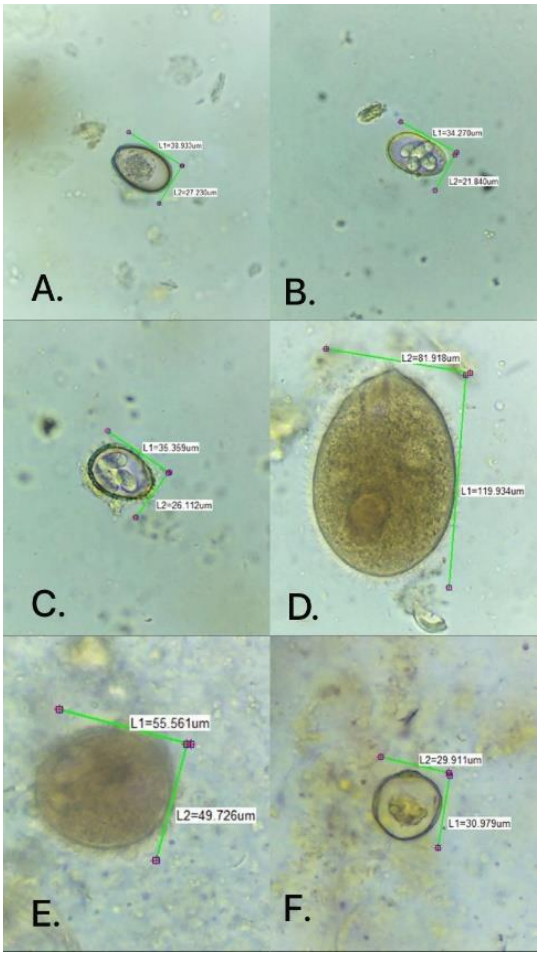

Figure 1. A) *Eimeria bovis*, B) *Eimeria canadensis*, C) *Eimeria auburnensis*, D) Tropozoit *Balantidium* sp., E) Cyst *Balantidium* sp., F) Cyst *Blastocystis* sp.

Eimeria bovis has ovoid-shaped oocysts measuring 34.9 x 21.9μm, double-layered walls, and oocysts have micropiles.

Eimeria canadensis has an ovoid shape with dimensions of 38.9 x 27.2 μm, the oocyst is wide and looks invaginated inwards.

Eimeria auburnensis has a double-layered wall morphology, measuring 35.3 x 26.1μm, and the oocysts have micropiles. The species *Eimeria auburnensis* was also found in the research of Hastutiek *et al*. (2022) which was followed by infection with *E. bovis*, *E. zuernii*, and *E. cylindrica*.

Balantidium sp. The trophozoite stage of *Balantidium* sp. found in this study measured 119.93 x 81.91 μm, was oval in shape, had cystotomes and cilia on the entire surface of the body.

The cyst stage of *Balantidium* sp. measures

55.56 x 49.72 μm, is round, and has thick walls.

The cyst stage of *Blastocystis* sp. was a round cyst stage measuring 30.9 x 29.9μm, having thick walls and vacuoles.

The results of examination of 100 dairy cow feces samples showed a prevalence of 85% (85 positive samples). These results consist of 19 positive samples (100%) in Sumur Waru Village, 5 positive samples (50%) in Sumber Dawe Sari Village, 47 positive samples (85.4%) in Semongkrong Village, and 16 positive samples (87.5) in Panditan Village.

The highest prevalence of gastrointestinal protozoa infects dairy cows aged 0-1 years (91.66%). This happens because immunity is not fully developed so it is easily infected by protozoa.

Table 1. Prevalence of Gastrointestinal Protozoa in Dairy Cattle Based on Age and Type of Infection

Ages (year)	Samples	Protozoa Positive Samples		Total Positive Samples (%)
		Single	Mix	
0 – 1	24	13	9	22/24 (91.66)
>1 – 2	12	5	4	9/12 (75)
>2	64	36	18	54/64 (84.37)
Total	**100**	**54**	**31**	**85**

Based on the results of the *Chi Square* test, the comparison between age and protozoa prevalence showed a result of 0.184, meaning there was no significant relationship (P>0.05). This occurs because all ages of dairy cattle are infected with gastrointestinal protozoa.

Differences in prevalence rates of gastrointestinal protozoan infections in various regions and regions are influenced by several factors such as rearing management, environmental conditions, season, feed and housing, as well as age and sex (Marskole *et al*., 2016). The number of dairy cows on several KUTT Suka Makmur farms ranges from 6-30 and the cows are mixed in one pen, making it easier for disease transmission.

Type *Balantidium* sp., was the main single infection with 26 positive samples (26%), *Eimeria* sp., the second single infection with 21 positive samples (21%), *Blastocystis* sp., the third single infection with 7 positive samples (7%). In mixed infections, 20 positive samples were found (20%) mixed infections, namely *Eimeria* sp., and *Balantidium* sp., mixed infections of *Balantidium* sp., and *Blastocystis* sp., 5 positive samples (5%), mixed infections of *Eimeria* sp., *Balantidium* sp., and *Blastocystis* sp. 3 samples were positive (3%), and mixed infection with *Eimeria* sp. and *Blastocystis* sp. 3 samples were positive (3%).

Prevalence of *Balantidium* sp. is the highest prevalence because *Balantidium* cysts carried by water flow will contaminate forage and ultimately be eaten by livestock. *Balantidium* cysts have a simple life cycle without going through a sporulation process so that the time period from when the cyst is ingested until disease occurs is shorter than other types of protozoa, such as *Eimeria* sp.

Examination results on 47 stool samples infected with *Eimeria* sp. Then an OPG (Oocyst per Gram) examination was carried out to calculate the degree of infection, but when the examination was carried out, only 25 samples could be counted for the number of oocysts. The degree of infection can be seen in Table 2.

Table 2. Degree of *Eimeria* sp infection. in the digestive tract of dairy cattle.

Ages (year)	Degree of Infection			Total
	Light	Medium	Heavy	
0 – 1	5	3	0	8
>1 – 2	2	1	0	4
>2	12	2	0	15
Total	**19/25 (76)**	**6/25 (24)**	**0 (0)**	**25**

Based on the results of calculating Oocysts Per Gram (OPG) in the 25 positive samples that were examined, the degree of infection was in the mild and moderate categories. The degree of protozoan infection was dominated by mild infections in 19 of the 25 positive samples. The *Kruskal Wallis* test analysis showed a result of 0.536 (p>0.05), which means that age has no effect on the degree of protozoan infection of the digestive tract of dairy cows at KUTT Suka Makmur.

CONCLUSION

The types of gastrointestinal protozoa that infect dairy cows at KUTT Suka Makmur are *Eimeria* sp., *Balantidium* sp., *Blastocystis* sp.

The prevalence of gastrointestinal protozoa in dairy cows at KUTT Suka Makmur is 85% (85 samples were positively infected with gastro-intestinal protozoa from 100 fecal samples)

Degree of infection with *Eimeria* sp. The digestive tract in dairy cows at KUTT Suka Makmur found 19 samples of mild infection and 6 samples of moderate infection.

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