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Prevalence and Infection's Degree of Gastrointestinal Nematode Worm in *Friesian Holstein* Dairy Cows at KUTT Suka Makmur Pasuruan Regency

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ABSTRACT

This study aims to determine the type, prevalence, and infection's degree of gastrointestinal Nematode worm in *Friesian Holstein* Dairy Cows at KUTT Suka Makmur, Pasuruan Regency. The study was conducted in July – September 2023. One hundred of feces samples were collected from four sub-districts at KUTT Suka Makmur working area. Samples were examined by sedimentation and floating methods. Positive samples were further examined by McMaster methods to determine the number of worm eggs per gram feces. The type of worms were *Oesophagostomum sp.* (24%), *Haemonchus sp.* (20%), *Mecistocirrus sp.* (13%), *Trichuris sp.* (8%), *Ostertagia sp.* (6%), *Trichostrongylus sp.* (6%), *Nematodirus sp.* (3%), and *Strongyloides sp.* (3%). The prevalence of gastrointestinal Nematode worm was 66% with mild and severe degrees of infection. The Chi Square test results showed that age had no effect on the prevalence and infection's degree of gastrointestinal Nematode worm in Friesian Holstein dairy cows at KUTT Suka Makmur. While location had effect on the prevalence but had no effect on the infection's degree.

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INTRODUCTION

Pasuruan Regency is the second largest contributor to cow's milk production in East Java Province with a dairy cow population of 94,084 heads and cow's milk production of 108,641 tons of milk per year. For the 2021-2022 period, the dairy cow population in Pasuruan Regency has decreased from 97,101 head to 90,304 head. This figure is directly proportional to milk production (Dinas Peternakan Provinsi Jawa Timur, 2023).

The economic potential of dairy farmers in Pasuruan Regency is supported by the existence of four milk cooperatives, one of which is KUTT Suka Makmur which is located in Grati Sub-District, Pasuruan Regency (Sutikno and Batoro, 2017). KUTT Suka Makmur has a working area that not only covers the highlands, but also the lowlands.

One of the factors that plays an important role in decreasing milk production is worm infection. It is caused by parasitic worms which absorb food substances that digested by cows. In addition, worms that have a predilection in the digestive tract of cattle can damage intestinal epithelial cells so that the intestine's ability to digest and absorb food is reduced (Zalizar, 2017). The impact of gastro-intestinal nematode infection is anemia, anorexia, drastic weight loss, dullness, and hair loss (Pinilla, Delgado and Florez, 2019).

Worms that have a predilection in the gastrointestinal tract of cattle are dominated by Nematoda class worms, among others

Oesophagostomum radiatum, *Haemonchus contortus*, *Bunostomum phlebotomum*, *Strongyloides papillosus*, *Trichostrongylus axei*, *Toxocara vitulorum*, *Nematodirus filicolis*, *Trichuris ovis*, and *Cooperia punctata* (Soulsby, 1982). Nematode worms easily infect definitive hosts because their life cycle does not require an intermediate host (Haryadi *et al.*, 2022).

Helminthiasis can be influenced by several factors, including environmental sanitation, feed nutrition, and maintenance management (Yunizeta and Siagian, 2021). In general, the prevalence of helminthiasis decreases as the cow ages. Infection in calves is caused by a lack of immunity to parasites (Habib, Arif and Ridwan, 2022).

Based on the background that has been described, it is necessary to conduct research regarding the prevalence and infection's degree of nematode worm in dairy cattle *Friesian Holstein* at KUTT Suka Makmur, Pasuruan Regency. So that, the data can be used for prevention and disease control.

MATERIALS AND METHODS

This research is an observational study with a cross-sectional research design. The research samples were obtained from 100 dairy cow's feces, taken randomly from four sub-districts, namely Nguling Sub-District with 19 samples, Grati Sub-District with 10 samples, Lekok Sub-District with 55 samples, and Lumbang Sub-District with 16 samples. Twenty grams of dairy cow's feces were taken and treated with 10% formalin solution. Feces samples were examined using sedimentation and Fulleborn floating methods.

Positive samples were counted using *McMaster* method to determine the degree of infection by mixing 4 g of feces with 56 ml of saturated sugar, then filtering. The solution was taken using a pipette to fill the *McMaster* counting chamber. Wait for five minutes to float the worm eggs. Then, count the worm eggs in the lined area.

The calculation formula is as follows (Fauziah, Morica and Rosnizar, 2017):

$$EPG = \frac{n\ x\ Vt}{Vk\ x\ Bt} = n\ x\ 50\ per\ gram$$

Information:
n : number of worm eggs
Vt : feces volume (60.000 mm^3)
Vk : chamber volume (300 mm^3)
Bt : feces weight (4 g)

Positive samples were analyzed to determine the prevalence of gastrointestinal nematode worms in dairy cattle using the following formula (Budiharta, 2002):

$$Prevalence = \frac{F}{N}\ x\ 100\%$$

Information :
F : The number of samples positively infected
N : The number of all examined samples

The data obtained will be analyzed to determine the influence of age on the prevalence and degree of infection as well as the influence between location and the prevalence and degree of gastrointestinal nematode worm infection in FH dairy cows at KUTT Suka Makmur, Pasuruan Regency using the Chi-square test with the Statistical Product and Service Solution (SPSS) program.

RESULTS AND DISCUSSION

The identification results of 66 positive samples found eight types of Nematoda worm eggs, namely *Oesophagostomum* sp. (24%), *Haemonchus* sp. (20%), *Mecystocirrus* sp. (13%), *Trichuris* sp. (8%), *Ostertagia* sp. (6%), *Trichostrongylus* sp. (6%), *Nematodirus* sp. (3%), and *Strongyloides* sp. (3%) (Figure 1).

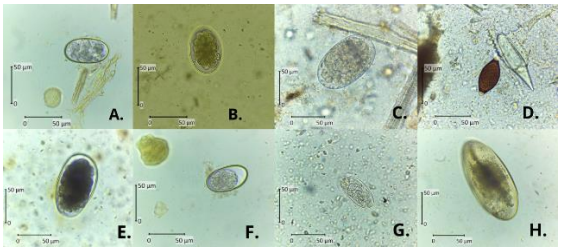

Figure 1. Documentation of Nematode Worm Eggs at KUTT Suka Makmur. A) *Oesophagostomum* sp., B) *Haemonchus* sp., C) *Mecystocirrus* sp., D) *Trichuris* sp., E)*Trichostrongylus* sp., F) *Ostertagia* sp., G) *Strongyloides* sp., H) *Nematodirus* sp. (400x magnification)

The type of worm that most commonly infected dairy cows in this study is *Oesophagostomum* sp. Oesophagostomum species that attack cattle and sheep are *Oesophagostomum columbianum* and *Oesophagostomum venulosum.* This Nematode worm attacks the age group of three months to two years (Underwood *et al.*, 2015). Cows can be infected with strongyloid worms through feed, drinking water and cage floors that are contaminated with eggs (Supriadi, Kutbi and Nurmayani, 2020).

The second biggest infection comes from *Haemonchus* sp. These worms are very pathogenic. Adult worms feed by sucking blood from the abomasum mucosa. Severe anemia can cause death (Underwood *et al.*, 2015).

The third largest infection comes from *Mecistocirrus* sp. Same as *Haemonchus* sp., *Mecistocirrus* sp. is a blood-sucking worm (haematophagous) in its predilection site, abomasum. Parasitic infestation can cause mucosal inflammation, hemorrhage, ulcers, and necrosis (Von Son-De Fernex *et al.*, 2014).

Based on the results of feces examination, 66 positive samples were obtained. So, the prevalence of gastrointestinal nematode worms in dairy cows at KUTT Suka Makmur was 66%. The highest to lowest prevalence is in Grati Sub-District (90%), Lekok Sub-District (82%), Nguling Sub-District (37%), and Lumbang Sub-District (31%).

KUTT Suka Makmur has a working area not only in the lowlands, but also in the highlands, namely Lumbang Sub-District. The research results show that Lumbang Sub-District has the lowest prevalence (31%) compared to the other sub-districts (Figure 2).

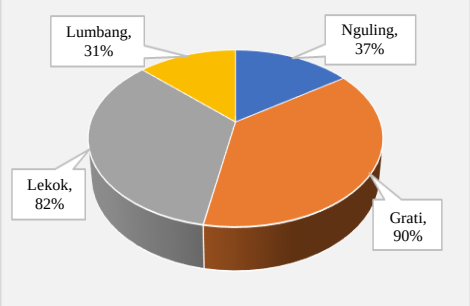

Figure 2. Prevalence of Gastrointestinal Nematode Worms in Dairy Cows in KUTT Suka Makmur Based on Location

Differences in the prevalence of gastrointestinal nematode worms can be influenced by several factors, including geographical conditions, maintenance management, and environmental conditions (Yasin *et al.*, 2020). According to research by Zulfikar, Hambal and Razali (2012), cattle in highland areas have a lower prevalence (33%) than cattle in lowland areas (66.6%).

The Chi Square test results show that asymptotic significance value is 0.000 (p <0.05). There is a significant influence between location and the prevalence of helminthiasis.

A significant influence can occur because maintenance management and cage conditions are different in each region. If you look at the condition of the pen, there are some grazier who mix several cows in one pen. Apart from that, in Lekok Sub-District there are farms whose cage floors are still on the ground.

The highest prevalence of worms came from dairy cows aged <1 year (70%) (Table 1). The higher prevalence rate in the young dairy cow group is possible because the body's immunity is not yet fully developed. Goblet cells in the intestines of cattle <1 year old have not increased in quantity so they are more susceptible to parasite infection compared to adult cattle (Soulsby, 1982). Goblet cells are the main source of mucus in the intestine which plays a role in protecting epithelial cells from extracellular pathogens and parasites (Vacca and Le Gros, 2022).

Table 1. Prevalence of Gastrointestinal Nematode Worms in Dairy Cows at KUTT Suka Makmur Based on Age

Ages (year)	Number of Samples	Helminthiasis Positive Sample		Total Positive Samples
		Single	Mix	
<1	20	9	5	14/20 (70%)
1-2	16	7	3	10/16 (62.5%)
>2	64	34	8	42/64 (65.6%)
Total	**100**	**50**	**16**	**66**

The *Chi Square* test shows that asymptotic significance value is 0.890 (p>0.05). There is no significant effect between age and the prevalence of helminthiasis. It is caused by equal maintenance management for each age group at the located farm (Indradji *et al.*, 2018).

The EPG calculations show that a severe degree of infection was only found in Lekok Sub-District in one sample, whereas in the other sub-districts only found a mild degree of infection (Table 2).

Table 2. Infection's degree of Gastrointestinal Nematode Worm in Dairy Cows in KUTT Suka Makmur Based on Location

Sub-District	Infection's Degree			Total
	Mild (<500)	Moderate (500-1000)	Severe (>1000)	
Nguling	7/7 (100%)	-	-	7
Grati	9/9 (100%)	-	-	10
Lekok	44/45 (97.7%)	-	1/45 (2.2%)	45
Lumbang	5/5 (100%)	-	-	5
Total	**65**	**-**	**1**	**66**

The *Chi Square* test shows that asymptotic significance value is 0.925 (p>0.05). There is no significant effect between location and infection's degree.

However, heavy infections in Lekok Sub-District are possible due to the condition of the cages which are still on the ground and the placement of food which is in direct contact with the ground. This condition supports the rapid proliferation of parasites, resulting in a high number of eggs per gram (Koesdarto, Subekti and Studiawan, 2001).

Based on the EPG calculations, mild infections were the most dominant in all age categories of dairy cows in this study. Meanwhile, severe infections were only found in the <1 year age group (Table 3). The severe infection in the <1 year age group is possible due to poor rearing management, so that the immunity of calves that has not yet fully developed will increase the risk of disease occurrence.

Table 3. Infection's degree of Gastrointestinal Nematode Worm in Dairy Cows at KUTT Suka Makmur Based on Age

Ages (year)	Infection's Degree			Total
	Mild (<500)	Moderate (500-1000)	Severe (>1000)	
<1	13/14 (92.8%)	-	1/14 (7.1%)	14
1-2	10/10 (100%)	-	-	10
>2	42/42 (100%)	-	-	42
Total	**65**	**-**	**1**	**66**

The *Chi Square* test shows that asymptotic significance value is 0.152 (p>0.05). There is no significant effect between age and infection's degree.

CONCLUSION

The type of gastrointestinal Nematode worm that found in the feces of dairy cows at KUTT Suka Makmur is *Trichostrongylus* sp, *Mecistocirrus* sp., *Oesophagostomum* sp., *Ostertagia* sp., *Haemonchus* sp., *Nematodirus* sp., *Strongyloides* sp., and *Trichuris* sp. and prevalence of gastrointestinal nematode worms in dairy cows at KUTT Suka Makmur is 66%. and infection's degree of gastrointestinal nematode worm in dairy cows at KUTT Suka Makmur was a mild infection (98.4%) and heavy infection (1.5%).

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