Journal of Parasite Science
Vol. 8, No. 2, September 2024, Pages 63-68

JOURNAL OF PARASITE SCIENCE
https:/e-journal.unair.ac.id/JoPS
2599-0993 (print) | 2656-5331 (online)

Original Research

OPEN ACCESS

Prevalence and Degree Trematoda Infection in Dairy Cattle *Friesian Holstein* at Koperasi Usaha Tani Ternak Suka Makmur Pasuruan

[1*)]Miftahur Rohmah, [2)]Agus Sunarso, [3)]Herry Agoes Hermadi, [2)]Poedji Hastutiek, [4)]Dian Ayu Permatasari, [2)]Kusnoto

[1)] Student of Faculty of Veterinary Medicine, Universitas Airlangga, Surabaya, Indonesia
[2)] Division of Veterinary Parasitology, Faculty of Veterinary Medicine, Universitas Airlangga, Surabaya, Indonesia
[3)] Division of Veterinary Reproduction, Faculty of Veterinary Medicine, Universitas Airlangga, Surabaya, Indonesia
[4)] Division of Veterinary Public Health, Faculty of Veterinary Medicine, Universitas Airlangga, Surabaya, Indonesia

***Corresponding author*: miftahurrohmah81953@gmail.com**

ABSTRACT

Trematode worm infections in dairy cattle have not been widely reported in various regions in Indonesia. This study aimsto determine the prevalence and degree of trematode worm infection in Friesian Holstein dairy cattle at KUTT Suka Makmur, Pasuruan. The research design used survey study and cross-sectional study. The study was conducted in July-September 2023. The number of samples taken was 100, which were selected from proportional random sampling of four sub-districts, namely Grati, Nguling, Lekok, and Lumbang, with the age ranges under a year, 1-2 years, and above 2 years. The sample were examined using the sedimentation method and Flukenfinder® method. Positive samples were further examined using the McMaster method to determine the number of worm eggs per gram of feces. The results of this study obtained a prevalence of 54% with low and moderate degrees of infection. The trematode worm species found through fecal examination were *Fasciola gigantica* and *Paramphistomum cervi*. The results of chi square statistical analysis showed that sample examination method and age were related to the prevalence of trematode worms, yet location was not related to the prevalence of trematode worms. The results of kruskal wallis statistical analysis showed that age and location influence the degree of trematode worm infection.

ARTICLE INFO

Article history

Received: July, 16th 2024
Revised: August, 31th 2024
Accepted: August, 31th 2024
Published: September, 15th 2024

Keywords

Dairy cattle,
Degree of infection,
Flukefinder®,
Prevalence,
Trematode.

INTRODUCTION

Dairy cattle are livestock that play an important role in meeting milk needs in Indonesia, which currently only supplies 21% and 79% is supplied from import activities (Amam and Harsita, 2019). Based on data from the Badan Pusat Statistik Jawa Timur (2023), one of the main producers of dairy products in East Java is Pasuruan Regency. Milk production comes from cattle farms, the majority of which are members of dairy cooperatives. One of the dairy cooperatives in East Java is Koperasi Usaha Tani Ternak (KUTT) Suka Makmur, Pasuruan Regency (Heraini, Purwanto and Suryahadi, 2016). Koperasi Usaha Tani Ternak (KUTT) Suka Makmur has 2,500 dairy farmers from four sub-districts, namely Grati, Nguling, Lekok and Lumbang which are capable of producing 64 tons of milk per day. KUTT Suka Makmur focuses on producing high quality of milk by actively developing *Friesian Holstein* dairy cattle (Hidayatullah and Rizkiantono, 2016).

The development of dairy cattle cannot be separated from various problems, both technical and

non-technical. Disease in dairy cattle is one of the problems that has the potential to be detrimental in the dairy cattle business, especially in the midst of seasonal and climatic conditions that are not always stable (Awaludin, Nugraheni and Muhamad, 2020). One of the disease issues in dairy cattle is health problems due to parasitic worms. Health problems due to parasitic worms cause a decrease in milk production in adult dairy cattle and stunted growth in young dairy cattle, it is able to cause huge economic losses (Arbabi *et al.*, 2018).

Trematodes are a type of parasitic worms that can infect dairy cattle, whose presence is often ignored (Khedri *et al.*, 2015). The research study conducted by Podpečan, Hajdinjak and Posedi (2023) for seven years in dairy cattle in Slovenia, the highest prevalence of worms was found to be Nematodes at 45.49% to 74.22% and Trematodes at 21.12% to 28.46%. The prevalence of trematode worm infections is not as high as nematodes because the life cycle of trematodes requires an intermediate host. Intermediate host has an important role in the epidemiology of trematode worm infections in dairy cattle. Dairy cattle can be infected by trematodes due to ingesting metacercariae from intermediate hosts carried through forage. The spread of trematode worm infection mainly occurs in adult dairy cattle, where the possibility of being infested with metacercariae is higher (Siswanto *et al.*, 2018).

Kurnianto *et al.* (2022) stated that trematode worm infection factors can be influenced by geographical conditions and faecal examination methods. The faecal examination method commonly used to detect trematode worm eggs is the sedimentation method. Another method that adopts the principles of the sedimentation method is the Flukefinder® method which is considered to have higher sensitivity and is easier to carry out than the sedimentation method (Reigate *et al.*, 2021).

Further information regarding the prevalence and degree of trematode worm infection in *Friesian Holstein* dairy cattle at KUTT Suka Makmur Pasuruan is not yet known. This research also evaluates the performance of the Flukefinder® method which is considered more sensitive in detecting trematode worm eggs, so that the research results are expected to be used as basic data in preparing an effective and efficient control program for trematode worm infections in dairy cattle.

MATERIALS AND METHODS

Study Period and Area

The research was carried out in July - September 2023. The research location was divided into two stages, namely sampling in the KUTT Suka Makmur Pasuruan working area and sample examination at the Veterinary Parasitology Division Laboratory, Faculty of Veterinary, Universitas Airlangga.

Study Design and Sampling

The research design used was survey research with a cross-sectional study design. Samples were fresh feces from dairy cattle from each KUTT Suka Makmur Pasuruan working area (Figure 1) with age limits for dairy cattle 2 years. The sample size was 100 which was calculated based on the Slovin formula and sampling used proportional random sampling where each member had the same opportunity to be sampled according to their proportions.

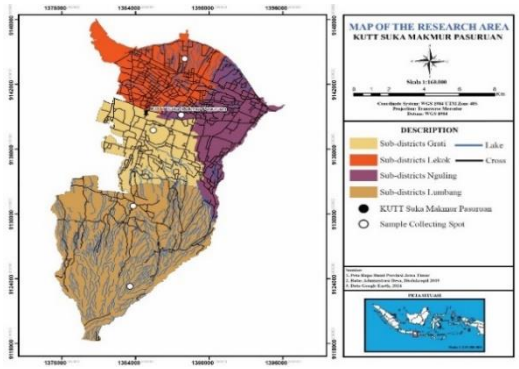

Figure 1. The research area at KUTT Suka Makmur Pasuruan was determined from four owners which reflected the four owners The suitability of different sub-districts is circled in white.

Data Collection

The sample is fresh feces weighing 20- 30 g, taken immediately after the dairy cattle defecates. The feces were put into a sample container filled with 10% formalin and stirred until homogeneous. Each container was written with a label code to identify the sample. Sample identity included number, age, feces consistency and location of sample collection. The collected samples were stored at 4 ℃ until examination (Reigate *et al.*, 2021; Kurnianto *et al.*, 2022). The fecal examination used the sedimentation method and the Flukefinder® method. The McMaster method was used to calculate Eggs per gram (EPG) on positive samples.

Statistical Analysis

The results included positive or negative samples infected with trematode worms. Positive samples were identified and grouped based on trematode worm species. The prevalence of trematode worms in dairy cattle at KUTT Suka Makmur was calculated using the following formula (Stevenson, 2008):

$$\text{Prevalence} = \frac{Number\ of\ positive\ samples}{Number\ of\ all\ samples}\ x\ 100\%$$

The data obtained were analyzed using the Chi Square test and the Kruskal Wallis test. This analysis was carried out using the SPSS program on Windows.

RESULTS AND DISCUSSION

Trematoda Worm Species

Two species of trematode worms were found in the feces of *Friesian Holstein* dairy cattle at KUTT Suka Makmur Pasuruan, namely *Fasciola gigantica* and *Paramphistomum cervi*. The trematode worm species found in faecal examination using the sedimentation method were *Fasciola gigantica* 3% (3/100) and *Paramphistomum cervi*

8% (8/100), while the Flukefinder® method was *Fasciola gigantica* 34% (34/100) and *Paramphistomum cervi* 37% (37/100) which can be seen in Figure 2. Trematode worm eggs can be seen in Figure 3. The eggs of *Fasciola gigantica* and *Paramphistomum cervi* found through faecal examination are ovoid in shape, there is an operculum at one pole, and when Methylene blue is dropped, the eggs of *Fasciola gigantica* are golden yellow in color measuring 150-190 × 70-140 µm, while the eggs of *Paramphistomum cervi* transparent color measuring 115-175 × 75-100 µm (Taylor, Coop and Wall, 2015).

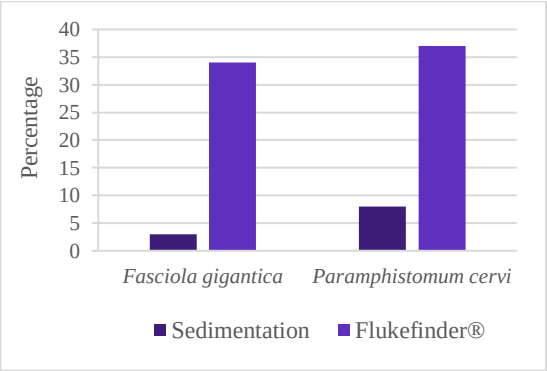

Figure 2. Trematoda Worm Species.

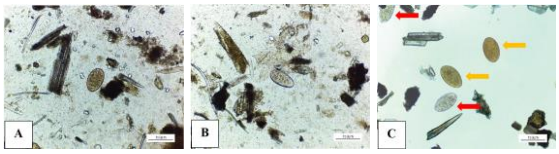

Figure 3. Trematode worm eggs were found in research with 100x magnification was observed using a Nikon Eclipse E100 binocular microscope and images taken using Optilab HDCE-X5N. (A) *F. gigantica* sedimentation method (B) *P. cervi* sedimentation method (C) *F. gigantica* shown by yellow arrow, *P. cervi* by red arrow Flukefinder® method.

Prevalence of Trematode Worm Infection in Dairy Cattle at KUTT Suka Makmur

The overall prevalence of trematode worms in *Friesian Holstein* dairy cattle at KUTT Suka Makmur Pasuruan was 54% (54/100). The results of the examination of the prevalence of trematode worms based on the feces examination method showed that the sedimentation method was 9% (9/100) and the Flukefinder® method was 54% (54/100). Based on the location of each sub-district, the prevalence of trematode worms was found to be 70% for Grati (7/10), 54.55% for Nguling (11/6), 53.70% for Lekok (29/54), and 48% for Lumbang (12/25). Based on the age of dairy cattle, it was found that <1 year was 10.53% (2/19), 1-2 years was 47.83% (11/23), and >2 years was 70.69% (41/58) (Table 1).

The results of research examining feces in *Friesian Holstein* dairy cows at KUTT Suka Makmur Pasuruan using the Flukefinder® method proved to be more effective than the sedimentation method in detecting trematode worm eggs. Another study was conducted by Kurnianto *et al.* (2022) on dairy cattle in Boyolali, Indonesia which obtained positive sample results of 9.75% for the sedimentation method and 14.50% for the Flukefinder® method. The research results of Reigate, *et al*. (2021) also stated that fecal examination using the Flukefinder® method is more effective than the sedimentation method in detecting trematode worm eggs, especially *Fasciola* spp. and *Paramphistomum* sp.

The prevalence of trematode worms in *Friesian Holstein* dairy cattle at KUTT Suka Makmur Pasuruan did not show a significant difference. Different results in the research of Kurnianto *et al.*, (2022) mentioning the origin of livestock is related to the prevalence of Fasciolosis infection. These differences in results can be caused by geographical conditions which are influenced by regional altitude, rainfall, soil conditions, temperature and air humidity (Bosco, *et al.*, 2021). The geographical conditions in the KUTT Suka Makmur Pasuruan working area have abundant water availability and lush vegetation, thus supporting the existence of an intermediate host, namely water snails, which develop well.

The prevalence of trematode worms in *Friesian Holstein* dairy cattle at KUTT Suka Makmur Pasuruan shows that adult dairy cattle (>2 years) have higher trematode worm infections than young dairy cattle (<1 year). The research results of Siswanto *et al.* (2018) stated that dairy cattle infested with *Fasciola* sp. average age ≥ 4 years. This can be caused by maintenance management, especially feed and cattle health.

Table 1. Prevalence of Trematode Worms Infection in Dairy Cattle at KUTT Suka Makmur

Factor	Category	Total	Sample		Prevalence (%)	p-value
			Positive	Negative		
Faecal Examination Method	Sedimentation	100	9	91	9.00	0.000*
	Flukefinder®	100	54	46	46.00	
Location of Each Sub-District	Grati	10	7	3	70.00	0.706
	Nguling	11	6	5	54.55	
	Lekok	54	29	25	53.70	
	Lumbang	25	12	13	48.00	
Age of Dairy Cattle	<1 years	19	2	17	10.53	0.000*
	1-2 years	23	11	12	47.83	
	>2 years	58	41	17	70.69	

*Chi-Square test results showed significant (p<0.05)

Young dairy cattle have a lower level of grass feed consumption than adult dairy cattle because the digestive system of young dairy cattle is still developing, so the possibility of being infested with metacercariae is lower (Siswanto *et al.*, 2018; Kurnia *et al.*, 2022). Siswanto *et al.* (2018) added that young dairy cattle may be more resistant to metacercariae infestation because they still consume milk from their mothers.

Degree of Trematoda Worm Infection in Dairy Cattle at KUTT Suka Makmur

The degree of trematode worm infection in *Friesian Holstein* dairy cattle at KUTT Suka Makmur Pasuruan as a whole is dominated by a mild degree of infection. The degree of infection was mild, 51 of the 54 samples were positive, while the degree of infection was moderate, three of the 54 samples were positive. The results of the examination of the degree of mild infection were in every sub-district and age of dairy cattle except Lekok Sub-District, and dairy cattle aged >2 years (Table 2).

The results of the Kruskal Wallis test showed significant differences ($p<0.05$) between the location of each sub-district and the age of dairy cattle on the degree of trematode worm infection. The results of the Kruskal Wallis analysis test showed that the degree of trematode worm infection was significantly higher in Lekok Sub-District and dairy cattle >2 years old.

The degree of trematode worm infection in *Friesian Holstein* dairy cattle at KUTT Suka Makmur Pasuruan is classified as mild and moderate. Mild degrees of infection were the dominant cases in this study. Similar results in the research of Awaludin, Nugraheni and Muhamad (2020) stated that the degree of infection with *Fasciola* sp. In dairy cattle, the lactation period in Jember Regency is dominated by mild degrees of infection. Cases of trematode worm infection in cattle with mild degrees of infection are generally chronic and do not cause clinical symptoms. The results of this research show that Lekok Sub-District has a higher degree of trematode worm infection compared to other sub-districts, this is because Lekok Sub-District is a lowland area geographical conditions around river with quite high humidity, thus allowing the existence of intermediate hosts to develop well.

The research results of Parmawati *et al.* (2018) stated that Lekok Sub-District is unique because its location is in the lowlands (0-25 meters above sea level). Research by Nugraheni *et al.* (2018) explained that the prevalence of trematode worm infections in cattle farms in rivers reaches 40%, this is because the spread in wetlands better supports the life cycle of these worms. The habit of making livestock manure waste channels that flow directly into forage fields, so that the life cycle of trematode worms will continue and allow them to spread to other dairy cattle. Feeding forage that is often not wilted also allows for the transmission of trematode worms because metacercariae attached to forage will also be eaten by dairy cattle and restart the life cycle of trematode worms in the dairy cattle's body (Awaludin, Nugraheni and Muhamad, 2020).

The results of this study indicate that adult dairy cattle (>2 years) have a higher degree of trematode worm infection compared to young dairy cattle (<1 year). The same results in the research of Awaludin, Nugraheni and Muhamad (2020) regarding the high degree of infection in dairy cattle during the lactation period. The results of other research conducted by (Hambal, Sayuti and Dermawan (2013) stated that age influences the degree of trematode worm infection in cattle and buffalo in Lhoong Sub-District, Aceh Besar Regency.

The age of the dairy cattle has a significant effect on the degree of trematode worm infection, which is closely related to the period of metacercariae infestation in the field (Hambal, Sayuti and Dermawan, 2013). Adult dairy cattle show a higher level of metacercaria infestation because the frequency of grass feeding in adult dairy cattle is higher than in young dairy cattle, thereby increasing the possibility of metacercaria infestation (Siswanto *et al.*, 2018; Awaludin, Nugraheni and Muhamad, 2020). Cattleya, Yuwono and Indasati (2023) added that the high degree of infection in the adult category is influenced by unstable immune systems due to pregnancy, childbirth and breastfeeding, which can cause poor body condition, resulting in trematode worm infections becoming more severe.

Table 2. Degree of Trematode Worms Infection in Dairy Cattle at KUTT Suka Makmur

Factor	Category	Total	Degree of Infection		Frequency (%)	p-value
			Light	Moderate		
Location of Each Sub-District	Grati	7	7	-	12.96	0.038*
	Nguling	6	6	-	11.11	
	Lekok	29	23	3	53.71	
	Lumbang	12	12	-	22.22	
Age of Dairy Cattle	<1 years	2	2	-	3.70	0.039*
	1-2 years	11	11	-	20.37	
	>2 years	41	38	3	75.93	

*Kruskal Wallis test results showed significant ($p<0.05$)

CONCLUSION

This study revealed that trematode worm infections are common in dairy farming in KUTT Suka Makmur Pasuruan. The prevalence and degree of trematode worm infection varies between individuals sub-district, although the majority showed mild infections. The prevalence and degree of significant trematode worm infection were identified in this study from the age of dairy cows. In addition, the Flukefinder® kit is a valuable and practical diagnostic tool for trematode worms for on-site use. This study has not distributed intermediate hosts of intermediate worms and their relationship to prevalence; therefore, a malacological survey will be necessary for future investigations. Our study findings provide an epidemiological basis information and can be used to develop and implement control and prevention programs for trematode worm infections in dairy farming in Indonesia.

REFERENCES

Amam, A. and Harsita, P.A. (2019) 'Pengembangan Usaha Ternak Sapi Perah : Evaluasi Konteks Kerentanan Dan Dinamika Kelompok', *Jurnal Ilmiah Ilmu-Ilmu Peternakan*, 22(1), pp. 23–34. Available at: https://doi.org/10.22437/jiiip.v22i1.7831.

Arbabi, M. *et al.* (2018) 'Epidemiology and Economic Loss of Fasciolosis and Dicrocoeliosis in Arak, Iran', *Veterinary World*, 11(12), pp. 1648–1655. Available at: https://doi.org/10.14202/vetworld.2018.1648-1655.

Awaludin, A., Nugraheni, Y.R. and Muhamad, N. (2020) 'Derajat Infeksi Fasciola Sp. Pada Sapi Perah Periode Laktasi', *Seminar Nasional Ilmu Peternakan Terapan*, 1(1), pp. 92–96. Available at: https://doi.org/10.25047/proc.anim.sci.2020.13 .

Cattleya, R., Yuwono, E. and Indasati, D. (2023) 'Prevalensi, Identifikasi, dan Pengaruh Umur Terhadap Trematodiasis pada Kambing di Sumbang, Banyumas', *Prosiding Seminar Nasional Teknologi Agribisnis Peternakan*, 10, pp. 119–126.

Ekawasti, F. *et al.* (2022) 'Trematode and Nematode gastrointestinal infections in livestock from different geographical regions in Indonesia', *International Seminar on Livestock Production and Veterinary Technology*, pp. 255–267. Available at: https://doi.org/10.14334/Proc.Intsem.LPVT-2021-p.25.

Hambal, M., Sayuti, A. and Dermawan, A. (2013) 'Tingkat Kerentanan Fasciola gigantica Pada Sapi Dan Kerbau Di Kecamatan Lhoong Kabupaten Aceh Besar', *Jurnal Medika Veterinaria*, 7(1), pp. 49–53. Available at: https://doi.org/10.21157/j.med.vet..v7i1.2921.

Heraini, D., Purwanto, B.P. and Suryahadi (2016) 'Perbandingan Suhu Lingkungan Dan Produktivitas Ternak Sapi Perah Melalui Pendekataan Stochastic Frontier (Study Kasus di Peternakan Rakyat KUTT Suka Makmur)', *Jurnal Sains Terapan*, 6(1), pp. 16–24. Available at: https://doi.org/10.29244/jstsv.6.1.16-24.

Hidayatullah, W. and Rizkiantono, R.E. (2016) 'Perancangan Branding Business to Business KUTT Suka Makmur untuk Meraih Pangsa Pasar Baru', 5(2). Available at: https://doi.org/10.12962/j23373520.v5i2.20896.

Khedri, J. *et al.* (2015) 'Prevalence and Intensity of Paramphistomum Spp. In Cattle from South-Eastern Iran.', *Iranian journal of parasitology*, 10(2), pp. 268–272.

Kurnia, D. *et al.* (2022) 'Prevalensi Trematoda Gastrointestinal pada Sapi di Pasar Ternak Payakumbuh', *VITEK : Bidang Kedokteran Hewan*, 12(1), pp. 35–39. Available at: https://doi.org/10.30742/jv.v12i1.102.

Kurnianto, H. *et al.* (2022) 'Prevalence, Risk Factors, and Infection Intensity of Fasciolosis in Dairy Cattle in Boyolali, Indonesia', *Veterinary World*, 15(6), pp. 1438–1448. Available at: https://doi.org/10.14202/vetworld.2022.1438-1448.

Larasati, H. *et al.* (2017) 'Gastrointestinal Helminths Dairy Cattle Prevalence in Period of June-–July 2016 on Public Farm at Lampung Province', *Jurnal Penelitian Peternakan Indonesia*.

Mubarok, F., Suratma, N.A. and Dwinata, I.M. (2015) 'Prevalensi Trematoda di Sentra Pembibitan Sapi Bali Desa Sobangan, Kecamatan Mengwi, Kabupaten Badung', *Indonesia Mediscus Veterinus*, 4(1), pp. 48–53.

Nugraheni, Y.R. *et al.* (2018) 'The Gastrointestinal Parasites Cows on Progo Watershed in Yogyakarta', *Jurnal Imu Peternakan Terapan*, 1(2), pp. 46–50. Available at: https://publikasi.polije.ac.id/jipt/article/view/889.

Parmawati, R. *et al.* (2018) 'Developing Sustainable Livestock Production by Feed Adequacy Map: A Case Study in Pasuruan, Indonesia.', *Tropical Animal Science Journal*, 41(1), pp. 67–76. Available at: https://doi.org/10.5398/tasj.2018.41.1.67.

Podpečan, O., Hajdinjak, M. and Posedi, J. (2023) 'Helminth Control as a Part of Animal Welfare Measure Protocol in Grazing Cattle in Slovenia', *Agriculture*, 13(5), p. 1038. Available at: https://doi.org/10.3390/agriculture13051038.

Reigate, C. *et al.* (2021) 'Evaluation of Two Fasciola hepatica Faecal Egg Counting Protocols in Sheep and Cattle', *Veterinary Parasitology*, 294, p. 109435. Available at: https://doi.org/10.1016/j.vetpar.2021.109435.

Siswanto, S. *et al.* (2018) 'Prevalensi Cacing Hati Sapi Perah pada Peternakan Rakyat di Provinsi Lampung', *Jurnal Ilmiah Peternakan Terpadu*, 6(3), p. 167. Available at: https://doi.org/10.23960/jipt.v6i3.p167-172.

Stevenson, M. (2008) *An Introduction to Veterinary Epidemiology*. Massey University, Palmerston North, New Zealand: Epi Centre IVABS.

Taylor, M.A.., Coop, R.L.. and Wall, R. (2015) *Veterinary parasitology*. 4th edn. London: John Wiley and Sons, Inc.