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Identification and Distribution of Soil Transmitted Helminths around The Shed and Grazing Fields of Madura Cattle in Sub-District of Geger, Bangkalan Regency

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Abstract

This research aims to determine the percentage and kind of Soil Transmitted Helminths contamination in around the shed and grazing field soil of Madura cattle in Sub-District of Geger, Bangkalan District. The research was conducted on July until September 2018. The method of this research used a non-experimental method and through an observation study. The sample of this study is 100 samples of around the shed and grazing field soil, then examined in the laboratory of Helminthology, Division of Parasitology, Faculty of Veterinary Medicine, Universitas Airlangga used Modifed Sucrose 58%. Based on the kind of contamination, the highest contamination was *Toxocara* sp. (45.9%). Followed by *Strongyloides* sp. (41.4%), *Trichuris* sp. (9.5%) and *Ancylostoma* sp. (3.2%). Based on location, the percentage of grazing fields was higher (70%) than around the shed (50%). The result of statistical analysis using Chi- Square test showed significant differences in the percentage between around the shed and grazing field soil ($p<0.05$).

Keywords : soil transmitted, helminth, the shed soil, grazing, field soil, Bangkalan.

Introduction

Soil is an important transmission route for a large number of pathogenic parasitic agents, both for animals and humans. The main source of soil contamination with parasites is represented by infected animals or humans which can spread large amounts of infective elements (eggs, larvae) in the environment through feces (Traversa *et al.*, 2014). Soil Transmitted Helminths (STH) is a gastro-intestinal nematode worm that requires soil as a medium of transmission. Soil Transmitted Helminths is a type of nematode worm that causes infection in animals or humans through contamination of eggs or larvae that develop in moist soil, especially in tropical and subtropical countries. The eggs released by STH take 3 weeks in the soil to become infective. In areas with poor sanitation, these eggs will contaminate the soil (World Health Organization, 2017). Worms belonging to STH and including gastrointestinal worms include the genus Toxocara (roundworms), Trichuris (whipworms), Strongyloides (threadworms), Ancylostoma (hookworms) (Bethony *et al.*, 2006).

Diseases caused by gastrointestinal nematode worms have economic losses for farmers in the form of a decrease in livestock weight by ±38% and a mortality rate of ±17% (Beriajaya and Stevenson in Beriajaya and Suhardono, 1997), decreased production, decreased body resistance to other diseases, metabolic disorders and death (Junaidi *et al.*, 2014). Especially if these worms can cause zoonotic diseases, in addition to economic losses, their health is also threatened (Medicastore, 2011).

The results of the study by Paller and Emmanuel (2014) showed that the contamination of Soil Transmitted Helminths from soil samples in the Philippines was 31%, with details of the examination results, including 77% of the genus Toxocara; 5% of the genus Trichuris; and 7% of the genera Strongyloides and Ancylostoma. According to the research results of Koesdarto *et al.* (2000) the prevalence of *Toxocara vitulorum* in soil samples in complex settlements around

abattoirs in the Surabaya area was 30.8%, and settlements around dairy farms was 69.2%. The high prevalence of gastrointestinal nematode worms in ruminants can be influenced by the host, parasites and livestock environment (Regassa *et al*., 2006).

Breeders in Geger Sub-District, Bangkalan District generally still apply the traditional cage system with cages that are still on the ground and permanent grazing fields so that there is a high possibility of STH transmission through the soil. In addition, the traditional housing pattern has a fairly high consequence of helminth infections, including for breeders who often have direct contact with cows and their feces (Saraswati *et al*., 2015), and there is no STH data on soil samples in Geger Sub-District, Bangkalan District, Indonesia. The study was conducted to determine the type of Soil Transmitted Helminths in the soil around the Madura cattle pen in Geger Sub-District, Bang-kalan District with the hope of knowing the types of worms that have the opportunity to infect and prompt appropriate treatment so as to minimize cases STH infection in livestock and humans.

Materials and Methods

The samples in this study amounted to 100 soil samples taken around the cage (± 100m) as many as 60 samples and 40 samples of grazing fields in Geger Sub-District, Bangkalan District and then examined at the Helminthology Laboratory of the Faculty of Veterinary Medicine, Universitas Airlangga. Soil samples were taken using a shovel with a depth of 1-10 cm as much as ± 200 g, then put in a plastic bag. After that, each plastic was labeled with a code and the location of collection is then taken to the laboratory for examination. Examination of soil samples using the Modified Sucrose Floatation Method. The Modified Sucrose Floatation Method procedure is that the soil sample that has been dried overnight is filtered and 2 g is taken and put into a centrifuge tube. Then the 2 g sample was filled with distilled water in a centrifuge tube, the suspension was centrifuged for 10 minutes at a speed of 1800 rpm. After centrifugation, the supernatant was removed and the sediment was added with 8 ml of sucrose solution with a specific gravity of 1.2 g/ml. The suspension was again centrifuged for 10 minutes at a speed of 1800 rpm. After that, the tube is placed on the tube rack and dripped with sucrose solution with a specific gravity of 1.3 g/ml until the mouth of the tube looks convex then place the cover glass over the mouth of the tube and let it sit for 1-2 minutes. Then it is taken and placed on the object glass and labeled. The preparations were examined under a microscope at 100x and 400x magnification. The sample is considered positive if it is found the presence of Soil Transmitted Helminths eggs, either single, double or mixed contamination. Data analysis to determine the effect of location with contamination using Chi-Square by calculating the Relative Risk.

Results and Discussion

The results of the study from 100 samples obtained from the soil around the stables and pasture fields found 58 (58%) soil samples were positive for soil-transmitted helminths eggs consisting of single, double and mixed contamination (Table 1). Samples taken from the soil in the grazing field had a higher percentage, namely 70%, while in the soil around the barn it was 50% (Table 1). Data analysis using Chi Square by calculating the Odds Ratio was obtained at 0.429 which indicates the location has a significant effect on contamination.

Table 1. Percentage of Soil Transmitted Helminths Around the Cages and Shepherd Fields of Madura Cattle in Geger Sub-District, Bangkalan District

Location	Amount Sample	Positive Sample of *Soil Transmitted Helminths* (species)			Total Positive sample (%)
		One	Two	Three	
Around the Cage	60	23	5	2	30 (50%)
Grazing Field	40	23	4	1	28 (70%)
Total	100	46	9	3	58% (58%)

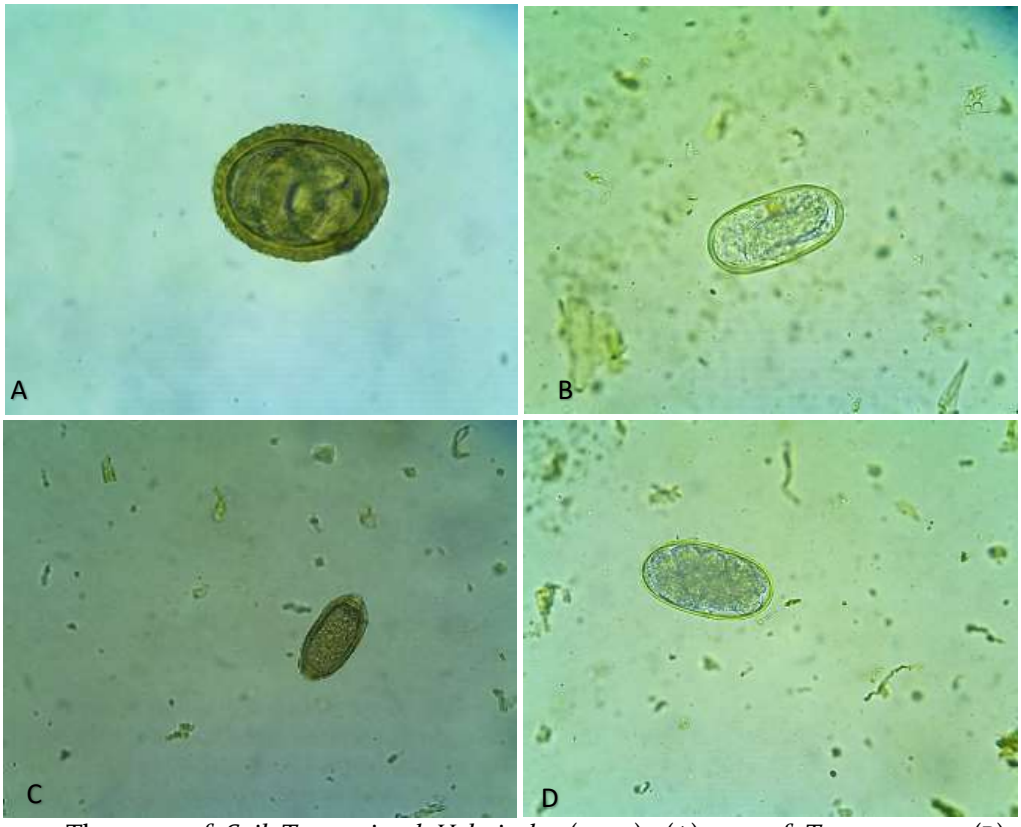

Figure 1. The type of *Soil Transmitted Helminths* (400x), (A) egg of *Toxocara* sp. (B) egg of *Strongyloides* sp. (C) egg of *Trichuris* sp. (D) egg of *Ancylostoma* sp.

The results of the examination showed that the eggs of *Toxocara* sp., had a size of 81.4 x 63.9 m, had thick walls and were yellowish in color (A). *Strongyloides* sp. worm eggs, which were obtained had a size of 63.4 x 28.7 m, when removed already contained an embryo and had thin walls (B). *Trichuris* sp. worm eggs, measuring 47.4 x 22.7 m, brown in color, shaped like a barrel (lemon orange) with both ends having transparent plugs (C). The eggs of *Ancylostoma* sp. worms have the characteristics of oval-shaped, thin-walled consisting of 2 layers, measuring 66.8 x 28.3 m, when released, the eggs have segments consisting of 8-16 cells (D) (Kusnoto *et al.*, 2014)

Based on the results of the study, the contamination of Soil Transmitted Helminths around the cage was *Strongyloides* sp., followed by *Toxocara* sp., and *Trichuris* sp. The two most contaminated species were *Strongyloides* sp., and *Toxocara* sp., followed by *Strongyloides* sp., and *Trichuris* sp. contamination of three species consisting of *Toxocara* sp., *Strongyloides* sp., and *Trichuris* sp. The most contaminants in grazing fields were *Toxocara* sp., followed by *Strongyloides* sp., *Trichuris* sp., and *Ancylostoma* sp. The two most dominant contamination species were *Strongyloides* sp., and *Toxocara* sp., followed by *Toxocara* sp., and *Trichuris* sp. contamination of three species consisting of *Strongyloides* sp., *Ancylostoma* sp., and *Trichuris* sp.

The percentage of Soil Transmitted Helminths contamination in this study was 58%, this percentage is higher than the research conducted by Paller and Emmanuel (2014) on rural soil samples in the Philippines which showed a percentage of 31%. This could be due to the fact that the sampling was carried out in August at the beginning of the rainy season, the environmental and soil conditions became moist, so the percentage became higher (Kusnoto *et al.*, 2014). In addition, humid areas are good conditions for the growth of various types of worms including the Soil Transmitted Helminths group to continue their life cycle (Suriptiastuti, 2006). Another factor that makes the percentage of STH contamination high is soil conditions. The development and viability of eggs and larvae of STH worms in the soil is influenced by soil conditions (Nurfarida *et al.*, 2005). Kompol Village, Geger Sub-District, has loose soil characteristic. The research results of Nwoke *et al.* (2013) from soil samples in Nigeria

showed the percentage of STH in loose soil was higher than clay by 10.3%. The type of loose soil mixed with sand is a good place for the development of eggs and larvae of STH worms. STH worm larvae can grow and develop well in loose soil because in loose soil the larvae can freely take up oxygen compared to if they were in clay soil.

The effect of location on Soil Transmitted Helminths contamination on the soil around the stables and pasture fields analyzed with Chi Square analysis (Chi-Square Test) by calculating the Relative Risk value of 0.429 which indicates that there is contamination of Soil Transmitted Helminths on pasture land has twice the chance of contamination compared to the soil around the cage. In accordance with the research results of Das *et al*. (2016), contamination in cattle grazing fields in Guhwati, Assam, was mostly gastrointestinal nematode worms. This could be due to access in the grazing field which is more open than around the pens which allows both wild and domestic animals to defecate repeatedly in this area thereby increasing egg density in the soil and grass around the pasture. Contamination of Soil Transmitted Helminths around the cage from 30 positive samples the most was *Strongyloides* sp., The larvae of this worm generally developed in shady and moist soil conditions as well as in the cage. The cages are generally rarely ventilated, causing high humidity, in addition to poor sanitation and polluted water can also be a factor in transmitting worm infections, because feces containing worm eggs or larvae will be ingested with cow drinking water and feed (Purwatiningsing, 2016). This is in accordance with the results of research by Fadli *et al*. (2014) cages with soil floors had the largest infection of *Strongyloides* sp., which was 6%, this was due to poor sanitation of the cages and the lack of sunlight entering the cages so that soil moisture was high. Contamination of Soil Transmitted Helminths in grazing fields of the 28 positive samples the most was *Toxocara* sp. This is because the largest cattle population in Kompol Village are female cows and calves. According to Winarso *et al*. (2015) *T. vitulorum* infection in calves was 23.68% compared to adult cattle by 1.34%, the decline in prevalence of the older age group of cattle was caused by at least three causes, namely the cessation of new transmammary infections in calves a few days after birth, death adult worms, and increased immunity of the animal (host). The female parent is a host for hypobiosis larvae, namely *Toxocara* sp. larvae, which survive for some time in the tissue and will be active before the parturition period and then migrate to the placenta and mammary glands. *Toxocara* sp., thrives in countries that have a tropical climate where the environment is humid, such as in Indonesia (Kusnoto *et al*., 2017). The eggs of *Toxocara* sp., have thick walls as a defense for worm eggs so that they can survive for a long time in the environment until they are eaten by the host (Yudha and Voni, 2014). These results are in accordance with the results of research conducted by Paller and Emmanuel (2014) that the largest contamination in rural soil samples in the Philippines is Toxocara by 77%. In addition, the results of research Hastutiek *et al*. (2018) showed that from 50 samples of cow feces in Kompol Village, Geger Sub-District, they contained zoonotic worms and protozoa, one of which was *T. vitulorum*. Other contaminations from Soil Transmitted Helminths in this study were *Trichuris* sp., and *Ancylostoma* sp. Although obtained in small quantities, infection with *Trichuris* sp. worms needs to be watched out for because *Trichuris* sp. infection can cause hemorrhagic necrosis, inflammation of the cecum mucosa, hemorrhagic diarrhea, and anemia (Kusnoto *et al*., 2014). *Ancylostoma* sp., infects dogs and cats, this worm belongs to the class of Soil Transmitted Helminths. *Ancylostoma* sp. eggs, obtained as many as 3 samples (3%) the results of this study were lower than the results of the study of Hezarjaribi *et al*. (2016) showed the percentage of *Ancylostoma* sp. in soil samples in Iran as much as 18%. This worm contamination can be influenced by Indonesia's tropical environment and the number of trees under which there is sandy soil which is a place for dogs and cats to defecate. Most of the soil in the world is polluted by the feces of dogs and cats infected with *Ancylostoma* sp. so that exposure to *Ancylostoma* sp. contamination on the soil is increasing (Ershandi *et al*., 2016). The double contamination of Soil Transmitted Helminths obtained was *Strongyloides* sp. and *Toxocara* sp., this could be due to the growth of these two worms in accordance with the environment of tropical countries such as Indonesia. Contamination of 3 species consisting of *Toxocara* sp., *Strongyloides* sp. and *Trichuris* sp. The results of this study are in accordance with research conducted by Rochmah et al. (2016) which showed infection of three STH species in Yogyakarta, namely *T. vitulorum*, *Trichuris* sp., and hookworm. Mixed parasitic infections are

common in cattle, infections that occur are usually carried out by various types of worms in the intestine, abomasum and other organs, so the effect is in the form of infection with a mixture of parasites that exist and contaminate the surrounding soil (Levine, 1990).

Conclusions

Contamination percentage of Soil Transmitted Helminths around stables and grazing fields is 58%. The types of STH obtained in this study were *Toxocara* sp., *Strongyloides* sp., *Trichuris* sp. and *Ancylostoma* sp. The biggest contamination in the grazing field was *Toxocara* sp., while the biggest contamination around the cage was *Strongyloides* sp. Statistical analysis using Chi-Square by calculating the Relative Risk shows that there is an influence of location on STH contamination in Geger Sub-District, Bangkalan District.

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