Occurrence of gastrointestinal parasites in cattle in Indonesia

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Abstract. Gastrointestinal nematode parasites play an important role in cattle farming in Indonesia. The majority of parasite infection cases cause weight loss and decreases in appetite, productivity, milk production and farmers’ economic income. This study aimed at finding out the incidence of gastrointestinal nematode parasite disease in cattle at several regions in Indonesia. It was conducted in the period of March 6th to October 2020. There were totally 335 samples randomly drawn from various regions in 15 provinces of 34 provinces in Indonesia. Stool was examined using Whitlock and flotation methods. The results showed that the prevalence of gastrointestinal nematodes Strongyle, Trichuris sp., Capillaria sp., and Ascaris sp. amounted to 24.2%. The highest prevalence of the Strongyle nematodes was found in West Nusa Tenggara (52%), Central Kalimantan (50.8%) and Southeast Sulawesi (40%). The prevalence of the Trichuris sp. in East Java was 15%, while it was 10% in Central Kalimantan. The prevalence of the Capillaria sp. in North Kalimantan was 21.1%, in West Sumatra 18.8% and in East Java 6.7%. The prevalence of the Ascaris sp. worms in East Java was 16.7%. The results of the characterization based on age, sex and cattle management showed that 4.6% of the Strongyle worms were found in bulls, 2.74% in females, 4.38% in intensive maintenance and 2.47% in semi-intensive maintenance, while 5.48% of the worms were found in adult cattle and 1.37% in young cattle. The same pattern was observed in Trichuris sp., Capillaria sp. and Ascarids sp. infections. The results indicated the need for the eradication of the gastrointestinal nematodes through deworming and good management system.

Key words: fecal, gastrointestinal parasites, Indonesia, nematode, prevalence

1. Introduction

Gastrointestinal (GI) parasites in cattle represent predominant disease in Indonesia. The disease, which is caused by nematode parasite infection, is located in the body of affected animals. It can inflict serious losses on cattle farming, including livestock weakness, decreasing appetite, weight loss, slow growth, anemia and diarrhea that can finally lead to death. Other losses result from low productivity and decreasing reproductive rates of livestock. Ruminants may be infected by endoparasites, especially nematode through grass feed that contains worm larvae or eggs. Common nematode worms include Strongylidae genera (Haemonchus sp., Ostertagia sp., Cooperia sp., Nematodirus sp., Bunostomum sp., Strongyloides sp., and Oesophagostomum sp.), Capillaria sp. and Ascaris sp. The prevalence of the gastrointestinal nematode based on age was reported to be 80% in young cattle [1].
Another study reported that the prevalence of the gastrointestinal nematodes in female cattle in Bali was higher than that in male cattle [2]. Meanwhile, in Central Java it was reported that the infestation rate was 65.93%. The parasites were Strongylidae (54%), and Trichuris sp. (3.67%) [3]. It was reported that the prevalence of the GI nematode parasites in cattle in several countries was as follows: Taiwan 7.9% [4], Sri Lanka 11.56% [5], Columbia 50.5% [6], Ghana 95.5% [7] and Pakistan 89.74% [8]. Gastrointestinal parasites were the causal factors of the problems in cattle and buffalo in India with varying prevalence rates [9]. The nematodes that often infected adult cattle were Cooperias sp., Bunostomum sp., Mecistocirrus sp., and Trichuris sp. [10]. There has not any comprehensive surveillance conducted to determine the prevalence of gastrointestinal nematodes in cattle in Indonesia. Considering the vast area of Indonesia consisting of thousands of islands, the study aimed at determining the diversity of gastrointestinal parasites in cattle at various regions in Indonesia. It was useful to find out the productivity of tropical cows in Indonesia that might be affected by the production and the reproduction in the incidence of gastrointestinal parasitic nematode infection.

2. Materials and Methods

2.1. Faecal samples collection

The samples used in this study were cattle feces obtained from beef cattle farms in Indonesia. They were collected directly from the rectum of 335 cattle in 15 provinces in Indonesia with the random distribution as summarized in table 1. About fifteen g (± 15 g) of stool samples were collected directly from the rectum using sterile gloves and then put in dry and clean plastic containers. The samples were kept in a cooler or immediately brought to laboratory and kept in a refrigerator at 4 °C. During the transportation of the cattle stool samples, they were kept in a box filled with dry ice to make sure that the parasites in the samples did not grow. In addition to the cattle fecal samples, questionnaires were also distributed to farmers to gather the information of the condition of the pen, the raising pattern of cattle whether it was intensive or semi-intensive, the age and the sex of the cattle.

2.2. The detection of nematode eggs

Whitlock method. Three grams of the feces from each animal were soaked in 17 ml of water and left for a few minutes. Once they have been soft, they were crushed and stirred homogeneously. And then, 40 ml of saturated salt solution of specific gravity were added to float the nematode eggs. After that, the fecal solution was taken using a pipette equipped with a filter while continuously stirring and the solution was put into the 'whitlock chamber' counting room (0.5 ml/room) [11].

Subsequently, the tubes were left for 2-5 minutes so that the worm eggs floated on the surface. The eggs were then observed under a microscope at 4 x 10 magnifications. They were identified on the basis of their shape and size, length and width and then counted to find out their number [12].

Sugar flotation method. The method was used to detect pathogenic parasites in the digestive tract quickly and easily. The feces of each cow were weighed to get 3 grams of them and 30 ml of distilled water was added and then centrifuged at 2000 rpm for 5 minutes. The supernatant was removed and 10 ml of saturated sugar solution were added and then centrifuged 2000 rpm for 5 minutes. Subsequently, the floating worm eggs on the surface were taken, put on object a glass object and covered with a glass cover (deck glass) of the dimension of 9 mm x 9 mm. The presence of the worm eggs was examined under a microscope at 100 and 400 magnifications.

3. Results and Discussion

Based on the results of the analysis using the Whitlock and sugar flotation methods, it was found that considering the diversity of the GI nematode worms in the cattle feces samples consisting of Strongylidae, Trichuris sp., Capillaria sp. and Ascarid sp. East Java was the province where the mixed types of GI nematode infection took place. Parasites were not found in the provinces of North Sumatra and Yogyakarta because the cattle have received worm treatment. Since the cattle fecal samples were drawn randomly, we did not know the history of previous events if the cattle have received treatment or not. Giving worm medicine to cattle could kill the worms at all of their living stages from eggs,
lartvae and adult nematode worms. Some worm larvae that have entered the intestinal epithelium and internal organs of the worms could also die because of the treatment. In certain period of the life cycle of the worms, the worms in the cattle's body would disappear because of the deworming treatment. However, re-infection incidence with the entry of worm eggs or larvae extant in cattle's feed could result in new infection in the cattle's body.

Table 1. The prevalence of the GI nematode at the Provinces in Indonesia

| No. | Provinces          | Strongyle Prev. (%) | Trichuris sp. Prev. (%) | Capillaria sp. Prev. (%) | Ascarids Prev. (%) | Total |
|-----|--------------------|---------------------|-------------------------|--------------------------|-------------------|-------|
| 1   | North Sumatera     | 0                   | 0                       | 0                        | 0                 | 0     |
| 2   | West Sumatera      | 3                   | 18.8                    | 0                        | 0                 | 0     |
| 3   | Bangka Belitung    | 2                   | 14.3                    | 0                        | 0                 | 0     |
| 4   | Central Java       | 2                   | 13.3                    | 0                        | 0                 | 0     |
| 5   | Yogyakarta         | 0                   | 0                       | 0                        | 0                 | 0     |
| 6   | East Java          | 6                   | 15.4                    | 4 (10.3)                 | 1 (2.6)           | 4 (10.3) |
| 7   | Central Sulawesi   | 2                   | 13.3                    | 0                        | 0                 | 0     |
| 8   | South East Sulawesi| 6                   | 40.0                    | 0                        | 0                 | 0     |
| 9   | West Sulawesi      | 5                   | 33.3                    | 0                        | 0                 | 0     |
| 10  | North Kalimantan   | 3                   | 15.8                    | 0                        | 4 (21.1)          | 0     |
| 11  | Central Kalimantan | 5                   | 50.0                    | 1 (10.0)                 | 0                 | 0     |
| 12  | West Nusa Tenggara| 19                  | 52.8                    | 0                        | 0                 | 0     |
| 13  | East Nusa Tenggara | 4                   | 8.3                     | 0                        | 0                 | 0     |
| 14  | North Maluku       | 2                   | 11.8                    | 0                        | 0                 | 0     |
| 15  | Papua              | 5                   | 8.9                     | 0                        | 0                 | 0     |
| Total|                   | 64                  | 5                       | 8                        | 4                 | 335   |

Table 1 summarized the prevalence of the GI nematodes at various provinces in Indonesia. There were 81 of the total samples of 335 GI nematode cow feces infected with the prevalence of 24.2%. The types of the infecting worms were Strongyle 64/335 (19.1%), Trichuris sp. 5/335 (1.49%), Capillaria sp. 8/335 (2.39%), and Ascarids 4/335 (1.19%). The highest prevalence of the Strongylidae was found in the province of West Nusa Tenggara (52.8%), Capillaria sp. in North Kalimantan (21.1%), Trichuris sp. in East Java (10.3%) and Ascarids in East Java (10.3%). The high prevalence of the Strongyle worms in cattle was also found in India. According to a study conducted in India the prevalence of Strongyle spp. was 21.9%, Trichuris sp. 5.7%, Ascaris sp. 9.3% [8]. It was also the case in Columbia [13]. There were four influencing factors of the incidence of GI nematodes. They were season, the age and the sex of cows and the condition of pen.

Generally, the climate in Indonesia is classified into 2 types, namely the rainy season that occurs in the period of October to March and the dry season that occurs in the period of March to October every year. According to Maichomo [14] endoparasite in big ruminants could inflict huge economic losses directly or indirectly and be inhibiting factor in cattle farming. The study showed that the prevalence of the GI nematodes in Sumatra was lower than the results of the study by Susana et al. [15] in Riau Province showing that the prevalence of Oesophagostomum sp. was 50% and Ascarids 20% in January. The study was conducted in the period of March to September. The high rainfall in January in Indonesia affected the growth of larvae into adult worms. Environmental factors were known to influence the development of nematode larva on grass, including temperature, humidity, and rainfall [16]. Several locations from which the samples were taken had different climates. For example, at the sampling location in Sumatra it should have rained at low intensity in April, but heavy rain still took place during the study. The same thing happened in Eastern Indonesia. For example, there should have usually been no rain in East Nusa Tenggara, but there was still rain at low intensity. It has been known that the presence of rainwater soaking around the cattle farm was significant determinant factor.
of the development of nematode parasites from eggs to larvae residing in grass feed that cows could accidentally eat.

**Table 2.** The characteristics of samples based on ages, sex and cattle management

| Variables | Categories | Strongyle (%) | Trichuris (%) | Capillaria (%) | Ascarid (%) |
|-----------|------------|---------------|---------------|----------------|-------------|
| Sex       | Male       | 4.66          | 0.55          | 1.64           | 0.00        |
|           | Female     | 2.74          | 0.27          | 0.27           | 0.55        |
| Management| Semi intensive | 2.47      | 0.00          | 0.00           | 0.00        |
|           | Intensive  | 4.38          | 0.82          | 1.10           | 0.00        |
| Age       | Calf (<2 yr) | 1.37     | 0.55          | 0.27           | 0.55        |
|           | Adult (>2 yr) | 5.48    | 0.27          | 1.64           | 0.00        |

Table 2 summarized the characteristics of the samples based on gender, drum management and cow age. The percentages of the sex of the cattle infected by *Strongyle* worm were 4.66% male and 2.74% female. The condition was different in other countries such as India with the prevalence in male cattle of 7.3% and that in female cattle of 14.6% [8]. The condition of the bulls affected by a parasitic disease could be explained by examining the relation of the disease and the ability of bulls to eat. A bull was usually heavier and bigger than female cattle. It was clearly observed in the picture that the possible amount of the parasite containing feed to enter the body of the bulls was bigger than that of female cows.

Management-based sample characteristics were classified into intensive and semi-intensive maintenance. Semi-intensive maintenance meant that the cows were placed in a drum, but they were released in the pasture in the morning until noon and they were returned to the drum only at night. Meanwhile, intensive farming was carried out by placing all cattle in a drum with intensive feed that satisfied the need of the cows for the feed 3 times a day. In the intensive management, the biggest percentage of the infection was by the *Strongyle* worm (4.38%), while the infection by *Capillaria sp.* was 1.1% and that by *Trichuris sp.* was 0.82%. A lot of parasitic infections took place in the cattle reared in the intensive model. It was because the cattle were less able to get a variety of feeds than the semi-intensive cattle reared in the field. As a result of frequent infection of various types in cattle that were raised semi-intensively, the cattle could get more plants that might contain herbs with anti-parasitic properties. Meanwhile, the cattle raised in intensive pens received only a type of feed.

Considering the age of the cows, the majority of the fecal samples were collected from adult cattle (more than 2 years of age), which contained *Strongyle* worms (5.48%), while those collected from young cattle (less than 2 years of age) contained 1.27% *Strongyle* worms, those collected from old cattle contained 1.64% *Capillaria sp.*, those collected from young cattle contained 0.27% *Trichuris sp.*, those collected from old cattle contained 0.55% *Trichuris sp.* and those collected from young cattle contained 0.27% *Trichuris sp.*. It was clearly observed that the older cattle got more parasitic nematode infections than young cattle. It was possible because the eating intensity of the older cattle was higher and the eating pattern was characterized by more frequent eating by the older cattle than by young cattle. As a result of the frequent eating pattern of cows, the possibility of nematode parasite infection was higher. Based on the results of the interviews with farmers it was also found that there were more causal factors of the incidence of the parasitic disease in adult cattle. Though some cattle have received deworming treatment, some of them were still infected by nematode worms. It might be because a type of worm medicine has become resistant. The monotonous use of single deworming treatment and antiparasitic medicine for a long period of time might result in drug resistance.

Cattle farming in developing countries had almost the same problem, which was gastrointestinal nematode infection [17]. The condition resulted from tropical climate, high rainfall, high humidity, and semi-intensive maintenance. Similar conditions were found in Pakistan [8], Bangladesh [18], and Sri Lanka [5]. The differences in the prevalence of GI nematodes in cattle were often found in tropical
countries. The areas with high rainfall would be suitable medium for the growth of GI nematode worm larvae. Furthermore, farm size, soil type, treatment effect, waste disposal management and cleanliness of drums played an important role in GI nematode transmission [19]. The raising pattern of the cattle in tropical countries looked the same. What was more distinguishing was the deworming pattern, whether it was regularly practiced to the cattle or not. Smallholder farmers who only had less than 5 cattle rarely implemented deworming program because it was costly. The knowledge of the cattle farmers of the importance of the deworming program was still insufficient. Also, the majority of the farmers did not that there were herbs with antiparasitic properties around their houses that could be given to their cattle to reduce the incidence of the parasitic nematode diseases in the cattle. The government program has not put higher priority on the treatment of parasitic diseases than on the treatment of bacterial or viral diseases. Therefore, the local government has not paid a good attention to the livestock health problems related to the parasitic infection.

4. Conclusion
The cattle at 15 provinces in Indonesia were infected by GI nematodes, including Strongyle, Capillaria sp., Trichuris sp. and Ascarids sp. The prevalence varies with geographical and weather conditions in the provinces. The causal factors of the incidence of GI nematode parasite infection were weather, age, sex and cow farm management. Therefore, it was necessary to monitor the incidence of the GI nematode parasite infection through periodic surveillance activities at various regions in Indonesia.

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