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PREVALENCE AND RISK FACTOR OF STONGYLOIDOSIS IN BEEF CATTLE IN KASIMAN SUBDISTRICT, BOJONEGORO

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ABSTRACT

A pair of cross-sectional studies was conducted to determine prevalence and risk factors of *Strongyloides* spp. (threadworm) infections in beef cattle in Kasiman Subdistrict, the Regency of Bojonegoro. A total of 263 and 270 of local beef cattle with various age were selected for faecal sample during dry season (August-October) and wet season (February-March), respectively. Feces were processed for counting the number of eggs per gram feces (EPG) using McMaster method. The prevalence of strongyloidosis was 4.56% and 7.04% in the dry season and the rainy season, respectively. The factors that associated with prevalence and intensity infection were age and sex of cattle. During the dry season and the rainy season, the calf and weaner group (<1 year) was more susceptible for Strongyloides infection than cattle with older age and showed higher intensity of infection (based on EPG values). The bulls showed a higher risk and intensity of infection than cows.

Key words: beef cattle, Bojonegoro, Strongyloides

ABSTRAK

Kajian potong lintang digunakan untuk mengetahui prevalensi strongyloidosis di Kecamatan Kasiman, Kabupaten Bojonegoro. Sampel feses dikoleksi dari sapi di berbagai kelompok umur sebanyak 263 sampel pada musim kemarau (selama Agustus-Oktober) dan 270 sampel dikoleksi pada musim hujan (selama Februari-Maret). Pemeriksaan tinja dilakukan dengan metode McMaster. Prevalensi strongyloidosis di Kecamatan Kasiman, Kabupaten Bojonegoro adalah sebesar 4,56% dimusim kemarau dan 7,04% dimusim hujan. Umur dan jenis kelamin sapi merupakan faktor risiko infeksi. Selama musim kemarau dan musim hujan, sapi pedet dan anak (<1 tahun) lebih rentan terinfeksi Strongyloides daripada sapi dengan umur yang lebih tua dan menunjukkan intensitas yang lebih berat (berdasarkan jumlah telur per gram tinja). Sapi jantan menunjukkan risiko infeksi yang lebih tinggi dan intensitas yang lebih berat daripada sapi betina.

Kata kunci: sapi potong, Bojonegoro, Strongyloides

INTRODUCTION

Cattle production in Indonesia is majority from small holder farming systems. Small holder farms have an important role in the contributing to the national beef production in Indonesia. The contribution of small holder beef cattle farm to the national beef demand is about 67%, while the rest is fulfilled through import (Anggiani and Azizah, 2019). Small holder farming system have characteristic as family business with a small number animals, as for savings and as a side job (LPPM, 2015). Government put a lot of efforts in developing domestic beef cattle production including in Bojonegoro District to achieve self-sufficiency in meat production. In order to develop small holder farm, the local government of Bojonegoro District from Sentra Peternakan Rakyat (SPR) program is initiated in three sub-districts. The programs of SPR are including the improvement of husbandry management and the improvement of animal health to increase the production.

The management system of small holder farm is generally traditional which have characteristic that cattle are kept in densely populated settlements and are kept behind the house, have not applied much technology, and feed source are cut and carry and must be sought in areas that are often far from home (LPPM, 2015). This management system make the cattle are vulnerable to parasitic infections including helminth parasite. Strongyloidosis is one of the diseases which are most commonly underestimated. Among helminth parasite in ruminant, *Strongyloides* spp. (threadworm) infection have less attention and covered by other diseases (Dimitrijevic *et al*., 2012), therefore the losses due to strongyloidosis in cattle are often uncounted. There are two species of Strongyloides, Strongyloides papillosus and Strongyloides vituli, found in cattle and small ruminants which were generally in the small intestine (Pwith ko *et al*., 2019). Adult female of Strongyloides can cause diarrhea and malnutrition, especially in young animals. *Strongyloides* spp. is able to infect cattle at all ages, however clinical symptoms are more common in young animals. Although the pathogenicity of Strongyloides is considered to be lower than other gastrointestinal nematode, Strongyloides caused of sudden death in young ruminant (sudden death syndrome) without being preceded by symptoms of illness (Taira and Ura, 1991; Kvac and Vitovec, 2007).

Considering the effect of strongyloidosis on the animals, the control measurement is much warranted. Effective control strategies to strongyloidosis need to be developed based on epidemiological patterns that are very specific to every area. Therefore, relevant epidemiological data are needed to compile and implement a rational prevention program for Strongyloides in cattle in the study area. This study aims to measure the prevalence and to identify the risk factors for strongyloidosis in SPR beef cattle in Kasiman District, Bojonegoro Regency.

MATERIALS AND METHODS

This study was conducted at the SPR of Mega Jaya, Kasiman Subdistrict, Bojonegoro Regency. Cattle feces sampling was carried out in the dry season (during August-October 2014) and in the rainy season (during February-March 2015). Stool sample examination was carried out at the Helmintology Laboratory, Department of Animal Desease and Veterinary Health, Faculty of Veterinary Medicine, Bogor Agricultural University.

Study Design

A cross-sectional study was conducted to determine the prevalence of strongyloidosis in Kasiman Subdistrict, Bojonegoro Regency. Simple random sampling was applied to determine cattle for faecal sample collection. A total of 263 fecal samples of cattle in the dry season and 270 faecal samples in the rainy season were collected from cattle belong to SPR members. Cattle samples consisted of calves groups (<6 months), weaner group (7-12 months), yearling group (>1 year to 2 years), and adults (>2 years). Stool samples were assessed using the McMaster method. Information of animal characteristics is obtained by interviewing the farmers. The collected data were analyzed using chi-square and logistic regression (Basri and Kiptiyah 2010).

Fecal Examination

Observation of parasites in the feces was carried out using the McMaster quantitative method (Nolan, 2006). As much as two grams of feces from each individual cattle were suspended in floatation solution to get the final volume of 60 mL. After homogeneous and filtered from large debris, suspension feces was filled into McMaster's counting chambers and observed using compound microscope with objective magnification of 10x. The Strongyloides eggs which were found were counted and expressed as egg per gram of feces (EPG). The EPG was calculated using the formula:

$$\mathbf{TTGT} = \frac{\mathbf{n \times Vt}}{\mathbf{Vk \times Bf}}$$

n = number of eggs in the McMaster counting chamber

Vt = total volume (60 mL)

Vk = the two chambers volume (0.3 mL)

Bf = feces weight

Data Analysis

The Strongyloides prevalence was calculated as the proportion of infected animals with the *Strongyloides* spp. The differences in the prevalence of Strongyloides among sex and ages were analyzed using Chi-Square at the level of 5%. The logictic regression was applied to determine the risk factor and the odds ratio (OR) at the confident interval of 95 % (Basri and Kiptiyah, 2010).

RESULTS AND DISCUSSION

The prevalence of strongyloidosis in cattle in the SPR, Kasiman between the dry (4.56%) and rainy seasons (7.04%) was not significantly different (Table 1). The prevalence of stongyloidosis in cattle has been reported to vary and influenced by location, age, management system, and season. The prevalence of strongyloidosis in SPR in Kasiman was higher than in some Asian countries such as in dairy cows in Thailand (0.19%) (Jittapalapong *et al*., 2011), in cows and buffaloes in India (0.49%) (Swarnakar *et al*., 2015), and in cattle in Taiwan (1.0%) (Tung *et al*., 2012). Laha *et al*. (2013) reported that the prevalence of infection of cow gastrointestinal parasites in the rainy season was higher than other seasons. Very high prevalence was found in lambs (58%) during spring in northern Tunisia (Akkari *et al*., 2012), and in sheep (18%) that were grazed during the summer in southern Poland (Balicka-Ramisz *et al*., 2013).

The intensity of Strongyloides infection between the dry season and rainy seasons also did not show any significant difference (Table 1). The geometric means of EPG in the dry season and rainy seasons were 469.67 and 399.08 EPG, respectively. Although there was no difference in the EPG between the two seasons, individually, there was very high EPG observed during the rainy season. Taira and Ura (1991) reported that high levels of infection intensity were found in cattle in wet and humid summers.

Environmental conditions have greatly affected to the life cycle of helminths parasite particularly in pre parasite phase. Therefore, environmental conditions would influence the transmission and the incidence of helminthiasis in grazing cattle (Pfukenyi and Mukaratirwa, 2013). Strongyloides has a unique life cycle with adult female worms in the intestine of host produce eggs via parthenogenesis, and male and female adults in the environment reproduce sexually. Eggs which are produced from parthenogenesis have female genotypes, however after hatching in the environment, male rhabditiform larvae will appear beside female rhabditiform larvae. In the environment, there can be two life cycle pathways, namely the direct pathway (homogenic) and indirect pathway (heterogenic) which are influenced by the host, the strain and the environment. The larval stadium 1 will develop into the homogonic route favored at higher environmental temperatures. The rhabditiform larvae in homogenic pathway develop and have two molting into infective strongyliform larvae. In heterogenic life cycles, both male and female rhabditiform larvae develop into adult rhabditiform worms. Larvae produced from heterogenic cycles will develop into strongyliform infective larvae (Anderson, 2000) in heterogenic route, typically there is only one generation of free-living adults. The animals are infected as a result of the introduction of infective larvae (stage L3) through percutaneous (active) penetration of the L3 larvae or by way of food and water (passive) (Dimitrijevic *et al*., 2012) and

furthermore Strongyloides infective larvae migrate through the lungs (Kvac and Vitovec, 2007).

The prevalence and intensity of Strongyloides infections in cattle were associated with the age and sex (Tables 2 and 3). The highest prevalence and intensity of Strongyloides infections were found in calf and followed by older cattle. Calf have more risk of being infected with *Strongyloides* spp. Pfukenyi *et al*. (2007) stated that calf with age 6-8 months are more susceptible to Strongyloides infection due to their immature immune system status.

Another factor that can contribute to the high infection in young cattles was thought to be related to management. Generally, young cattles stay longer in the cage than older cattles. Therefore, young cattles will be more infected while in cages. Jäger *et al*. (2005) reported *S. papillosus* was detected to have a higher prevalence in calves in cage during the winter (10-53%) compared to calves that were grazed during the summer (6%). The highest prevalence was found in calf aged 6-7 weeks after birth, then the prevalence decreased to 6% during the grazing season. The use of deep litter contributed to the accumulation of infective larvae in the environment and to the reinfections. The accumulation of feces in the cage also can be as the predisposition factor to *Strongyloides* spp. infection (Sajuri *et al*., 2017). The development of pre-parasitic stage of *Strongyloides* spp. is in the feces or soil and infects cattle via skin penetration or oral through contamination of feed and water (Dimitrijevic *et al.*, 2016). Animals can also be infected with *Strongyloides* spp. through transplacental route in the uterus during pregnancy (Anderson, 2000) and through trans-mammary during milk sucking (Urquhart *et al*., 1996). Therefore, calf may also be infected while in the uterus and through milk from cow exposed to Strongyloides.

The prevalence and intensity of infections were also related to the sex of the cattle. The results showed that bulls had a higher prevalence and intensity of Strongylides infections than cows both in the dry and in the rainy season (Tables 2 and 3). According to Adedipe *et al*. (2014), susceptibility of male cattle to infection is related to the immunity. Since puberty, the immune system of bulls is depressed by the activity of androgen hormones (Urquhart *et al*., 1996). Another factor that contributes in Strongyloides infection on bull is aggressive bull behavior including the eating behavior. This behavior enable the bulls swallowing more infective stages of nematode (Adedipe *et al*., 2014). In addition, cows also have estrogen which can stimulate reticulo endothelial system (RES) cells to form antibodies, make it more resistant to helminth infections (Paramitha *et al*., 2017).

Table 1. Prevalence and intensity of Strongyloides infection in cattle in Sentra Peternakan Rakyat Kasiman Subdistrict

Season	Prev. (%)	p-Value	OR	CI 95%	Geometric mean of EPG X (Min-Max)
Dry season (n= 263)	4.56	0.222	1	Reference	469.7 (100-17 700)
Rainy season (n= 270)	7.04		1.58	0.75-3.33	399.1 (100-31 000)

EPG= Egg per gram feces

Table 2. Prevalence of strongyloidosis in cattle in Sentra Peternakan Rakyat Kasiman Subdistrict based on age and sex

Group		N	Prev. (%)	p-Value	OR	CI 95%
Dry season						
Age	Calf	38	23.68	0.000	22.81	4.68-111.09
	Weaner calf	27	3.78		2.83	0.25-32.32
	yearling	49	0.00		0.75	0.03-16.91
	Adult	149	1.34		1	
Sex	Male	63	12.70	0.000	7.127	2.07-24.55
	Female	200	2.00		1	
Rainy season						
Age	Calf	12	33.33	0.000	28.17	5.38-147.61
	Weaner calf	54	16.67		11.27	2.93-43.35
	Yearling	32	9.38		5.83	1.12-30.29
	Adult	172	1.74		1	
Sex	Male	61	14.75	0.007	3.44	1.33-8.91
	Female	209	4.78		1	

Table 3. Intensity infection of Strongyloides on infected cattle in Sentra Peternakan Rakyat Kasiman Subdistrict based on age and sex

Group	Dry season	Rainy season
	Geometric mean of EPG X (Min-Max)	Geometric mean of EPG X (Min-Max)
Calf	674.3 (100.0-17.700.0)	1593.5 (200.0-31.000.0)
Weaner calf	400.0 (400.0-400.0)	430.7 (100.0-2.300.0)
Yearling	0.0 (0.0-0.0)	100.0 (100.0-100.0)
Adult	100.0 (100.0-100.0)	200.0 (200.0-200.0)
Male	441.2 (100.0-17.70.0)	613.1 (100.0-31 000.0)
Female	182.1 (100.0-500.0)	271.2 (100.0-2.100.0)
Total	469.7 (100.0-17.700.0)	399.1 (100.0-31 000.0)

EPG= Egg per gram feces

CONCLUSION

The prevalence of strongyloidosis in Kasiman District, Bojonegoro Regency is 4.56% in the dry season and 7.04% in the rainy season. The factors that associated with prevalence and intensity infection are age and sex of cattle. Weaner and calf (<1 year) are more susceptible to infection than older cattle. The bulls showed a higher risk and intensity of infection than cows.

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