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# Endoparasites of cattle raised under intensive and semi-intensive system at Klumpang Kebon Village, North Sumatra

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**Abstract.** Endoparasitic infestations tend to occur in all cattle breeding systems with different level of infection at spatial scale. This study aimed to distinguish the prevalence of endoparasites of cattle raised under intensive and semi-intensive systems at Klumpang Kebon Village, Hamparan Perak District, North Sumatra, Indonesia. Fresh dung samples were collected from 40 cattle and pre-treated with glass beads sedimentation method to obtain the endoparasite suspensions. The results showed that majority of cattle (35 out of 40) were infected by four endoparasitic species identified from the dung samples, namely *Buxtonella* in the class of Ciliata, *Dicrocoelium*, *Fasciola*, and *Paramphistomum* in the class of Trematoda with the absence of *Fasciola* in the semi-intensive breeding system. The percentage of infected cattle was higher in semi-intensive farm (100%. 20/20) than in intensive farm (75%. 15/20) in which the highest infestation of endoparasites were recorded from *Paramphistomum* (88.6%), followed by *Buxtonella* (65.7%), *Fasciola* (37.1%), and *Dicrocoelium* (2.8%). Most cattle were mostly found with two co-infecting endoparasites and higher percentage was recorded in semi-intensive breeding system. Based on the highest endoparasites prevalence there is a need to apply a parasitic control program to both breeding systems to prevent further infections.

## 1. Introduction

Endoparasitic infection of gastrointestinal tract (GI) is a serious problem in livestock management. The infestation of GI parasites may vary according to age, sex, nutritional conditions, and severity of infections. The species and prevalence of parasites are greatly influenced by the breeding systems. Previous study examined 163 cattle and bufaloes in which 13.39% of population were infected by more than one GI parasite species. The prevalence of parasitic infections was higher in buffaloes than cattle. The parasitic species identified from the study, i.e. *Trichuris* spp., *Bunostomum* spp., *Paramphistomum* spp., *Moniezia* spp., and Coccidians. Meanwhile, untreated livestock suffered a higher percentage of infections reaching 46.67% in which the males were more prone to parasitic infections than females [1].

Dung or fecal samples of livestock (cattle) may be examined by treating the samples with standard sedimentation and flotation methods to obtain parasite suspensions. The most common parasites were nematodes, trematodes and cestodes with co-infections in some cases. Some parasitic infestations may be higher in adults than calves [2]. Common reported endoparasitic species were *Bonostomum*, *Nematodirus*, *Capillaria*, *Marshallagia*, *Oesophagostomum*, *Cooperia*, *Toxocara*, *Chabertia*, *Ostertagia*, *Trichuris*, *Trichostrongylus*, *Haemonchus* in the class of Nematoda; *Paramphistomum*, *Cotylophorum*, *Dicrocoelium*, and *Fasciola hepatica* in the class of Trematoda; and *Avitellina*, *Moniezia expansa* in the class of Cestoda.



The prevalence and occurrence of helminth parasites in some livestock may be different across species and spatial scale. The prevalence of fasciolosis in Simeulue buffalo, Aceh Indonesia was very high reaching 95% [3]. The nematodes infecting cattle in Banda Aceh were *Oesophagostomum radiatum*, *Oesophagostomum columbianum*, and *Setaria labiatopapillosa* with a prevalence of 12%, 10%, and 6%, respectively while a species of trematode, *Eurytrema pancreaticum* with a prevalence of 0.4% [4]. In addition, GI parasites in cattle at Siak Sri Indrapura Regency were identified as *Blastocystis* sp., *Entamoeba* sp., *Eimeria* sp., *Giardia* sp., *Balantidium coli*, *Cryptosporidium* sp., *Oesophagostomum* sp., *Toxocara vitulorum*, *Moniezia expansa*, *Trichuris* sp., and *Fasciola* sp. Endemic GI parasites may threaten the health of livestock and have the potential for zoonotic transmission [5].

Different breeding system may lead to different tolerance of GI parasitic infections. Breeding under traditional or conventional system showed severe infections, especially by *Trichostrongylus* and *Cooperia*) which threatened the health of cattle and needed emergency treatment [6]. Other study also revealed that under intensive systems with highly nutritious diets, the parasitic infections may be lower in cattle besides the tolerant genetic traits of the livestock [7]. Cattle farmers in Indonesia still give less concerns to the problems of parasitic infestation. Under semi-intensive systems, the farmers let the cattle to graze in the open area which may be dominated by various endoparasite species. Moreover, the co-grazing cattle may even spread the parasites to other herbivores in the areas leading to an endless cycle of co-infection by endoparasites. In this study, we evaluated the prevalence of endoparasites from different breeding systems (intensive and semi-intensive) of cattle owned by some local community in North Sumatra.

## 2. Method

Fresh dung or fecal samples of cattle were collected from Klumpang Kebon Village, Hamparan Perak District, as one of the representative stock breeding sites in North Sumatra, Indonesia. Determination of sample count was based on Slovin's formula [8]. Forty dung samples were collected from both intensive and semi-intensive breeding system and stored in sterile glass bottles and preserved (4°C) prior laboratory experimentation. Samples were analyzed using the sedimentation method with glass beads [9]. Identification of parasitic helminth eggs was aided under light microscopy (40×) and compared to the photographic guide in an atlas of parasitology [10]. The data on endoparasite species and its prevalences were analyzed descriptively.

## 3. Results and discussion

### 3.1. Endoparasitic species of cattle

The results found four endoparasitic species which classified into Ciliata and Trematoda class. The results was quite consistent and only revealed an absence of *Dicrocoelium* sp. in semi-intensive farm. The taxonomy of endoparasitic species was presented in Table 1.

**Table 1.** Occurrence and taxonomy of endoparasites of cattle raised at Klumpang Kebon Village

N	Class	Order	Family	Genus/Species	Occurrence	
					Intensive	Semi-intensive
1	Ciliata	Vestibuliferida	Pycnotrichidae	<i>Buxtonella</i> sp.	+	+
2	Trematoda	Plagiorchiida	Dicrocoeliidae	<i>Dicrocoelium</i> sp.	+	+
3	Trematoda	Plagiorchiida	Fasciolidae	<i>Fasciola</i> sp.	+	-
4	Trematoda	Plagiorchiida	Paramphistomidae	<i>Paramphistomum</i> sp.	+	+

Based on the result, it can be seen that more species of helminth parasites infected the livestock raised under intensive system than semi-intensive ones. Under intensive system, the forage was obtained from different pastures, which increased the possibility of endoparasitic egg infestations in the forage. In contrary, the semi-intensive system allow the cattle to graze on the same sites, which indicated the relatively same endoparasitic species occurred in the area. The source of graze is a risk factor for parasitic infestations to livestock which may greatly spread especially during the lactation period [11,12].

*Paramphistomum* spp. is usually found in the digestive tract, where the cattle consume forage or grass contaminated with metacercaria, entering the digestive tract into the small intestine while develop into juvenile worms and cause damage to the intestinal mucosa due to intentional bites [13]. The life cycle of this helminth species depends on a suitable environment, especially high humidity and adequate temperature  $\pm 27^{\circ}\text{C}$ , which indicated its frequent infection to the livestock. Life cycle of *Fasciola* is completed only with the aid of freshwater snails as intermediate hosts. Oocysts or eggs will hatch into miracidium at a temperature of  $22\text{--}26^{\circ}\text{C}$  within a period of 9 days, while in low temperatures ( $>10^{\circ}\text{C}$ ), the period will be initiated longer [10]. One notable species, *Fasciola hepatica* is one of the causes of economic losses for the livestock industry globally and also causes zoonotic diseases so it needs immunological studies during infection [14].

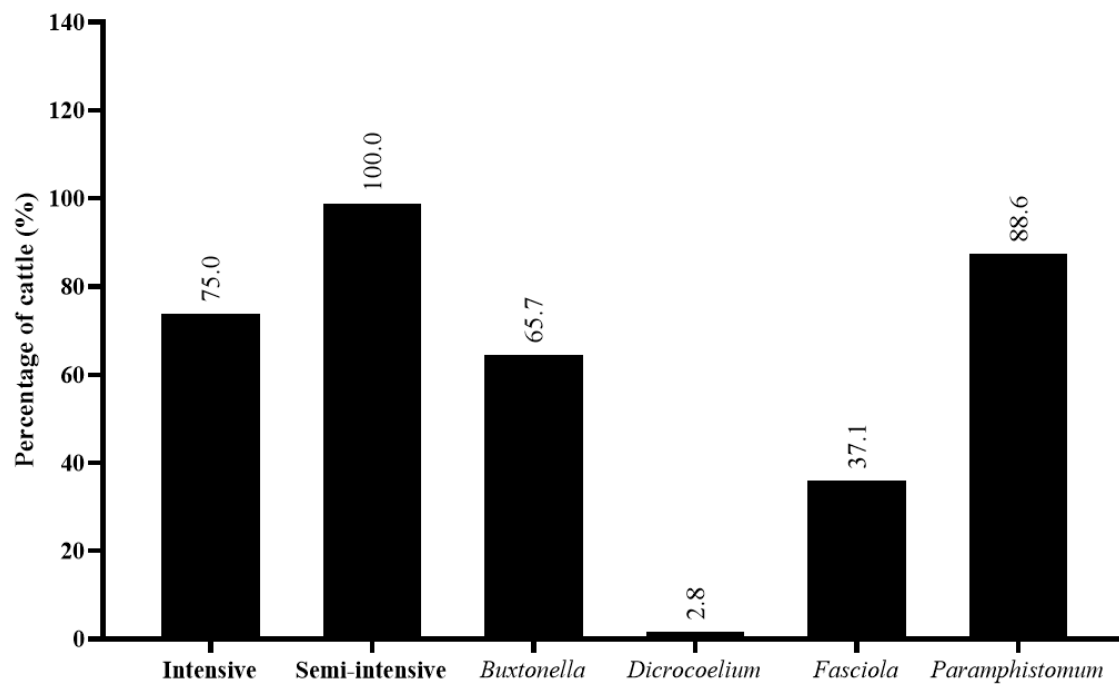
*Dicrocoelium* causes Dicrocoeliasis to the livestock with a flexible life cycle in the nature. Members of this genus were also known as lancet liver flukes. These parasites circulate among various herbivores and sometimes in humans with terrestrial snails and ants who play as hosts of biological intermediates [15]. This lancet worm has an indirect life cycle with two intermediate hosts namely snails and ants. Both of these intermediate hosts are one of the most striking life cycles among other parasitic worms [16]. *Buxtonella* usually present in the large intestine (colon) of livestock. These ciliate species developed cilia for their movement. Taxonomical study on *Buxtonella* is currently under debate by researchers, because *Buxtonella sulcata*, a member of this genus showed indistinguishable morphological characters from *Balantidium coli*, other ciliate species causing diarrhea [17]. Moreover, the occurrence of these endoparasites recorded in our study was considered as common among cattle and other ruminants.

### 3.2. Prevalence and intensity of endoparasites

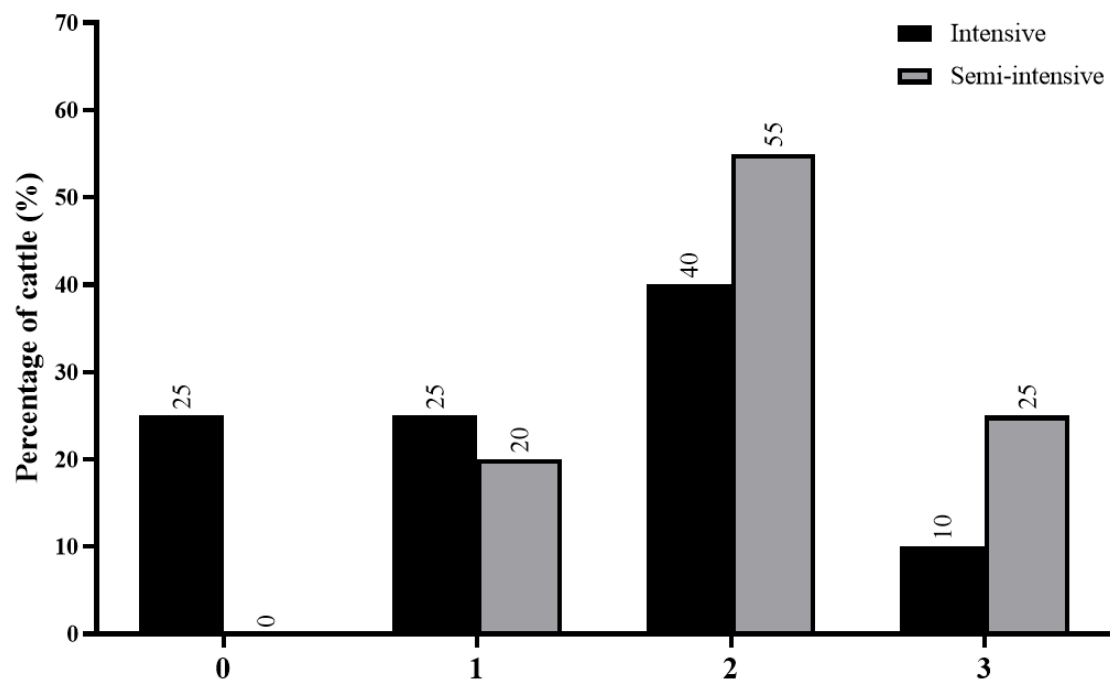
In general, the percentage of infected cattle was higher in semi-intensive (20/20) than in intensive breeding system (15/20) (Figure 1). *Paramphistomum* showed the highest prevalence (88.6%) among other species while the lowest was observed from *Dicrocoelium* (2.8%). The results indicated that majority of the cattle suffered mostly from trematode infections. In order of importance, the endoparasites observed in cattle were *Paramphistomum* ( $>80\%$ ), *Buxtonella* ( $>60\%$ ), *Fasciola* ( $>25\%$ ), and *Dicrocoelium* ( $>5\%$ ) (Table 2). Based on each infection, all endoparasitic species were categorized as light infections. Most cattle were infected by 1 to 2 parasites during the time of sampling (Figure 2), however the percentage was again obtained higher in semi-intensive than intensive system.

**Table 2.** Prevalence and intensity of endoparasites of cattle raised at Klumpang Kebon Village

Species	Intensive ( $N = 15$ )					Semi-intensive ( $N = 20$ )				
	Positive (%)	Min	Max	Mean	S.D ( $\pm$ )	Positive (%)	Min	Max	Mean	S.D ( $\pm$ )
<i>Buxtonella</i> sp.	60	1	13	5.1	5.3	70	1	74	12.8	16.2
<i>Dicrocoelium</i> sp.	6.7	1	1	1	-	-	-	-	-	-
<i>Fasciola</i> sp.	26.7	1	1	1	-	45	1	7	13.1	16.9
<i>Paramphistomum</i> sp.	86.7	3	22	5	5.2	85	1	74	12.9	16.1



**Figure 1.** Percentage of infected cattle from intensive ( $N=15$ ) and semi-intensive ( $N=20$ ) breeding systems from the total cattle ( $N=40$ ). The prevalence of each endoparasitic species was calculated from total infected cattle ( $N=35$ ).



**Figure 2.** Percentage of number of co-infecting endoparasites in cattle

Domesticated cattle are important protein sources for many Indonesians. To our most understanding, this is the first report in the Sumatran region which reported the dominance of *Paramphistomum* as endoparasites of cattle. In addition, our previous study also revealed the high dominance of *Paramphistomum* both in male and female deer in the North Sumatran region [18]. Therefore, *Paramphistomiasis* is regarded as a serious infectious disease in ruminants although commonly neglected and may lead to substantial productivity loss [19]. Majority of infections by the adults (flukes) were considered as harmless but may produce chronic pathological ulcers [20]. The infestation of *Paramphistomum* in grazing area may be influenced by temporal factors, such as climate and dry/rainy seasons. A monitoring study of GI parasites in sheep revealed that the prevalence of *Paramphistomum* was high during the summer and autumn [21].

Since both intensive and semi-intensive breeding systems showed a considerable infestation of endoparasites, several preventive methods need to be applied. Although the levels of endoparasite infections may vary from one farm to another, the basic principle of parasitic control is based on the pasture management. Pasture management may be started from the time management of grazing period following the changes of pasture in certain periods of time [22]. These practices may be effectively integrated in the semi-intensive system while for a breeding intensive system, the selection of forage from organic farming may be encouraged.

#### 4. Conclusion

The species of endoparasites identified from cattle dung samples were namely: *Buxtonella* (Ciliata), *Dicrocoelium*, *Fasciola*, and *Paramphistomum* (Trematoda) in which the prevalence and intensity were higher from semi-intensive than intensive breeding system although both systems showed a light infection level. Future preventive method, for example pasture management may be approached by selecting or changing pasture types and sources periodically to reduce the prevalence of GI parasites.

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