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Prevalence and Analysis of Risk Factors for Gastrointestinal Parasites in Beef Cattle Herds in Aranyaprathet District, Sa Kaeo Province, Thailand

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Abstract

A cross-sectional study was conducted to investigate the potential risk factors and prevalence of gastrointestinal (GI) parasites in beef cattle herds from Aranyaprathet district, Sa Kaeo province, Thailand in January 2019. A total of 239 bovines according to 34 herds (1-85 animals /herd) were selected. Fresh fecal samples were collected and tested by simple flotation as well as sedimentation techniques. Structured questionnaires via phone interviews were also applied to collect herd information. As the results, the overall prevalence of intestinal parasites was 59.0% (141/239). The most frequent identified parasites were strongylids 58.2% (139/239), followed by *Fasciola* sp. 7.9% (19/239) and *Toxocara* sp. 4.2% (10/239). In addition, the majority of the infection was only one type of GI parasite with 40.2% (96/239). The possible risk factors for strongyle infection were analyzed by univariate analysis for herd level. Feeding system was significantly associated with prevalence of strongylids (*P*-value = 0.013). Herd size with greater than or equal to 50 animals and every-6-month deworming program showed the highest prevalence rate. The high prevalence of GI parasitism of beef cattle in these areas might have been due to the feeding management and inadequate deworming program. Our findings serve as a baseline information for treatment and control strategies against intestinal parasites for livestock production in the future.

Key Words: Intestinal parasites, Prevalence, Beef cattle, Sa Kaeo, Thailand

Introduction

Helminthiasis, especially gastrointestinal (GI) parasites, is considered as a chronic problem of livestock production in most developing countries[16,28]. Clinical and sub-clinical GI parasite infection constitutes to pose a critical health threat and a limitation to the productivity and reproduction of ruminants[2,27]. The infection of GI parasite causes decrease in feed intake and increase in feed conversion ratio (FCR)[5]. The impaired absorption of nutrients regarding

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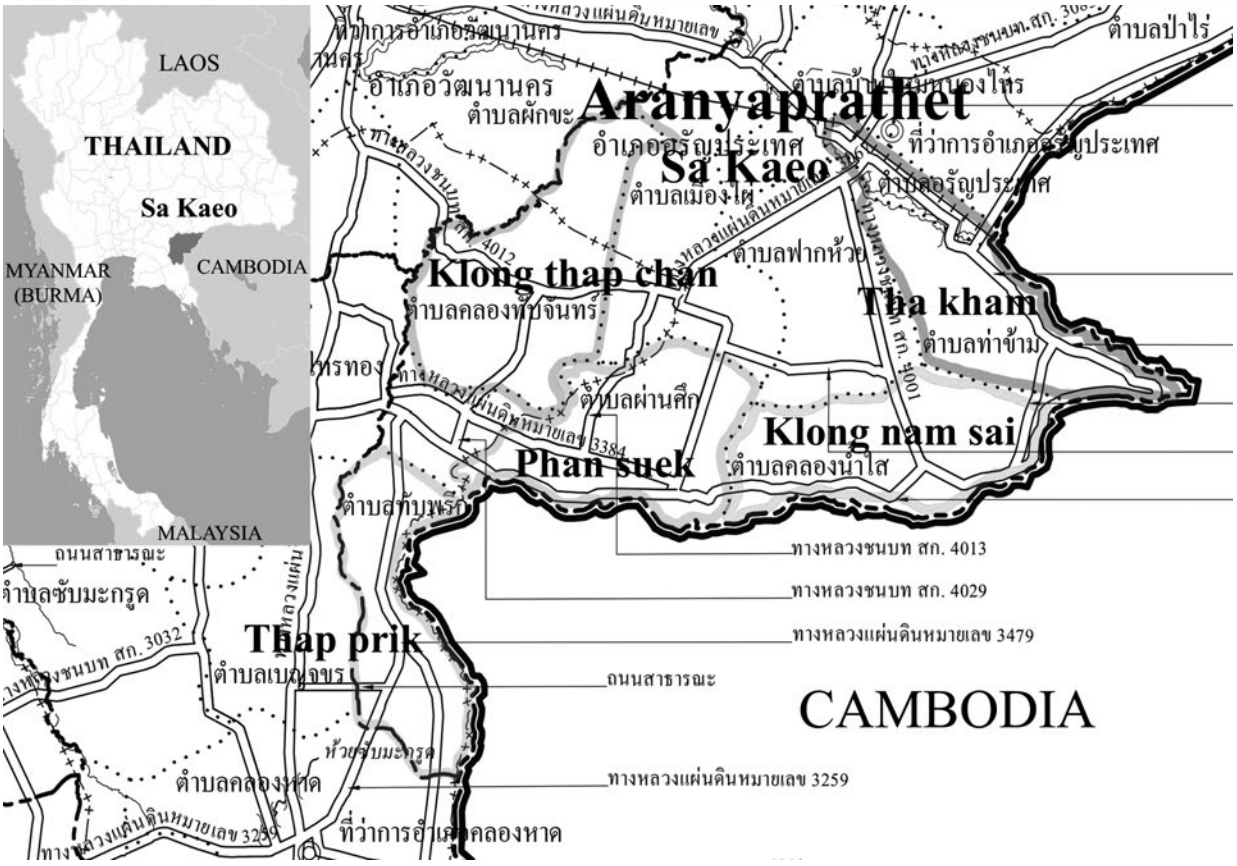

Fig. 1. Five subdistricts of Aranyaprathet, Sa Kaeo, Thailand[13,24)]

parasitic infection is leading to retarded growth[19,20)]. Moreover, GI parasite infection associates with high rate of morbidity, mortality, as well as an excessive cost of treatment and control[7,21)]. In Thailand, studies state that GI parasite infection including strongylids, liver fluke, and rumen fluke has been being a significant problem of ruminant production in several parts of the country[8,15,22,25)].

Sa Kaeo province, located on far eastern part of Thailand, is known as a special economic zone (SEZ) bordering Cambodia and has a potential for livestock development and ASEAN-oriented exports[1)]. According to the Department of Livestock Development's report of livestock inventory number in Thailand on 2017, Sa Kaeo had the largest number of beef cattle as well as other ruminants among the provinces in Region 2 (Eastern of Thailand) with 38,396 of beef cattle (37% of beef cattle in Region 2), 25,219 of dairy cattle (85% of dairy cattle in Region 2), and 2,542 of small ruminant (17% of goat and sheep in Region 2)[4)]. Livestock production contributes considerably to alleviate the poverty of rural farmers in Thailand. Thus, the Thai government promoted "Khoban Burapha" project to support beef cattle and meat goat production in Sa Kaeo for sustainable agriculture and sufficient economy[17)]. In addition, Aranyaprathet district of Sa Kaeo province serves as a border trade of Thailand and Cambodia connecting the international transportation and tourism of two counties as well as the dissemination of diseases from livestock production with epidemiological concern.

The lack of epidemiological information on the prevalence of parasite infection in Aranyaprathet district of Sa Kaeo province probably leads to the inefficient production of beef cattle and suffered poor farmers. Thus, a cross-sectional coprological

Table 1. Overall prevalence of gastrointestinal parasite infections in beef cattle herds in Aranyaprathet district, Sa Kaeo province, Thailand during January 2019

		Percent of prevalence
By animal	Tha kham subdistrict	60.0 (51/85)
	Klong nam sai subdistrict	58.3 (7/12)
	Thap prik subdistrict	68.5 (50/73)
	Phan suek subdistrict	74.1 (20/27)
	Klong thap chan subdistrict	31.0 (13/42)
	Total	**59.0 (141/239)**
By herd	Tha kham subdistrict	100 (1/1)
	Klong nam sai subdistrict	100 (4/4)
	Thap prik subdistrict	85.7 (12/14)
	Phan suek subdistrict	100 (1/1)
	Klong thap chan subdistrict	57.1 (8/14)
	Total	**76.5 (26/34)**
Type of infection[a]	Single infection	40.2 (96/239)
	Multiple infection	18.8 (45/239)
Feeding system[a]	Stall barn	78.8 (26/33)
	Grazing pasture	55.8 (115/206)
Herd size[a]	< 50 animals	55.7 (59/106)
	≥ 50 animals	61.7 (82/133)
Deworming[a]	Every month	28.7 (25/87)
	Every 3 months	75.5 (83/110)
	Every 6 months	78.6 (33/42)
Rearing system[a]	With other animal species	60.0 (51/85)
	Without other animal species	58.4 (90/154)

[a] The prevalence was based on the number of animals.

study and associated factors analyses were conducted to provide an overview of the situation in the borderline beef cattle area of Aranyaprathet district, Sa Kaeo province, Thailand.

Materials and Methods

Description of study area

The study was conducted along with beef cattle herds during January 2019 in Aranyaprathet district of Sa Kaeo province, Thailand. This district is located on the most eastern part of Thailand connecting to Cambodia. The total five subdistricts (Tambons) were included in this study: Tha kham, Klong nam sai, Thap prik, Phan suek, and Klong thap chan. The study area is shown in Fig. 1.

Study design and sampling method

Cross sectional study was employed to determine the prevalence of GI parasite using fecal examination. A total of 239 bovines according to 34 beef cattle herds (1-85 bovines/herd) with assorted gender, breed, age (1-8 years in range), rearing system, and herd size were sampled. The sample size for each herd, number of herds, and ages within each herd was chosen be proportional to the municipality's population of region 2[4] followed the surveillance and visit programs of provincial livestock officers, with an expected prevalence of 0.46, margin of error of 0.07, and a 95% confidence interval[8]. In addition, the sample numbers of each herd were also depended on the

Table 2. Prevalence of gastrointestinal parasites by species in beef cattle herds in Aranyaprathet district, Sa Kaeo province, Thailand during January 2019

Parasites	Percent of prevalence[a]
Nematodes	
strongylids	58.2 (139/239)
Toxocara sp.	4.2 (10/239)
Trichuris sp.	1.3 (3/239)
Trematodes	
Fasciola sp.	7.9 (19/239)
Cestodes	
Moniezia sp.	2.1 (5/239)

[a] The prevalence was based on the number of animals.

physical condition of cattle, the stubbornness of animals and the permission of herd owners. A structured phone interview with questionnaires was designed to achieve the herd information including feeding, management, and deworming program of each herd.

Sample collection and fecal examination

Fecal samples (at least 10 g each) were collected directly from the rectum of 239 beef cattle with 1-8 years in range of age during January 2019. All samples were stored at 4ºC and shipped within 24 hr to the laboratory for processing. Simple floatation and simple sedimentation techniques[11] were performed to determine parasite eggs in fecal samples. The microscopic examination was used to investigate the types of parasite based on morphology and size of eggs.

Statistical analyses

Descriptive statistics were computed for the most variables. Chi-square test was used to analyze the significant difference among the proportions, where a p-value < 0.05 was regarded as significant. The relationship between the prevalence of strongyle infection using fecal examination and independent variables of herd characters was analyzed. The results were presented as odds ratios (OR) along with 95% confidence intervals. The analytical software SPSS for windows, version 24.0 was used for the statistical analysis.

Results

Overall prevalence

The overall prevalence of GI parasites of the 239 beef cattle in Aranyaprathet district, Sa Kaeo province, Thailand was 59.0% across the five different subdistricts. The prevalence of each subdistrict was 60.0% (n=85) in Tha kham, 58.3% (n=12) in Klong nam sai, 68.5% (n=73) in Thap prik, 74.1% (n=27) in Phan suek, and 31.0% (n=42) in Klong thap chan (Table 1). The herd prevalence was 76.5% (n=34). All the herds in Tha kham, Klong nam sai, and Phan suek subdistricts were positive to GI parasites (Table 1). The prevalence of single-parasite infection was 40.2%, while the prevalence of multi-parasite infection was 18.8% (Table 1).

Prevalence by types of GI parasite

Nematodes had the highest frequency in this study followed by trematodes, and cestodes. Both roundworm and tapeworm eggs were detected using simple floatation technique, while liver fluke egg was found by simple sedimentation technique. Species-wise prevalence of strongylids, *Fasciola* sp., *Toxocara* sp., *Moniezia* sp. and *Trichuris* sp. were recorded as 58.2, 7.9, 4.2, 2.1, and 1.3%, respectively (Table 2).

Risk factor analysis

Risk factor analysis for beef cattle affected by GI parasites focusing on strongyle infection which was the most significant prevalence in this study (58.2%, P-value = 0) revealed that the feeding system by stall barn had higher prevalence (78.8%) than grazing pasture (54.9%) with OR = 3.06, 95% CI = 1.270-7.359, P-value = 0.013 (Table 3). The odds of being infected by strongylids were determined by the herd size. The herd containing equal or more than 50 animals had 61.7% of prevalence with OR = 1.38, while the herd with less than 50 animals had 53.8% of prevalence (Table 3). The frequency of deworming program using albendazole and ivermectin in these areas had the effect on the odds of strongyle infection.

Table 3. Univariate analysis of risk factors associated with strongyle infection in beef cattle herds in Aranyaprathet district, Sa Kaeo province, Thailand during January 2019

	Risk factors	Number of samples	Prevalence[a] (%)	Odds ratio	95% CI (OR)	*P*-value[b]
Subdistrict	Tha kham	85	60.0	1.13	0.657 - 1.928	0.668
	Klong nam sai	12	41.7	0.50	0.153 - 1.610	0.243
	Thap prik	73	68.5	1.88	1.053 - 3.361	0.033*
	Phan suek	27	74.1	2.23	0.906 - 5.506	0.075
	Klong thap chan	42	31.0	0.25	0.124 - 0.517	0.000*
Feeding system	Stall barn	33	78.8	3.06	1.270 - 7.359	0.013*
	Grazing pasture	206	54.9	0.33	0.136 - 0.788	0.013*
Herd size	< 50 animals	106	53.8	0.72	0.431 - 1.214	0.220
	≥ 50 animals	133	61.7	1.38	0.824 - 2.319	0.220
Deworming	Every month	87	26.4	0.11	0.061 - 0.204	0.000*
	Every 3 months	110	75.5	4.01	2.297 - 6.992	0.000*
	Every 6 months	42	78.6	3.15	1.431 - 6.925	0.004*
Rearing system	With other species	85	60.0	1.13	0.657 - 1.928	0.668
	Without other species	154	57.1	0.89	0.519 - 1.523	0.668

[a] The prevalence was based on the number of animals.
[b] Chi-square test.
* significance level of $P < 0.05$.

The lowest frequent program (every 6 months) showed the highest prevalence (78.6%) with OR = 3.15, 95% CI = 1.431 - 6.925, *P*-value = 0.004 compared to every-3-month and every-month programs showed the prevalence of 75.5% and 26.4%, respectively along with *P*-value = 0 (Table 3). Rearing with other animal species which was meat goat in this case also affected the prevalence of strongyle infection (60.0%), while rearing only beef cattle had 57.1% of prevalence along with the odds ratio of 1.13 (Table 3). In addition, the location was also considered as the risk factor of infection. It was found that Phan seuk and Thap prik subdistricts had the odds ratio of strongyle infection with 2.33 and 1.88, while Klong thap chan had the lowest odds ratio (0.25) with *P*-value = 0 (Table 3).

Discussion

Based on an uncommercial production system in majority rural parts of Thailand, GI parasitic infection is still considered as the potential impact of livestock industry in Aranyaprathet district of Sa Kaeo. The objective of this study was to identify provincial prevalence of GI parasites and the risk factors of infection associated with geographical distribution and management practices. The overall prevalence of GI parasite infection in beef cattle in Aranyaprathet district was 59.0%. Our finding correlated with the previous studies in cattle herds across different locations of Thailand including 61.0% in (northern-) Nan province[9], 65.9% in (north-eastern-) Udon Thani province[22], 86.4% in (western-) Kanchanaburi province[25], and 46.6% overall the country[8]. These data indicated that GI parasite infection is still a common problem in livestock production in Thailand. Due to the large geographic area of Aranyaprathet district and beyond Cambodian borderline, the official management and support are inadequate and not easy-to-access. Moreover, the herd prevalence in our study (76.5%) indicated the widespread distribution of intestinal parasite in beef cattle herds which supported the study from

Jittapalapong et al. with 67.8% of herd prevalence across the whole country[8].

The most common GI parasite infection in this study was strongylids (58.2%) which is in accordance with several studies in Thailand, and *Fasciola* spp. was also frequently reported[9,15,25]. Similar prevalence of about 30-80% were observed for strongyle type in beef and dairy cows across different parts of the world[3,14,18]. Result for *Fasciola* was as similar as those reported by Jittapalapong et al.[8]. However, *Toxocara* sp. infection is quite low in cattle production, it has been observed on irrigated farms with relentless moist or wet land[14]. According to Aranyaprathet of Sa Kaeo, there are plenty of ponds, small rivers, and dams nearby, together with rainfall and soil moisture. These are important factors influencing the development of the parasite from egg to miracidium and supporting a biotic potential for intermediate host (*Lymnaea* spp.) for Fasciola spp. in humid tropical areas[23]. It has been assumed that the prevalence of different species of the GI parasites can be explained by geographical distribution and related climatic conditions[14]. Furthermore, the single-type infection of GI parasite in this study showed the higher prevalence (40.2%) than multiple infection (18.8%) (Table 1). These results supported previous studies of cattle and goat herds in Thailand and other countries[6,14,22,25].

Factors affecting GI parasites focusing on strongyle infection including study area, feeding system, herd size, deworming program and rearing with other animal species were reported in the study. Because of the most significant prevalence, unique epidemiological and biological characteristics of strongylids, analyzing as separated category would represent more significant information of risk factors. The prevalence of infection across different subdistricts in Aranyaprathet district indicated that Phan suek had 2.33 times the risk of strongyle infection to other subdistricts, while Klong thap chan which has no connecting border to Cambodia (Fig. 1) showed the least odds ratio (Table 3). It implied that international transportation potentially leads to parasitic transmission. Comparing the feeding system in this study, there was a significant difference of infection prevalence (P-value = 0.013) between grazing pasture and stall barn. The latter system showed greater risk than the previous one (Table 3) which contrasts to the study of goat raised in Nakhon Pathom province, Thailand[15]. The excess prevalence of stall barn in our study may be the consequence of lacking in appropriate housing hygiene and management. Chaparro et al. reported that the larger herds showed lower levels of liver fluke infection than small-scale herds, conversely in strongylids[3]. Comparing to our study, the smaller herds (< 50 animals) presented lower risk of strongyle infection than larger herds (≥ 50 animals) resulting from capability on comprehensive management in backyard farms. The frequency of deworming program has a significant impact on the risk of strongyle infection. The least frequent program in this study (every 6 months) showed the highest odds of infection compared to other more frequent programs (OR = 3.15, P-value = 0.004). Our finding recommends that treatment once annually is not enough for livestock in this area, as also suggested by Zanzani et al.[26]. However, the standard criteria of deworming program was not complementary applied in this area. The application (using albendazole and ivermectin) was usually made by the provincial livestock officers coinciding with foot and mouth disease vaccination schedule or serological test for brucellosis. The odds of strongyle infection in mixed-species herds was higher than single-specie herds, even it was a trending (Table 3). In this study, meat goat was raised together with beef cattle. However, a few studies confirmed that multiple parasite species cannot infect two different animal species and recommended for pasture rotation which alternated between cattle, sheep, goats and/or horses helping to break the parasite's life cycles[10,12].

In conclusion, this study provides baseline data on the prevalence of GI parasites in

Aranyaprathet district of Sa Kaeo province which is considered as a center for livestock production of eastern Thailand and neighbor counties. Knowledge from our results can be used for development of appropriate control strategies and comparison with future studies. The results suggest that suitable husbandry in parasite prevention associated with routine effective treatment are recommended.

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Supplemental data

Supplemental data associated with this article can be found, in the online version, at http://dx.doi.org/10.14943/jjvr.68.2.69

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