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RESEARCH ARTICLE

PREVALENCE OF GASTRO-INTESTINAL PARASITES INFECTION IN PIGS REARED IN EXTENSIVE SYSTEM IN KORHOGO DEPARTMENT- NORTHERN CÔTE D'IVOIRE

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ABSTRACT

This study was conducted in northern Côte d'Ivoire to investigate pig gastrointestinal parasites infections. For this purpose, a total of 210 faecal samples were collected from 5 localities of Korhogo's department to inventory gastrointestinal parasites species and to determine their infections prevalences taking account risk factors as sex, age group and locality. Out of 210 faecal samples, 75 animals were found to be positive with various gastrointestinal parasites infections contributing an overall prevalence of 35.71%. The results revealed that eight parasites taxa were prevalent during the study period including *Hyostrongylus rubidus* (17.14%), *Globocephalus urosubulatus* (10%), *Eimeria sp* (8.10%), *Ascaris suum* (6.13%), *Strongyloides spp* (3.33%), *Oesophagostomum dentatum* (3.33%), *Stephanurus dentatus* (2.38%) and *Trichuris spp* (1.43%). Among sampling localities, the highest overall pigs gastrointestinal infection prevalence (44.44%) was observed in Tioro subprefecture while the lowest (27.66%) were noticed in Sohouo's one. Those results showed that Gastro-intestinal parasites are widely spread in the studied areas of Korhogo region during dry season.

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INTRODUCTION

Pigs gastrointestinal parasites infections are widely reported from all countries in the world. Those diseases are highly represented in tropical countries where poor environmental hygiene and extensive rearing system are the most widespread. It is also reported that those conditions represents risk factors of infection for livestock in general and particularly for pigs with gastrointestinal parasites (Nansen, 1999). In Côte d'Ivoire, as is the case of many SubSaharan countries, traditional livestock have a high socio-economic importance. Pig farming is a secondary activity generating incomes for many rural populations, especially for the often marginalized women (M'bari, 2004). This type of farming is carried out mainly in the north of the country which concentrates more than 4/5 of the national swine population (Deltour, 2000). A survey carried out in 2015 in the Korhogo department noted that this type of farming was practiced by 5,064 farmers for a global herd of 43,000 head (Anonymous, 2015) and contributes to reduce poverty (Anonymous, 2003).

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Despite this great importance, this production activity which remains confronted too many constraints like parasitic diseases occupy a large place. These diseases are one of the main limiting factors of this type of breeding. Numerous epidemiological studies have been carried out in Côte d'Ivoire on animal parasites, but none of them have been devoted to local pigs breed reared in extensive system. This preliminary study is conducted to fill this void. It aims to inventory gastrointestinal parasites and determine their prevalence's taking into account associated risks factor like ages, sex and locations in the northern Côte d'Ivoire.

MATERIAL AND METHODS

Study area and sampling: The study was conducted at the end of dry season (from March to April 2017) in Korhogo department. The study area is located in the savannas district, northern Côte d'Ivoire, precisely between North latitude 8°42'50'' and 9°50'50'' and longitude West 5°24'10'' and 6°18'20''. It is characterized by a subsudanese climate with 2 seasons.

A dry season from November to April, and a rainy season from May to October with rainfall varying from 1 100mm to 1600 mm per year (Anonymous, 2015). In this department, five localities (Korhogo, Niofoin, Karakoro, Sohouo and Tioro) were randomly selected. In each sub prefecture, sampled farms were selected based on farmers willingness. Faecal samples were collected in animals without distinction of age and sex. Their distribution according to risk factors is given in Table 1. For this study, faecal sample were collected from animal's rectum with an individual identified plastic bag and transported to the laboratory in a cool box where they were stored at 4 °C until processed.

Examination of faecal samples: 5 g of faeces were put in a mortar and crushed with a pestle. Then 60 ml of distilled water saturated with NaCl was added. The mixture was then carefully stirred with a wooden spatula and passed through a 250 µm sieve. The filtrate was collected in a second vessel and allowed to stand for 5 minutes. Then the two chambers of a McMaster slide were filled with a Pasteur pipettus. Microscopic examination was performed at x10 magnification. The parasites were identified according to the keys listed (Eldin, 1971).

Statistical analysis: Datas obtained after the coproscopical analyzes were performed using software R (version i386 3.2.4). The prevalence differences among age groups, sex, and localities were tested using a Chi-square test. Differences in prevalence were considered significant for p value <0.05.

RESULTS

In total, 210 pigs were sampled in the 5 localities (Table 1). Most of the samples were from adult animals (more than 12 months) and females. During this survey, eight parasite taxa belonging to seven nematodes families and coccidia family were identified.

The nematodes were

Hyostrongylus rubidus (Trichostrongylidae), *Globocephalus urosubulatus* (Ancylostomatidae), *Ascaris suum* (Ascarididae), *Strongyloides spp* (Strongyloididae), *Oesophagostomum dentatum* (Chabertiidae), *Stephanurus dentatus* (Syngamidae) and *Trichuris spp* (Trichuridae), while the coccidia was *Eimeria sp* (Eimeriidae).

Overall prevalence of parasites in pigs: Out of the total 210 pigs examined, 75 (35.71%) were positive for one or more species of gastrointestinal parasites. At the department level, *Hyostrongylus rubidus* (17.14%) where the most prevalent parasitic infection followed by *G. urosubulatus* (10%). In the other hand the lowest prevalence was recorded for *T. suis* (Table 2). Factors affecting gastrointestinal parasitic infestations prevalences are summarized in the table (Table 3). The prevalence of individual parasites did not vary significantly (p> 0.05) among the various age groups except Eimeria's one. For this parasite, male prevalence (13.89%) was statistically higher than female's one. According to age groups, prevalences were significantly different for coccidiosis (p <0.001) and Hyostrongylosis (p <0.05). In young adults' animals (6 to 12 months), *H. rubidus* prevalence was greater (28.57%) than in adult pigs (9.17%) and piglets (23.53%). As the same, coccidiosis prevalence was highest in grower pigs (21.43%) than in young pigs (0%) and adult pigs (4.17%) prevalences. Out of gastrointestinal parasites species identified during this survey, 4 species showed significant differences in prevalence by location (p<0.05). These are ascariasis, globocephalosis, coccidiosis and stephanurosis. In all these parasitic diseases, the prevalence of globocephalosis according to sampling localities was very highly significant (p <0.001). It was 22.92% in Niofoin and 22.22% in Tioro. On the other hand, this affection seems totally absent from other localities. However, it should be noted that cases of ascariasis were also observed in 2 localities namely Sohouo (10.64%) and Tioro (8.89%). The same observation was done for stephanurosis, which was diagnosed in 8.33% and 2.22% of pigs sampled respectively in Niofoin and Tioro localities. Tioro locality occupied for almost all the parasitosis diagnosed the second place of the highest prevalences.

DISCUSSION

This gastrointestinal survey realised during dry season in the north of Côte d'Ivoire identified eight species of gastrointestinal parasites in pigs from traditional farms. These are *Ascaris suum*, *Eimeria sp*, *Globocephalus urosubulatus*, *Hyostrongylus rubidus*, *Oesophagostomum dentatum*, *Stephanurus dentatus*, *Strongyloïdes sp* and *Trichuris suis*. These results are similar to those obtained in Guangxi Province of China (Thienpont *et al*., 1995) and close to those of Tamboura *et al*. (2006) in Burkina Faso, which identified six species. Except *Eimeria sp*, and *Stephanurus dentatus*, the others parasite species listed by the last author were identical to those of our study. However, studies conducted in Oromia regional state in Ethiopia (Kumsa and Kifle, 2014) found only 4 parasitic species (*coccidia, Ascaris suum, Strongyloïdes* and *Trichuris suis*). In contrast, in the municipality of Ejis in Ghana, 4 species of *Coccidia Spp, Strongyle Spp, Ascaris* and *Trichuris suis* were reported in pigs (Atawalna et al., 2016) against 15 species in the state in Ibadan, Southwest Nigeria (Sowewimo *et al*., 2012). The latter authors observed in addition to the majority of taxa identified in our study, *Ascarops strongylina, Physocephalus sexalatus, Metastrongylus salini, Cysticercus cellulosae, Cysticercus tenuicollis*, Hydatid cyst of *Echinococcus granulosus* and *Spirometra erinacei*. However, they accurately identified two species of *Oesophastomum* and did not detect the presence of coccidiosis.

This study revealed a moderate prevalence of gastro-intestinal infection in pigs from traditional farms in northern Côte d'Ivoire during the dry season. A total of 35.71% sampled pigs were positive for at least one species of gastrointestinal parasites infestation of. This finding was comparable to the results obtained in Nigeria (Atawalna, 2016; Sowemimo *et al*., 2012; Okorafor *et al*., 2014). These different authors noted respectives prevalence of 35.8%, 32.67% and 32.5%. The proximity of the results of these different studies could be due to similar environments and farm management methods. However, our results are higher than the overall prevalences of 31%, 27.3% and 25% reported, respectively in Nigeria and Ethiopia (Agumah *et al*.,2015; Akanni *et al*., 2017; Tomass *et al*., 2013). In contrast, the overall pig gastrointestinal infection prevalence in our study is lower than that reported by many authors in Africa and Asia. So, in Burkina Faso, in Tanzania in Ethiopia, in Zimbabwe and in Nepal, it has been noted gastrointestinal infection prevalence in those respective areas was 91%, 79.0%, 61.8%, 58.7% and 51.4%.

Table 1. Distribution of sampled pigs according to sex and age

	Korhogo	Niofoin	Karakoro	Sohouo	Department
Sex					
Female	35	32	18	53	138
Male	22	19	16	15	72
Total	57	51	34	68	210
Age group (month)					
< 6 months (young)	8	11	6	9	34
6–12 months (young adult)	15	14	8	19	56
> 12 months (adult)	34	26	20	40	120
Total	57	51	34	68	210

Table 2. Overall pigs' gastro-intestinal parasites prevalence in Korhogo region

Type of parasite	No examined	No of positive	Prevalence (%)
Ascaris suum	210	13	6.13
Eimeria sp	210	17	8.10
Globocephalus urosubulatus	210	21	10.00
Hyostrongylus rubidus	210	36	17.14
Oesophagostomum dentatum	210	7	3.33
Stephanurus dentatus	210	5	2.38
Strongyloides sp	210	7	3.33
Trichuris suis	210	3	1.43
Total	*210*	*75*	*35.71*

Table 3. Prevalence of gastro-intestinal parasites infection according to risk factors

Risk factors	No of sample	*A. suum*		*Eimeria spp*		*G. urosubulatus*		*H. rubidus*		*O. dentatum*		*S. dentatus*		*Strongyloides*		*T. suis*	
		positve	P value	positve	P value	positve	P value	positve	P value	positve	P value	positve	P value	positve	P value	positve	P value
Sex																	
Female	138	11(7.97%)	0.138	7(5.07%)	0026	15(10.87%)	0.56	20(14.49%)	0.24	4(2.90%)	0.33	1(0.72%)	0.47	3(2.17%)	0.19	0(0%)	0.16
Male	72	2(2.78%)		10(13.89%)		6(8.33%)		15(20.83%)		4(5.56%)		0(0%)		4(5.56%)		1(1.39%)	
Total	210	13(6.19%)		17(8.10%)		21(10%)		35(16.67%)		8(3.81%)		1 (0.48%)		7(3.33%)		1 (0.48%)	
Age group																	
young pigs	34	5(14.71%)		0(0%)		4(11.76%)		8(23.53%)		3(8.82%)		0(0%)		1(2.94%)		0(0%)	
young adult	56	3(5.36%)	0.918	12(21.43%)	***<0.0001***	3(5.36%)	0.401	16(28.57%)	***0.003***	1(1.79%)	0.21	0(0%)	0.68	4(7.14%)	0.16	0(0%)	0.68
adults	120	5(4.17%)		5(4.17%)		14(11.67%)		11(9.17%)		4(3.33%)		1(0.83%)		2(1.67%)		1(0.83%)	
Total	210	13(6.19%)		17(8.10%)		21(10%)		35(16.67%)		8(3.81%)		1(0.48%)		7(3.33%)		1(0.48%)	
Localities																	
Korhogo	29	0(0%)		3(10.34%)		0(0.00%)		5(17.24%)		1(3.45%)		0(0%)		0(0%)		0(0%)	
Niofoin	48	0(0%)		1(2.08%)		11(22.92%)		4(8.33%)		3(6.25%)		4(8.33%)		2(4.17%)		0(0%)	
Karakoro	41	0(0%)	***0.016***	7(17.07%)	***0.050***	0(0.00%)	***< 0.0001***	11(26.83%)	0.22	1(2.44%)	0.21	0(0%)	0.03	2(4.88%)	0.77	1(2.44%)	0.28
Sohouo	47	5(10.64%)		5(10.64%)		0(0.00%)		7(14.89%)		0(0%)		0(0%)		1(2.13%)		0(0%)	
Tioro	45	4(8.89%)		1(2.22%)		10(22.22%)		9(20.00%)		3(6.67%)		1(2.22%)		2(2.44%)		2(4.44%)	
Total	210	9(4.29%)		17(8.10%)		21(10%)		35(16.67%)		8(3.81%)		1(0.48%)		7(3.33%)		1(0.48%)	

(Tamboura *et al*., 2006; Nonga, 2015; Geresu *et al*., 2015; Marufu *et al*., 2008 ; Sah, 2018). These differences in prevalence may be due to differences in environmental conditions, farm management (Sah, 2018) and sampling period. Indeed, many studies have shown that gastrointestinal parasites infection prevalences are lower in the dry season. These conditions (low relative humidity and high temperatures) often delay the development of parasites outside their hosts (Kumsa and Kifle, 2014). These differences in prevalence could also be explained by the fact that this survey was conducted on stray animals during the dry season. In this season, pigs are left in complete wandering and receive only kitchen residues or agricultural by-products as food supplements. They naturally feed as much as possible on certain local plants that have antiparasitic properties such as *Cassia occidentalis* (Suleiman *et al*., 2014; Suman *et al*., 2014). This study revealed that *H. rubidus* was the most prevalent parasite in the study area during the dry season, followed by *G. urosubulatus*. This finding is contrary to previous studies in which these two parasites species ranked fourth and fifth in importance in Burkina Faso (Deltour, 2000). The prevalence of coccidiosis in males (13.89%) was statistically higher than in females (5.07%). These results are very similar to those obtained in Addis Abeba, Ethiopia (Geresu et *al*., 2015). In that area, these authors observed that pigs male coccidiosis prevalence was 15.1% compared to 6.9% in females. According to age group, the variability in gastrointestinal parasites prevalence in pigs was significant ($p < 0.05$) only for *Eimeria spp*. For this condition, young pigs coccidiosis prevalence (21.43%) was statistically higher than in adult pigs (4.17%) and piglets one. This result confirms the assertion that that young fattening pig can be affected by immunosuppression (stress, nutritional deficiencies, and dietary changes) (Robert, 1993). Their immune status during this period of food deficit would therefore favour coccidian infection (Radostits *et al*., 2006). In addition, feeding in an often unhygienic environment would substantially increase the risk of pigs contamination by certain parasitic species such as coccidia which resist in the outdoor environment at high temperatures. The comparison of different localities gastro-intestinal parasites infection prevalence showed significant difference for infestations due to *A. suum, Eimeria spp, G. urosubulatus and Stephanurus dentatum* ($p < 0.05$). However, it was noted that the locality of Tioro generally ranked 2nd among the highest prevalence. The importance of infestation level could be explained by the high farms concentration in this area

Conclusion

This study confirmed the presence of eight gastrointestinal parasites in the study area during dry season with an overall prevalence of 35.71%. *Hyostrongylus rubidus has the most important gastrointestinal infection prevalence* (17.14%) followed by *Globocephalosis* (10%) *and coccidiosis prevalence* (8.10%). In contrast, *Trichuris suis* has the lowest prevalence (1.43%). These results show that parasite prevalence in native pigs of Korhogo region is moderate during the dry season. In general, scavenging pigs consume deworming plants during the rainy season and at the beginning of the dry season. The ingestion of these plants at the beginning of the dry season associated with changing environmental conditions would be largely responsible of the low prevalence of gastrointestinal parasites. Further studies are needed to take stock of local plants with pest control properties and to evaluate their effectiveness on internal parasites found in local pigs.

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