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PREVALENCE OF HELMINTH PARASITES OF PIGS SLAUGHTERED IN SENTLHANE FARMS AND GABORONE NORTH ABATTOIRS, BOTSWANA

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ABSTRACT: A survey of the helminth parasites associated with pork slaughtered in Sentlhane farms and Gaborone north abattoirs was carried out between January and March, 2015. 10 pigs were utilized for the study. A total of 143 helminths were counted in the sample (growers: piglets, 1-12 months old) from Sentlhane farms, while 112 helminths were counted in the sample (adults: > 12 months old), from Gaborone north abattoirs. The helminthes from Sentlhane farms were; 41.3% *Hyostrongylus rubidus,* 36.4% *Oesophagostomum* spp., 13.3% *Trichinella spiralis* and 9.1% *Ascaris suum*. The helminthes from Gaborone north abattoir were; 45.5% *Oesophagostomum* spp, 33.9% *H. rubidus* and 20.5% *A. suum*.Thus *H. rubidus* and *Oesophagostomum* spp. were the most predominant helminths (>40%) while *A. suum* was the least (9.1-20.5 %) recorded.

Key words: Helminth, *Hyostrongylus rubidus*, *Oesophagostomum* spp.,*Trichinella spiralis,* pigs

INTRODUCTION

Parasitic helminths can be classified into two phyla; the Platyhelminthes (flatworms) and Nematodes (roundworms). Helminths are parasites that inhabit the circulatory, nervous, digestive, excretory, and reproductive systems of their hosts (BOGTISH*et al.,* 2013). They may also be found free living in fresh water or soil (BOGTISH*et al.,* 2013; ROBERTS and JANOVY, 2005). Helminths receive both nourishment and protection from their host while causing poor nutrient absorption, weakness and disease in the host. Some of the diseases caused by helminths in humans are: ascariasis caused by the nematode *Ascaris lumbricoides*, lymphatic filariasis (elephantiasis) caused by *Wuchereria bancrofti*, *Brugia malayi* and *Brugia timori* nematodes, schistosomiasis (Bilharzia) caused by *Schistosoma* spp. of the flatworms, trichuriasis caused by the nematode *Trichuris trichiura* (whip worm)and hookworm disease caused by nematodes *Ancylostoma duodenale* and *Necator americanus.* Some helminth diseases in pigs include; trichinosis caused by *Trichinella spiralis,* cysticercosis (Cysticercus cellulosae infestation) caused by an intermediate stage of the Platyhelminthes, *Taenia solium* (pork tapeworm), ascariasis caused by the nematode *Ascaris suum.*

Tropical helminthiasis is an infestation with parasitic worms which usually occur in countries found in the tropics. Tropical helminthiasis is of great concern because it is strongly linked with poverty as a result of the debilitating effects in some infected people. The disease flourishes in impoverished environment and thrives best in tropical areas (WHO, 2012). It is estimated that approximately one third of the almost three billion people living on less than two US dollars per day in developing regions of sub-Saharan Africa, Asia and the Americas are infected with one or more helminths (HOTEZ*et al*., 2006; HOTEZ *et al*., 2008). In sub-Saharan Africa, helminthiasis is frequently co-endemic with malaria and HIV/AIDS (HOTEZ*et al.*, 2008). The detrimental results of such co-infections include additive effects such as anemia and synergistic effects such as increased transmission of malaria-causing parasites, HIV and/or increased susceptibility to infection with these pathogens as well as an exacerbated progression of the two killer diseases (HOTEZ *et al.,* 2008). The most common helminthiasis in sub-Saharan Africa is those caused by infection with intestinal helminths which include ascariasis, trichuriasis and hook worm disease; followed by schistosomiasis and lymphatic filariasis (HOTEZ *et al.,* 2008). Other helminthiasis conditions prevalent in sub-Saharan Africa are onchocerciasis, loiasis and dracunculiasis, which have global presence of 37 million, 13 million and 0.01 million respectively (HOTEZ*et al.,* 2008).

Many studies have been conducted on the prevalence of helminth parasites in pigs slaughtered in slaughterhouses. A slaughterhouse is a facility where animals are killed for consumption as food. It is important to note that pigs do not contract helminth parasites from these slaughterhouses but from the production systems (ROEPSTORFF*et al.,* 2011). There is evidence to suggest that pigs in outdoor pig production systems are susceptible to intestinal parasite problems than those in indoor systems (ROEPSTORFF *et al.,* 2011). The primary factors associated with this condition are the increased prevalence of parasitic eggs in outdoor conditions (ROEPSTORFF *et al.,* 2011).

Research on the prevalence of helminth parasites isolated from pigs in Southern Africa has been carried out in Zimbabwe and South Africa, where several helminths were isolated from the pigs. Very little research has been conducted on this topic in Botswana. Considering the importance of helminth parasites and the paucity of information on these important endoparasites, there is a need to provide and add to our scientific knowledge the status of these helminth parasites in Botswana, the objective of the present study was to determine the prevalence ofhelminth parasites of pigs slaughtered in Sentlhane farms and Gaborone north abattoirs, Botswana.

MATERIALS AND METHODS

Sample collection: The samples utilized for the present study were collected Sentlhane farm and Gaborone North Abattoir and analyzed in a laboratory located in the Department of Biological Sciences, University of Botswana, from November 2014 to May 2015.

Selection of pigs for examination: Collection of samples was carried out from January to March, 2015. A total of 10 pigs were selected through random sampling technique. The pigs were then placed into two age groups, namely (i) growers ($\leq$ 12 months of age) and (ii) adults ($\geq$ 12 months of age). Examination was then conducted on newly slaughtered pigs using visual inspection, palpation and systemic incision of organs to look for adult parasites.

Collection of fecal samples: Freshly deposited faecal samples were collected from the floor of the Penns inhabited by individual pigs using clean, unused sterilized gloves. The collected samples were then placed in glass vials (2.5 cm dia. X 7.6 cm deep) containing 10% formalin and labeled and kept in a styrofoam cool box containing ice packs during transportation to the laboratory. Faecal samples were kept at 4°C and processed the following day.

Collection of tissue samples: Entire samples of stomach and intestines (small and large) were obtained from the newly slaughtered animals. The samples were wrapped in polystyrene bags and placed in a styrofoam cool box containing ice packs and transported to lab. of Department of Biological Sciences, University of Botswana .

Experimental procedure (Fecal analysis and Simple test tube flotation method): Three gram of each fecal sample was mixed with 50 ml of 0.4g/ml sodium chloride (flotation fluid) using mortar and pistil; the resulting fecal suspension was then be poured through a tea strainer into a beaker; the suspension was poured from the beaker into a test tube leaving a convex meniscus at the top; a cover slip was carefully placed on top of the test tube and the test tube was let to stand for 20 minutes, then the cover slip was carefully lifted from the tube together with a drop of fluid adhering to it and immediately placed on a glass slide for microscopic examination (BAYOU, 2005).

Sedimentation: In the detection of helminth eggs which do not float well in the sodium chloride solution such as *Fasciola* spp., simple sedimentation technique was carried out. 3 g of feces was put in a conical flask and mixed with 30 ml of water; the mixture was then sieved through a tea strainer into a beaker, transferred into a centrifuge tube and centrifuged at 1500 rotation per minute for 3 minutes; the supernatant was then be discarded, and the sediment was mixed with 1% of methylene blue and examined under the microscope using 40× objective lens (BAYOU, 2005).

Post mortem examination: Post-mortem examination was carried out as per the procedure described by ROEPSTORFF and NANSEN (1998) with slight modifications. The stomach was cut open along the major curvature using a pair of scissors and the contents transferred to a bucket, sieved using a mesh (250µm) and microscopically examined for stomach worms. The stomach wall was inspected for worms attached to the gastric mucosa after being incubated in 0.9% saline for 1 day. The small intestines were sliced longitudinally using a pair of scissors, the contents were sieved using a mesh (250µm) and examined microscopically. The large intestines were sliced longitudinally, the contents were emptied into a bucket andthe intestinal walls were washed with water. The samples were examined microscopically for the presence of worms and the intestinal wall inspected for worms attached on the mucosa in a similar manner to that carried out for the stomach wall. The number of worms were estimated using the total count method.

RESULTS AND DISCUSSION

A total of 143 helminths were counted in the sample (growers: piglets, 1-12 months old) from Sentlhane farms, while 112 helminths were counted in the sample (adults: > 12 months old), from Gaborone north abattoirs (Table-1). Helminth species found to be infecting the pig sample from Sentlhane farms were*Ascaris suum, Hyostrongylus rubidus*, *Oesophagostomum* spp. and *Trichinella spiralis.* The composition of the helminth parasites from Sentlhane farms can be given as; *H. rubidus* (41.3%), *Oesophagostomum* spp. (36.4%), *T. spiralis* (13.3%) and *A. suum* (9.1%). The pigs sampled from Gaborone north abattoirs were infected with three helminths species namely, *A. suum, H. rubidus* and *Oesophagostomum* spp. (Table 3). The summary of helminths from the Gaborone north abattoirs can be given as; *Oesophagostomum* spp. (45.5%) > *Hyostrongylus rubidus* (33.9%) > *Ascaris suum* (20.5%). The findings are comparable to those made by AERNAN*et al.* (2011), who found their pig sample to be highly infected with *Oesophagostomum* spp. (43.7%) while sample showed a low infection *Ascaris suum* (10.5%). These results are essential to the newly growing pig production industry in Botswana. The helminths found are of great concern as they have many negative effects on the pigs, for instance infections with *A. suum* result in the pig displaying symptoms such as vomiting, diarrhea and death if the small intestines rapture (LEE, 2012). The latter symptoms result in loss of production in the pig production industry (LEE, 2012).

Table-1: Prevalence of helminth species found in sampled pigs in relation to age

Sample location	Age (months)	No. Examined	Total worm count
Sentlhane farms	≤12	5	143
Gaborone North abattoir	> 12	5	112

Table-2: Prevalence of helminth species with percentages of pigs at Sentlhane farms

Parasites	Predilection site	Total worm count	Percentage (%)
*Ascaris suum*small	intestine	13	9.1
Hyostrongylus rubidus	stomach	59	41.3
Oesophagostomum spp.	large intestine	52	36.4
Trichinella spiralis	small intestine	19	13.3
Total143*	**100**		

*Total worm count

Table-3: Prevalence of helminth species with percentages of pigs at Gaborone North Abattoirs

Parasites	Predilection site	Total worm count	Percentage %
*Ascaris suum*small	intestine	23	20.5
Hyostrongylus rubidus	stomach	38	33.9
Oesophagostomum spp.	large intestine	51	45.5
Total		**112***	**100**

*Total worm count

There was no significant difference (t–test: p> 0.05), in the prevalence of *Oesophagostomum* infection amongst pigs in Sentlhane farms (36.4%) and Gaborone north abattoirs (45.5%). *Oesophagostomum* worms cause enteritis and nodular formation in the gut wall. These symptoms are especially unflattering to the meat industry as these intestines are usually used as casings for products such as sausages. There was a significant difference (t-test: p <0.05), in the prevalence *A. suum* infection amongst pigs in Sentlhane farms (9.1%) and Gaborone north abattoirs (20.5%). The larva of this helminth species are the cause of milk spots in livers of pigs (LEE, 2012). The latter symptom results in the condemnation of liver (which is consumed by a large population in Botswana) thus resulting in a loss in the pig production industry

ROEPSTORFF *et al.* (2011) reported that the major helminth species in temperate pig production are *A. suum*, *T. suis*, and *Oesophagostomum* spp. A study of internal and external parasites of pigs conducted in Botswana by NSOSO *et al.* (2000), showed a high incidence of *A. suum*, as well as *T. suis* and *Trichostrongylus* spp. NSOSO *et al.* (2000), reported, 54.55% of pigs being infected with *A. suum,* 20.48 with *Trichostrongylus* spp. and 6.8% with *T. suis.*

Fig-1: Prevalence of helminth species in sample from Sentlhane farms

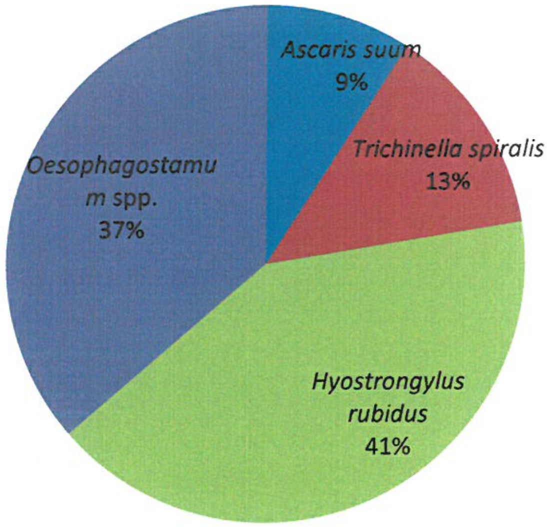
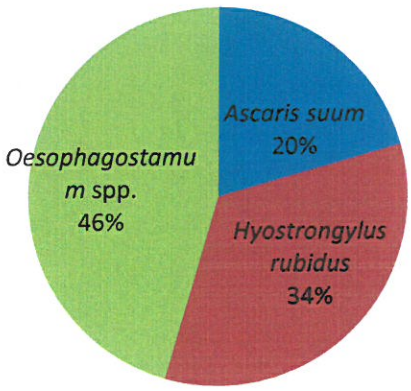


Fig-2: Prevalence of helminth species in sample collected from Gaborone North abattoir



AERNAN *et al.* (2011) conducted a study on the prevalence of helminths in pork slaughtered in Makurdi, Nigeria and reported pigs being infected by; 43.7% *Oesophagostomum* spp., 45.8% *Cysticercus cellulosae,* and 1.8% *Metrastrongylus* spp. Pigs usually acquire helminth parasites when scavenging (especially in outdoor systems) for food (ROEPSTORFF and NANSEN, 1998). Eggs of these helminth parasites are in the soil and are picked up by the pigs as they feed. In the case of human helminthiasis, a large number of these parasites are contracted by eating contaminated pork and various pork products (AERNAN *et al.,* 2011). The diseases contracted in the latter manner can be described as food borne zoonoses i.e. diseases acquired through the consumption of food of animal origin (ADEBISI, 2007).

Fig-1: Egg of *H. rubidus* in stomach contents Fig-2: *H. rubidus* in stomach contents

CONCLUSION: The pigs from Sentlhane farms (Growers) were predominantly infected with *H. rubidus* while those from Gaborone north abattoirs (adults) were predominantly infected with *Oesophagostomum* spp. Both age groups showed little infection with *A. suum*.

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