Journal of Agriculture and Technology Management (JATM)
20(1): 27-31 (January-June 2017)

Original Article

Detection of Gastrointestinal Parasites in Commercial Swine Farms in Cebu, Philippines

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ABSTRACT

Gastrointestinal parasites are known to cause losses and poor performance in the swine industry due to decreased litter size and reduced productivity. Infections of gastrointestinal parasites in pigs are well documented in different parts of the world. However, studies in the Philippines are limited, and there is none in Cebu. This study surveyed seven commercial farms in Cebu, Philippines for the detection of common gastrointestinal parasites in pigs. All production phases of the seven farms tested positive for parasites. The different parasites detected were *Balantidium coli*, *Strongyloides* spp., *Ascaris* spp., *Isospora* spp., *Hyostrongylus* spp., *Metastrongylus* spp., *Oesophagostomum* spp., *Taenia spp.*, *Trichostrongylus* spp., and *Trichuris* spp. Out of the 813 stool pools collected, 78.2% were found to be positive for parasites where 66.3% were infected with 2 or more parasites. The positivity rate in farms with pens of cemented floor types was higher (58.9%) than those with slatted floors (41.1%). Concurrent multiple infections were observed to be more common than single infections and were high in farms with concrete floors and with no deworming programs. This study is the first survey on gastrointestinal parasites among commercial swine farms in Cebu, Philippines.

KEYWORDS: *Cebu, Commercial Swine Farms, Gastrointestinal parasites, Philippines*

1 INTRODUCTION

Swine production is among the biggest industry in the Philippine agriculture (Lapus, 2009; Bureau of Agricultural Research, 2014). It has become one of the fastest growing business ventures because of its favorable rate of return on investments, short interval generation and rapid fecundity (Ikani and Dafwang, 1995). However, the substantial decline in the swine population is caused by gastrointestinal tract (GIT) parasites which affect pigs at various ages (Aliaga-Leyton *et al.*, 2011; Tamboura *et al.*, 2006).

Gastrointestinal parasites are known to cause losses and poor performance in the swine industry (Nsoso *et al.*, 2000, Stewart and Hale, 1988, Gibbens, *et al.*, 1989, Hale and Stewart, 1987). These conditions can greatly lower their efficiency and profitability (Joachium *et al.*, 2001). GIT parasites in pigs are reported in different parts of the world (Nsoso *et al.*, 2000, Stewart and Hale, 1988, Gibbens *et al.*, 1989, Nansen and Roepstorff, 1999).

In the Philippines, few studies have documented the presence of GIT parasites in the swine industry. Manuel and Capuli (1982) reported infection of GIT helminths in all 48 commercial swine farms they studied in the northern parts of the country, where they noted infection with one or more types of endoparasites. Multiple infections (2-5 parasite species) in pigs in Quezon, Philippines were also reported by Padilla and Ducusin (2015). Among the commonly identified parasites were *Balantidium coli, Ascarissuum, Trichurissuis, Stephanurus dentatus, Strongyloides* sp., and *Metastrongylus* sp. The first four parasites mentioned have zoonotic potential (Manuel and Capuli, 1982; Supan and Sanchez, 1994; Padilla and Ducusin, 2015). Generally, hog farms in the tropical and subtropical regions may have poor nutrition and sanitation practices, which increase the risk of the presence of parasites (Kumsa and Kifle, 2014). The Philippines' tropical climate with abundant in rainfall and good humidity is ideal for the multiplication, growth, and perpetuation of parasites (Manuel, 1983). Poor deworming programs in farms can contribute to the prevalence of GIT parasites in the country.

Although studies have been conducted on GIT parasites in pigs in some parts of the Philippines, to the best of the author's knowledge, no published studies have been reported in Cebu, the second most populated metropolitan area and regarded as a center of trade in the Visayas region. Thus, this study aimed to detect GIT parasites in selected commercial swine farms in the

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p-ISSN: 2599-4875 e-ISSN: 2599-4980

province. Results of this study would help increase the awareness of local swine producers and veterinary practitioners in the area and will add knowledge to the swine parasitic epidemiology in the country.

2 MATERIALS AND METHODS

Selection and profiling of farm and animals

A total of seven commercial farms in Cebu, Philippines were purposively selected. A transmittal letter to conduct the study was sent to the selected farms. Upon approval, the farm was sampled from each of its production available production phases. Its profile, including location, sow level, production phase, source of pigs, farming type and housing elements, deworming program and management system, were obtained.

Stool collection, handling, and preservation

Approximately 10 g of freshly excreted or on-ground fecal samples from stool pools were randomly collected from individual pens (regardless of the number of animals) using a scoop and were transferredinto clean, properly labeled stool cups. Labeled containers contained information on sample number, production phase, date of collection, and number of heads (per pen). Immediately after collection, 10% formaldehyde was added to the samples and was refrigerated at 4°C until further processing.

Fecal analysis

The preserved fecal samples were processed using distilled water and sugar solution for sedimentation (Gibbons *et al*., 2005) and floatation methods (Dryden *et al.*, 2005), respectively. The parasite eggs were examined under the light microscope. Identification of the eggs was based on structural and morphometric criteria (Beugnet*et al.*, 2008).

Data Collection and Analysis

Obtained profile and fecalysis results were manually encoded in Microsoft Excel. Descriptive statistics were employed. The positivity rate (PR) was computed using the following formula:

$$\text{PR of Parasite} = \frac{\text{number of stool pools found positive with the parasite}}{\text{Total number of stool pools analyzed}} \text{X } 100$$

3 RESULT AND DISCUSSION

A total of 813 samples were collected from seven participating commercial swine farms in Cebu. Farm A had the highest sow level. The majority preferred concrete flooring than slatted floors.

Farms A, B, and C do regular deworming while farms D and E dewormed only their dry sows and boars, and pre-starters, respectively. The farm G was not practicing deworming (Table 1).

Table 1. Profile of selected commercial swine farms tested for gastrointestinal parasites in Cebu (n=7)

Farm	Location	Sow Level	Flooring	Deworming
A	Bantayan Island	1000	Slatted	Yes
B	Sta. Fe, Cebu	300	Concrete	Yes
C	Bantayan Island	250	Concrete	Yes
D	Carmen, Cebu	250	Concrete	Yes (Dry sow and boar only)
E	Talisay City	50	Slatted	Yes (Pre-starter only)
F	Danao City	100	Slatted	Yes
G	Asturias, Cebu	140	Concrete	No

All production phases of all the farms tested positive for GIT parasites. Of the 813 fecal samples tested, 78.2% were positive for gastrointestinal parasites, of which 66.3% were positive for 2 or more parasites. The most common GIT parasites detected with high positivity rates were *Balantidium coli*, *Entamoeba* spp., *Strongyloides* spp., *Ascaris* spp., and *Isospora* spp. (Table 2). *Globocephalus* spp., *Hyostrongylus* spp., *Isospora* spp., *Metastrongylus* spp., *Oesophagostomum* spp. *Taenia* spp., *Trichostrongylus* spp., and *Trichuris* spp. were also detected but with low positivity rates. Three of these parasite species, namely, *B. coli*, *Ascaris* spp. and *Taenia* spp. are known to be potentially zoonotic (Padilla and Ducusin, 2015).

B. coli trophozoites and cysts were found in 52.25% of the stool samples analyzed, which has the highest positivity rate among the detected parasites (Table 2). *Balantidium* spp., are commensal parasites in the large intestine of most pigs. In high numbers, it may lead to diarrhea, which is the most relevant sign of infection since it is asymptomatic (Schuster and Ramirez-Avila, 2008). Transmission is by the feco-oral route, where the cysts are resistant to environmental condition and can survive for several weeks (Taylor *et*

p-ISSN: 2599-4875 e-ISSN: 2599-4980

al., 2007). *Entamoeba spp.*was found in 29.03% of the fecal samples analyzed. Similar to *B. coli,* the cysts are relatively resistant and are transmitted through the fecal matter. Once ingested, the amoeba emerges in the lumen of the large intestine (Taylor *et al*., 2007). Other studies have also reported high positivity rates for *Balantidium* spp. and *Entamoeba* spp. (Weng *et al*., 2005; Barbosa *et al*., 2015; Yui*et al.,* 2014). These two gastrointestinal parasites are common in pigs and are distributed worldwide. Given the normal behavior of pigs to forage even in confinement (Gonyou *et al*., 1992), the fecal-oral route is the most likely mode of transmission of these parasites in the farm.

Table 2. Positivity rate (%) of detected gastrointestinal parasites per farm (N=813)

Parasite	Farm							Total (N=813)
	A (n=102)	B (n=32)	C (n=80)	D (n=102)	E (n=157)	F (n=173)	G (n=167)	
Ascaris spp.	33.3	28.1	30.0	3.9	9.6	12.1	35.3	20.4
Balantidium coli	58.8	62.5	61.3	50.0	53.5	29.5	65.3	52.2
Entamoeba spp.	41.2	29.4	39.4	32.4	32.0	32.9	46.2	29.0
Globocephalus spp.	8.8	9.4	10.0	19.6	7.6	5.2	24.0	12.4
Hyostrongylus spp.	2.9	12.5	6.3	17.6	7.6	11.0	2.4	8.0
Isospora spp.	24.5	34.4	22.5	8.8	10.8	13.9	12.0	15.3
Metastrongylus spp.	1.0	3.1	0.0	8.8	5.1	2.9	1.2	3.2
*Oesophagostomum*spp.	7.8	28.1	15.0	32.4	12.7	6.9	6.0	12.8
Strongyloides spp.	36.3	25.0	21.3	28.4	26.1	11.0	19.8	22.6
Taenia spp.	10.8	12.5	6.3	3.9	5.1	6.9	0.0	5.4
Trichostrongylus spp.	4.9	6.3	6.3	18.6	3.8	6.4	2.4	6.4
Trichuris spp.	1.0	3.1	0.0	0.0	0.6	3.5	0.6	1.2

Eggs of *Strongyloides* spp. were identified in 22.6% (third highest) of the stool pools. This parasite is an important cause of death in younger pigs (10-14 days old). Manuel and Capuli (1982) reported its presence in 17 out of 48 Philippine commercial farms sampled. *Strongyloides* spp is common in humid environments and are usually present in areas with abundant feces and wet or moist bedding (Taylor *et al.*, 2007). Its detection may indicate that the sampled farms do not keep their pig pens dry.

Isospora spp., the causative agent of neonatal coccidiosis, is an important protozoan parasite in pigs. However, it is only lethal in newborn pigs and does not affect older pigs (Lee, 2012). Infection with *B. coli* and *Isospora* spp. may imply that the sanitation and maintenance in these farms were inadequate. Epidemiologically important swine helminth parasites include *A. suum, Oesophagostomum* spp., and *T. suis* (Nansen and Roepstorff, 1999). On the other hand, *Ascaris* spp. (20.4%) is one of the most important gastrointestinal parasites in pigs due to its environmentally resistant eggs, high fecundity of the female worm and various ways of transmission. Infection leads to general malaise characterized by poor appetite. In extreme cases, vomiting, icterus, and death may occur due to rupture of the small intestine (Lee, 2012). The positivity rate of *Ascaris* spp. shows that they are present among the pig population across farms. However, pigs from the sample farms were seen to be apparently healthy. This implies that the positivity rate does not necessarily correspond to a high worm burden in each pig. *Trichuris* spp. positivity rate (1.2%) is low which may be explained by their slow buildup of infective egg population (Tomass *et al*., 2013).

Table 3 shows the comparison between positivity rate of farms according to housing/floor types and deworming practices. Pens with concrete/cemented floor types had higher positivity rate (59.0%) than those with slatted floors (41.1%). Concurrent infections with 2 or more parasite species were common but were higher in concrete-floored farms (86.4%). Results of the study are not conclusive if the type of flooring has an impact on the parasitic load, but slatted floors are considered better than solid concrete since it can separate fecal matter from the bedding of the pig and promote better animal hygiene (Hultgren and Bergsten, 2001).

Multiple infections were observed in the study. Padilla and Ducusin (2015) reported that multiple infections with two to five parasites are common in Philippine commercial swine farms. Stool pools from phases without a deworming program had relatively lower single parasite infection (44.8%) compared to those with deworming program (55.2%). Conversely, higher cases of multiple infections (86.9%) were observed in those without deworming programs. Further investigations are needed to clarify these observations. The high positivity rate in farms with deworming programs may be due in part to anthelminthic resistance (Edmund *et al*., 2005).

p-ISSN: 2599-4875 e-ISSN: 2599-4980

Table 3. Comparison of single and multiple infection rates (%) among samples that were found positive according to floor type and deworming programs (n=650)

Category	Single Infection	Multiple Infection	TOTAL
Concrete	13.6	86.4	59.0
Slatted	17.2	82.8	41.1
With deworming	16.7	83.3	55.2
Without deworming	13.1	86.9	44.8

4 SUMMARY AND CONCLUSION

All production phases of the seven commercial farms tested positive for GIT parasites. The different parasites detected include *B. coli*, *Entamoeba* spp., *Strongyloides* spp., *Ascaris* spp., and *Isospora* spp., *Globocephalus* spp., *Hyostrongylus* spp., *Isospora* spp., *Metastrongylus* spp., *Oesophagostomum* spp., *Taenia* spp., *Trichostrongylus* spp., and *Trichuris* spp. Out of the 813 stool pools, 78.2% were found to be positive for parasites where 66.3% positive for 2 or more parasites. The positivity rate in farms with pens of concrete floor types was higher (59.0%) than those with slatted floors (41.1%). Concurrent multiple infections were more commonly observed than single infections and were higher in farms with concrete floors.

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p-ISSN: 2599-4875 e-ISSN: 2599-4980

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p-ISSN: 2599-4875 e-ISSN: 2599-4980