Production system dynamism and parasitic interaction of swine in and around Holetta, Ethiopia

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Abstract

A study was conducted in and around Holleta from October 2007 to April 2008 to assess the system of production and the prevalence of gastrointestinal and ecto-parasites of swine. A total of 1470 swine on 50 farms, 667 swine under extensive management and 823 swine in semi-intensive management were considered on the study. Swine were kept along with other livestock in 24% of the farms. A total of 388 swine with different age and sex groups were subjected to parasitological examination to study the prevalence of parasites. The result of faecal sample and skin scraping test revealed three species of gastrointestinal and one ecto-parasite. The findings were *Ascaris suum* (13.9%), *Eimeria species* (5.6%), *Oesophagostomum species* (6.7%) and *Sarcoptes scabiei* (16.2%). Mixed infection was observed on 13 swine, among them 2% were positive for *Ascaris suum* and *Eimeria species*, where as 1.14% were positive for *Ascaris suum* and *Oesophagostomum species*. There was variation in the distribution of these parasitic infections in different areas but not statistically significant. There was no statistically significant difference ($p>0.05$) in the infection rate of gastrointestinal and ecto-parasites between male and female swine as well as among the age groups. The occurrence of *Eimeria species* and *Oesophagostomum species* was significantly different ($p<0.05$) with the standard of farm management. *Ascaris suum* infection was significantly different ($p<0.05$) on the type of production system, and management standard higher in swine kept on pasture and on swine with poor body condition compared to zero grazing, and on swine with good body condition. The occurrence of *Sarcoptic scabiei* infection was highly attached with the standard of farm management. Both gastrointestinal and ecto-parasite infection was common in all farms. Therefore, swine diseases in general, parasitism in particular, should be given attention in this area to minimize health constraints of swine, thus to increase the productivity of the sector. The government should also work on cultural and behavioral change of the people to improve the supply of animal protein and food security of the country.

Keywords: Ectoparasite, GIT-Parasite, Swine Production, West Shoa

Introduction

Swine production forms an integral part of farmer's economy in many parts of the world. Many countries practice different kinds of production approaches. Swine production is increasing from time to time in many parts of tropical countries. An increased demand on international market, due to increased number of pork consumer and the profit obtained from the sector make the production to increase rapidly (Serres, 2001).

In tropical countries due to minimum management attention given to swine, they are prone to number of diseases and also various internal and external parasites (Hale *et. al.,* 1986). Helminthes are major health problem to those swine grazing on pasture. Helminthes importance on swine is chiefly economical with its sub-clinical infection delay's the achievement of market weight by being responsible for poor feed conversion rates (Borthakur *et al.,* 2007). The common helminth parasites of swine are *Ascaris, Trichuris, Oesophagostomum, Trichenella* and *Strongyles* species (Nganga *et al.,* 2007). Among protozoan diseases, *Eimeria* and *Isospora* species are very common (Nosal and Eckert, 2005). The most known external parasite of swine is *Sarcoptic* mange, although in some condition swine may be infested by *Demodex* mange and lice (Davis and Moon, 1990).

Swine production in Ethiopia is in its infant stage. The population is estimated at about 19,000 (CSA, 2004). For the last number of years adequate emphasis was not given for the sector. Unlike other livestock distribution, swine farms are restricted to central part of the country near, Addis Ababa. For instance, tradition of keeping swine is improving and their population is increasing from time to time in and around Holetta, west of Addis Ababa. Currently large numbers of swine are widespread in these areas and some are kept mixed with other livestock's. The major feeds available for the swine in the area were wheat bran; oil seed cake and human food remain (rest food). Some swine also feed on pasture, crop residue and garbage.

There is limited information on the production system and no studies were reported previously concerning the health constraints of swine in the country. Prior investigation of production system dynamism and identification of major health constraints is important for subsequent prevention and control of the health problems so as to improve the productivity of the sector. Therefore, this study was conducted to investigate the production systems dynamism and

identify the major internal and external parasite of swine in Holetta, which is the main swine production area of the country.

Material and Methods

The study was conducted in west Shoa in and around Holetta. Holetta is located in central highlands of Ethiopia (38° 3' E and 9° 3' N) at a distance of 40 km west of Addis Ababa, with an altitude of 2040 meters above sea level. The climate is predominantly temperate and conducive to animal production. The annual average temperature is 24°C and experiences bimodal rainfalls which are short rainy season (March and April) and long rainy season (June, July, August, and September). The area receives annual rainfall of 1060mm (BPED, 2000).

The production system in the area is mainly mixed crop-livestock farming. The population of cattle and sheep in the wereda is estimated at 20,000 and 83,047 heads, respectively (CACC, 2003). There is no exact data on swine population in and around Holetta but there are considerable numbers of swine farms in the area. This area is selected therefore, compared to other regions due to relatively high concentrations of swine population along with other livestock.

The study was carried out from October 2007 - April 2008. A total of 1470 swine (1265 adult and 205 piglets) from 50 households were included to study the production system. From the adults 872 were female and 393 swine were male. To investigate the major internal and external parasitic diseases, 388 swine were randomly selected to identify the parasite. The sample size was determined by assuming that the prevalence for GIT and ecto-parasites in the area is 50% and the desired absolute precision 5% and the estimated minimum sample size was 384 based on the Thrusfield's, (1995) formula:

30 swine farms were selected from Tateke where large numbers of swine farms are found which covered 60% of the sample size. The remaining 40% was from farms around Holetta, Menagesha and Burayu areas.

Questionnaire survey and observation was applied to study the production system on farms and cross sectional study was conducted to identify the major GIT and ecto-parasite through parasitological examination. A total of 50 swine farms with an average herd size of 29 swine were sampled by random sampling technique. Basic information's regarding the health status of the swine and their major health constraints were obtained from the questionnaire and personal observation. The market aspect and the overall socio economic impact

of swine production were also obtained from the questionnaire and personal observation.

Investigation and identification of major gastrointestinal and external parasites of swine were undertaken by laboratory examination of faecal sample from those emaciated and with digestive system disorder symptom and skin scraping from those with skin lesions, and also from swine that did not show any sign of disease assuming that any swine in each farm could have the chance of getting parasitic infection. Accordingly, 388 swine 140 from swine that showed the above mentioned symptoms and 248 from randomly selected swine that did not show sign of infection were used.

Faecal samples were collected directly from the rectum of the swine with strict sanitation, and placed in air and water tight sample vial. Then delivered to laboratory in icebox and stored at 4^{o}Cuntil processed for direct smear and flotation methods and examined under compound microscope for the presence of parasitic egg or cyst. Skin scrapings taken from each swine were placed on Petri dishes and Paraffin oil was applied on the scraping and examined through stereomicroscope for the presence of ecto-parasite and identification (Mira and Ralph 1989).

The production system was defined for this study as extensive for those grazing on pasture and kept mixed with other livestock; and semi-intensive for those kept and fed indoor separately. The standard of management was considered good (for those kept in clean concrete floor with drainage system), medium separate house without drainage) and poor (housed together with other livestock in open barn with no shed).

Statistical analysis

The Chi-square test was applied to test if there is any statistically significant association between risk factors such as age, sex, body condition, production system, and standard of farm management.

Result

Result obtained from the questionnaire survey showed that, from the total of 50 swine farms considered in the study 28 farms were under extensive swine production system and the rest 22 farms were Semi-intensive type. There were few farms which are mixed with other livestock (cattle, sheep and goat), that

makes 24% of the farms under study. The remaining farms were designed for swine production only, which covers 76% of the farms.

The result obtained from the questionnaire indicated also wheat bran, oil seed cake, and rest human food are the main sources of feed. Many of the swine owners release their swine to graze on the field along with other livestock. Those swine which were kept on pasture are watered at a nearby stream and/or unprotected springs, and those kept indoor watering is through small water trough.

The purpose of swine production in the area is for revenue generation. The swine owners sell young and non-productive swine to consumers. Almost all of the respondents replied that they never eat pork because their religions and culture strictly forbid them to eat pork. Due to the presence of various diseases of swine in the area, swine owners could not fully exploit the potential of their swine production. The extent of veterinary service in this area is very poor which in turn affects the overall productivity of the sector.

The major constraints in the production as indicated by the owners were prevailing disease, lack of financial capacity to provide swine with quality feed and lack of fair market to sell their swine.

Observational study was carried out on each of the farms for the presence of swine infections with their respective symptoms; on 17 swine farms a total of 165 swine that showed different symptom of disease were identified. Among them on 83 swine (50.3%) digestive disorder sign such as diarrhea, mucoid dysentery, constipation, reduced feed intake, and dehydration were observed. Sign of skin disease such as itching, loss of hair, rubbing of body with other objects was recorded on 96 swine (58.2%) and 11 swine (6.7%) showed respiratory diseases signs. There were 23 swine (13.9%) that experienced both digestive and skin symptoms. The presence of disease sign was significantly different between system of production, standard of farm management and health care ($p<0.05$ for each of the factors) (Table 1).

Table 1.The effect of risk factors on the percentage of disease occurrences

Risk factors	number of farms	Total number of swine	number of swine with health problem (%age)
Farm Size			
y<10	17	155	5 (3.22)
10<y<20	10	180	41 (22.8)
20 <y<30	9	248	37 (14.9)
y>30	14	887	62(6.9)
Total	50	1470	165
Presence of other livestock			
Mixed type	12	474	66 (13.92)
not mixed	38	996	99 (9.9)
Total	50	1470	165
Production system			
Extensive	22	667	121(2.39)
semi intensive	28	823	44 (5.34)
Total	50	1470	165
Standard of farm management			
poor	26	786	131 (16.7)
medium	9	415	34 (8.23)
good	5	269	0 (0)__
Total	50	1470	165

Y indicates the number of swine

Out of faecal samples examined, 54 swine (13.9%) were positive for *Ascaris suum*, 26 swine (6.7%) were positive for *Eimeria* speceis and 22 swine (5.6%) were positive for *Oesophagostomum* species. Examination of skin scraping for ecto-parasites on the same swine revealed the presence of mange mite *Sarcoptes scabiei* as the only ecto-parasite under the study. *Sarcoptes scabiei* was observed on 63 swine (16.2%).

Mixed infection was observed on 13 swine out of which 2% of the samples were positive for both *Ascaris suum* and *Emeria* species and 1.14% were positive for *Ascaris suum* and *Oesophagostomum* species. According to the study from GIT parasites, *Ascaris suum* was highly prevalent on swine in the area as compare to *Eimeria* species and *Oespophagostomum* species.

There was no statistically significant difference ($p>0.05$) in the infection rate of GIT parasites between male and female. The occurrence of *Ascaris suum* was significantly higher in swine kept out door than those kept indoor ($p<0.05$). There was no significant difference in infection rate with GIT parasites among

different age groups of swine (p>0.05). The prevalence of *Sarcoptes scabiei* was significantly higher (p<0.05) in swine kept on pasture and garbage on the field than those kept under zero grazing (indoor). The infestation of swine with *Sarcoptes scabiei* was much higher in swine with poor body condition than those with good body condition (Table2 and 3).

Table 2. Risk factor chi square and P-value, for GIT and ecto- parasite

Parasites	Parameters	Age	Sex	Body condition	Standard of farm management	Type of feed	Production system
A. suum	x^2	0.775	1.869	27.369	1.869	8.890	16.004
	p value	0.679	0.112	0.000	0.112	0.012	0.000
Eimeria spp.	x^2	0.819	0.543	1.423	7.534	6.861	10.829
	p-value	0.664	0.301	0.161	0.023	0.03	0.004
Oesoph.spp.	x^2	2.243	0.695	0.232	10.338	1.787	4.697
	p-value	0.326	0.269	0.399	0.006	0.409	0.096
Sarocptes	x^2	2.483	0.602	9.071	0.269	15.957	4.068
scabie suis	p-value	0.289	0.542	0.002	0.874	0.002	0.131

Table 3. The effect of risk factors on the prevalence of GIT and ecto-parasites

Risk factors	Number of. Animal. tested	Prevalence (%)			
		Ascaris suum	*Emeria spp.*	*Oesophagostomum spp.*	*S.scabiei*
Age					
X<2	92	13.04	8.7	3.3	20.7
2<X<4	173	15.6	6.4	7.5	13.3
X>4	123	12.2	5.7	4.7	17.1
Total	388				
Sex					
Male	227	11.9	7.5	4.94	16.3
Female	161	16.9	5.6	6.84	16.2
Total	388				
Body condition					
Poor	210	22.4	8.1	6.2	21.44
Good	178	3.9	5.1	5.1	10.1
Total	388				
Standard of farm management					
Poor	205	20.0	9.8	3.9	15.6
Medium	100	11.0	5.0	12.0	15.0
Good	83	2.4	1.2	2.4	18.1

There was variation in the distribution of these parasitic diseases in different area Holetta, Tateke, Burayu and Menagesha. The prevalence of A*scaris suum* was highest in Burayu (15%) and lowest at Holetta (4.64%). In Menagesha the prevalence of *Eimeria* and *esophagostomum species* was highest with a prevalence of 6.98%. *Sarcoptes scabiei* was most prevalent in Tateke area (21.2%) and lowest at Holetta (Table 4).

Table 4. The prevalence of GIT and ecto-parasites in different areas

Study area	**Number of animals**	**Number of positives / prevalence (%)**			
		Ascaris suum	*Emeria spp.*	*Esophagostomum spp.*	*S. scabiei*
Holetta	151	7(14.64)	9(5.96)	4(2.65)	9(5.96)
Tateke	184	26(14.1)	9(4.9)	9(4.9)	39(21.2)
Burayu	100	15(15)	5(5)	6(6)	11(11)
Menagesha	43	6(13.95)	3(6.98)	3(6.98)	4(9.3)
Total	388	54(13.9)	26(6.7)	22(5.6)	63(16.2)

Discussion

The production system recorded by this study was predominantly extensive and semi intensive management system with poor housing and facilities in which 14 farms were having more than 30 pigs and 36 farms were having less than 30 pigs and very poor stall. This is far behind the practice in many parts of Europe and Asia which is mainly semi intensive and intensive management system. Extensive type of swine production as organic farming was also reported in some European countries with good housing and facilities (Serres, 2001).

The type of feed available for swine in and around Holetta area was mainly oil seed cake, locally known feed "Furusheka" and waste food. Some swine were also feed on pasture, crop residue, and garbage. These are very different and unacceptable compared to Europe in which swine are provided with good quality feed like legume seeds, fruits, cereals, root and tuber, green forage and animal products (Whittemore, 1993).

The result of this study had shown that the occurrences of diseases on the farms were affected by the size of the farm, type of production system, system of feeding, standard of farm management and health care. The prevalence of recorded by this study 13.9% for *Ascaris suum,* and 5.6% for O*esophagostomum* species were less compared to the results reported for the prevalence of *Ascaris suum 40%* and *Oesophagostomum* species 17.61% in Burkina Faso

(Nilsson, 1982). Similar results were also reported in Kenya for *Ascaris suum* with prevalence of 13% in scavenging swine (Kagira *et. al.,* 2002).

The prevalence of GIT parasite and its occurrence was affected by the system of production, being higher under extensive farm management and also varied on the basis of standard of management system which is higher under poor management of the farm. This condition agreed with studies conducted on swine under different farm management system in Botswana (Nsoso *et. al.,* 2000).

The prevalence of O*esophagostomum* species was lower as compared to other results reported by (*Roepstorff* and *Nansen,* 1998; Kagira *et. al.,* 2002; Nganga *et.al.,* 2007; and Yadav and Tandon, 1989) with their respective prevalence 45%, 40%, 39.1%, and 27.6%. In one survey, in Papua New Guinea, the prevalence of *Emeria* species was 28% (Gibbens *et. al.,* 1989) which was much higher than the current finding.

The finding of this study revealed that the infestation of swine with parasitic diseases was not affected by the sex and age of the swine that is different from the findings of (Nosal and Eckert, 2005) in Poland in which the level of infection varied depending on the herd and age group; the probable reason may be the management system of our study population gave equal chance of infestation that made the infection rate unaffected by this risk factors. The 26% prevalence of *sarcoptes scabiei* reported in Britain under semi intensive farms (Roepstorff and Nansen, 1994) and 17% prevalence reported in Canada in intensive farms (Davis and Moon, 1990). Report from Denmark, under extensive swine farm also shows much higher prevalence (30%) (Yadav and Tandon, 1989). On the other hand lower prevalence of 5% was reported from France (Davis and Moon, 1990).

GIT and ecto-parasitic are prevalent disease in the area affecting the well being of the swine. However the attention given on the prevalence of swine diseases so far has not been sufficient, there were little scattered attempts made to study the epidemiology of internal and external parasite. Hence to get clear epidemiological picture of swine disease as well as their production system, comprehensive study should be launched in the area where swine are abundant. There should be strategic treatment of swine with appropriate, effective and broad spectrum anthelminthic and antiprotozoal drugs. This should be practiced at the beginning and after the end of rainy season to get rid of parasitic burden of the swine and to minimize pasture contamination.

This study revealed that the practice of swine production in Ethiopia is very primitive type and the attention given for the sectors is very low. To improve the supply of animal protein to ever increasing population by considering the high productivity of the species, the government should work on behavioral and cultural changes of the people and also formulate an appropriate policy regarding swine production without delay, and should be hold in the national livestock development program to meet the millennium development goal on food security and self sustainability. .

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