UNIVERSITY OF NAIROBI

SURVEY OF MITES AND THEIR POSSIBLE EFFECTS ON PIGS IN UNIVERSITY OF NAIROBI KANYARIRI FARM

A project report submitted in partial fulfillment of the requirements for award of a Degree in Bachelor of Veterinary Medicine from the University of Nairobi

By

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J30/2069/2010

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DECLARATION

I hereby declare that this project is my own original work and has not been submitted to any other University for the award of any degree

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DEDICATION

TO:

God almighty for the strength and resilience he has given me during my academic journey. I also dedicate this to my loving family for their endless support and prayers throughout my studies.

ACKNOWLEDGEMENTS

I would like to appreciate my project supervisor Professor N. Maingi for his guidance throughout this project. I acknowledge the Chairman and Technical staff of the Department of Veterinary Pathology, Microbiology and Parasitology, University of Nairobi, Upper Kabete Campus for their assistance during the running of my laboratory work. I am also truly grateful to members of The University of Nairobi Kanyariri Veterinary farm for their support and for offering their office facilities to conduct my research and to staff members for their hospitality willingly availing data for my project.

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ABSTRACT

The most common type of mange affecting pigs is *Sarcoptes scabiei* var. suis. A total of 20 skin scraping samples were collected from 20 pigs at the University of Nairobi Veterinary Farm Kanyariri. The samples were collected from 4 sows, 8 gilts, 3 boars and piglets, all of which showed suspected mange lesions. Of these samples 7 were collected from the rump 10 from the back and 3 from the ears. Out of the total samples, 55% (11) were positive for *Sarcoptes scabiei var suis* while 45% (9) were negative. From these, 57.14% (7) of the samples from the rump area were positive, 60% (10) of back samples were positive, and 33.33% (3) of ear samples were positive. Gilts which tested positive for sarcoptic mange had 50% (2) of lesions on the rump area and another 50% (2) on the back region. The senior boar (1) had sarcoptic mange on the back mainly. The piglets (3) all had sarcoptic mange on the back region. It was noted that environmental factors contributed to mange infestation where among the sampled sows, 33.33% (1) stayed in a watery environment and 66.67% (2) stayed in a dry environment. For the gilts, 37.5% (3) stayed in watery environment and 62.5% (5) stayed in a dry environment. The senior boar stayed in a dry environment. Among the piglets 40% (2) stayed in a muddy environment and 60% (3) in a watery environment and 50% (1) of junior boars stayed in watery environment and another 50% (1) stayed in a dry environment. Animals which stayed in wet or muddy areas had either moderate or severe mange lesions. It can be concluded that control of mange at the farm should be done by first keeping the environment of the pigs dry and treatment using effective acaricides.

Key words: sarcoptic mange, pigs.

CHAPTER ONE: INTRODUCTION

1.1. BACKGROUND

Mites are a huge and disparate group of almost 30,000 species with possibly another 450,000 species waiting to be described. The majority of mites are free living predators, herbivores or detritivores, occupying a wide range of habitats from soil to oceans and from deserts to ice-fields. However, a relatively small number are parasites. They affect many classes of invertebrate and all classes of vertebrates, particularly birds and mammals. The majority of these mite species are ectoparasites, although a small number (about 500 species) are endoparasites, living in the lungs or nasal passages of various birds, mammals and reptiles (Richard *et al*., 1997).

Mites are considered to belong to the sub-class Acari in the class Arachnida. The Acari may be divided into two orders, the Parasitiformes and Acariformes. The Acariformes do not have visible stigmata posterior to the coxae of the second pair of legs and the coxae of the second pair of legs and the coxae are often fused to the ventral body wall. The Parasitiformes possess one to four pairs of lateral stigmata posterior to the coxae of the second pairs of legs and the coxae are usually free. Generally, seven sub-orders of Acari are recognized; of which four include parasitic forms: the Metastigmata or Ixodida (ticks) ad three sub-orders of mites, the Mesostigmata, Prostigmata and Astigmata. (Richard *et al.,* 1997).

Mites of the sub-order Astigmata are of main importance in pigs. It is a large group of relatively similar mites. They are weakly sclerotised; stigmata and tracheae are absent and respiration occurs directly through the cuticle. The sub-order includes the families *Sarcoptidae*, *Psoroptidae* and *Knemidocoptidae* which are of major veterinary importance because they contain the most common mite species which cause mange (Richard et al., 1997).

Mites in the family *Sarcoptidae* are the main mites affecting pigs and they are burrowing astigmatid mite, which are parasitic throughout their lives. Their morphology and ecology are highly adapted to a life of intimate contact with their host. There are three genera in this family but of importance in pig production and is the genera *Sarcoptes* . There is believed to be only one species of *Sarcoptes*, the itch mite, *Sarcoptes scabiei*. Nevertheless, there are a number of host-adapted varieties distinguished by the presence or absence of dorsal and/or ventral spines (Richard et al., 1997).

Unquestionably, the mite *Sarcoptes scabiei var. suis* is the most important external parasitic mite of swine worldwide. Other external parasites include demodectic mites, lice, fleas, mosquito, flies, and ticks (Cargill *et al.,* 1999). The mite *Sarcoptes scabiei var. suis*, the cause of sarcoptic mange, which is considered the most detrimental skin disease affecting pigs, because of the economic losses from reduced growth rates and feed efficiency in growing pigs and decreased fertility in breeding sows (Zimmerman *et al*., 1998). Its economic importance tends to be underestimated, especially by pig producers who fail to check for encrustations in the ears or sows and to recognize the importance of clinical signs in growing pigs. Sarcoptic mange has two clinical form recognized: a hyperkeratotic from (chronic mange) that most commonly affects multiparous sows and a pruritic or hypersensitive form that affects growing pigs (Zimmerman *et al*., 1998). According to (Davies *et al*., 1995), their understanding of the pathogenesis of mange implies that deaths are unlikely in the absence of concurrent disease, although (Pullar *et al.,* 1941) argued that mortalities may occur in cases with severe hyperkeratotic lesions. Field studies indicate that improved mange control will improve milk production, reduce piglet mortalities due to overlying, and increase weaning weights (Hewett *et al*., 1982).

Other studies have demonstrated that feed utilization efficiency improved following pre-farrowing treatment of sows (Davies *et al*., 1995). Some other economic effects of mange have included downgrading and trimming of carcasses at slaughter and damage to pens and fixtures caused by rubbing pigs (Zimmerman *et al*., 1998).

In modern pig breeding and finishing, sarcoptic mange can seriously affect animal health and production and thus reduce economic efficiency (Smets *et al*., 2000). The worldwide losses from mange from mites on livestock production have been estimated to amount to US$14.4 million (Drummond *et al*., 1981).

For this reason, mange-free pig farms are desirable; however, the status of the animals needs to be controlled and confirmed. To determine the parasitological status of the herd, skin scrapings and the detection of antibodies against *Sarcoptes* mites are used (Rambags et al. 1998). These necessitated the survey for the rates of mite infestation in the farm and derive conclusions and recommendations.

1.2. OBJECTIVES

1.2.1. General objective

To determine the mites infesting pigs with mange like lesions at Kanyariri University Farm.

1.2.2Specific objectives

1. To identify mites affecting pigs at the farm.
2. To assess the possible predisposing factors for mite infestation in the pigs at the farm.
3. To evaluate the possible effects of the mites on the pig production at the farm.

1.3. JUSTIFICATION

Sarcoptic mange infestation in pigs is caused by the mite *Sarcoptes scabies var. suis* which causes significant morbidity and mortality in wild, domestic and farm animals (Walton *et al*. 2007). According to (Arends 1991), the annual losses for American pig breeders due to mange amount to approximately $US 84ï 114 per sow. In addition to morbidity and mortality, another important aspect of this infestation is that it causes decreased growth rate, decreased fertility and lower feed conversion ratio (Arends *et al*. 1990). Studies of growth performance of piglets from *S. scabiei var. suis* infested and treated sows showed significantly higher (541.5 g per day) than piglets from *S. scabiei var. suis* infested and untreated sows (518.4 g per day), because naturally infested untreated sows transmit the infestation to piglets and thereby showed less growth performance (Mercier *et al*. 2002). The growth performance (average daily gain in gram per day) of naturally contact-infected *S. scabiei var. suis* pigs, in comparison to non-infected pigs has been found to differ according to the period of infestations (Elbers *et al*. 2000). A decreased growth performance of 35, 50 and 41 g per day were recorded during 0ï 35, 35ï 112 and 0ï 112 days of infections, respectively (Elbers *et al*. 2000).

For these reasons it was prudent to have a survey on mites and their effects on the pigs at the farm.

1.4. PROBLEM STATEMENT

Sarcoptic mange infection in pigs is a worldwide cause of economic losses in pig production. The disease has several economic and pig production effects (Zimmerman *et al*. 1998). The pigs at the farm showed signs of itching and scratching and especially the piglets which appeared to be most affected by mange-like lesions and this necessitated an interest to survey mite infestation at the farm.

1.5. HYPOTHESIS

1. There are mites affecting pigs at Kanyariri Farm.
2. They have several effects on pig production in the farm.

1.6. SIGNIFICANCE OF STUDY

Mites may lead to considerable economic losses in domestic animals with repercussions for the animal trade. An appropriate disease control program against mites should take into account the entire ecosystem and thus integrate measures targeting livestock. From this study, an appropriate mite control programme can be developed to target the pigs present in the farm to reduce any losses in pig production in the farm.

CHAPTER TWO: LITERATURE REVIEW

Mites are a huge and diverse group of almost 30000 species, with possibly another 450000 species waiting to be described. The majority of mites are free living predators, herbivores or detritivores, occupying a wide range of habitats from soil to oceans and from deserts to ice-fields. However, a relatively small number are parasites (Richard *et al*., 1997). Infestation by mites is called acariasis and can result in severe dermatitis, known as mange, which may cause significant welfare problems and economic losses (Arlian *et al*., 1989).

Sarcoptes scabiei mites that parasitize humans, pigs cattle, horses, dogs, cats, and foxes i.e., *S scabiei var. hominis, suis, bovis, equi, canis, cati,* and *vulpes* respectively, exhibit no, or very limited morphological differences (Arlian *et al.,* 1996). However, biological and molecular evidence indicates that these mites are different and host species-specific (Arlian *et al*., 1989).

2.1. *Sarcoptes scabiei*

The most common mite species in pigs is *Sarcoptes scabiei*. This parasite is a ubiquitous ectoparasite in swine herds, unless eliminated by specific eradication procedures (Yeoman 1984) Herd prevalence estimates of between 43% and 95% have been reported in numerous countries (Wooten *et al*., 1987). Mites affect both domestic animals and humans, but also wildlife of zoonotic importance (Gakuya *et al*., 2012).

Sarcoptic mange infestation in pigs is causes by *Sarcoptes scabiei var suis*. It is distributed worldwide. Most pig owners are more concerned about the internal parasitic infections and ignore the external parasitic infections according to studies (Laha *et al*., 2013.)

Mange, caused by *Sarcoptes scabiei* var. *suis,* is the most widespread and important ectoparasites disease in pigs. Clinical signs such as rubbing, scratching and skin lesions indicate the significant

economic influence on production parameters, and demonstrate the welfare problems of infested pigs (Cargill *et al*., 1999).

Sarcoptes scabiei var. suis are parasites of the Family Sarcoptidae and the order Acarina. These mites are roughly circular in outline (Image 2.1). The male is about 250µm in length and is smaller than the mature female which is about 400-430 µm in length. In both sexes, the pretarsi of the first two pairs of legs bear empodial claws and a sucker like pulvillus borne on a long, stalk like pretarsus and unsegmented pedicels (Image 2.2). The pedicels occur on the first two pairs of legs in the female and on the first, second, and fourth pairs in the male (Zimmerman *et al*., 2006). The legs of both sexes are short and the third and fourth pairs do not project beyond the body margin. These legs end in long setae. The dorsal surface of the body of Sarcoptes scabiei is covered with transverse ridges but also bears a central patch of triangular scales. The dorsal setae are strong and spine-like. They have an anus that is terminal and only slightly dorsal (Richard *et al*., 1997).

Image 2.1: Sarcoptes species

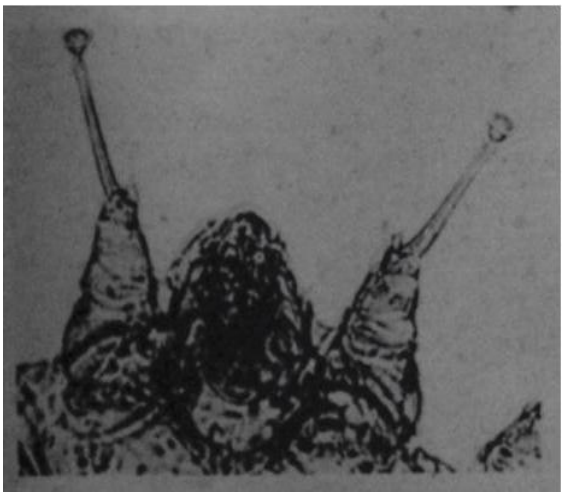

Image2.2. Sarcoptiform pretarsi of *Sarcoptes*

Mites are permanent ecto-parasites in the epidermis, where eggs, larvae, nymphs, and adults develop. The mites burrow by extra-oral digestion of the stratum corneum, and then consume cells of the stratum granulosum and stratum spinosum. After the female mate, they lay 40-50 eggs in tunnels carved into the upper two-thirds of the epidermis and die approximately 30 days after maturity. The eggs hatch in 3-5 days, larvae molt to nymphs, and then nymphs molt to adults, all within the tunnels. Mating occurs in the molting pockets or near the skin surface, after which the ovigerous females initiate new burrows (Zimmerman *et al.,* 2006). Reproduction can occur only on the host, and the entire cycle from egg to ovigerous female requires 10-25 days. Most studies in the pig suggest that most of the mite is confined to the inner surface of the ear (Walton *et al.,* 2007).

These mites do not live longer than 3-4 weeks. The mites are very susceptible to dryness and cannot live more than a few days off their host. They also have no capacity to reproduce outside the host, but the mite may survive outside the pig for up to 12 days at a temperature of 7 degrees Celsius to 18 degrees Celsius and a relative humidity of 65 to 75 % (Jacobson *et al*., 1999).

2.2. Pathogenesis

The mites pierce the skin to suck lymph and may also feed on young epidermal cells. Their activities produce a marked irritation, which causes intense itching and scratching, which aggravate the condition. This results in inflammation of the skin. Exudates accompany the inflammatory process and these exudates coagulate and form crusts on the surface, and are further characterized by excessive keratinization and proliferation of connective tissue, with the result that the skin becomes much thickened and wrinkled. There is a concomitant loss of hair which may be widely spread (Jubb *et al*., 1985).

Mange is mainly a disease of poor conditioned animals i.e. due to poor nutrition, hygiene, adverse environment and concurrent infections (Jubb *et al*., 1985)

2.3. Clinical signs

Sarcoptes prefers body areas that are uncovered by much hair, such as face and ears, the hock, elbow, muzzle, root of the tail, head and neck, sacral region and back areas of animals. In experimentally infested pigs, *S. scabiei var. suis* infestations causes excoriations on the luminal surface of the ear after seven days of initial infestations, developed encrusted lesions in the ears between third and eight weeks of infections, generalized pruritus accompanied by focal erythematous skin lesions with eosiniphilia and allergic reactions (Cargill *et al* 1999). Following exposure, pigs go through several phases, which include a non-response phase, a delayed type hypersensitivity phase, a delayed- and immediate-type hypersensitivity phase. The development of pruritus and the intensity of rubbing will depend on the number of mites in the initial exposure and the level of the ongoing exposure (Davis *et al* 1990a)

In natural infestations in crossbred pigs lesions are mostly observed in ears, head, neck region, shoulders, leg and back region of those pigs. The lesions are characterized by reddening of the infested area, formation of crusts, hyperkeratosis, and fall of hairs from the area with wrinkled, thickened, rough, raised and thick asbestos-like skin (Das *et al*., 2009). The main clinical symptoms observed in the naturally infested pigs are pruritic as a result affected pigs showed rubbing of the skin against the wall of the pen (Loewenstein *et al*., 2006b). Naturally contact-infected *S. scabiei var. suis* pigs reported to have nine time higher pruritic behaviour in comparison to non-infected pigs (Elbers *et al*., 2000).

Lesions of hyperkeratotic mange are most common in mature animals. In growing animals they occur mainly in pigs that fail to develop the typical hypersensitivity response after infestation.

The lesions, seen as thick asbestos-like scabs that are loosely attached to the skin, are very rich in mites and occur most frequently in the ears. (Zimmerman *et al*., 2006).

When the disease is allowed to spread, all parts of the body may eventually become affected. Small foci of mange have little or no effects on the general health of the host, but larger lesions with or without the bacterial complications produce progressive emaciation and even death. In pigs, excessive thickening of the skin may occur; this may then crack open leaving deep wounds which frequently become alopecic and secondarily infected by bacteria (Soulsby 1982). The effect of concurrent disease in the development of sarcoptic mange has not been elaborated (Zimmerman *et al*., 2006).

2.4. Diagnosis

Sarcoptic mange is present in most herds unless they have been derived from specific pathogen free sources or special measures have been taken to eradicate the parasite. Rubbing in growing pigs with small red papules on the body is the most obvious indication of sarcoptic mange. The small size of the parasite and its intracutaneous location, in combination with nonspecific signs (including pruritus), can make diagnosis of mange difficult to confirm (Smets *et al*. 2000). Diagnosis is confirmed by demonstrating the presence of mites within a herd and this is done by getting skin scrapings of affected skin areas until the moist layers of the skin are exposed (until bleeding). In pigs with subclinical infestation where skin lesions are not visible, a direct scraping is collected from the inside of the pinna (Gutiêrrez *et al*., 1996). The scrapings are observed under a low-power microscope after being broken down with 10% potassium hydroxide (Zimmerman *et al*., 2006; Sanders *et al*., 2000) Serodiagnosis of infestation by detection of antibodies against *S.scabiei var. suis* infestation in pigs is another method of diagnosis. Earlier passive haemagglutination test was used for detection of serum antibodies of *S. scabiei var. suis*

infested pigs using tanned bovine red blood cells and in experimentally infested animals titers ranged from 1:40 to 1:160 were detected (Wooten *et al*., 1987). Enzyme linked immunosorbent assays (ELISAs) are also being used for detection of antibodies against *S. scabiei var. suis* (Smets *et al*., 2000).

CHAPTER THREE: MATERIALS AND METHODS

3.1. STUDY AREA

The study was carried out in the University of Nairobiôs Veterinary farm at Kanyariri. The farm is approximately 375 acre and located in Kanyariri village of Lower Kabete. It is 2 km to the west of Upper Kabete campus and 15 km from Nairobi city along Fort Smith Road, bordering the historical Forth Smith. The estimate terrain elevation above sea level of the farm is 1927 meters. It is located at Long., Lat.: E 036º 42ô 32.02ò, S 01 º 14ô 50.08ò. The area lies in the upper catchment of Mathare River. The farm keeps a herd of dairy cattle, a flock of doper sheep, a piggery unit and a layer poultry unit. The poultry and cattle units are located to the east of the farm while the sheep and piggery units are located to the west. The piggery has 65 pigs of the large white breed. The farm is mainly a teaching facility in the faculty of Veterinary Medicine and Faculty of Agriculture of University of Nairobi.

3.2. COLLECTION OF SAMPLES

Skin scrapings were collected from 20 suspected or infested pigs. The samples were taken from areas of the body that had lesions and from the internal pinna of the ear. The pigs were restrained and the area with lesion scraped with a sharp scalpel blade until blood oozes. The scrapings were

collected in small plastic tubes and labeled according to the age and sex of the pigs and area of the body where the samples were collected from.

3.3. IDENTIFICATION OF THE MITES

The samples were taken to the University of Nairobiôs Faculty of Veterinary Medicine Departmental Veterinary Pathology, Microbiology and Parasitology laboratory for examination for presence or absence of mites within 24 hours. The skin scrapings were digested in 5 mls of 10% potassium hydroxide (KOH) in a test tube and with the help of a test tube holder the mixture was gently heated for about 2 minutes for digestion of the hairs. The mixture was allowed to cool. It was then centrifuged at 200 rpm for 2 minutes. The supernatant was decanted and the sediment transferred onto a slide for examination under a microscope. The mites were identified using their morphological characteristics as described by (Sanders *et al*., 2000)

3.5. DATA MANAGEMENT AND ANALYSIS.

Data were entered into Microsoft Excel program and screened for any errors that might have occurred during entry and any errors were rectified using original handwritten records.

CHAPTER FOUR: RESULTS

4.1. Affected body areas.

The mange lesions were seen and samples collected from various parts of the body (Figure 4.1), which were the back (50%), rump (35%) and ears (15%). The frequency distribution of pigs sampled was as follows; sows 20% (4), gilts 40% (8), boar 5% (1), piglets 25% (5) and junior boars 10% (2) (Figure 4.2).

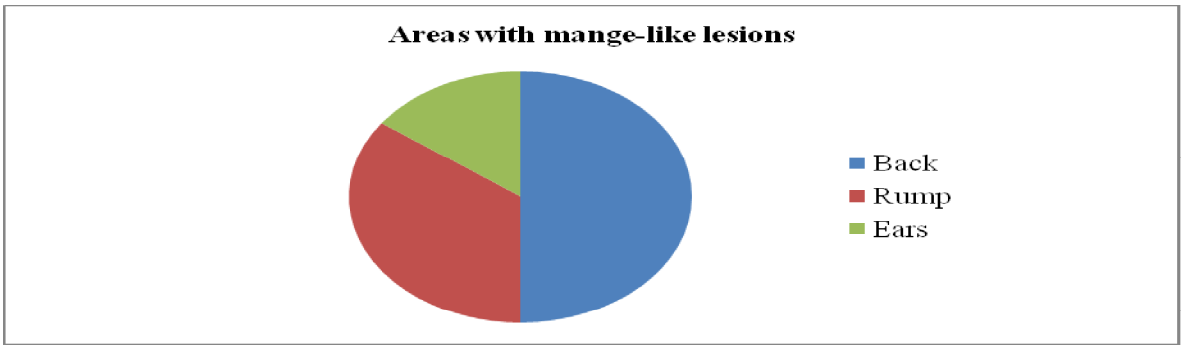

Figure 4.1: The body regions of the pigs with mange like lesions.

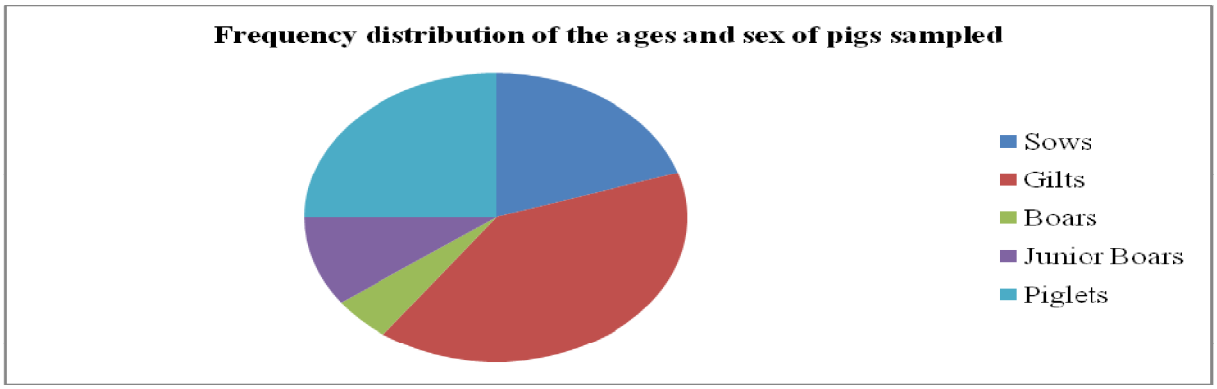

Figure 4. 2. The frequency distribution of the ages and sex of pigs sampled

4.2. Characterization of clinically affected pigs

The sampled pigs were categorized as mildly infected, moderately infected or severely infected according to the criteria given by (Jensen *et al.,* 2002). The pigs that were mildly affected, which constituted 70% (14) of those sampled, had only occasional small visible mange-like skin lesions (Image 4.1).

Image 4.1. Mange-like lesion on the back region of a sampled pig

Pigs with moderate infection constituted 20% (4) of those sampled and had occasional medium sized (4-8cm) mange-like body skin lesions at the predilection sites covering less than 25% of the body surface, no bloody skin injuries, combined with small visible lesions in the ears, good overall body condition and rubbing was more frequent (Image 4.2).

Image 4.2. Moderately infected gilt rubbing itself

Severely clinically infected pigs 10% (mostly piglets) had obvious severe body sarcoptic mange lesions at the predilection sites covering large areas of the body surface, body skin may have had bloody skin injuries due to rubbing, large visible scan lesions in the ears with bran-like coating, reduced overall body condition (Image 4.3) or showed extended rubbing.

Image 4.3. Severely infected piglet with lesions on ears and back

4.3. Distribution of sarcoptic mange positive body parts

From the samples collected 55% (11) of them were positive for *Sarcoptes scabiei var suis* while 45% (9) were negative. From these, 57.14% (4) of samples from the rump area were positive, 60% (6) of back samples were positive, and 33.33% (1) of ear samples were positive.

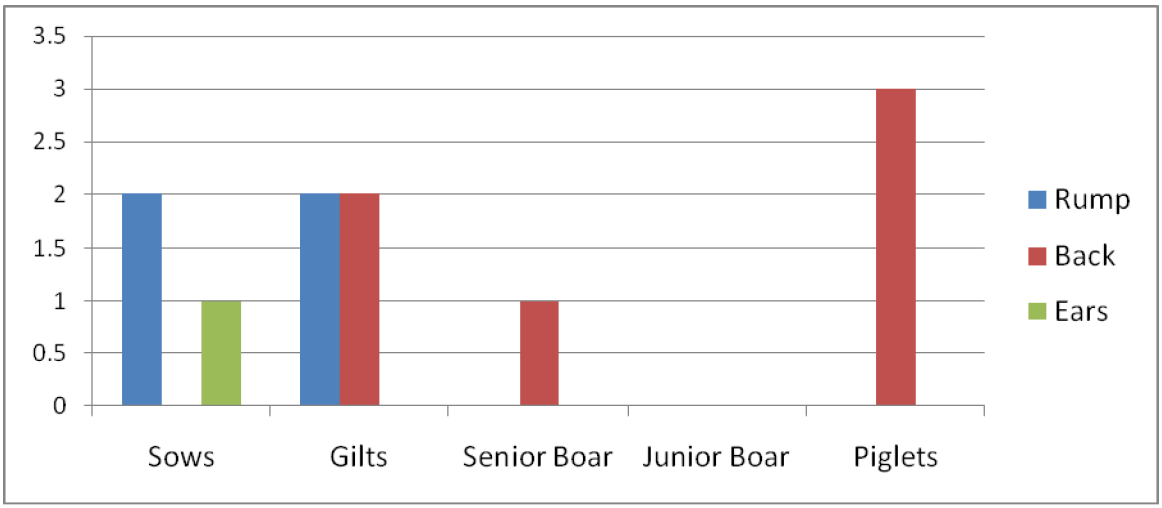

Figure 4.3. Sarcoptic mange positive body areas

A total of 20 skin scraping samples were collected from 20 pigs and 11 (55%) were positive**.** From the positive samples, 36.36% (4) were from the rump area, 54.55% (6) from the back and 9.09% (1) from the ears. Among these positive results, 66.67% (2) of the sows had sarcoptic mange on the rump area and 33.33% (1) had sarcoptic mange in the ears (Figure 4.3). Gilts which tested positive for sarcoptic mange had 50% (2) on the rump area and another 50% (2) on the back region. The senior boar (1) had sarcoptic mange on the back. The piglets (3) all had sarcoptic mange on the back region (Figure 4.3).

4.4. Pig environment

The environmental conditions in which the pigs lived was characterized as either muddy, watery or dry, 10% (2) of the pigs stayed in a muddy environment, 40% (8) stayed in watery

environment and 50% (10) of the pigs stayed in a dry environment. Among the sampled sows, 33% (1) stayed in a watery environment and 66.67% (2) stayed in a dry environment.

For the gilts, 37.5% (3) stayed in watery environment and 62.5% (5) stayed in a dry environment. The senior boar stayed in a dry environment. Among the piglets 40% (2) stayed in a muddy environment and 60% (3) in a watery environment and 50% (1) of junior boars stayed in watery environment and another 50% (1) stayed in a dry environment. The only senior boar stayed in a dry environment.

CHAPTER FIVE: DISCUSSION, CONCLUSIONS AND RECOMENDATIONS

5.1 DISCUSSION

Pig production at the farm is a key economic practice. The pigs are sold for pork or for reproduction by other farmers. The farm has other animal species in addition to pigs for various other uses. The sheep in particular are close to the pig unit and can be equally affected by sarcoptic mites. The environmental condition of the piggery was found suitable for survival of mites outside the host and possible spread among the pigs and even to/from other animals.

Mange is one of the main disease constraints in pig production (Ajala *et al*., 2007). In sarcoptic mange the only diagnostic approach that gives a reliable diagnosis is the observation of mites in skin scrapings. The test is highly specific but its sensitivity is not high since it is difficult to calculate sensitivity because the number of mites involved is related to the clinical form (acute or chronic) of the disease (Rossi *et al*., 1998). Sarcoptic mange was diagnosed in 55% (11) of the herd with most lesions affecting the back area 54.55%.

The main visible effects of mange in the farm noted were decreased growth rates due to the infestation (Elbers *et al*. 2000). This was mainly seen in piglets. Those severely affected were smaller in size than their mildly affected or seemingly normal age-mates. The dam to the piglets found positive for mange was also found positive for mange. Lesions were mainly found in the pinna of the ears of the dam. This suggested that the sow transmitted the mites to the piglets after birth.

Studies have shown that growth performances of piglets from treated sows were significantly higher (452 and 541.5 g per day) than that from untreated sows (433.5 and 518.4 g per day)

respectively, confirming that sarcoptic mange is detrimental to the production performances of growing pigs. (Mercier *et al.* 2002).

From the analysis of the predilection sites of mange, the sows had more lesions on the back area and this could be attributed to transmission from the boar since there was only one boar used at the farm for reproductive purposes which was also positive for mange. *Sarcoptes* prefers areas of the body with minimal hair cover such as the back, the sacral region and ears (Sanders et al. 2000) and this was evident in the farm since 54.55% (60) of positive lesions were on back, 36.36% (4) on the rump and 9.09% (1) on the ears and the transmission of this condition could most probably be due to direct contact with an infected animal. Coupled with this, the environmental conditions were also favourable for mitesô growth away from the pigs since some pigs stayed in wet or muddy areas and they showed moderate or mild mange lesions since moderate ambient temperatures and high humidity (normal swine facility conditions) may lengthen mite survival time off the host (Yazwinski *et al*., 1997).

Transmission of *Sarcoptes scabiei* in pigs can occur in as little as 24 hours exposure to formites, and studies have shown that longer exposure results in a more rapid development of clinical signs of pruritus and focal erythematous lesions (Sanders *et al*., 1986).

In the current study, the farm management sells junior boars to other farms or they castrate piglets and keep them for sale for pork meat. Replacement stocks in the farm (especially the boars) are bought from other farms which is similar to what was reported in Busia by (Kagira *et al*., 2011). Mange mites are typically introduced to a herd after the purchase of infested breeding stock, and spread after direct contact is rapid.

Most intensive pig farmers have a good knowledge of mange infestation where 84% of pig farmers use conventional acaricides (Wabacha *et al*. 2004) as was also noted in the Kanyariri veterinary farm where they use Ivermectin for treatment of affected pigs.

The main pig breed at the farm was the large white breed of pig. The use of improved pig breeds yield higher cash revenue due to higher output and they require higher input requirement (Lemke *et al*., 2006).

5.2. CONCLUSIONS

1. Sarcoptic mange is present in the pigs at Kanyariri farm.
2. Sarcoptic mange has a great economic significance to pig production thus needs to be monitored closely at the farm.
3. Piglets at the farm had most severe lesions and their environmental conditions should be improved and proper treatment given to them.

5.3 RECOMENDATIONS

1. Proper diagnosis of sarcoptic mange is advisable for effective control of mange infections. Diagnosis is best performed by observation of clinical signs of mange, ear or skin scrapings for microscopic examination. Proper diagnosis should be done and it is useful during an eradication campaign. Ivermectin and doramectin (300µg/kg, subcutaneously) are effective for treatment and control. Due to the major economic impact of sarcoptic mange on the pig industry, local, regional, and national eradication programs have been developed. These are very cost effective and include two injections of Ivermectin or Doramectin (300µg/kg, subcutaneously) given to all pigs in the herd on days 0 and 14. On day 7, piglets born during the previous week are also treated. Alternatively, an in-feed medication (Ivermectin premix, 100µg/kg) can be administered

for 2 weeks. In this case, suckling piglets or diseased pigs are to be injected twice at a 14-day interval at the start and end of the feed medication. (Bertrand, J., *et al*, 2011). A single dose of Ivermectin (300µg/kg subcutaneously) can be administered to sows 8 days before farrowing to prevent transmission of mites to piglets (Mercier *et al.,* 2002). The boars should be treated every 3-6 months to prevent the spread of mites at mating. Piglets born to sows that are free of mites should be housed in clean pens away from the pig herd (Cargill *et al.,* 2004).

2. Proper cleaning and maintenance of the pig unit is also recommended and the area should be dry reduce the length of time mites survive away from the host. The sows should also enter a thoroughly clean farrowing pen after treatment. Older animals that are chronically infested with mange should be culled from the herd to eliminate any source of mange mites. (Powell *et al*. 2012).

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