UNIVERSITY OF NAIROBI

COLLEGE OF AGRICULTURE AND VETERINARY SCIENCES

FACULTY OF VETERINARY MEDICINE

THE PREVALENCE OF MITES OF CHICKEN IN UPPER KABETE POULTRY UNIT, UNIVERSITY OF NAIROBI

A PROJECT REPORT

BY

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DECLARATION

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

Sign _____ date _____

Mburu Masala Gliford

This project has been submitted with my approval as the university of Nairobi supervisor.

Sign _____ date _____

R.M Waruiru (Bvm, MSc, PhD)

DEDICATIONS

I dedicate this work to my loving and caring mom and siblings, it is by your constant support and encouragement that I am the person I am today. May God bless you

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Firstly, I thank God almighty for the gift of life

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ABSTRACT

A study was carried out to identify the chicken mites (Mainly,*Dermanyssus gallinae*, *Knemidocoptes mutans* and *Ornithonyssus bursa*) and estimate their prevalence in chicken between November 2014 and April 2015 at the University of Nairobi, Upper Kabete poultry unit, Kenya. Visual inspection was done to observe the characteristic signs/lesions of miteôs infestation such as alopecia, scaly legs etc. and the skin scrapings for laboratory processing and analysis. Only 2% (thus 22 out of 1010 chickens) showed variable clinical signs of miteôs infestation, of which all were adult females. Out of 60 samples collected non showed evidence of mites during microscopic examination. Therefore it was concluded that the prevalence of mites in this poultry unit is low contrary to the hypothesis and this indicates that mites could not account to low production as it was suggested instead they could be other major constrains contributing to the same. It is then recommended that the current methods and strategies in place for control of ectoparasites be maintained.

CHAPTER ONE

1.1 INTRODUCTION

Chicken are the most abundant and widely kept livestock species in the world (Moreki et al., 2010). Intensification of agricultural production and diversification into more profitable and competitive livestock enterprises is one of the options to increase food production and reduce poverty (GoK, 2007). The increasing demand for animal food products and the trends of consumption and productivity strongly suggest that much of the demand for meat can be met through increased poultry production (Delgate et al., 2001). The indigenous chicken are better adapted to production circumstances of scavenging systems characterized by continuous exposure to disease incidence,inadequate quantity and quality feeding,poor housing and health care (Gueye, 1998).

Indigenous chickens constitute over 81% in Kenya and produce 71% of eggs and poultry meat (Kiptarus, 2005). The poultry industry occupies an important position the provision of animal protein (meat and egg) to man and generally play a vital role in the national economy as a revenue provider. In most African countries, backyard poultry account for more than 60% of the total national poultry flocks accorded an asset value of more than 5.75 billion US dollars. It is estimated that these provide 12kg of poultry needs per inhabitants per year whereas, cattle provides 5.3kg (Nnadi et al., 2010). About 90% of the small-scale farmers in Kenya rear indigenous poultry, majority of which are indigenous chicken (Gichoni et al., 1992). Kenya has estimated poultry population of 28.5 million, of these, 22million (76%) are free ranging indigenous chicken (Mold, 2006). Indigenouschicken are hardy, adapt well to the rural

environment, survive on low inputs and adapt to fluctuations in available feed resources (Gichoni et al., 1992). There is a potential for increasing production and productivity of indigenous chicken (Dessie, 1996). Its importance in national economies of developing countries and its role in improving the nutritional status and income of many small farmers and these with small land holdings as well as landless has been recognized by various scholars and rural development agencies in the last two decades (Nnadi and George, 2010). It is recognized that poultry industry has the potential to generate higher incomes to the businessmen and transform living standards of its players if appropriate interventions are developed and relevant strategies put in place (Kangôethe et al.,). The industry is flexible and do not require a lot of space (Kingoriô et al., 2010). As it is clear that poultry production is one of the economically important agricultural activities in Kenya there is a need to combat constrains which hinders increased productivity of poultry products. The low productivity of poultry can be partly attributed to a range of factors such as suboptimal management, lack of supplementary feed; low genetic potential, high morbidity and mortality rate due to various diseases (Amede et al., 2011). The challenges are particularly great in Western Kenya where indigenous chicken production is characterized by low levels of inputs and outputs (Okitoi et al., 2007) with low productivity levels, which limit their potential for commercialization.

1.2 PROBLEM STATEMENT

There is a high prevalence of poultry miteôs infestation in upper Kabete poultry unit which has led to a drastic reduction in production indices, particularly egg output which is owed partly to ineffective methods of external parasites control.

1.3 General objectives

1. To estimate the prevalence of mites infestation in Upper Kabete poultry unit, University of Nairobi.
2. To determine the (genus and species) of mites that are commonly encountered at the said poultry unit.

1.4 Specific objectives

To estimate the prevalence of mites infestation and also to determine the percentage occurrence of genera of mites of chicken in Upper Kabete poultry unit, University of Nairobi.

CHAPTER TWO

2. LITERATURE REVIEW

2.1 Description of mites and their effects in chicken

Mange is a contagious skin disease, characterized by crusty, pruritic dermatitis and hair/feather loss, and caused by a variety of parasitic mites burrowing in or living on the skin (OIE, 2013). While there are many species of poultry mites, many of these species are identical and readily infect birds. Mites are very small rounded shaped arachnids just visible without magnification. They are wingless and adults have eight legs without obvious segmentation. Three types of mites are of special importance, this includes Red mites (Dermanyssus gallinae), the tropical fowl mite (*Ornithonyssus bursa*) and the scaly leg mite (*Knemidocoptes mutans*). The presence of mites is indicated by itching, irritation of the skin and dermatitis in various forms (Chen, 2011). Poultry mites stay in cracks, crevices and other protected places during the day and crawl upon the birds to feed. Their only food is the blood of birds they infest (Antonelli et al., 2010)

Dermanyssus gallinae can have a significant economic impact in poultry production, loss in body weight of birds, and reduction of welfare of laying hens. It can also cause death of which the death among the hens can be from 1 to 4% with a reduction in laying performance of up to 10%.,as a results of infestation. Downgrading of egg quality in poultry affected by *Dermanyssus gallinae* has been observed (Hamidi et al., 2011).

Dermanyssus gallinae is a very prolific external parasite of birds which can be very difficult to eradicate, partly because the mite can survive for up to eight months between feeds, so they remain in situ, just waiting for the arrival of a new host (PestTrappa, 2009).

These parasites are also blood suckers, and when present in large number the loss of blood and irritation can make the fowls anemic, weak and restlessness (Bishop, 2005).

Poultry red mite is zoonotic, induces serious discomfort to the working staff in affected poultry premises, and frequently underdiagnosed. The parasites are predominantly hidden in cracks and crevices during the day and can survive several months out of the host (Gharbi et al., 2013).

Figure 1. *Dermanyssus gallinae*

Northern fowl mites (*Ornithonyssus sylvarium*) are regarded as the primary and most serious ectoparasites of poultry in North America (Axtell et al., 1990). This mite differs from *Dermanyssus gallinae* in that it breeds among the feathers of the host and may complete development without leaving the host. It is not necessary for this mite to stay on the host, however it may be found in nests, or roost areas, and in surrounding cracks and crevices. It can

survive for two or three weeks away from the host. The problem most frequently is irritation from the occasional bites inflicted by wandering mites. The mite is a general parasite of birds, being found on domestic fowls, sparrows, swallows and many other avian species throughout the temperate region (Public-Health Pesticide Applicator Training Manual, 5-1).

Northern fowl mites are most serious external parasites of poultry. Large numbers of these blood feeding mites can buildup on birds in just a few weeks, especially during cool weather. The parasite settles around the vent of the bird and the area can become matted and black (Lee Townsend, 2015).

Figure 2. Northern Fowl mite

Knemidocoptes mutans has also been reported to cause localized epizootics in domesticated chickens and are economically significant ectoparasites of the tropical chicken interfering with flexion of joints leading to lameness, arthritis or loss of toes (Ogbe et al., 2004). The parasite causes cutaneous lesions on the chickenôs feet and legs worldwide (Pence et al., 1999).Histologically scaly leg lesions were characterized by hyperkeratosis and acanthosis and tissue sections showed mites and their eggs in the deeper stratum corneum, associated with intensive mononuclear and eosinophilic infiltration (Biu et al., 2012).

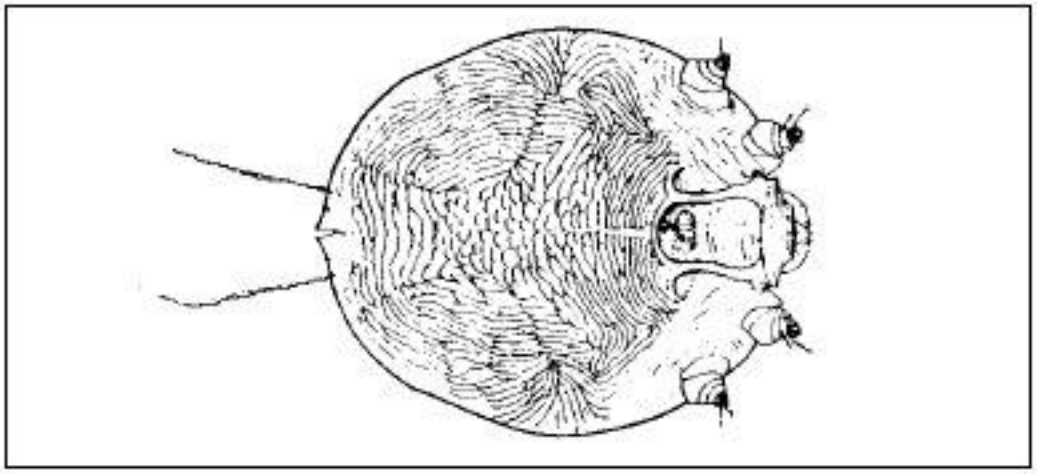

Figure 3. Dorsal view of scaly-leg mite

2.2 Life cycle

The life cycle of mites can be as little as 10days, which allows for a quick and heavy infestation. The general life cycle of mange mites is brief and it includes four stages, six legged larva, eight-legged nymph and eight-legged adult ,male & female (Kettle, 1995).

Dermanyssus gallinae feeds by sucking blood from its host, which they do mostly at night when birds are less active and lights are dimmed. An adult female engorge on average about 0.2mg blood per meal from its host (Sikes and Chamberlain, 1954). After feeding they withdraw in clusters to cracks and cavities in the interior of the stable, where they go to hide, mate and lay their eggs. The eggs normally hatch into larvae after 1.5-2 days after being laid and the larvae thereafter turn into protonymphs in lessthan a day, without feeding. About a day after feeding on a bird the protonymphs turns into deutonymphs which turns into sexually mature adults following second meal. Adults then mate soon after moulting and the female usually lay her eggs within three days after she had a blood meal (Sikes & Chamberlain, 1954). Several different

factors seem to be important for mites locating its host. Increased temperatures is one such factor (Kilpinen, 2001), as well as odor (Koenraadt et al., 2010) and carbon dioxide (Kilpinen et al., 2005). Poultry Red Mite seeks out the birds both at night as well as in daylight. In daylight, however, the laying hen can see approaching mites on the perch and consequently peck and kill them (Kilpinen, 2005).

Similarly the Northern fowl mite (*Ornithonyssus sylvarium*) and Tropical fowl mite (*Ornithonyssus bursa*) consists of four stages in their life cycle; eggs, larva, nymph and adult stage. Female adult mites lay eggs directly on their host. The eggs hatch in one to two days, depending on the temperature and humidity. The larvae that hatch do not feed on the bird, however larvae rapidly molt to the nymph stage in about eight hours (Kaufman, 1998). The nymph does need to feed on blood from birds and mature in four to seven days. Adult female mites complete the egg-laying process in two days after taking a blood meal from their host. The number of eggs laid per female is relatively small, usually two to five. However, the short lifecycle means that mite population can rise rapidly, with newly infested birds capable of 20 000 per bird in nine to ten weeks under favorable conditions (Williams, 2010).

2.3 Diagnosis

Diagnosis of mange is based on clinical manifestation and demonstration of mites or their developmental stages in host skin scrapings (Kettle, 1995).

2.3.1 Clinical manifestation

Birds infested with large Northern fowl mite population may suffer severe anemia and even death. Heavy infestation on commercial pullets as they begin laying can cause 10 to 30 percent mortality rate (Strother, 2008). Mite-stressed birds usually reduce feed intake, lose weight rapidly, may exhibit a pale pink comb and may have lower egg production of 10 percent or more (Williams,2010). Heavy infestations may make birds more susceptible to other parasites and diseases that can result in death (Strother, 2008).

Generally birds infested with mites or lice shows decreased egg production, decreased weight gain; decreased carcass-grading quality; increased susceptibility; and decreased feed intake. If any of these generalized symptoms are observed, a visual evaluation is recommended. Inspect birds around the ventral region for signs of mites or lice since the infestations usually start in this area of the bird (Pick worth et al.)

2.3.2 Demonstrations of mites in host skin scrapings

Scrapings should be taken from the edge of the lesion, from obviously pruritic locations, and from where a scalpel blade or other sharp instrument at a right angle to the skin and scraping off the outer surface of the skin. For the miteôs species that burrows into the skin, the scraping must be deep enough to cause a small amount of blood to ooze from the scraping site. Samples are promptly taken to the laboratory for processing and examination (Van veen, 1981)

2.4 Prevention and control

Control measures to be strictly adhering to can be summarize as follows;

2.4.1 Personal hygiene

Poultry house must have a hygiene zone where personal change clothes and shoes before entering the poultry facilities, in addition should be thoroughly washed and disinfected. Practice óall-in all outô principle between flock cycles and also avoid rodents in the poultry house a zone free from vegetation closest to the house established (Jordbruksverket, 2009)

2.4.2 Chemical control

An average of more than one mite or louse per five birds is economic threshold and indicates a need for treatment. Only few insecticides are available in liquid, dust or wettable powder formulations. Permethrins and Carbaryl (Sevin) are effective against Northern fowl mite, chicken mites, chicken body lice, bed bugs and fowl ticks. Tetrachlovinphos (Rabon), Ravap and nicotine sulfate can also be used in controlling Northern fowl mites and chicken body lice (Darre et al)

Table1. Recommended insecticides for treatment of poultry houses and litter against mites affecting chickens (Townsend, 2015).

INSECTICIDES	AMOUNT	DAYS TO SLAUGHTER	COMMENTS
Rabon 50%WP	6-1/2 OZ/5 gal water 1-2gal/1000sgft	0	Do not treat more than every 14 days.
Rabon 3% D	2-1/2 oz./100sft	0	Do not treat more than once every 4th week.

CHAPTER THREE

3. MATERIAL AND METHODS

3.1 Material/Equipments used

- Gloves
- Scalpel blade and handle
- Magnifying glass
- Oil immersion
- Slides and cover slips
- Laboratory requisition forms
- Sharp container
- Microscope
- Bunsen Burner
- 10% KOH
- Centrifuge

3.2 Study population and sampling:

The study was conducted at University of Nairobi, Upper Kabete poultry unit. The selection of the research site was done based on the availability of facilities and the study poultry. Upper Kabete is one of the University of Nairobi campuses and its located 14 kilometers, Northwest of Nairobi. The said unit supply the students and nearby families with eggs. The system of production is intensive system consisting of indigenous chickens of various ages and both sex.

3.3 Study birds: The targeted population includes chickens of all ages, both males and female which were physically examined by visual examination of the mites and the associated skin lesions such as alopecia and scaly legs.Skin scrapings was then collected from the randomly selected chickens for processing and analysis of results.

3.4 Sample size: Skin scrapings were collected from randomly selected 60 chickens of various ages and both sex, out of a population of about a thousand chickens. The sample size was determined based on the formula given by (Trustfield, 1995) for simple random sampling method.

3.5 Sampling procedure: The poultry mites do not usually remain on the host in daylight hence the birdôs environment was examined. Skin was scrapped by the use of scalpel blade and the scrapings were then collected in a well labelled (age &sex of chicken) containers. The scrapped areas include the legs, wings and featherless area of the skin. Obviously affected alopecic crusty areas were also scrapped at the periphery of the lesion. The samples were then taken to the Parasitological laboratory for processing and identification of mites.

3.6 Parasitological examination:

At the laboratory each sample were processed separately;

Materials required included 10% KOH solution, source of heat, forceps, graduated test tube, a centrifuge, and microscopic slides, coverslips and a light microscope.

Procedure;

- Digested the skin scrapings in 10% KOH (usually for 12-24 hours)
- To speed up the digestion process the solution with the sample were boiled

- Then centrifuged
- Discard the supernatant and put a drop of the sediments on the microscopic slides
- Put a coverslip
- Examine under low power (x40) of microscope first and if nothing seen, increase the magnification.

CHAPTER FOUR

4. Results

The results were obtained through visual and microscopic examination of chicken mites or associated lesions on mainly the skin and the legs of chickens.

4.1 Visual examination

The poultry unit had 1010 chicken population comprising of adult males and females,20 females showed signs of miteôs infestation, among them 11 had areas of alopecia and were scratching and the remaining 9 had pealed scales on their legs characteristic of scaly leg mite infestation. Out of 1010 chicken population they were only 5 males and none of them manifested with mange lesions/clinical signs. Apart from mange a number of chickens (about 10) had blood stained vents and dull appearance. Otherwise the rest of the chicken looked healthy and did not showed signs for any other disease condition.

4.2 Microscopic examination

Skin scrapings collected from randomly selected chickens (both those which showed the signs and those which did not) were processed and examined microscopically. The basis was to characterize and identify the mites (genus and species) under microscope. It was found that out of 60 samples collected and examined none showed any evidence of mites, all were negative.

CHAPTER FIVE

5. Discussion, conclusion and Recommendations.

5.1 Discussion

The results of this study shows that miteôs infestation in the studied poultry unit is not a serious problem and amount little to reduced productivity. However, ectoparasites (mites and ticks) cannot be ruled out as the potential cause of stress which may in turn lead to a decreased egg output and weight gain. As reported in the results some birds were scratching showing discomfort whereas, others manifested with the clinical signs of mites infestation. The prevalence of mites in Upper Kabete Poultry unit is very low and it is unlikely that mites can be the sole or main contributor of major productivity losses such as mortalities, reduced growth, and reduced size at maturity, poor egg lay and feed efficiency.

5.2 Conclusion

This study showed that mite infestation is not a major problem in Kabete poultry unit and thus the prevalence is low as it was depicted by results obtained both through visual examination and microscopy. Therefore the observed reduced productivity can be attributed to the fact that production system is intensive and is well managed. This clearly shows that good management has significant positive impact in controlling ectoparasites in poultry production, therefore application of parasite control measures must thus takes priority attention in conjugation with good hygiene practices including construct houses having no cracks and crevices is paramount. The low levels of miteôs infestation can also be due to the fact that there is no interaction of chickens from this unit with others from a different unit of which would have facilitated

transmission of chicken mites. The stated hypothesis has since proven otherwise and it can then be concluded that the decreased egg production and weight loss could be due to other factors.

5.3 Recommendations

Maintain high levels of hygiene in poultry house which will then inhibit the provision of favorable conditions for propagation of parasites and infectious agents. The management has to preserve the methods and strategies and methods in place for control of ectoparasites or improve if need arise thereof. The population of chickens showing clinical signs of an infestation by ectoparasites should be isolated and promptly treated with recommended acaricides. Poultry feeds of high quality and adequate quantity should be provided daily for both maintenance and production.

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