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Full Length Research Paper

A clinical survey on the Ixodid Ticks and dipteric flies of Sokoto Gudali Cattle in Nigeria

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Dipteric flies and ixodid tick samples were collected twice weekly for eight weeks between August to October, 2012. A total of 136 different dipteric flies and 84 Ixodid tick samples were collected from different cattle herds within the study area. These samples were duly preserved and subsequently identified. Results revealed that the nuisance fly, *Musca domestica* was present in all farm types as well as the abattoir and cattle market. The biting/blood-sucking flies, *Haematobia irritans, Stomoxys calcitrans* and *Tabanus spp.* were found in semi-intensive farms while *Culicoides spp*. was found in an intensively managed farm. The myiasis fly, *Lucilia spp.* was found in the abattoir and cattle market while *Oestrus ovis* was found in a semi-intensive farm. The cattle in semi-intensive farms, abattoir and cattle market were mostly infested with one-, two- and three-host ticks whereas no tick was found in intensively managed farms. Infestation by ticks and flies have been shown to impair cattle productivity, increase cost of production and cause the farmer to incur huge economic losses in the course of production. It is therefore, pertinent to control ectoparasitic infestation of cattle within the study area.

Key words: Dipteric flies, Ixodid tick, *Musca domestica, Haematobia irritans, Stomoxys calcitrans, Tabanus spp*

INTRODUCTION

Amongst all kinds of invertebrate animals, arthropods form the biggest group next to Subkingdom Protozoa. Arthropods are metamerically-segmented animals. Anterior group of segments form the head, the middle group the thorax and the posterior group the abdomen (Bhatia *et al.,* 2006). Not all arthropods display these characteristics, thus body segmentation has all but disappeared with the evolution of the mites and ticks, and many insect larvae have no legs. Adaptation to parasitism has led to extreme deviation in body form in certain cases. For example, mites of the Genus *Demodex* have evolved into tiny cigar-shaped organisms that fit comfortably into hair follicles and sebaceous glands of the skin (Jay and Marion, 1990).

Arthropod ectoparasites (invertebrates with jointed legs and an exoskeleton that live or feed on the body surface of a host animal) fall into two classes, arachnids and Insects Ectoparasite infestation affects the health of host animals in several ways. Cattle may be so pre-occupied with itching and irritation caused by lice that feeding is irregular, and consequently the animal may fail to gain weight. Such 'parasite worry' is a problem in almost all infestation. Animals may become emaciated and susceptible to various bacterial and viral diseases. Heavy infestation of the cattle tick, *Haemaphysalis longicormis* can cause serious blood loss and unthriftiness in young animals. Both ticks and lice can affect hide quality and result in poor leather quality.

Various arthropod parasites are found wherever cattle are raised. The worldwide incidence of parasites in cattle and their economic importance are greatly influenced by geographic location, season of the year and climatic conditions. In very general terms, ectoparasitism tends to cause the greatest losses in drier areas. There is considerable overlap in the incidence of endoparasites and ectoparasites. The effects of both types of parasites acting together on cattle herds are greater than the damage caused by either of the parasite types

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themselves. For example, a herd that is heavily infested with lice will be more severely affected by a sudden build-up in roundworm parasites than would a herd that is free of ectoparasites.

The incidence and prevalence of specific cattle arthropod ectoparasites vary from region to region with respect to different seasons of the year. As earlier stated, the incidence is greatly influenced by geographical location, seasons and climatic conditions. A good knowledge of the predominant arthropod species within a particular time and in specific geographical locations will be of immense help in the planning of control programs against these ectoparasites. This study is aimed at identifying the predominant ticks and fly species that pose threats to cattle production in Sokoto metropolis. This will be of tremendous help to the government in planning control programs and also of benefit to dairy and beef cattle producers. In the long run, it will help boost cattle production, conserve quality of hides, reduce the incidence of arthropod-borne diseases, as well as eliminate economic losses associated with ectoparasitism within Sokoto metropolis which is the selected study area. Many parasites of cattle have regional significance. Most parasites have complex lifecycles coordinated with climatic conditions. This seasonal incidence of parasites is a very important factor to consider when planning a total parasite control program.

Arthropod pests limit production in beef cattle industry in many ways. External parasites are the most serious threats since they feed on body tissues such as blood, skin and hair. The wounds and skin irritation produced by these parasites result in discomfort and irritation for the animal (Kaufman *et al.,* 2012). More significant however, is that any blood sucking arthropod may transmit diseases from infected animals to healthy ones. In addition, arthropod pests may reduce weight gains, because losses in milk and meat production, produce general weakness, cause mange and severe dermatitis and may create sites for secondary invasion of disease organisms. In general, infected livestock cannot be healthy or efficiently managed to realize optimum production levels (P. E. Kaufman *et al*., 2012).

External parasites are a serious problem to livestock breeders and these pests are prevalent during specific seasons of the year with respect to climatic conditions of the zone in question (P. E. Kaufman *et al*, 2012). This necessitated the collection and analysis of data for a given period of time to establish the presence of the various ticks and dipteric insect species that constitute a problem to cattle production in and around Sokoto metropolitan zone. This study intends to provide sound epidemiological information with respect to the subject matter.

The aims and objectives of this study are; to identify the predominant dipteric fly species that affect herds of cattle in different systems in and around Sokoto metropolis, to identify the specific tick species that serve as limitations to cattle production in and around Sokoto metropolis, to distinctly classify these flies into blood-sucking/biting flies, nuisance flies and myiasis-causing flies. This will serve as a guide in prioritizing future control programs and to classify the ticks based on the number of vertebrate hosts involved in their lifecycles into one-host, two-host and three-host ticks. This is aimed at providing guidance in the planning of tick-control programs.

MATERIALS AND METHOD

Study Area

This study was conducted in Sokoto state which is located to the extreme North-Western zone of Nigeria within the Sudan Savannah and between longitudes 4º8ºE and 6º54ºE and between latitudes 12ºN and 13º58ºN. By its location, it shares boundaries with Niger Republic to the North, Kebbi state to the West and Southwest and Zamfara state to the East. Sokoto state covers a total land area of about 32,000 square kilometers (Ministry of information, 2003). Based on the year 2006 population and housing census, Sokoto state has a projected population of about 3,696,999 people (Nigeria: 2006 census). Sokoto has a tropical continental climate dominated by two opposing air masses. The tropical maritime from the South brings moist conditions. Annual rainfall is about 550mm with a high peak in August. Dry season sets in first with the cold harmattan from October to February and a hot period comes in from March to the end of June when the temperature reaches 100ºF (38ºC) during the day with humidity less than 20%. The temperature is usually severe in March and April reaching 105.8º (41ºC) (Ministry of Information, 2003).

Samples and data collection

The materials used for this study included swoop nets, 70% alcohol, 5% Glycerine, universal bottles, Ziploc® bags (airtight, transparent nylon bag), plastic bowls with covers, disposable hand gloves, petri-dishes, thumb forceps, rubber boots, stereo microscope, Rambo® (Permethrin) spray.

Flies and tick samples were collected twice weekly for eight weeks between August to October from cattle herds in different locations. These locations included the Usmanu Danfodiyo University farm at Dabagi and other established cattle farms as well as the cattle market (Kara) and the Sokoto central abattoir, all within the study area. The dipteric flies samples were collected using swoop nets. Two swoop nets were made for this purpose. Based on the areas where the respective flies were seen to aggregate on the animal's body, the swoop nets were tactically placed over the flies with a swift motion and the net rose in a manner as to entrap the flies within the swoop net. The net was then held close at the open end

Table 1: Fly species found in various farm systems, abattoir and cattle market

Dipteric fly species	Nature of fly	Type of farm (management system)	Abattoir	Cattle market
Musca domestica	Nuisance	Semi-intensive and intensive	+	+
Oestrus ovis	Myiasis-causing	Semi-intensive	-	-
Lucilia spp.	Myiasis-causing Biting/blood-sucking	-	+	+
Haematobia irritans	Biting and nuisance Biting/blood-sucking	Semi-intensive	-	-
Culicoides spp.	Biting/blood-sucking	Intensive	-	-
Stomoxys calcitrans		Semi-intensive	-	-
Tabanus spp.		Semi-intensive	-	-

to prevent the escape of the entrapped flies. The flies were carefully transferred into the Ziploc® bag which was opened minimally to ensure that flies caught do not escape in the course of transferring them into the bag. The Rambo® was subsequently sprayed lightly into the bag. This was done to prevent the escape of the flies already trapped in the course of subsequent transfers of flies from the swoop net. If this was not done, most of the flies will either escape or attempt to escape and in the process will end up getting crushed, have their wings or legs broken and as such impair the identification process. The flies in the bag were then carefully transferred into universal bottles containing 70% alcohol for preservation and the bottles corked. The universal bottles were taken to the Parasitology laboratory for identification. The swoop net was also used to collect samples of flies found inside the pens of these cattle by swooping the net around these pens. Flies caught were subsequently transferred into the Ziploc bag as described earlier. The entire process was repeatedly done in all the locations mentioned earlier for the purpose of this research. Some of the farms were visited in early mornings (between 6:00 a.m. and 7:30 a.m.) while the others were visited in the evenings (between 5:00 p.m. and 7:00p.m.) in order to collect samples. This time for sample collection was chosen in order to maximize the chances of collecting diverse species of flies as these periods of the day (mornings and evenings) were characterized by presence of markedly high populations of flies among cattle herds in the various locations.

Tick samples on the other hand were manually detached (handpicked) from the skin of the infested animals. The ticks were mostly found around the perineal regions (under the tail), ears, udders, neck regions and trunks of cows or bulls. Cattle in the various farms and lairage of the abattoir as well as those that were just slaughtered were carefully examined for the presence of ticks. The ticks found were detached and placed inside plastic bowls with covers. These were subsequently transferred into universal bowls containing 70% alcohol with 5% Glycerine added. Glycerine was added in order to maintain the colours of the ornate ticks. The universal bottles were then corked and transported to the laboratory for identification purposes. The preserved ticks were subsequently picked with thumb forceps, placed in petri-dishes and examined under the stereomicroscope.

Identification of ectoparasites

The dipteric flies collected were gently transferred into petri-dishes using forceps. Extreme caution was applied in order to ensure that the morphology of the wings, mouthparts, aristae and legs are intact. Using the stereo microscope, the flies were viewed individually and identified based on the nature of their mouthparts, wing venation and colour of segments(head, thorax, and abdomen) according to guidelines provided by (Urquhart et al., 2003).

The preserved tick samples were also gently and carefully picked from the universal bottles onto petri-dishes. Morphological features such as shape and size of pedipalps, ornation, presence or absence of eyes, size and shape of ad anal perianal shields, shape of chelicerae, presence or absence of genital openings were used in identification of the various tick species collected according to the guidelines provided by (Walker *et al*., 2003) and (Richard and David, 2001).

RESULTS

A total of 136 dipteric flies and 84 Ixodid tick samples were collected from different cattle herds within the study area. These samples were duly preserved and subsequently examined using the stereomicroscope. The various species of flies and ticks identified are represented in tables 1 and 2 respectively.

Table 1 shows the overall pictures of the different biting/blood-sucking, nuisance and myiasis-causing flies in relation to the places in which they were found in the

Table 2: Tick samples from different farm management systems, abattoir and cattle market.

Ixodid tick species	Type of tick based on number of hosts in its lifecycle	Type of farm (management system)	Abattoir	Cattle market
Amblyomma variegatum	Three-host	Semi-intensive	+	+
Amblyomma hebreum	Three-host	Semi-intensive	+	+
Hyalomma dromedarii	Two-host	Semi-intensive	+	+
Hyalomma rufipes	Two-host	Semi-intensive	-	+
Hyalomma truncatum	Two-host	Semi-intensive	+	+
Hyalomma impressum	Two-host	Semi-intensive	+	-
Hyalomma impeltatum	Two-host	Semi-intensive	-	+
Rhipicephalus (Boophilus) decolaratus	One-host	Semi-intensive	+	+
Rhipicephalus (Boophilus) geigyi				
Rhipicephalus (Boophilus) annulatus	One-host	Semi-intensive	+	+
Rhipicephalus (Boophilus) microplus				
Rhipicephalus sanguineus	One-host	Semi-intensive	+	+
	One-host	Semi-intensive	+	-
	Three-host		+	-

course of the survey. Results obtained as clearly represented in the table reveal that the nuisance fly, *Musca domestica* was present in all farm types as well as in the abattoir and cattle market. The biting/blood-sucking flies, *Haematobia irritans, Stomoxys calcitrans* and *Tabanus spp.* were found in semi-intensive farms while *Culicoides spp*. was found in an intensively managed farm. The myiasis fly, *Lucilia spp.* was found in the abattoir and cattle market while *Oestrus ovis* was found in a semi-intensive farm.

Table 2 shows the overall pictures of the ticks which were identified in relation to the number of hosts in their lifecycle and the type of farms in which they were found. The cattle in semi-intensive farms, abattoir and cattle market were mostly infested with one-, two- and three-host ticks whereas no tick was found in intensively managed farms.

The overall picture of results show that arthropod ectoparasites (flies and ticks) are common in cattle within and around Sokoto metropolis. These ectoparasites pose threats to cattle production in the study area.

DISCUSSION

The results of this survey indicate that the dipteric flies, *Musca domestica, Stomoxys calcitrans, Lucilia spp., Culicoides spp., Haematobia irritans* are present in the study area. These flies pose threats to cattle production within and around Sokoto metropolis. The nuisance fly, *Musca domestica* was present in semi-intensive and intensive farms as well as in the abattoir and cattle market. The myiasis-causing fly*, Lucilia spp.* was found in the abattoir and cattle market. The biting flies, *Stomoxys calcitrans*, *Tabanus spp*. and *Haematobia irritans* was found in semi-intensively managed cattle farms. *Culicoides spp*., a biting and nuisance fly was found in an intensively managed cattle farm.

The survey on cattle tick species within the study area indicated the presence of two different three-host tick species, *Amblyomma variegatum* and *Amblyomma hebreum* in semi-intensively managed cattle farms. Six different two-host tick species were also identified in the course of the survey, these included *Hyalomma dromedarii, Hyalomma rufipes, H. truncatum, H. impressum, H. impeltatum and Rhipicephalus sanguineus* which was found only in the abattoir. The one-host ticks, *Rhipicephalus* (*Boophilus*) *annulatus, Rh.*(*Bo.*) *decoloratus, Rh.* (*Bo*)*. microplus* and *Rh.* (*Bo.*) *geiygyi* were seen to infest cattle in different semi-intensively managed farms, cattle market and abattoir. No tick sample was found in the intensively managed farms.

Several studies have shown that ectoparasitism has adverse effects on cattle production. In Southern Africa, Taylor and Plumb (1981), using fully tick-susceptible cattle, demonstrated a large difference (48 kg) in group mean-weight gain between heavily tick-infested and tick-free animals. Field trials in Kenya, using Boran heifers immunized against East Coast Fever (ECF) showed that animals dipped weekly gained an average of 78g per day more than unclipped animals over a 30-week period (de Castro *et al.*, 1985a). De Castro (1987) also demonstrated that high tick numbers caused proportionally greater live-weight losses in tick-susceptible Boran cattle than in tick-resistant animals of the same breed.

In Zambia, long term studies using a farming systems approach were undertaken to quantify the impact of tick control on local Sanga cattle. In the first trial, significant decreases in live-weight gain (LWG) occurred only in periods of medium to high challenge with *Amblyomma variegatum* (Pegram *et al*., 1989). In the second trial the

impact of tick-control on overall herd productivity was measured. Outputs of milk and weaner calf in relation to the carrying capacity of available land were found to be about 25 percent higher in tick-free herd (Pegram *et al.*, 1991). It is therefore very important to incorporate ectoparasite control programs into all forms of cattle management systems in order to maximise cattle production and its numerous benefits within the study area.

RECOMMENDATIONS

Infestation by ticks and flies have been shown to impair cattle productivity, increase cost of production and cause the farmer to incur huge monetary losses in the course of production. It is therefore, pertinent to curtail ectoparasitism in cattle within the study area. The following are hereby, recommended to be considered in order to reduce ecoparasites' population amongst cattle herds:

- Incorporation of an integrated ectoparasite control program in the different cattle production systems.
- Improvement of hygiene in farms and abattoir.

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