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DISTRIBUTION OF *SIMULIUM* SPECIES AND ITS INFECTION WITH *ONCHOCERCA VOLVULUS* ALONG RIVER MUVUR, MUBI, ADAMAWA STATE

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ABSTRACT
A survey of the distribution of Simulium species complex population and its infection rate with Onchocerca volvulus was carried out along River Muvir, Mubi between July and August 2009. Black flies were collected using baits, pooter and hand nets. Out of 310 flies collected, 89 (28.70%) were found to be infected with microflariae. Detection of the parasites in the vector was attained by dissection of flies under dissecting microscope. The result revealed that the prevalence of microfilariae among insects collected in the months July and August was 23.08% and 21.47% respectively. Statistical analysis using t-test and ANOVA revealed that there was no significant difference ($p<0.05$) in the prevalence between the months of collection. They also showed no significant differences in microfilariae load between the three anatomical parts (the head, thorax and abdomen). These investigations showed that Simulium damnosum is wide spread along the River Muvur and a large population of flies is infected with Onchocerca volvulus.
Keywords; Onchocerca volvulus, infection, Simulium species, Muvur.

INTRODUCTION

Onchocerciasis is an insidious non – fatal filarial infection which causes blindness, life- long human suffering and grave socio-economic problems (Noble, 1982). The disease is an insect borne infection, caused by a parasite called *Onchocerca volvulus* and transmitted by black flies of the species *Simulium damnosum* complex. Onchocerciasis is commonly called river blindness, because the black flies which transmit the disease abound in riverine areas. The disease affects millions of people in the world, but mostly in Africa for centuries and therefore it is considered to be of high economic importance (Noble, 1982). Approximately two million people are blind because of the disease (Smith, 1993). About 85.5 million people in Latin America and Middle East live in endemic areas (Smith, 1993).

Onchocerciasis is a disease of rural areas though it is found in urban centers due to rural urban migration. It was found that the travelers, the missionaries and peace- corps volunteers who were exposed to black fly bites in endemic areas are most at risk of contracting the infection. The developing countries are virtually associated with an agricultural economy; therefore there is little doubt that in many developing countries majority of the population dwells in the rural areas. The incidence of the disease increases with the increase in human activities in the rural areas. The incidence of the disease increases with the increase in human activities along the river valleys which are the habitat of *Simulium* vectors. Human activities could include bathing, swimming, farming, hunting, and other recreational activities carried out along and in the vicinity of the streams (Davies, 1997). According to Wealtheral (1985), habitat of people, natural resources, hereditary, social position and occupation influence health of many and the spread of the disease.

The effects of onchocercal infection is not only reflected in individuals but the economy of the countries at large since it is debilitating effects on human, incapacitate a huge number of working population and render them incapable of working. The study aimed to survey the distribution of *Simulium species* complex population and its infection rate with *Onchocerca volvolus* along the River Muvur.

MATERIALS AND METHODS

Study Area

Sampling was done along River Muvur, Mubi North L.G.A of Adamawa State. Muvur is located in the mountain chain 21km away from Mubi town and lies between Latitude 10^0 20^1 and 10^0 26^1 North of the Equator and Longitude 13^0 20^1 and 13^0 28^1 East of the Greenwich meridian (Aebayo, 2004).

Collection of Samples

Samples were collected between July and August 2009 along River Muvur in Adamawa State. There were three sampling sites along River Muvur; site A, B and C. Human activities such as swimming, washing of clothes take place at site A. Site B is an area of cattle grazing with abundant grasses along the river bank. Most of the cattle rest and drink water at site C. During the collection of samples the surface water temperature was measured. Adult flies were caught at the various sampling sites using baits, pooter and hand nets. They were preserved in 80% ethanol in specimen bottles. All the specimens were preserved in ice block and conveyed to the laboratory where they are maintained in a refrigerator at 4^0C as described by Eberhard, (1991).

Each of the specimen bottle was labeled with the type of sample, the month, day of collection, date and time of collection, before being conveyed to the laboratory in the Department of Biological Sciences, Adamawa State University for further analysis.

Microscopy

All the adult flies were dissected under dissecting microscope using dissecting pins. The dissected adult flies were then mounted on glass slides in saline solution and viewed under the microscope by using X10 objectives lens (WHO, 1991). This process was carried out to determined the presence of *Onchocerca volvulus* in the black flies.

RESULTS

The results on table 1 shows the microscopic examination of 310 *Simulium*, which reveals that 89 (28.71%) were found with microfilariae. Table 2 show the flies caught in the months of July and August respectively. The total concentration of the prevalence of microfilariae found within the three anatomical parts which were: head (H), thorax (T) and abdomen (A) of the insects caught during the month of July was found to be the same prevalence as shown on table 3. The microfilaria load found during the three weeks of sampling for the month of August was found to be different in which the H had 21 (51.21%), T had 14 (34.14%) and A with 6 (14.63%) as shown in table 3. There was also variation in the prevalence found within each of the anatomical part for each of the three weeks of collection within the month.

Table 1: Prevalence of microfilaria in black flies in Muvur, Adamawa State

Months of sampling	No. of sampled	No. of positive	% positive
Jul	160	48	30.00
Aug	150	41	27.30
Total	**310**	**89**	**28.71**

Table 2: Weekly distribution of microfilariae in black flies

Week /Month of sampling	No. caught	No. of positive (%)
1st /Jul	62	18 (22.50%)
2nd /Jul	45	13 (22.41%)
3rd /Jul	53	17 (24.29%)
4th /Aug	60	21 (25.93%)
5th / Aug	50	14 (21.88%)
6th / Aug	40	06 (14.04%)
Total	**310**	**89 (44.55%)**

Table 3: Microfilaria at different anatomical parts of black flies sampled in July and August, 2009.

	Anatomical Parts			
Week/Month	Head (H)	Thorax (T)	Abdomen (A)	Total
1st week/Jul	2(11.11%)	5(27.78%)	11(61.11%)	18(37.50%)
2nd week/Jul	5(38.48%)	6(46.15%)	2(15.38%)	13(27.08%)
3rd week/Jul	9(52.94%)	5(29.41%)	3(17.65%)	17(35.41%)
4th week/Aug	11(52.38%)	7(33.33%)	3(14.29%)	21(51.21%)
5th week/Aug	7(50.00%)	5(35.71%)	2(14.29%	14(34.14%)
6th week/Aug	3(50.28%)	2(33.33%)	1(16.66%)	6(14.63%)
Total	**37(84.54%)**	**30(67.47%)**	**22(47.96%)**	**89(100.00%)**

DISCUSSION

The results show that *Simulium* along River Muvur are heavily infected. This is an indication that the hosts (humans) around the river might harbor microfilariae. The high infectivity of the flies is also an indication that there is a lot of activities along the river since it was the rainy season and all the farms around are cultivated (Wealtheral, 1995).

Preservation methods described by Post *et al* (1993) seemed to be the best as demonstrated by the result as shown in table 1. The onchocerciasis control program has adopted the strategy suggested by Merdith *et al* (1994) which consists of biannual distribution of Ivermectin (Mectizan) to at risk community to prove beneficial outcome by reducing or eliminating transmission of *Onchocerca volvulus* in an endemic area. To carry out proper evaluation of the continuous chemotherapy on transmission, river Muvur were chosen taking in to consideration the endemic rates and the geographical location of the chosen site.

The prevalence of infected flies is an important epidemiological tool to help decision makers to adopt new control strategies in certain area. This could be accomplished by polymerase chain reaction (PCR) method for detecting *Onchocerca volvulus* in sample of black flies which seems to be highly expensive. In the scenario of the river Muvur site, where approximately 310 *Simulium spp* were captured in the month of July and August, 2009.

The only possibility of achieving reliable results was by using the dissection and parasite microscopic examination in a sample of 310 insects in three anatomical parts which were head (H), thorax (T) and abdomen (A). Further submission to the microscopic examination allows the definition of infected and or infective insects. Table 3 shows that microscopic examination of the distinct anatomical parts of insects samples reveals the prevalence of infected flies statistically similar to the rates obtained by Guillet *et al* (1995). Ham et al (1995) compared the vector competence of *Simulium spp* due to its; wide distribution and expressive number of biting specimens. These two factors contrast to the control of specific area by using insecticide which could hamper the transmission of *O. volvulus*. The potential of *Simulium spp* in transmitting onchocerciasis in Muvur community area was observed in this study due to positive microscopic examination result for *O. volvulus* in samples of insect collected in the month of July and August.

The number of infected *Simulium* vectors found in this study 48(26.08%) happens to be different from the number found by Collins (1989) which is 5% of *Simulium* found infected when the study were carried out in the area of intensive control. This significant difference between the two studies indicates that the control measures have never been launched in the Muvur community area, and consequently, higher prevalence of microfilaria found among black fly population.

The rates found in this study shows that the prevalence of infection among flies collected decrease from 48(23.08%) to 41(21.47%) for the month of July and August respectively. This could be as a result of decrease in human activities along river Muvur bank due to excessive rainfall and low temperature during month of August. Table 3 shows that total concentration of microfilariae found within head (H), thorax (T)and abdomen(A) for the three weeks of sampling in the month of July is constant with the number 16(33.33%). Nevertheless, there is variation in the prevalence found within each of the three anatomical parts. These constant numbers indicate the stability in the prevalence during this period. Also, on the same table 3, there was variation in the prevalence within each of the anatomical parts of the vectors sampled in the month of August. The result indicate that the head (H) had 21(51.21%), thorax (T) had 14(34.14%) and abdomen (A) had 6(14.63%) for the third, fourth and sixth weeks of sampling respectively. The uniform decrease in concentration of microfilariae observed from abdomen (A) to head (A) indicate the movement of microfilariae from abdomen to the infective stage (L3) in head even as the load of microfilariae reduce in fly population.

The number of black flies bites and the prevalence of infective larvae (L3) in the black fly population together determine the transmission potential, an important parameter for measuring the impact of onchocerciasis control program Walsh et al, 1988: WHO, 1999). According to Wealtheral (1995), the treatment with Ivermectin should be carried out in the beginning of the period of large transmission corresponding to large impact.

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