

ATTRACTION OF *SIMULIUM DAMNOSUM* COMPLEX TO *PTEROCARPUS SANTALINOIDES*: A PRELIMINARY STUDY

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ABSTRACT: Insects generally respond to varieties of cues but little is known on the attraction of *Simulium damnosum* sensu lato to plants. The present study investigates the attraction of *Simulium damnosum* s.l. to *Pterocarpus santalinoides* along Osun River in South Western Nigeria. Two consented fly captureurs were positioned under *Pterocarpus santalinoides* and a plant of comparable size at Osun Budepo and Osun Eleja both located along Osun river between October to December, 2008. The number of the flies caught under *P. santalinoides* was statistically higher than the control at both sites with *P. santalinoides* accounting for 63.86% and 59.39% of the flies collected at Osun Budepo and Osun Eleja respectively (Osun Budepo, $F = 218.4$, $P < 0.05$; Osun Eleja, $F = 147.2$, $P > 0.05$). The results therefore demonstrate that the identification of the compounds possibly responsible for the attraction could be used to develop lures for the trapping and control of *S. damnosum*.

KEY WORDS: *Simulium damnosum* s.l., *Pterocarpus santalinoides*, attraction.

In West Africa, human onchocerciasis is transmitted by members of *Simulium damnosum* sensu lato which differ in their epidemiological significance in different ecological zones (Ibeh et al., 2008). Human onchocerciasis caused by *Onchocerca volvulus* is a severely debilitating disease. It constitutes one of the major public health problems in many riverine communities of Africa in which it serves as an obstacle to their social and economic development (Post et al., 2003; Adeleke et al., 2011). The disease affects 18 million people worldwide, with 350,000 blind and 6 million cases of skin diseases. The global incidence of new cases of blindness is 40,000 annually, with 120 million people at risk and 1.09 million Disability Adjusted Life Years (DALYs) lost annually (CDC, 2006; Idowu et al., 2008; Maikaje et al., 2008; Oyibo et al., 2004). The disease is prevalent in 35 countries of the world of which 28 are in Africa and Nigeria accounts for one quarter of the global infection (Hassan et al., 1994; Opara et al., 2008).

Generally, insects respond to the various cues emanating from pheromones, auditory, olfactory, visual and other chemical sources. The recent discoveries of the attraction of the insect vectors and pests to semiochemicals; either chemical volatiles or pheromones have elicited renewed interest in utilization of such chemicals for studying insect populations and control (Hassan, et al., 1994; Idowu & Akinsele, 2000; Manda et al., 2007). Jiang et al. (2008) reported the attraction of *Musca autumnali* (Diptera: Muscidae) a veterinary pest to ornamental plants *Euonymus europaeus* and *E. kiautschovicus* in China. Torr et al. (1995) had earlier reported the attraction of tse-tse fly to the plant. However, there is little or no information on the attraction of *Simulium damnosum* s.l. to plants. The present study therefore presents the reports of

preliminary investigation on attraction of *Simulium damnosum* s.l. to *Pterocarpus santalinoides* along Osun river, South west Nigeria.

MATERIALS AND METHODS

The study was conducted along Osun river system, South Western Nigeria. River Osun lies on the latitude $8^{\circ} 20'$ and $6^{\circ} 30'$ N and longitude $5^{\circ} 10'$ and $3^{\circ} 25'$ E in the forest zone of Nigeria. Based on the information gathered at Osun Eleja (latitude $7^{\circ} 16'$ N and longitude $4^{\circ} 08'$ E) during focus group discussion with the villagers on their knowledge on bioecology of *S. damnosum* complex (the results presented elsewhere), *Pterocarpus santalinoides* ('Gbena') was identified to be harbouring adults of *S. damnosum* s.l. by the villagers.

To investigate the role of the plant in fly attraction, two consented fly catchers were positioned along the river between 7.00AM to 6.00PM. One fly catcher was positioned under *P. santalinoides* and the other one sat under a plant of comparable size and shade as a control. The two fly catchers were rotated hourly to eliminate the effect of individual attractant to the flies. The investigation was also replicated at Osun Budepo (latitude $7^{\circ} 04'$ N and longitude $4^{\circ} 08'$ E).

During the course of the experiment, the potential breeding sites were identified and their distances to the two plants under investigation were recorded. The study was conducted between October and December, 2008. The results were subjected to statistical analysis using Analysis of variance (ANOVA).

RESULTS

The results of the fly attraction of *P. santalinoides* in the study area are presented in tables 1 and 2. The results show significant difference in the number of flies caught under *P. santalinoides* and the control at both sites (Osun Budepo, $F = 218.4$, $P < 0.05$; Osun Eleja, $F = 147.2$, $P > 0.05$). Of the 202 flies caught at Osun Eleja, the flies caught under *P. santalinoides* accounted for 63.86% while the flies caught under the control plant constituted 36.14%. The distance of *P. santalinoides* (110m) was farther to the identified breeding site than the control plant (80m). At Osun Budepo, 165 flies were caught, out of which 98 flies (59.39%) were captured under *P. santalinoides* while 67 (40.61) flies were caught under the control plant. The distance of the potential breeding sites to *P. santalinoides* and the control plant was 90m and 101m respectively.

DISCUSSION

The results obtained from the studies at Osun Budepo and Osun Eleja showed the attractiveness of the adult of *S. damnosum* s.l. to *P. santalinoides*. The factors regulating the attraction of the biting adults of *S. damnosum* s.l. to *P. santalinoides* could not be specifically explained in this study, two factors are suggested to be likely responsible for the mechanism of attraction. Firstly, it could be that the plant exhibits certain odours which orientate the females (biting adults) of the flies towards the plant since dipterans are equipped with very sensitive antennae (Jang et al., 2008). *S. damnosum* s.l. may be attracted to saponnin which is one of the principal phytochemical constituents of *P. santalinoides* (Osuagwu et al., 2007) as observed in other insects (Adeleke et al., 2009). Though, the insecticidal properties of the seed oil of the plant had been reported against mosquito larvae (Service, 1999), the plant is a multi-purpose plant with wider benefits (Osagwu et al., 2007). Secondly, since the males of the

flies feed on plant juices and nectars, the males may show preference for feeding on the juices produced by *P. santalinoides* as the leaves and seeds of the plant have been reported to be nutritious and medicinal (Osagwu et al., 2007). The orientation of the females towards the plants may be initiated by mate location, but the females could become appetitive for blood meals after mating (Service, 1999). Therefore a high biting rate is expected where the females of the flies congregate. These two reasons are subject of further studies.

The relatively far distance of *P. santalinoides* to the identified breeding site as compared with the control plants at the two catching points possibly removed the influence of the breeding site distance as a contributing factor to the higher number of flies caught under *P. santalinoides*. The discovery of factors mediating the orientation of *S. damnosum* s.l. to *P. santalinoides* would provide opportunities towards controlling the insect. Such compounds could be used to develop lures for *S. damnosum* traps therefore stemming the use of human beings as baits for trapping insect vectors, most importantly now that there are strong criticisms in scientific circle over the use of human subjects as baits because of the risk of drug resistant parasites.

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Table 1. Summary of the black fly attraction of *Pterocarpus santalinooides* at Osun Eleja during the period of study.

Months of study	<i>P. santalinooides</i>	Control	Total
October	103 (60.59%)	67 (39.41%)	170
November	18 (78.26%)	5 (21.74%)	23
December	8 (88.88%)	1 (11.11%)	9
Total	129 (63.86%)	73 (36.14%)	202

F= 147.2

p<0.05

Table 2. Summary of the black fly attraction of *Pterocarpus santalinooides* at Osun Budepo during the period of study.

Months of study	<i>P. santalinooides</i>	Control	Total
October	81 (56.64%)	62 (43.36%)	143
November	10 (66.66%)	5 (33.54%)	15
December	7 (100%)	(0%)	7
Total	98 (59.39%)	67 (40.60%)	165

p<0.05