SURVEY OF INSECTS VISITING BANANA MALE BUDS IN EASTERN DEMOCRATIC REPUBLIC OF CONGO AND THEIR CONTAMINATION BY THE BACTERIUM CAUSING WILT

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INTRODUCTION

The banana bacterial wilt was formally reported for the first time in DRC in Massissi district in 2004. Since then, the disease had quickly spread to cover most parts of North Kivu province and beyond. The disease is spread mainly by tools, insect vectors and planting material. However the insect species involved in vectoring the disease in DRC is not known. In the neighbouring Uganda, Honey and Stingless bees as well as drosophilids were reported as important insect vectors. A survey was consequently carried out in September 2007 in Mutwanga and Kamango districts of Eastern DRC to identify the key insect species visiting male buds of different banana cultivars Kisubi (dehiscent inflorescence) and Nguma (persistent inflorescence) (Fig. 1) and assess the bacterial load on and in the body of the two most important insect species found.

INSECT SPECIES COMPOSITION AND ABUNDANCE ON MALE BUDS

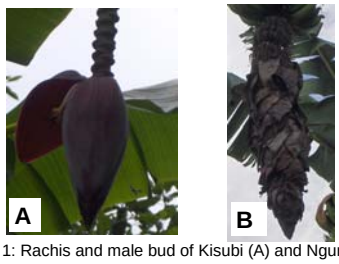

Figure 1: Rachis and male bud of Kisubi (A) and Nguma (B)

Survey activities were carried out in Mutwanga and Kamango districts in North Kivu from August 30 to September 12, 2007. In each districts 6 fields of Kisubi and 6 of Nguma were sampled. In each field, 3 male buds were sampled using entomological nets. A ladder was used to get closer to the inflorescence and a sweep net put quickly but carefully around the male bud. The bottom of the net was exposed to chloroform vapor in a killing jar in order to kill and count the insects.

Wasps and drosophilids were the two most abundant insects species sampled, with 19.3 ± 2.6 and 64.7 ± 11.6 individuals per male bud, respectively, in Mutwanga; and 24.7 ± 5.7 and 5.5 ± 1.6 in Kamango. Drosophilids were found on 97% and 44% of the male buds sampled at Mutwanga and Kamango, respectively, while wasps were found on 97% and 100% of male buds in Mutwanga and Kamango, respectively. Honey and stingless bees that are frequent and abundant on banana male buds in Uganda were not found at all on banana in the surveyed region although present sometimes on weeds in banana fields. In that region, high numbers of honey bees were recorded on palm trees (Fig 2). Both banana cultivars are equally attractive to insects and no differences were found in insect composition and abundance. This situation is different from the case observed between Kayinja and Mbwuazirume in Uganda and can be explained by the fact that both Nguma and Kisubi in DRC present high quantities of nectar. Site however did influence composition with drosophilids being more frequent in Mutwanga than Kamango. Drosophilids were however present on weeds in all banana fields sampled as were honey and stingless bees which were not sampled from male banana buds (Table 1).

Figure 2: Honey bees in Eastern DRC are very scarce on banana male bud but found in high numbers on palm trees.

Table 1: Mean number of important BXW insect vectors (± SE) per male bud in Eastern DRC

	Mutwanga		Kamango	
Insects	Nguma (n=18)	Kisubi (n=18)	Nguma (n=9)	Kisubi (n=9)
Drosophilids	43.3 ± 8.3	86.2 ± 20.7	8.8 ± 2.1	2.8 ± 2.1
wasps	15.2 ± 3.3	23.3 ± 3.8	26.3 ± 6.1	23.1 ± 10.1
Chloropidae	2.6 ± 1.5	10.3 ± 2.8	3.3 ± 1.5	2.1 ± 0.8
Others	7.5 ± 3.5	2.6 ± 0.7	7.8 ± 3.2	2.4 ± 1.6

INTERNAL CONTAMINATION

To study the external and internal bacterial load of the 2 most frequent and abundant insect species found, 3 groups of each species (5 and 10 individuals per group for wasps and drosophilids respectively) were made per field and tested in the laboratory.

Wasps and drosophilids that carried the bacteria did so both internally and externally. The incidence of drosophilids carrying Xvm was 60 and 54% on cultivar Kisubi and cultivar Nguma, respectively; and for wasps 63 and 67% on cultivar Kisubi and cultivar Nguma, respectively. The load of Xvm for both insect species on Kisubi was greater externally, with a mean external score of 0.6 ± 0.1 compared to an internal score of 0.4 ± 0.1. On Nguma, the internal load (0.5 ± 0.1) was higher than the external one (0.3 ± 0.1) (Table 2).

Table 2: Mean number of important BXW insect vectors (± SE) per male bud in Eastern DRC

		Incidence		Mean bacterial growth score ± SE	
Insect		Nguma	Kisubi	Nguma	Kisubi
Wasp	External	29%	56%	0.18 ± 0.0	0.68 ± 0.1
	Internal	54%	33%	0.46 ± 0.1 (n=84)	0.38 ± 0.1 (n=81)
Drosophilids	External	46%	55%	0.44 ± 0.1	0.57 ± 0.1
	Internal	38%	30%	0.47 ± 0.1 (n=72)	0.38 ± 0.1 (n=63)

CONCLUSION

- This study presents the first evidence of internal contamination of insect vectors of Xvm as well as the first evidence of the involvement of wasps as insect vectors in the spread. The internal contamination presents serious implications for the spread and management of banana bacterial wilt.
- Insect attraction to male bud is independent of persistence of flower and bract
- There is a possibility of using push-pull systems to draw important BXW vectors out from banana bunches

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