COMPARATIVE IMPORTANCE AND EPIDEMIOLOGY OF BXW TRANSMISSION THROUGH FEMALE AND MALE INFLORESCENCES

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INTRODUCTION

Banana Xanthomonas wilt caused by *Xanthomonas vasicola* pv *musacearum* (Xvm) is currently the most important threat to banana production in Eastern and Central Africa. The disease is spread mainly through insect vectors, tools and planting materials. The insect transmission of the pathogen through the male bud and the fresh cushions was the basis for early removal of male bud with a forked stick. However the insect transmission through female inflorescence has never been studied. Cultivars display two characters in regards to bracts dehiscence on female inflorescence: for some cultivars (e.g. Mbwazirume) the bract dries before falling, living no wound for bacterial contamination while for others (e.g. Kayinja) the bracts fall when still fresh living wounds that might heal only after 2 to 3 days (Fig. 1). The aim of the present study was to (1) test on possible plant infection when artificially inoculated through female fresh cushions, (2) compare epidemiology in regard to male and female inoculation routes and finally (3) evaluate importance of natural transmission by insects through both routes in field condition .

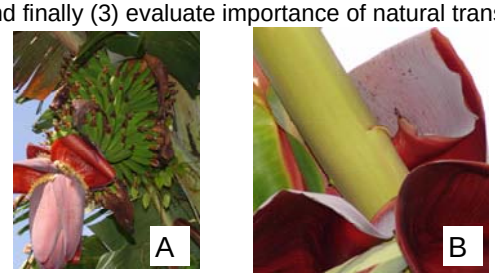

Figure 1. Two different bract dehiscence characters: A= Bracts dry before falling leaving no wound (Mbwazirume); B= fresh bracts dehiscing and leaving wound (Kaying).

MATERIAL AND METHODS

The experiments were carried out on banana cv. Kayinja in an isolated experimental field established in a forest. To test on possible infection through female cushions and to compare its epidemiology to male bud transmission route, inoculum was introduced artificially on the fresh wounds (less than 1 day old) left by the dehiscing bracts on: (1) the male bud; and (2) the female inflorescence. Thereafter, each mat was assessed weekly and data on presence of bacterial ooze on rachis and male bud, rotting of male bud, rachis and pulp, premature ripening of fruit, wilting of leave and sucker were recorded (Fig. 2).

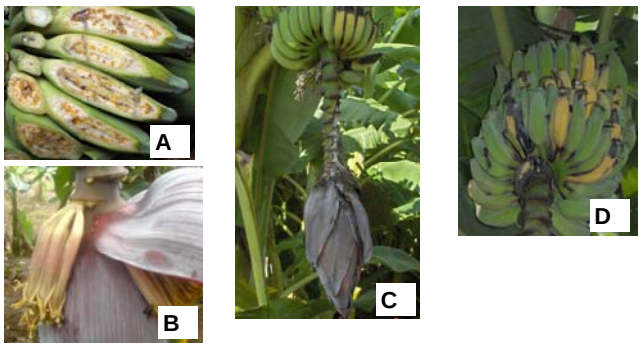

Figure 2. A= Pulp rotting, B= ooze appearance on rachis/cushion, C= rachis rotting and male bud wilting, D= premature ripening.

To evaluate the relative importance of insect transmission through male and female inflorescences, two groups of plants were observed: (1) plant having well formed bunches before artificial inoculation (MB) and (2) plants that flowered after appearance of ooze in the field (YB). These plants were left unprotected to allow spread by insects. The same epidemiological parameters studied in artificially inoculated plants were considered for this experiment too. And the differences found in previous experiment between epidemiology following both transmission routes were used to separate insect transmission through male and female inflorescences.

RESULT AND DISCUSSION

Epidemiological features of BXW were similar at advanced stages of infection independently of the infection route. However, at early stages of the disease, epidemiology features following infection through male and female inflorescences could be distinctly separated using various parameters (Table 1).

Table 1: Comparative epidemiology of BXW at early stages of disease following artificial inoculation via male bud and female inflorescences.

Epidemiological Parameters	Male bud inoculated	Female cushion inoculated
Position of first bacterial ooze on rachis	observed on **fresh** cushion left by the last fallen bract and/or on the one about to fall (100% of the cases)	found on **old** cushions but the most recent cushion and bract about to fall are still clean (100% of the cases)
Order and time frame between first ooze appearance on rachis and premature ripening of the first finger	Premature ripening **4 to 9** weeks **AFTER** ooze appearance on rachis (100% of cases)	• Premature ripening 1 week **BEFORE** ooze appearance on rachis (7.1% of the cases) • Both on **same date** (14.3% of the cases) • Premature ripening **1 to 2** weeks **AFTER** ooze appearance on rachis (78.6% of cases)
Order and time frame between first ooze appearance on rachis and first pulp rotting	First ooze appears 1 to 5 weeks **BEFORE** the pulp starts rotting (100% of the cases)	• Both first ooze and first pulp rotting are observed on the **same date** (64.3% of the cases) • First ooze appears 1 week **AFTER** the pulp rotting (21.4% of the cases) • First ooze appears 1 week **BEFORE** the pulp rotting (14.3% of the cases)
Order and timeframe between pulp rotting and male bud wilting	• Both occur the **same date** (57.1% of cases) • Pulp rotting occurs 1 to 5 weeks **AFTER** male bud wilting (42.9%)	• Pulp rotting occurs 1 to 3 weeks **BEFORE** male bud wilting (91.7% of cases) • Both occur the **same date** (8.3% of cases)
Order and timeframe between pulp rotting and rachis rotting	• Pulp rotting occurs 1 to 5 weeks **AFTER** rachis rotting (66.7%) • Both occur the **same date** (33.3% of cases)	Pulp rotting occurs 1 to 5 weeks **BEFORE** rachis rotting (100%)

The first symptoms from insect transmission occurred naturally 6 weeks after the artificial inoculation. Within 15 weeks 98.0 % and 64.8% of MB and YB respectively were naturally infected. All the MB infected plants were male bud transmitted. However, the YB infections were in 70.2% and 29.8% of the cases through female inflorescence and male bud transmissions respectively.

CONCLUSION

Disease transmission by insects through female inflorescence is very high especially when inoculum source is present in or close to the field during early stages of flowering. Any infected field with ooze on rachis can be source of infection to neighbouring fields through female flowers, even if these fields are debudded. The fresh wounds left on female cushions after bracts falling consist an entry point for the Xvm.

Acknowledgements

•To NaFORRI for availing research field
• To the Dutch government for funding
• To Francis Sebulime for his assistance in data collection

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