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► To cite this version:

J.P. Douzals, Eric Cotteux, M. Rombaut. Mass balance from aerial spray applications: a global approach on banana crop. 12th Suprofruit, Jun 2013, Valencia, Spain. p. 103 - p. 105. hal-00844649

HAL Id: hal-00844649

<https://hal.science/hal-00844649>

Submitted on 15 Jul 2013

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Mass Balance from Aerial Spray Applications - A global approach on Banana crop

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Introduction

Banana crop in French West Indies represent about 9000 ha that is still protected by using aerial applications. Preservation from Yellow & Black Sigatoka (resp. *Mycosphaerella musicola* & *Mycosphaerella fijiensis*) requires about 10 applications during crop development (8 to 10 months). Half of these applications consist of pure Banole® (paraffinic oil) with a fungistatic effect; fungicides with oil are used for curative applications. A 3 year program Optiban aimed at the optimization of aerial spraying [Cotteux et al. 1, 2011] as well as the development of ground based spraying [Cotteux et al. 2, 2011] in the perspective of the ban of aerial spraying according to EU Directive 2009, 128 EC. This paper introduces the methodology and results of a mass balance definition for aerial applications on banana crop.

Methods

Application mass balance consisted of the parallel evaluation of crop deposits and drift for different settings as shown on Table 1. Crop deposits were estimated in a 1 ha field by using 60 collector lines (Petri dishes 58 cm²) placed on telescopic masts at canopy height (about 5 m). Recovery rate was calculated considering the ratio between average deposit and the total amount sprayed. Drift was estimated in accordance with ISO 22866 and ISO 23369 – part 2 standards with 20 collectors (Petri dishes 58 cm²) placed every 2 m at 5 -10 – 20 – 30 – 50 and 100 m) from the field edge downwind. Meteorological conditions (Temperature, relative humidity, wind speed and direction) were monitored by using a Vaisala® 2D US sensor placed at 6 m height with a frequency of 0.3 Hz. Hollow cone nozzles as Albuz ATR and Teejet D6 were considered as references; optimized settings consisted of air induction nozzles Albuz CVI and AVI for the helicopter and airplane respectively. Spray mixes include *ad hoc* tracer (BSF for water and Radglo CFS 006 for Oil) at 1 g/l⁻¹.

Aerial vector	Spray Mix	Spraying configuration	Boom settings	Speed (km/h)
BELL 47	Water 15 l.ha ⁻¹	Albuz ATR Yellow 2 bar	65 % rotor 36 nozzles	90
		CVI 110 015 2 bar		
	Oil 15 l.ha ⁻¹	Albuz ATR yellow 2 bar		
		CVI 110 015 2 bar		
CESSNA 188	Water 15 l.ha ⁻¹	Teejet D6/DC45 2 bar	63 % wing span 56 nozzles	200
		AVI 110 03 2 bar		
	Oil 15 l.ha ⁻¹	Teejet D6/DC45 2 bar		
		AVI 110 03 2 bar		

Table 1: application conditions and spraying settings – 3 replicates per modality

Results

Spray mix distribution on the different compartments (Canopy, Drift sedimentation and unrecovered fraction) are shown on Figure 1

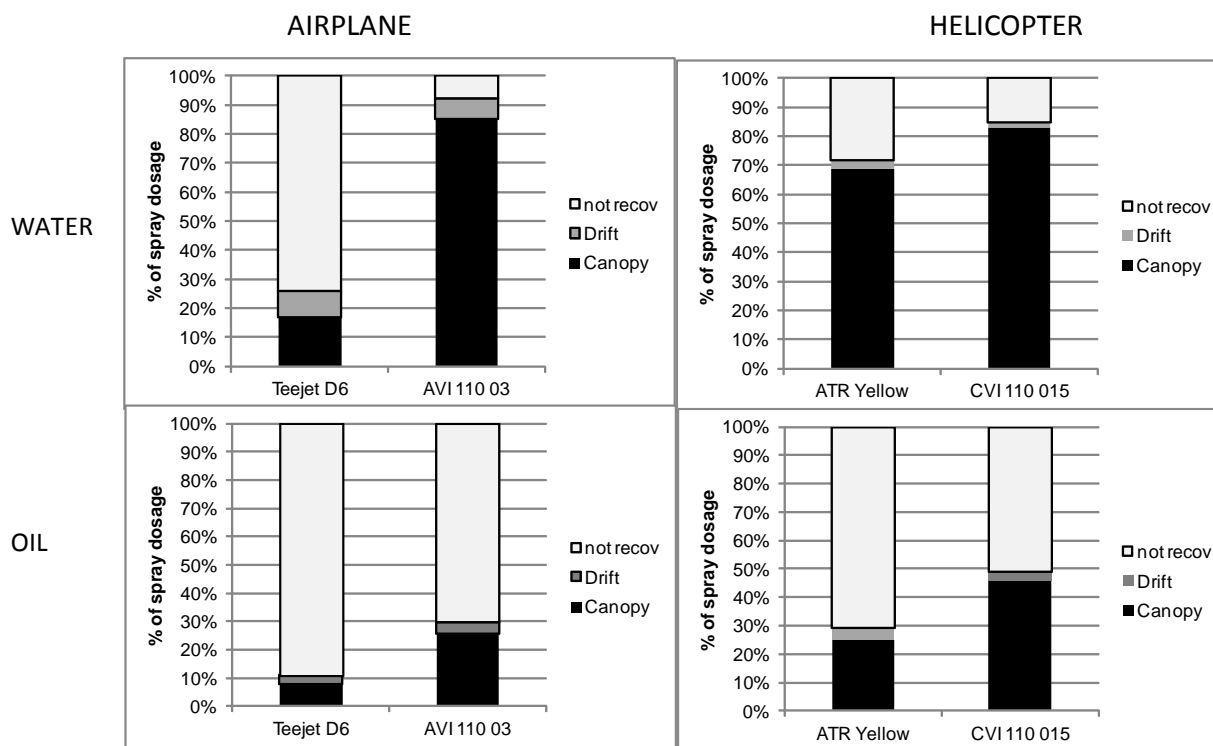


Figure 1 : Mass balance results from aerial applications

Great differences are shown between aerial vectors, nozzle types as well as spray mixes. In all situations, the recovery rate was improved by using optimized nozzle setting (combination of nozzle type and boom width) but can be very low. The case of oil will be discussed with a low drift fraction but a high unrecovered fraction as well.

Acknowledgements

French Ministry of Agriculture (DGAL) as well as banana producers union UGPBAN are acknowledged for financial support. SICA TG and SERVIPROBAN are acknowledged for their cooperation for aerial equipments disposal.

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