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Table of Contents

Welcome to the symposium

This 14th Workshop on Spray Application in Fruit Growing offers the floor for presenting the scientific results and for discussing the societal context of the application of plant protection products in orchards and vineyards. As science evolves by open minded discussions and by exchanging results and opinions, we hope to offer you in this workshop an optimal scene for fruitful discussions.

The principal organiser of this conference is the Research Station for Fruit npo, mostly abbreviated as 'pcfruit npo'. Pcfruit was started in 1997 as a coordinating structure of three former research institutes and demonstration gardens, all specialized in fruit growing and located in Sint-Truiden, the heart of the fruit growing area of Belgium. The oldest of these comprising institutes was founded in 1943. Pcfruit is recognized as a reliable, neutral and science-based partner active in various domains of fruit growing. Pcfruit covers applied scientific research, demonstration activities to growers, co-development programs with various kinds of industries and services for fruit growers. All these activities are centralized at one central location with suitable infrastructure like labs, greenhouses, storage facilities, plastic tunnels, shelters, warehouses and orchards. High level of specialism and understanding of the fruit practices have over time been developed in areas as crop protection, biological control, IPM, plant nutrition, application technology, variety evaluation, precision agriculture.

Co-organizers of the 14th Workshop are the University of Louvain with a Faculty of Bio-engineering and ILVO, the Flemish Institute for Agricultural and Fisheries Research, which both have a specialised research team working on spray application technology.

The Workshop is taking place in the former prison of Hasselt, which serves now as the faculty of Law of the University of Hasselt. Hasselt is the capital of the Belgian province of Limburg, of which the south offers the most suitable soil and climate for fruit production. More than 50% of the Belgian fruit is growing in this area. Hasselt is a relatively small city of about 80.000 inhabitants. Today Hasselt traditionally welcomes a lot of short stay tourists and shoppers.

Inge Moors
Deputy of the Province of Limburg for Agriculture
Chairman of pcfruit

www.pcfruit.be
www.ilvo.be
http://www.biw.kuleuven.be/m2s/biosyst/mebios
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Picture: pcfruit vzw

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Program

Tuesday May 9th, 2017	
16:30-18:30	Registration Hasselt University - Aula Louis Roppe Martelarenlaan 42, 3500 Hasselt
19:00-20:00	Welcome reception at the Gouverneurshuis of Hasselt (we walk (+/- 15 min) together from the registration desk)

Wednesday May 10th, 2017	
Opening Session	Hasselt University - Aula Louis Roppe Martelarenlaan 42, 3500 Hasselt
08:00-09:00	Registration
09:00-10:00	Welcome to the Symposium

Oral Session 1 : Pesticide dosing			**Wed May 10**
Time	**Oral Abstract Number**	**Title**	**Presenter**
10:00-10:20	1	Harmonization of pesticide dose expression is a key to dose adjustment	Doruchowski, Grzegorz
10:20-10:40	2	Towards a new model of dose expression in viticulture: Presentation of an experimental approach based on deposition measurement to test the relevance of different scenarios	Codis, Sébastien
10:40-11:00		Coffee and snack break	
11:00-11:20	3	Pesticide dose in persimmon orchards: Bases for its adjustments	Chueca, Patricia
11:20-11:40	4	Adjusting spay volume rates to the canopy vigour from aerial images in a vineyard	Román, Carla
11:40-12:00	5	Effect of formulation and spray application characteristics on the biological efficacy of a contact fungicide	Bakache, Adel
12:00-13:30		Lunch	

Oral Session 2 : Spray coverage			**Wed May 10**
Time	**Oral Abstract Number**	**Title**	**Presenter**
13:30-13:50	6	Spray deposition and distribution of a cross-flow fan orchard sprayer in spindle apple trees	Michielsen, Jean-Marie
13:50-14:10	7	First results of a campaign for the optimization of spray patterns of orchard sprayers by a moving test bench	Claes, Ruben
14:10-14:30	8	Improving spray deposition in orchard spraying by a Munckhof multiple row sprayer	Wenneker, Marcel
14:30-14:50	9	Basic experimental investigations of different influencing parameters on the quality of the vertical distribution of sprayers	Pelzer, Tanja
14:50-15:10		Coffee and snack break	
15:10-15:30	10	PulvArbo: a French project to improve spray application in fruit growing	Verpont, Florence
15:30-15:50	11	Sprayer classification in viticulture according to their performance in terms of deposition and dose rate reduction potential	Vergès, Adrien
15:50-16:10	12	Spray deposits from a recycling tunnel sprayer in vineyard; effects of the forward speed and the nozzle type	Carra, Mathilde
16:10-16:30	13	Leaf surface topography affecting the dynamic impact behaviour of spray droplets	Delele, Mulugeta Admasu
16:30-16:50	14	Assessment of aerial spray deposition on banana crop based on flight conditions	Cotteux, Eric

Oral Session 3 : Air support of sprayers for three dimensional crops - Part 1			**Wed May 10**
Time	**Oral Abstract Number**	**Title**	**Presenter**
16:50-17:10	15	Lidar vs. test bench for measurement of drift as affected by sprayer type, air flow, nozzle type and density of vine canopy	Gil, Emilio
17:10-17:30	16	Characterization of the air-flow and liquid distribution of orchard sprayers	van de Zande, Jan

Thursday May 11th, 2017	
Field day	
08:00	Departure in Hasselt by bus Kattegatstraat 1, Hasselt (in front of the Holiday Inn Hotel)
09:00-12:00	Visit Proefcentrum Fruitteelt, SintTruiden
12:00-13:30	Lunch at Proefcentrum Fruitteelt, Sint-Truiden
13:30-18:30	Visit BAB Bamps, Sint-Truiden Orchard visit, Wamoss bvba, Hakendover Vineyard visit, Kluisberg, Assent
19:30-22:30	Symposium dinner at Holiday Inn, Kattegatstraat 1, Hasselt

Oral Session 3 : Air support of sprayers for three dimensional crops - Part 2			**Fri May 12**
Time	**Oral Abstract Number**	**Title**	**Presenter**
08:30-08:50	17	2D CFD simulations of the air profile of three sprayers adapted to tomato crops in greenhouse conditions	Salcedo, Ramón
08:50-09:10	18	Adjustment of vertical spray pattern of orchard sprayers with Ve.S.Pa. 2.0 application	Tamagnone, Mario

Oral Session 4 : Spray drift / Spray loses			**Fri May 12**
Time	**Oral Abstract Number**	**Title**	**Presenter**
09:10-09:30	19	Potential spray drift evaluation of airblast sprayers	Grella, Marco
09:30-09:50	20	Spray drift of a cross-flow fan sprayer with wind-dependent variable air assistance	Stallinga, Hein
09:50-10:10	21	First assessments of spray drift in poplar plantations	Marucco, Paolo
10:10-10:30		Coffee and snack break	
10:30-10:50	22	Increasing droplet size in pneumatic cannon-type nozzles to reduce spray drift	Miranda-Fuentes, Antonio
10:50-11:10	23	Spray quality, droplet velocity and spray drift potential of sprays sprayed with additives through standard and venturi nozzles	Rodrigues da Cunha, João Paulo
11:10-11:30	24	Development of a National Spray Application Work Group	Hoheisel, Gwen-Alyn
11:30-11:50	25	Perceptions on how to reduce the risk of Plant Protection Products (PPP) losses to water in fruit production. Results from the European TOPPS stakeholder survey 2016	Roettele, Manfred
12:00-13:30		Lunch	

Oral Session 5 : New technologies on spray applications			**Fri May 12**
Time	**Oral Abstract Number**	**Title**	**Presenter**
13:30-13:50	26	Measuring canopy density in orchards and vineyards	Landers, Andrew
13:50-14:10	27	Crop characterization by Lidar sensor in different French orchards: preliminary results at early stages	Douzals, Jean-Paul
14:10-14:30	28	Variable rate orchard sprayer based on Lidar sensor	Xiongkui, He

14:30-14:50	29	ICT platform for fruit growing sector in Belgium	Ruysen, Kris
14:50-15:10	30	Field testing and monitoring of newly designed airblast sprayers in traditional olive orchards	Miranda-Fuentes, Antonio
15:10-15:30		Coffee and snack break	
15:30-15:50	31	Optimization of the fogging application of biological control organisms in fruit cold stores	Dekeyser, Donald
15:50-16:10	32	How to stimulate the installation and use of on farm bioremediation systems to avoid point pollution?	Koopmans, Kim
16:10-16:30	33	The electronic measurement of spray coverage	Landers, Andrew
16:30-16:50	34	CFD modelling of spray applications in cool rooms	Delele, Mulugeta Admasu
16:50		End of Symposium	

Saturday May 13th, 2017	
Werktuigendagen SOLV Tuinbouwschool, Diestersteenweg 146, Sint-Truiden	
09:30	Departure in Hasselt by car Kattegatstraat 1, Hasselt (in front of the Holiday Inn Hotel)
10:00-18:00	Visit Open Field Fair for Fruit Growing Equipment (Werktuigendagen), Sint-Truiden

Oral Abstract 16
Characterization of the air-flow and the liquid distribution of orchard sprayers

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INTRODUCTION

In order to identify and improve the current practice of spray application in fruit crops a research programme was setup assessing air and liquid distribution of nowadays often used orchard sprayers and spray distribution in orchard trees. Potential pathways of improvement are air amount and air distribution and therefore liquid distribution as the spray is transported by the moving air. Improved spray deposition can lead to reduced use of agrochemical and therefore reduced emission to the environment while maintaining high levels of spray drift reduction and biological efficacy. In order to be able to quantify the air and liquid distribution in a 3D space together with AAMS-Salvarani (Maldegem, Belgium) a measuring platform was developed. The setup and first results of these 3D air- and liquid distribution measurement platforms are presented.

MATERIALS AND METHODS

The base part of the measuring device consists of a two-rail traverse system positioned parallel (x-axis) alongside the sprayer on which a measuring platform can move up and down and a two rail traverse system on which the traverse system can manually be positioned at distances up to 5 m from the centre (x) axis of the sprayer. At the traverse system the measuring platform can move stepwise in 10 cm steps over a range of 6 m length or in a continuous way at a set speed up and down the traverse system. The stepwise mode is used for the air-flow distribution measurements. The continuous speed is used for the liquid distribution measurements using an AAMS-Salvarani patternator with discs (4.5 m height) which is moved up and down (x-axis) through the spray fans until measuring tubes are filled for 80%. With a double sided discs distribution also multi-row orchard sprayers

Figure 1. 3-D liquid distribution setup (left) and air-flow distribution setup (right)

can be assessed.The air distribution measurement uses three ultrasonic anemometers (Gill Windmaster) which sample air speed in 3 directions (x,y,z) at 20 Hz positioned above each other at 50 cm spacing (y-axis). The combined three ultrasonic sensors can be positioned manually from 40 cm height (lowest sensor) up to 4.5 m height (highest sensor) in 10 cm steps (z-axis). Through steering and data sampling electronics and software the three sensors are moved through the air flow in 10 cm steps sampling the air flow at each x,z-axis position for 30 sec. In this way a full scan of the air flow at one side of an orchard sprayer can be made. Measurements are repeated for the y distances 1.00 m, 1.25 m, 1.50 m, 2.0 m,

3.0 m and 4.5 m from the centre axis of the sprayer. Results can be presented as a grid (matrix) presentation showing mean vector air speed per grid cell, as interpolated speed distribution charts per y-distance, as speed vector distributions in the x,y or y,z planes.

RESULTS AND DISCUSSION

The average liquid distribution at the left and right hand side of a crossflow fan sprayer is presented in figure 2. Showing that liquid distribution over height is different for both sides and the maximum liquid deposit is climbing with height at further distances.

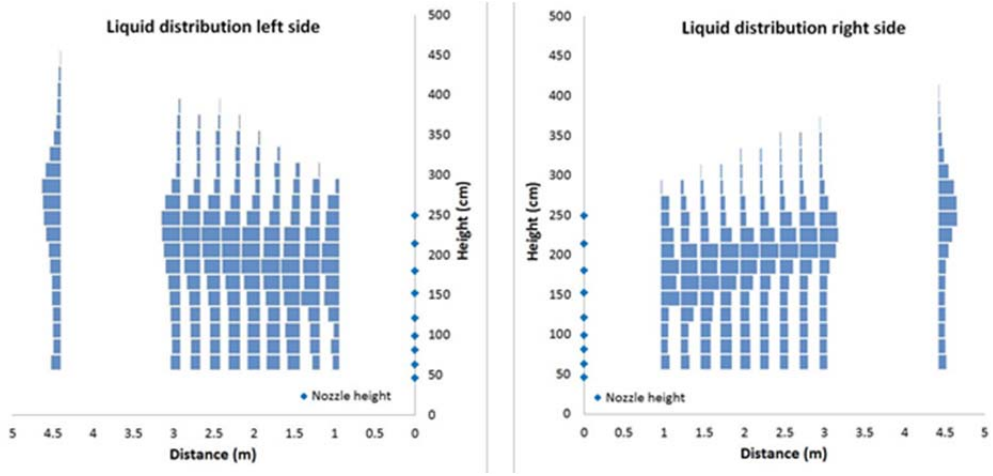

Figure 2. Liquid distribution in the x,z plane of the left and right handside of a cross-flow fan sprayer

The air distribution, at the right hand side of a cross-flow fan sprayer (figure 3) shows a gap in air speed at 2.0-2.5 m height which widens at larger y-distances from the sprayer. The gap however also rises to higher heights (z) up to 2.5-3.0 m at 3 m y-distance and 3.5 m at 4.5 m y-distance.

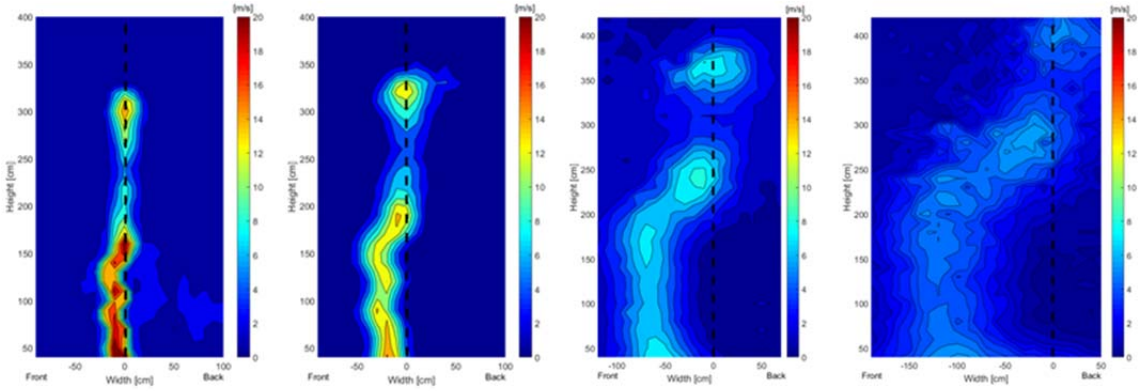

Figure 3. Air distribution (m/s) in x,z plane at 1.0 m, 1.5 m, 3.0 m and 4.5 m from the centre axis (x,z plane) of a cross-flow fan orchard sprayer (right hand side)