16th Workshop on Spray Application and Precision Technology in Fruit Growing
Programme and Abstracts

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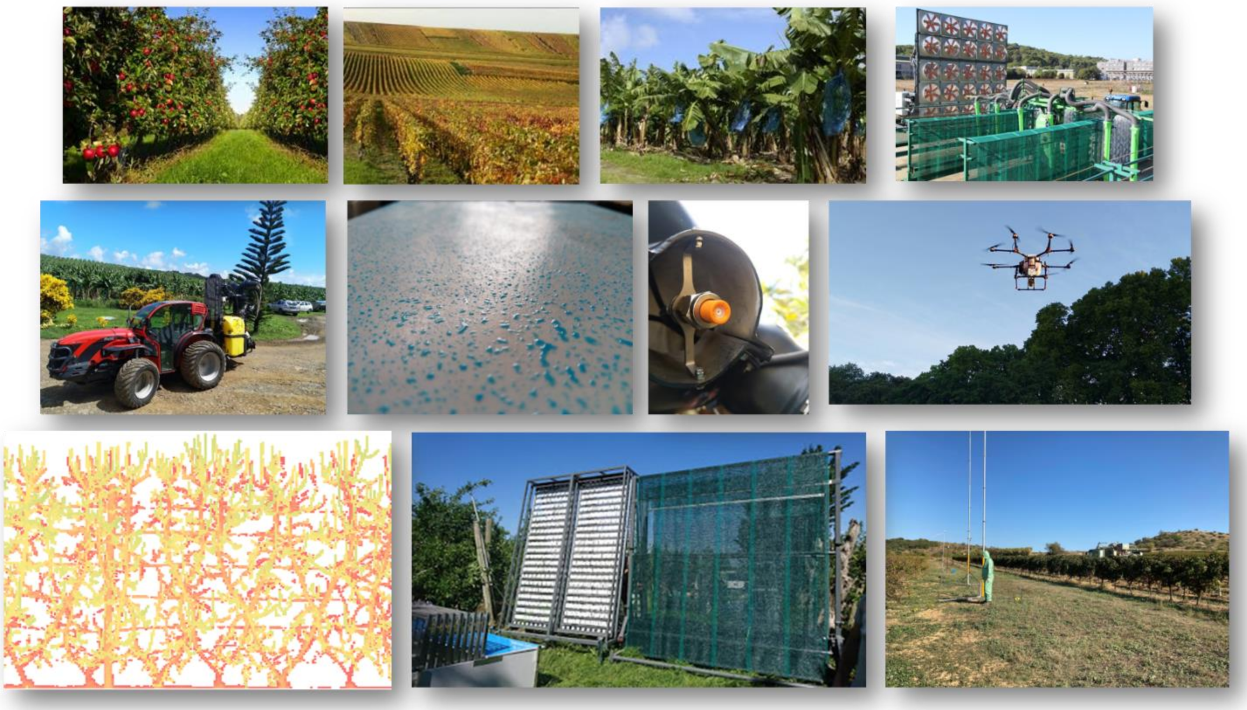
16th Workshop on Spray Application and Precision Technology in Fruit Growing

BOOK OF ABSTRACTS



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4.7 ADDI Spray Drift: A spray drift model for vine sprayers

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INTRODUCTION

Spray drift is an important topic concerning environment and health. Spray drift can be measured in vineyards (Herbst et al., 2023) or in semi-field conditions (Grella et al., 2021), but these experiments present a laborious task and are subjected to the weather conditions. In parallel, many attempts were taken on either empirical or mechanistic modelling (Djouhri et al., 2023) with the purpose of identifying and quantifying the effect of the key parameters on off-target deposition on the ground, in the air or on bystanders. On one hand, empirical models are based on deposition measurements but these have a limited capacity to extrapolated results from untested settings. On the other hand, mechanistic models offer sensitivity to parameters such as droplet size, atmospheric conditions, wind speed and direction (transport phase) but these still show limitation in the consideration of the emission phase: droplets velocity and direction, droplet evaporation, droplet interception, etc.

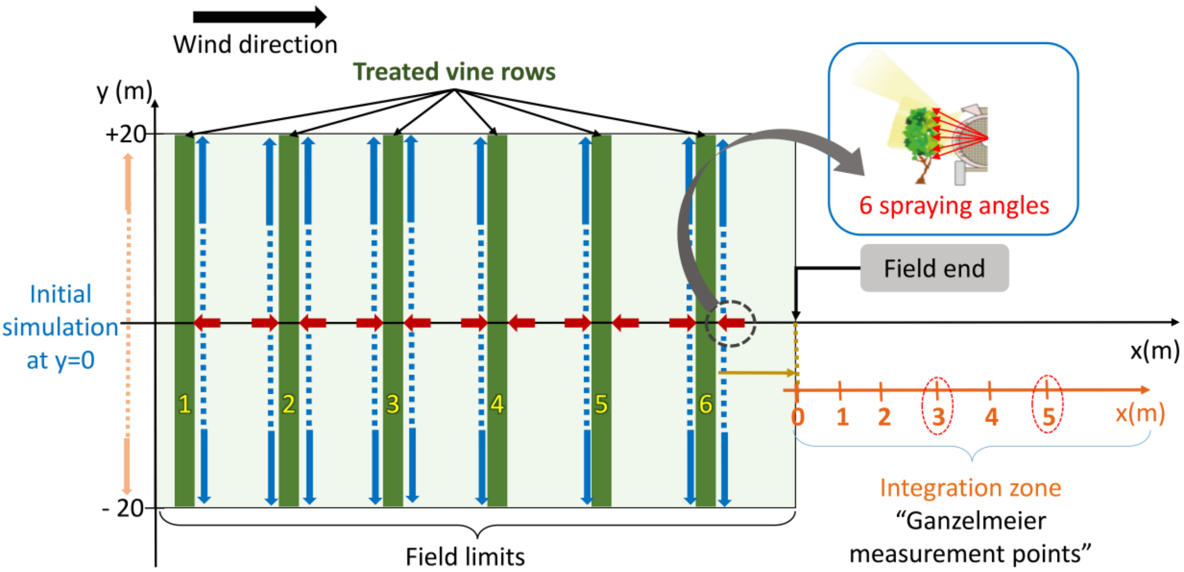

Fig. 1. Field scenario considered for modelling.

MATERIALS AND METHODS

The ADDI-Spray Drift model was developed to predict sedimentation and airborne spray drift at different distances from a vineyard. Based on a collaboration between three INRAE laboratories, this model also predicts infield soil deposition and canopy interception. The ADDI-Spray Drift is a 3D model, based on a random walk approach where inputs correspond to droplet and air emission profiles, but also taking into account droplet evaporation, atmospheric stability status, interactions between canopy and atmospheric turbulences, ground deposition and canopy interception.

Those parameters were evaluated for different sprayer locations (e.g.in the middle of the field or close to field boundary) as well as in terms of interaction between them (Fig. 1). Several spraying techniques were compared, such as pneumatic arch, axial fan or face-to-face vertical booms under different atmospheric conditions and active substance concentration.

RESULTS AND DISCUSSION

Many results were obtained from the different scenarios and some of them can be related to existing data. For this purpose, the Ganzelmeier et al. (1995) sedimentary spray drift data obtained in vineyard conditions were used for comparison with the modelling of an airblast sprayer. The prediction of sedimentary spray drift reduction along with the downwind distance was found satisfactory with less than 1% deviation at medium-range distances, and a maximum deviation reached 2.56% at shorter distances (Djouhri et al., 2023). According to the sensitivity analysis, the model appeared much more sensitive to spraying conditions, especially droplet ejection velocities that are not often easy to measure in practice.

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