Spray deposits from a recycling tunnel sprayer in vineyard:
*Effects of the forward speed and the nozzle type*

Suprofruit 2017, Hasselt, 2017-05-10
Introduction

French Ecophyto national action Plan

Objective: reduce the use of plant protection products (PPP) -25% in 2020 and -50% in 2025.

- Use efficient spray application techniques: a concrete way to reach this objective for vine crops

Materials and Methods

Results

Conclusion
Introduction

- However tunnel sprayers are known to be time-consuming compared to more usual sprayer:
  - Only two-rows tunnel sprayer
  - Important cleaning time
  - Maneuvering time during half turn

  Significant economical obstacles for their adoption in vineyards

- **Hypothesis:** increase forward speed could partly remedied to this situation

- **Questions:**
  - Could spraying quality be maintained while increasing forward speed ?
  - What is the effect of nozzle type on spray deposit according to forward speed ?
  - What is the effect of nozzle type on spray deposit distribution (upperside/underside of leaves) ?
Experimental site

- Mediterranean french vineyard

  - Caladoc variety with high vigor: « worse case »
    - height: 1.38m
    - thickness: 0.67m
    - low porosity
    - BBCH79 growth stage (bunch closure)

- Recycling tunnel sprayer: 
  *Arcobaleno* model from Bertoni manufacturer
Tested parameters

- **3 forward speeds:**
  - 5.3km.h$^{-1}$ (usual/reference forward speed)
  - 7.8km.h$^{-1}$
  - 10.4km.h$^{-1}$

- **Nozzle types** (size 01 – orange color code):
  - Air induction flat fan nozzle (Lechler IDK model)
  - Classic hollow cone nozzle (Teejet TXA model)

- Applications made using a pressure of 5bars, 6 nozzles opened on each side
Spray deposit measurement

- Using a tracer Tartrazine E102
- Methodology ISO22522:2007
- Measurement of deposit per unit area (ng/dm² for 1g/ha applied) on a grid perpendicular to the row
- 1172 collectors individually analysed
- Distribution evaluated by splitting grid in 2 compartments: inside canopy and canopy edge
- Leaf Upperside/Underside deposits measurements
- 4 replicates
Results: no forward speed effect on mean spray deposit

- Increase in forward speed did not cause a decrease in foliar spray mean deposits

- For each forward speed: mean spray deposit tended to be higher with air induction nozzle

![Graph showing mean spray deposit vs. forward speed.](image)
Results: spray deposits distribution

- Increasing forward speed had no bad effect on spray deposition profile
- Inside compartment: deposits were higher when using air induction nozzle compared to classic hollow cone nozzle

<table>
<thead>
<tr>
<th>Nozzle</th>
<th>Lechler IDK</th>
<th>Teejet TXA</th>
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<td>5.3 km/h</td>
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Complementary result: upperside/underside of leaves deposits ratio according to nozzle

- Boxplot: no nozzle type effect on leaf upperside/underside deposit ratio

  Air induction nozzle deposit on underside of leaf were equivalent to classic hollow cone nozzle

Forward speed: 5.3km.h⁻¹
Conclusion

- Deposits on underside of leaves were not affected by nozzle type

- Air induction nozzles offered equivalent or higher spray deposition quality (mean and distribution) compared to classic hollow cone

- Forward speed could be increased to reduce work time without lowering deposits and their homogeneity within the canopy

Next steps:

- Recovery rate and biological assessment with recycling tunnel sprayers according to nozzle type and forward speed
Thanks for your attention

*Recycling tunnel sprayers exhibition in Languedoc-Roussillon – October 2016*

Acknowledgments: Domaine du Chapitre