Spray deposits from a recycling tunnel sprayer in vineyard:

Effects of the forward speed and the nozzle type

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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

- Recycling tunnel sprayers:
  - reduce PPP inputs by recycling
  - decrease drift

A recycling tunnel sprayer in a vineyard

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

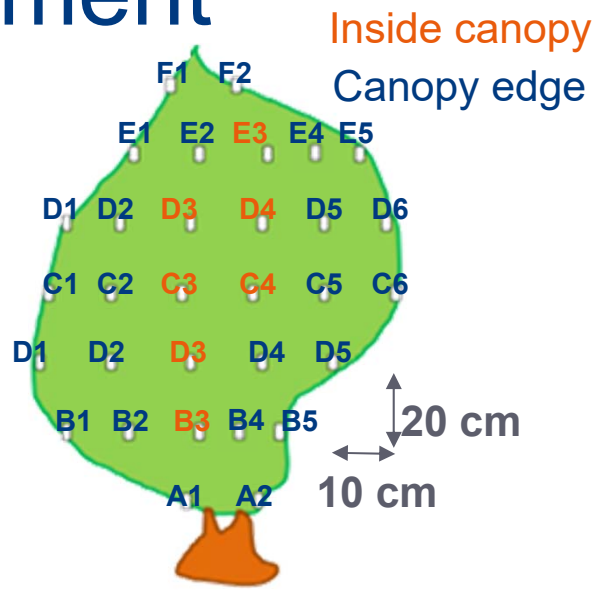
- 3 forward speeds:
  - 5.3km.h^{-1} (usual/reference forward speed)
  - 7.8km.h^{-1}
  - 10.4km.h^{-1}

- 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

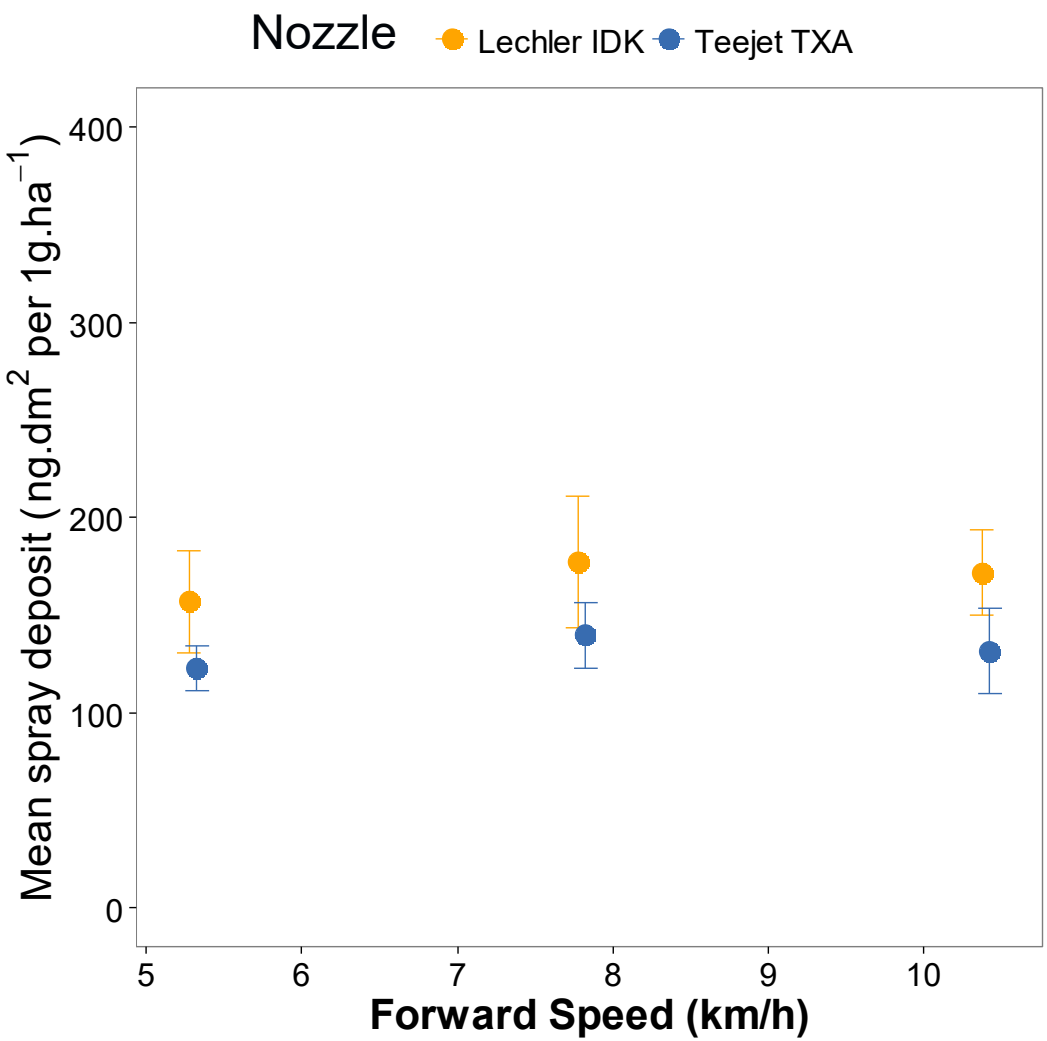


Grid used for deposit measurement sampling: one collector per cell

PVC collectors positionned on leaves

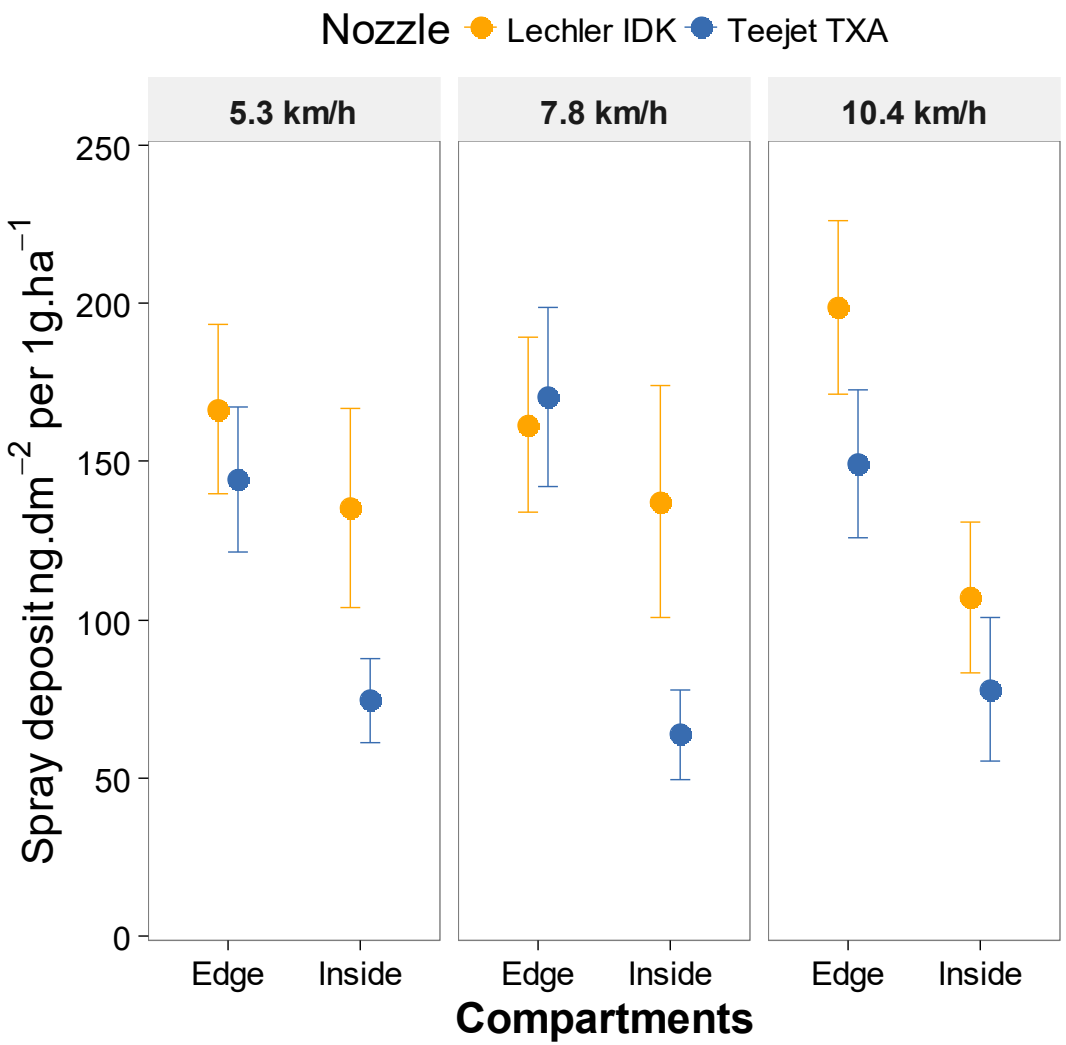
Results: no forward speed effect on mean spray deposit

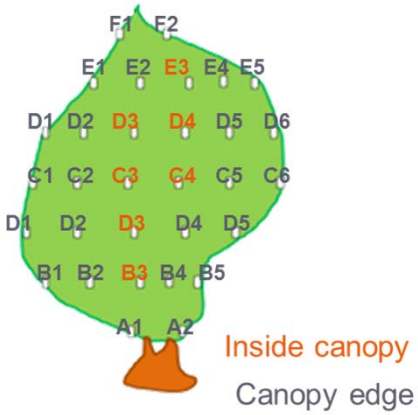
- Increase in forward speed did not cause a decrease in foliar spray mean deposits
- For each forward speed: mean spray deposit tended to be higher with air induction nozzle



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

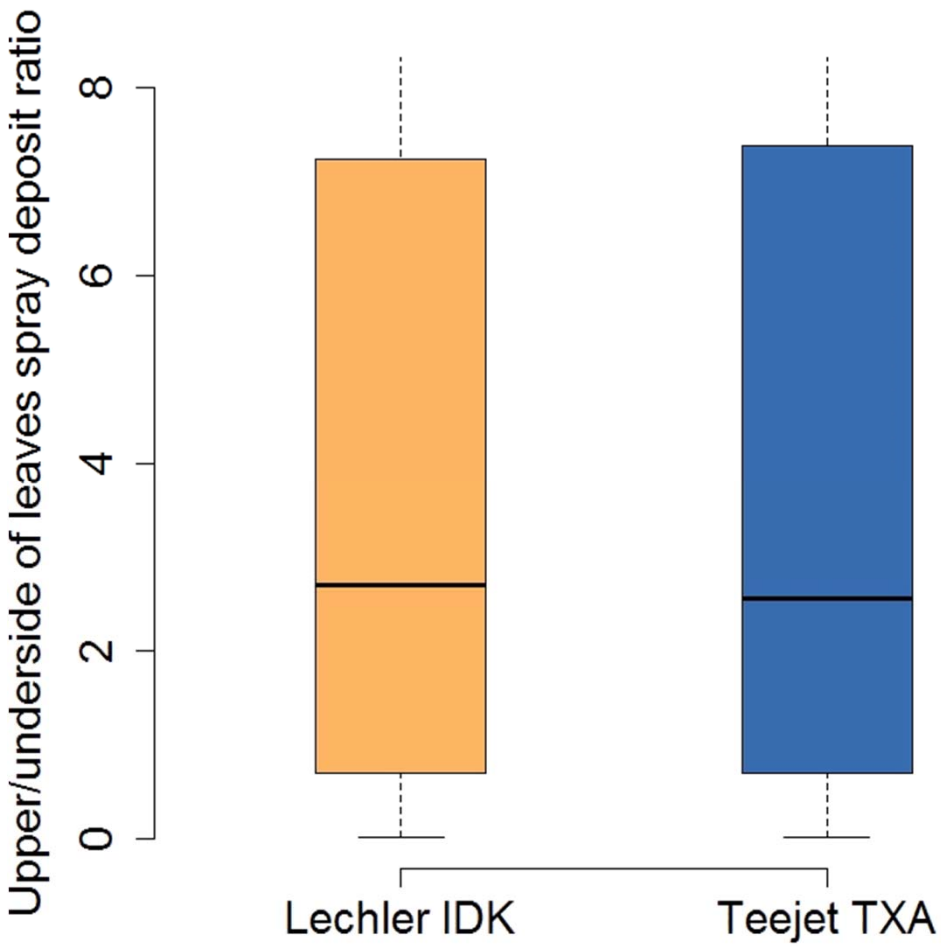




Complementary result: upperside/underside of leaves deposits ratio according to nozzle

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

→ Air induction nozzle deposit on underside of leave 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

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