IMPROVEMENTS OF VERTICAL PATTERNATORS

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INTRODUCTION

Vertical patternator is used for the adjustment of the spray distribution profile of air-assisted sprayers.

See also SPISE advice on bush and tree crop adjustment

MAIN LIMITS OF THE MARKET AVAILABLE PATTERNATOR MODELS

A - not suitable for the adjustment of sprayers used in large canopy plants expanded in volume (e.g. hazelnut plants)

B - Not suitable for use with tunnel/multi-row sprayers due to the collectors facing only one spraying side.

TEST CARRIED OUT

With the aim to provide solutions to the mentioned problem, experimental tests were carried out with:

A - a DISAFA modified patternator with the collectors inclined of 45° to the sprayer direction from an height of 1.5 m.

B - a new AAMS - Salvarani version of patternator with two opposite collector arrays.

The patternators performance has been evaluated (no international standard methodologies are at present available) in terms of:

1. Spray recovery capacity and its reproducibility;

2. Spray profile reproducibility.
**TEST CARRIED OUT**

1. **Spray recovery capacity (RC)**
   Has been determined:
   \[ RC = \left( \sum_{i=1}^{n} \frac{a_i}{s} \right) / (Q \times t) \]
   Where:
   - \( a_i \) is the amount of liquid collected by each single plate (ml)
   - \( s \) is the number of passes made by the patternator in front of the spraying unit (n°)
   - \( Q \) is the sprayer flow rate (ml s\(^{-1}\))
   - \( t \) is the spraying time on the test bench collectors (s)

2. **Spray profile reproducibility**
   Has been determined through the calculation of:
   \[ SPI = \sum_{i=1}^{n} (\text{max} - \text{min}) \]
   The lower is SPI value, the more similar the spray profiles are

**Main technical characteristics of DiSAFA modified Patternator (A)**

- Discrete stainless-steel spray collectors (square plates of 200 x 200 mm size)
- Single collector surface: 368 cm\(^2\)
- Spray collecting resolution: 200 mm

**Reproducibility of the recovery capacity results**

For each setting, the coefficient of variation (CV) calculated between the values obtained in three test replicates was considered.

**RESULTS**

(Tests made with patternator A)

**Spray recovery capacity (RC)**

The recovery capacity resulted comparable to data obtained in previous tests (Pergher et al., 2002)

Inclined patternator gave a reduction of ~30% of RC

**Variability (CV)**

<3% for all examined thesis.

**Spray profile shape**

The spray profile obtained with the two positions of the patternator collectors resulted featured by similar shape.

**TEST CARRIED OUT with patternator (A)**

- Tangential fan with air velocity of 10 m/s in correspondence of the collectors.
- Nozzles type: TXB 8001 and 8004
- Pressure: 1.0 MPa.
- Distance between nozzles and patternator: 750 mm.
- Relative position patternator/tangential fan: 2.
- Total settings evaluated: 4 (3 replications for each setting).

**RESULTS**

(Tests made with patternator A)
RESULTS (Tests made with patternator A)

SPRAY PROFILE REPRODUCIBILITY (SPI)

Just inclining a part of the patternator collectors it will be possible to provide useful information for the proper adjustment of the sprayer used in large volume canopy even if the recovery capacity decreased by 30% with respect to the collectors placed in vertical position.

TEST CARRIED OUT - PATTERNATOR B

MAIN TECHNICAL CHARACTERISTICS OF THE AAMS-SALVARANI NEW PATTERNATOR B

Two opposite walls, each consisting of 10 collectors

TEST carried out with patternator B

Double side collector “patternator B”

TEST CARRIED OUT - PATTERNATOR B

- Tunnel sprayer
- Nozzles type: TXB 8001 and 8004
- Pressure: 1.0 MPa.
- Distance between nozzles and the patternator surface: 500 mm
- Air fan settings: 4.9 and 8.4 m/s (in correspondence of the patternator collectors).
- Total settings evaluated: 4 (3 replications for each setting).

RESULTS - patternator B

RECOVERY CAPACITY

<table>
<thead>
<tr>
<th>Air velocity (m/s)</th>
<th>4.9</th>
<th>8.4</th>
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</thead>
<tbody>
<tr>
<td>TXB8001</td>
<td>61.8%</td>
<td>63.7%</td>
</tr>
<tr>
<td>TXB8004</td>
<td>65.1%</td>
<td>66.5%</td>
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</table>

Few influence of air velocity and nozzles size on recovery capacity.

VARIABILITY (CV)

4-6% (probably due to the air turbulence inside the tunnel)
RESULTS - patternator B

SPRAY PROFILE REPRODUCIBILITY (SPI index)

Air velocity (m s⁻¹)

SPI Indices

TXB8001
TXB8004

SPRAY PROFILE SHAPE

TXB8001 nozzle

RESULTS - patternator B

SPRAY PROFILE SHAPE

TXB8004 nozzle

CONCLUSIONS - patternator B

- Less time for tunnel sprayer adjustment with double patternator

- Necessity to realize a “modular” double surface patternator in order to easy adapt it to the different heights of tunnel/multi-row sprayers

Necessity to increase the length of the movement of the patternator to be able to collect all liquid (some tunnel sprayers have two separated air flows)

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