



Generalitat de Catalunya  
**Departament d'Agricultura,  
Ramaderia, Pesca i Alimentació**

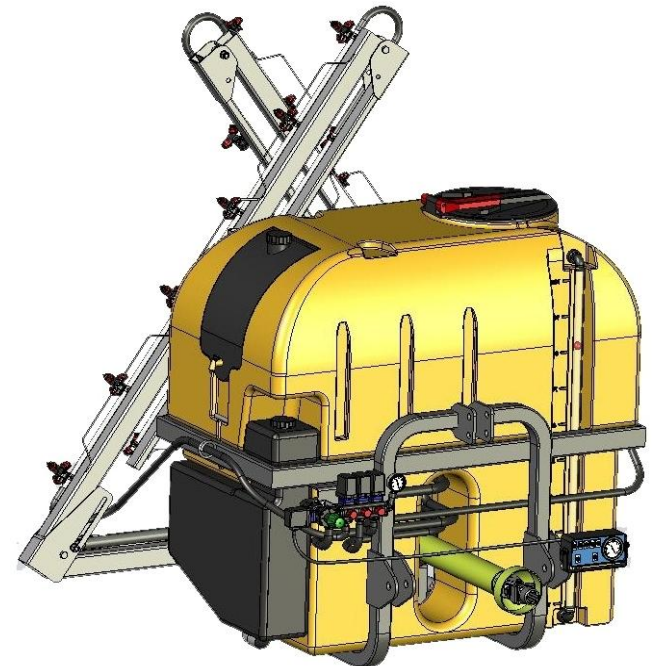
# **Assessment of the traverse distribution measurement in the inspection of horizontal boom sprayers**

**F. Solanelles, F. Camp, A. Fillat, F. Gracia**  
*Centre de Mecanització Agrària  
Rovira Roure, 191. Lleida*

# Introduction

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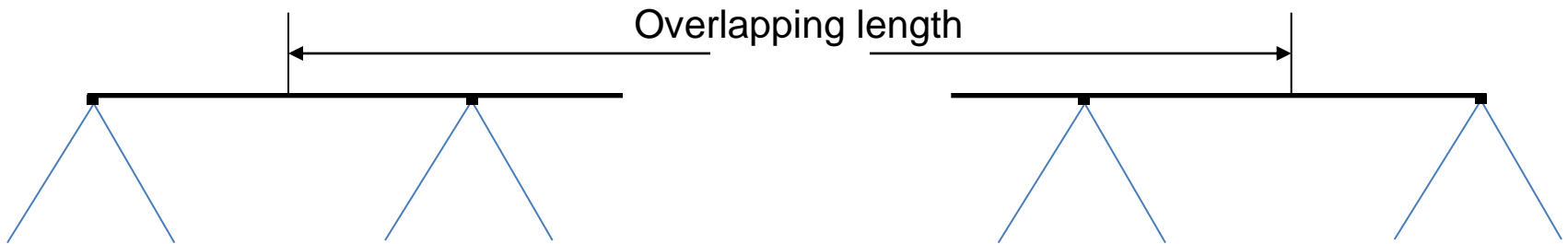
- According EN ISO 16122-2:2015, there are two methodologies for the measurement of the uniformity of the traverse distribution in spray booms
  - 1. Nozzle flow rate and pressure distribution measurements along the spray boom
  - 2. Measurement of the spray distribution uniformity on a horizontal bench



# Introduction

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- A new overlapping length for the measurement of the spray distribution uniformity has been defined in the EN ISO16122:2015



# Introduction

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- Mobile electronic benches, which scan the spray distribution along the boom, working in steps, are often used by inspection workshops



- Design requirements for these benches are established in EN ISO 16122-2:2015



# Introduction

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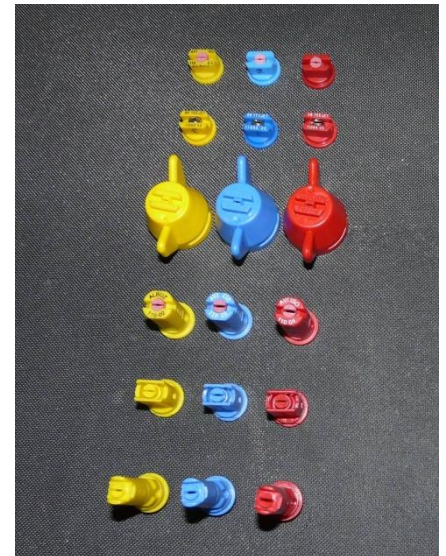
## ➤ Objectives

- Assessment of the inspection results obtained with the two standardized methodologies for the measurement of the spray distribution uniformity
- Assessment of the effect of the new overlapping length, as it is defined in EN ISO 16122-2:2015
- Assessment of the accuracy of the mobile benches for the measurement of traverse distribution



Manufacturer	Nozzle model and size	Pressure (bar)
Albuz	API 110 02, 03, 04	2, 3, 4
	<b>AVI 110 02, 03, 04</b>	3, 5, 7
Teejet	XR 110 02, 03, 04 VS	2, 3, 4
Hardi	F 110 02, 03, 04	2, 3, 4
	<b>INJET 02, 03, 04</b>	3, 6, 8
Lechler	<b>IDK 120 02, 03, 04</b>	2, 4, 6

Working pressures for the different flat fan nozzle models used in the tests







Horizontal patternator for the measurement of the **traverse distribution** uniformity

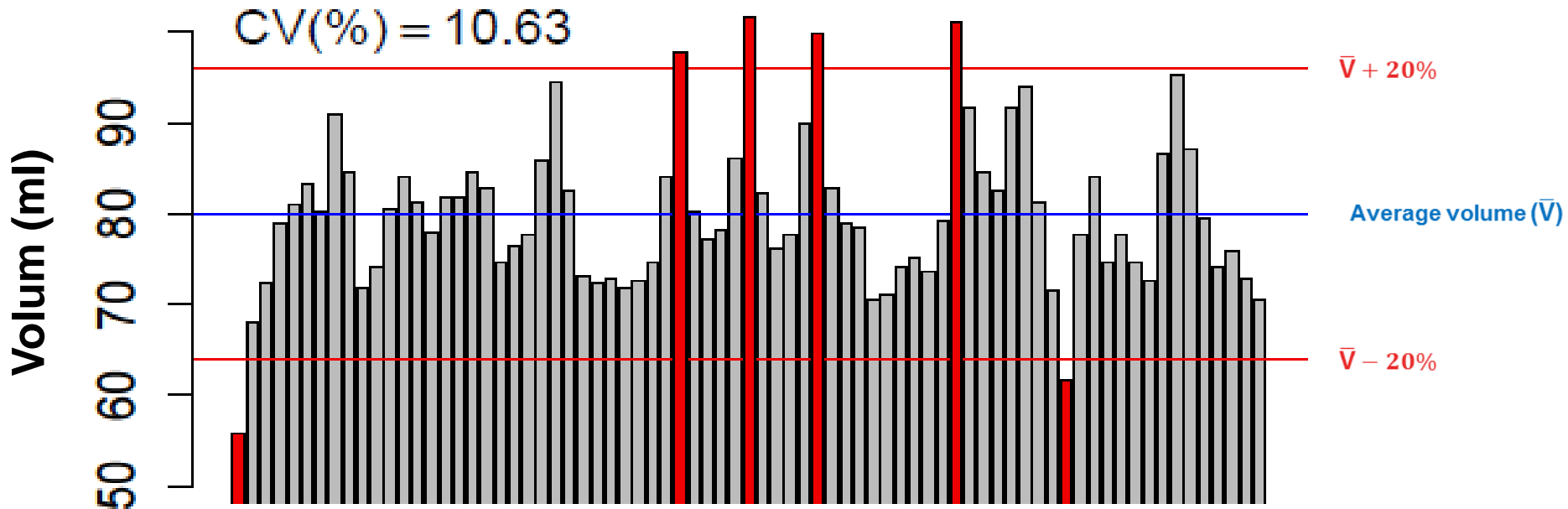




Mobile spray scanner for the measurement of the **traverse distribution** of a horizontal boom







- Requirements: the coefficient of variation of the volumes collected by all the bench grooves along the overlapping length of the boom has to be lower than 10%. Besides, all the measured volume values have to be within the  $\pm 20\%$  interval around the average volume

# Methodology

# Measuring equipment

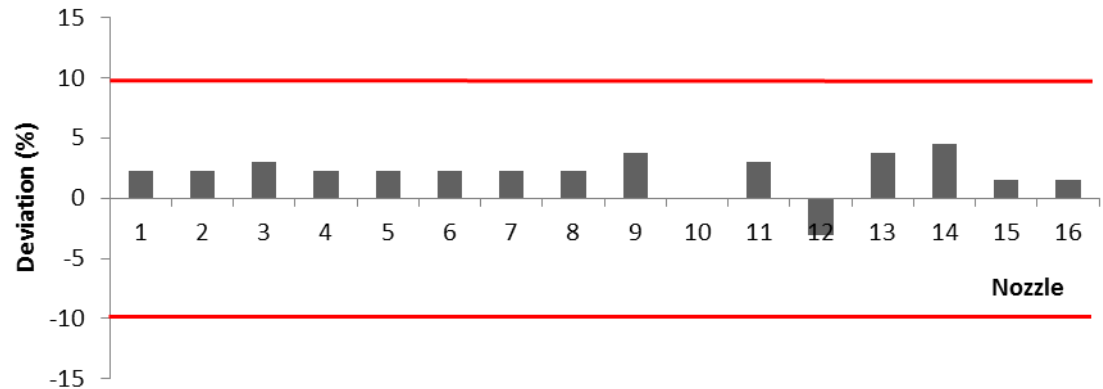


Nozzle flow rate bench



# Methodology

# Requirements



- Requirements: the deviation between the measured and the nominal flow rate has to be lower than  $\pm 10\%$  for each nozzle and the pressure drop in the sprayer boom has to be lower than 10% of the working pressure

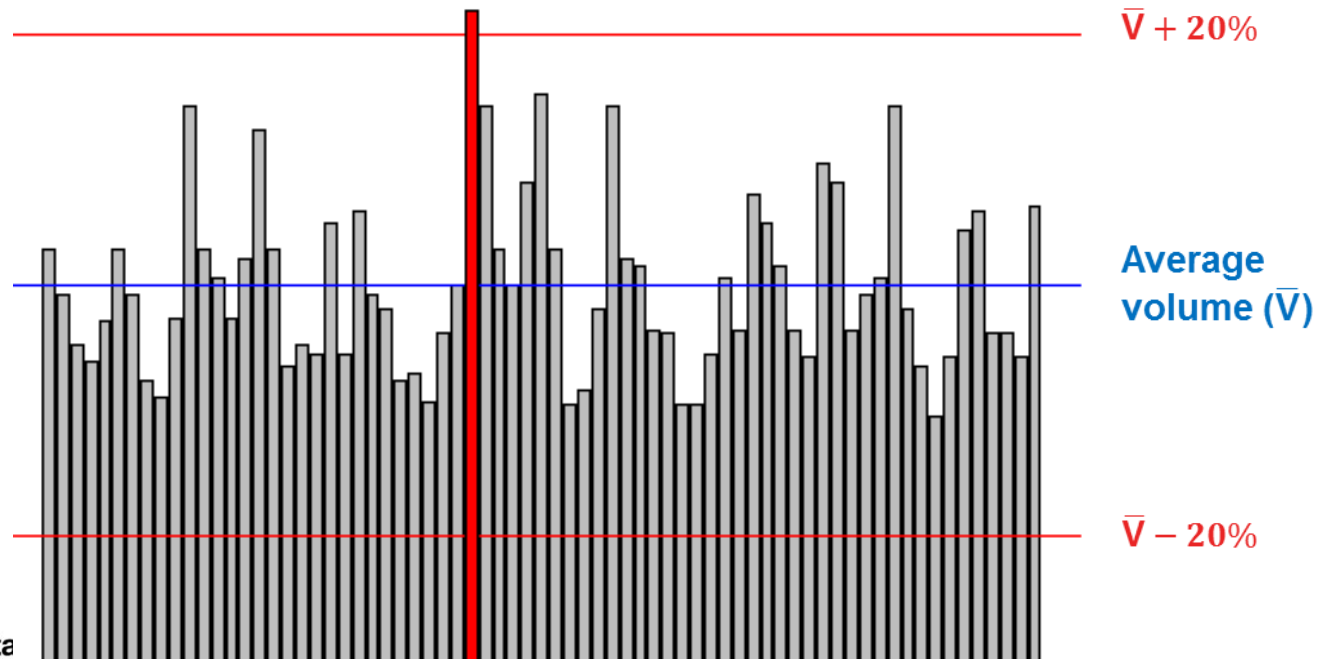
- A clear difference is seen between the inspection results obtained with the two inspection methodologies
  - If the traverse distribution was determined by the measurement of the nozzle flow rate and the pressure drop in the boom, **in all the cases** the results of the inspection were favourable
  - if the traverse distribution was measured by the patternator, the values of the coefficient of variation and of the deviation from the mean volume make that the inspection results **were not** always favourable



## Results and discussion Coefficient of variation vs. volume deviation

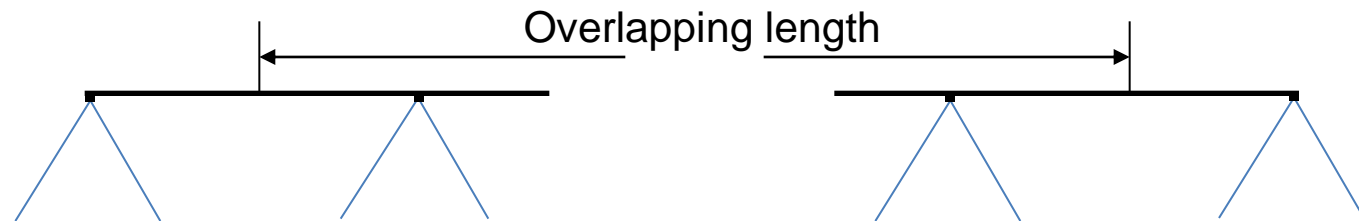
- It is noticed that the volume deviation (D) requirement for the traverse distribution is more difficult to meet than the coefficient of variation (CV) requirement
- In some spray distribution measurements, the value of the CV is less than 10%, but one or more measured volumes deviate more than  $\pm 20\%$  from the average value.

$$CV(\%) = 9.37$$





- If only CV values are taken into account, no significant differences are found between the inspection results obtained according the old or the new inspection standard
- Nevertheless, if D values are considered, the number of favorable inspection results significantly increases if the overlapping length is defined according to the new inspection standard.



# Results and discussion

## Working conditions

Factor	Kind of nozzle		Working height (cm)		Nozzle size			Pressure (bar)		
	Standard	Air-injection	50	60	02 (yellow)	03 (blue)	04 (red)	Low	Medium	High
Fav. (16122)	100a	108a	106a	102a	64a	72a	72a	70a	70a	68a
Number of total measurements	108	108	108	108	72	72	72	72	72	72

Number of favourable inspection results according to the coefficient of variation (**CV**) requirement when measurements are carried out following EN ISO 16122-2:2015

# Results and discussion

## Working conditions

Factor	Kind of nozzle		Working height (cm)		Nozzle size			Pressure (bar)		
	Standard	Air-injection	50	60	02 (yellow)	03 (blue)	04 (red)	Low	Medium	High
Fav. (16122)	65a	96b	83a	78a	33a	62b	66b	57a	52a	52a
Number of total measurements	108	108	108	108	72	72	72	72	72	72

Number of favourable inspection results according to the deviation from the mean volume (D) requirement when measurements are carried out following EN ISO 16122-2:2015

# Results and discussion

## Working conditions

Factor	Kind of nozzle		Working height (cm)		Nozzle size			Pressure (bar)		
	Standard	Air-injection	50	60	02 (yellow)	03 (blue)	04 (red)	Low	Medium	High
Fav. (16122)	65a	<b>96b</b>	83a	78a	33a	<b>62b</b>	<b>66b</b>	<b>57a</b>	<b>52a</b>	<b>52a</b>
Number of total measurements	108	108	108	108	72	72	72	72	72	72

Number of favourable inspection results according to the deviation from the mean volume (D) requirement when measurements are carried out following EN ISO 16122-2:2015

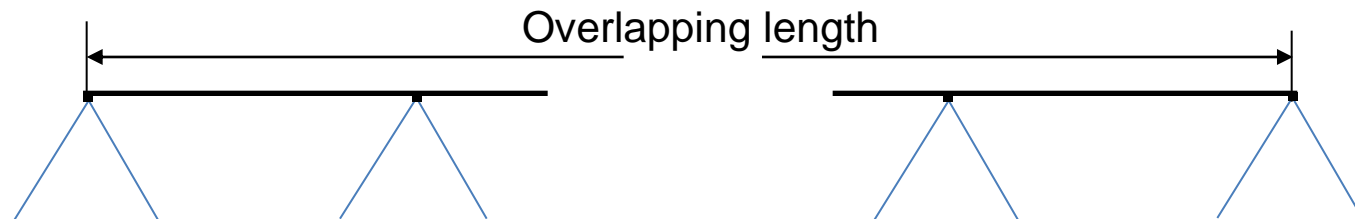


# Results and discussion

## Working conditions

Factor	Kind of nozzle		Working height (cm)		Nozzle size			Pressure (bar)		
	Standard	Air-injection	50	60	02 (yellow)	03 (blue)	04 (red)	Low	Medium	High
Fav. (13790)	43a	84b	77a	50b	20a	53b	54b	47a	42a	38a
Number of total measurements	108	108	108	108	72	72	72	72	72	72

Number of favourable inspection results according to the deviation from the mean volume (D) requirement when measurements are carried out following **EN 13790-1:2004**





# Results and discussion

## Spray scanner vs. patternator

	Kind of nozzle		Nozzle size			Mean
	Standard	Air-injection	02 (yellow)	03 (blue)	04 (red)	
Patternator	6,6	4,6	6,9	5,5	4,5	5,6
Spray scanner	7,0	5,4	6,9	6,3	5,4	6,2



The CV values obtained with the mobile spray scanner are slightly higher than the values obtained with the patternator but the difference is non-significant

# Results and discussion

## Spray scanner vs. patternator

	Kind of nozzle		Nozzle size			Mean
	Standard	Air-injection	02 (yellow)	03 (blue)	04 (red)	
Fav. (patternator)	12	16	5a	11	12	28
Fav. (spray scanner)	12	18	10b	10	10	30
Total number of measurements	18	18	12	12	12	36

The number of favourable results is higher when measurements are carried out with the sprayer scanner.

Significantly higher number of favourable results were found in the smallest size nozzles



# Conclusions

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- The standard requirements for the spray distribution uniformity are more difficult to meet when measurements are carried out with a horizontal patternator (fixed or mobile)
- The requirement based on the deviation from the mean volume is more restrictive than the requirement based on the coefficient of variation
- The nozzle working pressure does not influence the result of the inspection, as long as it is kept within the working range for each kind or nozzle
- The results of this work should be taken into account in the inspection of horizontal boom sprayers and could also provide useful information when a revision of the inspection standard is made.





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