Workshop (Lecture 4).
Calibration process. Different tools and methods for boom and orchard sprayers

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- Boom sprayers calibration
- Orchard sprayers calibration

- **Use of different tools for calibration process.**

For this workshop it will be available different tools to help in the calibration process: the Calibration Disk (Figures 1 and 2) and Calibra® software (Figure 3). Both are available at: http://uma.deab.upc.edu/developments-and-tools

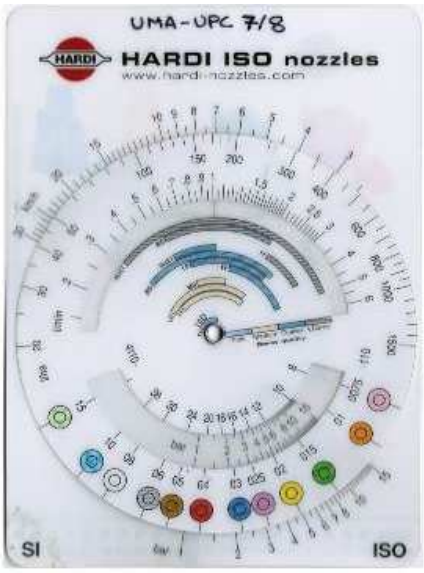


Figure 1. Calibration disk for boom sprayers.

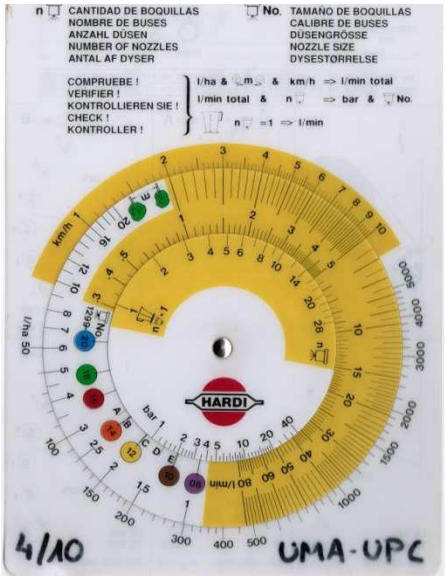


Figure 2. Calibration disk for orchard sprayers.

Calibra computer software is a tool for helping to adjust hydropneumatic sprayers. It is developed in Java® language and allows to choose among a widely types of nozzles, including nozzle colour code according ISO 10625. From the parameters chose by the user (volume rate, driving speed and working width), the program calculates the required nozzle pressure considering the technical criteria of selecting the pressure according to droplets size produced.

Figure 3. Calibra software.

- **Orchard sprayers**

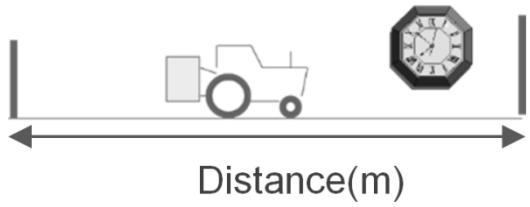
1. Sprayer description.

Tractor	**Sprayer description**
Brand:	Brand:
Model:	Model:
Weather conditions	Tank nominal capacity (L):
Temperature(ºC):	Number of nozzles:
Humidity (%):	Nozzle type:
Wind speed (m/s):	Working width (m):
Wind direction (º):	Pump type:
	Pump nominal flow rate (L/min):

2. Working parameters.

	Defined parameters				Calculated or determined parameters				
Treatment	Forward speed *Km/h*	Application Volume *L/Ha*	Air flow *m^3/h*	Droplet size *µm*	Gear/Group Tractor	Engine speed *r/min*	Nozzles	Fan gear	Pressure *Bar*
1									
2									

3. Forward speed calculation.



$$Forward\ Speed\left(Km/h\right) = \frac{Distance\ (m)}{Time\ (s)} * 3.6$$

$$Forward\ Speed\left(Km/h\right) = \frac{\_\_\_\_\_\ m}{\_\_\_\_\_\ s} * 3.6$$

4. Flow rate calculation.

Q: Total flow rate (L/min)
q: individual nozzle flow rate (L/min)
V: Application volume (L/Ha)
S: Forward speed (Km/h)
a: Working width (m)

$$Q(L/min) = \frac{V\ (L/Ha) * S\ (Km/h) * a(m)}{600}$$

$$Q(L/min) = \frac{(L/Ha) * \quad (Km/h) * \quad (m)}{600}$$

$$q(L/min) = \frac{Q(L/m)}{Number\ of\ nozzles}$$

$$q(L/min) = \frac{\qquad (L/m)}{}$$

5. Nozzles and working pressure.

Nozzle

Brand:
Model:
Working pressure: Bar
Flow rate: q: L/min

Nozzle	L/min	Nozzle	L/min	Nozzle	L/min
1		11		21	
2		12		22	
3		13		23	
4		14		24	
5		15		25	
6		16		26	
7		17		27	
8		18		28	
9		19		29	
10		20		30	

Q_{TOTAL}: _____L/min

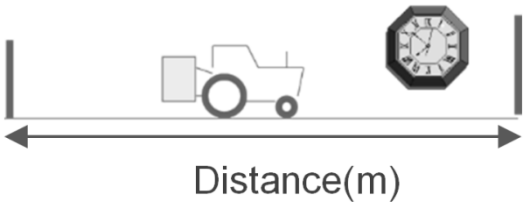
Admitted range of flow rate:

Q_{upper}= q nominal *1.1 =_____L/min

Q_{lower}= q nominal *0.9 =_____L/min

- **Boom sprayer**

6. Sprayer description.



Tractor	**Sprayer description**
Brand:	Brand:
Model:	Model:
Weather conditions	Tank nominal capacity (L):
Temperature(ºC):	Number of nozzles:
Humidity (%):	Nozzle type:
Wind speed (m/s):	Working width (m):
Wind direction (º):	Pump type:
	Pump nominal flow rate (L/min):

7. Working parameters.

	Defined parameters				Calculated or determined parameters				
Treatment	Forward speed *Km/h*	Application Volume *L/Ha*	Air flow *m^3/h*	Droplet size *µm*	Gear/Group Tractor	Engine speed *r/min*	Nozzles	Fan gear	Pressure *Bar*
1									
2									

8. Forward speed calculation.

$$Forward\ Speed\ \left(Km/h\right) = \frac{Distance\ (m)}{Time\ (s)} * 3.6$$

$$Forward\ Speed\ \left(Km/h\right) = \frac{m}{s} * 3.6$$

9. Flow rate calculation.

Q: Total flow rate (L/min)
q: individual nozzle flow rate (L/min)
V: Application volume (L/Ha)
S: Forward speed (Km/h)
a: Working width (m)

$$Q(L/min) = \frac{V\ (L/Ha) * S\ (Km/h) * a(m)}{600}$$

$$Q(L/min) = \frac{(L/Ha) * \quad (Km/h) * \quad (m)}{600}$$

$$q(L/min) = \frac{Q(L/m)}{Number\ of\ nozzles}$$

$$q(L/min) = \frac{\qquad (L/m)}{}$$

10. Nozzles and working pressure.

Nozzle

Brand:
Model:
Working pressure: Bar
Flow rate: q: L/min

Nozzle	L/min	Nozzle	L/min	Nozzle	L/min
1		11		21	
2		12		22	
3		13		23	
4		14		24	
5		15		25	
6		16		26	
7		17		27	
8		18		28	
9		19		29	
10		20		30	

Q_{TOTAL}: _____L/min

Admitted range of flow rate:

Q_{upper}= q nominal *1.1 =_____L/min

Q_{lower}= q nominal *0.9 =_____L/min

11. Evaluation of the application evaluation using WSP (additionally)