

Agricultural Machinery

Practical

2nd Stage

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Lecture 6



Plant Protection Equipments

Sprayers & Dusters

Sprayers

Sprayer is a machine to apply fluids in the form of droplets. Sprayer is used for the following purpose.

- * Application of herbicides to remove weeds.
- * Application of fungicides to minimize fungus diseases.
- * Application of insecticides to control insect pests.
- * Application of micro nutrients on the plants.



The main function of sprayer are

- * To break the liquid droplets of effective size.
- * To distribute them uniformly over the plants.
- * To regulate the amount of liquid to avoid excessive application.

Types of Sprayers

1. Knapsack Sprayers.
2. Foot Sprayer / Pedal Pump Sprayers.
3. Traction Pneumatic Sprayer.
4. Aerial sprayers.
5. Boom & Boomless sprayers.



Knapsack Sprayers



Foot Sprayers



Traction Pneumatic Sprayer



Aerial sprayers



A Simple Method To Calibrate Sprayers (Boom & Boomless)

Before you can accurately apply the right amount of herbicide to a field, you have to know how much spray mix is being applied to each acre (4200 m²).

This knowledge will help you determine how many acres you can cover with one tank and how much herbicide to add to each tank.

Sprayer calibration is not difficult, but it can be challenging if you have never seen it done before. Here are simple methods to calibrate a boom and boomless sprayer.



(Boom Sprayer) Calibration



Steps

1. Select a course (Distance) length based on nozzle spacing (from chart below)

| | | | | | | | | | | |
|-------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Nozzle spacing (inches) | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 34 | 36 | 38 |
| Course length (feet) | 204 | 185 | 170 | 157 | 146 | 136 | 127 | 120 | 113 | 107 |

2. Measure out course in field to be sprayed.
3. Measure time (in seconds) to drive course. Use a comfortable gear and speed. Take the average of three trips. Make note of engine speed (rpm).
4. Park tractor with engine running at same rpm and catch the output from one nozzle for the time found in Step 3.
5. Measure output from one nozzle in ounces (Ounce = 29.6 ml). This measurement will tell you the sprayer output in gallons per acre.
6. Determine acres that can be covered with one tank. This will be tank volume (gallons = 3.785 L) divided by sprayer output (gallons from Step 5).



7. Multiply acres from Step 6 by desired herbicide rate. This result will give the amount of herbicide to add to the full tank.

Example(Boom sprayer)

You would like to spray 2 pints (Pint = 0.473 L) per acre. How much herbicide do you need to add to the tank if you have a sprayer that holds 100 gallons with nozzles spaced 20 inches apart?

Answer

- Measure a course 204 feet in length.
- You drive the course three times and find it took an average 46 seconds to drive the 204 feet.
- Park the tractor and catch the spray from one nozzle for 46 seconds, which you find measures 20 ounces. You now know you are applying 20 gallons per acre.



- The sprayer holds 100 gallons, so $100 \text{ gallons} \div 20 \text{ gal/acre} = 5 \text{ acres}$ that can be covered with each tank.
- $2 \text{ pints per acre} \times 5 \text{ acres} = 10 \text{ pints}$ needs to be added to each tank.

Boomless sprayer (Calibration)



Steps

1. Select a course length based on spray swath width (from chart below)

| | | | | | | | | |
|----------------------|-----|-----|-----|-----|-----|-----|-----|-----|
| Spray width (feet) | 30 | 32 | 34 | 36 | 38 | 40 | 42 | 44 |
| Course length (feet) | 182 | 171 | 161 | 152 | 144 | 137 | 130 | 124 |

*If your sprayer's spray width is not listed, divide 5,460 by your spray width to get travel distance

2. Measure out course in field to be sprayed.
3. Measure time to drive course. Use a comfortable gear and speed. Take the average of three trips. Make note of engine speed (rpm).



4. Park tractor with engine running at same rpm, put garbage bag around nozzle and catch the output for the time found in Step 3.
5. Measure in pints. This measurement will equal sprayer output in gallons per acre.
6. Determine acres that can be covered with the tank. This will be tank volume (gallons) divided by sprayer output (gallons from Step 5).
7. Multiply acres from Step 6 by the desired herbicide rate. This total will give the amount of herbicide to add to full tank.

Example (Boomless sprayer)

You would like to spray 2 pints per acre. How much herbicide do you need to add to the tank if you have a sprayer that holds 100 gallons with a spray width of 34 feet?



Answer

- Measure a course 161 feet (foot = 0.3048 m) in length.
- You drive the course three times and average 41 seconds to drive the 161 feet.
- Park the tractor and catch the spray from the nozzle for 41 seconds, which you find measures 20 pints. You are applying 20 gallons per acre.
- The sprayer holds 100 gallons, so $100 \text{ gallons} \div 20 \text{ gal/acre} = 5 \text{ acres}$ can be covered with each tank
 - 2 pints per acre 2,4-D x 5 acres = 10 pints 2,4-D needs to be added to each tank.



Dusters

All dusters consist essentially of a hopper which usually contains an agitator, an adjustable orifice (Hole) and delivery tubes. A rotary fan or a bellows provides the conveying air.



Trailed Dusters



Types of Dusters

Depending on the source of power it can be classified as manually operated and power operated dusters.

The manually operated dusters are

1. Package duster



2. Plunger duster



3. Rotary duster.



4. Bellow duster.

BELLOWS DUSTER



Power operated duster

Power operated duster mainly consists of a power driven fan, a hopper and a delivery spout (Hole). The fan creates strong air flow which causes the dust to blow off from the hopper to a considerable distance vertically or horizontally. Direction of dust is regulated by a movable spout suitably fitted with the unit. This type of dusters are used for large areas.





Some of the recommendation for this duster are

- The sheet hopper should not be less than 0.63 mm thick.
- The concave bottom of the hopper permits all the dust to move towards the feeding aperture
- The fan should be capable of displacing 0.84 m^3 of air per minute at a speed of 35 rpm.

