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# Adjustment, operation and maintenance of spraying equipment

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# Spraying equipment or sprayer

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- Sprayer is a machine which is used to atomizes the liquid chemical and spray at the plant uniformly.
- A sprayer is a device used to apply chemical in liquid form for control of insects/ pests/ diseases



. View of air blast sprayer and

manually operated sprayer (Courtesy: ASPEE Sprayers)



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Fig: 2. View of mist blower    Fig: 3. View of jet type sprayer (Courtesy: ASPEE Sprayers)



# Adjustments in sprayers

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## A. Boom sprayers:

a) Sprayer output (Nozzle discharge rate)

b) Spray droplet size


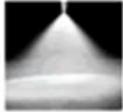



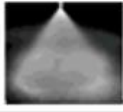
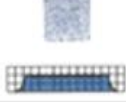



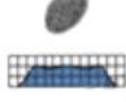






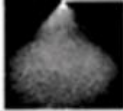










c) Uniformity of spray application

- The uniformity of spray application on plants depends on:
- Spray boom/ lance height
- Spray angle and
- Degree of overlap (This depends on spray boom height = spray angle and nozzle spacing on boom)



# Adjustments in sprayers

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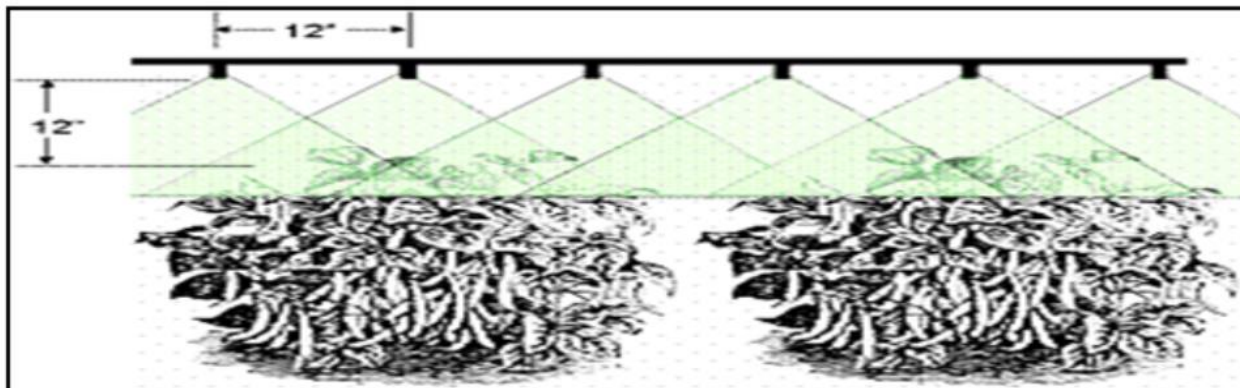
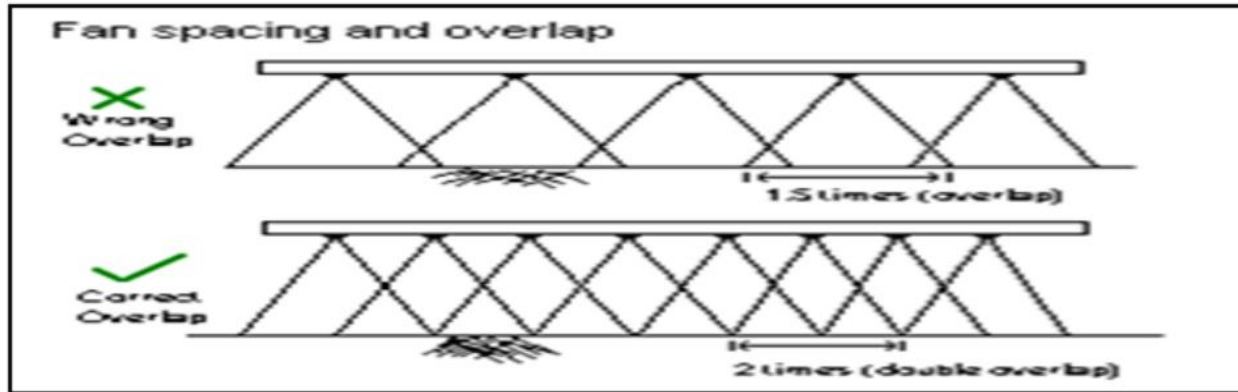
Full Cone Spray Patterns :					
Nozzle Models	Spray Pattern	Spray Effect	Flow Distribution	Spray Features	Cutaway View
	Standard Full Cone			Produces a full cone spray pattern filled liquid, generally utilize inside vane control flow before liquid reached jet orifice.	
	Full Square			Produces a square full cone spray pattern filled liquid, utilize a square panel in nozzle outlet and inside vane flowing.	
	Full Ellipse			Produces an ellipse spray pattern filled liquid, make an orifice according to proportion in short diameter up to a half of long diameter.	
	Spiral Full Cone			Produces a spiral full cone spray pattern, impacted with liquid and spiral line of consecutive.	
	Whirl Full Cone			Produces a full cone spray pattern; utilize a cavity of 90 degree angle made from axis line of nozzle and inlet axis.	
	Adjustable Full Cone			Utilize adjustable lacunaris cap, produces many hollow cone compages of cross distribution; come into full cone spray pattern.	
	Multiple Full Cone			Utilize a base with many-headed according to a sphere angle to let some full cone nozzle compages come into full cone spray pattern.	





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## B.Adjustments in T.D. Aero blast sprayer: -

Aero blast sprayer (Fig: 8.) is a precision spraying equipment. It projects fine droplets of chemicals into the target by spraying liquid chemical from hydraulic nozzles into an entraining blast of air generated by fans or turbine directed by volute, deflectors or ducts.



Fig: 8.Air blast sprayer(Courtesy: ASPEE Sprayer)



# Adjustments in sprayers

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## Sprayer output volume

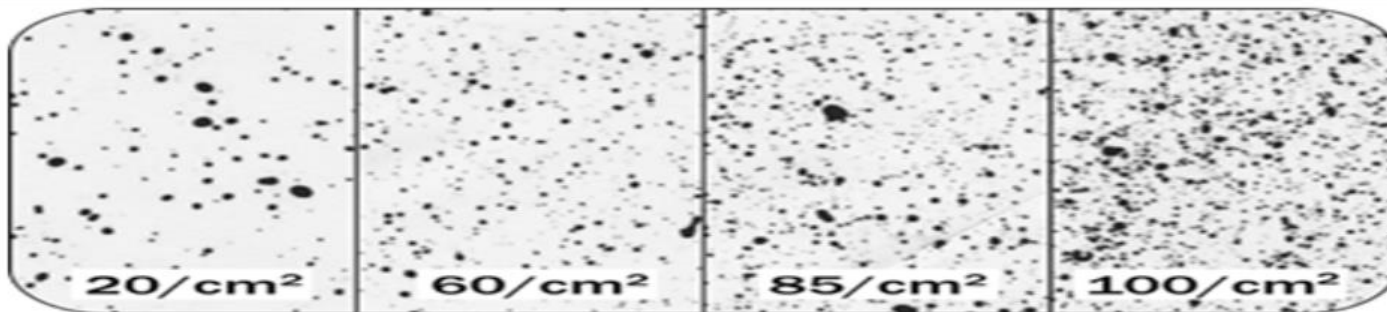
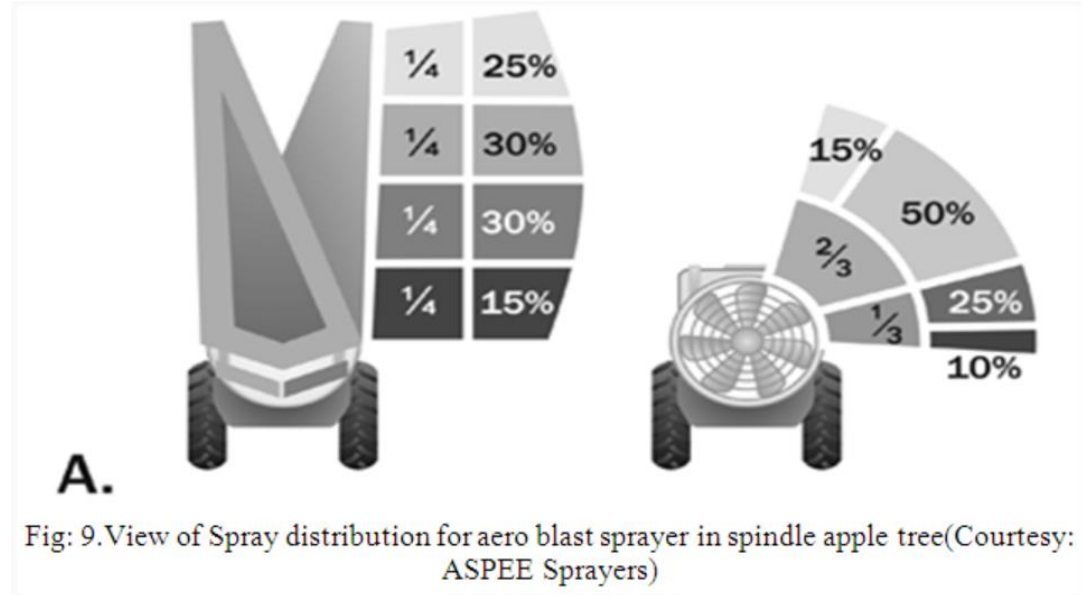


Fig: 11. these water-sensitive papers illustrate a range of coverage from 20-100 fine-to-medium droplets/cm<sup>2</sup>. Ideal coverage is a minimum of 80-90 fine-to-medium droplets/cm<sup>2</sup> for most fungicide and insecticide applications. (Courtesy: ASPEE Sprayers)





# Calibration of sprayers

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## a) Calibration

To apply a specified rate of chemical to the target surface (e.g. plant, soil, pest); one needs to measure the total spray output of the machine, the travel speed and the swath width. Then calculate the application rate.

## b) Total sprayer output (L/min)

The aim here is to measure the total liquid sprayed from the spray machine in one minute. First, disengage the gearbox and set the engine revs (1500 is a good starting point) with the power take-off (PTO) engaged at a normal operating speed. Set the pressure at the correct level for spraying. The correct pressure is specified by the manufacturer and determined by the type of nozzles used. All nozzles used for spraying should be left on.

## c) Travel speed (km/h)

The normal speed for spraying with small boom sprayers in horticulture situations is 4–10 km/h. The slower one travels the higher is the application rate. A change in ground speed of 10% results in a 10% change in application rate. Adjust the travel speed to suit the ground conditions.

## d) To calculate spray application rate (L/ha)

First, measure swath width (in meters). For general broadcast spraying, the swath width is equal to the number of nozzles multiplied by the nozzle spacing. For band spraying the swath width is equal to the total of all the band widths



# Safety precautions in operation of sprayers

## a) Precautions before spraying

- Identify the pest and ascertain the damage done
- Use pesticide only if crop damage has exceeded the Economical Injury Level.
- Use only the recommended least toxic pesticide.
- Read instructions manual of the pesticide and equipment.
- Check the spraying equipment and accessories which are to be used.
- Ascertain that all components are clean, especially filling and suction strainer, sprayer tank, cut off device and nozzles.
- Replace worn out parts such as 'O' ring, seal, and gasket, worn out nozzle tips, hose clamps and valves.
- Test the sprayer and ascertain whether it pumps the required liquid output at rated pressure. Check the nozzle spray pattern and discharge rate.
- Calibrate the sprayer. Set spraying speed and nozzle swath by adjusting spray height and nozzle spacing.
- Make sure that appropriate protective clothing is available and is used.
- Train all concerned with the application and also understands the recommendations.
- Ensure that soap, towel and plenty of water is available.



# Safety precautions in operation of sprayers

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## b) Precautions during spraying

- Take only sufficient pesticide for the day's application from the store to the site.
- Do not transfer pesticides from original container and packing into the containers.
- Recheck the use instructions of pesticide and equipment.
- Make sure pesticides are mixed in the correct quantities
- Wear appropriate clothing.
- Avoid contamination of the skin especially eyes and mouth.
- Liquid formulation should be poured carefully to avoid splashing.
- Do not spray in high wind, high temperature and rain.
- Avoid drift by selecting proper direction of spraying and also holding nozzle and boom at a proper height.
- Start spraying near the downwind edge of the field and proceed upwind so that operator moves into unsprayed area.



## c) Precautions after spraying

- Remaining pesticides left in the tank after spraying should be emptied and disposed off in pits dug on wasteland.
- Never empty the tank into irrigation canals or ponds.
- Never leave unused pesticides in sprayers. Always clean equipment properly. After use, oil it and then keep away in store room.
- Do not use empty pesticide containers for any purpose.
- Crush and bury the containers preferably in a land filled dump.
- Clean buckets, sticks, measuring jars, etc. used in preparing the spray solution.
- Remove and wash protective clothing and footwear. Wash yourself well and put on clean clothing.
- Keep an accurate record of pesticide usage.
- Prevent persons from entering treated areas until it is safe to do so.
- Mark the sprayed plots with a flag.





# Maintaining the sprayer

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## Step1. Pump maintenance

Before the first spray application of the year, pump clean water through the system until the discharge is clear of dirt, sludge or scale that might be present in the tank, pump, hoses, filters and nozzles.

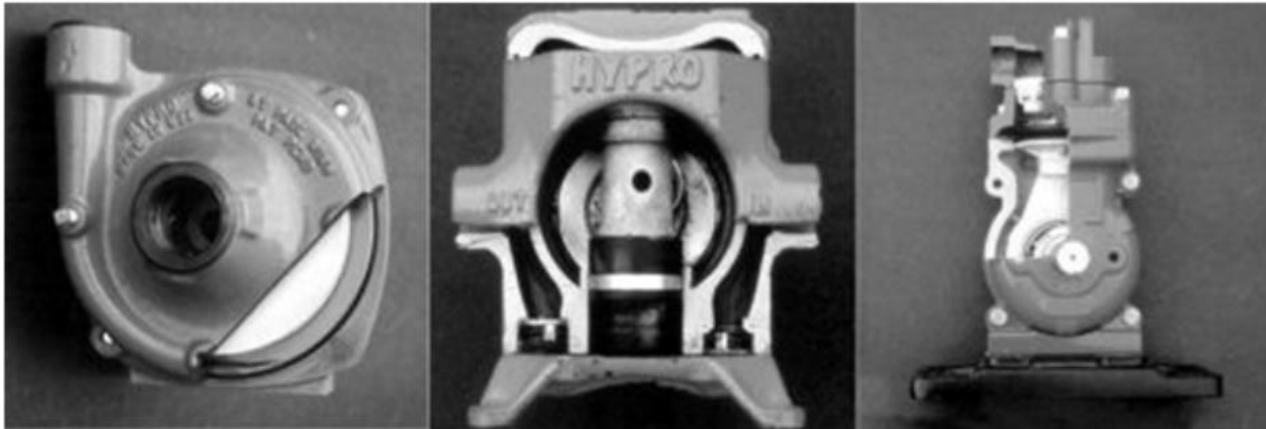


Fig: 12. Left to right: Centrifugal, piston, diaphragm pumps, cutaway views. All pumps should deliver the necessary flow rate at the desired pressure and have sufficient flow to provide proper agitation as well as spray (Courtesy: ASPEE Sprayer)



# Maintaining the sprayer

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## Step – 2 Hoses

The size of the hoses and their fittings affects the system capacity and pressure. Under-sized hoses and fittings can severely reduce the capacity of any pump. Suction hose diameter should be at least as large as the pump intake opening. Examine all hoses and connections for cracks or leaks.

## Step3.Strainers

Strainers (or filters) can be installed in the tank opening, between the tank and the pump, after the pump, and in the nozzle bodies. Scale the strainer size from the coarsest at the tank opening to the finest at the nozzle. Growers who do not use nozzle strainers because they feel they contribute to plugged nozzles may be using too small a nozzle strainer.



Fig: 13.A view of strainers (Courtesy: ASPEE Sprayer)



# Maintaining the sprayer

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## Step4. Regulator

Sprayer regulators with stem packing should be inspected annually. Tight packing restricts stem movement and could lead to fluctuations or dangerously high pressures. Loose packing may lead to leakage. Certain makes of airblast sprayer may not have adjustable regulators, and may use bypass valves for minor pressure adjustments.

## Step5. Pressure gauges

Pressure gauges are available as either oil-filled or dry. An oil-filled gauge is recommended because it dampens pressure pulsations and vibration resulting in a steadier reading.

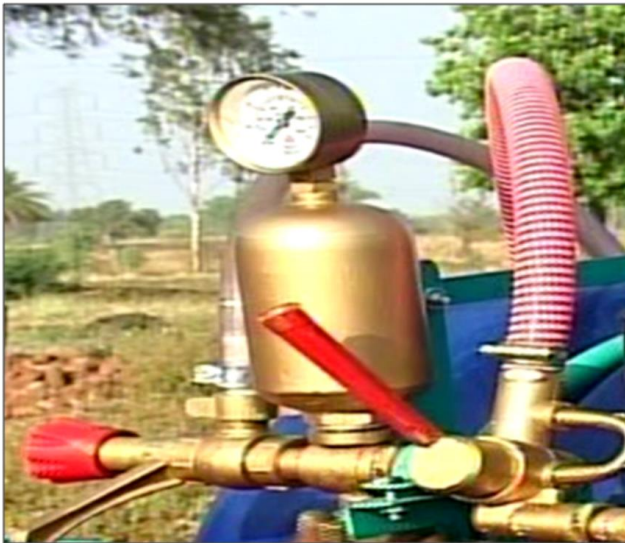


Fig.14.View of pressure gauge of sprayer (Courtesy:ASPEE Sprayer)



Fig: 15.View of beltsused (Courtesy: ASPEE Sprayer)



# Maintaining the sprayer

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## **Step6. Belts and power take off**

Check all belts for wear and proper tension. This ensures that power is transmitted efficiently. Tighten or replace any belts that require it. For PTO-driven units, grease the PTO splines and tubes and clean the connection zones.

## **Step7. Agitator**

Most spray materials do not mix well with water; one of the common causes of uneven application is poor agitation. For mechanical agitators, check for propeller wear and ensure that the paddles are secure on the agitator shaft. Lubricate the shaft bearing and adjust seals to prevent leakage.

## **Step 8: Propeller or centrifugal fan**

Check the blades of sprayer propellers for any nicks or cracks that affect the balance of the propeller and produce vibration. Scrape blades clean to remove any accumulated residue. Vibration can also be an early sign of blade breakdown, so replace suspect or damaged blades.

## **Step 9 Nozzles:**

Nozzles are often neglected. Because tip damage has a direct impact on product effectiveness and cost (Table 1), monitoring nozzle performance pays financial dividends.