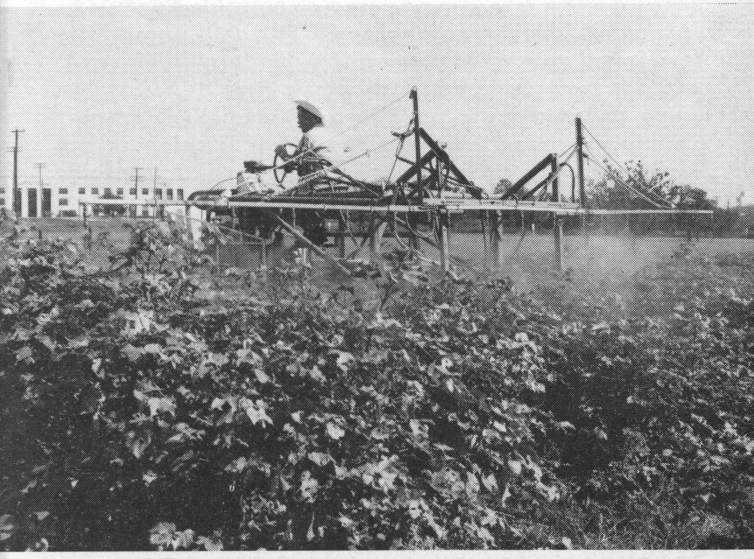
L-486

INSECTICIDAL SPRAYING of Field Crops with Ground Machinery



TEXAS AGRICULTURAL EXTENSION SERVICE
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Insecticidal Spraying of Field

SINCE THE DEVELOPMENT of low-gallonage concentrated insecticidal sprays several years ago, row-crop spraying has increased in popularity. Sprays have proved as effective as dusts, provided the correct amount of actual insecticide is applied per acre. Sprays have certain advantages over dusts: (1) sprays can be applied in winds up to 10 miles per hour; (2) sprays drift less on other crops or pastures than dusts; (3) less labor often is required for handling liquids than dusts; (4) sprays are less apt to be washed off by rain. There are other advantages for spraying as well as certain disadvantages when compared to dusts.

COMPONENTS OF A TYPICAL FARM SPRAYER

A complete sprayer unit is equipped with (1) a power source (engine or PTO), (2) pump, (3) pressure gauge, (4) pressure regulator, (5) tank, (6) booms and pressure hoses and (7) nozzles. The sprayer unit may be self-propelled, tractor mounted or pull type. The pump, which is operated by the power source, pumps the insecticide from the tank through the pressure regulator, then through the hoses and booms and out through the nozzles. The pressure regulator is used to regulate the pressure during the spraying operation. The pressure gauge is a device which registers the pressure imposed on the system. Typically, a sprayer pump will force about four times as much spray through the pressure regulator as is discharged through the nozzles. The excess spray is forced through a by-pass line and discharged back into the sprayer tank. This agitates the spray mixture, keeping it well mixed.

FACTORS AFFECTING OUTPUT PER ACRE

Three factors determine the number of gallons per acre a sprayer can apply. These are: (1) ground speed of the sprayer unit, (2) size and number of nozzles used and (3) pounds of pressure at which spray is applied.

Ground Speed. When nozzle size, number of nozzles per row and gauge pressure are held constant, the only variable that affects the rate of application is the speed at which the sprayer is traveling. If the speed is increased, the rate of application will decrease and vice versa. For example, a number 6 cone nozzle will apply 6 gallons per acre at 60 pounds pressure when the sprayer is traveling 3 miles per hour but only 4.5 gallons per acre at 4 miles per hour.

When spraying, set your tractor or sprayer throttle for a convenient speed and keep it there. If you change speed, you change the number of gallons per acre being applied.

Nozzle Size. Nozzles which produce hollow cone type spray patterns are recommended for insect spraying in Texas. In controlled tests, the cone nozzles consistently produced better spray patterns, more thorough plant coverage, lower insect infestations and higher yields than other types such as the fan or wideswath jet nozzles. These nozzles come in various sizes. For most crops, nozzles that deliver at least 2 gallons per acre but not more than 6 gallons are preferred. Generally nozzles are numbered according to size —the larger the number, the more gallons per acre it will deliver. For example, a number 2 cone nozzle will deliver 2 gallons per acre at 60 pounds pressure and 3 miles per hour while a number 6 nozzle will deliver 6 gallons at the same pressure and speed. Most nozzle dealers have the specifications for their nozzles on hand. The amount of material applied per acre varies with the number of nozzles used per row; 2 nozzles per row will deliver twice as much spray as one nozzle. Nozzles wear with use and should be calibrated frequently and replaced as needed. They also should be cleaned after each spraying operation. A good way to maintain nozzles is to store them in a can of kerosene.

When the ground speed of the sprayer and nozzle pressure are kept constant, rate of output can vary only with nozzle size and number per row. Check nozzle output frequently.

Pressure. The amount of pressure at which the spraying system is operating will influence the number of gallons applied per acre when other factors are held constant. For example, a

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number 6 cone nozzle will apply 6 gallons per acre at 60 pounds pressure at 3 miles per hour. The same nozzle at the same speed will deliver 5 gallons per acre at 40 pounds pressure or 7.5 gallons at 90 pounds. Recommended pressure for row-crop spraying is approximately 60 pounds. Pressure need not be changed due to windy conditions or larger plant size.

Select a sprayer pressure of approximately 60 pounds. Once pressure is selected, maintain this pressure regardless of factors such as weather conditions or plant growth.

CALIBRATING A ROW-CROP SPRAYER

Best results with a sprayer are obtained when it is properly calibrated. Before calibrating a sprayer do the following: (1) select throttle setting for ground speed; (2) select gauge pressure and set pressure regulator to maintain this pressure at the throttle setting for operation; (3) determine nozzle size and arrangement and mount on sprayer boom and (4) check all equipment for leaks and inspect nozzles for stoppage. Two commonly used methods for calibrating a sprayer follow:

Calibration by Field Trial. An easy way to determine the number of gallons a sprayer will apply per acre is to: (1) fill the sprayer tanks to capacity with water; (2) go to a field in which the number of rows required to make an acre are known; (3) spray this number of rows and (4) refill the tank to capacity with a measured amount of water. The amount of water required to refill the tank is the amount of spray mix that the sprayer will apply per acre.

The number of rows required to make an acre can easily be determined. Ten 40-inch rows, ¼ mile long (440 yards) or 20 such rows ⅛ mile (220 yards) equal 1 acre. If the exact length of a field row is not known, it can be measured or stepped off.

Calibration by Calculation. An exact method for determining sprayer output is by calculation. This is done by the following steps:

(1) Measure off 200 feet. Drive the sprayer over this distance and determine time required to travel this distance at the selected throttle setting. Make two or more runs and determine the average time required.

(2) Put the sprayer in neutral gear and set throttle at spraying position. Take a common kitchen measuring cup and catch the spray output from one nozzle for the same length of time as required for the sprayer to travel 200 feet. Repeat for several nozzles and calculate the average output in ounces per nozzle.

(3) Multiply this answer by 66 to obtain the number of ounces applied per nozzle per acre. Divide by 128 to obtain number of gallons per acre. The answer will be the number of gallons of spray the machine will apply per acre *provided you are using one nozzle per row* (*nozzles spaced 40 inches apart on the boom*). If you are using two nozzles per row spaced 20 inches apart on the boom, multiply your answer by two. If you use one nozzle directly over the row and one on each side of the row on drops (three nozzles per row) multiply by three.

Problem. A sprayer travels 200 feet within an average of 25 seconds. The pressure gauge indicates that the unit will operate at 60 pounds pressure. When the sprayer was setting still, the nozzles averaged 6 ounces output per nozzle in 25 seconds at 60 pounds pressure when the throttle was set at the spraying position. How much spray will this sprayer deliver per acre when using one nozzle per row? How much with two nozzles per row?

Solution:

6 x 66 = 396 oz. per acre per nozzle.
396 ÷ 128 = 3.1 gallons per acre if one nozzle per row is used.
3.1 x 2 = 6.2 gallons per acre if two nozzles per row are used.

Dilution. A common problem encountered in farm spraying is dilution; that is, the amount of insecticide to add to each sprayer tank of water. This problem can not be solved until the

rate of output per acre for the sprayer has been determined. An example of how to solve this problem once the sprayer has been calibrated appears below.

Problem. The sprayer has been calibrated to deliver 5 gallons per acre. The insecticide to be used contains 1.6 pounds of actual insecticide per gallon of concentrate. The recommended dosage is 0.4 pound of actual insecticide per acre. How much concentrate should be added for each acre to be sprayed? How much should be added per 100 gallons of spray mixture?

Solution:

Since 1 gallon of the spray concentrate contains 1.6 pounds of the actual insecticide, ¼ gallon (1 qt.) will contain 0.4 pound (1.6 ÷ 4= 4). Thus, add 1 quart of spray concentrate to each 4¾ gallons of water (¼ gallon + 4¾ gallons = 5 gallons).

Since the sprayer is applying 5 gallons per acre, 100 gallons will spray 20 acres (100 ÷ 5 = 20). Thus, 20 quarts of spray concentrate should be added to the tank. Then the tank should be filled to 100 gallons (add 95 gallons of water).

L-218, Texas Guide for Controlling Cotton Insects, lists the proper amount of insecticide to apply per acre in terms of pints, quarts or gallons. Similar guides for other crops are available from your local county agricultural agent. However, dosages can be computed from the information furnished on the container label.

Before spraying, the dilution should be pumped through the bypass and agitated until the material is well mixed.

The most important thing in spraying is to apply the correct amount of insecticide per acre. Make sure you have made the correct dilution.

Questions and Answers on Farm Spraying

1. How much water should be applied per acre?

Similar results can be expected from using 2 to 30 gallons per acre. Experience has shown that 3 to 6 gallons per acre is preferable.

2. What pressure should be used?

Forty to 60 pounds. However, field experience shows approximately 60 pounds to be

the most satisfactory. Regardless, do not change pressure during the spraying operation.

3. Should pressure be increased under windy conditions?

No, spray can be effectively applied at the above pressure in winds up to 10 miles per hour.

4. At what speed should the sprayer be operated?

This depends on field conditions and plant growth. Sprays can be applied effectively and safely at speeds from 3 to 6 miles per hour. Four miles per hour has proved to be a reasonable speed.

5. Will spray give as good coverage as dust?

Yes, if properly applied.

6. How many nozzles should be used per row for cotton?

One nozzle per row is adequate when cotton is small. Once the plants begin to lap the middle, one nozzle should be positioned directly over the row and one over the middle, or nozzles spaced 20 inches apart on the boom.

7. How many nozzles should be used per row for corn or grain sorghum?

This depends on the position of the plant where the insect injury is occurring. One nozzle positioned directly over the row is adequate when spraying for control of insects attacking heads of grain sorghum or the terminal buds of corn or grain sorghum. For the control of insects such as chinch bugs, which feed on the lower portion of plants, the spray material should be applied to the infested zone. This can be accomplished by using "drops" and two nozzles per row.

8. What is the best nozzle type to use?

The conventional hollow cone-type nozzle. This nozzle consistently produces better results than any other nozzles tested.

9. What nozzle size is best for general row-crop insect control?

Nozzle sizes from 2 through 6 may be used; however, experience shows the number 3 to 6 nozzles cause less nozzle clogging and require less water per acre.

10. How long is a spray mixture effective after mixing?

This depends on the material. It is best to mix only the amount of spray needed for the immediate job.

11. How high should the spray nozzles be positioned over the plant?

Approximately 10 to 15 inches. This much height is needed for the nozzles to develop a full cone and give broadcast coverage when nozzles are spaced 20 inches apart on the boom.

Cover Photo

Spraying cotton.

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