Calibrate to spray accurately

The method of applying pesticides is determined by formulation of the chemicals involved (i.e., liquid or granular) and the application equipment available. A superintendent should feel free to select the method and equipment best suited to a program's needs so long as accuracy and uniformity are assured. A critically important facet of minimizing error concerns accurately calibrating application equipment. Small areas magnify minute application errors. As an example, a desired rate of three (3) kilograms (kg) of material per hectare (ha), based on a 10 square meter (m²) plot becomes 3.3 kg/ha if inadvertently applied to only 9 m², or 2.7 kg/ha when applied to an 11 m² area.

There are two general approaches to, or methods of, applying herbicides: area basis and volume basis. Calculations for the amount of herbicide needed will be based on the application method chosen.

Area basis
The area of a plot, or plots, to be sprayed with a particular material at a predetermined rate forms the keystone of this system. However, should less than the full plot width be sprayed, the area actually sprayed supercedes the full plot area in calculating amounts.

Note: A small amount of liquid is sprayed at the beginning edge of (but outside) each plot to be sure that all lines and the boom are full and that all nozzles are operating properly. An additional amount is left in the boom and hoses at the end of the plot. Allowances are made by adding a predetermined amount of water and herbicide. With the area system, this step amounts to simply factoring additional area into the calculations. The added area should always be the same for a given boom, regardless of plot size, being based on the extra liquid needed to fill that boom and to check nozzle operation. This method is most satisfactorily used with a spray tank shaped to allow discharge of all the liquid.

(Editor's note: This section is included because many superintendents experiment with pesticides to determine which will give optimum performance and economy on a given course. Extreme care should be taken when spraying to fill the lines and boom, as mentioned in the note above, so as not to overspray in one area and kill the turf.)

Using a predetermined area size permits all calculations to be made in advance. Dry herbicides should be weighed into bottles, plastic bags, or paper envelopes in the herbicide storage area, because most balances do not function well under field conditions. Liquid formulations either can be measured in advance or

Continues on page 38

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measured from original containers in the field immediately prior to application.

Example 1
Material: atrazine
Rate: 2 kg active ingredient (ai)/ha
Plot size: 2 x 5 m
Replications: 3
Calculations:
(1) Plot size—2m x 5m = 10m² x 3
(2) Add 1.5 m² to allow for filling boom and hose
(3) One hectare (10,000m²) requires 2000g ai. Therefore, 30m² requires $x \frac{2000}{10,000} = 6.3$ g ai

Caution: The above example assumes the pesticide and water for all three replications are mixed together. When spraying wettable powders, each replication should be MIXED and SPRAYED SEPARATELY unless great care is taken to prevent the herbicide from settling to the bottom of the tank.

Greater accuracy is also required when all replications are mixed together; any error in application rate will not be noticed until the last plot of the series is sprayed. This is especially serious if all the spray is used before completing the last plot.

The amount of water required to cover the area to be sprayed can be determined by filling the sprayer's tank with clean water (only) and spraying the area at the desired pressure and speed and measuring the amount of water consumed. The operator should then pace himself by applying the measured amount of water to a non-plot area having the same size, surface, and walking conditions as the actual plot. Pacing requires several passes until the correct amount of water can be sprayed each time, making sure to actually begin spraying at the beginning of the pacing test and to stop spraying precisely at the test end as will be the case in applying herbicide to the plots.

Volume basis
With this method, the amount of herbicide is calculated for a given amount of water rather than for a certain area. The volume of water used usually exceeds that required to spray the plot or plots; consequently a method should be devised to assure an accurate speed. A stop watch serves this purpose. The volume method is useful when plots are large enough to require refilling the spray tank and when the spray tank design prevents using all of the liquid. There does not appear to be any other advantage in spraying small plots by this method.

The first step requires calibrating the sprayer to determine the output of water. A very convenient method of calibrating a small plot sprayer is described by L. Kasasian in his book, Weed Control in the Tropics: "Pour a measured amount of water in the sprayer and spray 100 m²...for a quick fix...but over the long run, the smart money is on Milorganite.

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Example 2
Assume: sprayer applies 200 liters (l) of water/ha
Total plot area: 2m x 5m = 30m²
Solution: use proportions

\[
\text{liters/ha} \times \text{liters/30m}² \times \text{liters} = 8 \times 10,000 \text{ m}² = 133.3
\]

Example 3
Compound: atrazine
Desired Rate: 2 kg ai/ha
Total plot area: 3 plots, 2m x 5m each = 60m²
Assume: sprayer applies 200 l of water/ha

grams/ha x grams commercial product

The commercial product (c.p.) required if the formulation is an 80 percent active wettable powder can be calculated as follows assuming 100 g of c.p.: 100 g c.p. = 80 g ai

Grams of commercial product

Example 4
Water consumed: 8 l
Length of test strip: 100 m
Width of spray swath: 6 m

Another technique for calibrating:

Example 5
Plots (replications) to be sprayed: 3
Plot size: .25 ha
Area = 3 x .25 = .75 ha
= .75 x 30% = .975 ha
or rounding off, 1 ha.

The above article was excerpted from the Field Manual for Weed Control Research, published by the International Plant Protection Center, Oregon State University, Corvallis, Oregon.