A New Method of Calculating the Wetted Radius of Sprinklers

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ASABE standard S398.1 January 2001 contains an arbitrary definition of how to characterize the wetted radius of sprinklers under test conditions. As a result, data reported by manufacturers can be open to interpretation. Unfortunately serious system design work is frequently based on this data and may further be modified by the consultant's perception of the data's integrity.

The method proposed here uses the total of the pattern data to develop a curve of the accumulated catchment volume vs. radius. The definition of the wetted radius is then defined as the radius that accounts for 99.5% (for example) of the accumulated volume. The definition applies equally well to sprinklers of any size and avoids the problem of trying to account for the significance of light water depositions that characteristically occur near the end of the deposition pattern.

The calculation is illustrated by using actual data from a Center for Irrigation Technology (CIT) test (record No. 3054P). This is a 28.0 gpm sprinkler operating at a base pressure of 80 psi. The actual deposition pattern is given in the record along with the ASABE defined wetted radius of throw of 67 ft. The deposition data was used to calculate the accumulated volume vs. radius curve shown in Figure 1.

This new method proposes to define the wetted radius as the radius that accounts for a high percentage of the water deposited in the catchment devices. The method includes then

fitting a function to the data given in Figure 1. Also shown in Figure 1 is the result of the curve

fitting as a 5th order polynomial. This function fits with a correlating coefficient of 0.999. This

correlation utilizes all of the deposition data and avoids the arbitrary values noted in the ASABE

standard (e.g. 0.01 in./h plus 1.0 ft for flowrates over 2.0 gpm) that only focuses on the end of

the deposition pattern.

The selection of the minimum accumulated volume represented by the design data can be

specified by the manufacturer and given in a footnote in their design tables. Alternatively, the

Irrigation Association could establish a recommended value that would then provide a common

basis when comparing data from different manufacturers. The following Table 1 gives the

relationship between the accumulated volume and the radius for the sprinkler characterized in

Figure 1.

Table 1 Accumulated Volume vs. Radius from Figure 1

Accumulated Volume, %	Radius, ft
99.00	66.3
99.50	66.8
99.90	67.2
100.00	67.3

A suggested value of 99.5% shows a wetted radius of 66.8 ft. The manufacturer's literature

shows the radius as 67 ft.

The proposed method is thought to be applicable to sprinklers of all sizes. It utilizes all of

the data measured in the deposition test instead of concentrating on the last one or two catchment

devices. No arbitrary judgments are required and the calculation lends itself to computerized
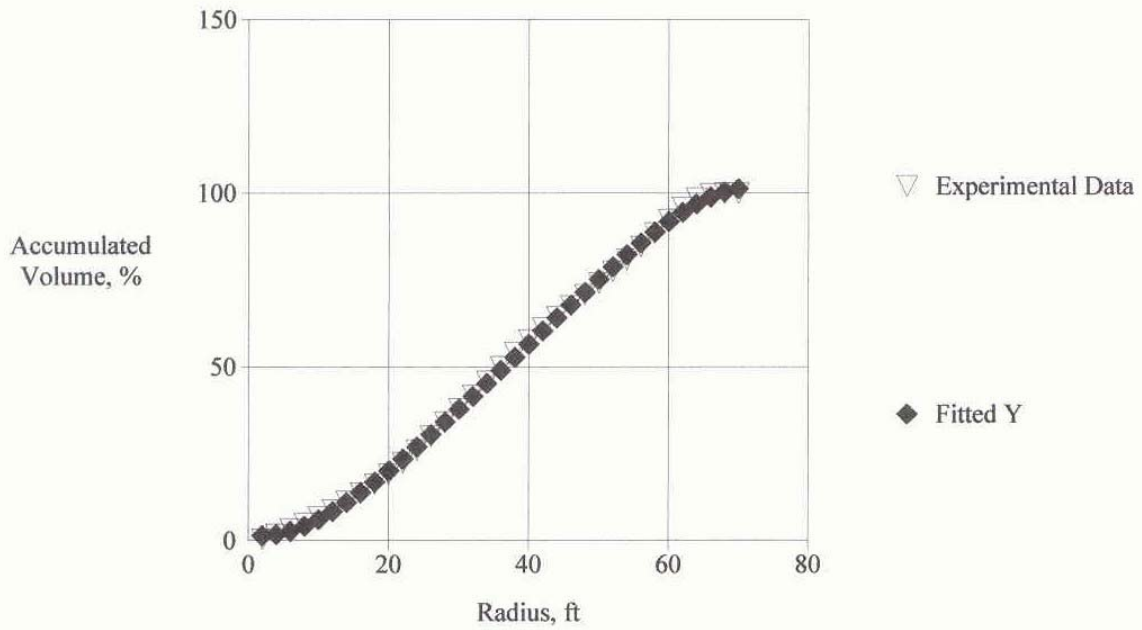
program analysis.

Figure 1. The deposition data (CIT record No. 3054P) was used to calculate the accumulated volume vs. radius curve.