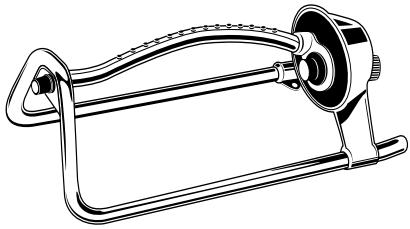

PRECIPITATION EVALUATION OF ROUND- AND SQUARE-PATTERNED IMPACT SPRINKLERS

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IMPACT STATEMENT

In the fall of 1999, two types of impact sprinklers were evaluated to determine the distribution of precipitation under normal operating conditions. The sprinkler types included a traditional round-patterned design (Rain Bird Maxi-Bird) and a recently developed sprinkler delivering water in a square pattern, called Square Shooter. The square-patterned sprinkler was more precise in delivering a uniform distribution of water. It accomplished this uniformity using half as many sprinklers as those with the round-patterned design.

BACKGROUND

Water conservation is a critical issue in many parts of the United States and the world. As demand for water increases, more stringent regulations governing water use are becoming evident in states and communities across the country. There is increasing pressure to require responsible use of water for irrigation of ornamental plantings in urban landscapes.

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The ultimate goal in irrigation is to deliver water as precisely as possible over a specific area. As a result, considerable engineering technologies have been used to create various high-quality irrigation products. While many excellent landscape irrigation products exist, improved efficiency is still important as increases in population and seasonal water shortages place strains on current resources.

RESEARCH DESCRIPTION

Four plots, each measuring 20 x 40 ft, were established at the University of Arkansas Agricultural Research and Extension Center, Fayetteville. The plots were adjacent to each other, and sprinklers were plumbed into perimeter positions using the manufacturers' specifications for spacing and adjustments. Two replicate plots were established for each of the sprinkler designs. Both sprinkler types used in the study are housed in a plastic case, installed flush with the ground, and pop up during operation to 7 cm above grade. In this study, normal irrigation placement practices were used except that all the equipment was placed on the ground surface rather than being buried in trenches. All sprinklers were set at 28 cm above the ground.

A pressure regulator and flow meter were installed on each plot. Flow rates were recorded for each run, and the operating pressure was 50 psi. Each run time was 20 min. and was executed when wind conditions were still. Precipitation for each run was collected in test tubes calibrated to measure in millimeters. The tubes were arranged in the plots on either 2-ft or 1-m spacings. Sprinkler placement varied for each sprinkler type and experiment and is detailed in Figures 1 and 2.

FINDINGS

The Square Shooter sprinkler produced a more uniform distribution of water than the round-patterned Rain Bird sprinkler (Table 1 and Figs. 1, 2, and 3). The average flow meter and precipitation volume of the Square Shooter plots were approximately half those of the Rain Bird plots, since sprinkling with Square Shooter requires half the number of sprinklers. In many situations this could be desirable, since applying water to the same area in twice the time would probably result in better soil penetration and less run off.

An arrangement of Square Shooter sprinklers, with all three sprinklers spaced on one side of the existing plots, was evaluated in two experiments. Because of high winds, data from these experiments were not as reliable as those obtained with the other two sprinkler

designs (data not shown). However, these preliminary numbers suggest that not only half the sprinklers but also half the pipe and trenching can result in an acceptable distribution of water. Since this would only be possible with a square-patterned sprinkler, this could prove to be another desirable feature of this new sprinkler design.

Table 1. Round- and square-patterned sprinkler performance.

	Precipitation data			
Sprinkler	Plot average (mm)	Standard error of average	Standard deviation	Coefficient of variation
	2-ft spacing[z]			
Rain Bird	15.29	0.07	4.61	0.30
Square Shooter	7.38	0.03	1.86	0.25
	1-m spacing[z,y]			
Rain Bird	15.89	0.22	3.41	0.21
Square Shooter	8.94	0.12	1.11	0.12
	1-m spacing[x]			
Square Shooter	8.16	0.11	2.61	0.32

[z] Distance between collection points in a square grid layout.

[y] See also Figures 1,2, and 3.

[x] 1-m between collection points and all three sprinklers aligned on one edge.

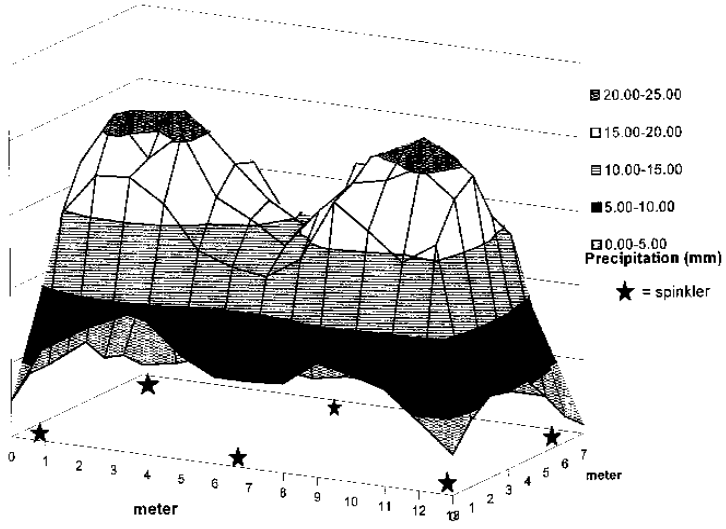

Figure 1. Average precipitation for Rain Bird Maxi-Bird impact sprinkler over three 20-min runs on two 20 x 40-ft plots with collection points at 1-m increments in a square grid including one set of points 0.5 m outside the target area.

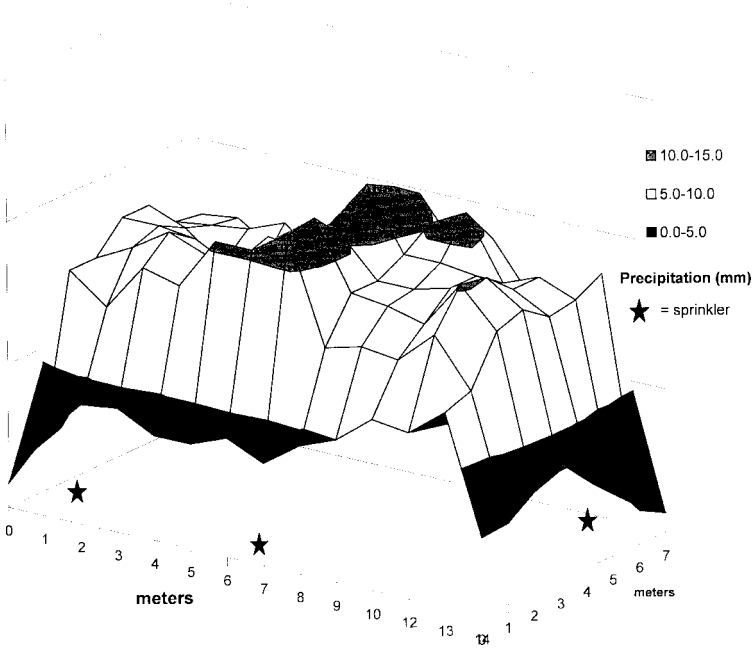

Figure 2. Average precipitation for Square Shooter impact sprinkler over three 20-min runs on two 20 x 40-ft plots with collection points at 1-m increments in a square grid pattern including one set of point 0.5 m outside the target area.

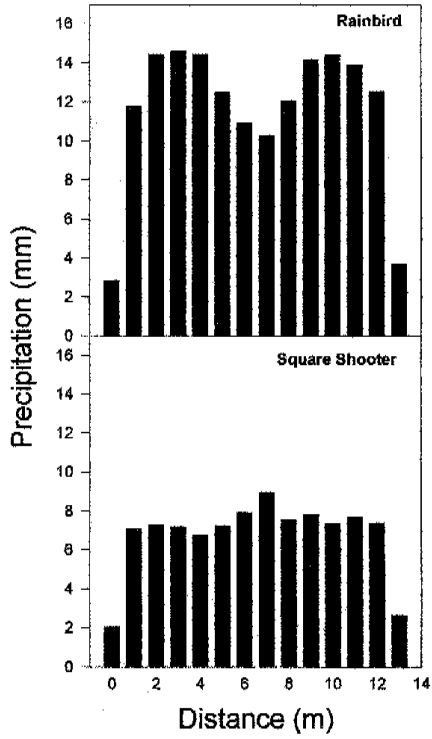

Figure 3. Precipitation averaged across the width of the 20 x 40-ft plots for the Rain Bird and Square Shooter impact sprinklers for three runs with collection points at 1-m increments in a square grid including one set of points 0.5 m outside the target area.