

# PENGARUH PERBEDAAN BESAR DIAMETER PIPA TERHADAP KINERJA *SPRINKLER*

Yana Purnama Dewi<sup>1</sup>, Asih Priyati<sup>2</sup>, Sirajuddin Haji Abdullah<sup>2</sup>

<sup>1</sup>Mahasiswa Program Studi Teknik Pertanian, Fakultas Teknologi Pangan dan Agroindustri  
Universitas Mataram

<sup>2</sup>Staf Pengajar Program Studi Teknik Pertanian, Fakultas Teknologi Pangan dan Agroindustri  
Universitas Mataram

## ABSTRAK

Irigasi *sprinkler* adalah cara pemberian air kepada tanaman yang dilakukan dari atas tanaman berupa pemencaran dimana pemencaran itu menggunakan tenaga penggerak berupa pompa air. Sistem irigasi curah terdiri dari unit pompa, jaringan pipa untuk menyalurkan air irigasi, serta alat pencurah untuk menyebarkan tetes-tetes air pada luasan tertentu. Penelitian ini bertujuan untuk mengetahui pengaruh diameter pipa yang berbeda terhadap koefisien keseragaman penyiraman dari kinerja *sprinkler* dan mengetahui beberapa aspek mekanika fluida pada saluran pipa dengan diameter yang berbeda. Metode penelitian yang digunakan adalah metode eksperimental dilaksanakan dengan pengamatan langsung di lapangan. Adapun variasi diameter pipa yang digunakan untuk uji kinerja sistem irigasi curah (*sprinkler*) dengan tiga variasi diameter pipa yaitu 1 in,  $\frac{3}{4}$  in, dan  $\frac{1}{2}$  in. Parameter yang diamati dalam penelitian ini adalah debit *sprinkler*, kecepatan aliran dalam pipa, koefisien keseragaman curahan (CU) *sprinkler*, pola sebaran *sprinkler* yang diukur pada wadah tampungan hasil curahan dari *sprinkler*, dan bilangan *Reynolds*. Nilai debit dan kecepatan yang diperoleh pada diameter pipa 1 in sebesar 0,000402 liter/detik dan 0,0000793 m/menit, diameter pipa  $\frac{3}{4}$  in nilai sebesar 0,000547 liter/detik dan 0,0002754 m/menit, dan diameter pipa  $\frac{1}{2}$  in sebesar 0,001037 liter/detik dan 0,008185 m/menit. Besar kecilnya diameter pipa yang digunakan mempengaruhi nilai debit dan kecepatan aliran. Sehingga semakin kecil diameter pipa yang digunakan maka nilai debit dan kecepatan yang didapatkan semakin besar atau mengalami kenaikan. Nilai bilangan *Reynolds* yang didapatkan pada diameter pipa 1 in sebesar 3508,86 (laminar) diameter pipa  $\frac{3}{4}$  in sebesar 3583,05 (laminar), dan diameter pipa  $\frac{1}{2}$  in sebesar 4527,19 (turbulen). Nilai pola sebaran tertinggi terdapat pada pipa diameter  $\frac{1}{2}$  sebesar 107,5 ml. Nilai *overlapping* pada semua diameter pipa mengalami fluktuasi (turun naik) karena saling tumpang tindih. Nilai koefisien keseragaman tertinggi didapatkan pada diameter pipa  $\frac{3}{4}$  in sebesar 53%.

**Kata kunci:** irigasi curah (*sprinkler*), variasi diameter pipa

# THE EFFECT OF DIFFERENT PIPELINE DIAMETERS ON THE SPRINKLER PERFORMANCE

Yana Purnama Dewi<sup>1</sup>, Asih Priyati<sup>2</sup>, Sirajuddin Haji Abdullah<sup>2</sup>

<sup>1</sup>Student at Studies Program of Agricultural Engineering, Faculty of Food and Agroindustrial Technology, University of Mataram

<sup>2</sup>Lecturer at Studies Program of Agricultural Engineering, Faculty of Food and Agroindustrial Technology, University of Mataram

## ABSTRACT

Sprinkler irrigation is a way of giving water to plants which are carried out from the top of the plant in the form of dispersal where the dispersal uses the driving force in the form of a water pump. The bulk irrigation system consists of a pumping unit, a pipeline to channel irrigation water, as well as a pouring device to spread water drops over a certain area. This study aims to determine the effect of different pipe diameters on the uniformity of watering of the sprinkler's performance and to know several aspects of fluid mechanics on the pipes with different diameters. The research method used was an experimental method implemented by direct observation in the field. The pipe diameter variance was used to test the performance of the bulk irrigation system (sprinkler) with three pipe diameter variation, namely 1 in,  $\frac{3}{4}$  in, and  $\frac{1}{2}$  in. The parameters observed in this study were the sprinkler discharge, the flow velocity in the pipe, the sprinkler overflow uniformity coefficient (CU), the sprinkler distribution pattern measured in the sprinkler container from the sprinkler, and the Reynolds number. The value of discharge and speed obtained at 1 in pipe diameter was 0.000402 liter/sec and 0.0000793 m/min, pipe diameter  $\frac{3}{4}$  in values were 0.000547 liter/sec and 0.0002754 m/min, and pipe diameter  $\frac{1}{2}$  in was 0.001037 liter/sec and 0.008185 m/minute. The size of the pipe diameter that was used affects the flow rate and velocity. So that the smaller the diameter of the pipe used, the value of the discharge and the speed obtained was getting bigger or increasing. Reynolds number value obtained at 1 in pipe diameter was 3508.86 (laminar) diameter in pipe diameter was 3583.05 (laminar), and pipe diameter  $\frac{1}{2}$  in was 4527.19 (turbulent). The highest distribution pattern value was in the  $\frac{1}{2}$  diameter pipe of 107.5 ml. Overlapping values on all pipe diameters fluctuate (up and down) due to overlapping. And the highest uniformity coefficient value was obtained at diameter in pipe diameter of 53%.

**Keywords:** bulk irrigation (sprinklers), pipe diameter variations