

PERFORMANCE EVALUATION OF SPRINKLER IRRIGATION SYSTEM IN GANDERBAL DISTRICT J&K STATE.

ABSTRACT

Field experiments were carried at Krishi Vigyan Kendra (KVK), Shuhama (Jammu and Kashmir) to study the performance evaluation of sprinkler system. The climatic conditions of previous years were obtained and were taken into consideration before the starting of the experiment. The climatic conditions recorded for the experiment were wind speed and wind direction. The micro sprinkler arrangement was made of two types – point arrangement and linear arrangement. The volume of water was collected in water containers, systematically leveled on ground surface and placed 0.75 x 0.75 m apart. The volume of water was measured by the aid of measuring cylinder. The water flow pressure for the experiment was kept 1.5 Kg/cm² and 2.0 Kg/cm². The pressure was measured by pressure gauge. The riser height was kept 0.75 m and 1 m respectively. The data revealed that uniformity coefficient varied from 82.83 to 88.7 percent in point arrangement of micro sprinklers, where as uniformity coefficient varied from 86.10 to 91.76 percent in case of linear arrangement of sprinklers. Experiments revealed that the change in riser height and operating pressure affected the uniformity coefficient significantly. Data also revealed that wind velocity was found to be low in morning as compared to evening. However, wind velocity didn't show a significant effect on uniformity coefficient as wind velocity was found to be very low in the experimental area.

1. Introduction

Water is the most vital natural resources for survival of human being. There is same amount of water on earth today as there was when earth was formed. However, with increase in human and cattle population, the demand for food fiber and fodder has been increasing. As a result, water resources are progressively getting exhausted and competition for available water between agriculture, the domestic and industrial sectors is increasing day by day. Irrigation is a crucial input for the development of agriculture and the importance of irrigation statistics in modernization and revolutionization of agriculture can hardly be under estimated.

In the global scenario, the demand for water has been on the increase from all

fronts, whether be it agriculture, industry or municipal use. To increase the production of crops for feeding the world population of about six billion with dwindling water resources is a challenge. The conventional method of irrigation has not been as efficient in use of water thus resulting in excessive wastage besides creation of problems in many regions through water logging and salinity. Unscientific use of water, apart from wastage have injurious effect on soil health. Therefore, judicious use of water is vital to achieve higher productivity in sustainable manner. Modern system of irrigation like drip, sprinkler coupled with other improved water management practices enhance the water use efficiency and productivity. The method of applying water above the ground surface somewhat resembling rainfall is known as sprinkler system.

The basic aim of the sprinkler irrigation method, is to apply water uniformly as possible to the root zone. Sprinkling, as a method, has been used for many years in different parts of the world for the irrigation of nurseries, vegetables and special crops. They are placed on a relatively close rectangular or triangular spacings for the maximum overlap to irrigate potatoes, carrots, leafy vegetables, groundnuts and other densely planted field crops. The sprinkler irrigation method can be used on lands with irregular topography and is well adapted to light application of water for purposes of seed bed preparation, seed germination and transplanting of seedlings. Irrigation by sprinkling can be adapted to all types of soils.. The quickness with which the equipment can be transported and installed, as well as the possibility of irrigating without any special land preparation, are features which make irrigation by sprinkling attractive for this purpose.

In view of the fact that micro-irrigation systems including sprinkler have not

been popularized in Jammu and Kashmir and not enough work has been done on the performance evaluation of Sprinkler system in Jammu and Kashmir. Given the importance of the sprinkler irrigation system and its popularity, the present study was taken to study the feasibility of the sprinkler system and effect of various operating parameters on the system performance.

2. Materials and Methods:

The experiment was conducted at the Krishi Vigyan Kendra (KVK), Shuhama which is situated in district Ganderbal. The experiment site is located at an altitude of 1730 m above the sea level and the region falls in temperate zone. The experimental site has longitude of 34.04 degree North and latitude of 74 degree south.

The micro sprinkler components manufactured by Jain irrigations were used for the experiment along with water containers. The main features of the given system are as under.

Crop	:	Vegetables
Area	:	40 x 85 m
Spacing	:	4.5 x 4.5 m (sprinkler)
Water source	:	Water tank
Mains	:	PVC pipe 75 mm x 4 kg/cm ²
Sub-mains	:	PVC pipe 63 x 4 kg/cm ²
Laterals	:	Polytube 16 mm.
Discharge	:	69 liters/hour

78 Water containers were used for collecting the discharge from the micro sprinkler in
79 such a way that loss of water because of splashing was avoided. The uniformity
80 coefficient was calculated on two arrangements namely, point arrangement (**Fig1**) and
81 linear arrangement (**Fig 2**). There were 34 water containers used in point arrangement
82 where as 53 water containers were used in linear arrangement. The water containers
83 were placed in 0.75 m x 0.75 m grid. The uniformity coefficients were calculated with
84 the help of Christiansen (1942) formula,

$$85 \quad c_u = 100 \left[1 - \frac{\sum x}{mn} \right]$$

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87 A pressure gauge having a range of 0-7 kg/cm² was used to measure the
88 pressure developed in the lateral line. The system was run at two different pressures,
89 1.5 and 2 kg/cm². Uniformity coefficient was also calculated on two different riser
90 heights of 0.75 m and 1 m.

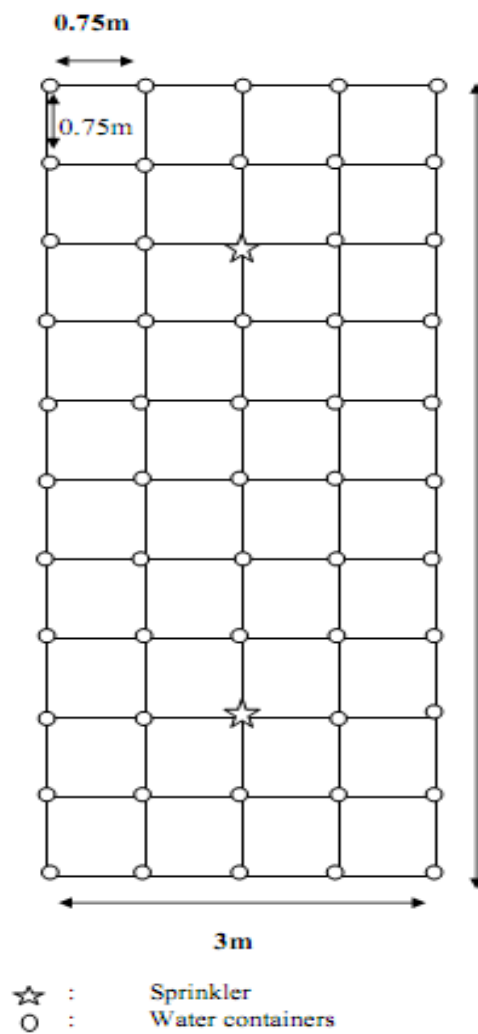


Fig 1 Layout of linear arrangement of micro sprinkler

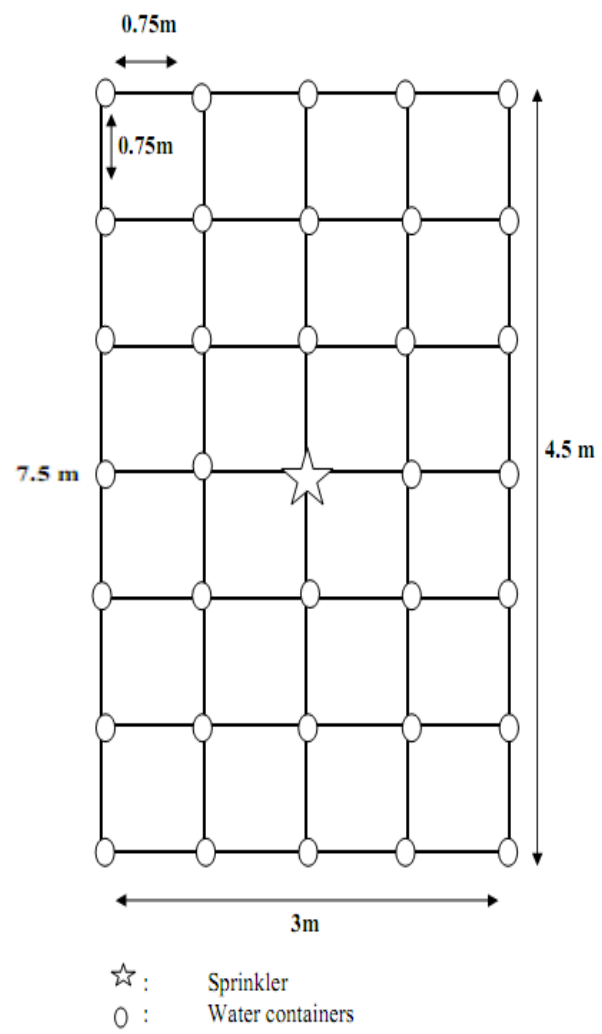


Fig 2 Layout of point arrangement of micro sprinkler

Different agro climatic factors were considered during the experiment. The different parameters recorded and analyzed were wind speed, wind direction and other weather conditions. These data were obtained from the Division of Agronomy, SKUAST-K.

3. RESULTS AND DISCUSSION

Uniformity coefficients were calculated from the field data and were found to be 82.83 and 88.7 per cent as minimum and maximum in point arrangement of micro sprinklers and 86.10 and 91.76 per cent respectively, in case of linear arrangement.

There was a significant effect of riser height and operating pressure on the uniformity coefficient. Uniformity Coefficient increased with the decrease of riser height (from 1 to 0.75 m) and increase of operating pressure (from 1.5 to 2 kg/cm²). The decrease in uniformity coefficient with the increase of riser height may be due to evaporation losses and drift losses. Higher uniformity was achieved at higher pressure (2 kg/cm²).

A unique problem for sprinkler systems is that the water application pattern is susceptible to distortion by the wind. While wind speed and direction are not controlled variables, their effect on irrigation uniformity is significant. However, in present case studies, it was found that the wind velocity remained nearly uniform.

With the increase in wind velocity, uniformity coefficient decreased. However, it was not significant in this particular area as the wind velocity was very low.

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