

Research Paper :

Effect of nozzle size and operating pressure on performance of medium volume rain gun

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ABSTRACT

The study was carried out on the Instruction Farm of Irrigation and Drainage Engineering, Dr. Ulhas Patil college of Agricultural Engineering and Technology, Jalgaon during 2009-2010. The medium volume rain gun model was used in the study of the nozzles of 8, 10, 12 and 14 mm diameter size. The empirical equation of the form, $Q = aH^b + C$ fitted for the pressure discharge relationship for the system. The system was operated at various pressures (2, 3, 4 and 5 kg/cm²) for different nozzle sizes. The increase in nozzle size and operating pressure, increased the discharge of medium volume rain gun. Jet length was also found to be increased in operating pressure. It is observed that increase in pressure increased the discharge of medium volume rain gun system. The minimum discharge was observed at 2 kg/sqcm as 4.17 m³/hr and 6.47 m³/hr for 8, 10 mm, respectively. The maximum discharge was observed at 5 kg/sq cm as 7.70 m³/hr and 10.69 m³/hr for 8 and 10 mm nozzle size, respectively.

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Key words : Rain gun, Nozzle, Operating pressure, Radius of flow

India, which has 17 per cent of world's population, has roughly 4 per cent of the world's water land area. Geographical area of India is about 329 Mha. The net sown area of the country has almost stabilized at about 143 Mha against the cultivable area 193 Mha of the country. Geographical area of Maharashtra is 30.77 Mha. Out of which 22.36Mha area is under cultivation and only 3.81Mha area is under irrigation. This reveals that only 17.20 per cent of total cultivable area is under irrigation which is far less when compared to average irrigated area at national level (40 %) (Economic survey of Maharashtra 2004-05).

The conventional system of water application revolved around the concept of replenishing the moisture to field capacity only after depletion by 50-60% of available soil moisture. Micro irrigation technologies can provide a reasonable solution to the emerging threats such as scarcity of water, soil salinity, water logging which are basically related to agricultural production. These technologies can improve productivity, raise income through crop yields and output and enhance food security of households. The aim is to increase agricultural production per unit volume of water per unit area of cropped land per unit time. These calls for scientific

management of all inputs especially water reasonable for enhance productivity. Irrigation water could be efficiently utilized only by adopting pressurized irrigation methods instead of conventional flood methods. These systems result in overall higher irrigation efficiency as conventional losses such conveyance, percolation, evaporation etc are either totally eliminated or kept at minimum level. These methods are adopted in order to overcome the losses in conventional methods and to use available water efficiently and economically.

In sprinkler irrigation system, rain gun can be used most efficiently for irrigating larger fields in short period with minimum labour requirement. This system consists of a large size nozzle (powerful mega sprinkler) that throws a large amount of water (up to 500 l/min) to a distance up to radius of 90 feet and even more, like a artificial rain. The commonly used hammer action type of the rain gun has some limitations for irrigating.

The research and development on micro irrigation give the proper solution of all problems by launching the medium volume rain gun with jet breaker arrangement and also full circle, half circle and part circle arrangements. Nowadays number of companies are manufacturing rain gun models like, Jain irrigation (model-medium volume