International Journal of Agricultural Engineering, Vol. 2 No. 1 : 72-74 (April to September 2009)

Effect of fertigation on emission uniformity of drip irrigation system

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Accepted : *February, 2009*

ABSTRACT

The recommended dose of NPK nutrients for sugarcane was applied in the form of commercially available water soluble fertilizers alongwith the irrigation water through drip irrigation system. The entire fertilizer dose of NPK was applied in ten equal splits at fortnightly interval. Each level of application was considered as separate treatment (T_1=10%RD, T_2=20%RD, T_3=30%RD, T_4=40%RD, T_5=50%RD, T_6=60%RD, T_7=70%RD, T_8=80%RD, T_9=90%RD and T_{10}=100%RD). The average discharges before and after application of fertigation was recorded and analysed to assess the per cent reduction in discharge and emission uniformity. The average reduction in initial discharge was found as 8.79 per cent. The reduction in initial discharge is suggestive to have one acid treatment at the end of the season when the quality of irrigation water is C_3S_1 and water soluble fertilizer as acidic. The field emission uniformity values were found in the range of 90.34 to 93.01 per cent with an average value of 92.39 per cent for the entire unit. The per cent reduction in field emission uniformity was to the extent of 3.49 % at the end of passing of 100% of RD. The reduction in discharge and the variation in EU was due to the variation in discharge of emitters due to clogging. It was found that the source of water was mainly responsible for clogging of emitters. The analysis of deposits in emitters and laterals revealed that the dissolved salts in water source dominated by carbonates, bicarbonates, chlorides and sulphates of calcium and magnesium are responsible for the emitter clogging. Thus, the reduction in discharge and emission uniformity was attributed to the water quality (C_3S_1) and not to the fertigation.

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Key words : Fertigation, Emission uniformity, Drip irrigation

Efficient water and fertilizer management is possible in drip irrigation. Fertigation through drip can save fertilizers upto 25 per cent (Kale, 1995) alongwith increased fertilizer use efficiency. The saving of fertilizer is an important economic consideration as millions of rupees are spent on the production and import of fertilizers. Not only economic consideration but environmental consideration is equally important as the improper application of fertilizers and irrigation water leads to leaching of nitrates and chlorides polluting the important water resource *i.e.* groundwater. When the fertilizers are applied with irrigation water, the problem of clogging the emitters gets aggravated due to interaction between water quality and chemical composition of water soluble fertilizers. However, to avoid clogging, fertilizers applied through drip system must meet certain requirements. The fertilizers must be completely soluble and must be compatible with the salts contained in the irrigation water. Precipitation of the applied fertilizers is a critical problem and must be controlled to avoid the clogging of the system which reduces the discharge of the emitters and emission uniformity of the drip irrigation system. Another clogging problem associated with fertilizer application is the increase in algae or microbial populations due to increased amount of nutrients in the water. In view of the above mentioned facts the present investigation was undertaken to study the effect of fertigation on the emission uniformity of drip irrigation system.

METHODOLOGY

The field experiment was conducted at the Instructional Farm of Department of Irrigation and Drainage Engineering, Dr. A.S. College of Agricultural Engineering, Mahatma Phule Krishi Vidyapeeth, Rahuri during the year 1999-2000. The soil of the experimental field was clayey type. The field capacity, permanent wilting point, bulk density and infiltration rate of the soil were 37.90 per cent, 19.70 per cent, 1.28 gm/cc and 0.46 cm/hr, respectively. The irrigation water used was of class C_3S_1 containing moderately high carbonates and bicarbonates of Ca and Mg. The SAR of water was 1.24 with pH 8.60 and EC 2.12 ds/m (Table 1). The experimental field was uniformly levelled and drip irrigation system was installed consisting of mainline, submain pipe, sand filter, screen filter, fertilizer tank, lateral (16 mm) and emitters (4 lph online-orifice emitters). The spacing between the laterals was 2.25 m and between the emitters was 0.75 m. The operating pressure of 1 kg/cm^2 was maintained during the investigation. The experiment was laid out in Randomised Block Design (RBD) with ten treatments and three replications. The recommended dose of fertilizer (250N:115P:115K kg/ha)