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Effect of soluble NPK fertilizers on the nutrient balance, water use efficiency, fertilizer use efficiency of drip system in a Tomato

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SUMMARY
A field experiment was conducted to study the nutrient balance, water use efficiency and firtilizer use efficiency of drip system as influenced by fertigation to tomato cv. Dhanashree. This experiment was laid out at Mahatma Phule Agricultural University, Rahuri during the year 1998-99. There was 8 different treatments and 4 different fertilizer grades. Surface irrigation was scheduled at 50 mm CPE for 11 irrigations @40 mm per irrigation and therefore the total depth of irrigation water was 44 mm and 2 days RAINS. Therefore the water requirement was 463.3 mm and for drip irrigation it is 227.9 mm for tomato. The water saving was 50.8 %. The water use efficiency was highest of 206.6 kg ha^{-1} mm in 100 per cent fertigated plots (T_4). The water use efficiency of surface irrigated plots was 79.8 kg ha^{-1} mm (T_8). The utilization of N was 107.1, P 18.1 and K 168.5 kg ha^{-1} which was maximum in T_4 treatment (100 % solid soluble fertilizer). The water use efficiency was highest (206.6 kg ha') in treatment T_4 (70 % N, 80 % P and K fertilizer dose,), fertilizer saving was also maximum in treatment T_4 of 30% N and 20% P and K over control.

Key words: Nutrient, Fertilizer, Drip, Tomato.

Water is an important factor for increasing the crop production and being limited, its efficient use is basic for the survival of agriculture. Further expansion of irrigation may depend upon the adoption of new systems such as pressure irrigation (drip / sprinkler), pitcher irrigation method etc. Amongst sophisticated methods, drip irrigation has proved its superiority due to direct application of water and fertilizer (liquid) in the vicinity of root zone.Tomato requires heavy supply of plant nutrient especially N, P and K fertilizer for ensuring good plant growth and giving higher yields. The use of NPK significantly increased the yield of tomato Mehta and Saini, (1986). Several studies have indicated that conventional methods of fertilizer application needs to be modified in order to take full advantage of drip irrigation system Miller *et al.*, (1976). Application of fertilizers in liquid form through drip irrigation has become increasingly wide spread in commercial fields during recent years. However, very scantly information is available regarding this topic and hence experiment was undertaken to use of liquid NPK fertilizer through drip irrigation on water use efficiency, fertilizer use efficiency and nutrient balance of drip system in tomato.

MATERIALS AND METHODS

A field experiment on tomato was conducted on sandy loam soil during the year 1998-99. This experiment was taken in the Post Graduate Institute Farm of Inter Faculty Department of Irrigation Water Management, M.P.K.V., Rahuri. The depth of the soil was 30 cm. pH 8.1, EC 0.22 dSm^{-1}, Available N, P and K was 148.6, 12.5 and 292.0 kg ha^{-1}. A representative soil sample from 0-15 and 15-30 cm soil depth layer were collected before transplanting and after harvest of the tomato. The experiment was laid out in a randomised block design with 8 treatments and 3 replications. Plot size 5.4 x 3.6 m. The treatment details are given below. -

T_1 100% recommended NPK as soil applied + Surface irrigation.
T_2 100% recommended NPK as soil applied + Drip irrigation.
T_3 100% recommended N through drip + P and K as soil applied.
T_4 100% recommended NPK through drip.
T_5 70% N and 80% P and K fertigated through drip.
T_6 70% recommended NPK fertigated through drip.
T_7 50% N and 80% P and K fertigated through drip.
T_8 50% N and 70% P and K fertigated through drip.

The different grades of fertilizers were used. The recommended dose was divided in to 10 splits at 10 days interval.

RESULTS AND DISCUSSION

Surface irrigation treatment

The water requirement under surface irrigation method was estimated by the climatological method which is presented in Table 1. The available soil moisture calculated was 6.57 cm for a soil depth of 30 cm. Keeping the Maximum Allowable Deficit of 50 per cent and irrigation application efficiency of 0.8, the depth of irrigation was calculated as 4 cm. Irrigation was scheduled at 50 mm CPE for 11 irrigations @4 cm per irrigation and therefore the total depth of irrigation was calculated to be 44 cm. There were only 2 rainy days and the effect rainfall was 23.3 mm for surface irrigation.

Drip irrigation

The water requirement for drip irrigated treatments