Trickle irrigation of processing tomatoes on red-brown earth: - effects of line placement and irrigation strategy on crop productivity

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Trickle irrigation shows great promise for use on tomatoes growing on loams in the Goulburn Valley. Reports vary on the optimum duration and frequency of irrigation to use, and whether the irrigation line should be buried, or on the soil surface. An experiment to assess the effects of these factors on tomato bush growth, yield and fruit quality for processing is described in this paper.

Methods

Nine beds (1.5m x 75 m long) were prepared on Shepparton fine sandy loam at Tatura for the 1985/6 tomato season, and were sown with seed of the processing tomato line K77105. Treatment plots 15 m long were arranged in a Latin square (4x4), and were separated by guard rows and 5 m non-irrigated buffers. Treatments consisted of surface (10 cm from the seed row) or buried (15 cm beneath the seed row) trickle lines (2.0 1 hr^{-1} x 0.5 m spaced emitters) operated at 1-2 day or 2-4 day intervals to correspond with cumulative Class A pan evaporation of 10-15 and 20-30 mm respectively. Irrigation frequency treatments were imposed at the onset of flowering and irrigation times were calculated to supply equal amounts of water to all treatments. Plant biomass was assessed at full flowering by harvest of 1 metre of plant row from each plot. Two metre harvest plots were used to estimate final yields when the crop matured, and to provide fruit for size and soluble solids analysis. Soil moisture was routinely monitored to a depth of 1.1 metres with a neutron probe. Root distribution was assessed on six soil cores (1 m x 32 mm diam.) taken from each plot at final harvest. Cores were cut into 20 cm lengths, and frozen prior to analysis. Frozen cores were soaked overnight in 10% Sodium hexametaphosphate to disperse the clay. Roots were then washed out, and measured on a Comair root scanner.

Results and discussion

Trickle line placement had no effect on plant size, fruit yield or quality, but there were fewer roots in the top 20 cm of soil with buried lines. During the course of the experiment, infrequently watered plots became progressively drier than those irrigated frequently. However, this was not reflected in early plant growth analysis, nor in final ripe fruit yields. Frequently watered plots produced larger fruit and more greens, but total fruit number was independent of irrigation treatment. Soluble solids were higher in fruit from infrequently watered plots. Total root length was not significantly affected by the treatments, but infrequently watered plots had fewer roots in the top 20 cm of soil, and more deep roots (20-100 cm) than those irrigated frequently. Dryness of the infrequently watered plots may have resulted from a discrepancy in flow rates through irrigation timers. Net treatment effects suggest that important processing attributes such as fruit concentration and solids content can be manipulated to commercial advantage through irrigation management.