**The effect of seedbed particle size on wetting patterns and seedling emergence under trickle.**

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Growing interest in the use of alternative irrigation schemes for row cropping in the Goulburn Valley prompted an investigation to determine optimum parameters for trickle irrigation on the heavy clay-loam soils of the area. One of the most important factors in determining water distribution from a trickle outlet is seedbed tilth. This paper reports on experiments where wetting characteristics and tomato seedling emergence under trickle irrigation were examined on a range of artificial seedbeds.

**Methods**

Two experiments were conducted during April and May 1984 in a series of ten boxed miniplots (1.2 x 1.3 x .15 m) constructed in a plastic tunnel so as to avoid rainfall and maintain temperatures conducive to seed germination. Shepparton Fine Sandy Loam (Dr 2.13) was dry sieved into fine (< 1 mm), intermediate (1-2 mm) and large (> 2 mm) aggregates which were mixed to form a range of simulated seedbeds.

Seed of the commercial tomato cultivar H2605 was sown (0.5 g/plot) at 15 mm depth in a line perpendicular to the central trickle tube. Microtube outlets with a discharge rate of 2 1/hr were centrally positioned above each plot, and a 72 hour irrigation period was used.

Surface wetting patterns and saturated zones where surface ponding occurred were measured during and immediately after irrigation. When seedling emergence was estimated at 50% in the best plots, soil water levels were determined gravimetrically. Bulk density for each aggregate mixture was measured before and after irrigation. The emergence of tomato seedlings and their distribution across the plots was monitored until the numbers stabilized to indicate that no further emergence could be expected.

**Results and Discussion**

The lateral movement of water from trickle outlets varied greatly with the aggregate composition of the seedbed, and correlated best with the percentage of fine (<1 mm) aggregates ($r = 0.88$ for experiment 1, $r = 0.81$ for experiment 2). Saturated zone areas also increased proportionately with percent fines ($r = .99, .89$). Surface soil gravimetric water levels and bulk densities were greater in beds with a high fine aggregate content.

Environmental conditions in the tunnel were such that surface soils, once wetted by irrigation, remained moist for the duration of the experiment. Surface crusting which accompanies rapid drying of irrigated topsoil in the field therefore failed to develop. Emergence was highest in plots with a fine aggregate component of between 26 and 44%. Early figures showed poor correlation (0.33, 0.78) between seedling emergence and surface wetting, but this improved in final countings (0.79, 0.92) as seedlings emerged from the saturated zones, where reduced soil oxygen levels had presumeably delayed their germination (1).

The results of this experiment emphasize the importance of seedbed tilth for achieving adequate wetting and seedling emergence under trickle. Commercial tomato beds in the Goulburn Valley have an estimated fine aggregate content of approximately 35% (2). Our results show that this should produce good lateral spreading of water and adequate seedling numbers under trickle, provided surface soil water levels are maintained. Poor soil aeration in the vicinity of the dripper may cause unevenness in seedling distribution, but this is unlikely to be of consequence commercially.

1. Rathore, T.R., Ghildyal, B.P. and Sachan, R.S. 1983. Soil and Tillage Research 3: 111-121.

2. Adem, H.H., Tisdall, J.M. and Willoughby, P. 1984. Soil and Tillage Research. In press.