## Response of onions to lime

M.G. Temple-Smith[1] and J.C. Laughlin[2]

Tasmanian Department of Agriculture
[1]Mt Pleasant Laboratories, P.O. Box 46, South Launceston, 7249
[2]Stoney Rise Centre, P.O. Box 303, Devonport, 7310

The gross value of onion production in Tasmania in 1981-82 was $5.2 million (19,200 tonnes) making onions the third most valuable vegetable crop after potatoes and green peas.

Onions are grown almost exclusively on acid krasnozems (Cn 4.12) and earlier glasshouse pot experiments have shown large responses in yield of onions when these soils are limed. However, there is no information on the response of field grown onions to lime treatments applied to these soils. This paper reports on the response of onions to lime in relation to growth, bulb yield and the distribution of roots at the start of bulbing.

### Methods

An irrigated field experiment was conducted on an acid krasnozem where various lime treatments had been applied 27 months previously. Soil pHw levels (1:5 soil:water) on these treatments at sowing ranged from 5.2 - 7.0. The design was a randomised block of four replicates of the following treatments : ground limestone (L @ 2.5, 5, 10 and 20 t/ha), gypsum (G @ 3.75 t/ha) and dolomite (D @ 4.25 t/ha).

Shoot dry weight was determined 3 and 4 months after sowing and bulb yields were measured at dry maturity.

Composite soil samples were taken at sowing for pHw and nutrient analysis. At the start of bulbing (4 months from sowing) two 100 mm diam. soil cores were sampled to a depth of 500 mm from plots in two replicates. The cores were cut into 100 mm sections and soil pHw and total root length were recorded.

### Results and Discussion

Lime treatments increased yields of onion at each harvest, maximum yield occurring at soil pHw values above 6.0 (see table).

**Effect of Lime on Soil pHw at Sowing and Onion Yield at each Harvest**

| | Treatments | | | | | | | L.S.D. |
|---|---|---|---|---|---|---|---|---|
| | Nil | L 2.5 | L 5 | L 10 | L 20 | G | D | P < 0.05 |
| Soil pHw (0-100 mm) | 5.4 | 5.6 | 5.9 | 6.2 | 6.8 | 5.4 | 5.9 | 0.19 |
| Shoot Yield - Harvest 1 (t/ha) | 0.15 | 0.26 | 0.38 | 0.49 | 0.51 | 0.16 | 0.46 | 0.11 |
| Shoot Yield - Harvest 2 (t/ha) | 2.98 | 3.36 | 3.85 | 4.69 | 5.27 | 2.47 | 4.98 | 1.58 |
| Bulb Yield - Dry Maturity (t/ha) | 34.8 | 46.9 | 42.7 | 54.3 | 59.9 | 39.5 | 47.6 | 12.3 |

Total root length/core and the % of total root length below 200 mm depth increased with increasing pHw. Regression of the % of total root length below 200 mm depth (y) against soil pHw at a depth of 200-300 mm (x) [$y = 32.3x - 157.4$, $R^2 = 0.76$, $P < 0.01$] indicated that low subsoil pHw was restricting rooting depth. Highest yields were obtained when 40-60% of total root length was present at depths below 200 mm at the start of bulbing.

We concluded that field pHw levels in at least the surface 300 mm of soil should be greater than 6.0 for maximum yield of onions on Tasmanian krasnozems.