

Irrigation of sunflowers in the southeast of South Australia

T.D. Potter

South Australian Department of Agriculture, Struan, SA, 5271

Experiments were initiated to determine the response of sunflowers to varied numbers of spray irrigations on a shallow soil in the southeast of South Australia.

Methods

In 1976/77, on a Uf 6.11 (1) groundwater Rendzina soil, a 10 hectare commercial crop of Peredovik sunflower was spray-irrigated at 6 frequencies from the early bud stage. From nil to 5 irrigations were applied, each of approximately 75mm. The trial was unreplicated, but four subplots (each 450m²) were harvested for each of the treatments and mean yields calculated. Seed size was determined and oil content measured by Nuclear Magnetic Resonance.

In 1977/78 a similar trial was repeated with one irrigation after sowing to ensure plant emergence. From one to six further irrigations each of approximately 75mm were applied. In each of the irrigation treatments, 24 subplots (each 60m²) were sown with established plant populations varying from 30,000 to 80,000 plants ha⁻¹. Within each irrigation treatment, regression analysis of seed yield on plant population was non-significant, so yields were pooled. Mean plant population varied from 55,000 to 66,000 plants ha⁻¹ and total plot size was 1440m².

Results and Discussion

Sunflower seed yields increased linearly with number of irrigations applied.

In 1976/77; $Y = 625 + 155.4 W$ ($P < 0.001$) $100R^2 = 77.3$

In 1977/78; $Y = 462 + 271.5 W$ ($P < 0.01$) $100R^2 = 95.9$

where Y = seed yield (kg ha⁻¹) and W = number of irrigations.

Seed weight and oil content were determined only in 1976/77. Mean oil content was 46.2% and was unaffected by irrigation frequency. Seed weight increased linearly with the number of irrigations applied:

$S = 5.63 + 0.186 W$ ($P < 0.01$) $100R^2 = 31.8$

where S = 100 seed weight (gm) and W = number of irrigations.

Seed weight accounted for only 17% of the 124% yield increase due to irrigation, indicating that most of the yield increase was due to increased seed number.

The results reported here confirm those of Browne (2) and extend his findings from flood irrigation on a deeper soil to spray irrigation on a very shallow clay overlying limestone.

Although response of seed yield to number of irrigations was linear, 375mm of irrigation water produced only 1400 kg ha⁻¹ seed in 1976/77 and 525mm of irrigation water produced only 2360 kg ha⁻¹ seed in 1977/78. These comparatively low yields may have been due to the limestone impeding root growth and thus reducing the ability of the plant to use all of the water applied. Browne (2) found that increased frequency of irrigation with reduced quantities of water increased sunflower seed yields. This could also be expected to occur on a groundwater rendzina soil by reducing moisture stress between irrigations.

1. Northcote, K.H. 1971. A Factual Key for the Recognition of Australian Soils. Third Edition. Rellim Tech. Public., Adelaide.

2. Browne, C.L. 1977. Aust. J. Exp. Ag. and Anim. Husb. 17: 482-488.

