

Comparison of water use by sunflower at two row spacings

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Both irrigated and rainfed sunflower are frequently grown at one meter row spacings in north-western New South Wales. At this spacing, an irrigated crop (population = 50,000 plants ha⁻¹) was found to intercept only 70% of incoming radiation at maximum LAI (= 1.8) (unpublished data). It was postulated that a more uniform spatial distribution of plants would intercept more radiation and that this should increase yields. Greater energy interception by the canopy may, however, increase crop water requirement by increasing the transpiration load. Where crops are irrigated, additional water could be applied to meet any increase in demand but, in rain fed crops where the total supply of water is limited, any factor which increases the rate of water use could reduce the yield potential of the crop. An experiment was undertaken on the N.S.W. Department of Agriculture Research Station at Narrabri to quantify the energy and water balances of both rainfed and irrigated crops grown in conventional one meter rows and with improved spatial distribution (square planting). Data relating to water use are presented.

Methods

Sunflower was sown on 2 m beds at either a 2 x 1 m or 4 x 40 cm row spacing and hand-thinned to 50,000 plants ha⁻¹. Irrigated plots were furrow-irrigated following depletion of 60% of the total extractable soil water within the root zone. Suncross 52 (tall late maturity) was planted for both sowings with Suncross 150 (semi-dwarf early maturity) being included for the second sowing only. Crop water use was computed from regular neutron probe measurements of soil water. Yield was determined on 40 heads hand-harvested at physiological maturity.

Results and Discussion

Table 1. The effect of rowspacing on the water use and yield of sunflower.

Sowing Date	Cultivar	Water	Water Use (mm)		Yield (kg/ha ⁻¹)	
			1m Rows	40cm Rows	1m Rows	40cm Rows
15/12/80	Suncross 52	Rainfed	246a	233a	626i	748i
		Irrigated	555b	587b	2177ii	2361iii
23/9/81	Suncross 150	Rainfed	261i	247i	607x	633x
	Suncross 52	Rainfed	251i	251i	715x	587x
	Suncross 150	Irrigated	564ii	565ii	2254y	2078y
	Suncross 52	Irrigated	676iii	696iii	2660z	2795z

Different symbols indicate significant differences between means within columns $P < 0.05$ (Duncan's Multiple Range Test).

There was no significant effect of row spacing on either water use or yield although there was a tendency for the long season cultivar to use more water and yield slightly more when grown in narrow rows. Under rain fed conditions in the second sowing, no significant differences between cultivars were found. Under irrigated conditions, however, the long season cultivar used significantly more water and had a significantly higher yield than the early season cultivar. A more detailed analysis of the cultivar differences in water use may be found in Dubbelde *et al.* (1982). The lack of any substantial response to row spacing, despite an increase in direct radiation interception (unpublished data), suggests that at wide row spacings indirect and reflected radiation may have an important role in both photosynthesis and transpiration. Detailed analysis of the daily water use, radiation interception and crop growth data may explain the absence of a significant rowspacing effect.

1. Dubbelde, E.A., Harris, Hazel C. and McWilliam, J.R. 1982. *Proc. 10th Inter. Sunflower Conf.*, Surfers Paradise, Australia (In press).