

The effect of water stress on yield and dry matter production of rapeseed

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Rapeseed has traditionally been grown in high rainfall environments of Victoria but recently it has been increasingly sown in drier areas of the State. The effects of water stress and water availability on rapeseed crop production has therefore been investigated in a field trial (1986) and two glasshouse experiments (1985, 1986).

Method

A field trial with four commercial cultivars of rapeseed was sown in 3 m x 1.2m plots (6 replicates) on an alkaline clay (Ug 5.2) at Horsham. The watering regimes were imposed at anthesis, namely rainfed only, single irrigation (40 mm) at anthesis, and 14 irrigations of 55 mm applied every three days from anthesis to physiological maturity.

In the glasshouse experiments, three groups of 50 L pots containing 5 plants of each selection (based on bagged, selfed, single plants) of rapeseed were grown in pine bark soil mixture. Water was made freely available until the commencement of anthesis, then withdrawn from stress treatment plants (4 pots of each selection) until they had been subjected to 24 hours of water stress at -15Y. Stress cycles were repeated 9 times between anthesis and maturity. The leaf water potential of control plants was not allowed to decline below -5Y.

Results and Discussion

Crop production data for the 1986 experiments are shown in the following table of results.

Field Cultivar:	Seed yield (t/ha)		
	Rainfed	1 Irrig.	14 Irrig.
Tatyoona	1.54	1.84	2.39
Wesbrook	1.37	1.50	1.79
Marnoo	1.34	1.60	1.99
Wesroona	1.19	1.38	1.68
LSD ^a (P=0.05)			

Glasshouse Selection:	Seed yield (g/plant)		Total DM ^b (g/plant)		Harvest index		Oil cont. %	
	SC	NS ^d	S	NS	S	NS	S	NS
Tatyoona	68	224	438	1,148	15.6	19.6	40.6	41.2
Wesbrook	58	189	490	1,077	11.9	17.8	40.2	42.3
Marnoo	58	233	396	927	15.0	25.9	40.5	45.1
LSD ^a (P=0.05)		27		195		4.7		1.0

^aLSD treatment x cultivar or selection; ^bDry matter; ^cStress; ^dNo stress

Significant effects of both cultivar and watering treatment on yield were observed in the field experiment. Production was limited in rainfed conditions despite high rainfall (75 mm) during late seed filling. Stress in the early post anthesis period reduced yield potential.

In the glasshouse experiment, water stress decreased seed production, total dry matter, harvest index and oil content. Significant treatment x cultivar interactions were observed in seed production, harvest index and oil content. The Marnoo selection was more affected by water stress than the other selections.

This research demonstrates genetic differences between cultivars in tolerance to water stress. If rapeseed production is to be increased successfully in lower rainfall areas, more appropriate cultivars must be selected to suit shorter growing seasons and avoid severe stress conditions which develop late in the season.