

Saturated soil culture of soybeans - a new agronomic system

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Periodic short term water-logging commonly occurs in dryland and irrigated soybean crops, particularly in the tropics. Although soybeans are reputed to tolerate water-logged soils (Pendleton 1976), conditions of excessive moisture are generally regarded as detrimental to nodulation and nitrogen fixation (Sprent 1969, 1972; Diatloff 1976).

In contrast we have demonstrated that permanent water tables maintained close to the soil surface in an alkaline black earth actually stimulated soybean growth and nodule development (Hunter *et al.* 1980) in comparison to overhead irrigation (Table 1). Using a modification of this management concept, high seed yields have been recorded on the Cununurra clay soil of the Ord River Irrigation Scheme (Garside, pers. communication).

TABLE 1. Effect of moisture regime on mean performance of nine soybean lines, after 36 days in beds of soil in the glasshouse (Hunter et al. in press)

	CWT 3	CWT15	OHI	LSD P = 0.05
Plant height (cm)	52.6	76.2	44.60	4.0*
Nodules plant ⁻¹	73	98	13	24*
Nodules weight (g plant ⁻¹)	0.29	0.26	0.01	0.05*
Whole plant weight (g)	7.50	14.21	9.70	1.17*

CWT 3,15 = constant water table maintained 3 cm and 15 cm below soil surface.

OHI = overhead irrigation before onset of visible wilting.

* = significant at P = 0.05.

Several aspects of management are critical to the successful application of this system; viz., adequate *Rhizobium* populations are necessary to ensure good early nodulation, the water table must be imposed as soon after emergence as possible and the level of the water table must be controlled throughout the crop cycle. Some variation in level of the watertable may occur without adverse effects.

The cultural system promotes rapid early growth, and this will allow use of short crop cycles (perhaps 80-85 days) in which high seed yield is possible. Short crop cycles can give greater flexibility of rotation and may provide less opportunity for disease and pest problems to develop. It is possible that under this system of management, soybeans may contribute to soil nitrogen for succeeding crops. The potential for weed growth is small. However, application of the system may be restricted to certain soil and topographic conditions, and mineral nutrition or disease problems may be induced on some soils.

Various aspects of this cultural system are under investigation. The system may have considerable application in broad-scale irrigated soybean production as well as being complementary to paddy rice culture.

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