Boron tolerance of australian wheat varieties

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Boron toxicity in cereals was first recognized in South Australia by Cartwright et al (1). Differences in the response of commonly grown South Australian wheat varieties to high levels of applied boron have been described and the distribution of boron tolerant wheat varieties has been used to estimate the extent of boron toxicity in southern Australia (2).There has remained a need to characterize wheat varieties from the other states for boron tolerance (BT).

Methods

Twenty Australian varieties and 11 breeding lines were grown in replicated trials at Two Wells during 1987 and 1988, a site known to contain potentially toxic levels of boron in the subsoil (2), and nearby at Windsor, during 1987, where boron toxicity is not a major problem. Grain yields and concentrations of boron in the whole tops were compared. The varieties were also grown in a replicated pot experiment at three levels of applied boron (0, 10, 25 mg B/kg soil).

Results and discussion

Five classes of BT were identified. Halberd and Olympic rated as the most tolerant but on an international basis could only be classified as moderately tolerant (MT). The majority of the lines, including those based on WW15 were moderately sensitive (MS). Two further classes appear to separate the MT and the MS types; Matong approaches Halberd and Olympic in tolerance, while Aroona and Bindawarra are only slightly more tolerant than the MS class. The cultivar Hartog is exceptionally intolerant. The tolerant types showed a relatively high yield at Two Wells with low tissue concentrations of boron. An exception was Bindawarra, with an east Asian ancestry, which yielded well despite having consistently high concentrations of boron in the tissue (Table 1). BT rankings are confounded by maturity and root distribution in the subsoil.

Table l. Boron tolerance of some Australian wheat varieties

	Tiss. B conc. Two Wells 1987 mg/kg	Yield ranking at Two Wells 1987/88	Windsor 1987	DM production Ratio B25/B0 (%)	Rating of boron tolerance
Halberd	36.3	2	1	89	MT
Matong	49.7	4	8	81	MT/MS
Aroona	57.2	1	3	40	MS/MT
Bindawarra	80.7	3	7	88	MS/MT
Condor	76.0	7	6	28	MS
Gutha	88.0	8	2	19	MS
W1*MMC	87.6	6	4	21	S
Hartog	64.4	5	5	4	VS

1. Cartwright,B., Zarcinas,B.A. and Mayfield,A.H. (1984) Aust.J.Soil Res., 261-72.

2. Rathjen, A.J., Cartwright, B., Paull, J.G., Moody, D.B. and Lewis, J. (1987). In: Priorities in soil/plant relations research for plant production (Searle P & Davey B, eds). Sydney Uni. Press.