

Vernalisation requirements of contrasting wheat genotypes

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In the British AFRO wheat model the vernalisation requirement of a genotype is characterised by two parameters, V_b and V_s , which are based on the accumulation of vernal days (VD). Plants must experience a base number of V_b vernal days before they will progress to reproductive development, and develop at a rate independent of vernalisation once a saturation number of vernal days (V_s) has been exceeded. In between, development rate is a linear function of VD. We present the results of two experiments in which the aim was to define values of V_b and V_s for Avalon and Moulin, two European winter cultivars with large vernalisation requirements, and Rongotea, a New Zealand spring cultivar with little or no vernalisation requirement.

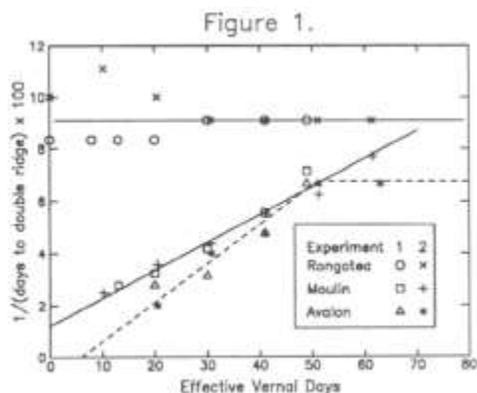
Methods

Seeds of the cultivars imbibed at room temperature for 24 hours were placed in the dark to vernalise at 4°C for between 0 and 49 days in experiment 1, and at 3°C for between 0 and 86 days in experiment 2. The seedlings were then planted and grown on in a growth room at a constant 20°C, 80 W m⁻² PAR and a photoperiod of 20 hours. Times from plant emergence to double ridge were recorded.

Results and discussion

The development rate of Rongotea was independent of vernalisation duration, confirming that it has no vernalisation requirement. In experiment 1, V_s was not reached for either Avalon or Moulin but it was reached for Avalon in experiment 2 (Fig.1). The lower treatment temperature in experiment 2 had less vernalising effect. Results were standardised by multiplying all vernalising times in experiment 2 by 0.73, which was the ratio of vernal days for the treatments in each experiment which took the same time from emergence to double ridge. Taking a day at 4°C as 1 effective vernal day, V_s for Avalon was estimated to be 51 VDs; with this requirement satisfied the plants took 15 days from emergence to double ridge. V_b was found as the intersection of a fitted regression line with the x-axis (Fig.1), and was 6 and -11 VDs for Avalon and Moulin respectively. However, vernalising effectiveness became erratic with short periods of exposure to the low temperatures.

These results reveal differing vernalisation responses between the 2 cultivars. The positive V_b value for Avalon means that it will not begin reproductive development without at least 6 effective days of vernalisation. In contrast, the negative value for Moulin indicates that it has no obligatory cold requirement and will develop slowly, even without vernalisation. In both cultivars, the development rate accelerates as more vernalisation is experienced.



1. Weir, A.H., Bragg, P.L., Porter, J.R. and Rayner, J.H. 1984. *Journal of Agricultural Science, Cambridge* 102: 371-382.