

## ARE WHEAT SEEDLINGS INTELLIGENT?

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The coleoptile is a hollow sheath produced by monocotyledonous seedlings through which the primary leaf grows from the embryo to the surface of the soil. Coleoptile lengths can be influenced by genetic and environmental factors and may influence yield through crop establishment. Coleoptiles have a high degree of directional sensitivity to light (phototropism) and gravity (geotropism) (1). This study has examined geotropism of wheat seedlings and its influence on coleoptile length.

### MATERIALS AND METHODS

A group of 114 wheat cultivars was evaluated in the laboratory for the influence of geotropism on coleoptile length. Ten grains were placed facing upwards and ten grains facing downwards on 32x46 cm Ekwip wetted filter paper (grade R6). The grains were placed equidistant (2 cm apart) in a row 5 cm from the base of the sheet. The filter papers were rolled into 'cigars' which were then wrapped in foil, and incubated vertically at 23°C for 10 days. The measurements made were for downward growth (length), upward growth (length), total coleoptile length and effective coleoptile length (effective upward growth from the seed).

### RESULTS AND DISCUSSION

For the grains facing upwards, minimum coleoptile length downwards ranged from -3.2 to 0 mm; maximum coleoptile length upwards ranged from 42.4 to 99.9 mm; maximum effective coleoptile length ranged from 41.7 to 99.9 mm; and maximum total coleoptile length ranged from 43.1 to 99.9 mm. For grains facing downwards, the equivalent ranges were 3.9 to 13.4 mm; 29 to 80.8 mm; 17.8 to 76.2 mm; and 40.2 to 85.4 mm.

None of the 114 cultivars examined had each of these four desirable characteristics. Cultivars not specifically selected for these characteristics could display variable field emergence, as grains are facing in any direction once planted. This may result in some grains having a significantly reduced coleoptile length and hence possible emergence problems. Eight of the 114 cultivars possessed three of the four desirable characteristics and 43 cultivars displayed no desirable characteristics. The latter group included the commercial cultivars Banks, Condor, Dollarbird, Flinders, Grebe, Hartog, Houtman, Janz, Kelelac, Kiata, Kite, Machete, Meering, Minto, Miskle, Mokoan, Moray, Oxley, Sunco, Sunelg, Sunfield, Vasco and Wilgoyne.

A procedure can now be recommended for wheat breeders to screen cultivars in the laboratory for coleoptile length and geotropic responses. It should prove to be a quick, cheap and efficient method to identify future "intelligent" cultivars: those having good seedling emergence and establishment properties with the knowledge of "which direction is upwards".

### REFERENCES

1. Hart, J.W. 1990. Plant Tropisms and other Growth Movements. (Allen & Unwin: North Sydney).