

Hypocotyl length as a determinant of white clover seedling emergence

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Sowing depth has long been recognised as an important factor governing the emergence of seedlings from drilled seeds (1) although this aspect is often neglected in practice. The recommended sowing depth for white clover (*Trifolium repens*) ranges from 12 mm (1) to 25 mm (2) although as many as 72% of the viable seed sown at 38 mm have produced seedlings (3). In this paper, the emergence of white clover seedlings from different sowing depths is compared with the hypocotyl lengths of a seed sample from the same seed source.

Methods

Experiment 1: Commercial white clover seed was germinated on cotton wool and grown in the dark at 18°C until seed reserves were near exhaustion and the hypocotyls had reached a maximum length. These were then measured.

Experiment 2: Wooden boxes were filled with a krasnozem to a depth of 75 mm and placed in the ground so that the top of the boxes were flush with the surrounding soil. White clover seeds were sown on the surface or at depths of 10, 20, 30, 40, 50 or 60 mm. The soil was maintained near field capacity by daily watering. Emergence was complete ten days after sowing. The mean ambient temperature during the emergence period was 18.2°C. Emergence was expressed as the number of emerged seedlings per 100 viable seeds sown.

Results and Discussion

The maximum hypocotyl lengths of the seeds germinated and grown in the dark were normally distributed with the following population mean and variance:

$$= 35.59 \text{ mm}, s^2 = 59.6, n = 211.$$

In experiment 2, actual emergence of seedlings from 10-60 mm closely approximated, but was slightly less than predicted from the population distribution of hypocotyl lengths grown at 18°C (Fig. 1). Probit analysis of the percent failure to emerge was used to obtain the following estimate of the depth from which 50% of the seedlings failed to emerge: 33.58 ± 0.49 mm. This depth was about 2 mm less than the depth predicted from the mean hypocotyl length of 35.59 ± 0.53 (P < 0.001). Surface sown seed failed to produce seedlings.

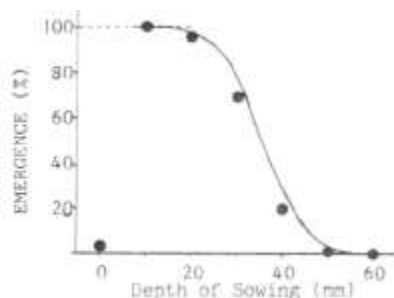


Figure 1. Actual emergence (•) compared with the emergence predicted from the distribution of hypocotyl lengths (---)

The potential length of the hypocotyl slightly overestimated (= 2 mm) the depth from which a seedling could be expected to emerge when sown in a well structured soil under favourable soil moisture and

temperature conditions. The results also highlight the critical importance of controlling sowing depth of white clover particularly as a small variation of \pm 5 mm around a depth of 35 mm can change emergence from 76% to 28%.

The optimum depth of sowing is a compromise between sowing as shallowly as possible to maintain a high potential emergence of seedlings without placing the seed so near the surface that adverse soil moisture and temperature conditions reduce the survival of the germinated seedling: The optimum sowing depth in this study is 10-20 mm.

1. Herriott, J.R. 1958. *Herbage Abstracts*. 28, 73-82.
2. Sherwin, R.A. 1938. *Tasmanian J. Agric.* 9, 181-184.
3. Cullen, N.A. 1966. *N.Z.J. Agric.* 112, (2) 31-32.