

A comparison of the root structure of trifolium Repens Cvv. Huia and Haifa

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White clover has two main types of roots, crown (tap) roots and adventitious roots which arise from the nodes of stolons. In most environments, the crown and its root system rarely survives beyond two years (1) and plant persistence then depends on the independent growth of stolons, supported by their adventitious root systems. This paper describes some essential differences between the two root systems in mid-summer on 10 month old plants of cvv. Huia and Haifa grown at Tamworth, NSW.

Methods

Plants were established in individual peat pots in May, 1988, and then transplanted into 1m² field plots placed 20 cm apart in a grid pattern. Three plots of each cultivar were established. Some spray irrigation was used to maintain active growth, especially during summer. A section of each plot (20 cm x 40 cm) was removed to a depth of 30 cm on 6 February, 1989, and all plants and intact roots were recovered by carefully washing the soil. Some crown roots penetrated below 30 cm, and these were followed to their extremity. The soil was a red-brown earth. Measurements were made on the lengths and mass of roots and stolons, and stolon diameter.

Results and discussion

Maximum depth of penetration of crown roots of both cultivars was 70 cm, which was the effective depth of soil at the trial site. Most of the crown roots recovered in the sample were between 11 and 25 cm long, while about 15% were longer (Fig. 1a). Very few reached the maximum depth of 70 cm. The adventitious roots rarely exceeded 25 cm in length (Fig. 1b), and most were less than 10 cm. The adventitious roots on Haifa were on average longer than those of Huia. More importantly Haifa had a higher proportion of adventitious roots longer than 20 cm. Haifa also had fewer but larger diameter stolons than Huia, and a lower number of roots/unit area.

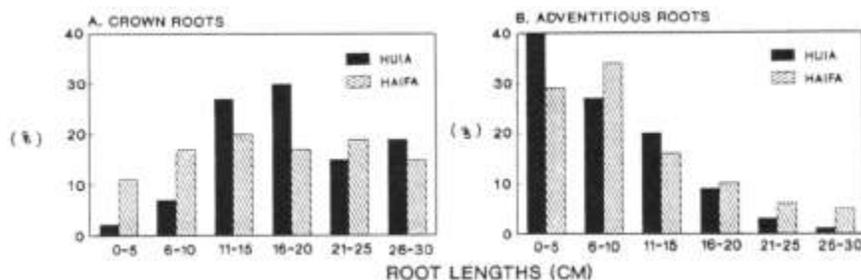


Figure 1. The percentage of crown and adventitious roots of white clover in various length categories.

These results suggest that white clover may be more drought tolerant when an active crown root system is present. It appears that the adventitious root system of white clover may only be capable of extracting moisture from relatively close to the soil surface. Stolons which become detached from the crown root system, either due to death of the crown roots, or through grazing and trampling, will therefore be more vulnerable to drought. The combined effects of lower stolon density and longer adventitious roots on Haifa also suggests an explanation for the better performance of Haifa compared to Huia in marginal white clover areas such as the north-west slopes of NSW (2).

1. Jones, R.M. 1980. Trop. Grasslands 40:19-21.

2. Archer K.A. 1981. Aust. J. Exp. Agric. Anim. Husb. 21:485-490.