Root carbon inputs into soil from a C4 root system.

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In recent years, considerable research interest has been focused on soil carbon, particularly with respect to the potential for soils to act as a sink for carbon in the context of climate change mitigation. To fully understand this potential, it is vital that we know how much carbon is contributed from various sources and the stability of each source. Roots and root exudates have received little attention with regard to their contribution to the soil organic carbon pool.

Using a soil with a history of C3 plant growth and growing Rhodes grass (Chloris gayana), a C4 subtropical species, we aim to determine the amount of 'new' carbon input from the root system. Isotopic Ratio Mass Spectrometry (IRMS) was used to determine δ13C in the bulk soil and rhizosheath to quantify C4 derived carbon and its distribution in the root system.

For this research the top 30cm of a Chromosol (Kirby Farm) and a Ferrosol (Waterfall Way) were sourced from the NSW New England Tablelands. The soils were air-dried and sieved to <4mm, and a basal nutrient solution and water added to reach a field capacity of 60%. A total of 70 PVC pots (50mm diameter and 370mm height) were repacked to achieve a bulk density of 1.2g/cm3. Five seeds were sown into each pot and grown in a glasshouse with night/day temperatures of 15°/25°C.

At regular intervals from thinning, five pots from each soil were destructively sampled and separated into bulk soil, rhizosheath soil and plants roots. Each of these components were analysed for δ13C. Plant root length and diameter measurements were obtained using WinRHIZO™. Data were analysed using generalised linear models. In this paper we describe the relationship between root growth, total root carbon input and the relative importance of C source in the root zone.