

Root growth and N uptake to 1.6 m soil depth by babyleaf rucola on sandy soil

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Little is known about root growth and N uptake of field-grown babyleaf rucola. However, the quality of the babyleaf product is very sensitive to decreases of N fertilisation despite high application of up to 250 kg N ha⁻¹ over the first 8 weeks growing period. This may be due to leaching of nitrate below the root zone on sandy soils, and subsequent losses of nitrate to the environment. Therefore a field experiment was performed to investigate 1) the root growth and N uptake of rucola on sandy soil; 2) the effect of N fertilisation and seeding density on soil N availability, deep root growth, N uptake activity and product quality. Root growth was studied by use of minirhizotrons and deep N uptake by isotope ¹⁵N placement at two subsequent harvests. Rucola was found to have a root depth of 0.8 m at the first harvest (eight weeks) and of 1.6 m at the second harvest after additional four weeks. The deep root growth was confirmed by uptake of ¹⁵N placed at 0.6 and 1.1 m depth. The deep N uptake was not affected by N fertilisation, but total N uptake and product quality were increased by higher N fertilisation and seeding density. In average more than 200 kg nitrate-N ha⁻¹ was lost from the 0-2.5 m soil profile during the 12 weeks of growth and another 200 kg N/ha was left in the soil after harvest. The apparent contradiction between the development of a deep root system, high N inputs and suboptimal quality at harvest was indicated to be due to high irrigation intensity at seeding. This caused low availability of nitrate in the early root zone, and extreme N losses from this sandy soil.

Keywords: rucola, deep root growth, N uptake, minirhizotrons, nitrate leaching