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Abstracts Book

Consequences of potassium deficiency and throughfall exclusion on fine root distributions down to 17 m depth in Brazilian Eucalyptus grandis plantations

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In many tropical regions, climates changes are expected to cause longer drought periods. Potassium fertilization (K) can have a positive effect on plant water use efficiency. Important morphological and physiological traits are modified by K availability and water supply regimes. Our study aimed to assess the combined effect of K fertilization and soil water availability on deep roots exploration of *Eucalyptus grandis* trees. A throughfall exclusion experiment was used to compare stands with 37% of throughfall excluded (-W) and stands without rain exclusion (+W), with and without K fertilization (+K and –K, respectively). Eucalypt fine roots (diameter $<$ 2mm) were collected along the soil profile down to the water table (17 m depth) in 12 plots (4 treatments x 3 blocks), at 2 and 3 years after planting. Total fine root biomass was twice as high in +K+W than in -K+W (507.5 and 253.2 g m-2 respectively) and 62% higher in +K-W than in -K-W (501.4 and 308.7 g m-2 respectively), 2 years after planting. The same patterns were observed at 3 years of age. The total fine root biomass almost doubled for all treatments between the second and third year of growth. At 2 years of age, the root front for all treatment was found from 7 meters depth for –K+W to 10.6 meters depth for +K-W. At 3 years, *Eucalyptus* trees in +K-W reached the water table at 17 m depth while no fine roots were found down 15 m depth in the other treatments. Potassium fertilization increased total fine root biomass and allowed *Eucalyptus* trees to reach the water table earlier when 37% of throughfall was excluded from the stand. Our study suggests that K fertilization increases the exploration of deep soil layers by fine roots, which is likely to improve tree tolerance to drought over the early growth of *Eucalyptus grandis* plantations, providing a fast access to water stored in deep soil layers.

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