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ORIGINAL PAPER

Do propagation methods affect the fine root architecture of African plum (*Dacryodes edulis*)?

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Abstract Belowground tree growth attributes determine whether associations will be complementary or competitive in an agroforestry context. A study on fine root ($d \leq 2$ mm) distribution patterns of *Dacryodes edulis* based on root density (RD), root length density (RLD) and root weight density (RWD) was conducted to evaluate the effect of propagation methods on rooting distribution. Results showed that *D. edulis* trees of seed origin had greater RD ($P \leq 0.001$) than trees of vegetative origin (cuttings and marcots) in the upper soil stratum (0–30 cm). Similarly, in the uppermost soil stratum (0–10 cm), RLD and RWDs varied significantly ($P < 0.01$). Trees of seed origin had an exponential distribution pattern for fine RD, RLD and RWD with depth to 80 cm. In contrast, the distribution pattern of fine roots of trees of vegetative origin (cuttings and marcots) were quadratic for the same variables which increased in the 20–30 cm soil depth stratum before declining steadily to a depth of 80 cm. The findings of this study suggest that *D. edulis* trees of vegetative origin (cuttings and marots) are likely to be less competitive than trees of seed origin when intercropped with shallow-rooted annual plants in an agroforestry system for belowground resources.

Keywords Agroforestry · Fine roots · Indigenous fruit tree · Propagation methods

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Introduction

Dacryodes edulis (G. Don) H. J. Lam. (Burseraceae) is a priority agroforestry species in the humid zone of West and Central Africa (Franzel et al. 1996) where it is indigenous to countries of the Gulf of Guinea (Kengue 2002). The fruits are easy to prepare and highly nutritious. They are an important source of food and edible oil (Silou 1994; Umoti and Okyi 1987). They are widely marketed both locally and regionally (Awono et al. 2002) and even, to a small extent, internationally (Tabuna 1999). Consequently, these fruits are an important source of income for vulnerable and marginalized people (women and the poor). This value is further enhanced by the coincidence of the fruit maturing season with the start of the school year (Schreckenberg et al. 2002, 2006) so providing parents the most-required financial resources from fruit sells to prepare for school going of the children. Agroforestry tree products such as these are also beneficial because of their easy access and limited need for capital investment (Ayuk et al. 1999). Conventionally, *D. edulis* is grown from seed (Kengue 1997) as shade trees in cocoa and coffee farms, as well as a fruit crop in home gardens and food crop fields (Ayuk et al. 1999). In this way, farmers have initiated the domestication of this tree, especially in Cameroon (Leakey et al. 2004).

Trees on-farm are also a source of livelihood diversification strategy for farmers through the provision of tree