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Initial seedling morphological characteristics and field performance of two Sudanian savanna species in relation to nursery production period and watering regimes

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Abstract

It has become apparent that some interventions are required to aid the regeneration of woody species in the Sudanian savanna. Direct seeding has been ineffective, thus planting high quality seedlings may be a viable alternative. In this study, we examined the stock quality of two valuable Sudanian savanna species, *Acacia macrostachya* and *Pterocarpus erinaceus*. Different nursery production periods were tested as well as the species' field performance under well-watered and stressed conditions. The results showed that older seedlings (9-month) were morphologically distinct from younger ones (3-month), particularly in the case of *P. erinaceus*. Eighteen months after planting out, survival and growth of seedlings were not affected by initial seedling size; this was the result of the high root to shoot ratio of seedlings in all age groups at the time of planting. Seedling mortality as high as 30% was observed and attributed to both drought stress and other factors such as herbivory. Regression analyses revealed that initial shoot height was a poor predictor of field performance for both species, but initial root collar diameter accounted for 25% of the variation in diameter of *P. erinaceus* in the field. We conclude that initial seedling size does not affect survival and growth in the field provided that all sizes of seedling have a high root to shoot ratio at the time of planting. The prediction of field performance could be improved by developing a model that incorporates a wide range of root collar diameter.

Keywords: *Acacia macrostachya*; *Pterocarpus erinaceus*; Drought tolerance; Root:shoot ratio; Seedling survival; Field performance

1. Introduction

African dry forests and woodlands have tended to disappear due to severe environmental conditions and anthropogenic impacts; thus only relatively small patches are now left within the savanna biome (Menaut et al., 1995). The remaining woodlands and dry forests are being maintained through the establishment of State forest reserves, to allow both wood production and biodiversity conservation. In Burkina Faso, the management policy of State forest (dry forests and/or woodlands) entails prohibition of grazing, setting annual early fire and selective tree cutting of 50% of the merchantable standing volume over a 20-year rotation (Bellefontaine et al., 2000). The harvested stands are mainly left to regenerate naturally, but in some cases this is supplemented by direct seeding at a rate of 625 planting holes per hectare (Soto Flandez, 1995). Natural regeneration in these woodlands is inadequate and supplementary direct seeding has frequently failed due to high mortality rates of both seeds and seedlings (Kaboré, 2004), these are associated with drought, fire, and herbivory (Sawadogo, 2006). Obviously, the current management approach has to consider planting high quality seedlings as an alternative in order to assist and accelerate the natural regeneration process. High quality seedlings establish quickly and can survive and grow satisfactorily under a variety of environmental conditions

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