



Evaluating the Growth Performance of *Melia volkensii* in Kifu Forest, a Potential Timber Plantation Species in Uganda

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Abstract

Melia volkensii is a tree species endemic to the semi-arid areas of eastern Africa. Its natural range falls within areas which are characterized by dry bush land and wooded grassland, lying between 400 and 1600 metres above sea level. Recently, there has been increased awareness about its importance as a potential plantation species for timber production in Uganda. However, its potential is limited by its knowledge of growth potential in different agro ecological zones in Uganda. Therefore the determination of its growth performance and growth impact of disease and other growth depressing agents were monitored from the time of planting in the field in Kifu forest. This would address its potential for timber production in this area. The assessment was conducted at the age of 6 months after planting and the subsequent once would be conducted at intervals till the time of timber production. This report covers the first phase of frequent monitoring of the trials to assess survival and the initial growth performance of *Melia volkensii* (n = 50) and survival was 75.9%.

Keywords

Melia volkensii; Termite-resistant; Intercrop; Vegetation

Introduction

One of the biggest selling points of *Melia volkensii* is its being termite-resistant, drought-resistant and fast-growing [1]. Being not native of Uganda it is important to study the incidences of its pest and diseases apart from the growth performance and importance as source of timber. This would mean lower costs and potentially, a more efficient way to increase farmers' income. *Melia volkensii* can be processed as high-value timber for use in furniture, door making, construction timber and fuel wood. In addition it's used as fodder (fruit and leaves); medicine (bark), bee forage, mulch and green leaf manure [2]. It also has insecticidal properties [3,4,5,6] with some people using it on the skin of goats to control ticks and fleas suggesting that the farmers' practices could be in principle justified. *Melia volkensii* is a fast growing tree species, reaching over 1 m height in six months in Kifu forest. Even with this fast growth, *Melia* in its initial stages does not compete with crops as it has a light crown and

the root system is not extensive. It is therefore possible to intercrop the tree with most agricultural crops. However, under plantation, it is recommended that only short crops such as beans are planted in the first year since taller crops such as maize shade the tree. After four years the tree canopy does not favour intercropping due to shading effect on the crops. In the end, these trees could mean great gains for farmers in the different agro ecological zones of Uganda. Continue tuned for updates on the progress of our experiment.

Methods

Study sites, survival and growth performance assessment

Kifu Forest (Kifu Forest) is a forest(s) (class V - Vegetation) in Uganda (general), Uganda (Africa) with the region font code of Africa/Middle East. It is located at an elevation of 1,172 meters above sea level. Its coordinates are 0°25'60" N and 32°43'60" E in DMS (Degrees Minutes Seconds) or 0.433333 and 32.7333 (in decimal degrees). Its UTM position is VF74 and its Joint Operation Graphics reference is NA36-14. The sun rises at 07:58 and sets at 20:05 local time (Africa/Kampala UTC/GMT+3). The standard time zone for Kifu Forest is UTC/GMT+3.

Survival was assessed at 6 months after tree establishment and the causes of mortality identified. A range of possible variables at the site that could affect seedling survival were well thought-out. Plant age was determined from the difference between planting date and the site-specific monitoring dates. Plant height was measured as the distance from the ground to the highest green leaf and root collar diameter was measured at stem ground level using a veneer caliper. The growth environment was monitored specifying the types of weed management [7]. The height of crops intercropped or growing grass was recorded as higher as or lower than the maximum height of planted seedlings during the assessment to identify the performance and the vulnerability of the seedlings after planting. The seedlings were maintained under on farm situation (intercropped with: short crop; tomatoes and tall crop; maize), while others were maintained by slash weeding and no maintenance as control [8].

Data analysis

In order to determine how much variance of the recorded survival and growth performance was, the bar graphs, scatter plot of tree height and Root Collar Diameter (RCD) for *Melia volkensii* under different seedling maintenance options were used. A rule of thumb a strong correlation or relationship had an r-value range of between 0.85 to 1, or -0.85 to -1. In a moderate correlation, the R-value ranges from 0.75 to 0.85 or, -0.75 to -0.85. In a weak correlation, one that is not a very helpful predictor, r ranges from 0.60 to 0.74 or -0.60 to 0.74.

Results and Discussions

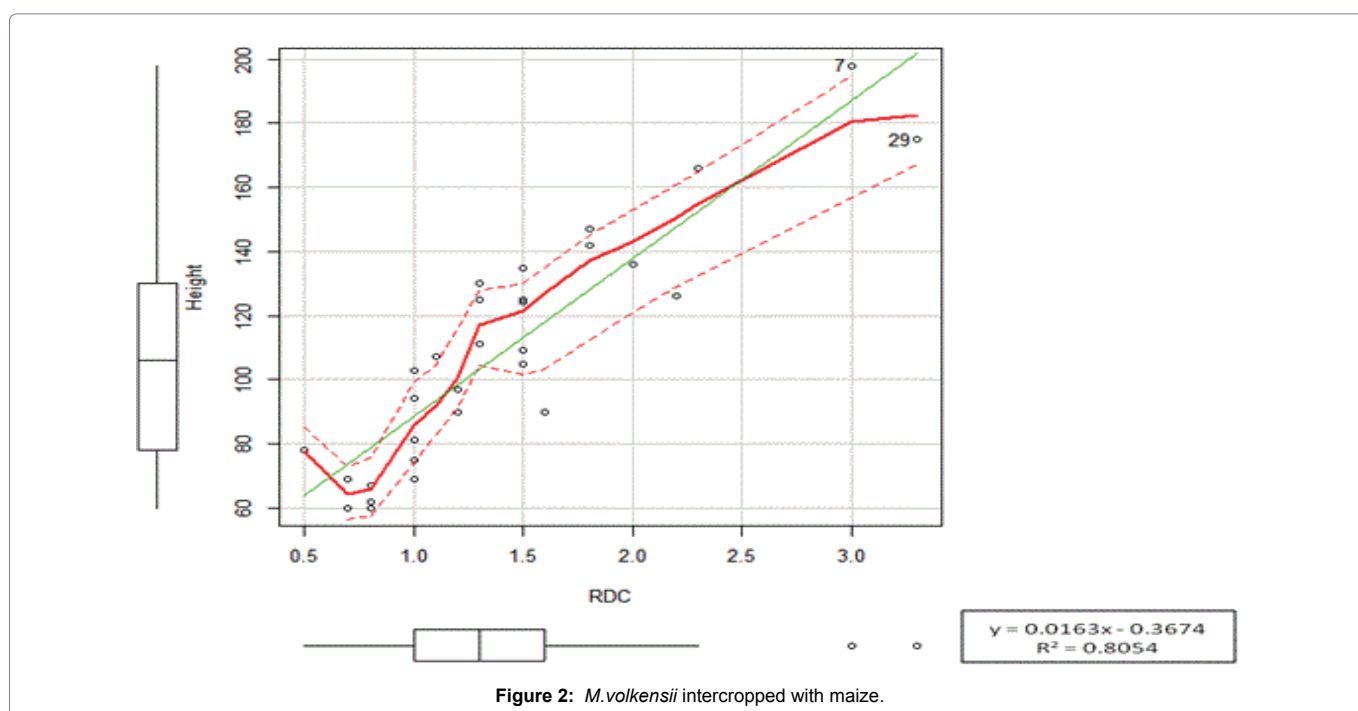
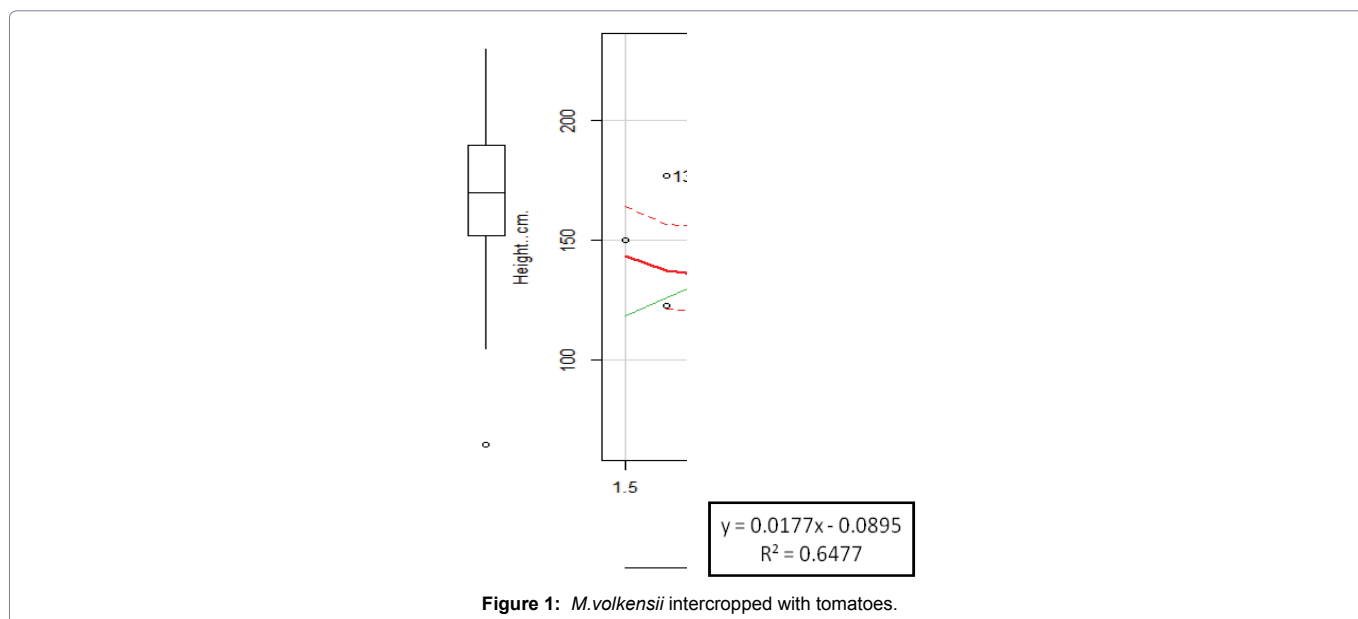
Comparing growth performance of individual trees

The scatter plots of tree height and Root Collar Diameter (RCD) for *Melia volkensii* under different management options reveal a positive linear relationship between them (Figures 1 and 2).

Relationship between *Melia volkensii*'s height (cm) and RDC (cm) under intercropping management option at 6 months: The different management options had different effects on the

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relationship between tree height and root collar diameter. When the site was managed by intercropping with tomatoes the correlation coefficient number was 0.6477 and the mean height and RDC were 170 cm and 2.5 cm respectively. This signifies that there was weak growth performance relationship between the root collar diameter and tree height under this seedling management option [9] (Table 1).

On the other hand when intercropped with maize the correlation coefficient number was 0.8054 and the mean height and RDC were 110 cm and 1.3 cm respectively. This indicated a moderate relationship between the RCD and the height under this seedling management option [10]. This option provided poorer tree performance in height and RCD by about 54.5% in height growth and 92.3% in RCD growth as compared

to the management option under tomatoes. Figures 3 and 4 show the different tree height densities under different crop management options.

Height (cm) densities of intercropped *m.volkensii* at 6 months

However differences in the tree management options when intercropped had no significant differences in height growth as at 95 percent confidence level, while the RCDs had significant differences in growth in the two management options. But when comparing the height performance of trees under tomato crop and those left unattended to in the bush, it was found that it had significant differences in height and RCD.

Table 1: Oak DT haplotypes and their variable positions unique mutations identifying respective haplotypes are **bold** underlined. TF* column refers to additional sequencing of TF region, where the presence of *Cfo I* site is indicated by 9 and absence by 1, following notation in (Petit [3]).

Haplotype		Lineage	85 bp	98 bp	149 bp	252 bp	363 bp	1137 bp	1543 bp	1544 bp	TF* CfoI	GenBank
Our	Petit											
I	1	C	<u>C</u>	C	A	T	T	C	T	G	1	KP256524
II	5a	A	A	C	C	T	T	C	<u>A</u>	G	9	KP256523
III	5a	A	A	C	A	T	T	C	T	G	9	KP256525
IV	26	A	A	C	C	T	T	<u>G</u>	T	T	9	KP256526
V	?	B	A	C	A	T	G	C	T	G	1	KP256528
VI	24a	B	A	T	A	C	G	C	T	T	1	KP256529
VII	24a	B	A	T	A	C	G	C	T	G	1	
VIII	17	E	A	C	C	T	T	C	T	G	1	

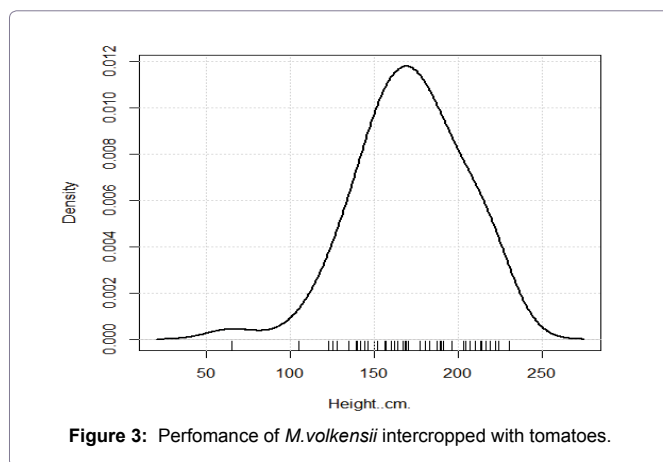


Figure 3: Performance of *M. volkensii* intercropped with tomatoes.

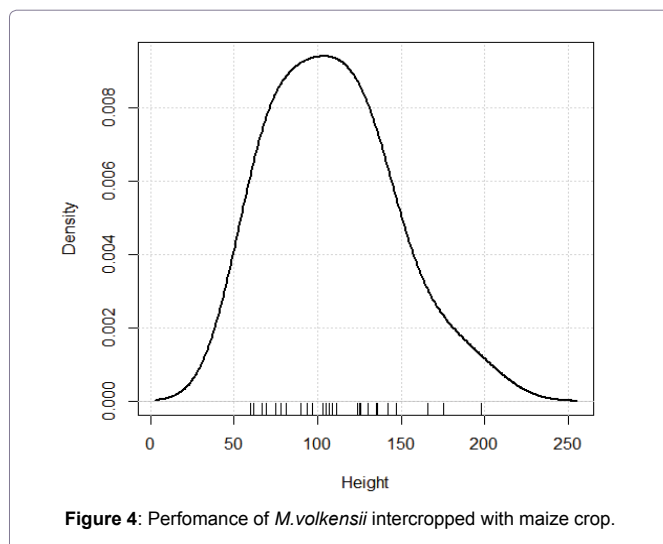


Figure 4: Performance of *M. volkensii* intercropped with maize crop.

Evaluating effects of young stand management

The comparison technique revealed stand dynamics and to this extent it is useful in evaluating the effect of tree growth on the different tree management options especially where land has conflicting demanding uses among the stakeholders. This points out to a substantial response to crop management during tree establishment. Percentage height increment for *Melia volkensii* was known under farm management, slash weeding and when not maintained at all. This corresponded to the different mortality rates of *Melia volkensii* at 6 months as shown in the Figure 5.

Conclusions and Recommendations

This information is necessary to help forest stakeholders on plantation projects on both small and large scale to improve their planting and management strategies and thus reduce tree establishment costs. The highest growth performance and survival was recorded when the *Melia volkensii* was planted with crops in an on farm situation but especially with short crops other than tall light shading crops, this was followed by those maintained by slash weeding and worst when no maintenance was done.

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