



Forestry and Beekeeping Division



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Possibility of the Use of Red Soil for Nursery Soil Mixture
in Same Lowlands

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Nursery Section

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1. Introduction

In nursery operation, pot soil is one of the most important elements which determine the growth and the quality of seedlings. Most commonly used materials for potting soil are forest top-soil, sand and decomposed cow manure. Forest top-soil is usually recommended as the base material, because it contains a high level of organic matters and nutrients. Most technical textbooks written for dry areas (e.g., Noda, 1991; Oballa et al., 1992) also ask small-scale nursery operators to use locally available fertile top soil.

Soil types found in semi-arid areas like the lowlands of Same District, where savannah woodland is dominant, usually have reddish colour compared to black soils found in the forests. According to the analysis of soil samples taken in the KVFP's Mkonga site, the organic matter content of the soil is very low and the level of nitrogen is also low (Kaihura, 1996). Considering the result of this analysis, it may be easy to conclude that red soils widely found in Same lowlands are not suitable for nursery use.

However, in Same lowlands, rich forest top-soil is usually not available. The KVFP, for example, brings forest top soils from Mwembe area located as far as 20 km away from its Mkonga nursery. It is obvious that most small-scale nurseries established or to be established in semi-arid areas have practically no access to fertile forest soils and the nursery operators lack any measures to transport a large amount of soil over a long distance.

Thus, only the available option for the small-scale nurseries in lowlands is to use local red soils regardless of their productivity. The KVFP, therefore, has examined the possibility to use the red soils to grow seedlings in the nursery.

2. Methodology

Ten tree species were selected for this experiment. They were *Acacia nilotica*, *Albizia lebbek*, *Azadirachta indica*, *Cassia siamea*, *Cassia spectabilis*, *Croton megalocarpus*, *Delonix regia*, *Leucaena leucocephala*, *Melia azedarach* and *Tamarindus indica*. At the time of this experiment, these species were considered to be relatively promising for planting in Mkonga site.

The height growth of the seedlings raised both with red-soil mixture and with black-soil (forest soil) mixture was measured. The mixture ratio adopted for red soil, manure and sand was 7:2:2. This mixture ratio might be selected after a preliminary test without any reference to the mixture ratio of forest soil.

In Mkonga nursery, the standard mixture ratio of forest top-soil, manure and sand is 5:2:2. Although some problems were pointed out by Araki (1994), the KVFP so far has been successful in producing seedlings with the black soil mixture. Therefore, the performance of red soil mixture was compared to this standard black soil mixture.

One may notice that different mixing ratio were used for red soil and black soil. Although t-tests were conducted by assuming normal distribution for comparison, results do not directly indicate the superiority of a soil type over another due to different mixture ratio. It is obvious that 5:2:2 black-soil mixture contains more nutrients than 7:2:2 red-soil mixture. The reason why the different ratio were applied was unfortunately not known due to lack of records in the planning stage of this experiment. However, the t-tests still the results which were considered valid and discussed below.

3. Results and discussion

Table 1 below shows the results of the experiment.

As it had been expected, black-soil mixture has shown better performance in the case of eight out of ten species, and in all eight cases it was statistically significant. On the other hand, in the cases of *A. lebeck* and *L. leucocephala*, red-soil mixture shows better results, though they are statistically not very significant. It is interesting to find that these two are known as nitrogen-fixing species and often described as fast-growing trees (e.g., ICRAF, 1992; Mbuya et al., 1994).

Table 1: Results of t-tests to compare two soil mixture types

Species	<i>Acacia nilotica</i>		<i>Albizia lebeck</i>		<i>Azadirachta indica</i>		<i>Cassia siamea</i>		<i>Cassia spectabilis</i>		<i>Croton megalocarpus</i>		<i>Delonix regia</i>		<i>Leucaena leucocephala</i>		<i>Melia azedarach</i>		<i>Tamarindus indica</i>	
	Sown in	Measured in	Black	Red	Black	Red	Black	Red	Black	Red	Black	Red	Black	Red	Black	Red	Black	Red	Black	Red
	July 95	Oct. 95																		
	July 95	Oct. 95	June 95	Mar. 96	June 95	Mar. 96	Sep. 95	Mar. 96	June 95	Mar. 96	July 95	Mar. 96	July 95	Mar. 96	July 95	Mar. 96	Aug. 95	Feb. 96	July 95	Mar. 96
Average Height (cm)	32.5	26.6	24.4	25.5	13.9	10.6	18.1	16.1	15.6	13.7	28.5	21.7	20.1	17.1	25.5	27.4	20.1	12.2	23.9	22.3
Standard Deviation	6.5	5.8	6.6	7.0	3.1	2.5	3.6	5.3	3.4	3.7	6.1	3.9	5.3	4.5	5.9	6.5	2.8	3.0	5.1	3.9
Number of samples	100	100	100	91	100	100	100	52	96	96	100	100	98	99	100	99	100	100	100	99
Probability	0.000		0.870		0.000		0.004		0.000		0.000		0.000		0.983		0.000		0.006	
Null hypothesis* at 5 % level	Rejected		Not rejected		Rejected		Rejected		Rejected		Rejected		Rejected		Not rejected		Rejected		Rejected	

* Null hypothesis of 'Both groups are equally distributed' was tested against 'Black soil group performs better' since the black-soil mixture contains more nutrients.

Other nitrogen fixing trees, namely *A. nilotica* and *T. indica* also performed well with red-soil mixture. In the case of *A. nilotica* the average height reached was 26.6 cm within three months. Although this average growth is slower than one with black-soil mixture, it is practically fast enough. In the case of *T. indica* the difference between samples with black-soil and those with red-soil is less than 2 cm on average. Although the difference is statistically significant, in practice, this difference seems negligible.

In other cases, the difference between two groups was larger. It is obvious that the higher nutrient content in black-soil mixture, due to the higher mixing ratio of manure, has contributed to it at least partially. Therefore, it is not relevant to

conclude that the red-soil mixture in general is inferior to the black-soil mixture. If same mixing ratio had been applied to both soil mixture types, the difference might have been smaller and negligible for all species.

Summarising above discussion, it can be said that nitrogen-fixing species perform well enough with red-soil mixture. To raise nitrogen-fixing species, therefore, dose not require forest soils.

For other species, it is still too early to conclude that red-soil can be used without any drawbacks. Further studies with different mixture ratio (especially higher ratio of manure) is required.

4. References

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