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KENYA FORESTRY RESEARCH INSTITUTE

Technical Note No. 9

INTERIM RECOMMENDATIONS FOR THE PRE-SOWING TREATMENT OF TERMINALIA BROWNII AND TERMINALIA SPINOSA

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Introduction

Terminalia brownii Fresen and *Terminalia spinosa* Engl. are common trees in the drier parts of Kenya. The local names of *T. brownii* are:

Muuku (Kamba), Onera (Luo), Mbarao (Swa.), Hareri Biiris (Som.), Koloswet (Tugen), Koloswa (Pokot), Boresa (Boran), Shiraha (Luhya)

T. spinosa is called locally:
Mwangati (Swa.), Hareri (Som.), Mwanga (Gir.) Mutula (Kamba).

Terminalia brownii is an often straight-boled tree with a roundish crown, growing up to 15 m, sometimes 25 m tall. The tree grows in sub-humid woodland and savanna; in drier areas as it is conf ined to the vicinity of rivers. It occurs in the **districts of South Nyanza, West Pokot, Baringo, Nandi, Elgeyo Marakwet,**

Machakos, Kitui and in North Eastern Province. In Machakos and Kitui, its distribution overlaps with that of T. kilimandscharica from which it can hardly be differentiated.

Terminalia spinosa is a somewhat sparsely leaved looking tree with straight stem. It reaches heights of 3 - 15 m. Its branching habit is strictly in whorls giving the tree a storey-like appearance. The pointed and rigid spines are conspicuous. The tree inhabits drier savanna areas in West Pokot, Baringo and Tana River districts, Ukambani, and along the coast. The species is sometimes confused with T. prunoides which normally occurs in even drier habitats, but T. prunoides lacks the whorled branching habit and the sturdy thorns.

Both species produce hard, durable, termite resistant timber; the of T. spinosa being heavier. Both are highly

valued for fencepost, poles and house construction. T. brownii logs of higher diameter are suited for other construction purposes as well as mortars. Both species yield high quality firewood and charcoal.

2. **Germination**

2.1 **Terminalia brownii**

Most foresters and nurserymen complain of slow and irregular germination of T. brownii with often poor results (TEEL 1984). A number of experiments were therefore carried out at Kenya Forestry Seed Centre aiming at developing methods of improved germination.

2.1.1 Pretreatments Applied

East African indigenous Terminalias have

2-winged fruits with a hard, more or less woody endocarp which contains a rather small, longish, and delicate seed. The endocarp of T. brownii is very hard and sturdy that it either forms a barrier to water uptake or to radicle emergence. That is the reason for the germination problems. It was assumed the an appropriate mechanical, water, or acid pretreatment would soften or open the hard endocarp without damaging the embryo. The following methods were tried:

(i) Soaking in water:

seeds soaked in water at room temperature (Approximately 15 - 20°C) for 7 days, the water being changed every day

boiling water poured over seeds and let cool overnight

soaked in water at room temperature for 1 day, sundried, and the soaking procedure repeated

(ii) Stratification in damp sand for 30 days in refrigerator (approx. 7 °C)

(iii) Mechanical scarification:

rotating in concrete mixer together with sand for S hours
removing wings by secateurs
nipping at radicle end by cross cut
nipping at radicle end by V-shape cut

(iv) , Burning with dry grass

(v) Soaking in chemical solution:

concentrated sulphuric acid (H_2SO_4) from 5 to 60 min.
potassium nitrate (KNO_3)
hydrogen peroxide (H_2O_2) for 30 min

The germination tests were carried out in

the glasshouse using sand as germination medium.

2.1.2 Results of Germination Tests

The untreated seed sample did not produce a single germinant and most of the mechanical, the water soaking and burning pretreatment resulted in nor or only few occasional germinated seeds. The only pretreatment producing acceptable results were soaking in sulphuric acid for 60 min and V-shaped nipping. They gave 25% and 55% germination of the viable seeds respectively.

2.1.3 Seeds Moisture and Drying

There is a strong indication from the experimental results the the fruits must dry to a moisture content (MC) of 12 - 10% to produce the best germination

results.

In the experiment the freshly harvested fruits had an initial MC of 32%. In other, drier areas, this figure may be lower. For the drying process it is recommended to spread the fruits on a rack or on shelves and let them dry for about a week in the shade before continuing the desiccation in the sun. That should last from a few days to 2 weeks depending on the temperatures and humidity of the air. Fruits should be very brittle before they are ready for sowing.

2.1.4 Recommendations for the pre-sowing treatments of Terminalia brownii fruits

(i) An initial cutting test with 100 randomly picked fruits is strongly recommended as T. brownii seedlots often contain a low percentage of

full, viable seeds. Cut the fruit across in the middle, so that it is clearly visible whether it is empty, shrivelled, insect affected, the tissue brown or black, or viable with a whitish-**yellowish seed inside.**

(ii) Dry the seeds as described under 2.1.3.

If the viability is regarded to be sufficient, apply the nipping technique and cut the radicle end like indicated in the drawing. Often the fruit stalks of harvested fruits are not existent any more and the fact that the veins cross the wing at full length of the fruit is confusing. Thus it seems almost impossible at first sight to determine which is the fruit stalk end and which the radicle one. But examining the

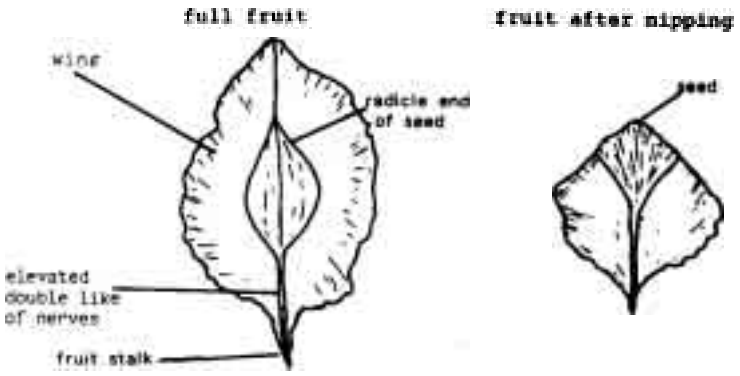
fruit a bit closer one will notice that on the fruit stalk end normally an elevated double line of veins can be seen and felt more clearly than on the opposite end (see drawing) . In case there is no way of differentiating which end of a fruit is which, it may be nipped on both ends.

The hard woody top part of the endocarp is nipped with several cuts forming a pointed V so the the tip of the radicle end of the seed is just visible. At this stage it is possible to analyse the individual viability of the seed and discard all empty dead seeds.

If the fruit is properly dried it is brittler and easier to cut. But still the procedure has to be done very carefully, for an incision into the seed itself will result in its death. Therefore, after the first cuts one has

to continue very carefully cutting small pieces and slices, sometimes rather breaking than cutting.

Thus nipping Terminalia brownii fruits requires attention, skill, and practice which can yet be achieved after trying to nip a few dozens. It is advisable to train one or two handy persons in the technique and let them alone carry out the tricky, but very promising task. Much better results will be obtained than applying no or other pretreatments.



2.1.5 Sowing

The nipped fruit has immediately to be put flat into the seedbed and covered with a centimeter of soil or sand. It should not be placed head or radicle end down. A few experiments showed better results, if the fruits were dusted with the fungicide Captan before sowing. This suggests that Terminalia seeds are susceptible to fungi. If Captain cannot be applied it seems at least promising to use sand, which normally contains less fungi than soil, as a germination medium.

2.2 Terminalia spinosa

The germination of this species causes much less problems since it does not have such a hard, woody endocarp. If the viability is good, sufficient germination results are obtained even without pretreatment before sowing.

2.2.1 **Pretreatment and Results**

Only pretreatment that had proved successful with T. brownii were tried in the experiment:

soaking in concentrated sulphuric acid for 2 minutes
nipping on radicle end of fruit

The experiments showed a tendency for higher germination rates if fruits were pre-treated in the above ways, with nipping being the best. Viable nipped, acid treated and untreated fruits gave 81%, 77% and 66% germination respectively. When the seeds were dried in the sun for a couple of days, there was hardly any difference left between seeds pre-treated by nipping and seed left untreated.

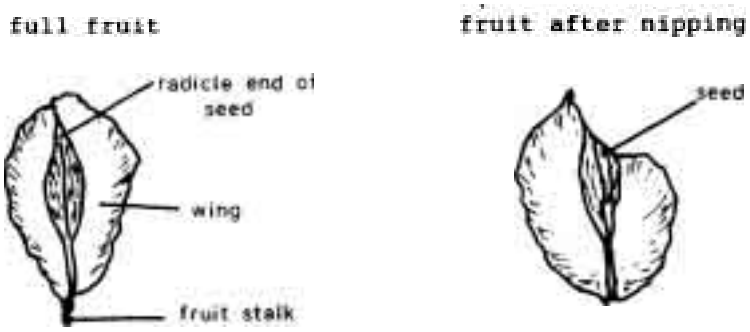
2.2.2 Recommendations for the pretreatment of Terminalia spinosa fruits

(i) T. spinosa fruits are normally fairly dry when mature. But it is advisable to dry them in the sun for another 3 - 7 days according to the weather.

(ii) Before sowing, a cutting test should be carried out to determine the rate of viable seeds as described under 2.1.4. T. spinosa often has a very high rate of insect-affected or empty seeds.

(iii) If the fruits are dry enough, no pretreatment seems to be necessary prior to sowing. But if it is not quite certain whether they are dry enough then fruits should be nipped by breaking off the very tip of the woody exocarp across or

in a slanting direction. Nipping of T. spinosa can easily be done without a tool by holding the fruit in one hand and breaking the tip off with thumb and forefinger of the other hand (see drawing below).



3. Conclusion

The germination of Terminalia brownii can be enhanced considerably by apply the nipping method explained above. it requires certain experience, but apart from a pair of secuteurs no further input is required. The same technique can be applied for the pretreatment of T. spinosa. The procedure is also recommended for T. sambesiaca, T. kilimandscharica, T. orbicularis since the structure of their fruits is very similar to that of T. brownii and T. spinosa. As the method is labour intensive, further research to develop easier ways of improving germination needs to be done.

4. Acknowledgements

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5. References

TEEL, W., 1984: A Pocket Directory of Trees and Seeds in Kenya, KENGO, Nairobi, 151p.