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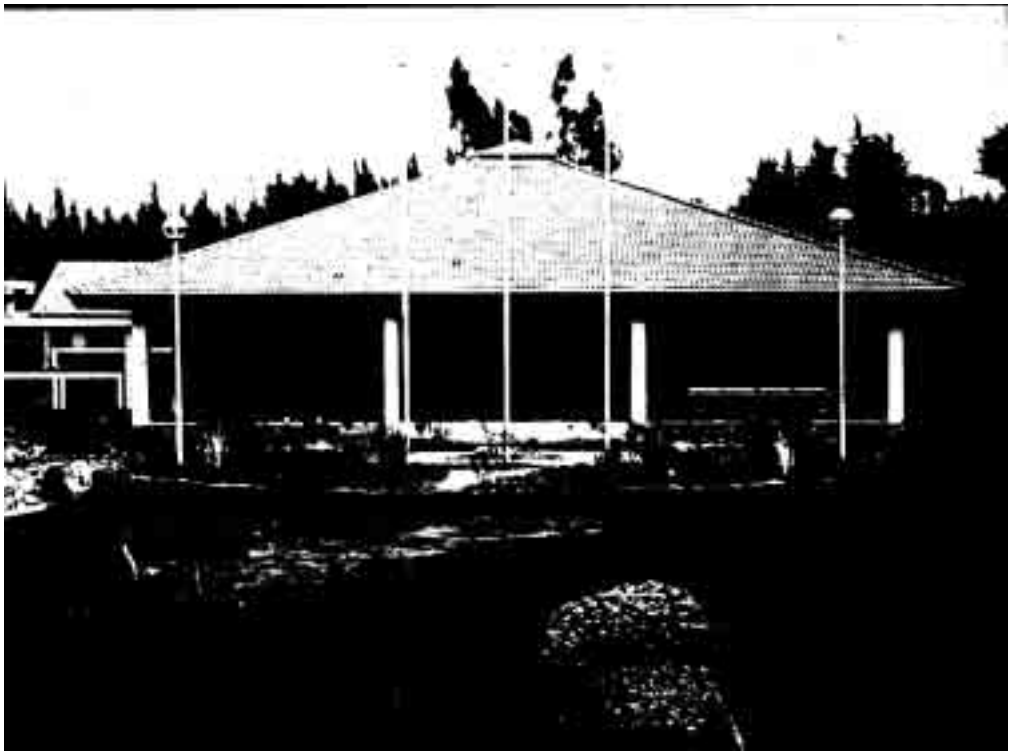

Kenya Forestry Research Institute (KEFRI) Institute

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Technical Note No. 11

Storage and Germination of Seeds of *Podocarpus milanjianus*

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1. Introduction

Podocarpus milanjianus Rendle - the official recognized name was recently changed to Podocarpus latifolius (Thumb.) R. Br. ex Mirb - is a well known timber species occurring in humid mountain forests of East Africa. In Kenya it is found e.g. in the Taita Hills, on Mt. Kenya, in the Aberdare Range, Mau Range, Cherengani Hills and Matthews Range. Local names are: Mithengera (Kikuyu), Mubiribiri (Meru), Sosaite (Marakwet), Septa (Tugen), Saptet (Nandi).

It is easily distinguished from Podocarpus gracilior by its longer, wider and darker green leaves; by its fruit with red receptacle and by the fact that the tree grows on moist mountain sites often above the P. gracilior zone. P. milanjianus is a typical climax species, initially growing as an understorey tree

and only gradually rising to a large canopy member.

The timber of both Podo species is equally valuable for all types of joinery and light construction work.

Germination of fresh seeds is easy and rates of 80% are obtainable depending on the percentage of insect infested fruits. **But it is reported in literature (e.g.** LAMPRECHT 1986) and claimed by field staff that the seed looses viability very quickly thus limiting their availability.

2. Seeds and their Treatment

2.1 Reproductive System

Since P. milanjianus germinates on the forest floor and grows in the shade for **a long time before reaching the canopy** the growth rate is slow. But trees of

only 8 - 10 m height may be already mature and produce seeds although completely shaded and suppressed by neighbours.

According to DALE and GREENWAY (1961), trees are mostly either male of female. Male flowers are about 30 mm long cylindrical catkin-like "cones". Female flowers develop to more or less ball-shaped fruits of 0.7 - 1.2 cm in diameter with an outer thin leathery shell, an inner slightly woody shell and a scarlet-red fleshy receptacle attached which becomes shrivelled before long. The fruits are shed when mature.

Flowering is so inconspicuous that it is hardly observed. Seeds mature in most areas in March/April. There are 1700 - 1900 fresh seeds (receptacle removed) in one kg.

2.2 Experiments on Storage and Germination Treatments

2.2.1 Treatments

The fruits of P. milanjianus have 'a high moisture content (MC) of approximately 45% after shedding, and without receptacle. Seeds of many species with such a high MC loose viability partly or totally when desiccating (recalcitrant seeds). Hence it was assumed that the problems of low germination capacity are due to the normal loss of moisture during storage or even deliberate drying of a **seedlot.**

Experiments in Europe and South East Asia with recalcitrant seeds have shown a remarkable prolongation of viability if the seeds were mixed with a damp medium like moist sawdust, peat, or sand and kept in an open or perforated container to allow the gaseous exchange (SUSZKA and

TYLKOWSKI 1980, CHIN 1988). The lifespan of the seeds could be prolonged even more if they were kept under the coolest conditions possible; preferably in a cold storage to suppress the metabolism and thus the ageing process as far as possible.

In the experiment a fresh seedlot of P. milanjianus was divided into three samples which were stored in:

- damp sawdust
- damp peat
- without a medium (control)

and kept in a perforated polythene bag under coldstore conditions (+3°C). The germination tests were carried out both in the greenhouse and the germination cabinets of the laboratory.

2.2.2 Development of the Moisture Content

Within one year of storage and on 3-monthly checks the MC of the control sample remained almost unchanged, ranging between 42 and 45%. The seeds stored in peat lost moisture and were at 38% after a year, whereas the sawdust stored sample continuously gained and finally reached 58%. Only in the control sample little growth of mould fungi was observed.

2.2.3 Germination Results

The germination capacity of the control sample slowly dropped from the initial 69% to 50% after one year's storage. The peat-stored sample remained relatively good up to 9 months after storage, but then fell to 50%, too. The seeds in the sawdust retained the initial germination capacity and yielded 72% germinated seeds

after a year. Thus the retention of a high MC of the seedlot stored in sawdust allowed to maintain the germination rate **unchanged.**

2.2.4 Visual Viability Estimation

A precise cutting test revealed a close correlation between the outlook of **the** seeds and the viability. Regardless of the way the seeds were stored, about 85% of the full, viable seeds were green and the rest (15%) were black with slight dark-green streaks. On the other hand, 88% of the rotten seeds were black, grey or brown and only 12% green. This shows that by using only green seeds a high germination capacity can be achieved.

2.3 Recommendations for the Seed Handling

When dealing with P. milanlianus seeds one should bear in mind, that the **seeds**

are very sensitive to desiccation, but that with the proper handling very satisfactory results can be achieved.

2.3.1 Seed Sowing in the Nursery

Seeds should be collected from the ground as soon as possible after shedding. The best and safest way to get a high germination rate is to remove the scarlet receptacle and sow the seed immediately. The seeds should by no means be dried. If it becomes necessary to postpone sowing for a short time, the seeds should be stored in a shed or in the shade by spreading in a thin layer. But this sort of storage must not exceed 3 - 4 days. If seeds are obtained from a coldstore, they should be separated from the storage medium (sawdust) by washing in water and sown without delay. The seeds can be sown into the seedbed or directly into the tubes.

2.3.2 Storing the Seeds in Coldstore

The collected fresh seeds have to be transported to the central coldstore as soon as possible after collection. If it takes more than a day between collection and arrival of the seeds at the store, they should be dried in a thin layer in **the shade for a few hours, so that the** excess water evaporates before transport and the seeds do not get moulded on the way. On arrival at the store, the seeds should be stripped off the receptacle and then dried in a shed for a day. Their surface must be dry when they are taken to the store. Seeds are then well mixed **with sawdust** 1 - 2 times their volume. The sawdust should feel slightly moist, with an MC of its own of approximately 30%. If necessary, a bit of water can be added. Fine cypress or pine sawdust without wood chips has proved suitable.

The seeds/sawdust mixture is kept in open plastic boxes, drums or perforated polythene bags. Wooden boxes may be used, but metal ones are not recommended because of the development of rust. The seeds are kept in a coldstore at 1 - 4°C. It is possible to use a household refrigerator, as well, but as these normally operate at 5 - 7°C, storage might not be so efficient. Longer lasting power failures with increase in temperature will result in early germination and decreased lifespan.of the seeds. Temperatures below freezing level must be avoided.

The seeds should be dispatched mixed with the sawdust only. They should be taken from the coldstore immediately before the transport and then forwarded to the field stations without delay. Exposure to heat must be avoided.

In **the experiment part** of the sawdust stored seeds showed a slight beginning of radicle emergence after 9 - 12 months of storage. That does not affect the viability at all, but a careful and particularly quick transport and nursery handling is required so that any emerged radicle does not desiccate.

3. Conclusion

Kenya Forestry Research Institute has developed a method to preserve the high moisture content of P. milanjianus seeds by mixing the seeds with sawdust and keeping them in an open container in a coldstore. By these means the initial germination capacity can be retained for at least one year. Although seeds can be dispatched to customers from the headquarters, it is strongly recommended that Forest Stations collect their own

seeds and sow them immediately. The reasons are:

- the trees are ecologically adapted to the locality
- sowing fresh seeds bears no risks
- storage capacities in the Muguga coldstores are limited.

To avoid a waste of precious seedlings the silvicultural operations should be adjusted to the natural behaviour of the species. Seedlings should never be planted in the open, e.g. a clearcut, but only in the half shade of a gap or completely under the canopy. P. milanjianus seems to be particularly suited for enrichment planting in degraded natural forest, but it probably requires regular spot weeding in the early years.

4. Acknowledgements

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5. References

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