Keur *(Virgilia oroboides)*: A Feasible Indigenous Hardwood for the South African Forestry Industry

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SINOPSIS

Ekonomiese, ekologiese en boskultuur argumente word aangevoer wat daarop dui dat *Virgilia oroboides* vir houtproduksie aangeplant kan word. Groot oppervlaktes in die Suid-Kaap en Tsitsikamma bosstreke is uiters geskik vir hierdie inheemse boomsoort, terwyl slegs uitheemse soorte teenswoordig aangeplant word vir kommersiële houtproduksie.

ABSTRACT

Economic, ecological and silvicultural arguments are presented, indicating that the use of **Virgilia oroboides** for timber production is a definite possibility. Large areas in the Southern Cape and Tsitsikamma regions are ideally suited for this indigenous species, yet only exotics are presently being planted for commercial timber production.

Virgilia oroboides (Berg.) Salter is a very popular ornamental tree, not only in the Republic of South Africa, but also in Australia, New Zealand and California. *Virgilia divaricata* Adamson, a darker form that is sometimes regarded as a separate species, is the most popular due to its compact habit and attractive flowers.

Economic potential

Economising on imports of sawn hardwood timber could save a considerable amount of foreign currency. The furniture and joinery industries had to import 215 000 m^3 of hardwood during 1976. According to Lubbe (1980), imports of sawn timber, sleepers, parquet and other timber products, accounted for about R25-million for the year 1978. The shortage of local hardwoods prompted the Directorate of Forestry to carry out growth and provenance studies of a number of exotic hardwoods, including *Khaya nyasica, Liquidambar styraciflua* and *Liriodendron tulipifera.*

At present, *Virgilia* logs of suitable dimensions for the sawmilling industry are rare and the wood quality is not above suspicion. Available information indicates that *Virgilia* trees attain a reasonable size in a short time and produce useful timber. In the past, the wood was popular for spars, yokes and bedplanks for wagons.

Phillips (1926) reported heights of 4,6 to 7,7 m and girths of 22,5 to 30 cm within 4 years under normal conditions. Girth-increment in older stands of 15 to 25 years is reported to range from 1,25 to 3,75 cm per annum. Assuming an average of 2 cm it means that a 4-year old tree of 8 cm DBH can reach 15 cm at 15 years and more than 21 cm DBH at 25 years. Larger trees (28 to 48 cm DBH) are quite common and by inference they should be between 35 and 50 years old, using Phillips (1926) increment figures. Personal observations indicate that these figures are conservative and that the same dimensions can be reached in 30 to 35 years on good sites. Even allowing for inaccuracy in these calculations, it is clear that *Virgilia* successfully competes with many exotic hardwoods in terms of growth rate. It is beyond doubt one of the fastest growing indigenous trees.

The shrinkage, density and mechanical properties of *Virgilia* timber are compared with a few other popular timbers in Table 1. It shows that Keur is comparable with these timbers.

More extensive surveys are needed to establish the utility of *Virgilia* timber, but it certainly merits consideration. There is a world-wide trend towards the use of small diameter logs in timber production, as shown by Johnson (1979) who studied the economics of harvesting trees of only 7,37 cm DBH for pulpwood. A study done by Malan (1981) shows that the conversion efficiency of small diameter *Eucalyptus grandis* sawn for furniture timber is 52 %. The recovery figure for log top diameter ranges 15 to 21 cm and 23 to 39 cm were 51,6 % and 52,3 % respectively, showing that even small diameter logs can be efficiently utilized if a suitable conversion pattern is used. The possibility of peeling, rather than sawing, as proposed by Margadant (1981), is another way to obtain the required dimensions, especially if combined with lamination techniques. It is interesting to note that young *Eucalyptus grandis* logs are considered for furniture timber, despite the drawback of end-splitting; a problem not found in *Virgilia.*

The very fast rate of biomass production makes *Virgilia* a candidate for fuel production. Fast-growing hardwoods are currently receiving attention all over the world for their possible use as an energy source in underdeveloped areas. Finally, *Virgilia* may also be considered for the pulp and paper industry. Pulping properties need to be investigated as nothing is known at present.

*TABLE 1. *Density, *Shrinkage and +Mechanical properties of some popular timbers compared with* Virgilia

SPECIES	Green moisture content %	Density at 10 % moisture content		Percentage shrinkage from green to 10 % moisture content %			Static bending (centre point)	Hardness load to imbed 11,278 mm sphere to mid-diameter (side grain)	Impact bending (Toughness)
		Average g/cm³	Range g/cm³	Radial (R)	Tangential (T)	R + T 2	Modulus of elasticity MPa	N	Joules (Nm)
Virgilia oroboides	120	0,60	0,58-0,66	2,44	5,28	3,86	10 914	4 657	30,1
Entandrophragma cylindricum (Sapele)	71	0,74	0,69-0,80	1,93	3,71	2,82	13 062	4 781	—
Eucalyptus grandis (12-15 years old)	88	0,57	0,50-0,80	3,07	6,49	4,78	15 772	5 108	32,5
Pinus patula	128	0,45	0,35-0,61	1,92	4,79	3,36	13 721	2 776	19,0
Pinus radiata	81	0,53	0,35-0,66	2,43	4,26	3,35	11 042	4 997	29,2
Pterocarpus angolensis (Kiaat)	69	0,66	0,56-0,78	1,26	1,84	1,55	9 355	6 645	22,9

*From Van Vuuren *et al* 1978
+From Banks (1977) as revised. (Tested at 12 % moisture content)

Silvicultural considerations

Virgilia oroboides sensu lato varies tremendously throughout its natural distribution range along the coastal regions, from the Cape Peninsula to Port Elizabeth. The biggest concentration of natural populations occurs in the Southern Cape Region, where variation within, as well as between populations is considerable. The selection of favourable biotypes, especially with regard to growth habit and timber quality, should yield appreciable improvements in a reasonably short time. A wide genetic base is available from which selection and breeding word could commence. Considering the improvement that has been achieved with exotic species, provenance trials and selection work on *Virgilia* can clearly be justified.

The silviculture of *Virgilia* is beset with remarkably few problems. Seeds are produced in abundance, are easily collected and can be stored indefinitely without loss of germination capacity. Treatment to break dormancy is a simple and effective operation (Geldenhuys, 1975), resulting in between 50 % and 90 % germination (Phillips, 1926; own work in progress). *In situ* sowing (either spot or line sowing), is therefore feasible, cutting establishment costs to an absolute minimum. Corrective pruning during early growth may prove necessary, but with selected material even pruning may be unnecessary.

Large areas are available in the Southern Cape and Tsitsikamma regions that are ideally suited for establishment with *Virgilia*. As pioneer species it should do well, even on drier fynbos sites, provided the soil is deep enough.

Virgilia may also be grown commercially in the Eastern Cape, Ciskei, Transkei, Natal and parts of the Transvaal. Deep, alluvial and moist soils in these regions should be ideally suited, provided the area is free of heavy frosts. Information on suitable soil types in the Transvaal and Natal is already available (Schönau and Fitzpatrick, 1981). Comparative growth studies within the areas mentioned should yield valuable information and are, to my mind, long overdue.

Ecological considerations

The use of exotic trees for wood production in the constant rainfall area of South Africa is probably inevitable, but from an ecological and conservation point of view definitely open to criticism. Indigenous timber species are not used for commercial forestry, because of uneconomically long rotations. *Virgilia* can be grown on relatively short rotations — the same or even shorter than those used to produce hardwood sawn timber at present. Being a pioneer species of certain forest types and also a natural element of fynbos vegetation (Van Daalen, 1980), the cultivation of *Virgilia* in these areas makes good sense. It is presently being used as a nurse stand in the reclamation of indigenous forest patches. According to Geldenhuys (1980), the variation between trees used for this purpose needs to be investigated. Trees with long single trunks and wide spreading crowns, resulting in a mottled shade, are ideal.

Conclusions

The attractive Keurboom could undoubtedly play an interesting role in the commercial industry in the Republic of South Africa. Even if planted on a limited scale, it could make a substantial contribution to the production of local hardwood timber resulting in possible import replacement. The ease of cultivation and short rotations needed, makes it a worthwhile possibility and justifies further investigation. Being endemic to the coastal regions of the Cape, its cultivation would

be ecologically most acceptable. It is not time that we have another look at *Virgilia?*

REFERENCES

BANKS, C.H., 1977. The mechanical properties of timbers with particular reference to those grown in the Republic of South Africa. The Department of Forestry, Bulletin No. 48. Government Printer, Pretoria, Republic of South Africa. (Revised and metricated edition.)

GELDENHUYS, C.J., 1975. Die kweek van inheemse bome. The Department of Forestry, Pamphlet no. 150. Government Printer, Pretoria, Republic of South Africa.

GELDENHUYS, C.J., 1980. Personal communication.

JOHNSON, L.R., 1979. Production of wood from small diameter stands: a cost assessment. Transactions of the ASAE 22(3): 487-493. Michigan, USA.

LUBBE, W.F., 1980. Survey of the exotic hardwood timber industry in South Africa. CSIR Special Report Hout/198. Pretoria, Republic of South Africa.

MALAN, F.S., 1981. The use of timber cut from overgrown *E. grandis* mining timber stands for furniture. A preliminary report. National Timber Research Institute, CSIR. Document 8/6, (Unpublished).

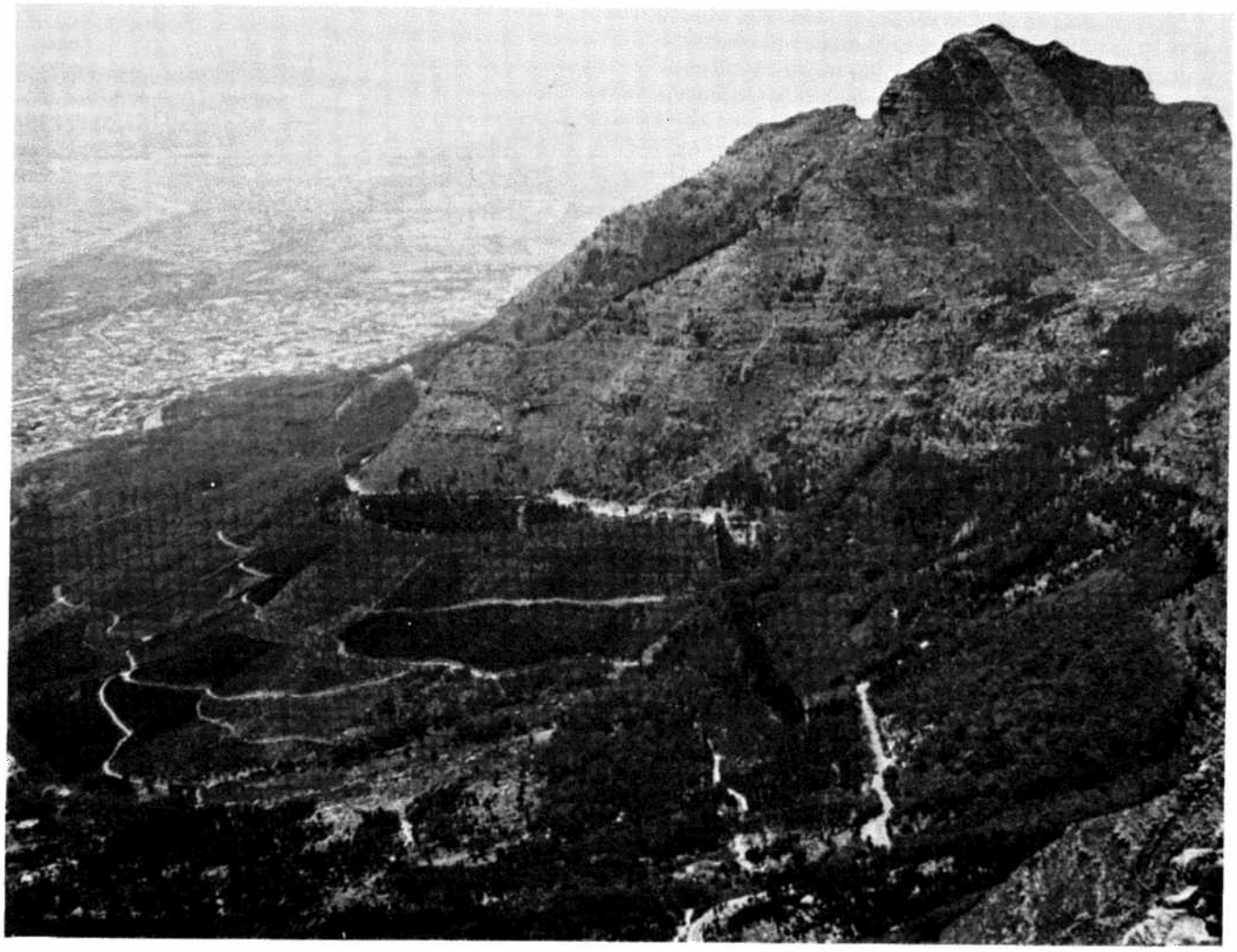
MARGADANT, R.F., 1981. Why not peel locally grown *Eucalyptus* species? Wood Southern Africa 6 (10): 8, August 1981.

PHILLIPS, J.V.C., 1926. *Virgilia capensis* Lamk. ("Keurboom"): a contribution to its ecology and silviculture. S.A. Journ. Science 23: 435-454.

SCHÖNAU, A.P.G. and Fitzpatrick, R.W., 1981. A tentative evaluation of soil types for commercial afforestation in the Transvaal and Natal. S.Afr. For. J. 116: 28-39.

VAN VUUREN, M.J.J., *et al,* 1978. Shrinkage and density of timbers used in the Republic of South Africa. The Department of Forestry, Bulletin No. 57. Government Printer, Pretoria, Republic of South Africa.

VAN DAALEN, J.C., 1980. The colonization of fynbos and disturbed sites by indigenous forest communities in the Southern Cape. M.Sc. Thesis. University of Cape Town.



DEVILS PEAK plantasie teen die hange van Duiwelspiek in Kaapstad.

Dwarslêers van gelamineerde Suid-Afrikaanse dennehout

P. Krogh

DIE Suid-Afrikaanse Spoorweë gebruik betondwarslêers in die spore van hooflyne en ingevoerde dwarslêers van harde hout vir kruisings, brûe en skerp draaie.

Dit het deur die jare egter al hoe moeiliker geword om die harde houtsoorte in te voer of van plaaslike bronne te bekom. Die uitheemse houtsoorte in Suid-Afrika is geneig om te bars en het ook 'n besondere weerstand teen voortplanting wat dit nie geskik vir die Spoorweë se doel maak nie.

In die lig hiervan het die Bosnavorsingsinstituut net meer as 20 jaar gelede reeds begin om toetsrekords te hou van verskeie soorte houtdwarslêers wat onderskeidelik met chemikalieë behandel en in spoorlyne gebou is.

Met die navorsing is veral die geskiktheid van die Suid-Afrikaanse den ondersoek. Dit was egter duidelik dat dit nie ekonomies moontlik is om stewige dwarslêers, veral lang kruisbalke, van denneblokke, wat klein in omtrek is, te produseer nie.

Mnr P.M.D. Krogh het dus in samewerking met mnr G.S. Vermaak en later bygestaan deur mnr P. Quinn, almal van die Bosnavorsingsinstituut, verskeie prototipes van gelamineerde dwarslêers van sekere dennsoorte, wat in Suid-Afrika geplant word, ontwerp, ontwikkel en geproduseer en dit aan strawwe toetse in die laboratorium onderwerp.

Die Navorsingsinstituut het die rangskikking van die laagvorming, minimum digtheid van binneste en buitenste lae, regte volinhoud vir die gomproses, lewensduur van die geskikte kleefstof, die druk benodig vir bevredigende kleeflaste, behandeling met bewaarmiddels, die grootte van gate vir koetsskroewe en terugtrekkingsweerstand asook weerstand deur sywaartse druk in dwarslêeres, ondersoek.

Met die waardebepaling van die kwarslêers is faktore soos verwering, breuke, los skroewe, brandskade en ander in ag geneem.

'n Stel van die prototipe dwarslêers is aan die Spoorweë gebied vir hulle eie besondere laboratoriumtoetse. Na eindelose toetse deur die Bosnavorsingsinstituut en die Spoorweë is daar tussen laasgenoemde en die Departement Bosbou besluit om 800 van die dwarslêers in spoorlyne te toets.

Kruuislêers is net buite Jeppe, Germiston en Johannesburg se stasies ingebou en die lêers van gewone lengte in die spoorlyn tussen Witbank en Germiston op Angello in 'n baie skerp draai op 'n steil bult.

Teen 1975 het die gelamineerde denne-dwarslêers hulleself bewys en was dit duidelik dat 'n bruikbare leeftyd van 15 tot 20 jaar daarvan verwag kon word.

Voordat dit egter op groot skaal vervaardig kon word moes daar eers spesifikasies opgestel word. Dit is in 1977 gesamentlik deur die Bosnavorsingsinstituut, die Spoorweë en die Suid-Afrikaanse Buro vir Standaarde gedoen maar was ongelukkig nie bevredigend nie.

Die spesifikasies is in 1979 hersien. Die uitslag was bevredigend en het gelei tot 'n kontrak met H.M. Timber Structures.

Dit is toe ook besluit om tenders vir 'n verdere 750 000 dwarslêers, waarmee ingevoerde dwarslêers oor 'n tydperk van drie jaar vervang sou word, aan te vra.

Dit sal 'n verwagte besparing van R9 000 000 per jaar lewer.

Daar is dus bewys dat onder die huidige omstandighede dit ekonomies lewensvatbaar is om gelamineerde denne-dwarslêers, gemaak van denneplanke met klein afmetings en met kreosoot behandel, te vervaardig.

Dit word egter benadruk dat denne-dwarslêers, wat nie behandel is nie, slegs ses maande tot vyf jaar onder die verskillende klimaatstoestande in Suid-Afrika sal hou.

Dit is reeds bewys dat dennehout wat met kreosoot behandel is en in kontak met die grond is onder die ergste toestande langer as 50 jaar kan hou.

Die eerste kreosoot is in Suid-Afrika deur Yskor en Sasol produseer. Dit is deur die Bosnavorsingsinstituut by toetssentrums op Pienaarsrivier teen rysmiere en op Kruisfontein teen swammegetoets om die weerstand van die verskeie chemikalieë teen rysmiere en verrotting te bepaal.

Mnr Krogh van die Bosnavorsingsinstituut en dr "Scholly" Scholtz van Yskor het die eerste spesifikasies vir die kreosoot opgestel. Sasol het intussen begin met die produksie van Waxol K, 'n waks met 'n baie hoë smeltpunt. Toetse wat deur die Bosnavorsingsinstituut hierop gemaak is het getoon dat die waks uitstekende weerstand teen son, hitte, reën en wind het.

Verdere toetse het gewys dat wanneer Waxol K met kreosoot gemeng word in die verhouding 70 persent kreosoot en 30 persent Waxol K, die mengsel baie beter vir die bekserming van gelamineerde denne-dwarslêers in hulle horisontale posisie tussen die spoorlyn is as wanneer dit net met kreosoot behandel is.

Die aanvaarding van die dwarslêers deur die Spoorweë is 'n besondere deurbraak vir die werk van die Bosnavosingsinstituut.

Die voortgehoue sukses van die dwarslêers is net afhanklik van streng kwaliteitsbeheer, om te hou by die gewone spesifikasies soos dit uitgewerk is en die gebruik van die Suid-Afrikaanse den weens sy besondere aanpassing met kreosoot-behandeling.

Kontrakte vir die vervaardiging van gelamineerde dennehout-dwarslêers is aan 'n aantal firmas toegeken. Sommiges het sedertdien nuwe gespesialiseerde fabrieksaanlegte opgerig wat ook ingestel kan word as massaproduksie van gelamineerde S.A. dennehout vir die boubedryf en vloere vir marine houers en sleepwaens.

BRONNE: KROGH-VERMAAK verslag; **BOSBOUNUUS** en **YORKKOR** se jaarverslag.