

**VARIATION IN VOLUME AND WOOD DENSITY OF EIGHT PROVENANCES
OF Pinus oocarpa and P. patula SPP. Tecunumanii IN CONOCOTO, ECUADOR**

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ABSTRACT – A provenance trial of **Pinus oocarpa** Schiede and **P. patula** Schiede and Deppe spp. **tecunumanii** (Eguiluz and Perry) Styles of the international series coordinated by the Oxford Forestry Institute, University of Oxford, was established at Conocoto, Ecuador in 1973. This trial was assessed in 1979 for volume under bark and wood density and these two traits plus the derived indices of within sample density variation and dry matter index were analyzed. There were no statistically significant differences between provenances for the four assessed characteristics, but provenances of **P. patula** spp. **tecunumanii** were superior in volume under bark to provenances of **P. oocarpa**.

INTRODUCTION

Ecuador is a country with few coniferous forest resources.

Plantations of **P. radiata** D. Don planted in the Andean region have proven susceptible to **Dothistroma** sp. Studies to evaluate other conifer species suitable for afforestation are being evaluated (WEBB, 1979). This publication is based on a trial of **P. oocarpa** Schiede provenances established at Conocoto in January, 1973. The study was established with seed supplied by the Oxford Forestry Institute (OFI), University of Oxford, as part of the international series of trials coordinated by the OFI.

MATERIALS AND METHODS

Conocoto is located at 00° 16'S latitude and 2510 m altitude with annual temperature and rainfall of, 15.2°C and 1386 mm, respectively. The trial consists of eight provenances in a design of five blocks with 49 tree/block and a measured plot of 16 trees. Collection information for the **P. oocarpa** provenances can be found in GREAVES (1979). Three of the provenances in this trial have been reclassified as **P. patula** Schiede and Deppe spp. **tecunumanii** (Eguiluz and Perry) Styles (McCARTER & BIRKS, 1985). Details of the provenances in the trial are given in Table 1.

The trial was measured in 1979 and increment cores of 8 mm diameter were removed at breast height (1.3 m) from the three largest trees in each measurement plot.

Following shipment to the OFI, the wood density (DEN) and variation of wood density (VAR) was determined using X-ray densitometry as described by WRIGHT et alii (1986a). The volume under bark (VUB) was calculated for each tree sampled for wood density and this value was multiplied by the DEN to derive a dry matter index (DMI). The data for DEN, VAR, VUB and DMI were analysed using the analysis of variance.

TABLE 1 – Details of provenances, country of origin and abbreviations for **P. oocarpa** y **P. patula** spp.

Species	Provenance	Abr.	Country	Precipit. Mean Annual (mm)	Temp. Mean Annual (C)
P. oocarpa	Canas	CAN	Guatemala	1900	21.3
	Jitotol	JIT	Mexico	-	-
	Lagunilla	LAG	Guatemala	936	19.5
	Zamorano	ZAM	Honduras	1117	20.2
	Zapotillo	ZAP	Honduras	1272	21.8
			CAM	Nicaragua	1500
P. patula spp	Camelias Mountain				
	Pine Ridge	MPO	Belize	1558	23.9
	Yucul	YUC	Nicaragua	1394	22.4

The provenance of **P. oocarpa**, Jitotol, was not included in the analysis because seed was collected from only four trees (GREAVES, 1979) and three of these appear to have been **P. patula** spp. **Tecunumanii**. Therefore, within a measurement plot, there is a mixture of species. Differences in DEN, VAR, VUB and DMI between trees derived from the Jitotol provenance and tentatively identified as **P. oocarpa** ou **P. patula** spp. **Tecunumanii** are given in Table 2.

TABLE 2 – Mean values of DEN, VAR, VUB and DMI of **P. oocarpa** and **P. patula** spp. **Tecunumanii** in the provenance Jitotol.

Species (No of Trees)	DEN	VAR	VUB	DMI
P. oocarpa (4)	482	80	19	9
P. patula spp tecunumanii (11)	447	63	118	52

RESULTS AND DISCUSSION

The results of the analysis of variance are given in Figure 1. There were no significant provenance differences for the traits DEN, VAR, VUB or DMI.

The provenances of **P. patula** spp. **Tecunumanii**, Camelias, Mountain Pine Ridge and Yucul had a good density lower than the trial mean but a VUB that was above the trial mean but lower for VUB. The superior growth of the **P. patula** ssp. **Tecunumanii** provenances has also been observed in Colombia (FAO, 1979; LADRACH, 1985), South Africa (WRIGHT et alii, 1987), Puerto Rico (WRIGHT et alii, 1988), Zambia (WRIGHT et alii, 1986a) and Brazil (WRIGHT et alii, 1986b).

The trees identified as **P. patula** ssp. **Tecunumanii** from the measured plot established with the provenance Jitotol were much superior for VUB and DMI relative to the other provenances. The faster growth rate of the trees identified as **P. oocarpa** due to their inability to compete for nutrients, water and light. The Jitotol provenance indicates the difficulty to identify pine species in the field where there is a large diversity between and within species.

CONCLUSIONS AND RECOMMENDATIONS

Trial results of six years of growth are not sufficient to indicate a new pine species for afforestation. The better growth rate of **P. patula** ssp. **Tecunumanii** indicates the necessity to establish more trials, possibly on several sites of five to ten hectares in extent. These trials should include a wider range of provenances from **P. patula** ssp. **Tecunumanii**.

The wood density at Conocoto was generally higher than that reported in other trials of this series (WRIGHT et alii, 1986a, 1987, 1988). The indications are that the wood of these provenances and species would be adequate for a number of social and industrial uses.

ACKNOWLEDGEMENTS

Seed for the provenance trials of **P. oocarpa** were collected and distributed by the Oxford Forestry Institute (OFI), funded by the Overseas Development Administration of the British Government and with the cooperation of the forest authorities in the various countries of Central America where the species are indigenous. The trial was established and maintained by the Forest Service of Ecuador and we acknowledge their assistance in the measurement of the trial and in permission to publish these results. We would also like to thank Mr. Tony Quilter of OFI for his help in preparing the wood samples.

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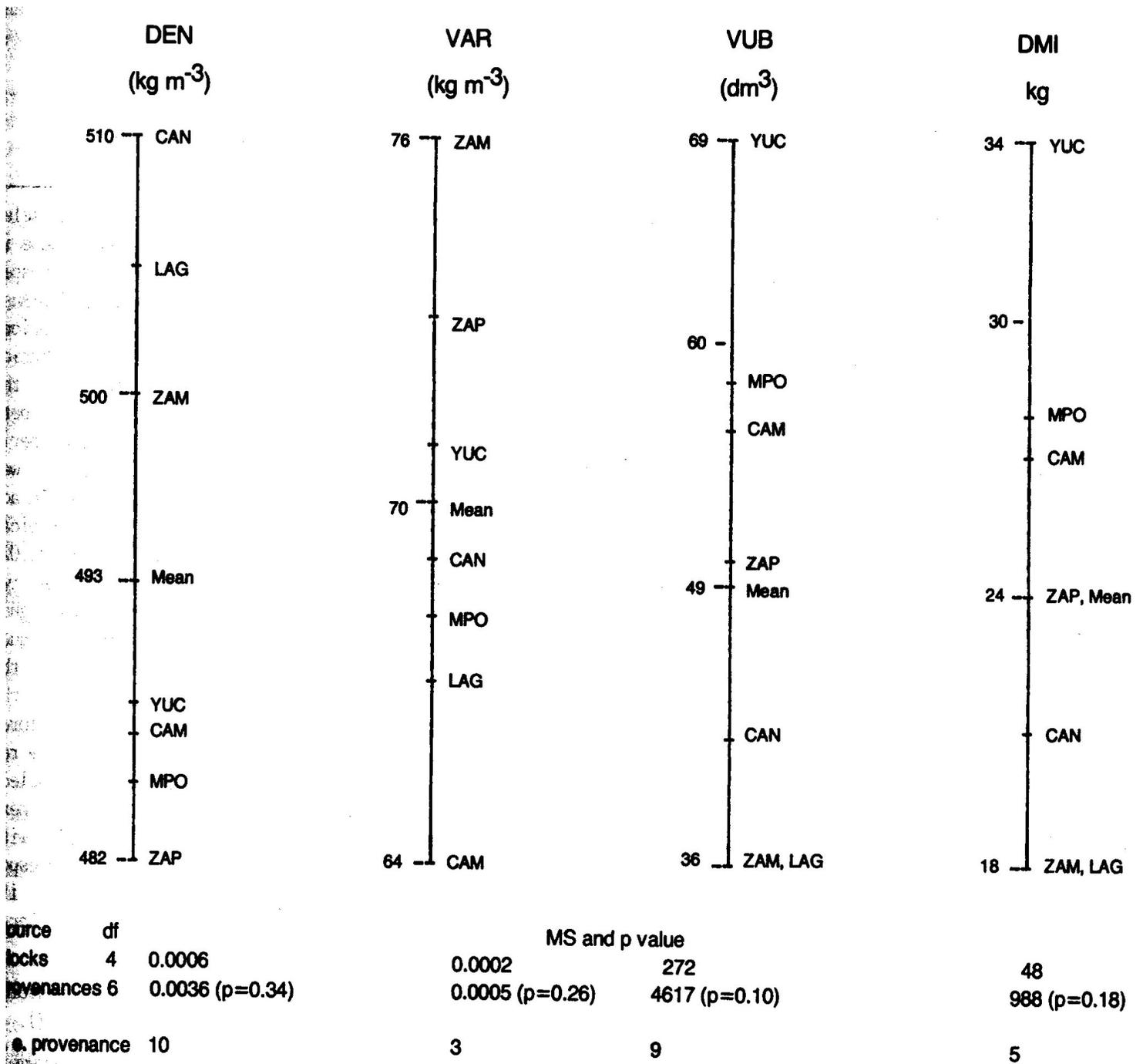


FIGURE 1 – Analysis of variance, ranked means and the critical difference, Q, at the 5% level for densitometric density (DEN), within sample density, variation (VAR), volume under bark (VUB) and dry matter (DMI) of *P. oocarpa* and *P. patula* ssp. *Tecunumanii* provenances at Conocoto.