NOTE

DRY MATTER AND NUTRIENT CONTENT OF 8-YEAR-OLD EUCALYPTUS SALIGNA GROWING AT TAHEKE FOREST

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ABSTRACT

An 8-year-old plantation of **Eucalyptus saligna** Sm. with 829 stems/ha had a height, basal area, and volume close to that of a stand of the same age in Brazil. The weight and nutrient content of the trees and forest floor in the two stands were very similar. Mean annual increment of the New Zealand stand was 16 tonnes/ha but this could have been increased by closer spacing.

Keywords: biomass; above-ground components; nutrients; soil; energy; **Eucalyptus saligna**.

INTRODUCTION

Eucalyptus saligna is a fast-growing species which occurs naturally from southern New South Wales to south-eastern Queensland (Hall *et al.* 1963). It has been successfully planted in several parts of Australia and overseas in Africa, Brazil, and Hawaii. Yields of planted *E. saligna* in Western Australia have been good but inferior to *E. globulus* Labill., *E. botryoides* Sm., and *E. grandis* Hill ex Maid. (Borough *et al.* 1978). In South Africa (FAO 1979) and Brazil (Turnbull & Pryor 1978) yields have ranged from 15 to 35 m^3/ha/yr. In New Zealand best plantation success has been achieved in the northern part of the North Island on loam and clay soils and on warm sites with a low incidence of frost (Bunn 1971).

Information on dry matter production and nutrient content for *E. saligna* is scarce. This paper presents data for an 8-year-old stand which is compared with a stand of similar age in Brazil (Andrae 1982).

MATERIALS AND METHODS

Sample Stand

An 8-year-old *E. saligna* stand which was originally established as a planting stock and fertiliser trial was selected at Taheke on lands leased by N.Z. Forest Products Ltd. The site is located 150 m above sea level on a steep northern slope of 30° within 24 km of the Bay of Plenty coastline (lat. 37° 55'S, long. 176° 20'E). The soil is classified as Oropi Kaharoa (Soil Bureau 1954) and is considered very fertile owing to the presence of old buried topsoils. The previous vegetation consisted of manuka (*Leptospermum scoparium* J.R. et G. Forst.), bracken fern (*Pteridium aquilinum* var. *esculentum* (Forst. f) Kuhn.), and mixed herbaceous plants. The site was burned in April 1973 and V-bladed down the slope. Planting was carried out between the mounds. At the time of the present study, no obvious differences in tree size due to initial treatment could be detected.

All trees in a 20 × 20-m plot were measured for diameter and nine trees were selected for destructive sampling. Sampling procedures for trees, forest floor, and soils, the methods of preparation and chemical analysis, and the computational procedures used were identical to those used in previous studies (Frederick *et al.* 1985).

RESULTS AND DISCUSSION

The top height of the stand was 23.5 m (Table 1) which would approximate to a site index of 33 m at age 20 according to the curves of van Laar (1961). Stand height, basal area, and volume growth were all closely comparable to the observations of Andrae (1982) in an 8-year-old *E. saligna* stand in Brazil which contained about twice the number of stems per hectare.

TABLE 1—Stand characteristics of an 8-year-old **Eucalyptus saligna** stand

Stocking (stems/ha)	829
Basal area (m^2/ha)	25.3
Average height (m)	20.5
Top height (m)	23.5
Volume under bark (m^3/ha)	211

The sample plot had a stocking of 829 stems/ha and a basal area of 25.3 m^2/ha. Examination of six unthinned *E. saligna* stands in the nearby Rotoehu State Forest ranging in age from 11 to 13.3 years and from 580 to 2100 stems/ha indicated that mean annual basal area increment increased by 0.29 ± 0.02 m^2/ha for every increase of 100 stems/ha. Thus the stem weight of our sample plot was probably low compared with potential productivity on this site. Foliage and branch weights were greater than those for the stand in Brazil (Table 2).

Concentrations and total contents of nitrogen, phosphorus, calcium, and magnesium were comparable for the two stands. Energy values were within the range reported for a variety of *Eucalyptus* species (Singh 1980; Madgwick *et al.* 1981; Frederick *et al.* 1985) with highest values for foliage and low values for stem bark.

The dry weight and nutrient contents of the forest floor were almost the same as in the 8-year-old stand of Andrae (1982) (Table 3). The dry weight was comparable to that expected for *Pinus radiata* D. Don in the central North Island (Carey *et al.* 1982) and about twice that under stands of *E. regnans* of comparable age in New Zealand (Frederick *et al.* 1985).

TABLE 2—The average concentrations of eight elements and the average calorific values of the above-ground components of an 8-year-old **E. saligna** stand

Component	Nutrient								Energy
	N	P	K	Ca	Mg	Mn	Cu	Zn	value
	(%)					(ppm)			(kJ/g)
Leaves	1.62	0.121	1.00	0.55	0.26	137	4.8	16.1	21.7
Leaf-bearing twigs	0.47	0.096	0.91	0.64	0.15	77	6.1	17.0	19.6
Branches									
Live	0.20	0.024	0.37	0.44	0.12	86	3.1	10.8	19.1
Dead	0.13	0.004	0.06	0.73	0.13	239	3.2	11.6	19.0
Reproductive parts	1.14	0.149	1.19	0.70	0.29	181	5.2	14.9	20.1
Stem									
Wood	0.09	0.010	0.15	0.05	0.03	10	1.0	3.0	19.5
Bark	0.31	0.035	0.61	1.96	0.45	682	2.4	9.4	17.0

TABLE 3—The dry matter, nutrient, and energy content of some components of an 8-year-old **E. saligna** stand

Component	Dry matter	Nutrient								Energy
		N	P	K	Ca	Mg	Mn	Cu	Zn	
	(t/ha)	(kg/ha)								(10^{10}J/ha)
Leaves	5.7	91	6.9	54	30	14.7	0.78	0.03	0.09	11.3
Twigs	1.6	8	1.6	15	11	2.7	0.13	0.01	0.03	3.2
Branches										
Live	8.0	16	2.0	28	35	10.2	0.72	0.02	0.08	15.3
Dead	9.3	12	0.4	5	70	13.0	2.35	0.03	0.10	17.7
Reproductive parts	0.1	2	0.2	2	1	0.4	0.01	0.00	0.00	0.3
Stem										
Wood	94.3	81	9.6	137	46	25.1	0.99	0.10	0.25	183.7
Bark	10.4	32	3.7	62	200	45.1	7.07	0.02	0.09	17.6
Total	129.8	241	24.4	302	393	111.3	12.00	0.22	0.65	249.1
Forest floor	19.2	140	8.8	15	198	39.9	n.d.*	n.d.	n.d.	n.d.
Mineral Soil†										
(0–40 cm)	193.2	3963	12.0	477	1695	569.4	n.d.	n.d.	n.d.	n.d.

* n.d. not determined

† dry matter = loss on ignition; P = Bray No. 2 extractable; K, Ca, and Mg = exchangeable

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