

YIELDS OF *LEUCAENA LEUCOCEPHALA* IN FIJI

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## ABSTRACT

The yields of six introduced strains of *Leucaena leucocephala* were compared in plots sown on the alluvial flatland of the Sigatoka Valley, Fiji. The Mexico strain gave the highest yield of 42,900 kg/ha dry matter from eleven cuts over a two-year period. Crude protein levels in leaves and fine branches were 33% and 13% respectively with no significant differences between strains. The Ivory Coast strain appeared to be a more suitable browse plant because of its profuse development of lateral branches.

## INTRODUCTION

*Leucaena leucocephala*, known locally in Fiji as "vaivai", has generated interest in Australia, Fiji and a number of other Pacific territories because of its high production of leaf with a very high crude protein content (30%), (Gray, 1962; Kinch and Ripperton, 1962; Hill, 1971). Being a deep rooted shrub it remains productive during dry weather. One disadvantage of vaivai is that part of the crude protein is contributed by an alkaloid, mimosine, which may be present at high concentrations in young leaflets. Mimosine causes hair loss and other symptoms in ruminants (Hegarty *et al.*, 1964). Vaivai is common in coastal areas on most islands of Fiji. It is a calcicole, frequently occurring on coralline soils of high pH. The local strain is not high yielding and comparisons with a Peru strain introduced from C.S.I.R.O., Queensland, have shown the latter to be a faster growing type. Recently, five strains collected in Central America were obtained from Dr. J. L. Brewbaker (Rockefeller Foundation, Bangkok, Thailand).

This paper reports the yields of seeded plots of these five recent introductions and the Peru strain.

## METHOD

The experiment was sown on the fertile alluvial flatland of the Sigatoka Valley at a site which had previously grown *Leucaena*. The land was ploughed, raked to remove old stumps and then ploughed a second time to control nutgrass (*Cyperus rotundus*). The Sigatoka clay loam soil was fertilized with 247 kg/ha each of single superphosphate and potassium sulphate. No fertilizer was applied in the second year. Hot water treated seed (Gray, 1962) of the six strains shown in Table 1 was inoculated with soil collected from beneath nodulated *Leucaena* bushes and sown on October 10th, 1967, in rows 30 cm apart to plots of 2.4 m × 9.1 m. Plots were arranged in a 6 × 6 Latin square design. A heavy seed rate of 0.45 kg/plot was used because of low viability of seed. Seedlings appeared after seven days and nut grass was removed by hand until the seedlings were well established.

To simulate mowing to a constant height by a forage harvester the small branches were cut with a caneknife to produce a cutting table at 30 cm. Plots were harvested when branches were approximately 120 cm high. One row on each side and a 90 cm segment at the end of each plot were treated as guards leaving a harvest area of 13.1 m<sup>2</sup>. The harvested green material was weighed and sub-sampled for the estimation of dry matter, leaf-branch ratio and crude protein. Leaves were separated from branches by hand-stripping the dried leaflets and pinnae.

The experiment was harvested five times (March 2, May 6, Sept. 15, Oct. 19, 1970) in the first year and six times (Nov. 19, 1970 and Jan. 11, March 3, May 12, July 30 and Oct. 9, 1971) in the second year.

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TABLE 1

*Strains of Leucaena leucocephala, plant introduction numbers, and observations of the branching habit of individual unpruned trees in rows (3 m × 4 m) 1968–1969.*

Strain	F.D.A.*	Hawaii Seed No.†	C.P.I.‡	Branching habit
Peru	15346	—	18614	Tall growth, less branching.
Mexico	16436	K8	—	Tall growth, less branching.
Yucatan, Mexico	16437	K28	—	Good branching.
Honduras	16438	K29	—	Fairly good branching.
Ivory Coast	16439	K62	—	Numerous lateral branches.
Salvador	16440	K67	—	Tall growth, fairly good side branching.

\* F.D.A. Fiji Department of Agriculture number.

† Hawaii number from U.S.D.A. funded Central America *Leucaena* collection 1967 (Brewbaker, private communication).

‡ C.P.I. Commonwealth Plant Introduction number (Australia).

## RESULTS AND DISCUSSION

Rainfall of 1,016 mm was recorded in the first year of the experiment and 1,778 mm in the second.

The Mexico strain produced the highest total dry matter yield of leaves and fine stem over the two years but its total yield did not differ significantly from Ivory Coast, Peru and Yucatan strains (Table 2). Mexico was also the most productive strain in a comparison of fresh hay yield in Thailand (Brewbaker, personal communication). All strains were more productive in 1970 than in 1971, probably due to the excessive rainfall and because fertilizer was not re-applied in the second year. There were no marked differences in seasonal production.

TABLE 2

*Total dry matter yields of leaves and fine stems.*

Strain	Dry Matter Yields		
	1970	1971	Total
	Kg/ha	Kg/ha	Kg/ha
Mexico	25,600	17,300	42,900
Ivory Coast	26,800	15,100	41,900
Peru	24,300	16,300	40,600
Yucatan, Mexico	24,400	15,300	39,700
Honduras	23,600	14,800	38,400
Salvador	21,600	14,600	36,200
S.E.	1,500	800	2,000
L.S.D. (P = 0.05)	3,200	1,700	4,100

This experiment was cut more frequently than the four cuts recommended in Hawaii for maximum production (Takahashi and Ripperton, 1949). The frequency of cutting in our experiment was governed by the rate of recovery of the stump, with plants being cut before branches became so woody that the quality of a dried leaf meal was greatly reduced. Plants were first cut at 22 cm height but this was increased to just over 30 cm by the end of the experiment because each successive cut was made slightly higher to avoid harvesting woody stumps. In Hawaii highest yields have been obtained from cutting at 5 cm (Takahashi and Ripperton, 1949).

The ratio of leaf to fine branches by dry weight was approximately 65 : 35 with no significant differences between strains. The average crude protein values for leaves and fine stem were 33% and 13% respectively, and with no differences between strains (P > 0.05). There was a small variation between crude protein levels at different harvesting dates but no seasonal pattern was apparent.

In Hawaii, *Leucaena* leaf has been dried and used as a lucerne meal substitute to animal feeds. However, in Fiji interest is now changing from the dried leaf meal production to use of *Leucaena* as a high quality browse plant. The use of the dried leaf meal in large quantities is restricted to ruminants, since even small levels of mimosine have produced adverse effects in poultry (Labada, 1969). Under Fiji conditions growth is rapid and tips of tall strains soon grow out of reach of cattle, resulting commonly in thickets of inaccessible vaivai. The Ivory Coast strain with its profuse lateral branching appears to have a more suitable growth habit as a browse feed. The widely spaced individual trees described in Table 1 all attained heights of 6 m with trunks often over 130 mm diameter, however at the very close spacing used in this trial, together with regular cutting, resulted in plants of similar leafiness.

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#### REFERENCES

- GRAY, S. G. (1962)—Hot water seed treatment for *Leucaena glauca* (L) Benth. *Australian Journal of Experimental Agriculture and Animal Husbandry* 2: 178-80.
- HEGARTY, M. P., SCHINKEL, P. G., and COURT, R. D. (1964)—Reaction of sheep to the consumption of *Leucaena glauca* Benth. and to its toxic principle mimosine. *Australian Journal of Agricultural Research* 15: 153-67.
- HILL, G. D. (1971)—*Leucaena leucocephala* for pastures in the tropics. Review. *Herbage Abstracts* 41: 111.
- KINCH, D. M., and RIPPERTON, J. C. (1962)—Koa Haole Production and Processing. Bulletin 129, Hawaii Agricultural Experiment Station, p. 58.
- LABADA, M. M. (1969)—The effects of various treatments and additives on the feeding value of ipilpil leaf meal in Poultry, *Philippine Agriculturist* 53: 392.
- TAKAHASHI, M., and RIPPERTON, J. C. (1949)—Koa Haole (*Leucaena glauca*) its establishment, culture and utilisation as a forage crop. Bulletin 100, Hawaii Agricultural Experiment Station, p. 56.

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