THE EFFECT OF THE LEUCAENA PSYLLID ON THE YIELD OF *LEUCAENA LEUCOCEPHALA* CV. CUNNINGHAM AT FOUR SITES IN THE TROPICS

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ABSTRACT

Leucaena leucocephala *cv. Cunningham was grown at 4 sites in the wet tropics, 2 in Indonesia and 2 in Australia. The effect of leucaena psyllids on dry matter yield was examined by comparing the yield from plots sprayed with insecticide and unsprayed plots over a period of approximately 1 year. In Australia, total dry matter production when psyllids were not controlled was reduced to about 45% of that in the sprayed treatment. At 1 site in Indonesia, total yield was reduced by one third while at the other, psyllids did not appear to affect yield. The large amount of damage possible in the first year suggests that psyllids could be a major factor in hindering establishment and reducing yield. Further work is needed to establish the factors responsible for variations in damage levels at different sites.*

RESUMEN

Leucaena leucocephala *cv. Cunningham fue cultivada en cuatro sitios en el trópico húmedo, 2 en Indonesia y 2 en Australia. El efecto del psyllid sobre el rendimiento de materia seca fué examinado por comparación de los rendimientos entre parcelas rociadas con insecticida y parcelas no rociadas sobre un periodo de aproximadamente 1 año. En Australia, cuando el psyllid no fue controlado la producción total de materia seca fue reducida en casi 45% comparada con obtenida en los tratamientos controlados. En 1 de los sitios en Indonesia, el rendimiento total fue reducido en un tercio mientras en el otro, el psyllid no pareceïo afectar los rendimientos. La gran cantidad de posibles daños al primer año sugieren que el psyllid puede ser un factor negativo importante tanto en el establecimiento como reduciendo los rendimientos. Trabajos adicionales son necesarios para establecer los factores responsables por las variaciones en los niveles de daños en diferentes sitios.*

INTRODUCTION

Leucaena leucocephala is a leguminous tree or shrub native to areas of Mexico and Central America. From these areas it has spread over much of the tropical regions of the world where it has been used largely as a source of cut-and-carry feed and also as fuel. In some countries (e.g. Hawaii and Australia) it is used for extensive cattle grazing. Thus leucaena has become an inportant part of many farming systems throughout the world.

In 1983 the presence of leucaena psyllid (*Heteropsylla cubana* Crawford) was reported in Florida. Since then this insect, which is native to Central America and the Caribbean, has spread to most areas where leucaena is grown, and poses a serious economic threat to the continued successful use of leucaena (NFTA 1987).

Although extensive damage has been reported from many areas, there are also places where the psyllid appears to have had little effect. To our knowledge there have been no quantitative studies to determine the extent of psyllid damage on leucaena. This paper reports some results from experiments comparing leucaena yields both with and without psyllid control.

MATERIALS AND METHODS

The data reported here were obtained as part of a wider program designed to evaluate the performance of a range of 20 shrub legumes over 4 sites in the topics, 2 in Indonesia and 2 in Australia. Details of the sites shown in Table 1. The 22 entries were planted in rows 2 m apart, with 0.5 m between plants. This paper considers only data from the plots of cv. Cunningham. There were 2 replications of 2 fertilizer treatments (nil and complete) at each site. Plot size was 6 plants. Seedlings were raised in plastic bags of local soil from each site and were transplanted at approximately 8 weeks of age.

TABLE 1

Details of sites of the shrub legume experiment.

Site	Location	Soil Type	Mean Annual Rainfall	Planting Date
			(mm)	
Indonesia:				
Sei Putih	3°30'N, 99°00'E	Tropudult	1850	December 1986
Sembawa	3°00'S, 104°30'E	Paleudult	2220	December 1986
Australia				
Utchee Creek	17°45'S, 146°00'E	Oxisol	3700	February 1987
Silkwood	17°30'S, 146°00'E	Inceptisol	3700	February 1987

The first harvest was taken about 6 months after transplanting, with subsequent harvests being taken approximately every 3 months. For the first harvest plants were cut back to 75 cm. Thereafter cutting height was 1 m. The centre 4 plants in each plot were cut and weighed. In Indonesia, all plants were separated into leaf (plus small stem to 6 mm diameter) and stem. In Australia, and "average" plant was separated for each entry in 1 replication only. Subsamples of the separated leaf and stem fractions were dried, and the results used to calculate the dry-weight yields of leaf and stem.

In each replicate there was 1 entry of cv. Cunningham, with no insect control. There were also 2 entries of cv. Cunningham which were sprayed every 4 weeks with 0.04% dimethoate to control psyllids.

RESULTS AND DISCUSSION

At all sites rainfall was below average, with considerable periods of moisture stress. Psyllids were present on all plots almost from establishment. At Sei Putih, there has never been major damage observed (equivalent to a maximum of 2 on the scale of Bray and Woodroffe 1988, representing only curling of leaflets) while at the other sites severe damage resulting in leaf loss was frequent (equivalent to scores of 4, 5 and 6, representing various degrees of leaf loss, up to total defoliation of the terminal shoot).

Yields obtained from the harvested plots are shown in Table 2. Since yields from the non-fertilised plots at Sembawa and Silkwood were negligible they have not been included, and since there was no significant effect of fertiliser at Utchee Creek and Sei Putih the results from these sites are the means of plus and minus fertiliser treatments. Also, since the results from the various havests at any one site have been consistent, only total yields over all harvests are shown. However we have not included the yields from the first (clearing) harvest. Thus because of long periods of moisture stress, data from only 1 harvest is available for Sembawa.

TABLE 2

Dry matter production of leucaena at 4 sites, with and without insect control. (The standard error shown is for the difference of total yields at each site)

Site	Number of Harvests	Dry Matter Production						S.E. of difference
		Leaf		Stem		Total		
		with	without spray	with	without spray	with	without spray	
				(t/ha)				
Sei Putih	4	6.67	7.53	7.28	8.46	13.95	15.99	2.64
Sembawa	1	1.05	0.84	0.95	0.59	2.00	1.42	0.41
Utchee Creek	4	8.41	3.67	7.88	3.55	16.29	7.22	1.77
Silkwood	3	3.30	1.78	2.67	0.97	5.97	2.75	0.69

The effect of the spraying treatment differed according to the site. In Australia, production at Utchee Creek and Silkwood when psyllids were not controlled was reduced to about 45% of that obtained in the sprayed treatment. In Indonesia, lack of insect control at Sembawa reduced total yield by 30%. At Sei Putih, the sprayed treatment yielded less (although not significantly so) than the unsprayed one.

The data above demonstrate that the psyllid can be responsible for considerable losses in production levels, both of leaf and stem. However this level may vary from site to site, and quite likely also from time to time. We have no explanation for the different effects of psyllids on yield at the different sites, but suggest that potential users should be aware of the possibility of substantial losses due to psyllid infestation. Because of the relatively slow growth of leucaena in the first year, any setback to production during that time may lead to greater accumulated losses in subsequent years. The variation in the effect of the psyllid in different areas provides a strong case for further research on the ecological factors responsible for its multiplication and dispersal.

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REFERENCES

BRAY, R. A. and WOODROFFE, T. D. (1988)—Resistance of some Leucaena species to the leucaena psyllid. *Tropical Grasslands* **22**: 11-16.

NFTA (1987)—Proceedings of a Workshop on Biological and Genetic Control Strategies for the Leucaena psyllid. A Special Edition of "Leucaena Research Reports" Volume 7(2). Honolulu. HI.

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