STUDIES ON THE GROWTH OF LEUCAENA LEUCOCEPHALA

3. PRODUCTION UNDER GRAZING IN THE NEW GUINEA LOWLANDS

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ABSTRACT

Under a six-week grazing cycle over a nine-month period at Erap in the Markham Valley, the Peru strain of Leucaena produced an estimated 11,000 *lb of dry matter per acre. On the basis of other results from the same site this could be expected to have a crude protein content of* 21 *per cent. Yield responded markedly to increased rainfall, and during the wet season grazing would need to be more frequent than every* 6 *weeks to keep Leucaena under control.*

INTRODUCTION

NO information is available on the production of Leucaena when grazed by cattle in Papua New Guinea. Studies in Hawaii and Australia have shown the ability of this legume to produce good liveweight gains from cattle (Henke, Work and Burt 1940; Furr 1965; CSIRO Aust. 1968). It was decided, therefore, to estimate the yield of the plant under grazing.

From the literature (Takahashi and Ripperton 1949), harvesting about every 12 weeks gave maximum dry matter production in Hawaii. This cycle would be too long for lowlands grazing in Papua New Guinea because of rapid growth. It was therefore decided to use a fixed six-week grazing cycle. An established area of the Peru strain of Leucaena at the New Guinea Lowlands Livestock Station, Erap, was sampled before each grazing to estimate dry matter production. Further samples were taken after grazing to estimate the amount of unconsumed forage.

MATERIALS AND METHODS

The paddock (16 acres in area) had been sown to the Peru strain in rows 10 ft apart at approximately 10 lb per acre in February, 1967.

Cattle were admitted to the paddock from late 1967, and it was grazed intermittently until the start of the experiment in October, 1968. The companion grass was Buffel (*Cenchrus ciliaris*) and the paddock was moderately infested with *Sida cordifolia.*

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A uniform area of 14 rows of Leucaena was selected for sampling. Length of selected rows was 60 ft, giving a sample area of 60 x 140 ft. The Leucaena in the sample area was cut back into hedges 3.5 ft high and about 0.75 ft thick on 21st October, 1968. All leaves and twig outside this frame were cut and removed from the site, which was then fenced off from the remainder of the paddock.

A total of six harvests was taken. For sampling, each 60 ft of hedge was divided into six sample spaces of 10 ft. At each harvest ten samples were taken prior to grazing. The area was then heavily stocked with cattle until all leaf material was consumed, and a further four samples taken.

At each complete harvest one sample was taken from each row. The position sampled within the row, and the rows to be sampled before and after grazing, were allocated at random with the restriction that each sample space was cut only once during the entire experiment to ensure that the response measured was to grazing and not to cutting.

Estimation of Yield

From each 10 ft sample space the central 5 ft was cut back to the same hedge size as at the start of the experiment. The sample was weighed, and from it a 1 kg subsample was taken and dried to constant weight in a forced draught oven at 85 deg. C. Dried samples were weighed direct from the oven.

Grazing Cycle

Six weeks after the preparatory cutting, pregrazing samples were taken and cattle admitted. The number varied from harvest to harvest,

but was never less than 21 head. This gave a stocking density of 105 beasts per acre. The time taken to graze the area varied from 3 to 5 days. Cattle were removed when no green leaf was visible in the trial area. Post-grazing samples were taken the day the cattle were removed. The next sampling took place six weeks later.

The condition of the trial area after grazing is shown in *Plate* I. Comparison with *Plate* II gives an indication of the volume of forage consumed.

Plate I.—Condition of trial area Leucaena grazing trial, Erap, after grazing, 22nd April, 1969

RESULTS AND DISCUSSION

The first two harvests occurred during the dry season at Erap, harvests three and four during the wet season, five at the end of the wet, and six at the period of the "little wet" (July to August).

It is of interest to note that at the period of the "little wet" there was a considerable increase in the amount of dry matter on offer consumed. At all other harvests the amount of unconsumed forage ranged from 32 to 46 per cent. At the sixth harvest, however, this fell to 19 per cent. This was probably due to increased leaf growth between harvests five and six following the dry period between harvests four and five, thus increasing the amount of leaf relative to unconsumed stems.

Rainfall between harvests is shown in the *Figure*. The response of Leucaena and Buffel to rain was very marked. The condition of the plants at harvest four (18th April, 1969) is shown in *Plate* II.

Plate II.—Condition of the trial area prior to grazing, 18th April, 1969. Comparison with *Plate* I gives an indication of the amount of forage removed by the cattle

An interesting feature of the experiment was the effect of the grazing regime on the companion grass. In the rest of the paddock where intensive grazing had not been practised, *Sida cordifolia* was not grazed and tended to dominate the grass. In the experimental area, the high stocking density forced the cattle to graze the Sida. The grass recovered fully after each grazing, and by the second, Sida was no longer a serious weed. The Buffel grass was taller and darker green than that in the remainder of the paddock.

It would thus appear that the grazing regime employed successfully controlled this weed.

Table.—Dry matter production Leucaena grazing—Erap

Harvest Date	Dry Matter (lb per acre)			
	Total	Utilized	Unconsumed	% Unconsumed
2nd December, 1968	861	540	321	37.3
16th January, 1969	892	609	283	31.7
3rd March, 1969	2,941	1,959	982	33.4
18th April, 1969	2,627	1,568	1,059	40.3
2nd June, 1969	1,453	778	675	46.5
17th July, 1969	2,228	1,803	425	19.1

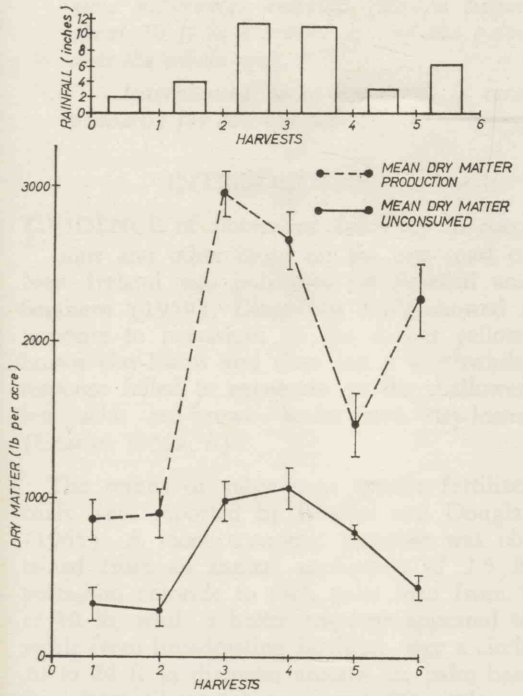

Figure.—Estimated available forage and amount unconsumed (dry matter lb per acre) and rainfall between harvest (Range indicated at each harvest ± Sx (mean))

Dry Matter Production

Mean values for dry matter production are recorded in the *Table,* and are shown in the *Figure.* Maximum dry matter production for any between-grazing period of 2,941 lb per acre was obtained at harvest three.

Estimated total dry matter production over the 289 days of the experiment was 11,000 lb per acre. The amount of utilized forage was estimated at 7,257 lb per acre, or 65.9 per cent. From the results of Hill (1969), six-week-old Peru Leucaena at Erap has an average crude protein content of 21 per cent, giving an estimated crude protein yield of 2,320 lb per acre. These yield estimates do not include production from the companion grass.

When rainfall was adequate, production under a six-week grazing cycle was maintained at high levels. The fixed grazing cycle of 6 weeks did not appear equally suitable for all seasons. During the wet season, grazing clearly needed to be more frequent for efficient utilization and to prevent the hedge from growing out of control.

CONCLUSIONS

The estimated dry matter yield of the Peru strain obtained in this experiment is comparable with that obtained by other workers. Hutton and Bonner (1960) obtained a yield of 11,236 lb dry matter per acre in nine months; and Oakes and Skov (1967) 13,619 lb dry matter per acre in a year, or 10,783 lb per acre if reduced to the same period as the present experiment. From 6 ft hedges, spaced 50 ft apart, Anslow (1959) obtained 2,392 lb per acre using the Mauritius strain. At a 10 ft spacing, assuming no mutual competition, this would give a yield of 11,962 lb, or reduced to the same period as this experiment, 9,471 lb dry matter per acre.

It can be seen that Peru Leucaena because of its high level of production and its very high crude protein content has excellent potential as a forage legume for the lowlands of New Guinea.

ACKNOWLEDGEMENTS

Mr G. A. McIntyre for advice on sampling, Mr M. D. Pirkis for provision of facilities, Mr J. H. Schottler for supervision of the cattle, and Mr S. Meara for help in the field.

REFERENCES

ANSLOW, R. C. (1959). Fodder production from hedges of acacia (*Leucaena glauca*). *Revue agric. sucr. Ile Maurice,* 39 : 99-102.

CSIRO AUST. (1968). *Rep. Div. trop. Past. CSIRO Aust.,* (1967-1968) : 11-13.

FURR, R. D. (1965). Pasture performance of grade Hereford compared to crossbred steers on guinea grass: koa haole pasture. *Hawaii Fm Sci.,* 14 (3) : 4-5.

HENKE, L. A., WORK, S. H. AND BURT, A. W. (1940). Beef cattle feeding trials. *Bull. Hawaii agric. Exp. Stn,* 85.

HILL, G. D. (1969). Effect of environment on the growth of *Leucaena leucocephala.* (M.Sc. (Agric.) Thesis, University of Western Australia.) viii + 249 pp.

HUTTON, E. M. AND BONNER, I. A. (1960). Dry matter and protein yields in four strains of *Leucaena glauca* Benth. *J. Aust. Inst. agric. Sci.,* 26 : 276-277.

OAKES, A. J. AND SKOV, O. (1967). Yield trials on *Leucaena* in the U.S. Virgin Islands. *J. Agric. Univ. P. Rico,* 51 : 176-181.

TAKAHASHI, M. AND RIPPERTON, J. C. (1949). Koa haole (*Leucaena glauca*) its establishment culture and utilization as a forage crop. *Bull. Hawaii agric. Exp. Stn,* 100.

(Accepted for publication November, 1970.)