THE EFFECT OF ADDING *LEUCAENA LEUCOCEPHALA* MEAL TO COMMERCIAL RATIONS FOR GROWING PIGS

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ABSTRACT

Thirty weaned crossbred pigs were used in an experiment to study the effect of including Leucaena leucocephala *in rations for growing pigs.*

Leucaena meal was substituted for a commercial grower ration at levels of 0, 10, 20, 30, 40 *and* 50 *per cent of the rations. The rations were balanced for vitamins and minerals.*

The results showed that weight gain and food conversion ratio were adversely affected at levels higher than 20 *per cent. The possible reasons for these adverse effects are discussed.*

INTRODUCTION

LEUCAENA leucocephala (Lam) de Wit., (formerly *Leucaena glauca*) is a tropical leguminous shrub belonging to the Mimosaceae family. It originated in Mexico but is now widely distributed throughout the tropics including Papua New Guinea.

The high yields of protein obtainable with this plant have stimulated considerable research into its use for ruminant and non-ruminant nutrition.

Mascré (1937) first isolated a toxic principle from the plant which he called leucenol. Yoshida (1944) from a study of the chemistry of the toxic principle proposed that it was identical with mimosine.

Yoshida (1944) studied the toxic effects of mimosine and found they could be controlled by the addition of soluble iron salts to the ration. The effect of the iron salts was to reduce the absorption of mimosine. Concentrations of ferrous sulphate as low as 0.3 per cent of the ration have been shown to improve the efficiency of rations containing leucaena for growing poultry (Labadan, *et al.* 1969).

Leucaena dehydrated with a high temperature rotary drier has been used in the rations for growing swine (Iwanaga, Otagaki and Wayman 1957). The present study was undertaken to assess the effects of the addition of varying amounts of leucaena in rations for growing pigs.

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MATERIALS AND METHODS

Sun-dried leucaena leaves were purchased from a local farmer who used the plant as coffee shade. The leaves were hammer-milled to make a meal. This was added to a commercial grower ration[1] to provide six levels of leucaena: 0, 10, 20, 30, 40 and 50 per cent by weight. Supplementary bone ash, salt, mineral and vitamin premix were added to balance the diluting effect of the leucaena. Ferrous sulphate B.P. was added to all rations at a rate of 2 g per kg.

The composition of the rations used is shown in *Table* 1. It can be seen that increasing the levels of inclusion of leucaena meal had the effect of increasing the crude protein content of the rations. This was particularly so with the higher levels of inclusion which were higher than normally recommended (Agricultural Research Council 1967).

Five litters of six crossbred weaner pigs were used in the experiment. Each litter formed a block, with pigs allocated to diets at random. Each litter of pigs stayed in the experiment for a period of 50 days.

[1]Kaiani Feed Mills, Lae.

Table 1.—Composition of experimental rations

Leucaena Meal (kg)	0	10	20	30	40	50
Bone ash (g)	0	120	120	360	480	600
Salt	0	90	180	270	360	450
Mineral premix[1] (g)	0	100	200	300	400	500
Vitamin premix[2] (g)	0	100	200	300	400	500
Ferrous sulphate (g)[3]	200	200	200	200	200	200
Commercial ration[4] (kg)	100	90	80	70	60	50
Moisture (%)	13.8	12.7	13.3	11.7	12.7	16.0
Crude protein[5] (%)	18.9	20.7	21.0	20.5	22.9	26.1

[1] Contains per 100 lb. of premix 8.8 g ($C4SO_4$, 20 g $MnSO_4$)

[2] Contains per 100 lb. of premix 1 g riboflavine, 4 g Pantothenic acid, 600,000 I.U. Vitamin A, 60,000 I.U. Vitamin D_3.

[3] Ferrous sulphate B.P.

[4] 18% crude protein grower rations, Kaiani Mills, Lae.

[5] Dry matter basis.

Table 2.—Effect of adding Leucena leaf meal to a commercial ration for growing pigs.

	Level of leucena meal (%)					
	0	10	20	30	40	50
Initial weight (lb)	26.6	33.6	27.4	29.6	30.2	30.0
Final weight (lb)	58.6	78.0	70.2	61.8	54.2	46.8
Av. daily gain (lb)[1]	0.62[b]	0.89[a]	0.86[a]	0.66[ab]	0.48[bc]	0.34[c]
Food conversion ratio	4.48[b]	3.04[a]	3.02[a]	4.98[b]	5.12[b]	6.70

[1]Means with the same superscript are not significantly different ($P < 0.05$).

All litter blocks were commenced within a 2-month period. Feed was prepared in 100 kg lots and fresh feed made up as each lot was used up.

Pigs were housed individually in concrete pens 5 ft by 3 ft (153.5 x 91.5 cm). Feed and water were supplied *ad libitum*. Food was weighed daily while the pigs were weighed every week.

RESULTS AND DISCUSSIONS

All pigs remained healthy during the experiment. Although Alopecia was found by Yoshida (1944) to occur in rats fed rations containing 30 per cent leucaena leaf, it was not observed in this experiment. Many of the pigs fed leucaena were observed to pass red-coloured urine, due, presumably to the breakdown product of mimosine, 3, 4-dihydroxypyridine (Hegarty, Schinkel and Court 1964).

Weight gain and food conversion efficiency data are shown in *Table* 2. Analysis of variance showed that the inclusion of between 10 and 20 per cent leucaena leaf meal significantly improved growth rate over the control ration ($P < 0.05$).

Similar effects were observed for feed conversion ratio which was significantly improved by the inclusion of 10 and 20 per cent leucaena, unaffected by 30 and 40 per cent inclusion and significantly worse at the 50 per cent level.

The declining performance of pigs fed levels higher than twenty per cent might have been due to leucaena toxicity or excessive crude fibre.

It is possible that at the high levels of leucaena inclusion, insufficient ferrous sulphate was added to prevent the absorption of mimosine. Ross and Springhall (1963) have calculated on theoretical grounds that approximately 65 g ferrous sulphate per kg of leucaena are needed for detoxification. Labadan *et al.* (1969) however found 30 g per kg leucaena to be adequate for chicks.

In the present study the inclusion of 0.2 per cent ferrous sulphate was equivalent to levels of inclusion of 20, 10, 7, 5 and 4 g per kg leucaena. However there does exist the possibility of ferrous sulphate toxicity at high levels of inclusion due to phosphate binding (Ross and Springhall 1963).

Another possible reason for poor performance of pigs fed high levels of leucaena is high levels of crude fibre. Calculation of crude fibre content based on proximate analysis data of Yoshida (1944) reveals that the rations contained up to 8 per cent crude fibre.

The Agricultural Research Council (1967) in a review of the feeding requirements of pigs concluded that performance declined with increasing crude fibre. Such effects would have been particularly severe in the young pigs used in the experiment.

The incorporation of leucaena in rations for monogastric animals has been shown to reduce fertility. Wayman and Iwanaga (1957) found that a ration containing 15 per cent leucaena increased the number of services per successful conception, and reduced litter size and weight In male rats leucaena reduced libido and testis size (Joshi 1968). If leucaena is to be used in rations for growing pigs these animals might not be suitable for subsequent breeding.

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