J. Natn. Sci. Coun. Sri Lanka 1979 7(2) : 105—110

Manioc Leaf Meal (*Manihot esculanta* Crantz) as a Source of Protein for Fattening Swine

A. S. B. RAJAGURU, V. RAVINDRAN AND R. M. RANAWEERA BANDA
Department of Animal Husbandry, University of Peradeniya, Peradeniya, Sri Lanka.

(*Paper accepted* : 27 *August* 1979)

Abstract : Studies were conducted to evaluate manioc leaf meal MLM as a source of protein in rations for growing and finishing swine. The results suggest that MLM could be included upto 30% level in fattening swine rations, without any adverse effects on the performance of animals. Significant improvements in growth rate and feed conversion efficiency were observed in growing swine fed on 20% and 30% levels of MLM when compared to the coconut meal based control ration. This effect was attributed to the high lysine content of manioc leaf meal.

1. Introduction

The rapid increases in cost and shortages of coconut meal, which is the major protein supplement for swine in Sri Lanka, has hampered the expansion of the swine industry during the recent past. Thus, it has become necessary to find alternate cheap sources of protein to replace coconut meal in rations.

Manioc Leaf Meal (MLM) is potentially a good source of protein (Table 1) and it may be possible to use it as a substitute for coconut meal. The essential amino acid profile of manioc leaves has been reported to be comparable to that of soyabean meal.[8] Further, manioc leaves apparently contain adequate amounts of vitamins and minerals for inclusion in livestock rations.[3,8] Despite of a certain amount of risk of toxicity due to its cyanogenetic glucoside content, MLM has been subjected to much research work and there is sufficient evidence on the usefulness of manioc leaf in poultry ration.[2,6,9,10] However, very little work has been done on the use of MLM in swine rations.

Hence the trials reported here were designed to evaluate MLM as a protein supplement for swine and to determine the possible levels of replacing coconut meal with MLM in rations for both growing and finishing swine. The trials were conducted at the swine production unit of the Department of Animal Husbandry of the University of Peradeniya, Sri Lanka.

2. Experimental

MLM was prepared from fresh manioc leaves and petioles, obtained from mature plants at the time of harvest by wilting in the shade for three days and drying overnight in an Unitherm Oven at 100°C. The dried material was then ground into a semi-powdery form. Siriwardene and Ranaweera[10] resorted to bruising of leaves,

while wilting them in shade, to lower the cyanide levels. They recorded a cyanide level of 0.0049% (4.9mg/100g) in their test material. However the procedure used in our trials was sufficient to lower the cyanide levels to 0.00329% (3.29 mg/100g). The proximate analysis of the MLM used is given in Table 1.

TABLE 1. Chemical composition in manioc leaf meal (%)

Dry matter	90.85
Crude protein	22.60
Ether extract	6.20
Crude fibre	19.71
Ash	6.32
Nitrogen free extract	36.02
Hydrocyanic acid (HCN)	0.00329

Two trials were conducted using twenty Large White male piglings in each trial, utilizing the same facilities and experimental procedure. The housing and feeding methods were similar to those described by Rajaguru *et al.*[7] Intake capacity of feed in each group was estimated at the beginning of each week, on the basis of the feed consumption per half an hour.

The feed provided per meal, in all groups, was then restricted to the lowest estimate recorded, so that the feed intake between treatments was maintained at the same level. The feed intake determined this way was used as the basis of feeding during the week.

2.1. Trial I.

20 Large White males selected from three littermate groups, were assigned at random into four treatments on the basis of weight. They were around 75 days of age and weighed an average of 13.14 kg at the commencement of the trial.

A coconut meal based ration, formulated to contain the recommended nutrient requirements of growing swine,[5] was used as the control. The three experimental rations were formulated by substituting the coconut meal with 10%, 20% and 30% MLM (Table 2).

The weekly weight gains were recorded until the termination of the trial, which lasted five weeks.

TABLE 2. Percentage composition of rations used for growing swine—Trial I.

	Control Ration	Experimental Rations		
		10% Manioc leaf meal	20% Manioc leaf meal	30% Manioc leaf meal
Coconut meal	40	30	20	10
Manioc Leaf meal	—	10	20	30
Rice polish	25	25	25	25
Maize	16	16	17	16
Manioc chips	10	11	10	11
Milk powder	2	2	2	2
Fish meal	6	5	5	5
Bone meal	1	1	1	1
Zoodry*	0.25	0.25	0.25	0.25
Methionine	0.06	0.06	0.06	0.06
Chemical analysis (%)				
Crude protein	16.0	15.90	15.91	15.69
Crude fibre	9.89	12.01	12.46	13.36
Ether extract	5.20	5.08	4.20	5.30
Ash	7.06	7.12	7.03	11.20
Nitrogen free extract	51.45	50.29	50.97	44.95

*Vitamin and mineral supplement.

2.2. Trial II

20 Large White males, initially averaging 130 days of age and weighing 23.82 kg, were randomly allocated to four treatments with five animals in each group. A coconut poonac based ration, which was formulated to provide the nutrient requirements of finishing swine as recommended in the N.R.C. standards,[5] served as the control. In the three experimental rations, coconut meal was replaced by 10, 20 and 30% levels of MLM. The energy was kept at a higher level in this trial by using a maize as the main energy source. Composition of these rations is presented in Table 3. Weekly weight gains were recorded throughout the trial period, which lasted seven weeks.

TABLE 3. Percentage composition of rations for finishing swine—Trial II

	Control Ration	Experimental Rations		
		10% Manioc leaf meal	20% Manioc leaf meal	30% Manioc leaf meal
Coconut poonac	40	30	20	10
Manioc leaf meal	—	10	20	30
Maize	41	42	41	42
Manioc chips	10	10	10	11
Fish meal	6	5	5	5
Milk powder	2	2	2	2
Bone meal	1	1	1	1
Zoodry*	0.25	0.25	0.25	0.25
Methionine	0.06	0.06	0.06	0.06
Chemical analysis (%)				
Crude protein	14.36	14.28	14.88	15.39
Ether extract	6.75	6.00	6.20	5.30
Crude fibre	9.89	12.01	12.46	13.36
Ash	10.00	10.20	10.20	10.60
Nitrogen free extract	49.00	48.33	47.18	45.85

*Vitamin and mineral supplement.

3. Results

3.1. Trial I

The effects of different levels of MLM or the performance of growing swine are given in Table 4.

TABLE 4. Mean effects of manioc leaf meal on weight gain, feed consumption and feed conversion efficiency of growing swine.

	Initial weight (kg)	Final weight (kg)	Weight gain (kg)	Feed Consumption (kg)	Feed Conversion efficiency
Control	12.72	21.22	8.50[a]	52.80	6.09[a]
10% MLM	13.32	24.25	10.93[ab]	53.20	4.87[b]
20% MLM	13.18	25.32	12.14[b]	53.20	4.37[b]
30% MLM	13.32	25.82	12.50[b]	53.20	4.25[b]

Statistical significance at 5% level is denoted by different letters.

No significant differences were observed in the average weight gains, between the animals fed on coconut meal based control ration and those fed on ration containing 10% MLM. Inclusion of both 20% and 30% MLM into the growing swine rations resulted in significantly higher weight gains over the control ration. Feed conversion efficiency of animals fed on rations containing all three levels of MLM was significantly superior to those fed on control ration.

3.2. Trial II

The performance of finishing swine fed on different levels of MLM is presented in Table 5.

TABLE 5. Mean effects of manioc leaf meal on weight gains and feed conversion efficiency of finishing swine.

	Initial weight (kg)	Final weight (kg)	Weight gain (kg)	Feed Consumption (kg)	Feed Conversion Efficiency
Control	24.09	45.45	21.26	84.85	3.94
10% MLM	23.48	43.33	19.85	84.85	4.27
20% MLM	23.18	43.64	20.45	84.85	4.14
30% MLM	23.72	45.68	21.96	84.85	3.86

Data statistically not significant.

There were no significant differences between the average weight gains or the feed conversion efficiency of finisher swine fed on control ration and those fed on rations containing 10%, 20% and 30% levels of MLM.

4. Discussion

The results of these two trials suggest the usefulness of MLM as a substitute for coconut meal in rations for both growing and finishing swine. MLM could be safely incorporated into swine rations upto 30% level without any adverse effect on the performance of animals. This is to be expected, since the nutrient composition (Table 1) and the metabolizable energy value[10] of MLM are comparable to those of coconut meal. However, these results are in complete disagreement with the only work recorded on the utilization of MLM in swine rations by Kok Choo and Hutagalung.[4] They reported that inclusion 10% and 20% MLM reduced palatability and depressed weight gains and feed conversion efficiency in growing and finishing swine. The explanation for the above disagreement probably lies in the differences in HCN in the MLM used. Apparently the MLM used in their trials was not processed to eliminate the HCN. It is well known that HCN depresses performance of swine, by interfering with the efficiency of energy utilization.[7]

The reason for the improvements observed in the performance of growing swine fed on rations containing 20% and 30% levels of MLM could be attributed to the high lysine content of MLM. Rajaguru[6] reported similar results in the performance of broilers fed on rations containing 20% MLM. It was reported that MLM contains almost twice as much lysine as coconut poonac.[10] However, inclusion of MLM in finisher rations did not result in any significant responses as observed with growing swine (Tables 4 and 5). This difference may be due to the high lysine requirements of growing swine, when compared with finisher swine.[1,5] The high vitamin and mineral content of MLM[3,8] also may have influenced the superior performance in the growing swine.

Based on the results of this study, it may be concluded that MLM could be used to replace coconut meal upto 30% level in swine fattener rations. It is also apparent that MLM does not carry any factors that affect the palatability of the ration. Further, because of its high lysine content, inclusion of MLM will be of advantage in balancing rations deficient in lysine. It may be advisable however to supplement the MLM rations with methionine, since the HCN present in the MLM increases the requirement for methionine to provide sulphur for the detoxification of cyanide.[9]

Inclusion of MLM will also be an economic proposition as it could be prepared cheaper as a by-product of manioc grown for tubers. From the foregoing explanations, it could be recommended that detoxified MLM will be a substitute superior in quality to coconut meal to be used in the swine feed industry. More work is essential to study the effects of MLM in the carcass quality of swine.

Acknowledgements

The authors gratefully acknowledge the financial assistance provided by the National Science Council of Sri Lanka. We also wish to thank Messers. L. Mahawela and M. Ganepola for their technical assistance in conducting these trials.

References

1. A. R. C. (1970). *Nutrient requirements of farm animals.* No. 3. Pigs. *Agricultural Research Council, London.*
2. Hutagalang, R. I. Jalaludin, S. & Chang, C. C. (1974). *Evaluation of Agricultural Products and by-products as animal feeds, Malaysian Agric. Res.* 3: 49.
3. Johnson, R. M. & Raymond, W. D. (1965). *The chemical composition of some tropical food plants IV. Manioc, Trop. Sci.,* 7: 109.
4. Kok Choo, T. L. & Hutagalung, R. I. (1972). *Nutritional value of tapioca leaf for swine. Malaysian Agric. Res.,* 1: 38.
5. N. R. C. (1966). *Nutrient requirements of domestic animals, No.* 2. *Nutrient requirements of swine,* National Research Council, Washington, D. C.
6. Rajaguru, A. S. B. (1975). *Problem of HCN in cassava,* Agric. Research Seminar series Faculty of Agriculture, University of Sri Lanka, Peradeniya, No. 75-7, pp. 9.
7. Rajaguru, A. S. B., Ravindran, V., & Dias, E. A. (1978). *Utilization of cassava meal in swine feeding, J. Natn. Sci. Coun Sri Lanka.* 6(2): 95.
8. Rogers, D. J. & Milner, M. (1963). *Amino-acid profile of manioc leaf protein in relation to nutritive value, Econ. Bot.* 17: 211.
9. Ross, E. & Enrique, F. G. (1969). *The nutritive value of cassava leaf meal, Poultry Science* 48: 846.
10. Siriwardene, J. A. de S. & Ranaweera, K. N. P. (1974). *Manioc leaf meal in poultry diets, Ceylon Vet. J.* 22: 53.