APPARENT DIGESTIBILITIES OF DRY MATTER, ORGANIC MATTER, CRUDE PROTEIN, ENERGY AND ACID DETERGENT FIBRE OF CHOPPED, RAW SWEET POTATO (*IPOMOEA BATATAS* (L.)) BY VILLAGE PIGS (*SUS SCROFA PAPUENSIS*) IN PAPUA NEW GUINEA

C.J. Rose* and G.A. White†

ABSTRACT

Mean apparent digestibilities of the components of sweet potato tubers measured with village pigs were 95.3%, 96.1%, 94.2% and 72.4% for dry matter, organic matter, energy and acid detergent fibre respectively. The digestibility of the crude protein was significantly different ($P < 0.05$) measured with two groups of pigs of different ages. These were 57.2% for 15 month old pigs and 42.3% for the 10 month old group.

INTRODUCTION

There is usually discussion and often confusion in development programmes in Papua New Guinea concerning the nutritional value of sweet potato (*Ipomoea batatas* (L.) Lam.) for both man and pig. In the Highlands where pig numbers are greatest, this is of particular importance. As the pig slowly assumes a greater nutritional role than the previous social and cultural role, the need to evaluate its feed, and efficiency of usage increases.

In the literature there are a limited number of references concerning the evaluation of sweet potato and even fewer for its evaluation as a pig feed (Zarate 1956; Calder 1960; Pond and Maner 1974). However, there does seem to be some indication (Zarate 1956) of a difference between breeds in the ability to digest sweet potato. It seemed necessary to evaluate this root crop using the indigenous Papua New Guinea village pigs. It is recognized that there are many varieties of sweet potato in Papua New Guinea. They vary in colour of both skin and flesh. This indicates, perhaps, a variety of levels of the carotenes. They also vary in the level of nitrogen. It ranges from 0.3% to 1.1% (White, unpub.). This trial was conducted with a uniform line of sweet potato tubers of 0.4% level of nitrogen on a dry matter basis.

* Rural Development Officer, Piwa Agricultural Station, Primary Industry Branch, Tari, Southern Highlands Province, Papua New Guinea. Present address: Tropical Pig Breeding and Research Centre, P.O. Box 766, Goroka, E.H.P., P.N.G.

† Formerly Scientific Officer, Poultry Research Centre, Labu, Lae, P.N.G. Present address: C.S.I.R.O., Division of Animal Production, P.O. Box 239, Blacktown, N.S.W. 2148, Australia.

MATERIALS AND METHODS

The trial was conducted at the Tropical Pig Breeding and Research Station at Goroka, in the Eastern Highlands of Papua New Guinea (altitude 1,600 m; Latitude 6° 05′ S; longitude 145° 25′ E).

Eight village pigs (*Sus scrofa papuensis*, Lesson and Garnot in Laurie and Hill 1954), four male castrates of approximately 15 months and four boars of 10 months of age, were individually penned and restrained in an open-sided, corrugated iron roofed shed (temperature maximum 28°C; minimum 17°C). The pigs were on wood slats over concrete. Faeces collection trays were fitted beneath the slats below the animals' hind quarters. Urine did not contaminate these collections. Removable galvanised buckets were used for feeding and fresh water was freely available.

A preliminary feeding period of seven days was allowed for the pigs to get accustomed to the diet and the restraint of the pens. The diet was of raw chopped sweet potato tubers of a white fleshed variety (local name: Giopa). They were washed under running water, topped and tailed, and then sliced. The pigs were offered feed in two, 2 hour feeding periods each day (10.00 to 12.00 and 14.00 to 16.00 hours). About 1.5 and 0.75 kg was offered each period to the older and younger animals respectively. This regime was adopted to facilitate accurate intake measurements. Intakes of sweet potato and faecal outputs were recorded for each of the seven days. In the first feed and first after last, 1 g of ferric oxide was included with a small amount of tuber. When the red brown colour was noticed in the faecal matter the collection commenced or finished. A sample of the tubers was taken each day and all faeces were collected. These materials were dried overnight at 96°C. Any feed residues were also collected and dried similarly so actual intakes were calculated.

The dried feed and faeces were analysed for organic matter (OM) by loss of sample on ignition at 600°C for 2 hours. Nitrogen and crude protein (CP) were determined by the Kjeldahl method using selenium as catalyst. Acid detergent fibre (ADF) method of Van Soest (1963) was used. Energy (E) of sample was determined by bomb calorimetry using a Gallenkamp adiabatic bomb calorimeter.

RESULTS

Table 1 shows the composition of the sweet potato diet. It is low in crude protein. *Table 2* shows mean intake and apparent digestibility for each dietary component analysed for the two groups of animals. Because one pig did not defecate for over 72 hours it was discounted from the final analysis.The apparent digestibility of crude protein was significantly different ($P < 0.05$) for the two groups. This was therefore not pooled. Other component data was combined.

DISCUSSION

Dry matter (DM), organic matter (OM) and energy (E) digestibilities were high compared with 90.4% DM and 89.3% E published by Pond and Maner (1974). This may be due to the low intakes in this experiment and a depression in apparent digestibility might be expected as the level of intake is increased. It could be several percentage units lower with fully fed animals (Schneider and Flatt 1975). Although the intake levels were low, they are comparable with those of pigs fed under Papua New Guinea village conditions. Such animals may gain only 50 g body weight per day when intake includes nutritiously poor grazing of sweet potato fallow. Further trials (Rose, unpublished data) confirm similar levels of sweet potato intake, fed *ad lib.*, where protein supplement is 5% of that recommended by Whittmore and Elsley (1976).

Crude protein (CP) digestibilities for both groups were much higher than that of Pond and Maner (1974), which was 27.6%. If the effects of a low intake were operating, the measurement would be higher for younger animals with a much lower intake. However this is not the case. On either a body weight or metabolic body weight basis the intake of the younger group is higher (15.4 cf. 9.9 g day^{-1} kg body wt^{-1} or 35.7 cf. 30.9 g day^{-1} kg body $wt^{-0.75}$).

The ADF digestibility was not affected by age, so these results have been combined. The level of fibre digestibility was higher than might be expected. With levels of digestibility as high as these, it is unlikely that any significant gains will be made by cooking the tubers. This is in line with the view of Calder (1960). However, it is possible that with the cooking of tubers significant gains may be made in the amount of material that the animal may ingest in a given time, that is, it could affect appetite. If this could be digested as quickly as the uncooked material, then perhaps increased growth rates might be possible. Malynicz and Nad (1975) feeding

Table 1.—**Feed composition on dry matter (DM) basis for organic matter (OM), crude protein (CP), acid detergent fibre (ADF) and energy (E)**

	D.M.	% on dry matter basis			E
	%	OM	CP	ADF	(MJ/kg)
Mean	34.8	97.4	2.54	3.43	16.718
SE*		0.411	0.762		

* Standard error of mean.

Table 2.—**Apparent digestibilities of DM, OM, CP, E and ADF for sweet potato tubers**

	Live weight kg	DM intake g/d	Apparent digestibility %				
			DM	OM	CP	E	ADF
Mean	92.9	925	95.6	96.5	57.2*	94.8	73.6
SE†	13.6	79	0.11	0.17	4.2	0.17	1.70
n = 3							
Mean	29.0	447	95.1	95.8	42.3*	93.8	71.5
SE	6.2	68	0.39	0.35	6.7	0.6	2.81
n = 4							
Mean	—		95.3	96.1	—	94.2	72.40
SE			0.41	0.44	—	0.67	1.69
n = 7							

* Significantly different at $P < 0.05$.
† Standard error of mean.

European pigs doubled consumption of sweet potato by cooking it. This improved intake produced a 36% improvement in liveweight gain but was associated with a reduction of 29% in the food conversion ratio. Therefore further work seems appropriate to determine if cooking of sweet potato for pig feed is worthwhile using the limited resource of firewood.

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