NUTRIENT CHARACTERISTICS OF SOME LOCALLY AVAILABLE FEED RESOURCES IN FIJI

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Summary

Locally available milk mix, coconut meal, cassava root meal, cassava leaf meal, maize, meat meal, fish meal, rice bran, rice polishings, tallow, molasses and coral sand in Fiji were analysed for proximate components, gross energy and mineral contents. The results obtained indicated typical and variable amounts of nutrients in these materials. On the basis of their nutrient contents, the potential usefulness and weaknesses of the various feed materials are discussed with specific reference to the formulations of diets for livestock and poultry in Fiji based on these locally available feed materials.
(Key Words: Local Feed Resources, Nutrient Characteristics, Fiji)

Introduction

The Fiji livestock and poultry feed industry is very largely dependent on importation of various forms of feed materials (Naidu, 1988). These ingredients are expensive and no doubt are making successful commercial livestock and poultry farming expensive. However, there exists in Fiji, a number of potentially useful feed resources which could be used to successfully replace all or most of the ingredients that are currently being imported into the country. The proper utilization of these locally available feed resources is being hampered by lack of information on their contents. This information is vital. Reported herein are therefore the results of the chemical analyses of some locally available feed resources in Fiji.

Materials and Methods

Feed Materials

Feed materials of local origin, which were considered to be potentially useful in feed making, were obtained from local farms around Suva, or bought from the companies that are currently producing them. Mill mix, sometimes referred to as mill run, is a wheat milling by product made up of wheat bran and pollard mixed in 3 : 2 parts by weight, respectively. Rice bran analysed was solvent extracted sample. Fish meal was made mainly from Red Snapper fish (*Etelis carbunculus*), Yellow Fin (*Thunnus albacares*) and Skipjack Tuna (*Katsuwonus pelamis*).

Chemical Analysis

The various items were ground through 1 mm sieve and were analysed for proximate principles according to standard methods (AOAC, 1980). The feed samples were analysed in triplicates. Gross energy was determined using an Adiabatic Oxygen Parr Bomb calorimeter. Phosphorus was analysed using a Beckman spectrophotometer according to AOAC (1980) method, while the rest of the minerals were determined using Atomic Absorption spectrophotometry (Perkin - Elmer, 1976).

Results

Proximate composition

Table 1 outlines the proximate composition of the locally available feed materials. With the exception of fresh cassava roots which contained 65% moisture, leaves, 82% moisture, and molasses, 25% moisture, all the materials analysed had low and safe moisture contents. Fresh cassava roots and leaves contained high moisture levels. However, when cassava roots and leaves were dried in the sun, the moisture contents were reduced considerably to acceptable and safe storage levels

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of 11 percent.

The protein contents of the feed items analysed varied from very low levels in cassava roots, whether fresh (1.3%), or dried (2.6%), molasses (3.5%) and tallow, through moderate but still low levels in maize (8.6%), rice bran (13.1%), rice polishing (11.9%) and mill mix (13.8%), to very high levels in meat meal (45.5%) and fish meal (47.6%). Coconut meal (17.9%) and dried cassava leaf meal (22.4%), were higher in protein content than the ingredients analysed except fish meal and meat meal.

Ether extract, a measure of fat/oil content, was typically high in tallow (94.1%), moderate in fish meal (12.8%), meat meal (11.7%), coconut meal (7.1%), and rice polishing (13.5%), and low in all the other ingredients.

The level of fibre was relatively high in mill mix (15.1%), rice bran (12.0%), and coconut meal (13.3%). Cassava root and leaves, fish meal, meat meal, maize, rice polishings and molasses contained very low levels of fibre; while animal tallow did not contain any fibre.

Ash contents were low in maize (1.1%) and cassava roots (1.4-3.9%), and leaves (0.8-5.8%), and very high in the two animal feed materials, fish meal (13.8%), and meat meal (24.1%). The other ingredients contained moderate but variable amounts of ash.

Nitrogen free extract (NFE), which is the difference between the total of the proximate components from 100 percent, was typically high in maize (72.6%), dry cassava roots (78.8%), and molasses (62.2%). NFE values were moderate in all the other materials except the animal feed materials which were quite low in NFE.

Gross Energy

The gross energy values determined on triplicate samples, using Adiabatic Oxygen Parr Bomb calorimeter on the different feed materials, are presented in table 1. The values obtained indicate that tallow is a very rich source of energy. Its gross energy was 37.8 MJ/kg. Rice polishings has a higher energy density, 16.3 MJ/kg, than either maize (15.2 MJ/kg) or dried cassava root meal (14.9 MJ/kg) which were noted to be comparable in energy content. The other feed materials, cocount meal (12.4 MJ/kg), fish meal (12.0 MJ/kg) and meat meal (12.1 MJ/kg) were only moderate in energy contents, while molasses (8.5 MJ/kg), rice bran (9.3 MJ/kg) and mill mix (11.2 MJ/kg) could be described as being rather low in energy. Cassava leaf was also rather low in energy content. Fresh cassava leaves contained only 2.3 MJ/kg, while the dried leaves had 9.7 MJ/kg.

Minerals

Table 2 outlines the mineral contents of the various feed materials analysed.

Coral sand contained quite a high level of calcium, nearly 33 percent. The animal protein feed ingredients analysed, meat meal (8.7%), and fish meal (7.7%), were also reasonably high in calcium; with meat meal being higher than fish meal. The rest of the other feed materials were rather low in calcium.

Phosphorus levels were reasonably high in fish meal (4.7%) and meat meal. (3.9%). Phosphorus levels were higher in rice polishings (1.3 %) and rice bran (1.7%) than mill mix (0.7%) and coconut meal (0.6%), which were about comparable in phosphorus contents. Maize and cassava contained very low levels of phosphorus. Except for the two animal feed sources, fish meal and meat meal, which were reasonably high in zinc and iron, the plant feed materials were low in these two micro minerals. Plant feed materials, however, tended to be rather high in manganese. Variable levels of copper were noted in the feed materials.

Discussion

The values reported on the chemical composition of the locally available feed materials in Fiji are generally typical and reflect variations that have always been noted and reported elsewhere on such similar feeds (FAO, 1982; Pond and Maner, 1974; Ochetim 1987 a, b). These figures should prove useful when one is considering formulating diets for livestock and poultry which are to be based on locally available feed materials in Fiji. The nutritional weaknesses and strengths of the various feed materials must be taken into account together with costs and availability of these raw materials in practical feed formulations.

Currently in Fiji, feed is reported to be the major factor limiting livestock and poultry farming. The high feed cost is due to the high costs

TABLE 1. PROXIMATE COMPOSITION AND GROSS ENERGY CONTENT OF SOME LOCALLY USEFUL FEED MATERIALS IN FIJI

Feed Material		Moisture (%)	Protein (%)	Fat (%)	Fibre (%)	Ash (%)	NFE[1] (%)	G.E.[2] (MJ/kg)
Maize		12 (0.05)[3]	8.6 (0.03)	3.1 (0.01)	2.0 (0.01)	1.1 (0.01)	72.6 (0.21)	15.2 (0.05)
Cassava roots	Fresh	65 (0.15)	1.3 (0.01)	0.3 (0.01)	1.5 (0.01)	1.4 (0.01)	30.5 (0.12)	5.0 (0.02)
	Dry	11 (0.04)	2.6 (0.01)	0.9 (0.02)	2.8 (0.02)	3.9 (0.01)	78.8 (0.27)	14.9 (0.06)
Cassava leaves	Fresh	82 (0.20)	5.1 (0.01)	0.2 (0.01)	0.8 (0.01)	0.8 (0.01)	11.1 (0.02)	2.3 (0.02)
	Dry	11 (0.03)	22.4 (0.06)	1.1 (0.01)	6.1 (0.02)	5.8 (0.02)	53.6 (0.17)	9.7 (0.04)
Mill mix		11 (0.04)	13.8 (0.04)	2.8 (0.02)	15.1 (0.03)	8.9 (0.02)	48.4 (0.15)	11.2 (0.04)
Rice bran		9 (0.02)	13.1 (0.04)	1.3 (0.01)	12.0 (0.03)	10.0 (0.03)	54.6 (0.17)	9.3 (0.03)
Rice polishings		10 (0.03)	11.9 (0.03)	13.5 (0.00)	3.0 (0.01)	8.0 (0.02)	53.6 (0.06)	16.3 (0.05)
Coconut meal		11 (0.03)	17.9 (0.04)	7.1 (0.03)	13.3 (0.03)	7.0 (0.03)	43.7 (0.15)	12.4 (0.04)
Meat meal		12 (0.03)	45.5 (0.10)	11.7 (0.07)	2.1 (0.01)	24.1 (0.21)	4.6 (0.30)	12.1 (0.04)
Fish meal		12 (0.03)	47.6 (0.10)	12.8 (0.03)	1.0 (0.01)	18.8 (0.12)	7.8 (0.04)	12.0 (0.04)
Molasses		25 (0.05)	3.5 (0.02)	0.1 (0.01)	0.7 (0.01)	8.5 (0.03)	62.2 (0.08)	8.5 (0.03)
Tallow		nd[4]	nd	94.1 (1.10)	nd	nd	nd	37.8 (0.15)

NFE[1] Nitrogen free extractives. G.E.[2] Gross energy in mega joules per kg (MJ/kg).
( )[3] Standard Deviation. nd[4] Not determined.

TABLE 2. MINERAL CONTENTS OF SOME LOCALLY AVAILABLE FEED MATERIALS IN FIJI

Feed Material	Ca (%)	P (%)	Zn (mg/kg)	Fe (mg/kg)	Cu (mg/kg)	Mn (mg/kg)
Maize	0.02 (0.001)	0.3 (0.01)	22.1 (0.25)	2.1 (0.32)	5.0 (0.2)	8 (0.32)
Cassava roots Dry	0.06 (0.01)	0.1 (0.001)	nd[1]	nd	nd	nd
Mill mix	0.1 (0.01)	0.7 (0.003)	28.4 (0.61)	95 (2.7)	11.1 (0.6)	150 (5.1)
Rice bran	0.15 (0.01)	1.7 (0.05)	25.1 (0.91)	190 (7.1)	10.0 (0.6)	400 (13.1)
Rice polishings	0.03 (0.01)	1.3 (0.02)	19.2 (0.87)	90 (2.8)	6.1 (0.4)	125 (4.5)
Coconut meal	0.2 (0.01)	0.6 (0.02)	39.2 (1.4)	183 (7.0)	24.8 (1.2)	51 (2.1)
Meat meal	7.7 (0.35)	3.9 (0.11)	60.6 (2.3)	790 (19.5)	6.9 (0.4)	9 (0.6)
Fish meal	8.6 (0.41)	4.7 (0.21)	47.4 (2.1)	345 (13.2)	5.4 (0.3)	16 (0.5)
Coral sand	32.8 (1.7)	nd	nd	nd	nd	nd

nd[1] Not determined.

of importing feed materials, . (Naidu, 1988). Because of this high import dependency of livestock feed resources, there is now considerable interest in making use of locally available feed materials.

A prerequisite for an effective utilization of these locally available feed materials in feed formulation is information on their nutrient characteristics. The results of these analyses have shown that there are available in Fiji, many feed materials that may be singularly or in combination with others, be depended upon to supply various nutrients required in the formulations of feeds for livestock and poultry in the country. The similarity in the levels of nutrients between two or more locally available feed resources should offer a basis for substitution of the various ingredients in diets. The substitution could be made on the basis of availability and/or cost of the ingredients. Thus, for example, cassava root meal and maize could be used to substitute or complement each other as energy sources in the feed. Similarly, fish meal and meat meal may be substituted for each other as protein feed sources depending upon their relative prices and availability. It is this kind of complimentarity and/or substitutability of locally available feed materials for each other that real opportunities for developing a viable local feed mill industry should be based.

While the results of these chemical analyses data are an important first step in the utilization of local feed resources in the formulation of diets for livestock and poultry, the actual worthiness of these local feed materials can only be obtained by conducting carefully planned feeding trials using these local feed resources. the results of such feeding trials, which used these locally available feed materials, are the subject of other subsequent reports.

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