NUTRIENTS IN IMPORTANT BUSHFOODS

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Summary

The aim of this project is to produce tables of composition of Australian Aboriginal bushfoods. The foods have been analysed for moisture, protein, fat, fibre, ash, seven minerals and two vitamins. Carbohydrate and energy contents have been calculated from the data. This paper presents the results of analyses of some important and interesting bushfoods. The findings indicate that with a few exceptions their organic composition is similar to that of corresponding cultivated foods. One exception is the 'green plum', Terminalia ferdinandiana, which appears to have the world's highest vitamin C content.

I. INTRODUCTION

Bushfoods are one area in which the Aboriginal Australian is recognising the worth of his traditional culture. With the advent of the outstation movement and increasing awareness of the significant role of bushfoods in the diet of some groups, the need for comprehensive tables of composition of Australian Aboriginal bushfoods has been highlighted. Information on the nutrients in bushfoods is required not only by Aborigines but by health workers and dietitians, anthropologists, the Armed Forces (for survival purposes) and the wider community (bushwalkers, foragers etc).

In four studies prior to 1980 (Dadswell 1934; Fysh et al. 1960; Elphinstone 1971; Peterson 1978) only 40 different bushfood species were analysed, with few data on vitamins and minerals. The Australian Armed Forces recently reported (James and Forbes-Ewan 1982) the analysis of some 60 foods, but the sample size was small and only a few nutrients could be determined.

Our aim is to measure and calculate the following components: edible portion, water, protein, fat, carbohydrate, fibre, ash, energy, seven minerals (Na, K, Mg, Ca, Fe, Zn, Cu) and, depending on sample size, vitamin C and thiamin. Eventually other vitamins will be added. So far about 80 individual samples of food have been analysed, with a goal of 300 from both the plant and animal kingdoms.

II. METHODS

Aboriginal health workers and dietitians have collected most of the foods analysed to date as part of the 'Bushfoods Program' of the Northern Territory Department of Health. A small number of foods have been collected and identified by independent workers in Central Australia, New South Wales and Victoria.

The collectors are responsible for recording local names, common names, inedible parts and preparative or cooking treatment. Taxonomic classification in Darwin is carried out by the Department of Primary Production.

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The samples are frozen within 24 h of collection and despatched by air to our laboratory in Sydney. They are photographed and then freeze-dried. If a sufficiently large sample is available, vitamin C is determined on the 'fresh' food as soon as possible. The logistics of stabilising a sample of the food in acid in the field for vitamin C analysis proved too difficult in the pilot study and this step was reluctantly abandoned.

The methods of analysis are those recommended by Southgate (1974). Carbohydrate was calculated by difference. Hence, in the tables, carbohydrate represents either total or available carbohydrate, depending on whether fibre has been assayed. Energy value of the food was calculated using available carbohydrate where possible. Vitamin C was measured by high performance liquid chromatography. All determinations were made in duplicate.

III. RESULTS

Eighty-two individual samples of food have been fully or partially analysed to August 1982, a few species analysed more than once in one form or another. The average weight of samples collected was about 150 g, with a range from 20 g - 550 g.

The table shows the composition of some of the more interesting or important foods. For reasons of space, some minerals and thiamin have not been included.

IV. DISCUSSION

Our results provide a guide to the nutrient content of Australian Aboriginal bushfoods. Some caution, however, must be used in interpreting the results since they represent the analysis of only one sample. Such a sample is unlikely to be representative of that species throughout different geographical regions or seasons of the year. Cooking and preparation processes will also alter the composition.

With a few exceptions, the organic composition of the bushfoods appears to be similar to that of corresponding foods. For example,the composition of waterlily stalk, Nymphaea sp., can be likened to that of celery.

A few of the foods were exceptional in their nutrient content. The green plum, Terminalia ferdinandiana, with about 3 g vitamin C/100 g, appears to be the highest in the world. We have confirmed the finding in two different seasons and from different localities. Other foods relatively high in vitamin C were the Indian gooseberry, Phyllanthus emblica,with 316 mg/100 g, the cheeky yam, Dioscorea bulbifera (which is an important staple) with 233 mg/100 g, and the unusual fruit, Cynanchum pedunculatum, with 119 mg/100 g.

A few foods were unexpectedly high in protein compared to similar cultivated foods. The 'bush banana', Leichhardtia australis and L. leptophylla, contained 8.1 and 9.8 % protein respectively, in comparison with the cultivated banana which contains 1.1 %. Waterlily root, Nymphaea macrosperma contained 9.6 % protein.

Some foods were remarkable in their fat content. The witchetty grub, Cossidae sp., contained 34.9 % and the green ant, Oecophylla smaragdina, 25 %, while the meat of the turtle, Chelodina rugosa, the possum,Trichosurus arnhemensis, and goanna tail are very low in fat, about 3 %.

Iron levels were relatively high in some of the plant foods, for example, the bush banana, L. australis (4.0 mg/100 g), the bush apple, Zyzigium suborbicularis (2.8 mg/100 g), the long yam, Dioscorea transversa (another important staple in Arnhem Land) (2.8-4 mg/100 g), and the damper made from Portulaca oleracea seeds (13.0 mg/100 g). The latter was an important cereal of the Central Australian Aborigines.

Some of the foods were very high in fibre. The waterlily root, N. macrosperma contained 30.0 %; Aponogeton elongatus 14.9 % and the damper made from P. oleracea seeds, 13.9 mg/100 g. Witchetty grubs, Cossidae sp., and the plague locust, Chortoicetes terminifera, contained high levels of a fibre-like substance (10.4 and 16.0 % respectively).

This work is continuing and the results will be published in stages. We hope this project will continue to increase pride in the traditional and present Aboriginal culture and the unique national heritage of all Australians.

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Composition of Australian Aboriginal bushfoods per 100 g edible portion
(raw unless otherwise indicated)

Foods	Edible portion (%)	Energy (kJ)	Water (g)	Protein (g)	Fat (g)	Carbohydrate (g)	Fibre (g)	Vitamin C (mg)	Ca (mg)	Fe (mg)	Zn (mg)
Aponogeton elongatus - cooked	100	619	46.0	4.6	0.6	32.4	14.9	-	47	2.0	0.7
Dioscorea bulbifera (cheeky yam) - cooked	80	127	77.4	1.6	0.2	5.8	14.8	233	2	0.8	0.2
Dioscorea transversa (long yam) - cooked 1.	90	490	68.0	3.2	0.3	26.5	-	10	3	4.0	0.7
Ipomoea graminea - cooked	83	627	60.0	3.8	0.2	34.7	-	-	4	3.0	1.1
Nymphaea macrosperma (waterlily root) - cooked	100	575	33.6	9.6	1.0	23.4	30.0	4.3	92	3.4	0.8
Nymphaea sp. (waterlily stalk)	94	77	94.6	0.1	0.1	4.5	0.5	-	-	0.5	0.1
Portulaca oleracea (seeds, ground and made into damper)	100	587	47.2	9.8	2.2	21.1	13.9	-	112	13.0	3.0
Solanum chippendalei (bush tomato) - raw	80	294	78.2	1.8	0.6	15.1	3.2	49	38	1.5	0.5
- cooked	100	337	78.4	1.1	0.7	18.3	0	-	54	2.0	0.4
Terminalia ferdinandiana (green plum)	36	432	72.0	1.1	0.1	25.6	-	3150	43	11.5	2.6
Zyzigium suborbicularis (bush apple)	76	91	89.1	0.4	0.6	3.9	5.4	17	-	2.8	0.2

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Cynanchum pedunculatum	100	223	86.4	0.1	0.8	12.0	-	119	1	0.8	0.3
Leichhardtia australis (bush banana)	100	227	84.9	8.1	0.5	4.4	0.9	-	17	4.0	0.8
Nymphaea macrosperma (waterlily pods) - raw	100	350	69.7	2.8	0.4	18.0	8.3	6	99	3.0	0.4
- cooked	100	513	59.4	2.9	0.5	27.8	8.3	1	66	2.0	0.5
Phyllanthus emblica (Indian gooseberry) - cooked	74	281	78.4	0.6	0.3	16.2	4.1	316	-	0.9	0.5
Santalum acuminatum (quandong) (NSW)	75	345	76.7	1.7	0.2	19.3	-	-	42	Tr	0.2
Chelodina rugosa (long-necked turtle) - flesh, cooked	100	577	67.8	26.8	2.9	0.9	0.9	-	-	1.1	1.2
- liver, cooked	100	908	65.0	11.1	18.1	3.1	1.0	-	-	-	2.5
Chortoicetes terminifera (plague locust)	100	499	67.2	25.0	2.0	Tr	10.4	-	-	4.0	9.2
Oecophylla smaragdina (green ant)	100	1272	52.4	1.8	25.0	19.8	-	-	-	-	-
Trichosurus arnhemensis (possum) - flesh, cooked	100	700	61.3	33.6	3.5	0	-	-	25	10.3	4.2
- liver, cooked	100	704	64.7	26.5	6.8	0.1	-	-	25	10.2	4.5
- kidney, cooked	100	713	62.2	28.7	5.7	0.9	-	-	132	2.0	3.8