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Protein Content of Cassava Cultivars and its Hybrid with Wild Manihot species

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RESUMEN

Se calculó el contenido proteínico de los tubérculos de dieciseis cultivares de yuca y um híbrido de yuca con la variedad silvestre Manihot oligantha. También se analizó la semilla de yuca y de ocho variedades silvestres de Manihot. El porcentage de proteína en el tubérculo pelado de cultivares de yuca variaba entre el 0.9% y el 1.4%, y era de 4.5% en el tubérculo pelado del híbrido.

La proteína en las semillas de las variedades silvestres de Manihot variaba entre el 27.9% y el 37.3%, comparado con el 26.8% en la semilla de yuca.

INTRODUCTION

Cassava, the sixth major staple food in the world, has the poorest protein content in comparison to the five leading food crops: wheat, rice, maize, sorghum and barley. Cassava is the major source of food energy in several tropical countries. As 50-80% of calories consumed by people in these countries are from Cassava, their diets are often protein deficient (12).

Recently attention was given to correcting this protein deficiency either by selecting clones with high protein content or by studying the proper utilization of other parts of cassava such as the seeds or leaves. Some attempts were made to select clones with protein rich tubers but not outstanding success was achieved. (13)

This paper reports protein content in sixteen cassava clones maintained in our germplasm collection and a hybrid of cassava with the wild species. ***M.olingantha***

MATERIALS AND METHODS

Tubers of sixteen cassava clones, 8 months old maintained in the germplasm collection at the Experimental Station, University of Brasilia were analyzed chemically for protein content. Total nitrogen and dry matter basis was determined by the A O.A.C procedures (2). Percent protein was obtained by multiplying percent N by the factor 6.25. For every clone two samples were analysed, one from small tuber (50g) and the second from older tubers (200g). Tubers were peeled, and protein was estimated in both peel and pulp. Tubers of hybrid between cassava clone Catelo and *M.oligantha* were analysed in the same way. Seed of cassava and wild Manihot species maintained in the living collection at University of Brasilia were analysed for protein content by the same procedures.

RESULTS AND DISCUSSION

The concentration of protein in tubers of cassava clones and tubers of the hybrid is presented in Table 1. It is seen that protein percent (N% x 6.25 = protein percent) ranged from 0.7% to 1.2% in larger tubers (bigger than 200g) while the range was 0.9% to 1.4% in tubers less than 50g. In the same clone, protein content of the pulp was higher in small tubers than bigger ones. These numbers agree with those found by Akinrele (1) who reported 0.7% for protein content in peeled tuber on dry matter basis and Chada (3) who found 1.2%. However, these researchers did not pay attention to the effect of tuber size on protein content. Jennings (4) stated that protein in cassava root tends to be concentrated in the outer zone of the root. This may explain why the small tubers have higher protein content since they have a larger proportion of the outer zone than older and bigger ones. The very little variation of protein content among the sixteen clones collected from all over Brazil shows that selection for this characteristic in cassava clones will not bring any notable improvement . From Table 1 it is seen also that protein is higher in peel than in pulp in all the examined samples and in all clones. This may be explained by the above mentioned statement of Jennings that protein in cassava roots tends to be concentrated in the outer layers.

The analysis of hybrid tubers showed a notable increase in the hybrid of cassava with *M.oligantha* as it is 4.6%. In an earlier paper, the senior author reported the high

protein content in *M.oligantha* (9) as it was 7.1% on dry matter basis. Moreover, cisses of this species with cassava were highly fertile (6, 8). This author also showed low HCN content in the wild species *M.oligantha* (10). This may exclude any possibility that high protein content in the wild species is due to HCN nitrogen (11).

Table 2 shows the results of seed analysis of some wild Manihot species maintained in our living collection. The highest protein content is that of *M. brachyandra* followed by *M. alutacea*. *M. brachyandra* is native to Western Pernambuco and Northern Bahia, one of the driest areas in Brazil. The senior author had reported that the seed of wild cassava is eaten by the population of these regions particularly in famine times. Jones (5) reported that cassava seed is eaten in several parts of West and Central Africa. Thus, this discovery of the high protein content in native cassava hybrids may open a new door to better protein balanced food for people of the tropical world.

Table 2. Protein content in wild Manihot species seed on dry matter basis

SPECIES	PROTEIN %
M. glaziovii	30.09
M. cearulescens	27.01
M. brachyandra	35.35
M. pseudoglaziovii	31.15
M. alutacea	37.33
M. zenhtneri	28.99
M. dichotoma	29.24
M. reptans	33.25
M. esculenta	26.81

SUMMARY

Protein contents of tubers of sixteen cassava cultivars and hybrid of cassava with the wild species *Manihot oligantha* were estimated. Seed of cassava and eight wild *Manihot* species were analysed also. Protein percent in peeled tuber of the cassava cultivars ranged from 0.9% to 1.4% while it was 4.5% in the hybrid peeled tuber. Protein in wild *Manihot* species seed ranged from 27.9% to 37.3% compared with 26.8% in cassava seed.

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Table 1. Protein content of tubers of cassava clones

CLONE	APPROXIMATE SIZE	PROTEIN IN PEEL%	PROTEIN IN PULP%
CBM 0206	200g 50g	2.13 2.09	0.90 1.22
EAB 348	200g 50g	1.41 1.69	0.85 1.04
BGM 188	200g 50g	- 1.68	- 1.45
CPM 0231	200g 50g	- 1.56	- 1.26
CPM 2002	200g 50g	- 2.08	- 0.99
CPM 0232	200g 50g	2.00 1.82	1.02 1.15
BGM 808	200g 50g	1.63 -	0.93 -
CPM 0225	200g 50g	1.38 1.25	0.89 0.95
BGM 204	200g 50g	1.24 -	1.06 -
CPM 1805	200g 50g	1.14 1.37	0.72 1.00
EAB 1156	200g 50g	1.58 1.28	0.84 1.16
EAB 484	200g 50g	1.96 -	1.07 -
BGM 048	200g 50g	1.41 1.11	0.82 1.17
BGM 020	200g 50g	1.80 1.53	0.98 1.23
CPM 1060	200g 50g	- 1.58	- 1.19
EAB 765	200g 50g	1.36 1.51	0.70 0.93
Hybrid	200g 50g	6.63 8.06	4.56 4.56

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