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UnB 033: An Interesting Interspecific Cassava Hybrid [1]

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RESUMO

A avaliacao de um hibrido interespecifico da mandioca com Manihot dichotoma mostrou que ele tem crescimento erecto e muito rápido tornando o candidato ao consorciamento com outros culturas.
O analise de suas folhas revelaram que possui o dobro de carotino e , cinco vezes mais de minerais alem de 26.4% de proteína em relação a mandioca.

ABSTRACT

Evaluating progeny of an interspecific hybrid of cassava with M. dichotoma showed. That it has an erect stature combined with rapid stem growth makes it a candidate for Intercropping with other crops.. Analysis of its leaf content showed twice the amount of carotin, five times of minerals, and higher protein content of 26.4%.

Key words
Manihot dichotoma, Carotin, minerals, protein content

Cassava , the most important staple crops in the tropics and subtropics ranking the fifth. It is a food for more than 800 million people (3). It is one of the most efficient calorie producers reaching 250 kilocalories per hectar day (2). In various countries of Africa and Latin America, cassava is grown in a mixure culture which is known as intercropping. Since protein content of cassava is as low as 1% in its roots,one of approaches to optimize its use is to intercrop it with legumes. Another approach is to improve its leaf protein content during intercropping and add the leaves to poor people meals. Carotins and minerals needs also to be improved in cassava considering its daily use by the poor people. In addition to this, breeding program must aim to produce a modified plant stature to enable plant adapt to consorsium model. The best stature is to grow erect contrary to canopy shading form, and to change the spatial arrangement from rectangular to single stem growing, impeding it from covering adjacent plants.

Wild Manihot species are a source of many useful genes that may contribute to modify the cultivate stature, and provide so many useful genes(5, 6, 9,10). One of these species, M. dichotma is known for its compact form which raise the possibility to select among its hybrids with cassava vertical form cultivars. If the leaves of these cultivars are rich in protein and other nutrients, it will be ideal for intercropping system, offering a cheap source of balanced food for poor people.

Matrial and Methods

As a part of the breeding program set up by the author, hybrids of cassava wild Manihot species with cassava were obtained(7). The cassava hybrid with M.dichotoma was left for open pollination. From its progeny a clone displaying a unique vertical stem was selected (Fig.1), herein called unb 033, and described as follows: roots conic with rough surface, external color is brown, root fresh color cream, stem grows vertical and reaches 4 m. within 6 months, color grey, large scars; leaf lobe shape ovate; sinousity of lobes linear; length of median lobe less than 12 cm; width of median lobe ca 2 cm; petiole green, young foliage is reddish blue; mature fruit green .It was planted for growth habit and productivity at the experimental station of the Universidade de Brasilia where soil analysis (mg/100ml) is as follows: Ca+Mg 4.5, Ca 3.4, Mg 1,1, Al 0.0, H+Al 1.8, N 0.05, K 19.0, P 0.0. The analysis of the leaves of this clone for protein content, carotinoid, HCN and minerals were carried out according to the A O A C procedures (1970), using 5 replications every treatment. Anova analysis was applied using Bonferroni correction, and using Stats 95 program. Our results are presented as medium, standard deviation and variation coefficient.

Results and Discussion:

Despite the poor soil where phosophorous content is almost zero, the selected clone showed rapid growth. The unique erectl stem reached about 4 m . height within 8 months (Fig.1). Root productivity per plant planted in 1x1 m distance ranged from 2.8 + 0.2 kg after 8 months from planting. Vertical growth habit is very rare in cassava. Some literature is available on using it as a cultivated variety. Single stem is ideal for intercropping systems since it replaces the normal canopy habit of cassava (fig. 1), allowing maximun of light exposure for the companied crops. The analysis for HCN, protein content, and B-carotin is seen in Table 1. Results for Mg, Al, P ,Mn,Fe,Cu, Zn and Ca is presented in Table 2 .

HCN content was found to be 128,5 + 11.67mg p/kg in the selected clone compared to 152.3 + 18.26 in common cassava clone EB01. Cyanide levels of cassava leaf ranging from approximately 100 to 1100 mg HCN per kg of fresh leaf are occasionlly reported. e.g. 1860 mg HCN per kgm fresh leaf weight (4). These levels are compared with a normal range of of 15 to 400 mg per kg in fresh cassava roots (2). Leaf cyanide levels have little correlation with root content of this material. Direct comparison of leaf and root cyanide levels often yielded conflicting results. Yeoh and Oh (13) found that leaf cyanide levels were similar to those in root peel but 6 times higher than those in root pulp. In the case of the improved bred clone 033 , this is a medium HCN level which allows using this clone in animal nutrition after sun drying for one day maximum or using the plant for silage purposes. Both the two treatments shall lead to detoxification of HCN. Protein content in leaves was found to be 26.41+1.66 g per Kg compared to 24.25+0.43 in the cassava clone. A wide range of protein contents has been reported ,varying considerably among cultivars. Rogers (12) who tested over 100 samples found a minimum of 20% crude protein (total N x 6,25) on a dry weight basis.

Attempts have been made in the past to increase the protein content of the leaves of some cassava cultivars by crossing with other Manihot species (11) but no concrete result been reached. In literature, Probably the only successful case was that which has been reported by Nassar and Dorea (8) analysing hybrid of Cassava and M.oligantha.
These researchers reported double of protein content in the hybrid root,accompanied by increase of root production and hybrid vigour. This result was confirmed by us recently through chemical analysis of the hybrid produced by Nassar in the 1980's(7).

The most striking feature of analysis of this developed clone (033) is the doubled carotin content compared to the other cassava clone used in this experiment, and the very high contents of minerals specially of Mn and Zn up to five times for both minerals. The results show clearly that wild species confer cassava not only resistance to diseases and pests but can contribute also significantly to inceasing their nutritive value, and above all reshaping the plant for different culture purposes.

Table 1. HCN, protein and cCarotinoid content in the selected clone UnB 0 33 and common cassava clone EB01

Clone	HCN mg/kg	Protein %	B-Carotin mg/kg
UnB 033	128.55±11.67	26.41±1.66	22.30±3.3
EB01	152.30±18.26	24.25±0.43	13.10±1.5

Table 2.Mineral Content in the selected clone 033 and the common cassava clone EB01

Clone	Mg	Al	P	Ca	Mn	Fe	Cu	Mg	Zn
(mg)									
UnB 033	36.58+4.77	17.18+2.91	1196.67+97.81	1435.00+142.19	3,87+0.51	16.49+2.69	1.20±0.11		16.36±1.48
EB01	37.71+1.35	19.77+3.34	1090.83+39.38	1139,17+167.49	0.72+0.05	13.58+1.24	1.00±0.10		3.18±0.28

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Legend
Fig. 1. Left: Clone UnB 033, right: common cassava clone