Nutritive Value and Stature of a Cassava (Mandioca), *Manihot esculenta* Crantz Hybrid

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ABSTRACT

Evaluating progeny of an interspecific hybrid of cassava with *M. dichotoma* showed it has a erectical stature combined with rapid stem growth which candidates it for intercropping with other crops. Analysis of its leaves content showed double of carotin, five times of minerals, and higher protein content of 26.4%.

Key words
Interspecific hybrid, *Manihot dichotoma*, Carotin, minerals, protein content

Cassava is one of the most important staple crops in the tropics and subtropics ranking the the fifth. It is a food for more than 800 million people (FAO1998), and one of the most efficient calorie producer reaching 250 kilocalories per hectar day (Coursey and Haynes 1970). In various countries of Africa and Latin America, cassava is grown in 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 protein content in leaves while it is being mixed with other crops and to use these leaves in poor people meals. Carotins and minerals needs also to be improved in cassava considering its daily use in food of 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 singular stem growing, impeding it covers adjacent plants.

Wild ***Manihot*** species are source of many useful genes that may contribute in modifynig the cultivate stature, and provide so many useful genes(Nassar, 1978a , 1978b,1986,1999). One of these species, M. dichotma is known by compact form that may speculate of possibility to select among its hybrids with cassava vertical form cultivars. If these cultivars leaves are rich in protein and other nutrients, it will be ideal in intercropping system, offering a cheap source of balanced food for poor people.

MATERIAL AND METHODS

Within the breeding program of the author, hybrids of cassava wild Manihot species with cassava were obtained(Nassar,1980). The hybrid of cassava with M.dichotoma was left for open pollination. From its progeny a clone that has unique vertical stem was selected (Fig.1). It is called here unb 033. Its description is 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, its color is grey, nature of scars on it is large; leaf lobe shape is ovate; sinousity of lobes is linear; length of median lobe is less than 12 cm; width of median lobe asbout 2 cm; petiole color is green, color of young foliage is reddish blue; color of mature fruit is green .It was planted for evaluation for growth habit and productivity at the experimental station of the Universidade de Brasilia where soil analysis (mE/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. Analysis of this clone leaves 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 (Berk and Carey, 1998)corrections, and using Stats 95 program. Our results are presented as medium, standard deviation and variation coefficient.

RESULTS AND DISCUSSION

In spite of the poor soil where phosphorous is almost zero, the above mentioned selected clone showed rapid growth. The unique erectl stem reached about 4 m . height within 8 months (Fig.63). Productivity of roots per plant when planted in 1x1 m distance ranged from 2.8+ 0.2 kg after 8 months from planting. The vertical habit of growth is very rare in cassava. A little documentation in the literature is available on using it as a cultivated variety. The habit of single stem is ideal for consorsium plantations since it replaces the normal canopy habit of cassava (Fig. 63), permiting he maximun of light exposure for consorsed crops. The analysis for HCN, Protein content, and B-carotin is seen in Table 1. Result of analysis for Mg, Al, P ,Mn,Fe,Cu, Zn and Ca is

presented in Table 2.

The HCN content was found to be 128,55 + 11.67mg p/kg in the selected clone compared to 152,30+ 18.26 in common cassava clone EB01. Levels of cassava leaf cyanide range from approximately 100 to 1100 mg HCN per kgm fresh leaf are occasionly reported. e.g. 1860 mg HCN per kgm fresh leaf weight (Gondwe,1974). These levels are compared with a normal range of of 15 to 400 mg per kgm in fresh cassava roots (Coursey,1973). Leaf cyanide levels have little coorrelation with root content of this material. Direct comparison of leaf and root cyanide levels often yielded conflicting results. Yeoh and Oh (1979) 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 level of HCN which enables using this clone in animal nutrition after drying in sun for one day maximum or using the plant for silage purposes. Both of the two treatments shall lead to deotoxification of HCN. Protein content in leaves was found to be 26,41+1.66 g per Kg compared to 24,25+0.43 in cassava clone. A wide range of protein contents has been reported ,varying considerably among cultivars. Rogers (1959) 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 (Nobre et al.1973), but no concrete result been reached. In literature, probably the only case reached successfully was that which has been reported by Nassar and Dorea (!982) 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 analysing chemically the hybrid produced by Nassar in the 1980's.

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

Table 1. HCN, Protein and Carotinoid content in the selected clone 33 and common cassava clone EB01

Clone (mg)	HCN	Protein	B-Carotin
UnB 33	128.55+11.67c	26.41+1.66a	22.30+3.3a
EB01	152.30+18.26b	24.25+0.43ab	13.10+1.5b

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

Clone (mg)	Mg	Al	P	Ca	Mn	Fe
UnB 33	36.58+4.77a	17.18+2.91a	1196.67+97.81a	1435.00+142.19a	3.87+0.51a	16.49+2.69a
EB01	37.71+1.35a	19.77+3.34a	1090.83+39.38a	1139.17+167.49	0.72+0.05c	13.58+1.24a

Table 2 (cont.)

Clone (mg)	Cu	Zn
UnB 33	1.20+0.11a	16.36+1.48
EB01	1.00+0.10ab	3.18+0.28b

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