

# PHENOTYPIC and BIOCHEMICAL CHARACTERISATION of the NEWLY DEVELOPED CULTIVAR of *MOMORDICA CHARANTIA* – BRÂNCUȘI

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## RESEARCH ARTICLE

### Abstract

Our study aimed phenotypic and biochemical characterization of a new variety, Brancusi, *Momordica charantia* obtained lately. *Momordica charantia* contains a collection of biologically active plant chemicals as confirmed by the latest studies. The collection consists of 30 varieties, from which Brancusi variety was bred by repeated individual selection. The working methods consisted in phenotypic and biometrical observations. The biochemical analyses were performed by organoleptic and physicochemical examination of 3 variants of processed fruit: powder, paste and dried fruit. The researches were concluded by Brancusi variety patent that presents a distinct phenotypic expressiveness with white immature fruit and the highest yield per plant, of 9.2 kg. The highest percentage of total invert sugar, 1.18 g% but also carbohydrates 69.4 g% was obtained in the fine powder variant, which outlines a specific direction of use with numerous benefits in human nutrition and health. The variety called Brancusi was achieved, with distinct phenotypic characteristics that give it uniqueness compared to other varieties.

**Keywords:** breeding; carbohydrates; white fruit.

## INTRODUCTION

The original home of the species is not known, other than that it is a native of the tropics. Bitter melon grows in tropical areas, including parts of the Amazon, east Africa, Asia and the Caribbean. It is widely grown in India and other parts of the Indian subcontinent, Southeast Asia, China, Africa and the Caribbean (Dinakaran S. K. et co., 2010). Our study has shown clearly for the first time that karela improves glucose tolerance in diabetes, confirming previous anecdotal reports. The effect was most pronounced with raw juice, but a small improvement occurred with fried karela (Leatherdale B. A. et co., 1981). *Momordica charantia* contains a collection of biologically active plant chemicals including triterpenes, proteins, steroids, alkaloids, saponins, flavonoids and acids due to which plant possesses antifungal, antibacterial, antiparasitic, antiviral, antifertility, antitumorous, hypoglycemic and anticarcinogenic properties (Ahmad N. et co., 2016).


## MATERIALS AND METHODS

The experimental fields were established by seedlings. Seedling production was made in heated greenhouses and the optimal temperature provided was of 18-22 °C to ensure germination. The optimal seedlings must be 55-60 days old.

The seeding was done in early March by introducing a single seed in the pots, the used depth was of 1.5 - 2 cm when using simple peat and 1 cm when using mixture. Seedling planting was done manually and by machine in early May, after

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36 the threat of late spring hoarfrost passed.  
 37 The crop density did not exceeded 30 000 plants/ ha. Permanent irrigation culture consists of 5-7 watering of  
 38 250-300 m<sup>3</sup> of water / ha.  
 39 Upper shoots were also tied to the trellis tip; here the plants were guided and helped to form a small bed on the  
 40 chosen support system "T" or tunnel - pergola type. Harvesting depending on the varieties was done in stages.  
 41 The planting distance between plants / row is 70-80 cm and between rows varied from 2 to 3 m. In the field,  
 42 planting distances between plants in the rows varied between 40-50 cm and 1.2-1.4 m between rows.  
 43 The collection consists of 30 varieties, from which Brancusi variety was bred by repeated individual selection. The  
 44 working methods consisted in phenotypic and biometric observations based on UPOV and IPGRI descriptors. The  
 45 biochemical analyses were performed by organoleptic and physico chemical examination of 3 variants of  
 46 processed fruit: powder, paste and dried fruit. The analyses were made according with the standard test methods  
 47 accredited by RENAR as organoleptic test, gravimetric methods, volumetric methods.

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## 49 RESULTS AND DISCUSSIONS

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### 51 Phenotypic and biometrical characteristics of *Momordica charantia* cultivar, Brancusi

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53 Research concluded with a new cultivar registration under the name of Brancusi (Figure 1), with distinct  
 54 phenotypic expressivity given by the white colour of the immature fruit and the high yield potential/plant of 9,2  
 55 kg (table 1).

56

57 **Table 1.** Biometric characteristics of unripe and ripe fruits

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Characteristics	Unripe fruit	Ripe fruit	
Fruit weight (g)	76.5	661.7	59
Fruit length (cm)	15.6	33.8	60
Equatorial diam. (cm)	max.	1.84	61
	med.	2.89	62
	min.	3.67	63
Pericarp thickness (cm)		8.79	64
		2.89	65
Ridges height (cm)		0.15	66
	small	-	0.67
Pericarp weight (g)		0.75	67
	tall	-	613.8
Peduncle length (cm)	63.8	12.8	68
Inserted peduncle diam.(cm)	52.27	9.63	69
Peduncle diameter (cm)	7.24	0.23	70
	0.22		71
			72



Figure 1. Fruits details

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75 Note: Mean values calculated on 30 fruits/character

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77 Regarding fruit weight, this grows as the fruit ripens reaching a value of 613 g, mentioning that a weight loss of  
 78 over 80 g is registered when the fruit is over ripped and ready for seed extraction. In what concerns the variability  
 79 coefficient, the highest variability was registered at the pericarp weight, a characteristic that can vary by over 80%  
 80 (table 2).

81

82 **Table 2.** Main characteristics variability of *Momordica charantia* fruit- Brancusi cultivar

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Characteristics	$\bar{x}$	SD	C.V.%	$\bar{x} \pm SD$
Fruit weight (g)	369.1	292.6	79.3	76.5-661.7
Fruit length (cm)	24.7	9.1	36.8	15.6-33.8

	<b>max.</b>	0.5	22.2	1.84-2.89
		2.4		
<b>Equatorial diam. (cm)</b>	<b>med.</b>	2.6	41.1	3.67-8.79
		6.2		
	<b>min.</b>	1.2	28.7	2.89-5.22
		4.1		
<b>Pericarp thickness (cm)</b>		0.3	66.7	0.15-0.75
		0.5		
				0.67-0.97
<b>Ridges height (cm)</b>		0.2	18.3	
		0.8		
<b>Pericarp weight (g)</b>		275.0	81.2	63.8-613.8
		338.8		
<b>Peduncle length (cm)</b>		-19.7	60.7	52.27-12.8
		32.5		
<b>Inserted peduncle diam.(cm)</b>		1.2	14.2	7.24-9.63
		8.4		
<b>Peduncle diameter (cm)</b>			2.2	0.22-0.23
		0.2	0,0	

Note:  $\bar{x}$ - mean, SD-standard deviation, CV%- coefficient of variation

The seeds cultivar (Figure 2), were analysed for biometric and phenotypic determinations, registering values of 4 seeds/ fruit with a total weight that includes the seed aryl of 45,9 g, decreasing after drying at 10 g (table 3).

**Table 3.** Main seeds characteristics

Characteristics	Value
Seed no./fruit	4992
Seed length (mm)	14.4
Seed width (mm)	9.24
Seed thickness (mm)	4.63
Seed weight with aryl/fruit (g)	45.9
Seed weight without aryl/fruit (g)	14.95
Dried seed weight/fruit (g)	10.46



**Figure 2.** Seeds details

### Biochemical characterization of *Momordica charantia*, Brancusi

The highest percentage of total invert sugar, 1.18 g% but also carbohydrates 69.4 g% was obtained in the fine powder variant, which outlines a specific direction of use with numerous benefits in human nutrition and health (table 4).

**Table 4.** Physiochemical organoleptic biochemical analyses of Brancusi cultivar (*Momordica charantia*) in three different processing stages- paste, dried and powdered fruit

Characteristics	Paste	Dried fruit	Powdered fruit
<b>Aspect</b>	Paste without impurities	Dried, without impurities	Fine powder, without impurities
<b>Colour</b>	Dark brown	Light brown	Light brown
<b>Flavour</b>	Specific flavour, pleasant	Specific flavour, sensed pleasant	Specific flavour, sensed pleasant
<b>Odour</b>	Pleasant specific flavoured	Pleasant specific flavoured	Pleasant specific flavoured

<b>Moisture g%</b>	94.03	15.56	8.31
<b>Protein g%</b>	1.18	10.17	13.12
<b>Total fat g%</b>	0.20	0.05	0.024
<b>Saturated fatty acids g%</b>	0	0	0.00
<b>Total invert sugar g%</b>	0.63	0.99	1.18
<b>Sodium chlorate g%</b>	0.03	0.31	0.27
<b>Total ash g%</b>	0.34	9.36	8.34
<b>Fiber g%</b>	1.14	1.19	1.17
<b>Carbohydrates g%</b>	3.11	63.67	69.04
<b>Energetic value, kcal %/KJ%/100 g product</b>	21.24/89.45	298.19/1266.65	330.98/1406.82

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108 The fruits of the new cultivar of *Momordica charantia*, Brancusi were analyzed in the laboratory for chemical  
109 composition determinations. The fruits were examined in three processing stages as paste, powdered and dried  
110 fruit. The highest value for moisture content was determined for paste fruits, with a 94% content. No saturated  
111 fatty acids were determined. The natural sugar content is beneficial to human consumption, especially for those  
112 suffering from diabetes. The highest totally inverted sugar percent of 1,18 g and of 69,4% carbohydrates were  
113 achieved in the powdered fruits which outlines the direction of use for the new cultivar with numerous benefits in  
114 human nutrition and health. The highest values in what concerns the fruit chemical composition were registered  
115 in the powdered fruits.

116

## 117 CONCLUSIONS

118 A distinct variety registered under the name of Brancusi was achieved, with distinct phenotypically characteristics  
119 that gives its uniqueness compared to other known cultivars.

120 **Author Contributions:** C.V. collected *Momordica* varieties, bred the new variety and coordinated the entire  
121 research theme, B.M. bred the new variety and made the phenotypic and biometric measurements, centralized  
122 data, wrote the paper, C.B. Contributed data and analysis tools, G.N. Collected the data, M.P. conceived and  
123 designed the analysis, C.Ş. performed the analysis.

124

## 125 Conflicts of Interest

126 The authors declare no conflict of interest.

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