

Original Research Article

CONSUMPTION DIAGNOSIS OF CASSAVA IN THREE MUNICIPALITIES IN CUBA

Abstract – Cassava is an important staple food for human and animal feeding in Cuba. Despite its importance, there is little or nonexistent information to diagnose preferences and frequency of consumption of cassava in that country. In this sense, the present article characterizes the preferences and frequency of consumption of cassava in the municipalities of Plaza de la Revolución (La Habana), El Salvador (Guantanamo) and San José de Las Lajas (Mayabeque) - Cuba. It was conducted a survey through a questionnaire containing twelve closed and two open questions. The sample was determined based on the number of total population of each municipality considering 95% as confidence interval and 5% as error margin. The results were statistically analyzed by calculating the absolute and the relative frequencies of each question. It was observed that the acquisition of fresh cassava is determined by the in natura purchase in small quantities for home consumption of up to one week. The choice of the cassava is made based on the skin color (light brown), on the pulp color (white) and on the empirical knowledge about its ease of cooking. Cassava is consumed mainly in boiled and fried forms, up to four times a week when there is market supply (from September to December) for roots with desirable culinary characteristics (ease cooking).

Keywords: *Consumer preferences, cassava, La Habana, Mayabeque, Guantanamo.*

1. INTRODUCTION

The consumption of cassava in Cuba is a tradition inherited from the islanders who lived there before its colonization by Spain. In that country, cassava is known as vianda, a generic name given to the roots, fruits and tubers that can be boiled, fried and even cooked as stews, soups and sweets (Figuerola e Lama, 2010; Suárez e Mederos, 2011).

Cassava is currently considered an important source of energy for human food and animal feed in tropical and developing countries where their use has increased considerably, whether fresh, processed or industrialized (Balagoplan, 2002). However, each region or country has a certain nutritional profile that is strongly associated with their cultural, nutritional, socio-economic and demographic aspects (Bonomo et al., 2003).

According to González e Johnson (2009), there is little or no information that identifies localized preferences and frequencies of consumption of cassava as well as the factors that determine such parameters. Investigative results of such issue partially characterize the nutritional profile of a population and serve as a reference to vegetal improvement programs, contributing to improvements in local food security (Bonomo et al., 2003; Suarez e Rios (2005).

Thus, this paper characterizes the preferences and frequencies of consumption of cassava in the municipalities of Plaza de la Revolución (La Habana province), El Salvador (Guantanamo province) and San José de Las Lajas (Mayabeque province), Cuba.

2. MATERIAL AND METHODS

The preparation of the survey questionnaire was preceded by a gathering of information on the subject through interviews with individuals belonging to the universe of the study.

The research was thus conducted in two stages. The first step consisted of the preparation of the questionnaire from the information obtained in the pre interviews and the second one in the administration and evaluation of the questionnaires.

After drawing up the questionnaire, the sample size surveyed was determined based on the population of the municipalities (Rodríguez et al., 2011) of Plaza de la Revolucion (227) - Havana province, San José de Las Lajas (226) - Mayabeque province and El Salvador (226) - province of Guantanamo, in Cuba.

Sample surveyed were selected with random sample method. Sample number was determined using Probability Sampling Method based on the formula given below:

$$n = \frac{Nt^2 pq}{d^2N + t^2pq}$$

N = population number of Plaza de la Revolución, San José de las Lajas and El Salvador (152,318; 73,939; 45,305)

69 t = t value for confidence interval (for 95% confidence interval,
 70 $t = (1.96)$,
 71 p = existed probability (0.5),
 72 q = non-existed probability (0.5),
 73 d = error rate (0.065).
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75 The questionnaire was administered to men and women (20 and 60% respectively)
 76 between twenty and sixty years of age, with at least high school graduates (eleven years of
 77 literacy), strictly limited to residents of urban areas in each municipality.

78 After determining the sample size the study was conducted by applying individual
 79 questionnaires with 12 closed questions and two open ones in November 2012.
 80 Subsequently, the data were statistically analyzed by calculating the relative and absolute
 81 frequencies of each question.

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83 3. RESULTS

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85 In the urban areas of the municipalities under study, cassava is mainly obtained by
 86 purchase, however cultivation is more representative in El Salvador. Since about 90% of
 87 respondents are unaware of the variety of cassava cultivated or consumed (Table 1),
 88 knowledge of the variety does not determine the preference of consumers in the purchase or
 89 choice of branches for the cassava cultivation.

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98 **Table 1.** Ways and criteria for cassava acquisition.

	Cassava acquisition way		
	-----%-----		
	Plaza de la Revolución	El Salvador	San José de las Lajas
Buy	89	73	87
Cultivate	9	21	13
Buy and cultivate	2	6	0

Awareness of cassava variety			
Yes	5	10	7
No	95	90	93
Decision criteria for obtaining cassava			
Pulp color	11	10	6
Skin color	57	61	3
Empirical knowledge	26	16	77
Other	7	12	14
Most consumed cassava pulp color			
White	99	97	98
Yellow	1	3	2

The choice of cassava at the time of purchase or cultivation is determined by the morphological criteria of flesh color and the skin color or by an empirical knowledge about the ease of cooking. In Plaza de la Revolución and El Salvador, the skin color is the main criterion when choosing the root, followed by empirical knowledge about the ease of cooking. White pulp cassava is the most consumed variety in the three municipalities.

According to the survey results, the market supply is the main factor that determines the frequency of consumption. When a supply exists cassava is consumed 1 or 2 times a week in Plaza de la Revolución and San José de las Lajas and 1 to 4 times per week in El Salvador (Table 2). The price is not a determining choice factor at the time of purchase or consumption of cassava given that it was the one the least chosen by respondents in all municipalities.

Table 2. Frequency and criteria that determine cassava consumption frequency.

Most consumed types of cassava -----% -----			
	Plaza de la Revolución	El Salvador	San José de las Lajas
Weekly frequency of cassava consumption			
0	1	3	1
1 to 2	78	46	82
3 to 4	15	48	13
5 to 7	7	4	4
The frequency of cassava consumption is determined by			
Market supply	71	85	63
Cost	1	3	8
Prefers other	20	2	14
Other	8	10	15
Is there any difference during cassava preparation			
Yes	59	84	85

No	41	16	15
Kinds of differences that occur during preparation of cassava			
Taste	3	4	1
Texture	21	16	19
Flesh color	49	30	7
Other	27	50	73

When asked about the occurrence of changes in the qualitative characteristics such as taste, texture, flesh color or the occurrence of more than one of these items, during and/or after cooking, the flesh color was the most cited by citizens of Plaza de la Revolución and San José de las Lajas, followed by the change of more than one factor in the three municipalities. About 90% of the answers “others - more than one factor” were associated with changes in texture and color of pulp.

In Cuba, cassava is most commonly consumed boiled and fried. Cassava is usually purchased in small quantities, 4 kg, for immediate consumption or after a short period of time and therefore it is normally stored in the freezer when peeled and stored in the natural environment otherwise. Citizens of Havana keep about 50% of their cassava frozen and the other 50% in natura. A small group of people grows cassava in the backyard and keeps the roots in the ground. The “other” option represents the group that chose the options “frozen” and “store in the natural environment” (Table 3).

Table 3. Use and means of conservation of cassava and its residues as human food in Cuba.

Most consumed types of cassava -----%-----			
	Plaza de la Revolución	El Salvador	San José de las Lajas
The most common way to consume			
Cooked	51	42	72
Fried	1	3	1
Cooked and fried	45	53	27
As flour	3	1	0
Means of cassava conservation			
Frozen peeled	44	42	81
Buried	2	2	8
In natura	50	19	5
Other	4	37	6
Disposal of cassava skin			
Discarded as waste	77	42	70

Animal feeding	21	53	12
Organic fertilizer	0	4	3
Other	3	14	2
Knowledge about cassava industrial processes			
Yes	3	12	7
No	97	88	93

In most cases the use of cassava peels are discarded as domestic waste, mainly in the municipalities of Plaza de la Revolución and El Salvador. In San José de las Lajas almost 60% of respondents declared to use them as animal feed.

When asked about the knowledge of the ways of cassava processing and industrialization, approximately 90% of respondents in the three counties, declared to ignore these types of processing. Those who answered "yes" mentioned production of starch and cassava yogurt, used in animal feed.

Finally, respondents were asked about the use of cassava as a main ingredient in dishes of Cuban cuisine. In Plaza de la Revolución and San José de las Lajas, it was stated that cassava is present in all Cuban dishes as vianda as well as in caldosas, atol and frituras, while in El Salvador, cazabe was mentioned.

4. DISCUSSION

Given the lack of space in urban areas and the ease of purchase, the most common way of obtaining cassava in urban areas of Cuba is its purchase in agricultural markets. Although El Salvador is a urban region, the province of Guantánamo in Cuba is known as a rural region, ie, does not have the same development and life rhythm of the urban areas of the provinces of La Habana and Mayabeque.

Cassava production scale is in the range of what respondents named the "backyard farming", ie, production just for family consumption without surpluses for sale.

Another factor that makes purchasing the most common form of achievement is that the price is not a factor (maximum 8%). In addition to this, when home outside spaces are preferably used for the production of animal protein such as chicken or pork, as can be seen by comparing the percentage of those who grow cassava (Table 1) and use the waste as animal feed (Table 3).

The morphological traits flesh color and skin color are the factors that determine the choice of cassava type and can be explained by the characteristics of cassava varieties that are grown in Cuba.

According to data provided by the Instituto de Investigaciones de Viandas Tropicales (INIVIT, 2013 a), the cassava germplasm bank in Cuba consists of varieties with are light pink (32%) and cream (30%) peels, white pulp (82%), and 5% of the accesses have high content of hydrocyanic acid (INIVIT, 2013a). Thus the most cultivated cassava varieties are those with white pulp with light brown bark and pinkish peel, represented by CMC-40, INIVIT Y 93-4, CEMSA74-725, CEMSA74-6329 and Señorita Varieties. Varieties as Selección Holguin, Enana Rosada and Dulce Jagüey are grown primarily in the eastern regions of the country, where El Salvador, Guantanamo is (INIVIT, 2013b).

Consumption frequency determined by market supply, according to the information obtained during the interviews, is related to the supply of easy to cook cassava, that is, in Cuba there is supply of cassava throughout the year, however roots easy to cook and with a texture pleasant to the consumer are produced only from September to December.

The changes in texture and flesh color after cooking identified by respondents can be determined by factors such as genotype, interaction between genotype and environment, age or stress endured by the plant throughout its life cycle, which can promote an increase in content fiber, reduction in dry matter content and change in chemical and physical composition of starch granules (Anggraini et al., 2009; Beléia et al., 2004; Charoenkul et al., 2011; Franck et al., 2011).

According to Miranda et al., (2003) and to Fe e Martinez (2003), in Cuba the cultivation of varieties not adapted to certain localities is explained by the fact that peasants act as key players in the management of plant genetic resource, i.e., preservation, production, selection and exchange of local improved propagation material due, among other factors, the peasants' limitation of access to improved materials adapted to each region.

To control the quality produced of produced cassava Suarez e Rios (2005) reported the development of participatory plant improvement projects to establish an improvement strategy, through the stimulation of the selection, conservation, multiplication and seed exchange capabilities of farmers with different socioeconomic conditions and levels of varietal diversity on their farms.

The color change of cassava pulp at cooking is determined by the total or partial gelatinization of the starch, which may be related to its chemical composition as well as to the presence of physical barriers (cell wall) that prevent the entrance of water in cells at the time of baking (Pereira & Beléia, 2004; Hoover, 2001).

Cassava is a highly perishable food and so it is seldom acquired in large quantities, i.e., consumers typically purchase a certain amount to be used in no more than a week.

Processing or manufacturing of cassava for human consumption is rare or nonexistent in Cuba, in natura being the most significant way of consumption. Those who have some knowledge of cassava industrialization processes cited starch used for ironing clothes or cassava yogurt for animal feed.

The flour used in Cuba is the zest flour produced from sun dried ground cassava pulp. In addition to the most common way to consume it, boiled to accompany any dish, one of the most popular ways of preparing cassava is the yuca con mojo. Cassava is normally used in the preparation of caldosa or sopón cubano, a soup of meat, vegetables and cassava, of atol, sort of porridge of milk thickened with the starch removed from the cassava batter, fried dumplings made from grated manioc cooked and the cazabe that has the shape of a thin-crust pizza dough made with raw cassava, grated and roasted.

5. CONCLUSIONS

The acquisition of cassava in the municipalities of Plaza de la Revolución, El Salvador and San José de las Lajas, Cuba is done by purchase in natura, and in small quantities for home consumption within one week.

The choice of cassava is made based on skin color (light brown) and pulp (white) and empirical knowledge about its ease of cooking.

Cassava is consumed mainly in boiled and fried forms up to four times a week in times where there is root market supply with the desirable culinary characteristics (cooking facility), that is, from September to December.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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