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Consumption Diagnosis of Sweet Cassava in three Municipalities in Cuba

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Authors' contributions

This work was carried out in collaboration between all authors. All authors read and approved the final manuscript.

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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 province, El Salvador–Guantanamo province and San José de Las Lajas–Mayabeque province in Cuba. A survey was conducted 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 cassava in the municipalities of Plaza de la Revolución, El Salvador and San José de las Lajas in Cuba is done by purchase small quantities of fresh cassava for home consumption within one week, due to the extreme perishability of cassava, which limits consumers' ability to store fresh roots at home. The choice of cassava is made based on both skin colour (light brown) and pulp (white) and empirical knowledge about its ease of cooking, and that cassava is mostly consumed in

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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.

Keywords: Consumer preferences; sweet 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 [1,2].

Cassava is currently considered an important source of energy for human food and animal feed in tropical and in developing countries, where their use has increased considerably, whether fresh, processed or industrialized [3]. However, each region or country has a certain nutritional profile that is strongly associated with their cultural, nutritional, socio-economic and demographic aspects [4].

According to [5], 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 plant breeding programmes, contributing to increase local food security [4,7].

Thus, this paper characterizes the preferences and frequency 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 in Cuba.

2. MATERIALS AND METHODS

The preparation of the survey questionnaire was preceded by a gathering of information on the subject through pre interviews with individuals belonging to the universe of the study. The research was thus conducted in two stages. The first one consisted of the preparation of the questionnaire from the information previously obtained in the pre interviews and the second one consisted of the administration and evaluation of the questionnaire.

After drawing up the questionnaire, the sample size that would be surveyed was determined based on the population of the municipalities [7] of Plaza de la Revolución (227) - Havana province, San José de Las Lajas (226) - Mayabeque province and El Salvador (226) - province of Guantanamo, in Cuba. Sample size was determined using probability sampling method based on the equation 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)
t = t value for confidence interval (for 95% confidence interval),
t = (1.96),

p = existed probability (0.5),
q = non-existed probability (0.5),
d = error rate (0.065).

The questionnaire was administered to men and women (40 and 60%) respectively, between twenty and sixty years old, with at least high school graduates (eleven years of literacy), strictly limited to residents of urban areas of each municipality.

After determining the sample size the study was conducted by applying individual questionnaire with 12 closed questions and two open ones. Subsequently, the data were statistically analyzed by calculating the relative and absolute frequencies of each question.

3. RESULTS

In the urban area of the municipalities under study, cassava is mainly obtained by purchase, however cultivation is more representative in El Salvador. Since about 90% of respondents are unaware of the variety of cassava cultivated or consumed (Table 1), knowledge of the variety does not determine the preference of consumers at the moment of purchase or choice the cassava branches to plant.

Table 1. Percentage distribution of respondents about cassava consumption way in three urban municipalities in Cuba

	Plaza de la Revolución	El Salvador	San José de las Lajas
	%	%	%
Cassava acquisition way			
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 colour	11	10	6
Skin colour	57	62	3
Empirical knowledge	26	16	77
Other	6	12	14
Most consumed cassava pulp colour			
White	99	97	98
Yellow	1	3	2

The choice of cassava at the moment of purchase or cultivation is determined either by the morphological criteria of pulp colour and the skin colour or by an empirical knowledge about the ease of cooking. In Plaza de la Revolución and El Salvador, the skin colour 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 moment of cassava purchase or consumption, given that it was the one the least chosen by respondents in all municipalities.

Table 2. Frequency and criteria that determine cassava consumption frequency in three urban municipalities in Cuba

	Plaza de la Revolución	El Salvadoı	San José de las Lajas
	%	%	%
Weekly frequency of cassava consumption			
0	1	3	1
1 to 2	77	46	82
3 to 4	15	47	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 cooking			
Yes	59	84	85
No	41	16	15
Kinds of differences that occur during cassava cooking			
Taste	3	4	1
Texture	21	16	19
Pulp colour	49	30	7
Other	27	50	73

When asked about the occurrence of changes in the qualitative characteristics such as taste, texture, pulp colour or the occurrence of more than one of these items, during and/or after cooking, the pulp colour 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 pulp colour.

In Cuba, the most common form of cassava consumption are boiled or fried. Cassava is usually purchased in small quantities, for short-term storage or immediate use. About 50% Plaza de la Revolución citizens are able to storage cassava in the refrigerator and the other 50% keep the roots in a natural, without post-harvest treatment or protection. A small group of people whose cultivate cassava in the backyard keep the roots in the ground. The option “other” represents the group of people whose chosed the options “frozen” and “storage in the natural ambient” (Table 3).

In most cases the use of cassava residues 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.

Table 3. Consumption, strategies to prevent post-harvest deterioration of roots and utilization of cassava residues (skin and bark) in three urban municipalities in Cuba

	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
Strategies to prevent post-harvest deterioration of cassava			
Frozen peeled	44	42	81
Buried	2	2	8
In natura	50	19	5
Other	4	37	6
Disposal of cassava bark			
Discarded as waste	76	70	42
Animal feeding	21	12	53
Organic fertilizer	0	4	3
Other	3	14	2
Knowledge about cassava industrial processes			
Yes	3	12	7
No	97	88	93

When asked about the knowledge 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 the 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, the 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 in Cuba is purchase in agricultural markets. Although El Salvador is an urban region, the province of Guantanamo 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 does not limit the cassava acquisition by purchasing (maximum 8%). In addition to that, when houses have outside spaces people preferably used the space to develop backyard livestock, in order to produce mainly chicken and pork, as can be seen by comparing the percentage of those that cultivate cassava (Table 1) and those whom use the cassava residues as animal feed (Table 3).

The morphological traits as pulp and skin colour are the factors that determine the choice of cassava and can be explained by the characteristics of cassava varieties that are cultivated in Cuba. According to data provided by (Instituto de Investigaciones de Viandas Tropicales, local handout) Cuban cassava germplasm bank are composed with varieties which have light pink (32%) and cream (30%) bark colour, white pulp (82%), and only 5% of the accesses have high content of hydrocyanic acid or are bitter cassava.

Thus the most cultivated cassava varieties are those with white pulp, light brown skin and light pink bark, and are represented by the follow varieties: CMC-40, INIVIT Y 93-4, CEMSA74-725, CEMSA74-6329 and Señorita. Varieties as Selección Holguin, Enana Rosada and Jagüey Dulce are grown primarily in the eastern regions of the country, where are the province of Guantanamo (Instituto de Investigaciones de Viandas Tropicales, local handout).

The frequency of consumption determined by market supply, is related to the supply of roots that cook easily and have fast softening. In Cuba there is supply of cassava throughout the year, however cassava which are those characteristics and with a texture pleasant to the consumer are available only from September to December.

The changes in texture and pulp colour 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 fiber content, reduction in dry matter content and change in chemical and physical composition of starch granules [8,9,10,11].

According to [12,13], 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.

In order to control or improve the quality of cassava produced, [2,6] reported the development of participatory plant breeding 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 change of the colour of cassava pulp at cooking time is determined by the total or partial gelatinization of the starch, which may be related to chemical composition as well as to the presence of physical barriers (cell wall) that prevent the entrance of water in cells at the moment of cooking [14,15].

Cassava is a highly perishable food and so it is seldom acquired in large quantities, i.e., consumers typically purchases a small amount to be used in no more than a week. Processing or manufacturing of cassava for human consumption is rare or nonexistent in Cuba, boiled cassava have being the most significant way of consumption and accompany any dish in daily meals.
Those who know some cassava industrialization processes cited the starch used for ironing clothes or cassava yogurt for animal feed. The flour used in Cuba is a whole flour (pulp+bark dried and mashed).

Cassava is the main ingredient of the follow Cuban dishes *yuca con mojo*, dish made by marinading cassava in garlic, lime, and olive oil, *caldosa* or *sopón cubano*, a soup with meat, vegetables and cassava, *atol*, sort of porridge of milk thickened with the starch removed from the mashed cassava, *frituras*, fried cassava, and the *cazabe* that has the shape of a thin-crust pizza dough made with raw mashed cassava, and roasted.

5. CONCLUSION

The acquisition of cassava in the municipalities of Plaza de la Revolución, El Salvador and San José de las Lajas in Cuba is done by purchase small quantities of fresh cassava for home consumption within one week, due to the extreme perishability of cassava, which limits consumers' ability to store fresh roots at home.

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

Cassava is mostly consumed 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.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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