

Evaluation of Population Knowledge regarding the Implementation of Gardens with UFP Plants in a School Environment

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Abstract: *Brazil has a vast diversity of Unconventional Food Plants (UFP), which are an excellent food source, containing levels of nutrients similar to or even superior to the vegetables we are used to consuming, they are low cost and easy to handle, and can be found on the streets of the cities. However, the population does not have the knowledge of the current agrifood system, making it urgent to disseminate knowledge about the UFP and the implementation of vegetable gardens, as a way to rescue them, which allows relating food and environmental education, developing a sustainable society. In view of this, the school environment is the best promoter to disseminate this knowledge. An online survey was carried out via the Google Forms platform whose objective was to assess the population's knowledge about UFP and vegetable gardens, as well as the opinion about the implementation of the UFP gardens as an educational means to encourage their consumption within the school environment. The questionnaire had 16 investigative questions and was available from August 1 to 15, 2021. There were 601 participations from the public from all regions of Brazil and other countries, of all ages, genders, and education. From the results obtained, it was verified that among the UFP addressed in this study, Hibiscus stood out as the most popular (90.6%), followed by the others, Barbados gooseberry (70.1%), Dandelion (70 %), Elephant ear (69.5%), lamb's ears (40%), green amaranth (32.6%) and vine spinach (28.9%). 51% of the participants are familiar with the term UFP and 98% stated that the implementation of gardens with PANC in schools is an important tool for ecological awareness and dissemination of knowledge.*

Keywords: Unconventional Vegetables, Public, Pesticides-free, Nutritional and economic potential, Juvenile child

1. Introduction

Unconventional Food Plants (UFP) are vegetables known and used for many years in indigenous culture, but which have lost prominence today and are rarely found in city commerce, becoming underutilized by the population (DE PADUA SOARES, 2020).

These species can be represented by leaves, flowers, fruits, rhizomes, inflorescences, and seeds, which can be consumed raw or after cooking. Plants that have not yet been completely studied by the scientific community or explored by society are called UFP (GOLLNER-REIS E SILVA, 2016).

UFP are accessible, low-cost production, resistant to several factors, easy to adapt, grow spontaneously on sidewalks and land. However, due to lack of knowledge and information, there is also a lack of use of these foods (FERREIRA, 2020).

In the Brazilian flora, the diversity of UFP is great, it is estimated that there are more than ten thousand species with food potential, however, the current agrifood system is maintained by a conventional agricultural matrix and by a predominantly limited food pattern, which contributes to the lack of knowledge and underutilization of hundreds of native species with immense economic and nutritional potential (BEZERRA, 2020).

In Brazil, the National Biodiversity Policy was created, however, according to Brack (2011), the project did not advance in the way it should have, therefore, it is necessary to seek economic alternatives that prioritize the maintenance of socio-environmental diversity and the sustainable use of the flora, because currently there is no national market for the commercialization of UFP, since the current market is used to commercializing only common vegetables. PANC are not commercially exploited by companies and are rare to find them in large markets (PEIXOTO, 2019).

However, there is a rise in the search for a healthy life, in which functionality, sustainability and exemption from pesticides are primarily considered, in this perspective, the return to natural life is taking place. This factor opens a range of possibilities for UFP that should be part of human eating habits, since it is a great option for diversifying the daily food menu, in addition to being nutritionally rich since they have antioxidants, essential vitamins, proteins, fibers and mineral salts (LIBERATO et al., 2019).

Easy cultivation generates a new source of income for family farming, and can be used in any small area of residences such as balconies of buildings, vacant lots, and backyards, and can complement income, generating profits, through the sale of plants or products made based on UFP such as jams, flour, snacks, cakes and others (TERRA; VIERA, 2019).

The implantation of vegetable gardens is an important way of rescue, which makes it possible to relate environmental education with food education and social values, developing a sustainable society through activities aimed at education. In this scenario, the school is the best place to promote adequate dietary guidance, as it is in childhood and adolescence that eating habits are developed (OLIVEIRA, 2018).

Thus, it is essential to encourage the recovery of cultivation and ways of use, encouraging the consumption by people in the city and in the countryside (KINUPP e LORENZI, 2014).

The objective of this work was to verify the population's knowledge and opinion about the UFP and their insertion in vegetable gardens within the school environment.

2. Material and Methods

An online survey was carried out, containing qualitative and quantitative questions about Unconventional Food Plants (UFP), and about vegetable gardens and their possible insertion in the school environment.

The questionnaire was developed on the Google Forms platform and was available for responses during the period from August 1 to 15, 2021. The survey was randomly sent

through social networks to the participants, it was applied to 601 people from all regions of Brazil and some other countries, people of all ages, genders, and education levels participated.

The results obtained were calculated in percentages using the Forms platform. Data were presented in frequency and percentage format. Bioestat 5.0 software was used to compare averages between two groups. Statistical analysis was performed using Pearson's Chi-Square test, Tukey and ANOVA with a significance level of 5% ($p < 0.05$).

It was compared with results achieved by other researchers in the area, in order to structure the theoretical basis. For this purpose, articles published between 2005 and 2021 in the following data sources were selected: Scielo, Google Scholar, Lilacs and PubMed.

3. Results and Discussion

There was the participation of 601 people in the research, most of them female (79%), a similar result was found in the research by Santos et al., (2021), and most of the interviewees were in the age group between 40 and 59 years old (43.3%), completed higher education (61.4%), as shown in Table 1 ($p < 0.05$).

Table 1: Characterization of the population

Characteristics		No. of Interviewees	%
Gender	Female	475	79%
	Male	126	21%
	Other	0	0%
Age Group	Under 18 years old	12	2%
	18 - 28 years old	147	24.5%
	29 - 39 years old	108	18%
	40 - 59 years old	260	43.3%
	60 years old or older	73	12.1%
Educational Level	Uncompleted secondary school	12	2%
	Completed secondary school	9	1.5%
	Uncompleted high school	21	3.5%
	Completed high school	90	15%
	Uncompleted higher education	100	16.6%
	Completed higher education	369	61.4%
Total		601	100%

Source: Authors (2021).

Most participants were from the Southeast region (87.85%), followed by the South (5.99%), Midwest (2.49%), Northeast (1.66%), North (0.16%) and other countries (1.83%), including Canada, Portugal, Mexico, Colombia, and France, as shown in Graphic 1 ($p < 0.05$).

The study conducted by Nunes et al. (2021) shows similarity, with 148 participants, of different ages, with all education levels and from all regions of Brazil.



Graph 1: Number of respondents and respective regions in Brazil and the world
Source: Authors (2021)

When asked about their knowledge of the term UFP, the majority (51%) ($p < 0.05$) of respondents already knew this acronym, as can be seen in Graphic 2. A higher value is found in the study by Barbosa et al. (2021), in which 87.7% of the people interviewed indicated having heard about it.

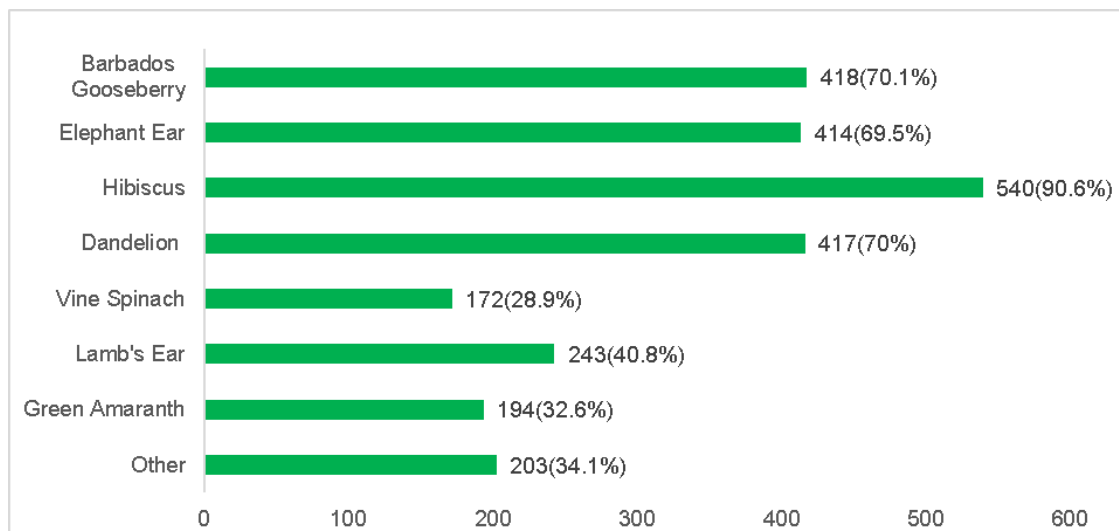


Graph 2: Popular knowledge about the term UFP

Source: Authors (2021).

To facilitate understanding, the use of images was used next to the names of Unconventional Food Plants and the consumption of these by the participants was questioned, the results indicated that 73% of the participants had already consumed some plant previously presented ($p < 0.05$), this value is higher when compared with the studies by Barbosa et al. (2021) showing that around 67% of people consume unconventional plants or parts of them. Thus, only 24% of respondents had no information about this term, but they are aware of these plants.

According to De Padua Soares (2020) and Nunes (2021) Unconventional Food Plants have been known and used for many years in indigenous culture, family farmers and by elderly people. However, these people do not necessarily know the names of such plants. The participants were asked if they knew the plants listed in graph 3 ($p < 0.05$) according to them, the best known vegetables were, in ascending order, Hibiscus (90.6%), Ora-pro-nobis (70.1%), Dandelion (70%), Taioba (69.5%), Peixinho (40%), Caruru (32.6%) and Bertalha (28.9%).



Graph 3: Knowledge about the types of Unconventional Food Plants (UFP)

Source: Authors (2021).

Among the four PANC most known by the population, Hibiscus stood out, in which 540 people said they knew it, that is 90.6% ($p < 0.05$). A similar result was found in the study by Nunes et al. (2021), that showed that most people (88.5%) know this edible flower rich in calcium, magnesium, niacin, riboflavin, iron, vitamins A and C, acids such as tartaric, succinic, malic, oxalic, citric and hibiscus, in addition, it has a high content of pectin (DA CUNHA, 2018). The Barbados gooseberry stood out as the second best known where 418 people mentioned knowing it, that is 70.01%. A study by Moraes (2021) showed that 60.06% of people know Barbados gooseberry. This popularization of the Barbados gooseberry may be due to the greater marketing on this species, as it has a high protein content (28%), being known as the meat of the poor (SCHMIDT, 2021).

The third most popularly known plant is the Dandelion, which presented 70% of the answers, there were 417 people who know this plant. In addition to being used as a medicinal herb due to its antimicrobial potential, this plant is a source of several active principles and substances of nutritional value, such as vitamins and mineral salts (FERREIRA; DE FREITAS SALLA, 2020).

About 69.5% of people ($p < 0.05$) said they knew elephant ear. According to Souza (2020) this is a vegetable with high nutritional potential, rich in vitamins A and C, calcium, phosphorus, iron, and potassium. The study by Oliveira et al. (2018) showed that 54.5% of respondents knew about this food plant.

Respondents could suggest other vegetables they considered unconventional, 27.9% said they knew another not

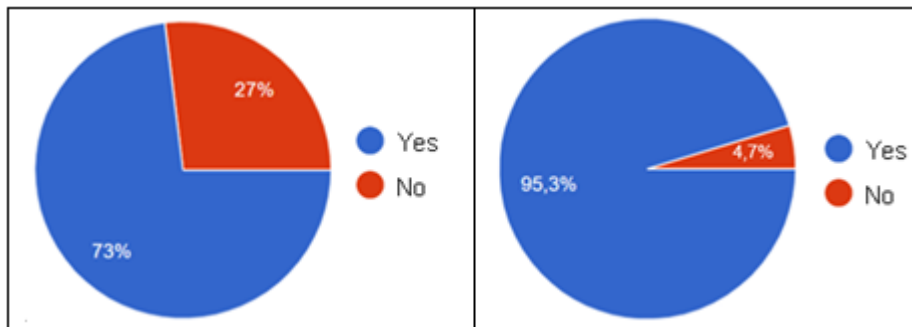
mentioned, the most indicated were: sow thistle, nasturtium, purslane, sorrel, and pansy ($p < 0.05$).

It was asked if the interviewees, upon learning that UFP bring health benefits, would be interested in consuming them and according to graphic 4, about 95.3% were interested in adding UFP to their diet ($p < 0.05$).

When asked if it is possible to find these plants in markets or fairs in the city where the interviewee lives, the majority (64.6%) did not have knowledge of their commercialization in local businesses ($p < 0.05$). These data corroborate the hypothesis that these plants are rejected by stores and agroindustry, and are hardly found in supermarket chains (NARSISA OLIVEIRA, 2018). According to Soares (2020), the lack of knowledge about UFP makes it easier for the population to become dependent on the large capitalist food monopolies that are responsible for controlling and establishing food prices and trade, as well as essential sectors of the agroindustry.

Respondents who responded affirming the previous question (64.6%) were asked where the commercialization of UFP is more common, the places most cited by them were: street markets, organic fairs, and natural product stores ($p < 0.05$).

The participants were asked whether the respondent has had or has a vegetable garden at home, about 30.4% of respondents replied that they do not have a vegetable garden, 28.3% assumed they already had one, 26.1% said they have a vegetable garden at home and 15.1% showed interest in starting to develop a home vegetable garden. Da Costa (2021), found that 64.6% of respondents have vegetable gardens at home, and 87.5% intend to have one.



Graphic 4: Comparison of the consumption of Unconventional Food Plants (UFC) and the consumption intention after learning about their nutritional benefits.

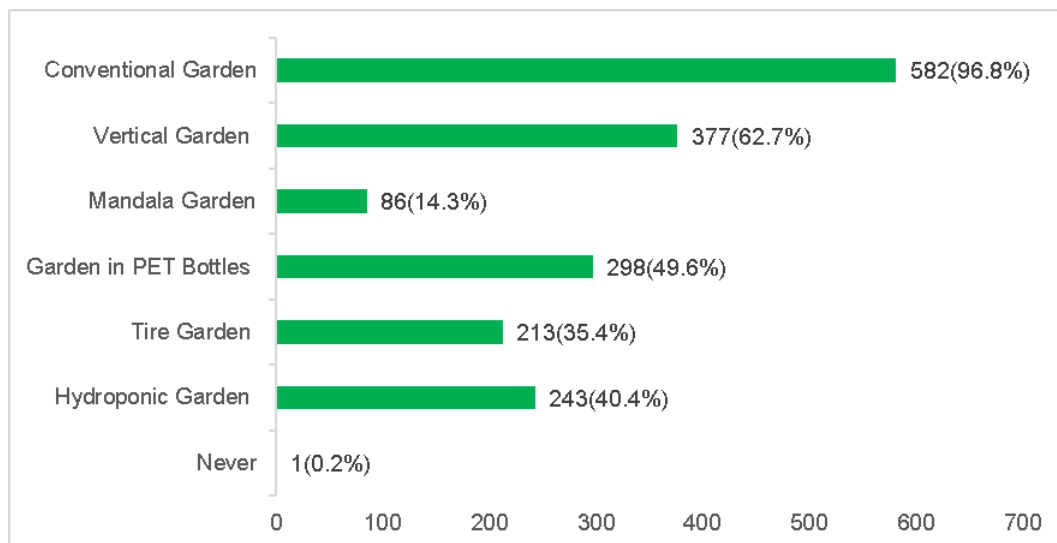
Source: Authors (2021).

These results show that more and more people are looking for quality fresh food and free of pesticides, as well as they are looking for a healthier diet, considering that home vegetable garden is a great option, in addition to contributing to disease prevention (ALMEIDA et al., 2018).

The research participants were asked about their knowledge regarding the necessary care to maintain a vegetable garden, the majority (48.8%) answered that they have sufficient knowledge about the necessary care that must be taken for the management of vegetable gardens, 32.6% did not know about the subject, but were interested in learning, the rest (18.65%) demonstrated that they were not familiar with the

subject and showed no interest in studying and knowing about this ($p < 0.05$).

Respondents were asked what types of gardens they had already seen. As shown in Graphic 5, the conventional vegetable garden is the most known by the population (96.8%), followed by the vertical garden (62.7%), garden in PET bottles (49.6%), hydroponic garden (40.4%), tire vegetable garden (35.4%), mandala garden (14.3%) and 0.2% of respondents said they had never seen these types of gardens ($p < 0.05$). The ideal type of vegetable garden varies according to the species recommended for cultivation, due to available space and climatic conditions (GONÇALVES et al., 2021).



Graphic 5. Knowledge about gardens in general

Source: Authors (2021).

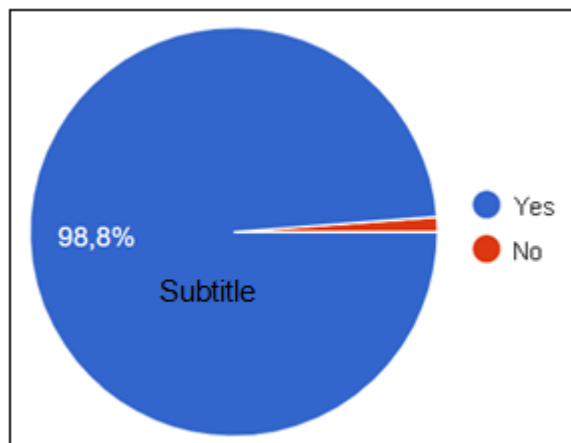
The research participants were asked if they had studied or know any school that has vegetable gardens, the majority (61.3%) answered that they knew ($p < 0.05$). For Capra (2005), the vegetable garden is an interdisciplinary activity in which a connection can be established between the child, the food and the vegetables that will be planted, awakening ecological awareness for environmental conservation and a more sustainable development.

At the end of the survey, participants were asked about their opinion regarding the implementation of vegetable gardens in schools and whether this could become an educational means with benefits for children, such as nutritional

improvement in their meals and environmental awareness, according to graphic 6, about 98.8% believe that it is possible to acquire environmental and nutritional knowledge through school gardens ($p < 0.05$).

The implementation of school gardens with the participation of students points to several benefits, in addition to learning how to cultivate a vegetable garden, students learn about the dangers of using pesticides for both human health and the environment, they understand the need to preserve the environment with less impactful lifestyle habits, as well as the reuse of materials such as: PET bottles, Tetrapak packaging, disposable cups, among others. The capacity for

teamwork and cooperation is also developed and, finally, it provides the modification of eating habits, as children will be interested in consuming food grown by themselves (CRIBB, 2010).



Graphic 6: Opinion about the implantation of gardens with UFP plants in a school environment.

Source: Authors (2021).

4. Conclusion

According to the results obtained in this research, we can verify that the most part of the respondents have already consumed some UFP or are interested in adding it to their diet; Hibiscus and Barbados gooseberry are the most popular UFP; Regarding home gardens, the interviewed population reported already having experience with this practice and 98.8% believe that the implementation of school gardens is a valid strategy to acquire environmental and nutritional knowledge.

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