



Preparation of Bocachico in goatling (*Prochilodus magdalenae*) as a strategy for teaching horticulture and food safety

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Abstract

The practice and knowledge of horticulture is increasingly of interest to different people. Due to the gastronomic versatility offered by vegetables and considering that Bocachico fish is essential for food security in the department of Córdoba, the culinary recipe for Bocachico in goatling with vegetables was prepared with a group of 25 people from the village of Popayán, Colombia, with ages between 47 and 53 years and high school level, and in this activity some basic concepts of horticulture were taught. Once the evaluation was carried out, on a scale of zero to five, it was found that 68% of the participants obtained an average rating of 4.3, 12% of 4.6 and 20% of 3.6, distinguishing the categories of “Good”, “Very good” and “Regular”, respectively. There were no “Bad” grades, with which the acquisition of significant learning of the knowledge imparted and interest in horticulture as a food safety strategy was considered, without influence of the age of the participants.

Keywords: Bocachico; Vegetable; Food safety; Situated cognition; Montería; Barranquilla

1 Introduction

The Bocachico (*Prochilodus magdalenae*), also called Sábalo Coporo, is native to the Magdalena River basin [1], and is considered the flagship fish of Colombia, standing out for its importance in the livelihood of more than 150,000 riverside families. of the Magdalena, Cauca, San Jorge and Sinú rivers [2].

The Bocachico is considered a typical Caribbean delicacy [3] and has a high cultural and anthropological value that makes it part of the idiosyncrasy, cultural legacy, and tradition of cities such as Montería and Barranquilla [1, 3].

The times when the consumption of Bocachico stands out the most are Lent and Holy Week, when the popular Bocachico in goatling recipe is prepared, which is part of the ancestral knowledge of Caribbean cuisine and consists of filling the fish with a variety of vegetables, wrap it in Bijao leaves (*Calathea lutea*), and slowly grill it over charcoal [3].

Due to its flavor, aroma, gastronomic versatility, ease of preparation and protein, Bocachico in goatling is a fundamental component for food safety, since the vegetable component that it includes provides vitamins and minerals that contribute to better nutrition for families both from the rural environment as well as from the urban environment.

Taking into account that horticulture is the science in charge of the study and production of horticultural plants, among which vegetables are included, and that it also produces 30% of the food consumed by humanity [4], and its teaching is constituted a means for people, regardless of their level of education or occupation, to learn new knowledge and techniques, this research was carried out in the village of Popayán, municipality of Canalete, department of Córdoba, Colombia, with the objective of instructing in knowledge of identification of some species of vegetables, their vernacular name, scientific name, family and gastronomic use, through the preparation of the Bocachico in goatling recipe, as a way

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to strengthen the planting of vegetables and strengthen the food security that bocachico offers in the rural and urban environment, integrating knowledge that can improve the quality of life of vulnerable communities.

2 Material and methods

The research was carried out in the village of Popayán, municipality of Canalete, department of Córdoba, Colombia, located at 8°40'12.7" North latitude and 76°12'31.9" West longitude.

From a population of 60 people with a high school level of education and age between 47 and 53 years, a sample of participants consisting of 25 individuals was selected, using the formula $n = \frac{z^2 * p * q}{E^2}$, where n is the size of the sample, z = 2.6 (value per normal table standardized for the 99% confidence level), p and q are the probabilities for and against, respectively, and E= 0.05 is the sampling error.

Taking into account that the Bocachico in goatling is a distinctive and desirable food on the Colombian Caribbean coast, the objective was to teach the participants how to prepare this culinary recipe and thereby transmit some basic knowledge of horticulture such as vernacular names, scientific names, botanical families and edible parts of the different species of vegetables that the gastronomic recipe includes, to strengthen skills in the knowledge of food safety and thereby promote the practice of horticulture at different levels of the social environment where the research was carried out.

To achieve the proposed objectives, the participants were instructed on the information of the ingredients necessary for the preparation of a unit of Bocachico in goatling (Table 1).

Other plant materials of horticultural origin were also used in the wrapping, cooking, and garnish (Table 2).

The ingredients and materials used to prepare the bocachico in goatling were purchased in the peasant market of Mocarí, Montería, Córdoba.

Table 1 Information on the ingredients and method to prepare the Bocachico in goatling recipe

Vernacular name	Amount (Unit)	Scientific name	Family	Edible part or use
Bocachico	1 of 800 g	<i>Prochilodus magdalenae</i>	Prochilodontidae	Meat
Lemon	1	<i>Citrus x limon</i>	Rutaceae	Fruit
Garlic	3 cloves	<i>Allium sativum</i>	Amaryllidaceae	Bulb (stem)
Sweet pepper (Topito)	2	<i>Capsicum annum</i>	Solanaceae	Fruit
Red Bell pepper	1	<i>Capsicum annum</i>	Solanaceae	Fruit
Carrot	1	<i>Daucus carota</i>	Apiaceae	Root
Chive	1	<i>Allium schoenoprasum</i>	Amaryllidaceae	Leaves
Red onion	1	<i>Allium cepa</i>	Amaryllidaceae	Bulb (stem)

Table 2 Information on the materials used to wrap, cook, and garnish the Bocachico in goatling

Vernacular name	Amount (Unit)	Scientific name	Family	Edible part or use
Bijao	2	<i>Calathea lutea</i>	Marantaceae	Leaf
Fique thread	1	<i>Furcraea andina</i>	Agavaceae	Leaf
Charcoal	2 kg	<i>Quercus robur</i>	Fagaceae	Stems
Cassava	1 kg	<i>Manihot esculenta</i>	Euphorbiaceae	Roots
Plantain	1	<i>Musa AAB Simmonds</i>	Musaceae	Fruit

To transmit the learning of the Bocachico in goatling recipe, the demonstrative explanation was made with the following procedure: wash the bocachico with water and lemon juice. Season the bocachico with salt to taste and crushed garlic. Regarding the vegetables, grate the carrot, cut the sweet pepper (Topito), the red bell pepper, the chives, and the red onion into julienne strips. Fill the Bocachico with the vegetables and wrap it in bijao leaves. Tie with the fique thread and place to roast over charcoal at a medium temperature for half an hour on each side. Unwrap the bocachico from the bijao leaves and serve it with fried plantain slices (patacones). Optionally it can be served with cooked cassava.

The learning of the horticulture concepts transmitted was evaluated through a questionnaire that was administered in writing to each of the participants (Table 3).

Table 3 Questionnaire to evaluate the learning of some horticulture concepts to the participants of the preparation of the bocachico in goatling

No.	Question	Answer
1	What is a vegetable?	Vegetable is an herbaceous plant of intensive or extensive cultivation that is cultivated for the use of its different organs such as root, stem, leaves, flowers, fruits, and seeds.
2	According to its edible part, how are vegetables classified?	According to their edible part, vegetables are classified into root vegetables, stem vegetables, leafy vegetables, flower vegetables, fruit vegetables and seed vegetables.
3	According to Table 1, group and classify the vegetables according to their edible part	Root: carrot; Stem: red onion, garlic; Leaf: chive; Fruit: lemon, sweet pepper (Topito), Red Bell pepper.
4	According to Table 1, indicate the scientific names and families of the vegetables used in the preparation of Bocachico in goatling	Example: Carrot: <i>Daucus carota</i> (Apiaceae)
5	According to Table 2, ¿what other materials of horticultural origin were used to prepare the Bocachico in goatling?	Bijao, fique thread, charcoal, cassava, plantain.

A rating scale of zero to five was used, where zero was the lowest rating and 5 the highest. Each question had a value of 1. To assign a qualitative assessment to the learning obtained by the participants through the ratings resulting from the application of the questionnaire, a rating scale was considered to assign to each participant according to their results (Table 4).

Table 4 Qualitative assessment scale of the learning obtained by the participants

No.	Qualification obtained	Qualitative appreciation of learning
1	0.00 - 2.90	Bad
2	3.00 - 3.90	Regular
3	4.0 - 4.50	Good
4	4.60 - 5.00	Very good

3 Results and discussion

When the fish were purchased at the Mocarí peasant market, it was found that they were tied with a vegetable fiber from the aerial roots of the *Ficus aurea* tree (Moraceae), known by the vernacular name of Strangler Fig (Figure 1), a species that in this context of traditional ethnobotanical use can also be considered as a horticultural plant, since the use of its roots as fiber to tie objects gives it the concept of its usefulness due to the use of one of its organs, and that is why it is appreciated and managed with individual and specialized work, plant by plant to obtain the expected product [5], which in this case is the fiber.



Figure 1 Vegetable fiber from *Ficus aurea*, a plant that is not a vegetable, but its product is used as such or as a horticultural plant, for which reason it must be of interest to the horticulturist (A) [5], and a peasant vendor from bocachico showing the fish tied with *Ficus aurea* fiber (B)

The direct execution of the culinary recipe using vegetables and the other materials used to wrap, cook, and garnish the Bocachico in goatling was important for the transmission of the horticultural knowledge that was wanted to be transmitted (Figure 2), which is very important in the teaching and learning process of rural communities, since the horticultural tradition is part of the knowledge that involves the characteristic features of the populations rooted in their culture and also takes into account the material, spiritual, sociocultural and even environmental [6], which find an important space for development in gastronomy as an important part of rural development and food security with local products, which could translate in the future into an important motivation for the establishment of local family-type orchards and generation of various horticultural crops.

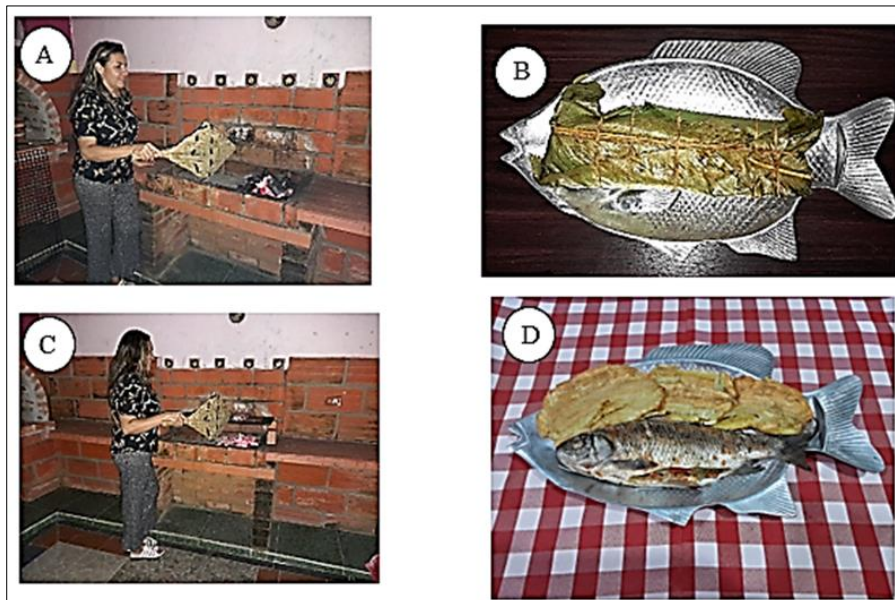


Figure 2 The ignition of charcoal requires that no materials derived from petroleum or toxic substances to human health be used (A), once the fish is filled with the vegetables, it must be wrapped in the Bijao leaf and tied firmly with the Figue thread (B), to further convey the flavor of the Bijao leaf to the fish, it can be additionally wrapped in a sheet of aluminum foil, and After an hour, the Bocachico in goatling is ready to eat with plantain slices (patacones)

The scores obtained in the evaluations carried out on the research participants are presented on a scale of zero to five (Table 5). It can be verified that the magnitudes of the qualifications obtained were presented from a minimum value of 3.50 to a maximum value of 4.60, obtaining an average value of 4.03, and the qualifications with the highest frequency

were 4.0 and 4.5 (Figure 3), with which It can be seen that none of the participants failed the evaluations, which proves that there was learning of the transmitted knowledge [7], which can account for the effectiveness of the theoretical-practical teaching process taught through a real life dynamic related to directly with the food security of the participants and a real utility in improving the quality of life in social, cultural and educational aspects mainly.

Table 5 Qualifications obtained in the evaluation and behavior of the frequencies

Qualification	Absolute frequency	Cumulative frequency	Relative frequency	Percentage relative frequency
3.50	2	2	0.08	8
3.60	1	3	0.04	4
3.70	1	4	0.04	4
3.80	1	5	0.04	4
4.00	6	11	0.24	24
4.20	3	14	0.12	12
4.40	2	16	0.08	8
4.50	6	22	0.24	24
4.60	3	25	0.12	12

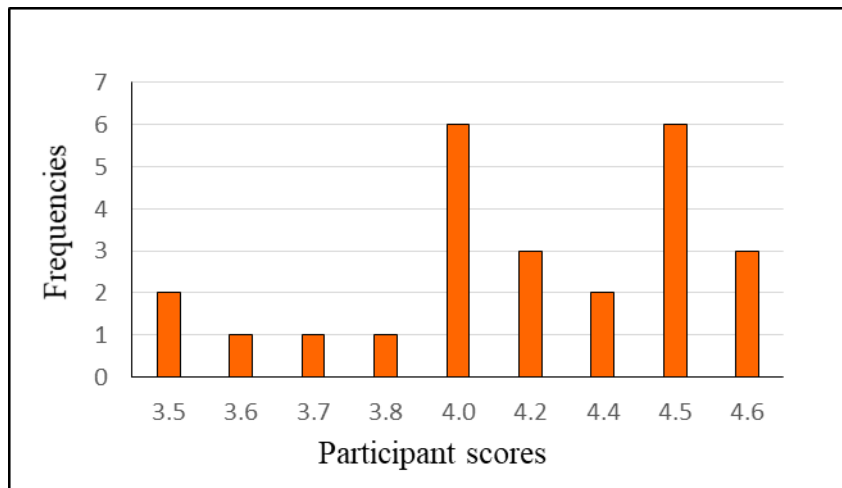


Figure 3 Absolute frequencies found in the qualifications of the participants to evaluate their learning in general horticulture by preparing the Bocachico in goatling recipe

Regarding the qualitative appreciation of learning, according to Figure 3, it was possible to verify that a total of 17 participating people obtained the "Good" assessment, while 5 people obtained a "Regular" rating and 3 "Very good".

Due to the above, it is possible to affirm that the majority of the individuals of the population participating in the study, were located in the learning categories that go from fair to good, as can be seen in Figure 4, which confers satisfaction in the learning dynamics carried out, taking into account that there were no participants qualified as bad, in contrast to the lower percentage of participants qualified as very good, which may be related to the lack of academic contact of the participating members with the scientific names, which they are words derived from the Latin language, and which at any given moment can certainly be difficult to remember by virtue of the specificity that this knowledge has with people who have previously been related to disciplines such as taxonomic botany, and who could better handle their learning.

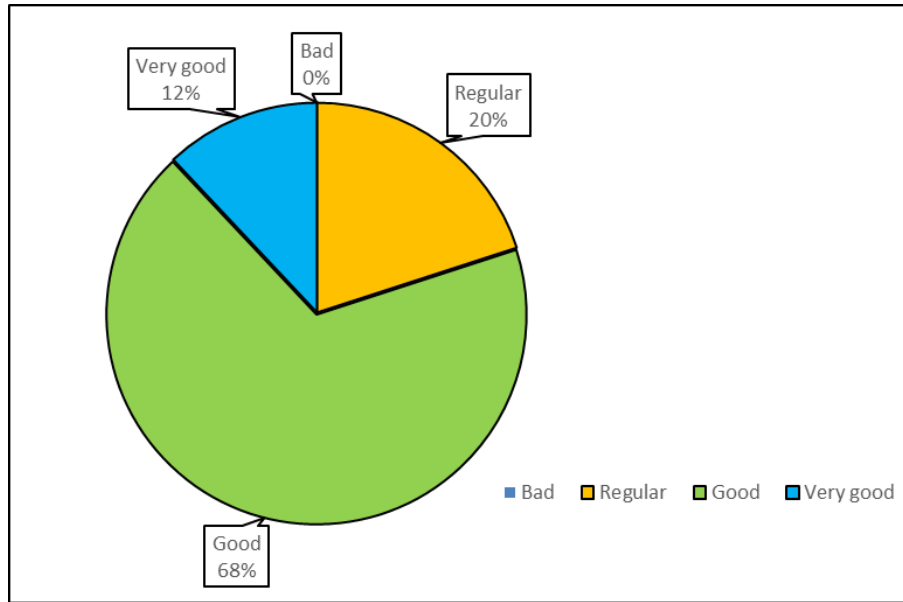


Figure 4 Distribution of the participants in the different qualitative categories of appreciation of learning

Given the previous observations, it can be inferred that the practice of preparing Bocachico in goatling recipe as a means of teaching basic concepts of horticulture constitutes a means of situated cognition, since the knowledge imparted is situated and contributes to artisanal learning, which is part and product of the activity, the context, and the culture in which it is developed and used. In this sense, the fact of learning and doing are inseparable actions [8], and therefore it is imperative that the participants must learn in the relevant context.

Within the groups of people differentiated by the qualifications obtained, it was possible to verify that the low values of variances and standard deviations both in the "Regular", "Good" and "Very Good" group, indicate that the qualifications obtained by the participants are not dispersed with respect to the average values obtained of 3.6, 4.3 and 4.6, respectively [9], as observed in Figure 5.

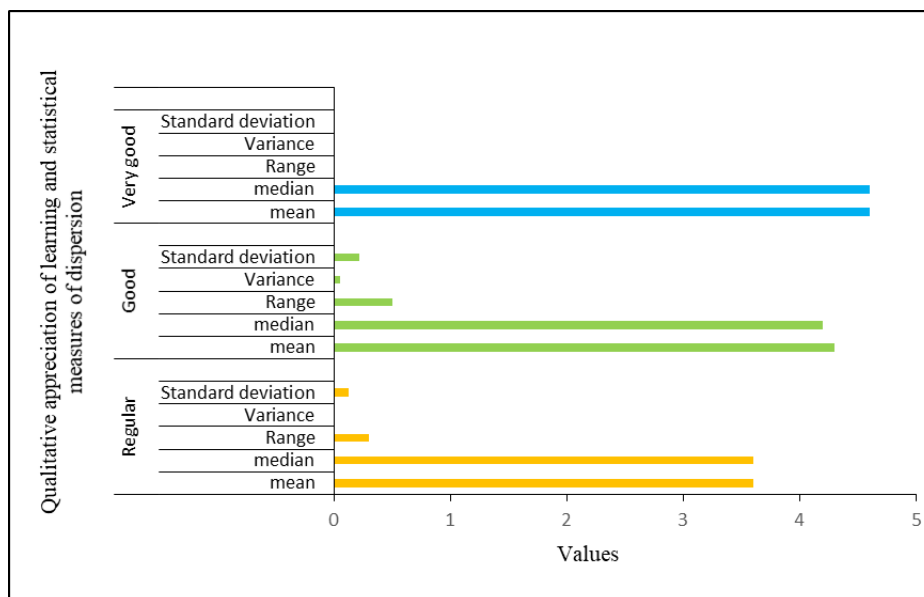


Figure 5 Statistical measures of dispersion obtained for the qualifications registered in the "Regular", "Good" and "Very good" groups

The analysis of variance carried out on the qualifications obtained by the participants with respect to their age (Table 6) did not present statistical differences ($p < 0.05$), so the age of the people did not influence their learning. In this case, it is important to point out that teachers must be permanently updated on new techniques, knowledge and pedagogical

strategies that contribute to obtaining a deep conception of agriculture as a science on which food safety is based [10], as well as the proper use and management of fruit and vegetable products to take better advantage of their preparation versatility, contributing to a better quality of life in urban and rural environments, and to efficiently carry out the teaching and learning process in different social groups that have significant age differences among their members.

Table 6 Analysis of variance (ANOVA) of the qualifications obtained with respect to the age of the participants in the preparation of Bocachico in goatling as a means of teaching general horticulture

ANOVA				
Source of variation	Degrees of freedom	Sum of squares	Mean square	F
Regression	1	0.63	0.63	0.001
Error	23	10442.72	454.03	
Total	24	10443.35		

With the results obtained, it is important to highlight that the preparation of Bocachico in goatling turned out to be an important means of teaching general horticulture, giving the participants a broad vision of the valuation of horticulture as a science, and the importance of vegetables in the daily diet of people, constituting an important source of vitamins and minerals mainly, through which gastronomic versatility can be achieved in all kinds of preparations, in this case the Bocachico, whose promotion is important, since it is an endemic species of the Colombian rivers, mainly Magdalena, Atrato and Sinú, and which has an important role as a food resource for artisanal fishing communities [11], for which its conservation must also be sought.

In addition to the above, it is important to consider the positive impact of the results obtained, in that horticultural activities help to obtain a lot of information regarding plants and the promotion of people's interest in managing their own crops, both at a family and on a larger scale, as well as opportunities to form work teams that promote group and collaborative work [12], developing confidence as an individual and as a member of a society. Furthermore, work related to horticulture has been associated with stress relief [13] in people and recovery from the hassles of the hectic daily life of modern people.

4 Conclusion

Significant learning of the knowledge masterfully transmitted through the teaching of the preparation of the Bocachico in goatling gastronomic recipe was evidenced, which includes species of vegetables that were used as models to exemplify themes inherent to basic concepts of general horticulture and safety food. In the measure of the qualifications obtained by the participants, they allowed to classify three groups of learning as "Regular", "Good" and "Very good", no group of the "Bad" category was obtained.

Compliance with ethical standards

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Disclosure of conflict of interest

No competing financial interests or of any other nature exist for the present investigation.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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Author's short biography



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