Survey on the use of unconventional food plants, medicinal plants, and organics in Inconfidentes – MG

Cristina de Magalhães Ávila[1], Cícero Eduardo de Rezende[2], Letícia de Alcântara Moreira[3], Wallace Ribeiro Correa[4], Bruno Manoel Rezende de Melo[5], Sindynara Ferreira[6]

[1] Instituto Federal de Educação, Ciência e Tecnologia do Sul de Minas Gerais, Campus Inconfidentes, Discente. cristina.avila@alunos.ifsuldeminas.edu.br
[2] Instituto Federal de Educação, Ciência e Tecnologia do Sul de Minas Gerais, Campus Inconfidentes, Discente. cicero.rezende@alunos.ifsuldeminas.edu.br
[3] Instituto Federal de Educação, Ciência e Tecnologia do Sul de Minas Gerais, Campus Inconfidentes, Gestora Ambiental. leticiamoreira@unifei.edu.br
[4] Instituto Federal de Educação, Ciência e Tecnologia do Sul de Minas Gerais, Campus Inconfidentes, Docente. wallace.correa@ifsuldeminas.edu.br
[5] Instituto Federal de Educação, Ciência e Tecnologia do Sul de Minas Gerais, Campus Inconfidentes, Técnico Administrativo. bruno.melo@ifsuldeminas.edu.br
[6] Instituto Federal de Educação, Ciência e Tecnologia do Sul de Minas Gerais, Campus Inconfidentes, Docente. sindynara.ferreira@ifsuldeminas.edu.br

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Abstract

Unconventional food plants (UFPs) and medicinal plants offer significant flavors, properties, and textures to be explored. The concept of food is transformed according to the population's knowledge about healthy foods and their benefits. Organic food production aims to reduce environmental impacts by cultivating healthier products, basing its production on the use of renewable energies while always seeking harmony with the environment. Rescuing and giving visibility to UFPs, medicinal plants, and organic production are actions that promote people's reconnection and their understanding of the place where they live. This study was conducted to survey the municipality of Inconfidentes – MG, regarding population's knowledge and use of UFPs, medicinal plants, and organic products, as well as to identify whether local organic production exists. A total of 1,042 people were interviewed, both in urban and rural neighborhoods, using a semi-structured questionnaire. Data were analyzed using descriptive statistics, categorized into frequency classes. The findings indicate that UFPs are less known compared to medicinal plants. Organic foods represent a niche market that is not yet widespread in Inconfidentes – MG; however, there is interest among interviewed farmers in this production. There is a demand for the implementation of a farmers' market in the municipality, serving as a venue for various goods, predominantly local produce.

Keywords: Farmers' market. Traditional plants. Food security. Curative use.

Introduction

Global awareness regarding the importance of quality of life and the environment is increasing, as evidenced by the growing concern for ecosystem preservation, proper use of natural resources, and the production and access to healthy foods. Actions aimed at encouraging the consumption of local produce are fundamental for the diversity and richness of people's diets, the perpetuation of good eating habits, and the appreciation of Brazil's sociocultural heritage (Sartori *et al*., 2020).

In Brazil, developing actions that interconnect biodiversity and food sovereignty presents significant challenges in food security. Recognizing and disseminating neglected species with substantial nutritional and bioactive potential becomes extremely important (Sartori *et al*., 2020). This context includes unconventional food plants (UFPs), medicinal plants, and organic foods.

Encouraging the consumption of healthy foods, especially among children and young people, is crucial and counters the current trend of increased consumption of ultra-processed products. This shift, notably observed in Brazil, indicates high caloric intake and a lack of nutrient balance due to the replacement of *in natura* or minimally processed plant-based foods with ready-to-eat industrialized products (Brasil, 2014).

UFPs integrate human communities and diverse cultures, serving as a tool of self-affirmation and empowerment, referred to as "food

and ecological sovereignty" (Kelen *et al*., 2015). While in many places UFPs are not yet recognized as food, in certain localities, they have always been part of the cuisine, passed down through generations (Brasil, 2015). Overall, these plants lack a structured production chain, and their cultivation is predominantly conducted by family farmers, whose knowledge of their management is transmitted across generations; moreover, many of these crops are established in small home gardens for family consumption, with no commercial appeal (Zacharias, Carvalho, Madeira, 2021).

Medicinal plants in Brazil have a strong connection with Indigenous culture, influenced by European and African traditions. According to the Brazilian Collegiate Board Resolution No. 26 of May 13, 2014, from the Brazilian Health Regulatory Agency (ANVISA), a medicinal plant is defined as a "*plant species, cultivated or not, used for therapeutic purposes*." The derived product is defined as a "*product obtained from the extraction of the fresh medicinal plant or the herbal medicine, containing the substances responsible for the therapeutic action, which may occur in the form of extract, fixed and volatile oil, wax, exudate, and others*." The plant material is described as "*comprising the medicinal plant, the herbal medicine, or the plant derivative*" (Anvisa, 2014; free translation).

This class of plants is also closely related to nutraceuticals and functional foods. However, in the search for new compounds with pharmacological activities of interest to the pharmaceutical industry, medicinal plants can be highlighted as an important natural source of these compounds (Ordoñez, Govín, Blanco, 2004).

The use of medicinal plants associated with the consumption of natural organic foods can promote significant health benefits, as no chemical or synthetic compounds are used in the production of these plants, preserving biodiversity, soil cycles, and biological activities, thus constituting more balanced ecosystems (Domingues, 2011). The concept of eating habits is highly variable, as new knowledge and discoveries about healthy foods and their benefits are continually being disseminated. Notably, the demand for organic products has been increasing in the recent years (Nascimento *et al.*, 2013). The production and consumption of organic foods represent significant values for the Brazilian economy and the health of the population, serving as a form of social and economic sustainability for family farming (Coelho, 2001).

Notably, consumer habits have been driving market changes, as their willingness to pay for highest-quality products more adequately reflects changes in consumption patterns (Castro Neto *et al.*, 2010). The revival and proper visibility of UFPs, medicinal plants, and organic production enable the promotion of knowledge and the reconnection of people with their place of residence.

In light of the above, this study was developed to gather information about the knowledge and use of organic products, UFPs, and medicinal plants in the city of Inconfidentes, southern Minas Gerais, aiming to establish a relationship between producers and consumers regarding production, commerce, and consumption for a possible implementation of a farmers' market in the municipality.

Material and methods

The survey was conducted in the municipality of Inconfidentes, which is located 869 meters above mean sea level, with the following geographic coordinates: 22° 19' 00" S and 46° 19' 40" W. Situated in the southern part of the state of Minas Gerais, the municipality covers an area of 145 square kilometers and with 7,301 inhabitants (IBGE, 2022). According to Ferreira and Marinho (2013), Inconfidentes comprises 32 neighborhoods—28 in the rural area and four in the urban area—although the urban population exceeds the rural.

The research was conducted using both qualitative and quantitative methods via interviews. The target audience was broad, without identification by name, educational background, purchasing power, or social class, and the interviews were conducted randomly with individuals either encountered in transit or directly approached at their homes. As an inclusion criterion, only individuals aged 18 or older were surveyed, while those who refused to respond to the questionnaire were excluded.

Data collection was conducted from November 2022 to December 2023 in both urban neighborhoods and rural areas indicated by the Technical Manager of the Municipal Technical Assistance and Rural Extension Company (EMATER), considering rural neighborhoods with higher figures of vegetable production.

A semi-structured questionnaire (Appendix I) with standardized questions was employed to facilitate data organization. This instrument enabled the exploration of the population's knowledge regarding unconventional food plants (UFPs), medicinal plants, organic product consumption, and organic production. Questions were directed to the general public, with additional specific questions for those who identified as rural producers. The study was conducted in accordance with the Resolution No. 510 of the Brazilian National Health Council, dated April 7, 2016 (Brasil, 2016a).

The data were processed following the recommendations of descriptive statistics, with each question categorized into percentage frequency classes generated using the Sisvar software (Ferreira, 2011).

Results and discussion

Among the 1,042 interviewees, 35.4% were aged from 18 to 30 years, 19.6% from 30 to 40 years, 17.6% from 40 to 50 years, 13.1% from 50 to 60 years, 8.4% from 60 to 70 years, 4.3% from 70 to 80 years, and 1.6% were aged over 80 years. In this sample, 54.9% of the respondents were women and 45.1% were men. Regarding residence, 78.1% of the interviewees lived in the urban area and 21.9% in the rural area.

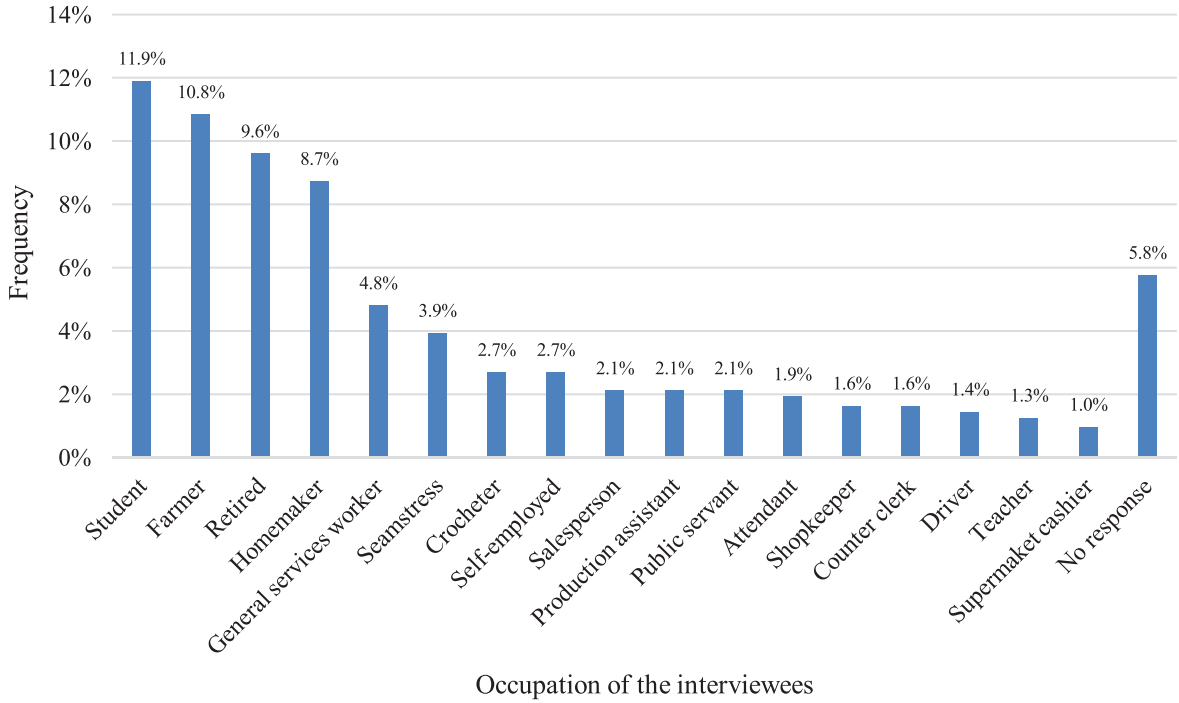
Concerning occupations, 11.9% were students, 10.8% were farmers, followed by 9.6% retirees, among other categories. Occupations representing less than 1% of the respondents, which comprises a total of 76 professions, were not displayed in the figure and 5.8% of the interviewees did not report their occupation (Figure 1).

Located in the mesoregion of southern Minas Gerais, Inconfidentes have an economy focused on agriculture and livestock, especially with highlights in the production of coffee, garlic, milk, maize, sponge gourd, banana, and beans, as well as a textile industry oriented toward the knitwear sector. In addition to its resident population of 7,328 people, according to the 2019 estimate (IBGE, 2022), the municipality also hosts an average of 1,200 transient students at the Federal Institute of Education, Science, and Technology of Southern Minas Gerais (IFSULDEMINAS), Inconfidentes Campus, which accounts for the 11.9% of students surveyed (Figure 1).

According to Ferreira and Marinho (2013), in the rural area of Inconfidentes/MG, small and medium-sized properties cultivating coffee crops predominate. These findings are consistent with the 11.8% of farmers interviewed.

Regarding the knowledge of the term UFPs, 82.5% of the interviewees reported that they were not familiar with it, while only 17.5% stated they were aware of it. Among the 182 respondents who were familiar with UFPs, the most frequently cited species were lamb's ear (*Stachys byzantina*), common sow-thistle (*Sonchus oleraceus*), Barbados gooseberry (*Pereskia aculeata*), American taro (*Xanthosoma*

Figure 1. Occupation of the interviewees in the municipality of Inconfidentes/MG, both in rural and urban areas. IFSULDEMINAS – Inconfidentes Campus. Inconfidentes/MG, 2024.



Source: authors (2024).

sagittifolium), creeping woodsorrel (*Oxalis corniculata*), taro (*Colocasia esculenta*), Indian lettuce (*Lactuca indica*), monarch rosemallow (*Hibiscus radiatus*), garden nasturtium (*Tropaeolum majus*), common purslane (*Portulaca oleracea*), and slender amaranth (*Amaranthus viridis*). Respondents could select more than one option in the questionnaire (Figure 2).

The option "others" was used for UFPs mentioned by less than 7.1% of respondents, and the cumulative percentage for this category reached 24.7% (Figure 2). Those respondents who indicated familiarity with some UFPs reported having inherited this knowledge from their families and that they routinely consume these plants.

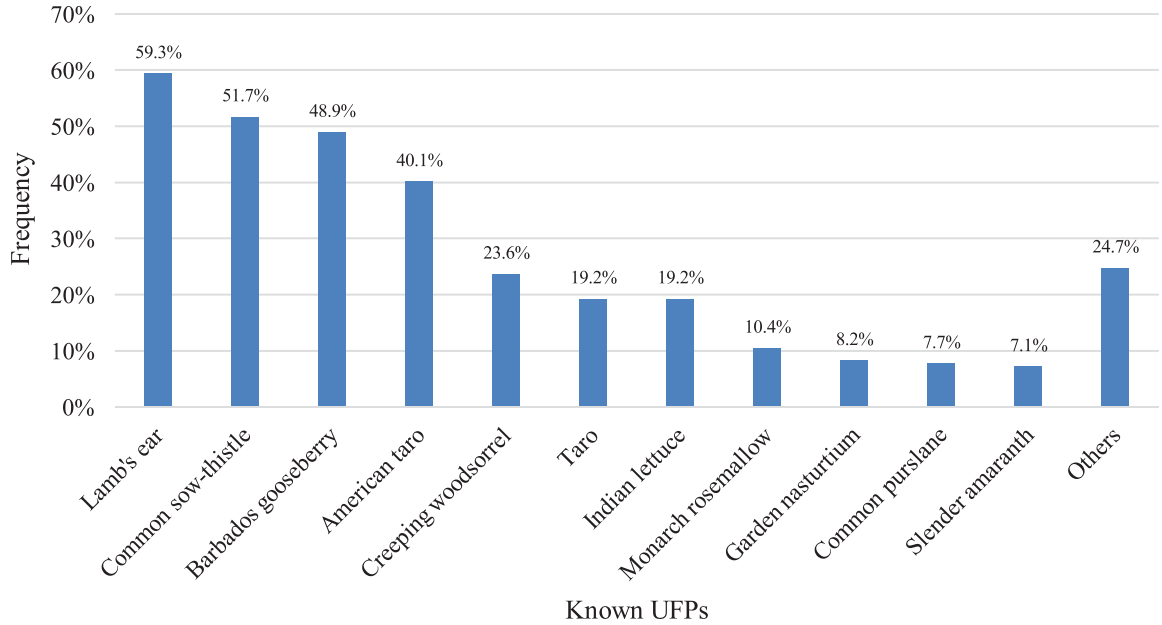
Regarding the propagation environment, UFPs are found in pastures, among agricultural crops, and in home gardens. More than half of them have an herbaceous growth habit, presenting smaller height. They have short production cycles but propagate more easily, being mainly found dispersed along pastures, among crops, and in home gardens (Barreira, 2013).

Among the percentage of respondents who stated not knowing UFPs (82.5%), many could potentially include these plants as part of their daily diet; however, poor popular knowledge leads to these plants being characterized as a worthless plant, easily found in nature, regarded as weed or simply ignored (Liberato, Lima, Silva, 2019) When consumed, these plants promote family autonomy and ensure food and nutritional sovereignty (Paula Filho, 2015).

The disuse and lack of knowledge about these plants are linked to several factors, such as market competition with conventional vegetables, low market availability, little information about their nutritional potential, and the population's dietary habits (Kinupp, Lorenzi, 2014).

During interviews, respondents were asked about their consumption of UFPs; 35.8%

Figure 2. Unconventional food plants that the respondents in the municipality of Inconfidentes/MG know best, both in rural and urban areas. IFSULDEMINAS – Inconfidentes Campus. Inconfidentes/MG, 2024.



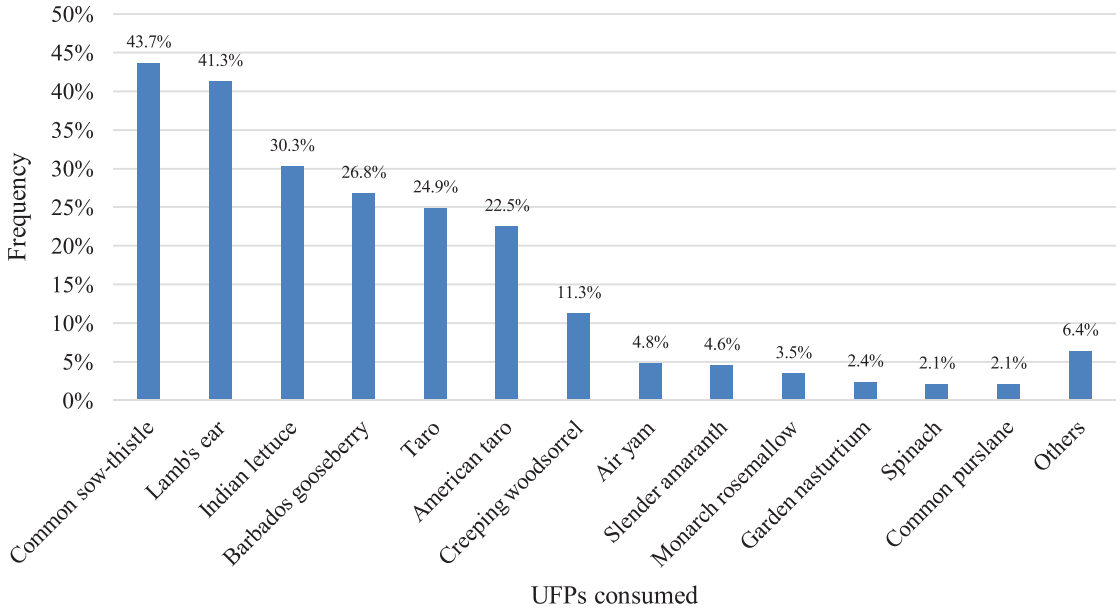
Source: authors (2024).

mentioned that they have consumed or still consume them, 63.3% reported that they have never consumed them, and 0.9% said they do not remember if they have ever consumed them. Of the 373 people who reported having consumed or still consuming UFPs, the most cited were, respectively: common sow-thistle, lamb's ear, Indian lettuce, Barbados gooseberry, taro, American taro, creeping woodsorrel, air yam (*Dioscorea bulbifera*), a local variant of slender amaranth, monarch rosemallow, garden nasturtium, spinach (*Spinacia oleracea*), and common purslane (Figure 3). The "others" category was defined for UFPs cited by less than 2.1% of respondents, which together accounted for 6.4% (Figure 3). Notably, respondents provided more than one example of a UFP they had consumed during the interview.

An increase in the consumption of these plants could improve the nutritional condition of economically disadvantaged individuals in both urban and rural areas across different regions of Brazil (Almeida, Correia, 2012). UFPs are among the food sources that grow in natural environments without synthetic inputs or the clearance of new areas (Bressan *et al*., 2011). The fact that many of these plants are found in areas managed by farmers becomes a fundamental strategy for strengthening the food sovereignty of many families (Cruz-Garcia, Price, 2011). However, despite their low cost, many of these plants remain unknown and underused by a significant portion of the population (Kinupp, Barros, 2007; Luizza *et al*., 2013).

Regarding medicinal plants, 85.3% of respondents said they were acquainted with them, and only 14.7% stated that they did not know any medicinal plant. Among the 889 people who mentioned knowing medicinal plants, the most known are mint (*Mentha spicata*) at 57.9%, boldo (*Peumus boldus*) at 34.9%, lemon grass (*Cymbopogon citratus*) at 31.8%, and fennel (*Foeniculum vulgare*) at 28.1%. Other medicinal plants were also mentioned and respondents could listed several other options. In the "others" grouping, 62 plants were included, each cited by less than 3.9% of respondents, totaling 70.6% (Figure 4).

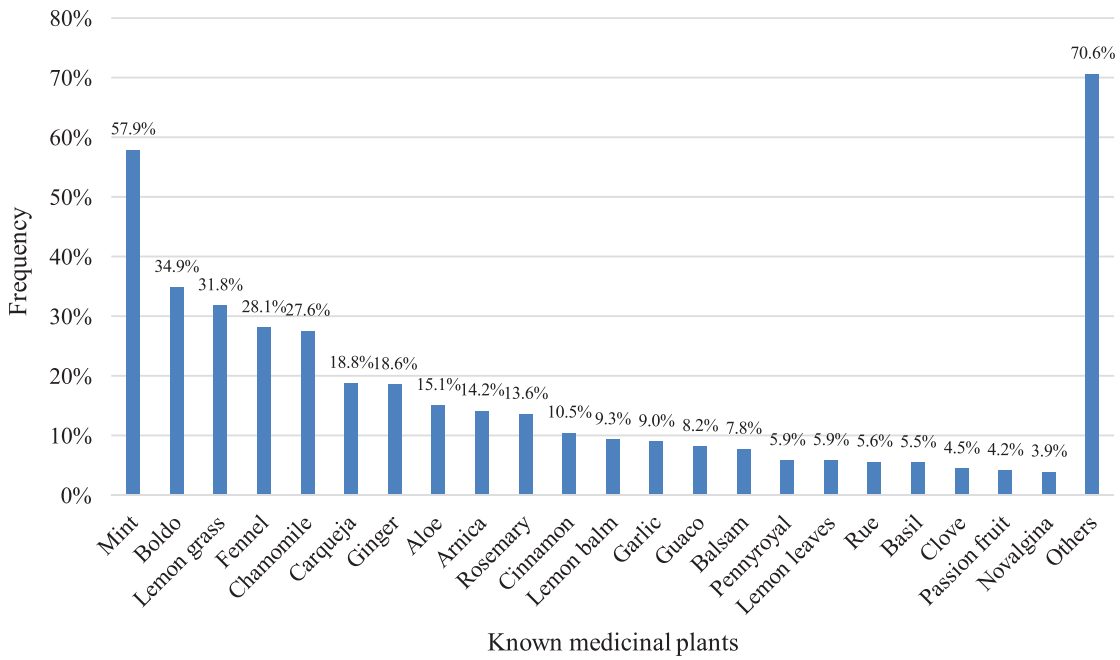
Figure 3. Unconventional food plants (UFPs) most consumed by the respondents in the municipality of Inconfidentes/MG, both in rural and urban areas. IFSULDEMINAS – Inconfidentes Campus. Inconfidentes/MG, 2024.



Source: authors (2024).

In Brazil, the National Policy on Medicinal Plants and Phytotherapy, established in 2006, and the National Program on Medicinal Plants and Phytotherapy, created in 2008, aim "*to guarantee the Brazilian population safe access to and rational use of medicinal plants and phytotherapy, and to promote the sustainable use of biodiversity, the development of the productive chain and the national industry*" (Brasil, 2016b; our translation).

Figure 4. Medicinal plants known by the respondents in the municipality of Inconfidentes/MG, both in rural and urban areas. IFSULDEMINAS – Inconfidentes Campus. Inconfidentes/MG, 2024.



Source: authors (2024).

Among the respondents, 63.5% have used or are currently using medicinal plants, while 36.5% stated that they have not used or do not use medicinal plants. Of the 662 people who reported having used or still using medicinal plants, the most commonly used are: mint at 50.5%, chamomile (*Matricaria chamomilla*) at 24.5%, boldo at 22.2%, fennel at 18.3%, lemon grass (*Cymbopogon citratus*) at 18.3%, and ginger (*Zingiber officinale*) at 17.1%, among others. Note that respondents could mention more than one species during the interview (Figure 5). In the "others" grouping, 45 plants were included, each cited by less than 1.8% of respondents, totaling 22.1% (Figure 5).

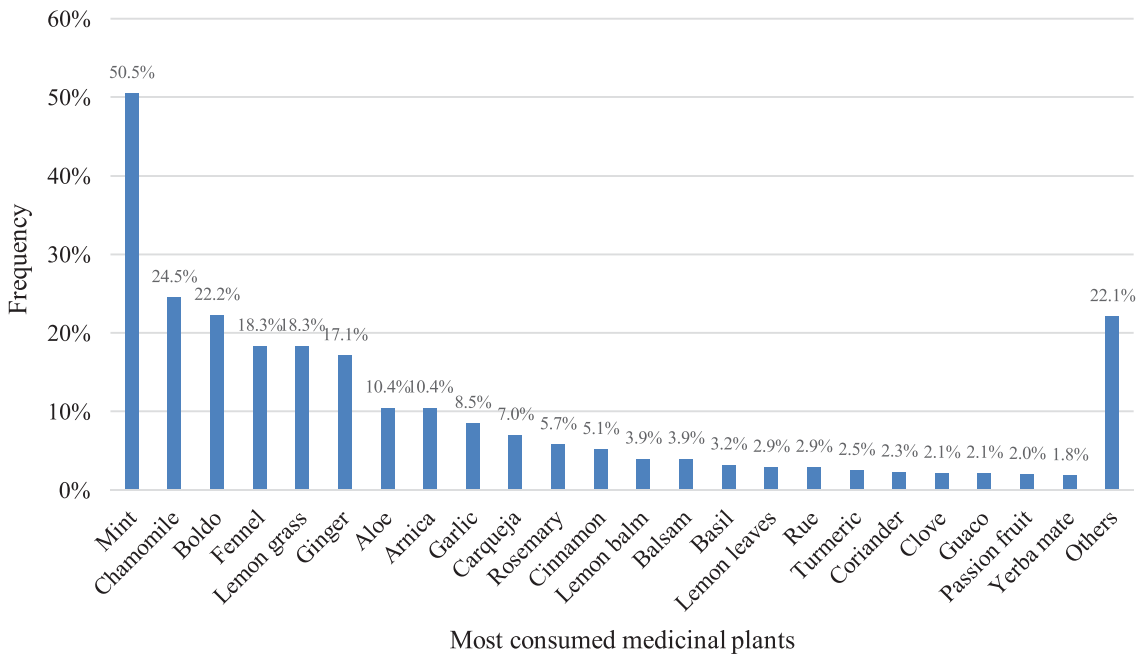
Many people are still reluctant to use medicinal plants, but this reality is changing as producers invest in improving quality and, consequently, build confidence in their products so that healthcare professionals feel secure in prescribing them (Rigotti, 2009). Nevertheless, one cannot disregard the role of the physician in any treatment, and if possible, the two forms of knowledge should be integrated.

In the past decade, there has been an increase in the use of alternative therapeutic practices supported by policies within the Brazilian Unified Health System (SUS), particularly in the use of medicinal plants and phytotherapy. In the work of Zeni and Bosio (2011), the authors observed that 21.9% of respondents used homemade remedies, with medicinal plants obtained from their home gardens being the main choice. The most cited among these were lemon verbena, chamomile, and mint.

The use of plants for medicinal purposes is not recent; in fact, it holds a millennial tradition that is being passed down orally through generations, with these resources being used for the treatment of ailments. Moreira *et al*. (2002) described that these practices are transmitted among family members, carrying historical, cultural, and socioeconomic value.

The evolution of conventional medicine has not hindered the progress of popular healing practices, as they offer a better cost-benefit relationship for the population by promoting

Figure 5. Medicinal plants most consumed by the respondents in the municipality of Inconfidentes/MG, both in rural and urban areas. IFSULDEMINAS – Inconfidentes Campus. Inconfidentes/MG, 2024.



Source: authors (2024).

health via local produce. Such use is influenced by habits, customs, and socioeconomic parameters, as well as by the mode of transmission of this knowledge. Oral transmission alone can be a negative factor, as such information may be lost or altered over time.

Regarding organic products, 29.9% of respondents reported consuming organic products, 69.9% did not consume them, and 0.2% did not express an opinion on the matter. Of all respondents, when asked if they would pay more for these products, 52.6% would accept paying extra, while 46.7% would not, and 0.7% did not express an opinion.

Regarding price, of the 548 respondents who said they were willing to pay more for an organic product, 30.7% stated they would pay 5% more, 39.6% said they would pay 10% more, 14.6% said they would pay 15% more, 11.9% reported they would pay 20% more, and 3.2% said they would pay more than 20% extra.

Organic food production uses fewer synthetic inputs, which can reduce some costs. However, productivity is significantly lower compared to conventional production, resulting in a higher final cost. Additionally, the demand for organic products exceeds supply, and many consumers are willing to pay more for these products, which also influences the final price.

According to Ferreira and Coelho (2017), schooling level impacts the decision to consume organic foods more than *per capita* income. The authors noted that income was very important in explaining the quantity purchased of these goods—especially organic foods, which are more expensive—and, as expected, organic foods are more sensitive to price variations in all categories compared to conventional ones. Thus, increases in the prices of organic foods tend to reduce the quantity consumed in a proportion greater than that observed for conventional foods. Conversely, a reduction in organic food prices positively influences consumption to a greater extent than conventional foods (Ferreira, Coelho, 2017).

Regarding farmers' market, respondents were asked if they would buy from this market niche; 99% responded positively and only 1% responded negatively. For those who answered positively, they were asked about the best day for such an event in Inconfidentes – MG. Of these, 27.3% said Saturday morning, 6.3% Saturday afternoon, 61.5% Sunday morning, 3.8% Sunday afternoon, and 1.1% preferred not to opine on the best day and time for the market.

Also regarding farmers' market, respondents were asked about the types of goods; 51.7% expressed a preference for organic products, 90.5% for conventional products, 62.8% for the inclusion of handicrafts, 74.7% for homemade baked goods, 55.9% for cultural attractions, and 69.8% for snacks. In the "others" option, participants suggested spaces for bingo (0.1%), book exhibitions (0.2%), pet products (0.4%), broths (0.1%), savory snacks (0.1%), and ready-made seasonings (0.1%).

In this context, of the 1,042 respondents, 74.5% expressed greater interest in products produced or manufactured in the municipality of Inconfidentes – MG, while 25.5% were indifferent regarding the production location.

Farmers' markets also provide farmers with access to the market, generating income for purchasing products for family consumption, and are considered an important distributive policy structure that enables the population's income to remain within the municipality and contributes to its development (Silvestre *et al*., 2006). Moreover, the development of open markets can add value to producers' sales by shortening the supply chain, as well as generating social and environmental benefits for the community (Hunt, 2007).

The freshness and quality of the products are some of the reasons driving the increasing

interest of consumers in farmers' markets in recent years, including in countries such as New Zealand, Australia, Great Britain, Canada, and the United States, where these markets had disappeared mainly because of supermarkets. A reason for this resurgence is that consumers are becoming increasingly selective in their search for food, resulting in a reevaluation of how food is cultivated, distributed, and sold (Guthrie *et al*., 2006).

Regarding the frequency with which participants purchase fruits and vegetables, 59.4% shop weekly, 39.8% shop biweekly, and 0.8% did not express an opinion.

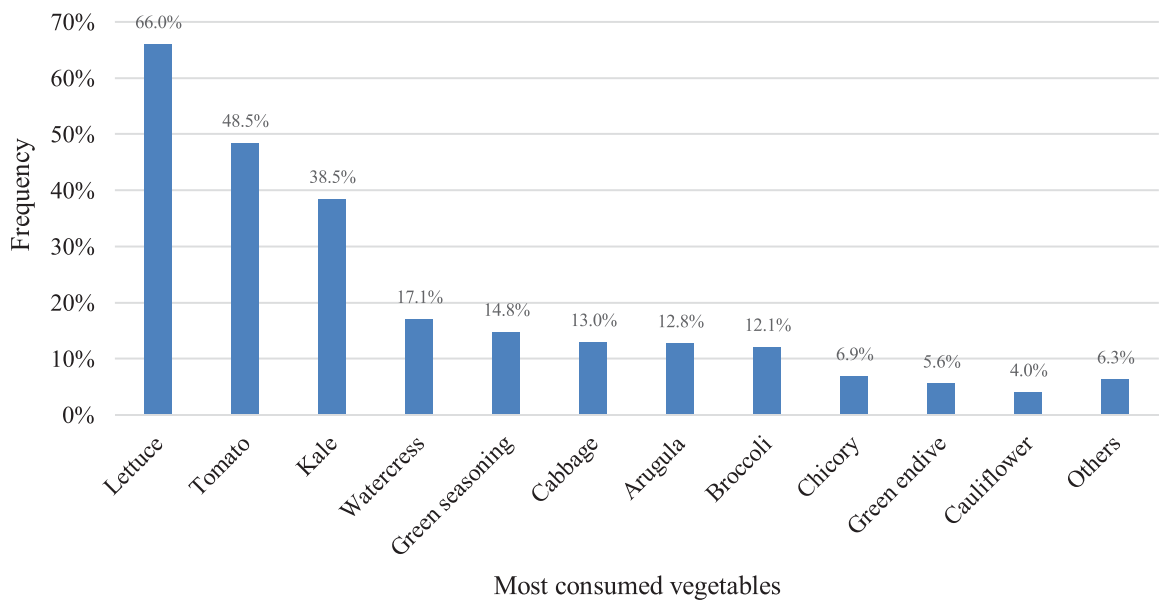
Among the vegetables most consumed by the respondents, who could mention more than one species, the most prominent were lettuce, tomato, kale, watercress, green seasoning, cabbage, arugula, broccoli, chicory, green endive, and cauliflower (Figure 6). In the "others" option, four species of vegetables with less than 4.0% citation were grouped (Figure 6).

Among the fruits most consumed by the respondents, who could mention more than one species, were banana, orange, apple, pineapple, papaya, lemon, watermelon, mango, grape, strawberry, and guava (Figure 7). In the "others" option, 18 species of fruits with less than 13.7% citation were grouped, totaling 58.4% (Figure 7).

According to Kotler and Keller (2006), consumer behavior is influenced by social factors, such as reference groups, family, social roles, and status. This behavior is also influenced by personal characteristics, such as age and life cycle stage, occupation, economic circumstances, personality, self-image, lifestyle, and values, leading people to purchase different goods and services throughout their lives.

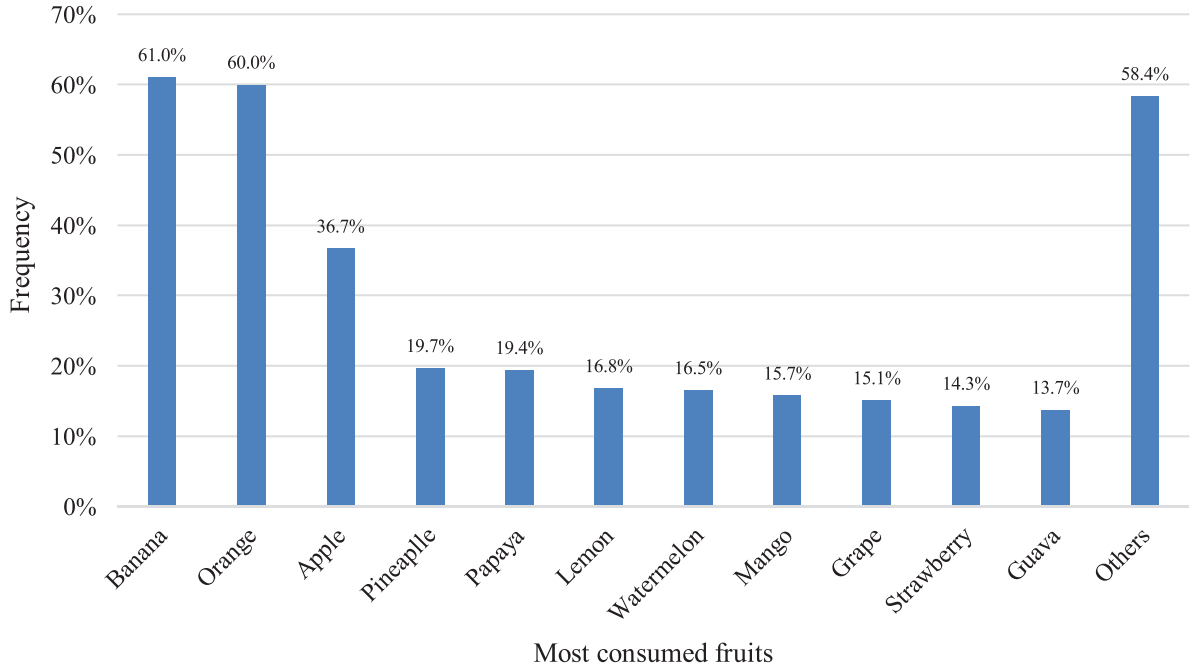
These behaviors are in line with what was proposed by Cazane, Machado, and Pigatto (2008), who found in their research that the purchasing behavior of fruit, vegetable, and legume consumers is influenced by social factors (family and friends) and personal factors (sex, age, family income, schooling level, and marital status). Comparison of these results with similar studies confirms the positive influence of schooling level and average income on consumer behavior. Variables such as convenience, flexible

Figure 6. Vegetables most consumed by the respondents in the municipality of Inconfidentes/MG, both in rural and urban areas. IFSULDEMINAS – Inconfidentes Campus. Inconfidentes/MG, 2024.



Source: authors (2024).

Figure 7. Fruits most consumed by the respondents in the municipality of Inconfidentes/MG, both in rural and urban areas. IFSULDEMINAS – Inconfidentes Campus. Inconfidentes/MG, 2024.



Source: authors (2024).

hours, and product freshness positively influence the choice of purchase location (Cazane, Machado, Pigatto, 2008).

Among the respondents, 52.3% stated that they would buy handicrafts at the open market, 31.2% responded negatively, and 16.5% preferred not to answer. Regarding homemade baked goods, 92.1% would buy them at the farmers' market, citing homemade rolls and breads, while 7.9% would not.

According to Coutinho, Neves, and Silva (2006), farmers' markets are considered an important structure for the supply of food in cities, especially in more rural regions, as they promote economic and social development, fostering the economy of these towns. They offer consistently fresh products and allow for a close relationship between consumers and producers, enhancing their bargaining power.

Of the 113 producers interviewed (10.8% of the sample), 79.7% reported cultivating under the conventional system, 16.8% under the conventional system without pesticides, and 3.5% under the organic system.

Among organic producers, 50% are certified and produce strawberry, lettuce, kale, carrot, beet, tomato, sugarcane, and coffee.

Of the 113 farmers, when asked about the sale price of organic products compared to conventional products, 31.0% indicated that they observed a price difference, whereas 69.0% could not identify any difference in value between organic and conventional products.

In conventional or pesticide-free cultivation, only 23.9% of the interviewed farmers expressed interest in migrating to organic production, whereas 76.1% stated they were not interested. When asked about what is necessary to become an organic producer, the farmers mentioned technical guidance (22.0%), financial resources (22.0%), training (17.4%), market demand (13.8%), certification (14.7%), and other factors (10.1%).

Conclusion

Unconventional food plants (UFPs) are not widely known when compared to medicinal plants. Organic foods represent a niche market that is not yet widespread in Inconfidentes – MG; however, there is interest among interviewed farmers in this type of production. There is a demand for the implementation of a farmers' market in the municipality, serving as a venue for various goods, predominantly locally produced items.

Acknowledgments

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Appendix I – Semi-structured questionnaire used during the interviews

GENERAL PUBLIC

Age:
Gender:
Resident of the municipality: ( ) Yes ( ) No.
Where? ( ) Rural area, neighborhood:_____ ( ) Urban area, neighborhood: _____
Primary Occupation:

1. Are you familiar with the term PANC – which stands for Unconventional Food Plants? ( ) Yes ( ) No
1.2 If yes, which plants do you know that are considered PANCs in the municipality?

2. Have you ever consumed any PANC? ( ) Yes ( ) No
2.1 If yes, which species have you consumed?

3. Do you know any medicinal plants? ( ) Yes ( ) No
3.1 If yes, which medicinal plants do you know?

4. Have you ever used or do you currently use medicinal plants? ( ) Yes ( ) No
4.1 If yes, which medicinal plants have you used?

5. Do you consume organic products? ( ) Yes ( ) No

6. Would you be willing to pay more for an organic product? ( ) Yes ( ) No

7. If yes, what percentage would you be willing to pay?
( ) 5% ( ) 10% ( ) 15% ( ) 20% ( ) more than 20%

8. Would you shop at a farmers' market if there were one in Inconfidentes? ( ) Yes ( ) No

9. What day of the week would you prefer for a market to function? ( ) Saturday ( ) Sunday

10. What time of the day would you prefer for the market to function on the chosen day?
( ) Morning ( ) Afternoon

11. What type of market should be held in Inconfidentes?
You may check more than one option:
( ) Organic ( ) Conventional ( ) Handicrafts ( ) Baked goods ( ) Cultural events ( ) Snacks
( ) Others: _____

12. Are you more interested in products produced in the municipality or are you indifferent to the place of production?
( ) More interested ( ) Indifferent

13. How often do you buy fruits and vegetables?
( ) Weekly ( ) every two weeks

14. What fruits and vegetables do you consume the most?

15. Would you buy handicrafts at a market? ( ) Yes ( ) No

16. Would you buy bread, sweet rolls, or other baked goods at a market? ( ) Yes ( ) No

SPECIFIC TO FARMERS

17. What type of cultivation system do you use? ( ) Conventional ( ) SAT ( ) Organic
If organic:

18. Do you have certification? ( ) Yes ( ) No
18.1 If yes, which one?

19. Which species are produced under the organic system?

20. Can you identify the price difference between organic and conventional products?
( ) Yes ( ) No
If conventional or SAT:

21. Are you interested in transitioning to organic production? ( ) Yes ( ) No
21.1 If yes, can you identify what is needed to become an organic producer?
( ) Technical assistance ( ) Financial resources ( ) Training ( ) Market demand ( ) Certification ( ) Others: _____