




**Medicinal plants used in gastrointestinal disorders by the academic community  
of Campus CECITEC - Tauá, Ceará**

**Plantas medicinais utilizadas nos distúrbios do trato  
gastrointestinal pela comunidade acadêmica do Campus CECITEC -  
Tauá, Ceará**

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**ABSTRACT**

Medicinal plants are used by a large part of the world population as an alternative medicinal resource for the treatment of various diseases, since, for many communities, this represents a more accessible resource in relation to allopathic medicines. There is a great diversity of medicinal plants that are used by people in the fight against diseases of the gastrointestinal tract, which justifies the present work. The objective of this study was to evaluate the ethnoknowledge of the Academic Community of CECITEC on the use of medicinal plants used in gastrointestinal disorders. The survey was conducted in 2019 through an interview using a structured questionnaire. The data obtained were transformed into charts and graphics to better elucidate them. The choice of participants was made at random, where they signed a Free and Informed Consent Term (FICT) of participation. The research consisted of 72 students. It was cited 32 varieties of plants used in the prevention and combat of infections common to the gastrointestinal tract. The most cited plants were: boldo (*Peumus boldus Molina*) with 29.6% and macela (*Egletes viscosa* (L.) Less) with 17%. The most used parts were the leaves and seeds in the form of tea. It was concluded that CECITEC students have a vast knowledge about the use of medicinal plants.

**RESUMO**

As plantas medicinais são empregadas por grande parte da população mundial como um recurso medicinal alternativo para o tratamento de diversas enfermidades, uma vez que, para muitas comunidades isso representa um recurso mais acessível em relação aos medicamentos alopáticos. Há uma grande diversidade de plantas medicinais que são utilizadas pelas pessoas no combate a enfermidades do trato gastrointestinal o que justifica o presente trabalho. O objetivo do trabalho foi avaliar o etnoconhecimento da Comunidade Acadêmica do CECITEC sobre o uso de plantas medicinais utilizadas nos distúrbios do trato gastrointestinal. A pesquisa foi realizada em 2019 através de entrevista utilizando um questionário estruturado. Os dados obtidos foram transformados em tabelas e gráficos para melhor elucidar os mesmos. A escolha dos participantes se deu de forma aleatória onde, os mesmos assinaram um Termo de Consentimento Livre e Esclarecido (TCLE) de participação. A pesquisa constou com 72 alunos. Foi citado 32 variedades de plantas usadas na prevenção e combate das infecções comuns ao trato gastrointestinal. As plantas mais citadas foram: o boldo (*Peumus boldus Molina*) com 29,6% e a macela (*Egletes viscosa* (L.) Less) com 17%. As partes mais utilizadas foram as folhas e as sementes em forma de chá. Concluiu-se, que os alunos do CECITEC possuem um vasto conhecimento sobre o uso plantas medicinais.

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Digestivo.

## Introduction

Medicinal plants have been used by man since the beginning of their history and long before the appearance of writing mankind already used herbs for medicinal purposes (Toscano, 2011). Medicinal plants are used by a large part of the world population as an alternative medicinal resource for the treatment of various diseases, since in many communities they represent a more accessible resource in relation to allopathic drugs (Silva et al., 2018; Santos et al., 2015). According to ANVISA (National Agency for Sanitary Surveillance), medicinal plant is every plant or parts of it that contain the substances or classes of substances responsible for therapeutic action (Brasil, 2019).

Brazil is the largest holder of genetic diversity in the world, with about 55,000 species cataloged (out of an estimated total of between 350,000 and 550,000), and has a broad tradition of the use of medicinal plants perpetuated to popular knowledge transmitted between generations (Fonseca, 2012). Despite the richness of the Brazilian flora, the number of information about medicinal plants has grown very little. Despite the fact that there is not much investment for research with medicinal plants, it is estimated that at least half of the plants contain substances called active ingredients, that is, they have curative and preventive properties for many diseases (Lorenzi & Matos, 2002).

In Brazil, there are about 20% of the medicinal species cataloged by the United Nations Educational Scientific and Cultural Organization (UNESCO), facilitating the use of the curative potential of vegetables for the treatment of diseases in the country. Thus, many plants have not yet been studied regarding their therapeutic potential, however, the traditional knowledge about plants for medicinal use has already made them as an integral part of popular medical practices, being applied by up to 90% of the economically deprived population of the Northeast, for the purposes of their health problems. Brazil is among the twelve nations that protect 70% of the planet's biodiversity (Matos, 2002).

Brazil is only rich in diversity of genetic resources and also a country rich in cultures developed by individuals who have had and have to fight for life with their hands, handling the environment and knowing in detail in all its connections and interrelations (Elizabetsky, 2003). Health is explained as a welfare effect, which is the result of a dynamic balance and this implies the physical and psychological dimensions of the human being, as well as the increased interactions of the natural and social environment (Capra, 2012). Assessing the diversity of the cultural context allows an equivalent form of care and with a view to the integrality of the human being who, according to Araujo, (2022) makes incorrect use of drugs, without a medical prescription, thus increasing the risk of intoxications, which is linked to the level of information about the incorrect use of medications.

In this context, the need arises to study the most varied species of medicinal plants have been used in the treatment of gastrointestinal disorders that have efficiency proven by science. The first systematically effective drug against gastric ulcers was carbenoxolone, discovered as a result of research with *Glycyrrhiza glabra* L. (Licorice), commonly used by indigenous peoples (Aktar & Munir, 1989). In Brazil, there is a great diversity of medicinal plants that are used by people to fight diseases of the gastrointestinal tract. Often, these species are known by different local names and there are various forms of use according to the culture experienced by the population (Lima, et al., 2019; Araújo, 2021).

Data in the literature prove the wide variety of chemicals isolated from plants that showed antiulcerogenic activity and against gastrointestinal tract disorders, such as the work of Hiruma-Lima (2000) which soldesidcrotonine and trans-crotonine of *Croton cajucara* Benth (sacaca), and that of Rao et al. (1997) which isolated the ternatin of *Egletes viscosa* L. (Macela).

The choice of the theme of the present work was due to medicinal plants presenting themselves as promising choices to relieve morbidity present in numerous pathologies due to the great potential they have to supply different phytotherapeutic needs of the population (Araújo, 2021), which justifies the present study that aimed to evaluate the ethnoknowledge of the academic community of the Education Center, Sciences and Technology of the Inhamuns Region - CECITEC, Tauá - CE, on the use of medicinal plants used in the treatment of gastrointestinal tract disorders, seeking in the current literature, studies that prove the efficacy of medicinal plants mentioned by the academic community and relating them to the theme of this research.

## **Methodology**

### **County location**

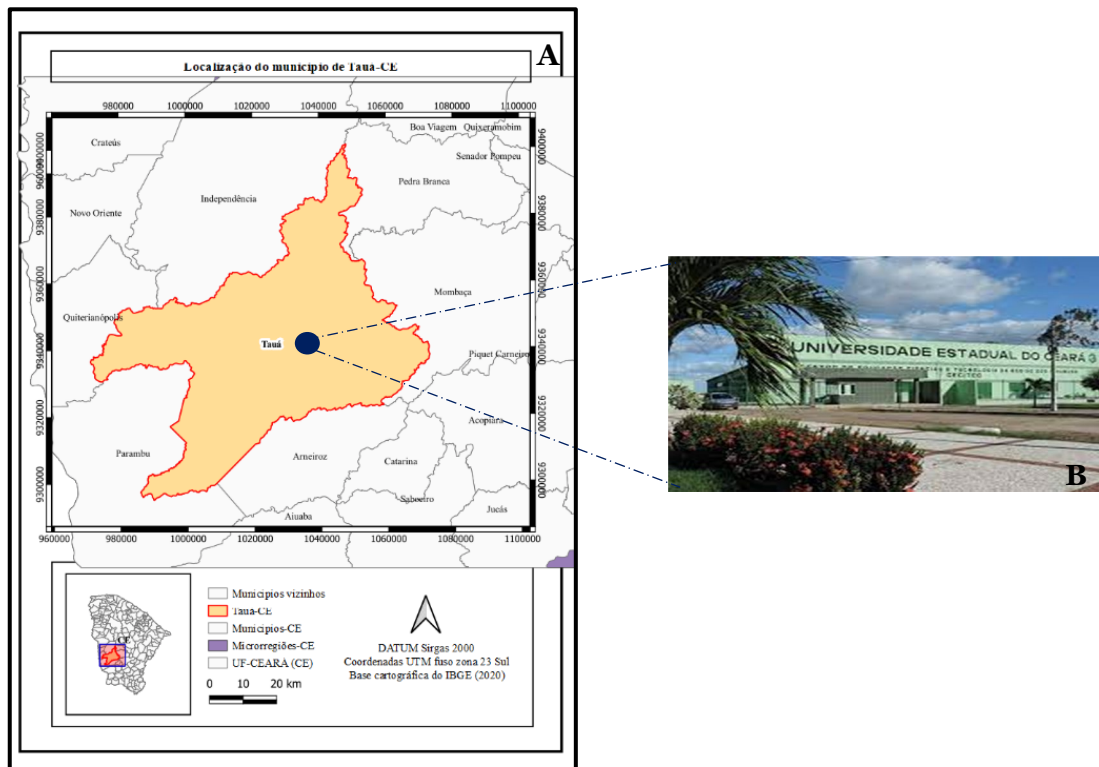
The study was carried out at the Center for Education, Science and Technology of the Inhamuns Region - CECITEC, city of Tauá, state of Ceará, northeast Brazil located in the Inhamuns Region, in February of 2019. The county of Tauá is at a distance of approximately 357 km from the capital Fortaleza, obeying the following geographical coordinates: latitude: 06° 00' 11" S, longitude: 40° 17' 34" W, altitude: 402.7 m and occupies a territorial unit area of 4,010.618 km<sup>2</sup>, with 59,062 inhabitants, has a semi-arid warm tropical climate, with rains from February to April, relief sertaneja depressions and residual massifs, with open scrub caatinga vegetation and thorny deciduous forest rainfall (average in 2019) of 416.9 mm (Ceará, 2009; IBGE, 2020).

The county of Tauá is bordered to the north with Pedra Branca and Independência, to the south with Parambú and Arneiroz, to the east with Mombaça and Pedra Branca, and to the west with Quiterianópolis and Parambú (Figure 1).

Since 1995 the county is composed of 8 districts, among them the district of Tauá (headquarter), Barra Nova, Carrapateiras, Inhamuns, Marrecas, Marruás, Santa Teresa and Trici (Ceará, 2009; IBGE, 2020).

**Figure 1.**

A: Map of the county of Tauá - CE. B: UECE/CECITEC - TAUÁ.



Source: A: Author. B: Melo (2019) (Photo - mar. 2019).

## Research typology

This work makes initial use of an exploratory bibliographic review, complemented by a qualitative and quantitative analysis of the data obtained through a questionnaire. The research was carried out based on methodologies proposed by (Tavares, 2014; Oliveira, 2017b) with adaptations.

Exploratory research is developed with the objective of adapting an overview of a given fact, being carried out mainly when the chosen theme is little investigated and it becomes difficult to formulate precise hypotheses about it, and, also used as a first step for other studies familiarizing the researcher with the phenomenon investigated, effecting accurate descriptions of reality and seeking to detect the relationships between its components. Additionally, it can be considered as an important way to produce hypotheses that will be tested in later research, making exploratory research, which, by its characteristics, is strongly qualitative, a design that can be used to initiate quantitative studies (Gil, 2008; Cervo et al., 2007).

It is known that a quali-quantitative research enables the analysis of legal processes in the face of qualitative methods of quantitative methods with structural analysis of phenomena, quali-quantitative research is supported by each other (Schneider et al., 2017). According to Silva et al. (2017), CAPES - Coordination for the Improvement of Higher Education Personnel (*Coordenação de Aperfeiçoamento de Pessoal de Nível Superior*) establishes parameters for the validation of a scientific research, and they are: validity (obtaining an answer for a study), reliability (reliable data) and generalization (studying individual elements and/or groups to formulate a hypothesis that can encompass a population). Such criteria are common to quantitative and qualitative research, with no superiority between them.

### **Ethical issues and sampling**

During the execution of the research, ethical issues were taken into account:

- i) Only subjects who voluntarily agreed to participate were part of the population sample of this study;
- ii) There was protection of the database during the research period, under the custody of the coordinator of the same;
- iii) There is absolute secrecy about all information collected, guarding the privacy of participants in the presentation of the results.

In this study, 72 CECITEC students were interviewed. Initially, the objectives of the research were well explained in the Academic Community, and the students' voluntary collaboration was requested, where they were signed the Informed Consent Form (*Termo de Consentimento Livre e Esclarecido - TCLE*). Once the participation was accepted, the interview began. The research of ethnoknowledge about medicinal plants was analyzed through quantitative and qualitative approaches.

This study follows the ethical principles of Resolution 466/12 of the National Health Council (*Conselho Nacional de Saúde*), in which data used in this study do not address nominal data of participants or any others that establish their identification. In this context, it was not necessary to submit to the Research Ethics Committee (*Comitê de Ética em Pesquisa - CEP*), according to Resolution of the National Health Council (*Resolução do Conselho Nacional de Saúde*) No. 466 of December 12<sup>th</sup>, 2012 (Brazil, 2012).

### **Agents studied, data collection and analysis**

CECITEC has three higher education courses: Biological Sciences, Chemistry and Pedagogy. Courses run morning and evening. The work was carried out in February of 2019. The interviewed people study at CECITEC and are aged between 18 and 51 years, belonging to both sexes. The interviewed people were randomly selected.

To perform the work on the ethnobotanical survey of the use of medicinal plants, a structured quantitative-qualitative questionnaire was used as a methodological resource during the interview with the students.

The questionnaire consisted of 5 questions that addressed the traditional knowledge about the use of medicinal plants to treat disorders of the gastrointestinal tract, which were the species of medicinal plants used, the therapeutic indications, the forms of use, frequency, which part of the plant is used, the way of preparation, with whom they obtained ethnobotanical knowledge, as well as whether or not they indicate the use of medicinal plants for the treatment of gastrointestinal disorders.

Data were collected in three days in the morning, evening and night periods at CECITEC.

The collected data were organized and analyzed through an ANOVA, presented in the form of graphs (lines) and chart made in Word and Excel 2019. The relative frequency (%) was calculated by the following formula:  $Fr = \left(\frac{Fi}{n}\right) \times 100$ , where (Fr) is the relative frequency; (Fi) the Absolute Frequency and (n) represents the amount of data.

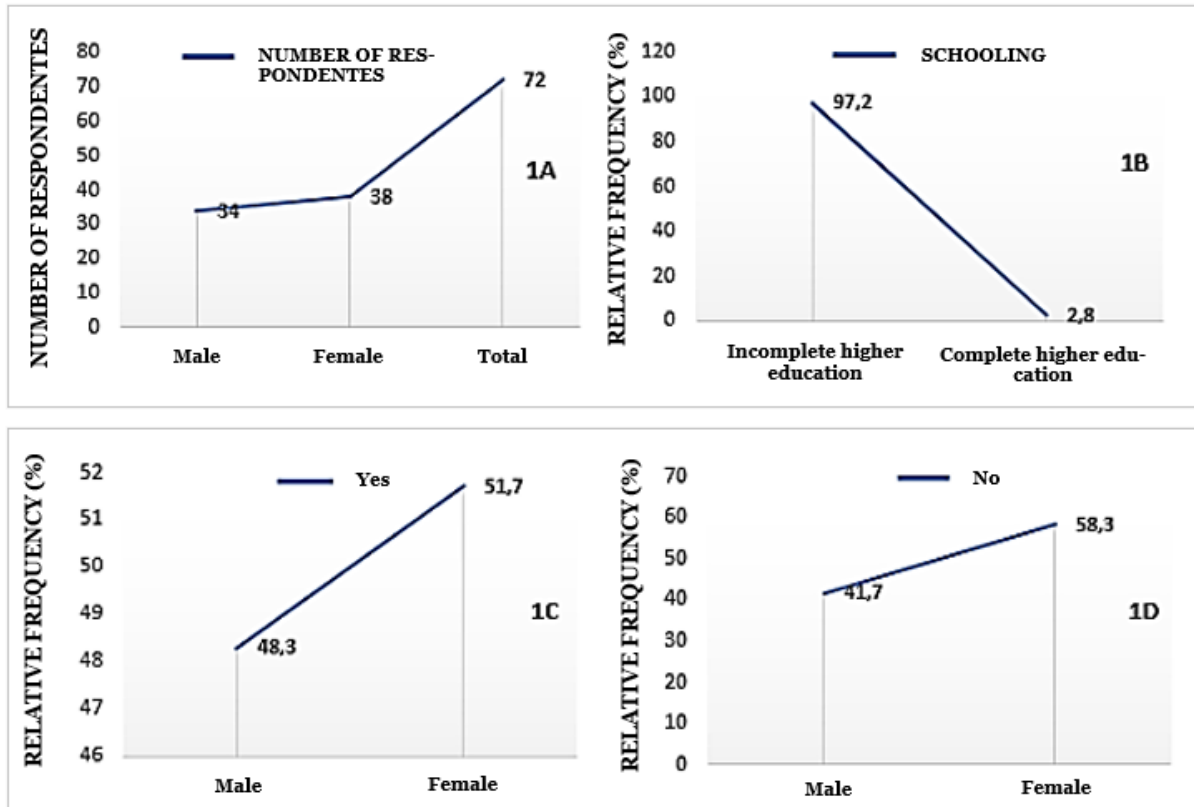
## Results

The academic community of CECITEC is composed of 266 students distributed in the courses of Biological Sciences, Chemistry and Pedagogy, and most students come from the interiors of the county and even from other neighboring cities that have their way of life inseparable from the sustainable use of biodiversity and common goods, passing the knowledge acquired through generation times to generation. Seventy-two students from CECITEC were interviewed, representing 27% of the 266 students on campus, where 34 students interviewed were male, corresponding to 47.2% of the participants and 38 female students, corresponding to 58.8% of the interviewed (Graph 1A). Most students (97.2%) are studying higher education and 2.8% have completed higher education (Graph 1B).

The research showed that 60 of the 72 interviewed people use medicinal plants to treat diseases related to the gastrointestinal tract, and 29 of those surveyed are male, which corresponds to 48.3% and 31 are female, representing 51.7% of respondents (Graph 1C) and 12 students do not use medicinal plants to treat gastrointestinal infections, where 5 are male, which corresponds to 41.7% and 7 are female, which is equivalent to 58.3% (Graph 1D).

**Graph 1.**

A. Number of respondents at CECITEC. B. Level of education of the surveyed. C. Practitioners in the use of medicinal plants to treat disorders of the gastrointestinal tract. D. Non-practitioners in the use of medicinal plants to treat disorders of the gastrointestinal tract.



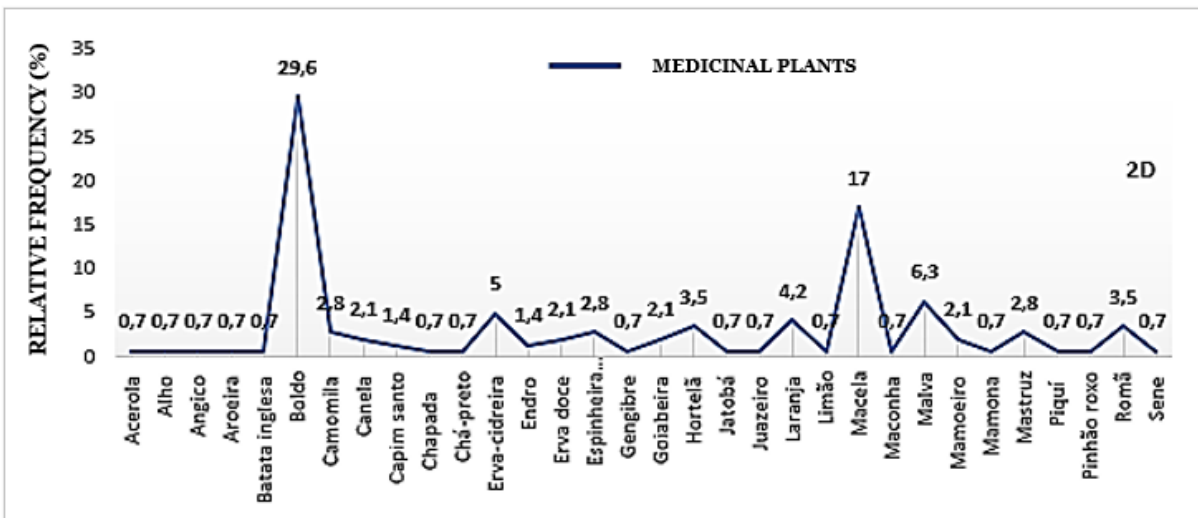
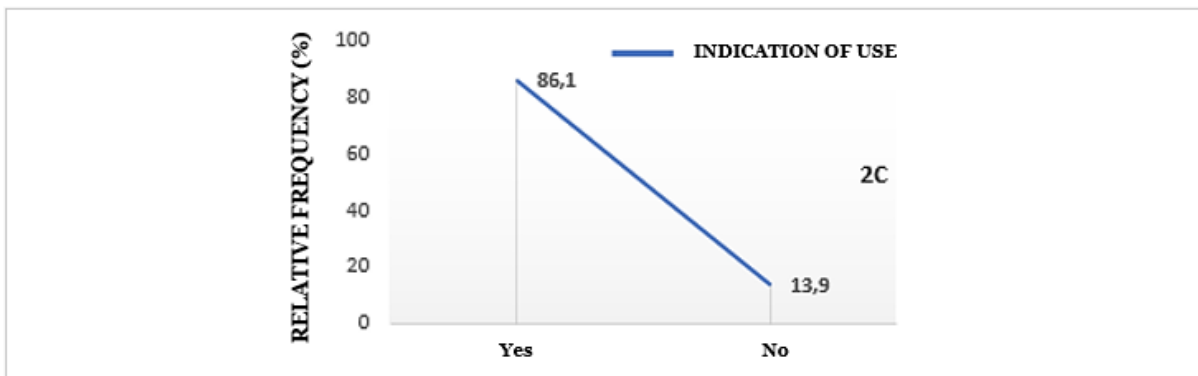
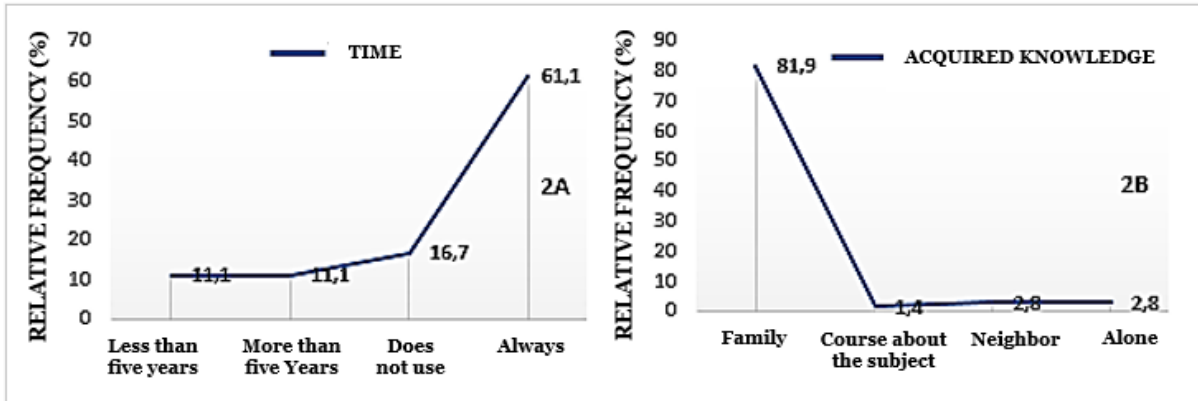
Source: Research data.

Graph 2A illustrates that the majority of CECITEC students are adherents of folk medicine where, 61.1% of students always use medicinal plants to treat gastrointestinal tract disorders and 16.7% have never used it, 11.1% use it for more than ten years and 11.1% use it less than five years ago. Graph 2B identifies that the majority of respondents 81.9% acquired knowledge about the use and benefits that medicinal plants have to treat diseases of the gastrointestinal tract with family members, while 1.4% had knowledge in ethnobotanic courses, 2.8% with neighbors and 2.8% learned alone.

Most of the interviewed people recommend the use of medicinal plants to treat diseases related to gastrointestinal tract disorders, because 86.1% say that plants can help fight and even cure disease and 13.9% do not advise use (Graph 2C). Graph 2D shows a list of 32 species of medicinal plants cited by the students to treat gastrointestinal tract disorders and the relative frequency with which the plants were mentioned. The most cited plants were: “*boldo*” with 29.6%, “*macela*” 17%, and “*malva*” with 6.3%.

**Graph 2.**

A. Time using medicinal plants to treat disorders of the gastrointestinal tract. B. Knowledge of the use of medicinal plants to treat disorders of the gastrointestinal tract. C. Advice of the interviewed people regarding to the use of medicinal plants to treat disorders of the gastrointestinal tract. D. Medicinal plants used by CECITEC students to treat gastrointestinal tract disorders.



Source: Research data.



The most cited plant by the respondents was “boldo” with 42 citations, then “macela” 24 times, “malva” 9 times, lemon balm 7 times, orange 6 times, pomegranate and mint were cited 5 times, holy spinel, chamomile and mastruz 4 times, cinnamon, fennel, guava and papaya tree 3 times, dill was cited 2 times and aroeira plant, angico, acerola, garlic, english potato, chapada, black tea, ginger, jatobá, juazeiro, lemon, marijuana, castor, piquí, purple pinion and sene were cited only 1 time during the research, totaling 142 citations (Chart 1).

The part of the plant most used by the interviewed people was the leaf (55.40%), then the seeds (17.60%), bark (10.80%), fruits (6.70%), flower (4%), grains (2%), root (1.30%), branches/stem/whole part of the plant (1.30%) and sap (0.67%).

Research has identified that tea/infusion is almost always prepared by decoction of plant parts and is mostly used to treat diarrhea, gauze, abdominal pain, flu, seasickness, gastritis, ulcers, cramps, poor digestion, constipation, stomach pain, nausea and etc. In natura/powder/infusion form are used against gauze, abdominal pain, heartburn, poor digestion, diarrhea, stomach pain, nausea, constipation, swelling in the abdomen and “stewing”. Associated with milk is used to treat mainly gastritis and constipation. Syrups are preparations used especially against throat infections, bellyache and flu. I use it in the form of cigarettes to treat anxiety. In the form of olive oil to fight versand the juice in the fight against flu and throat infections (Charts 1 and 2).

**Chart 1.**

*List of plants with popular name, part of the plant used, forms of use, treated gastrointestinal disorder and number of citations mentioned by CECITEC students against gastrointestinal tract infections.*

POPULAR NAME	PART USED	FORMS OF USE	TREATED GASTROINTESTINAL DISORDER	NUMBER OF CITATIONS
Chapada	Bark	Tea	Vomit	1
Mastruz	Leaves/All plant	Shake with milk (animal)	Gastritis; constipation	4
Aroeira	Bark	Immersed in water	Gastritis	1
Fennel	Leaves; seeds	Tea; cake	(*)	3
Macela	Seeds; flower; fruit; grain	Tea; raw with water; fresh; mastication; infusion; ground	Gauze; bellyache; heartburn; poor digestion; diarrhoea; stomach (pain); nausea; constipation; swelling (abdomen); stewing; several	24
Pomegranate	Bark; fruit	Pieces; sauce in water; tea; mastication	Diarrhoea; throat (pain)	5
Acerola	Fruit	Juice	Inflammations in the throat	1
Boldo	Leaves	Tea; infusion	Poor digestion; stomach (pain); heartburn (gastritis); gauze; gastric secretions; diarrhoea; liver disorders; bellyache; constipation	42
Guava	Guava eye; leaves; flower	Tea	Bellyache; diarrhoea; nausea	3
Orange	Leaves; bark (fruit)	Tea; <i>in natura</i>	Nausea; bellyache; flu; malaise	6
Lemon balm	Leaves; twigs	Tea	Bellyache; constipation; poor digestion; fever (intestinal)	7
Garlic	Seeds	Syrup	Sore throat	1
Angico	Bark	Extract	Kidney pain	1
English potato	Root	Juice extraction	Gastritis	1
Camomile	Flowers	Tea	Gastritis; ulcer; several	4

Cinnamon	Branches; peel	Tea	Astringent; poor digestion	3
Holy grass	Leaves	Tea	Malaise; flu	2
Black tea	Leaves	Tea	Vomit	1
Dill	Seeds	Tea	Diarrhoea	2
Holy spinel		Tea	Gastritis; ulcers; stomach (pain); reflux	4
Ginger	Root	Tea	Stomach (pain)	1
Mint	Leaves	Tea	Poor digestion; cramps	5
Jatoba	Bark	Soaking in water	Inflammation	1
Juazeiro	Leaves	Tea	Poor digestion	1
Lemon	Seeds	Syrup	Sore throat	1
Marijuana	Leaves	Cigarette	Anxiety	1
Malva	Leaves	Tea; molasses; raw	Sore throat; bellyache; flu	9
Papaya	Leaves	Tea	Sore throat; stomach (pain)	3
Castor	Grain	Olive oil	Worms	1
Purple pinion	Sap	Sap with water	Diarrhoea	1
Piquí	Fruit oil	Lambedor	Inflammations in the throat	1
Sene	Leaves	Tea	Constipation	1

(\*) Not informed by the respondents.

Source: Research data.

The researched make use of medicinal species for therapeutic purposes mainly through teas/infusion, *in natura*/powder, in milk, lambedor/syrup/honey, cigarette, olive oil and juice/juice of the plant (Chart 2). The research also showed that the majority of respondents use plants to treat disorders of the gastrointestinal tract in the form of tea. Tea was mentioned 135 times by participants which is equivalent to 85%. The *in natura* form/powder/infusion was mentioned 9 times, or 5.6%. The use of part of the plant associated with milk was mentioned 5 times, which represents 3.1% and the use in the form of lambedor/syrup/honey was mentioned 6 times, with 3.8%. In the forms of cigarettes and olive oil, it was mentioned only once with 0.6%, and juice/juice of the plant was mentioned 2 times, which represents 1.2% (Chart 2).

### Chart 2.

Forms of use of medicinal plants by CECITEC students.

Forms of use	Absolute frequency	Relative frequency (%)
Tea/infusion	135	85
<i>In natura</i> /powder	9	5,6
With milk	5	3,1
Lambedor/syrup/honey	6	3,8
Cigarette	1	0,6
Olive oil	1	0,6
Juice	2	1,2
<b>Total</b>	<b>159</b>	<b>99,9</b>

Source: Research data.

## Discussion

The use of plants in the treatment of diseases is described as one of the oldest practices of humanity (Yunes, 2001). Therefore, it is believed that medicinal plants have been tested and homologated through their prolonged use, considering them effective and safe, without side effects (Ostrosky et al., 2008). In this context, the study and validation of the use of medicinal plants with popular indications are extremely important.

According to researchers, it is notorious all the recognition about the acquired knowledge to be based through the past generations, in such a way that this knowledge is transmitted to other people, consolidating the family culture, but also because it is known that these have phytotherapeutic properties and curative potential against various pathogens (Oliveira, 2017a; Araujo, 2021; Lima et al., 2019). Therefore, indicated for use against diseases such as to treat disorders of the gastrointestinal tract. Therefore, ethnobotanical studies are relevant because they indicate how people gather knowledge, how knowledge is transmitted to the new generations, how plants are used, as well as the indication that such plants have.

The research showed that most respondents recommend the use of medicinal plants to treat diseases related to gastrointestinal tract disorders. In this argument, the use of medicinal plants is evidenced in the prevention and treatment of diseases, because the use of plants is related to the credibility of obtained results, the ease of finding herbs and their low cost (Brasil, 2015). Thus, individuals who include popular knowledge in health, with the use of medicinal plants, are holders of a tradition, and historical performance involves, in addition to individual health, environmental health and concern for the community. The plants most mentioned by the students were “boldo” (29.6%), “macela” (17%), and “malva” (6.3%). Many of the species mentioned in the research appear in other ethnobotanical works, such as “boldo”, mint, chamomile, holy grass, “macela”, “malva”, among others (Silva & Freire, 2010; Santos et al., 2018; Merhy & Santos, 2017).

The part of the plant most used by the respondents was the leaf (55.40%). This research corroborates the findings of several other authors who also obtained that leaves are the organ of the medicinal plant most used in the preparation of homemade medicines and this is attributed to greater ease of collection and availability during the year (Merhy & Santos 2017; Liporacci & Simon, 2017; Silva & Freire, 2010; Pilla, et al., 2006; Oliveira, 2017b). In addition, Santos et al. (2013) show that most active compounds are found in leaves and the collection does not cause many problems to the plant, allowing preservation and continued use.

The use of the flower as the part of the medicinal plant used was 4% by the academics of CECITEC. The study presented a value similar to the work done by Liporacci and Simão (2013) which was 3.4%. The use of bark (10.80%) was much higher than the findings of Merhy and Santos (2017), who indicated only 2.1% and quite different from the values found by Coutinho et al. (2002) in which the bark was part of the plant most cited to treat gastrointestinal tract disorders in a study conducted in state of Maranhão, in Brazil.

Medicinal plants can be used in various ways, such as through teas/infusion, decoction, macerated, tincture, extracts of soft or dry fluids, pomades, creams, syrups, inhalation, poultice, compress, gargaring or mouthwash (Fernandes & Krupek, 2014). Tea/infusion stood out as the most used method of preparation in research and, according to Martins et al. (2000) and Pilla et al. (2006), this is used in all parts of tender medicinal plants such as leaves, buds

and flowers, because they are rich in volatile components, delicate aromas and active ingredients that degrade by the combined action of water and prolonged heat used for various therapeutic purposes.

### Final Considerations

It was concluded that CECITEC students have knowledge about the recognition of medicinal plants, parts of plants and forms of preparation to treat gastrointestinal tract disorders, indicating that it is a low cost and effective alternative, besides being a legacy passed from generation to generation over the years. Thus, the dissemination and preservation of traditional family knowledge are indispensable for the maintenance of cultural identity and ethnobotanical knowledge that corroborate to the conservation of plants and ethnoknowledge that are essential to foster scientific research, because the search for acquired active principles of medicinal plants can provide the discovery of new compounds useful for the development of new drugs, and at more affordable prices for the majority of the population.

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