Microbiological Safety of Carqueja Products *Baccharis* spp

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ABSTRACT: *Medicinal plants are used worldwide as herbal medicines, in the preparation of teas and as raw material for the elaboration of derivatives. These plants are often dried and packed without good handling practices, which favors their contamination. Given this reality, this work was carried out with the objective of evaluating the microbiological quality of carqueja-based products, as well as dry carqueja for infusion preparation. The analyzes were performed at the Laboratory of Food Microbiology of the University of Uberaba, where the investigation of total, thermotolerant coliforms, Escherichia coli, Salmonella sp, total aerobic bacteria count (CPP), filamentous fungi was carried out. The results show that 100% of the samples are in accordance with the legal standards established by the Brazilian Pharmacopoeia for non-sterile products, but when interpreting the results according to the World Health Organization, the samples are in disagreement with these standards. microbials. The results revealed that these samples pose risks to human health, because the infusion preparation process is not always sufficient to eliminate the present microorganisms.*

KEYWORDS -*Escherichia coli, Medicinal plant, Microbiological safety, Non-sterile products, Salmonella sp,*

I. INTRODUCTION

The use of plants to cure diseases is an ancient practice, where the growth of the pharmaceutical industry and the development of new and more effective synthetic drugs have not diminished the importance of medicinal plants [1].

Research interest in this area has increased in recent years, where projects funded by public and private agencies are being instituted. In the 1970s, none of the world's major pharmaceutical companies ran programs along these lines, and today this has been a priority in most of them. Among the factors that have contributed to an increase in research is the proven efficacy of substances originating from plant species such as vinca alkaloids with antileukemic activity or jaborandi with antiglaucoma activity, both still considered indispensable for treatment and for many plants. they are raw material for drug synthesis [2].

Among the plants used in folk medicine is the genus *Baccharis* which contains about 500 species, where the species *Baccharistrimera* (Lees.) DC (Asteraceae) is popularly known as: carqueja, bitter carqueja, bitter carqueja, carqueja-sweet, broom and carquejinha. Its aerial parts are used as an infusion, and is well known for its bitter taste and widely used in folk medicine for its therapeutic effects against liver and digestive disorders, rheumatism, diabetes, inflammatory processes, angina and poor circulation. They also participate in weight loss formulas. *B. trimera*essential oil has effects against *Schistossomamansoni*[3].

According to the Brazilian Pharmacopoeia, the plant drug has winged, dried and fragmented *B. trimera* stems containing at least 1.7% of total caffeic acids, expressed as chlorogenic acid. Several phytochemical studies have revealed that the chemical composition of B. trimera is rich in tannins, polyphenols and flavonoids such as quercetin, luteolin, lactones, sesquiterpenes [4]. It is also rich in tannins apigenin and hispidulin, neptin and cliterodine diterpene [5]. [6] [7]. In the essential oil were found α-pinene, β-pinene, carquejol, carquejila acetate, camphene and nopinene [8]. Tests carried out with carqueja essential oil verified hepatoprotective, anti-inflammatory and antidiabetic actions [9]. It was also verified the

analgesic, bacteriostatic and bactericidal action [10], antiproteolytic and antihemorrhagic action against snake venom [11].

It is common in Brazil to use medicinal plants as an alternative source of medication. Due to the high consumption of medicinal plants, research interest in this area has increased in recent years, where projects funded by public and private agencies are being instituted. In 2006, the federal government approved the National Policy on Medicinal Plants and Herbal Medicines, through Decree No. 5.813, of June 22, 2006, which constitutes an essential part of public policies on health, environment, economic and social development. as one of the fundamental elements of transversality in the implementation of actions capable of promoting improvements in the quality of life of the Brazilian population [12], which boosted the implantation of medicinal and phytotherapeutic plants as a therapeutic modality.

Medicinal plants usually have a high microbial load, whether saprophytic or pathogenic. Contaminating microorganisms are usually sourced from soil, water and air or acquired during the drying process, which is normally done outdoors without the good handling practices necessary to avoid environmental contamination. Given this reality the objective of this work was to evaluate the microbiological safety of samples of carqueja and derivatives.

II. METHODOLOGY

The samples of carqueja were randomly obtained from herbalist houses, supermarkets, pharmacies and herbalists in the city of Uberaba_MG, being composed of 4 samples of carqueja fragments, a capsule sample and a tablet sample. The samples were taken to the Food Microbiology Laboratory of the University of Uberaba, where the analyzes were performed, investigating *Salmonella* sp, *Clostridium* sulfite reducing agents, coliform group, *Escherichia coli*, total aerobic bacteria count and filamentous fungi. The analyzes were performed according to the authors presented in the references [13] and [14].

III. RESULTS AND DISCUSSION

The use of microbiological tests is very important in the quality control of pharmaceutical products and supplies, given that microbial contamination can cause changes in their physical and chemical properties and affect product quality and consumer safety. **Tables 1** and **2** below express the results of the analysis of microorganisms that indicate the sanitary hygienic quality of the samples.

The Brazilian Pharmacopoeia determines that oral and topical pharmaceutical products (capsules, tablets, suspensions, creams, adhesives, etc.) that are not required to be sterile should be subject to microbial contamination control and quality assurance and quality control. Good manufacturing practices shall ensure that the product meets the specified specifications, that is, that meets, in addition to other parameters, the acceptable limits for microorganisms. The Brazilian Pharmacopoeia establishes that in non-sterile products for oral use that will be subjected to hot extractive process (eg infusions or decoctions), the total count of aerobic bacteria with a limit of 107 CFU / g, fungal count should be performed. with a limit of 10^4 CFU / g. *Escherichia coli* and Salmonella sp should be absent in 10g of sample [15]. By the results expressed above all samples meet the microbiological recommendations established by the Brazilian Pharmacopoeia. These results are also in accordance with RDC Resolution No. 12 of January 2, 2001, which establishes the absence of Salmonella sp for tea and similar products, not obtained by thermal processing (dried, dehydrated or not), and consumed after heat treatment (infusion and or decoction), with or without added sugar and other ingredients [16].

Table 1. Sanitary hygienic quality of the samples.

	Microorganisms		
Samples	Total Coliforms (NMP/g)	Fecal coliforms (NMP/g)	*E. coli*
Sample 1	240	<3,0 (aus.)	Aus.
Sample 2	240	<3,0 (aus.)	Aus.
Sample 3	35	<3,0 (aus.)	Aus.
Sample 4	3,6	3,6	Aus.
Capsule	<3,0 (aus.)	<3,0 (aus.)	Aus.
Tablet	<3,0 (aus.)	<3,0 (aus.)	Aus.

Source: Food Microbiology Laboratory_UNIUBE.
Aus: Absence.
MPN: Most Likely Number.

Table 2. Sanitary hygienic quality of the samples.

Samples	Microorganisms		
	Salmonella (Aus. 10 g)	CPP (UFC/g)	Mold and yeast (UFC/g)
Sample 1	Absence.	$2{,}53x10^3$	$>6{,}5x10^6$ (est)
Sample 2	Absence.	$2{,}08x10^3$	$>6{,}5x10^6$ (est)
Sample 3	Absence.	$2{,}80x10^2$	$>6{,}5x10^6$ (est)
Sample 4	Absence.	$1{,}00x10^4$	$>6{,}5x10^6$ (est)
Capsule	Absence.	$7{,}70x10^2$	$>6{,}5x10^6$ (est)
Tablet	Absence.	2,00x10	$>6{,}5x10^6$ (est)

Source: Food Microbiology Laboratory_UNIUBE.
Aus: Absence.
MPN: Most Likely Number.

According to the World Health Organization, the recommended microbiological limits for herbal medicines in preparations for oral administration containing raw materials of plant origin are: aerobic bacteria (standard plaque count): $<1.0x10^4$ CFU/g; filamentous fungi and yeast: $<1.0x10^2$ CFU/g; Enterobacteria: $<1.0x10^2$ CFU/g; *Salmonella*sp*:* absence in 10g; *Escherichia coli* and *Staphylococcus aureus*: absence in 1g or 1mL [17]. When using this microbial standard for the interpretation of results, we have that of the total samples analyzed (n = 6), 33.33% (n = 2) have the presence of Enterobacteria above the allowed limit.

Results for aerobic bacteria and filamentous fungi and yeast indicate that 100% (n = 6) is above the recommended limit [17]. Aerobic bacterial counting is a method used as a general indicator of bacterial populations in samples, but does not differentiate bacterial types, but provides information on product quality, manufacturing practices, processing conditions, handling and shelf life. It is a safety indicator as it is not directly related to the presence of pathogens or toxins, but may be useful in assessing quality. Molds and yeast are microorganisms that most often originate from the soil and are also resistant to adverse conditions such as acidic pH and low water activity, and are favored by firm solid substrates, on which surface there is easy access to oxygen. Several molds produce mycotoxins, which are toxic metabolites formed during growth. The most important genera of toxigenic molds are *Aspergillus*, *Penicillium* and *Fusarium*. These results from aerobic bacteria are similar to the results found by the authors cited in [18], who analyzed samples of medicinal plants grown in home gardens, and observed that untreated medicinal plants showed counts of mesophilic aerobic microorganisms ranging from $6.3x10^2$ to $2{,}32x10^5$ CFU/g.

For *Salmonella* sp, the results indicate absence in 100% (n = 6) of the analyzed samples. These results are similar to those found in work done with medicinal plants by [19], who when analyzing several samples of medicinal plants the carqueja presented absence for Enterobacteria, *Salmonella*sp and *E. coli*.

In this experiment the presence of reducing *Clostridium* sulfite was analyzed, even though it is not a microorganism provided for by the legislation, and the results show that 50% of the samples are contaminated with this microorganism. It is a spore-producing microorganism, widely distributed in the environment, in the soil, inhabiting the intestinal tract of healthy people and animals (cattle, pigs, poultry and fish) and the health compromise is produced by the formation of toxins in the organism.

The results show the importance of the implementation of good practices for handling these herbs, since they include rules and procedures that aim to achieve a certain standard of identity and quality of the product and the processes involved.

IV. CONCLUSION

The use of herbal medicines has advantages for use in official health systems, but in order that this practice does not pose risks to the health of the patient, the same safety and supervision criteria should be established as for the other medicines, because the results show the presence of indicator and pathogenic microorganisms in the samples.

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