

Full Length Research Paper

## Ethnobotanical study of *Arruda quilombo* community in the State of Ceará, Brazil

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The aim of the present study was to investigate the use and storage of medicinal plants in the *Arruda quilombo* community in the state of Ceará, Brazil. Semi-structured interviews were conducted for the determination of traditional knowledge. The qualitative-quantitative collective subject discourse method was used for the data analysis, focusing the discussion on six categories. The Chi-square test with a 5% level of significance was used to analyze the relationship between the age of the interviewee and the postharvest care of medicinal plants. The majority of the *quilombo* community (76.19%) cultivates the medicinal plants used. Among this total, 57.14% of the interviewees store the plants in plastic bags and do not establish an expiration date. On health risks, 97.62% of the community members reported medicinal plants are natural and therefore cause no harm. Thus, the population is unaware of the care required for storing medicinal plants or the administration of a safe dose. The statistical analysis revealed that the storage of medicinal plants and ingestion of home-remedy phytotherapeutic medications by pregnant women is not associated with age group.

**Key words:** Safe use, storage, toxicity, medicinal plants.

### INTRODUCTION

Traditional communities, such as the *quilombo* communities in Brazil, make up part of the immense cultural diversity of humanity. The collective knowledge of these communities is passed down from generation to generation and constitutes a source of immeasurable cultural wealth. Such traditional knowledge results from many years of experience and constitutes a connection

between the community and the natural environment, from which community members gather food and medicinal plants as well as practice rituals and other cultural activities (Davies and Kassler, 2015).

The *Arruda quilombo* community in the state of Ceará, Brazil, has no healthcare center, which leads to the search for folk medicine solutions based on medicinal

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plants, such as the use of herbal brews, shamans and healers as well as other folk practices (Marques, 2010). However, the use of such products does not exempt the user from the toxic effects such medicines can cause. Thus, an investigation was performed to identify how this community uses medicinal plants. The authors analyzed the planting, harvesting, modes of preparation, doses and storage of medicinal plants, all phases of which could be subject to contamination. The situation was more serious when the plants were collected from roadsides or near farms on which pesticides are used, which could lead to the accumulation of pollutants and toxic substances. This possibility is accentuated at more vulnerably time, such as during pregnancy, when the consumption of medicinal plants should be avoided (Araujo et al., 2014).

The aim of the present study was to investigate the use of medicinal plants in the *Arruda quilombo* community in the municipality of Araripe, state of Ceará, Brazil. The authors analyzed the storage of medicinal plants, doses ingested and the relationship between the method of storage and age as well as the restrictions to the consumption of plant-based “medicines” as a function of age.

## MATERIALS AND METHODS

### Study area

The *Arruda quilombo* is located in a rural area of the municipality of Araripe (7° 11' 44.37"S; 40° 15' 23.76"W) in the state of Ceará, Brazil (Figure 1), approximately 17 km from the center of the city. The *quilombo* families previously occupied the *Coqueiro* site during the time of slavery in the 18<sup>th</sup> century. In 1980, the families migrated to a location denominated *Bolandeira dos Estevãos*, which is currently called *Arruda*. The land was acquired through a purchase and in 2010, the members of the community requested the permission from the federal government to increase the acreage due to the fact that the land was insufficient for the sustenance of the group. The community is formed by 39 residences made up of the remainder of the *quilombos* that practice subsistence farming. The community relies on water from cement cisterns, electricity and a school for children (Marques, 2010).

### Ethnobotanical survey

After clarifications regarding the project and the obtainment of the community's authorization through the signing of the statement of informed consent, the project was submitted to the Human Research Ethics Committee of *Universidade Regional do Cariri* (URCA) in compliance with Resolution 510/2016 of the Brazilian National Board of Health, which determines the ethical guidelines for research involving human subjects. Approval was obtained from the committee (process number: 51480515.5.0000.5055). Due to the fact that the traditional knowledge investigated was in a *quilombo* community, the project was sent for authorization by the National Artistic and Historical Heritage Institute [*Instituto do Patrimônio Artístico e Histórico Nacional (IPHAN)*] and subsequently directed to the Genetic Heritage Management Committee [*Conselho*

*de Gestão do Patrimônio Genético (CGEN)*], which is linked to the Secretary of the Environment. Semi-structured interviews with appropriate, accessible language were conducted with the *quilombo* community (Albuquerque et al. 2010) between April and June 2016. A representative of each family was interviewed, totaling 42 informants.

### Data analysis

The socioeconomic data of the interviewees were analyzed using descriptive statistics (percentage and frequency data). The questionnaires were analyzed using the qualitative-quantitative collective subject discourse (CSD) method. The *Quali Quanti Soft* program, with licensing linked to *URCA* (Lefevre and Lefevre, 2005) was used for this step. The collective discourses were identified numerically from 1 to 6 and groups into six discussion categories according to the question. The chi-square test of independence was used to analyze the proportion of the safe use of plant resources. The level of significance was set to 5%.

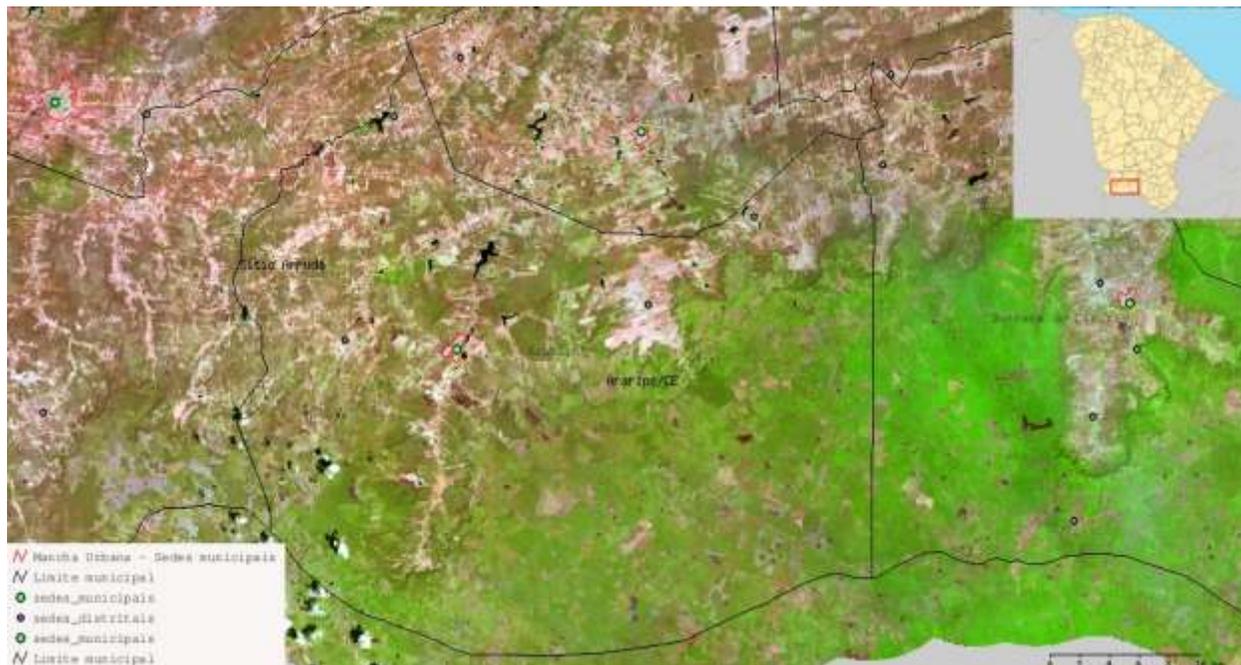
## RESULTS AND DISCUSSION

In the remaining *Arruda quilombo* community, the female gender accounted for 83.33% of the interviewees, which is similar to findings described in previous ethnobotanical studies (Arnous et al., 2005; Freitas et al., 2012). With regard to schooling, none of the community members had a university education, 33.33% were illiterate and 66.67% had attended school, but did not continue their studies. Among the latter group, 54.77% had an elementary school education and 11.9% had an incomplete high school education. The difficulty in attending school in the *Arruda quilombo* community is associated with the absence of schools in the location to continue one's studies through to the end of high school. With regard to marital status, 83.33% of the interviewees were married and 16.67% were single. This demonstrates the importance of marriage, which is a way for outsiders to become legal members of *quilombo* community (Marques, 2010). A total 35.71% of the interviewees were older than 50 years of age.

During the interview, the source of knowledge was identified. For this first discourse, the following question was posed: From whom did you learn to use medicinal plants? The answer corresponded to CSD 1:

*“I learnt from the older ones here— my mother, grandmother, mother-in-law, great grandmother, aunt, my husband's grandmother, my father and older people in Coqueiro. My grandmother was a blesser; blessed people here and in Coqueiro. My aunt prayed here and my mother is a blesser here and a healer for the children here.”*

It is evident by CSD 1 that the responsibility of traditional knowledge regarding plants falls to the older people, who



**Figure 1.** Location of municipality of Araripe in state of Ceará, Brazil, IPECE, 2014

pass this knowledge down to the younger individuals. Older individuals are known in their communities as local specialists due to their considerable knowledge on plants and/or animals in the region (Albuquerque et al., 2010). Thus, the blessers and healers of the *Arruda quilombo* are designated specialists in the community due to their knowledge regarding medicinal plants, herbs and potions. Their immemorial knowledge earns these individuals respect and admiration in the community and it is through these individuals that knowledge on the use of medicinal plants propagates. The origin of the medicinal plants used in the *quilombo* community is divided among cultivation in one's own yard (76.19%), gathering from nearby woods (19.05%) and, in some cases, purchasing (4.76%). CSD 2 presents the answer to the following question: Where did you find the plant mentioned?

*CSD 2: "I plant it here in the yard. I plant it and take care of it so it does not die with the drought. When there is none here around the house, I look for it at my mother's house or a neighbor's house. I get cinnamon from the woods nearby and I get ipecac root from the field. I get catingueira [Caesalpinia pyramidalis] from the woods, but the drought kills everything. I also get "purging potato" [Operculina macrocarpa] and umburana-de-cheiro [Amburana cearensis] from the nearby woods. Others I buy at the market in Araripe. I buy mustard, others I plant in the yard. I plant everything at my house. We plant and have to take special care so that nothing dies."*

CSD 2 demonstrates that cultivation favors the propagation of medicinal plants. Treatment aimed at curing or alleviating an illness with medicinal plants has increased in developing countries due to the difficult access to hospital facilities, exams and conventional pharmaceuticals as well as the ease of cultivating medicinal herbs (Junior et al., 2005). This is similar to what was observed in the community studied herein, in which members need to travel 3 km to a health unit in the district of Pajeú to treat a simple health problem or 17 km to the center of the city of Araripe for hospital care in more serious cases. Due to transportation difficulties, the distance constitutes an obstacle to the *quilombo* community with regard to treating health problems and the members therefore turn to treatment with medicinal herbs (Marques, 2010).

In CSD 3, the storage of medicinal plants in the *quilombo* community was investigated through the following question: Do you store part of the plant for when you will need it at a future date? How do you store it?

*DCS 3: "When it dries in the sun, I pull up the plant, put it in a plastic bag and store it; peppermint, rue, dill weed, lemon grass, eucalyptus, Mexican mint, ipecac root- I store it all. Pull up the plant, dry it and store it. I get a bag, put it inside and hang it in the living room. It lasts a long time before running out. Some even get moldy. I dry rosemary in the sun and put it in a can and it lasts for a long time. I buy garlic and marcela [Achyrocline*

*satureioides*]. I put it in a plastic bottle and keep it for my whole life. I put others out to dry in the sun and store them for a very long time. I also store mallow, umburana (*Amburana cearensis*) in a bag for six months. I do not store other plants. I get them from the garden when I need them, because I always plant and have them in the garden or get them from the neighbor's yard. You just go to the plant, take the part you need and make the medicine."

The drying and storage of medicinal plants is an issue of the utmost importance. If performed in an unduly manner, the active substance could be lost and pathogenic microorganisms could colonize the plant (Bochner et al., 2012). When drying and storage are performed in improper locations and/or in an inadequate fashion, fungi such as *Aspergillus flavus* and *Aspergillus parasiticus* can develop, which have toxic substances (aflatoxins), even small amounts of which can lead to the development of severe poisoning and liver cancer (Almeida, 2011). Fungi can contaminate vegetal tissue even before harvesting and subsequently develop due to a lack of quality with regard to cleaning and storage (Mendes, 1998). Therefore, care must be taken for the correct storage of herbs.

According to Mengue et al. (2001), medicinal plants should be stored in clean, dry places to avoid the proliferation of bacteria and fungi. Likewise, Jorge (2013) states that storage should only be for a short time to avoid the loss of active ingredients, which occurs through hydrolysis, metabolic degradation or degradation caused by light, enzymatic decomposition, degradation caused by heat, volatilization of essential oils and fungal contamination. Thus, medicinal plants should be dried well and stored in a dry, ventilated place in the absence of light and free of dust, rodents and insects. The author also states that medicinal plants should be stored in paper sacks or glass jars. Each species should have its packaging and a label with the name of the plant, date of collection, portion of the plant harvested and the name of the person who collected the material. If the species is aromatic, it should not be stored near other aromatic plants.

Packaging and storage means protecting the plant from infective agents and conserving its active substances, as medicinal plants should have adequate postharvest care to maintain the quality of the vegetal matter (Kffuri, 2011). The storage place should also be exclusive for this purpose or, if not, should at least be free of insects, odors, light, humidity, dust and radiation. Correct drying and storages allows a plant to last 10 to 12 months. Thus, one should chose a well-ventilated, shaded place for the drying process, which could be in flat layers that allows air circulation, such as on top of sieves, on top of cardboard boxes with holes or tied to a suspended rod

(Jorge, 2013). Members of the *Arruda quilombo* community do not take due care with regard to the safe storage of medicinal plants. Most interviewees (57.14%) store plants in plastic bags and other places in the home (Figure 2) and do not establish an expiration date.

The Chi-square test was conducted to determine the strength of the possible association between storage and age. The result of this test was  $\chi^2 = 0.7$ . Thus, no statistically significant association was found between how medicinal plants were stored and the age of the interviewee, which precludes the extrapolation of the result to the population.

CSD 4 addresses adverse reactions and contraindications regarding the use of plant-based medicines. For such, the following question was posed: Can the medicine you mentioned cause any harm to someone's health?

*CSD 4- "It does good and it does not do any harm. Medicine from a plant is better than medicine from a drugstore. It makes us better. So, it does good and not harm. It does no harm at all."*

This discourse demonstrates the notion that natural products are good. This concept was found among 97.62% of the interviewees, who stated that medicinal plants offer no health risks because they are natural. The concept of 'natural' employed by many individuals in relation to medicinal plants alludes to the belief that plants are healthy and do not release chemical substances (Mengue et al., 2001). Mistakenly, this concept has been disseminated in the population, leading to the risk of the occurrence of poisoning by medicinal plants that toxic chemical compounds as a defense against predators. The notion that a natural product is always healthy leads to the indiscriminate use and commercialization that is inadequately monitored by sanitation agencies (Araujo et al., 2014). The widespread notion that natural products cause no harm disregards the possibility of adverse reactions or toxicity and increases trust on the part of the population in religious beliefs despite the lack of proven efficacy (Rates, 2001). Medicinal plants can also act as xenobiotic agents that can activate the metabolism, with the effect manifested in a prolonged manner. Moreover, the non-identification of the toxic effect could lead to continual use, thereby compromising different systems of the body (Araujo et al., 2014). According to Almeida (2011), some species cause delayed harmful reactions in the organism due to the presence pyrrolizidine alkaloids, which, when ingested over a long period of time, cause liver and lung problems that can appear even years after use.

CSD 5 addresses interactions stemming from the use of both plant-based medicine and conventional pharmaceuticals. For such, the following question was



**Figure 2.** Storage of medicinal plants in *Arruda quilombo* community. A- Storage of seeds in plastic bottle with no label and with presence of insects; B- Storage in plastic bags with no label and exposed to humidity, light and dust; C- Improper storage on roof of interviewee's residence; D- Improper storage on roof of interviewee's residence (Source of photos: Gilmara Matias de Sousa).

posed: When you are sick, do you only take the plant medicine or do you take medicine from a drugstore?

*CSD 5- "I first take the plant medicine. If it does not work, I go to the hospital. But I rarely go to the hospital because the doctor gives you the wrong medicine. But I also take medicine from the drugstore. You cannot mix the two medicines, because it causes harm to your health. I sometimes take a pain medication from the drugstore. Other times I take the plant medicine. What you cannot do is mix a plant medicine with medicine from the drugstore. Otherwise, it will poison you. You can only mix them as an anointment. One hour after you take the plant medicine, you can take the drugstore medicine. I do not go to the doctor. Drugstore medicine does not work. Plant medicine is what is good."*

This discourse demonstrates that the members of the *Arruda quilombo* community used their own plant-based

medications and conventional pharmaceuticals. The majority of the interviewees (66.66%) took both types of medications, 30.95% preferred plant-based medications and 2.38% primarily took conventional pharmaceuticals. However, 73.81% of the interviewees recognized the danger in consuming the two types of medication together, which is a positive point in the culture. Paiva et al. (2007) stress the importance of warning the population regarding the use of medicinal plants as medication, as the ingestion of the active chemical substance is equivalent to medication sold in pharmacies and medicinal plants therefore need to be considered medications with possible side effects. Addressing drug interactions, Junior et al. (2005) warn that some medicinal plants potentiate the effect of a pharmaceutical drug, whereas others may inhibit the effect. It should be noted that some medications are produced from medicinal plants, metabolized through the same pathways in the organism and transformed into the same

substances. This was evidenced in CSD 5, when the community (71.43%) taking drugstore medication together with plant-based medicine had poisoning.

In CSD 6, the aim was to determine the administration of phytotherapeutic medications to risk groups. For such, the following question was posed: Can pregnant women, children and old people take plant medicine?

CSD 6: “Yes, they can. Everyone can take it. There’s no problem. Except pregnant women are not indicated because a pregnant woman is sensitive. Pregnant women do not take marcela, rue, “malva-sete-dor” [*Plectranthus barbatus*], aroeira [*Myracrodruon urundeuva*] orlosna [*Artemisia absinthium*] because they are bitter and they could lose the baby. Bitter remedies cause miscarriages, but others do not do any harm. Everyone can take other medicine. Children and old people take everything. Pregnant women can only take rosemary and peppermint. Children and old people take everything. There’s no problem. Children take everything, all the medicines. It does not cause any harm.”

CSD 6 shows that the population in the *Arruda quilombo* is unaware of the danger of administering medication to children and elderly individuals. However, the discourse demonstrates concern for pregnant women, who are considered sensitive, and some active substances found in medicinal plants can cause miscarriage.

A total of 61.90% of the interviewees said that all age groups can take plant-based medicines without any restrictions. The danger in this thinking is the possibility of self-medication. In contrast, 38.10% of the interviewees reported concerns during pregnancy. Self-medication is dangerous for children and elderly individuals because these groups are more sensitive to poisoning (Samek, 2012). According to Kffuri (2011), infants and children require extra care and prudence should be exercised with regard to the ingestion of plant-based medication, which should preferably be prescribed by a specialist. Junior et al. (2005) stated that pregnant women and children are more sensitive to adverse reactions and therefore should not be submitted to treatment with herbal medicine. Regarding elderly individuals, Paula et al. (2012) reported that changes stemming from the aging process lead to greater sensitivity in the metabolism of drugs and poisoning in this age group can be lethal. In the statistical analysis of this variable,  $X^2$  was larger than 0.05, indicating that the ingestion of phytotherapeutic medications by pregnant women in the community was not associated with the age of the interviewee.

## Conclusion

The findings of the present study demonstrate that the

*Arruda quilombo* community in the city of Araripe, Brazil, has vast knowledge of medicinal plants. A total of 97.62% of the community members believe that medicinal plants are healthy and cause no harm, but are unaware of due care required with regard to drying, storage and the safe administration of medicinal plants. The findings also demonstrate that the ingestion of plant-based medications in the *quilombo* community studied and the storage of medicinal plants are independent of the age of the interviewee. As medicinal plants play a unique role in the treatment of health problems in this traditional *quilombo* community and constitute a therapeutic alternative as a way to circumvent the transportation difficulties of reaching local healthcare centers, it is necessary to warn the members of this community with regard to the postharvest storage and use of medicinal plants. Thus, the present study is of fundamental importance, as it offers a unique portrait of the use of medicinal plants by a traditional *quilombo* community and demonstrates the need to disseminate knowledge produced in the academic setting regarding safe postharvest methods and the administration of medicinal plants to these communities so that they may enjoy the benefits of biodiversity without harming their own health.

## CONFLICT OF INTERESTS

The authors have not declared any conflict of interests

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