

CONSERVATION OF THE DIVERSITY OF MEDICINAL PLANTS WITH APPLICABILITY DENTAL MEDICINE AND SUSTAINABLE USE OF PLANT RESOURCES

Madalina BORCA¹, Alexandru BORCA², Alin CIOBICA^{1,3,4,5},
Ioannis MAVROUDIS^{5,6}, Ecaterina BURLUI³, Vasile BURLUI³

¹ Department of Biology, Faculty of Biology, Alexandru Ioan Cuza University, B dul Carol I, No. 11, 700506 Iasi, Romania

² George Emil Palade University of Medicine, Pharmacy, Science, and Technology of Targu-Mures, Faculty of Engineering, Gheorghe Marinescu 38 Targu Mures, Romania

³ Apollonia University, Păcurari Street 11, 700511 Iasi, Romania

⁴ Center of Biomedical Research, Romanian Academy, Iasi Branch, Teodor Codrescu 2, 700481 Iasi, Romania

⁵ Academy of Romanian Scientists, 3 Ilfov St., 050044, Bucharest, Romania

⁶ Leeds Teaching Hospitals, NHS Trust, Leeds LS2 9JT, UK

Abstract. *The high incidence of oro-dental pathologies correlated with the significant increase in antibiotic resistance has led to the urgent need to develop alternative treatments, using as natural sources the active principles present in medicinal plants. Thus, at the border between traditional and modern, the use of therapeutic effects of various medicinal plants seems to be a way of preventing and treating oro-dental diseases. Along with this use of plant resources, there is therefore also an awareness of the need to conserve species affected, over time, by overharvesting or even mass extinctions. The sustainable use of these resources leads to maintaining the dynamic balance of ecosystems, maintaining and preserving ecosystem services vital to the development of life on Earth.*

Keywords: medicinal plants, conservation of plant resources, sustainability, oro-dental pathologies.

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Medicinal plants are a valuable source of herbal medicine, but it is diminishing in number of species globally. This subsection develops strategies for the conservation of the diversity of medicinal plants, but also methods of sustainable development, which are urgently necessary for the sustainable use of plant resources [1, 2].

More than 1300 medicinal plants are used in Europe, 90% of which are harvested from wild flora, and in the United States of the 150 commonly used medicinal slopes, 118 are often found as sources of therapeutic agents on medical prescriptions [3]. At the same time, to these percentages is added the fact that up to

80% of the population of least developed countries is completely dependent on herbal medicines when it comes to primary health care, and in developed countries there is a significant percentage of over 25%, which reveals the use of medicinal plants harvested from spontaneous flora [2].

Specialists' predictions state that currently the loss of plant species is between 100 and 1000 times higher than the natural extinction rate, resulting in the fact that at least one medicinal plant of major importance in the field of phytotherapy is lost on Earth once every 2 years [4].

According to IUCN and WWF, there are between 50,000 and 80,000 species of cormophytes used in alternative medicine for therapeutic purposes worldwide. Of these species, around 15 000 plant species are threatened with extinction, with multiple causes, such as overexploitation and habitat destruction and fragmentation [5].

Due to the anthropo-zoogenic pressures mentioned above, the extinction of medicinal plants globally has gained worrying proportions especially in China, India, Nepal, Tanzania, Kenya, Uganda, etc. [6,7,8].

Conservation strategies for medicinal plants cover both in situ modalities such as nature reserves and wild nurseries and ex situ modalities such as botanical gardens and plant gene banks [9]. In situ conservation across the globe is based on the establishment of protected areas with high biodiversity and also supports the conservation of an entire ecosystem, not just species that want to be conserved [10]. Ex-situ conservation aims to cultivate and naturalize endangered species to ensure their perpetuation over time [11,12]. In this sense, plant gene banks, seed banks, offer the optimal solution for ex situ storage of genetic diversity and at the same time provide extremely useful information for the conservation of still existing natural populations [13,14]. Ex-situ conservation modalities also include cultivation techniques and in particular those focused on extensive, organic farming [15].

Therefore, taking into account the fact that overexploitation and overharvesting of plant resources can inevitably lead to the extinction of plants valuable both for the dynamic balance in food chains and for the bioactive principles contained therein, which are used in phytotherapy, some applicable measures are needed to maximize the perpetuation of medicinal species, but also to preserve biodiversity in ecosystems.

A tangible solution would be to use the aerial parts, instead of the underground ones, when it comes to plants where the similarity of bioactive compounds in their morphological structures is known, in this way the depletion of plant resources can be prevented and at the same time pharmacological properties can be used sustainably helping in the treatment or prophylaxis of pathologies [16].

Currently, there is a multitude of techniques used in genetic engineering, which help in the large-scale biosynthesis of natural extracts, this aspect facilitating the regeneration of plant resources using fragments of them on in vitro culture media or

the application of molecular markers at the genetic level to reduce the type of reproduction in plants [17, 18, 19].

Regarding medicinal plants used in the treatment and prophylaxis of dental pathologies, they are also widely used globally, some of them being threatened with extinction due to overexploitation, as is the case of the species *Dalbergia nigra* (Vell.)AllemãoexBenth., which is included in the IUCN Red List [20]. Other plants such as *Embelia ribes* Burm. f. is on red lists of medicinal plants at national level, having a vulnerable status in those areas [21].

Therefore, we wanted to emphasize the importance of preserving the diversity of medicinal plants, to exemplify and present possible ways to improve the extremely accelerated extinction process in recent years within these widely used medicinal plants, being the main sources of bioactive compounds that have therapeutic properties.

There is a need for better knowledge of the conservative status of certain plants, while sustainably harvesting medicinal plants and conserving them ex situ, with germplasm reserves avoiding the global extinction of species severely affected by pressures in their environment. In this context, a One Health approach is needed, leading to a thorough understanding of the use of natural plant resources and to the practice of traditional or even modern, responsible medicine that will provide sustainability to future generations of plant and human individuals alike.

Conserving the medicinal plants listed in this study presents specific challenges that need to be addressed to ensure their availability for future use in dentistry. One of the primary challenges is the threat of overharvesting, especially for plants that are in high demand due to their proven therapeutic benefits. This overharvesting not only depletes natural populations but also disrupts local ecosystems and biodiversity. Another challenge is habitat destruction, often caused by urbanization, agriculture, and climate change, which leads to the loss of natural habitats for these medicinal plants.

Additionally, there is a lack of awareness and understanding among local communities and stakeholders about the importance of these plants and the need for their conservation. This is compounded by inadequate legal and regulatory frameworks to protect these species and their habitats.

To address these challenges, the following strategies for sustainable harvesting and cultivation are proposed:

- Develop and implement guidelines for sustainable harvesting practices to ensure that plant populations are not depleted. This includes setting limits on the amount that can be harvested and promoting the use of non-destructive harvesting techniques.

- Encourage the cultivation of medicinal plants, particularly those that are in high demand, as a means to reduce pressure on wild populations. This can be done through

the establishment of medicinal plant gardens and agroforestry systems, which can also serve as a source of income for local communities.

- Promote the use of tissue culture and other biotechnological methods for plant propagation, which can help in the rapid multiplication of plant material without affecting the wild populations.

- Implement conservation education programs to raise awareness among local communities, policymakers, and stakeholders about the value of medicinal plants and the need to conserve them.

- Strengthen and enforce legal and regulatory frameworks to protect endangered medicinal plant species and their natural habitats.

- Collaborate with local communities, NGOs, and government agencies to develop and implement conservation projects that are culturally appropriate and economically viable.



Figure 1. *Dalbergia nigra* (Vell.)AllemãoexBenth.- graphic representation of morphological characters

By implementing these strategies, it is possible to balance the use of medicinal plants in dentistry with the need to conserve these valuable resources for future generations.

Tree endemic to Brazil (has specific ecological requirements, thus lives in moist forests and rich soils), belongs to the family Fabaceae. It is a vulnerable species, included on the IUCN Red List and in 1992 included on the CITES list, which restricts trade with it, being an endangered tree [20].

In dentistry it was used as a natural antibiotic.[25] We have included this species on the list of species with therapeutic uses in dentistry to emphasize the importance of sustainable use of plant resources so that therapeutic properties can be used over generations, taking into account sustainable development. It is obvious that the

species described above is no longer used as an antibiotic, as both the species and its habitat are in danger of extinction. These notions have been presented here to emphasize the need for conservation of plant species. We will dedicate a subsection, within our analysis, of reference bibliographic studies, in which we will adequately describe the importance of plant resource conservation for contemporary society and for the development of phytotherapy as a branch of medicine with future perspectives.

Future prospects

In parallel with conducting large-scale clinical trials for the development of alternative medicine in dentistry and implicitly the use of bioactive principles present in medicinal plants, ecology studies are needed to show the real conservation status of widely used plants, especially in developing countries, where plants are overexploited, as are the cases described above in Uganda, India, etc. [6].

Perhaps the most useful approach would be the One Health approach that brings traditional medical practices and their sustainable exploitation into a common point of interference, preserving the dynamic balance in nature and bringing well-being and health to people who use natural resources for therapeutic purposes. Because traditional practices of using medicinal plants have been known since ancient times, the information of indigenous communities, known throughout human history, can also be preserved in order to understand the medicinal capacities of spontaneous flora plants [22].

In-depth study of plant biodiversity and extraction of biologically active compounds can lead to the identification and development of new pharmaceuticals that bring innovation in the field of applied phytotherapy in various branches of modern medicine [23], including dental medicine.

The introduction of medicinal species into agroforestry systems, the approach to sustainable cultivation techniques and the conservation of plant biodiversity from spontaneous flora enhance the maintenance of ecological balance, deepening ancestral traditions on the applicability of medicinal plants [24] and forward-looking studies for the future of medicine, including dentistry complemented by biotechnology and phytotherapy.

Therefore, there are various areas of research leading to the innovation of dental medicine, using as main sources the bioactive compounds present in medicinal plants. However, a multidisciplinary approach is needed to develop both prevention and treatment modalities and to sustainably use these natural resources valuable for both human health and biodiversity in nature.

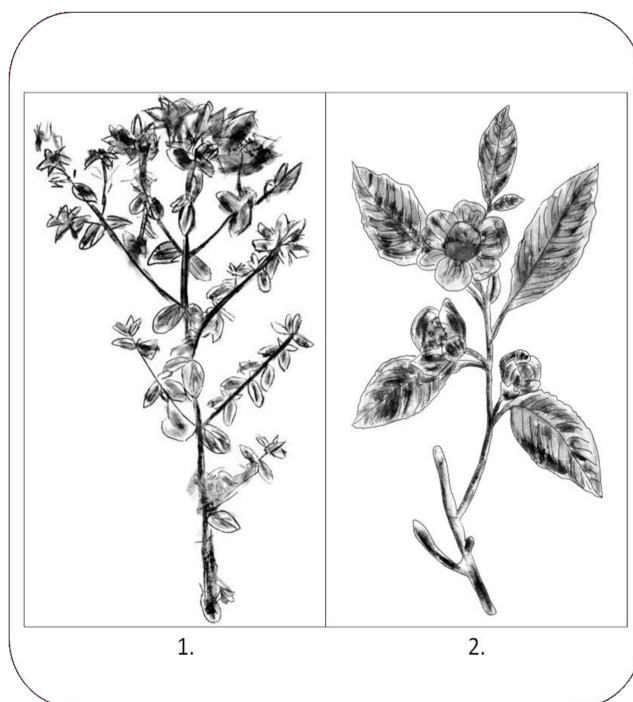


Figure 2. Medicinal plants used in oro-dental medicine

1. *Hypericum perforatum L.- graphic representation of morphological characters*

Herbaceous plant with yellow inflorescences belonging to the Hypericaceae family. It has in its chemical composition a diversity of phytochemicals such as volatile oils, flavonoids, tannins that confer therapeutic properties antidepressant, anti-inflammatory, antitumor and healing at skin level [26]. In dentistry it is particularly used for antibacterial effects, having significant effects on all types of bacteria that cause dental pathologies [27].

2. *Camellia sinensis Kuntze, 1887- graphic representation of morphological characters.*

The green tea tree belongs to the Theaceae family and is widely used in food and traditional medicine. As far as the use in dentistry is concerned, plant extracts are used in the treatment of gingivitis, periodontitis, dental caries and even oral cancer [28].

CONCLUSIONS

Taking into account the unprecedented need for alternative treatments to combat bacterial resistance to antibiotics, it is necessary to understand the importance of using medicinal plants in the prophylaxis and treatment of oro-dental pathologies.

In parallel with the development of studies for the use of medicinal plants in the treatment of dental pathologies, it is necessary to develop strategies for the conservation of plant resources so that they can be used sustainably over generations, without disturbing the ecological balance or causing extinctions of valuable species.

For plant conservation, the study underscores the urgency of sustainable harvesting and cultivation practices. It highlights the necessity of preserving the biodiversity of medicinal plants, not only for their ecological value but also for their potential in future medical discoveries and treatments.

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