

## SUMMARY

**Keywords:** *Abies alba, Nepeta pannonica, chlorophyll, active principles, remedies*

The maintaining of the health has raised over time probably the greatest difficulties. Epidemics, accidents, wars, conflicts between the social classes, natural calamities, insufficient or inadequate food were factors that led to the danger of human health. Thus, the interest for the treatment of the diseases appeared, using a wide range of methods.

Medicinal plants have always been one of the main natural resources used to maintain the health. These have been appreciated over time, being carefully analyzed and described by famous authors, such as Hildegard von Bingen.

Hildegard von Bingen was a benedictine nun, famous for her writings in fields such as medicine, botany, philosophy, music and theology. She was born in 1098 into a noble family, but, despite the very good material situation, she preferred to enter the monastery. It is said that, from the age of 40, he had a series of visions, through which he would have received numerous information on the causes of the diseases and the most effective methods of prevention and treatment. He died in 1179, being beatified in the 16th century and canonized in 2012 by Pope Benedict XVI, when he received the title of Doctor of the Church. The idea that St. Hildegard von Bingen's natural therapies resurfaced in many clinics in Western Europe was the starting point for the beginning of doctoral studies in this regard.

The present work, entitled *Ecophysiological researches concerning active principles and valuation of some species of medicinal plants used in "Hildegard von Bingen" therapies*, is structured in two parts. The first part, dedicated to the statute of national and international knowledge, consists of three chapters. These include information on the life and work of Saint Hildegard von Bingen, her researches on the plants known by her and the remedies mentioned in her works.

Chapter I contains some general aspects concerning the life and work of Saint Hildegard. There are mentioned both biographical data and information about practiced therapies and used medicinal plants used.

Chapter II presents researches on the plants used by this author. A special place is occupied by modern and contemporary studies, but also by the presentation of active principles, existing in medicinal plants used by Hildegard. Also, within this chapter it is discussed the importance of plant physiology in the study of medicinal plants.

Chapter III deals with herbal remedies and preparations. There are listed the main ingredients of the remedies elaborated by Hildegard von Bingen, the empirical products that can be made according to his prescriptions, respectively the principles underlying the preparation of cosmetic and medicinal preparations.

The second part refers to own researches, being made up of three chapters. They focus on the natural and institutional framework of the researches, on the description of the materials and the working methods, respectively on the presentation of obtained results.

In Chapter IV, essential information is captured regarding the natural and institutional framework of the research. There are presented harvesting areas of the plant material from Cacica and Câmpulung Moldovenesc, the emphasis being placed on the environmental conditions: climate, relief, soil, vegetation. The institutions that were involved in the research are The University of Agricultural Sciences and Veterinary Medicine “Ion Ionescu de la Brad”, Iasi, The University of Padua, Italy, The Abbey of St Paul’s outside the Walls, Rome, Italy, The Abbey of St. Hildegard from Rudesheim, Eibingen, Germany. “Ion Ionescu de la Brad” University of Agricultural Sciences and Veterinary Medicine, Iasi, represents the institutional framework where the determinations and other laboratory activities took place. The University of Padua, thanks to the subordinate botanical garden, was the place where most of the medicinal plants used by Hildegard von Bingen could be recognized. These monasteries are two main centers of natural medicine, focused on the therapies practiced by the Benedictine nun. The lands cultivated with medicinal plants, their laboratories and pharmacies were important sources of documentation regarding the preparation of the remedies elaborated by Hildegard. Chapter V is dedicated to the purpose, objectives, material and working methods.

**The purpose of this study** is to determine the connection between the photosynthesis process and the amount of some biochemical compounds from two species of medicinal plants used in the therapies practiced by Hildegard von Bingen, in order to establish optimum harvesting periods, so that the plant material to have as much high as possible content of active principles, being ready for capitalization. The investigated plants are silver fir (*Abies alba*) and hairless catmint (*Nepeta pannonica*). By determining the presence and quantity of these substances depending on the area of harvesting and phenophase, it is possible to appreciate the medicinal value of the studied species, respectively the optimal period of harvesting. Plants with the highest content of active principles are those suitable for use in the form of teas, tinctures, ointments, creams, etc.

Researches are of multiple importance: ecophysiological, biochemical, botanical and medicinal.

➤ **The ecophysiological importance** consists in the fact that there was determined the influence of the external factors, specific to the harvesting area, on the synthesis of some active substances, in the tissue of some medicinal plant species.

➤ **The biochemical importance** is due to the fact that, through these studies, there was highlighted the presence of bioactive substances, existing in the tissue of the analyzed plants.

➤ **The botanical importance** of the research is given by the fact that there was demonstrated, by carrying out them, the quality of medicinal plants of certain taxa from the spontaneous flora.

➤ **The medicinal importance** of the study is conferred by the valorization of the active compounds from the investigated plants, by their use in the elaboration of recipes of products with therapeutic and cosmetic value.

The objectives of the research were set to achieve the proposed purpose, namely to determine the content in bioactive substances of certain medicinal plant species, used in the "Hildegard von Bingen" therapies, existing in the spontaneous flora of Bukovina. All of these objectives concentrate the entire research and study work.

The objectives of the research were:

- Determination of chlorophyll and flavonoid pigment content of annual growths;
- Determination of the antioxidant capacity of the plant extracts, which corresponds to the content of antioxidants;
- Highlighting the connection between the total amount of chlorophyll and the synthesis of some biochemical compounds, respectively the antioxidant activity;
- Elaboration of recipes with cosmetic and medicinal value, using the plants under investigation.

The determination the amount of volatile oil, flavonoids and antioxidants reflects the medicinal and economic value of the investigated species. The content in these active principles is given both by the genetic characteristics of the plants and by the influence of external factors, specific to the harvesting areas.

By developing recipes with therapeutic value, it was desired to create products that would help the health. In addition, there was wanted to create cosmetic preparations.

The biological material was collected from two different localities from Bukovina region, Câmpulung Moldovenesc and Cacica, taking into account that the pollution degree is very low in this area. The harvesting periods corresponded to the growing and flowering phenophases.

The research methods used were aimed at making certain quantitative determinations regarding chlorophyll pigments, volatile oils, flavonoids, antioxidants, but also the elaboration of cosmetic-therapeutic products, using the plant material, rich in these active substances.

The chlorophyll pigments were extracted from the plants with the help of acetone, being quantitatively determined using the SHIMANDZU UV-1800 spectrophotometer. The amounts of chlorophyll a, chlorophyll b, as well as the total chlorophyll content were determined. The amount of flavonoids was also determined by acetonetic extraction, followed by measurements made using the spectrophotometer.

The volatile oils were extracted by steam distillation method with the help of the volatile oil distiller. These were separated from the floral water through a separator. Both the extracted oils and the floral water are valuable ingredients, entering the composition of the finished products.

Antioxidants were detected using DPPH (2,2-diphenyl-1-picrylhydrazyl) reagent, which is a free radical. By its degree of neutralization by the acetonetic extracts made from the studied plants, the antioxidant power was determined as a percentage, which reflects the total amount of antioxidants in the plant.

Within this chapter there were also presented the materials and working methods developed for the production of alcoholic, hydroglyceroalcoholic extracts, as well as some preparations with therapeutic and cosmetic value: a micellar water for cleaning and maintenance of the skin, an ointment dedicated to skin disorders, respectively two emulsion creams for skin maintenance and treatment of diseases of muscular or osteo-articular nature.

Chapter VI contains the results obtained from the research. Within it, there are presented data regarding the content of chlorophyll, flavonoids, volatile oils and antioxidants

of the studied plants, making correlations between the nature of the plant material and the obtained results. It has been observed that the plant samples of *Abies alba*, with the highest total chlorophyll content, are those collected in the flowering phenophase, from the Cacica area. In the case of the *Nepeta pannonica* species, the highest total chlorophyll content was identified in the plants from the Cacica harvest area, from the growing phenophase. The amount of flavonoids and volatile oils, as well as the antioxidant power, identified in plant samples, is directly proportional with the total chlorophyll, in both species.

Thus, it seems that the whole set of environmental conditions in the area of Cacica commune is more favorable to the development of medicinal floristic elements. At the same time, it has been established that the optimum harvesting period of the plant material from *Abies alba* is in the flowering phenophase, whereas the *Nepeta pannonica* in the growth phenophase, contrary to the general opinion that the aromatic plants must be harvested in full bloom.

Also, in the researches, there have been developed and put into practice recipes for two triple concentrated tinctures, a micellar cleaning and maintenance solution for skin, an ointment, respectively two emulsion type creams with fir extracts (*Abies alba*) and hungarian catmint (*Nepeta pannonica*). The tinctures were made by repeated maceration of the plant material in ethyl alcohol in order to obtain high concentrations of active substances.

The micellar solution was developed as a cosmetic cleaning and skin care product. Based on the floral water of *Nepeta pannonica* and *Abies alba*, it uses this by-product obtained by distilling the plant material in order to separate the volatile oils.

The ointment was mainly designed to treat wounds, burns and other skin problems. Developed on the basis of existing formulas in empirical medicine in Bukovina and of the principles enunciated by St. Hildegard, the recipe combines substances known in the people as basic therapeutic ingredients (oil, resin, beeswax) with some known in modern natural therapies, such as volatile oils. The creams were made by the technique of emulsifying the oily and aqueous ingredients. Their usefulness lies in the possibility of their use in both cosmetics and herbal medicine. Moisturizing and therapeutic effects are indicated by the presence of active ingredients, such as glycerin, oily extracts and volatile oils.

Achieving the purpose and objectives is a step forward in the plant physiology domain, but also of natural therapies. The valorization of the studied species, existing in the local spontaneous flora, can also be a starting point for the economic development of the Bucovina area, where the raw material can be harvested in quite significant quantities due to its richness and floral diversity, but also to its purity.