

FINAL GRANT REPORT

Grant name: Virtual atlas of natural drugs

Keywords: Pharmacy, Plants, Pharmacognosy, Ethnopharmacology, Extracts

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Start date of a grant: 4th January 2018

Grant completion date: 31th December 2018

Summary of grant:

The aim of the grant was the creation of a Virtual Atlas of Natural drugs in the university textbooks form published on the internet. This project should summarize the knowledge of selected pharmacopoeial

plants with focus on detailed macroscopic and microscopic description of the natural drugs, their parent plant, the main content substances responsible for the drug's effect and the using of drugs. A high quality pictures should complement the macroscopic and microscopic description of natural drugs. All information must be published (free of charge) on the website and be available to professionals as well as to lay public in three language variants (Slovak, Czech and English). The creation of a Virtual Atlas would be beneficial for increasing the quality of teaching domestic and foreign students at both participating universities (University of Veterinary Medicine and Pharmacy in Košice as well as the University of Veterinary and Pharmaceutical Sciences Brno).

Background of grant:

The Pharmacognosy is taught for two semesters at University of Veterinary Medicine and Pharmacy in Košice. Students must attend lectures, practical lessons and to pass the exam to successfully complete the subject. The pharmacognosy exam consists of two parts namely a practical and a theoretical exam. The task of a practical exam is to identify 10 randomly selected unmarked herbal drugs. This test is often challenging and stressful for students because pharmacognostic atlases are relatively few, they are poorly available and obsolete. The students must to depend on oven pictures of drugs or to come to Department of pharmacognosy and botany UVMP in person. We wanted to make information of medicinal plant more accessible as well as to improve a stuof dy for practical pharmacognosy exam. The solution was to create a Virtual Atlas of Natural Drugs.

Aim of a grant:

The aim of the grant is to create a Virtual Atlas of Natural drugs webpage (free of charge). A webpage must include information on detailed macroscopic and microscopic description, parent plant, main content substances and the use of selected pharmacopoeial natural drugs. Quality pictures should accompany the webpage.

Material and Methods:

For virtual atlas creation, we used pharmacognostic collections of natural drugs available at the University of Veterinary Medicine and Pharmacy in Košice as well as the University of Veterinary and Pharmaceutical Sciences Brno, but we also purchased new drugs.

Assoc. Prof. Renata Kubínová provided to grant some microscopic samples of natural drugs, Dr. Miriam Bačkorová helped to create a text material by using scientific researches published on database such as *ScienceDirect* or *PubMed*. Slavomír Kurhajec prepared microscopic slides, created photographic material and he created a website by *WordPress* software.

Budget of the project:

Item	Planned value	Real costs
Consumables and utilities	1 100 €	1 100.16 €
Travel costs	300 €	203.68 € (*876.60 PLN)
Services	600 €	634.32 € (*2 730 PLN) 13.78 €
<i>SUMARY</i>	<i>2 000 €</i>	<i>1 951,94 €</i>

**The costs referred in Polish zlotys (PLN) spend during EAFP Annual Conference in Krakow are recalculated according to the current exchange rate of the European Central Bank on 22. May. 2019 (1 € = 4.3038 PLN).*

The grant costs listed as consumables and utilities were used to purchase missing natural drug samples at both collaborating universities. A travel costs represent spent money of a grant participants for travel tickets and hotel accommodation during the presentation of a grant results in the 2019 EAFP Annual Conference, in Krakow, Poland (15-17 May. 2019). There are service costs, which are related to above mentioned conference registration fees and they also were spend for the creation of conference poster.

All invoices are attached in *Supplement 1*.

EAFP have already refund costs listed as consumables and utilities (1 100.16 €) in January 2019. It remains to refund travel and service costs (851.78 €).

Results:

The "www.naturaldrugs.eu." has been chosen as a domain name for a Virtual Atlas of Natural Drugs. A webpage offers three language variations - Slovak, English and Czech. There should be found "*List of drugs*" in main menu that contains alphabetical list of 82 natural drugs. The names of these drugs correspond to the nomenclature of the European Pharmacopoeia 8th Edition. After clicking on a selected drug, it is possible to see the page with all information about a drug. This information includes both the Pharmacopoeia (Latin) and the English name of the drug, the Latin name of the parent plant, detailed macroscopic picture, definition of the drug according to European Pharmacopoeia 8th Edition as well as the name of the parent plant in several languages (Slovak, Czech, English, German, French, Spanish, Italian, Polish, Hungarian and Russian). Additional information that can be found on the web page are brief macroscopic description, photograph of microscopic preparation including a scale and a legend, list of the main active substances, some of which are accompanied by the chemical structural formula. The website also includes the use of the drug and, for selected drugs there is toxicity information or some curiosity. There is the mark "*Dictionary of terms*" in webpage main menu. This dictionary contains a definitions or a short explanation of all the pharmacological terms that are added by hyperlinks of natural medicines examples. All science researches and books that were used to a Virtual Atlas of Natural Drugs realization are listed in the "*References*" section.

Grant outputs:

1. Website: www.naturaldrugs.eu
(Supplement 2)
2. Poster presentation in EAFP annual conference 2018: Parma
(Supplement 3)

3. Poster presentation in EAFP annual conference 2019: Krakow
(*Supplement 4*)
4. Oral presentation in EAFP annual conference 2019: Krakow
(*Supplement 5*)

Future vision:

There are innumerable natural drugs but their processing would take much more than 1 year, which is the time, set by EAFP to implement this grant. Therefore, a Virtual Atlas of Natural Drugs contains only 82 selected drugs. Grant participants would like to add other important herbal pharmacopoeial drugs to website in the near future. The webpage also includes the contact information of participants (it can be found in the "About us" section). Therefore, the users of an atlas can send their suggestions for improvement. We would like to inspire by these suggestions and a Virtual Atlas of Natural Drugs to edit if it is necessary.

Conclusions:

A Virtual Atlas of Natural Drugs, which is available on the internet (www.naturaldrugs.eu), provides a free access to relevant and mainly verified information for students and general lay public. It can be also understood as innovative and improved method of Pharmacognosy teaching.

We assume that students will intensively use a Virtual Atlas of Natural Drugs as a basic study material for the study at University of Veterinary Medicine and Pharmacy in Košice as well as at other universities.

Acknowledgement:

A Virtual Atlas of Natural Drugs was created by the financial support of the European Association of Faculties of Pharmacy.

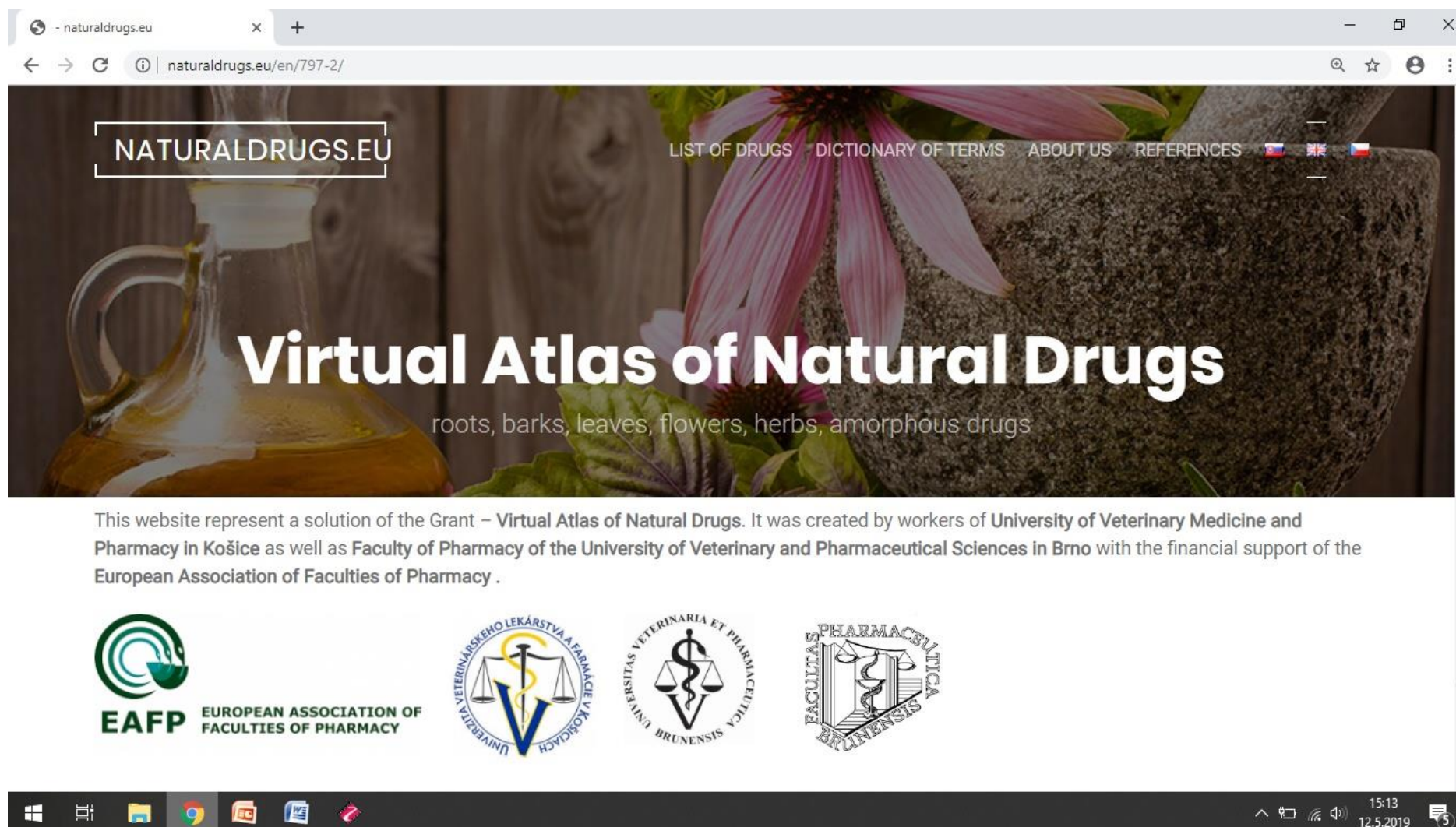
We would like to express special thanks to Prof. Lilian M. Azzopardi as well as Prof. Andries S. Koster.

Date: 22.5.2019

Signature:

Slavomír Kurhajec
(principal applicant of project)

SUPPLEMENT 2 – (Print screen of webpage *www.naturaldrugs.eu*)



The 2018 EAFP Annual Conference in Parma (Italy), May 16-18, 2018

PROJECT “VIRTUAL ATLAS OF NATURAL DRUGS” FUNDED BY PARTNERSHIP FOR FACULTY EDUCATION AND RESEARCH GRANT

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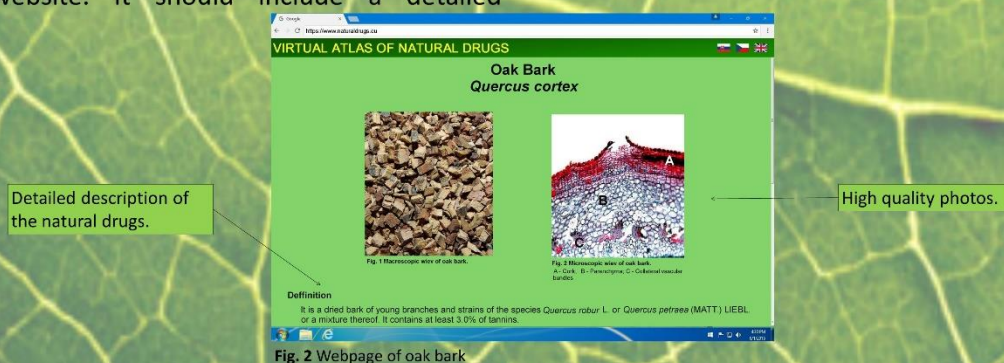
The EAFP Partnership for Faculty Education and Research Grant is a year-long faculty development programme designed to support early career academics and researchers in attaining the next level in their education, research and leadership development. The grant is primarily intended to ease the start-up of new projects and to assist in the development of an effective collaboration. The University of Veterinary Medicine and Pharmacy in Košice (UVMP) as an institutional member of EAFP received a grant from PFER 2017.

The University of Veterinary and Pharmaceutical Sciences Brno, Czech Republic (EAFP member institution from another country) is a collaborating partner. The aim of the project is to prepare a virtual atlas of natural drugs in three languages (Slovak, Czech and English), which will be published on the university website. It should include a detailed

macroscopic and microscopic description of the natural drugs, their parent plants or parent animals, the main content substances responsible for the drugs' effect and the information about their use. The macroscopic and microscopic description of natural drugs will be complemented by a high quality photographic supplement.

For virtual atlas preparation, we are going to use pharmacognostic collections of natural drugs available at the UVMP as well as the University of Veterinary and Pharmaceutical Sciences Brno.

Pharmacognostic atlases are relatively few in number, they are poorly available and obsolete. The creation of a new virtual atlas available on the internet will improve pharmacognosy teaching and provide better access to relevant and verified information for Slovak, Czech and foreign students and for the general public.



EAFP Annual Conference in Kraków (Poland), 15 – 17.05.2019

VIRTUAL ATLAS OF NATURAL DRUGS



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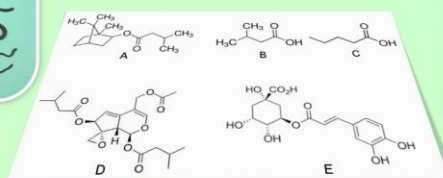
² Department of Natural Drugs, University of Veterinary and Pharmaceutical Sciences Brno, Czech republic



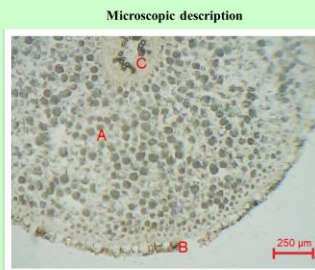
Macroscopic description

There are often outdated or false information on natural drugs in the available literature. Nowadays, the need to use pharmacognostic atlases is essential during pharmacy studies.

Valerianae radix



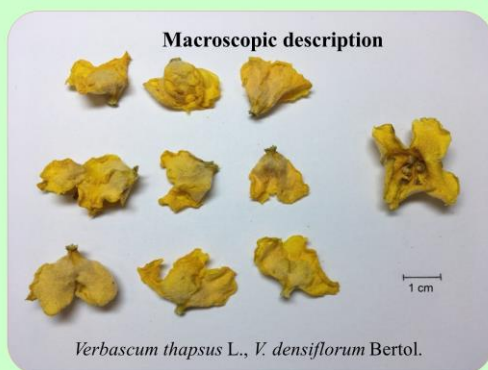
A – bornyl isovalerate; B – isovaleric acid; C – valeric acid; D – valepotriates; E – chlorogenic acid



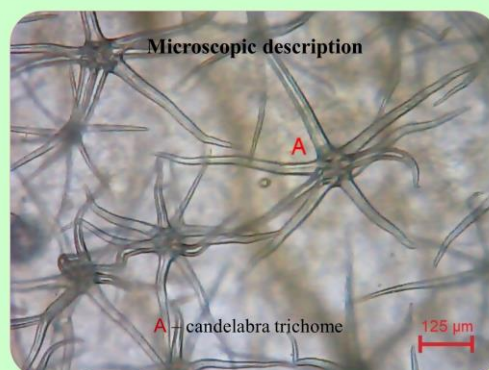
Cross-section of a root: A – parenchyma with starch
B – cuticle
C – vascular bundles

The results of solution to this problem is our project, which is published on the internet domain www.naturaldrugs.eu. The Virtual Atlas of Medicinal Plants occurs three language versions (Slovak, English and Czech). It contains an alphabetical list of drugs according to the nomenclature introduced by the European Pharmacopoeia 8th Edition. Each selected herbal drug is documented by photography. In addition to the short definition, there are the macroscopic and microscopic characteristics, the names of parent plant in various languages, the using of drug, and there is the warning or the curiosity in some cases. The Virtual Atlas of Medicinal Plants represent part of the modernization of teaching Pharmacognosy. Thus, information on medicinal plants have become more accessible to the professionals and to the lay public.

Verbasci flos



Verbascum thapsus L., *V. densiflorum* Bertol.



A – candelabra trichome

Acknowledgments

This project was financially supported by European Association of Faculties of Pharmacy.