THE EXPOSURE FIELDS OF MEDICINAL PLANTS IN THE BOTANICAL GARDEN OF SUA IN NITRA AS A PART OF EDUCATIONAL PROCESS

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Abstract: *Medicinal plants in the Botanical garden of the Slovak Agricultural University in Nitra maintain representative collection of medicinal plant since 1982. In this collection there was a lack of the collection of medicinal and potentially healing plants, that would serve not only as a demonstration of native material for the learning process, but also as a source of biological material for purposes of evaluation of active substances. Common planting of different species also allows the confrontation of traditional medicinal herbs with new, less known taxa. The very important part of agenda is also a supplement and enrichment of genetic resources of healing plants. In the Botanical garden of Slovak University of Agriculture in Nitra, the stuff of co-workers deals with the genetic resources of medicinal plants. The main part share the species of the tribe Asteraceae (Compositae) – 31 taxons and the tribe Lamiaceae (Labiatae) – 28 taxons The main aims of the subject stage are as follow: protection and conservation of gene pools of selected medicinal species, collection of seeds ex-situ (from plantations of medicinal plants in campus botanical garden) for the purpose of index seminum and other additions to the records of plant material with emphasis on evaluation of active substances in medicinal plants. In the first years of the solving period basic recultivation of soil and preparation of experimental field for the introduction of medicinal plants were done. Through Index seminum (international exchange seeds) the assembled product range of less known medicinal plants, that can enrich individual plots. As for the species of medicinal plants collected through the Index seminum network we focused first of all on resistant taxons. In 2012 plots will be created by the collected range of medicinal plants. The plots will be ready for the basic botanic research, as well as for educational purposes and for assessment of the content of the efficacious substances in chosen species. There is an assumption, that the creation of cultivar plots will lead to the confrontation between old conventionally known medicinal plants and new medicinal plants and possible medicinal plants which are the object of the scientific research aimed at botany, pharmacognosy and phytochemistry.*

Key words**:** *education, medicinal plant, Botanical garden, genetic resources, index seminum*

INTRODUCTION

The intention to build a garden with agro botanic character and function appeared as in 1975. There was a sustained place in the center of academic area which was assigned for this purpose. In first January 1982, The Botanical garden was founded as a special facility of the Slovak University of Agriculture in Nitra. The collection of the Botanical Garden includes tropical and subtropical species, plants from the moderate climate, domestic vegetation, decorative and utility plants The aim by the foundation of the Botanical garden was to build a facility which would fulfil the main functions of botanic gardens and besides it would supply the background of the live demonstration source of utility, decorative and wild plants for the uses of the educational process at individual departments of the Slovak University of Agriculture (ČERVEŇANSKÝ, 2003) Initially there was an intention to build fields of medicinal plants. The first collections were gained from the natural stands (HABÁN A KNOLL, 1997), especially from the hills of Zobor (KERÉNYI-NAGY ET AL., 2008) and through the exchange by means of the list of the seeds of wild and cultivated plants, so-called Index seminum, which is

usually updated every year (ELIÁŠ, 2000). In the Botanical Garden it started to be published in 1990 (ŘEHOREK ET AL., 1990). At the beginning of the exchange of seeds by the Index seminum the object of the exchange was first of all the allochthonous material cultivated in the Botanical Garden gained by the exchange and donation of the plants.

MATERIAL AND METHODS

The area of the Botanical garden is irregularly shaped. There is a lake in the middle with uphill and side-walks which divide the area into the irregular aesthetic shapes. The Botanical Garden is situated in the eastern part of the city Nitra, in the cadastral area of Chrenova. It spreads over an area of about 20 ha. The base of the ground is built by the floodplain soil with high content of clay from the river Nitra. As for climate conditions of the Botanical Garden average year temperature is 10.9 °C and the average atmospheric humidity is between 70 and 87%. At the beginning of the project (2010, 2011) the main target was to establish introductionary places of medicinal plants, re-cultivator works and collecting a range of plants and seeds. Some of these seeds were planted as well. The vegetable stuff was collected in the decorative nursery, in so-called field security collection. The classification into the system, names of tribes, species and kinds in the tables are listed according to the Nova Květena ČSSR 1 and 2 (DOSTÁL, 1989a, 1989b) and according to the Willis's dictionary of the plants (Willis, 1966), or eventually corrected according to the valid botanic nomenclature (MARHOLD, HINDÁK ET AL., 1998).

RESULTS AND DISCUSSIONS

Collection of medicinal plants and possible medicinal plants in the Botanical garden gathered at the beginning of the project as well as the material gained during the existence of the garden involves taxons of different tribes with different efficacious substances. The main part have the species of the tribe Asteraceae (Compositae) – 31 taxons and the tribe *Lamiaceae* (*Labiatae*) – 28 taxa (Table 1).

Table 1.

The list of the medicinal plants cultivated and collected in the Botanic Garden of the Slovak University of Agriculture in Nitra

Tribe	Species
Agavaceae	*Yucca filamentosa* L.
Apocynaceae	*Vinca minor* L.
Aristolochiaceae	*Asarum europaeum* L.
Asclepiadaceae	*Asclepias syriaca* L.
Buxaceae	*Buxus sempervirens* L.
Caryophyllaceae	*Agrostemma githago* L.
Compositae (Asteraceae)	*Achillea millefolium* L. *Anthemis tinctoria* L. (*Cota tinctoria* (L.) J. Gay) *Artemisia dracunculus* L. *Aster novae-angliae* L. *Bellis perennis* L. *Calendula officinalis* L.
Compositae (Asteraceae)	*Centaurea cyanus* L. *Cosmos bipinnatus* Cav. *Cynara cardunculus* L. *Echinacea angustifolia* DC. *Echinacea pallida* (Nutt.) Nutt. *Echinacea purpurea* (L.) Moench. *Echinacea tennessensis* (Beadle) Small *Echinops ritro* L. *Eupatorium purpureum* L.

Tribe	Species
	Gaillardia pinnatifida Torr.
	Helenium autumnale L.
	Helichrysum italicum (Roth.) G.Don.
	Liatris punctata Hook.
	Liatris scariosa (L.) Willd.
	Liatris spicata (L.) Willd.
	Ligularia hodgsonii Hook.f.
	Ratibida columnifera (Nutt.) Wooton. et Standl.
	Rudbeckia hirta L.
	Santolina chamaecyparissus L.
	Senecio cineraria DC.
	Solidago canadensis L.
	Stevia rebaudiana Bertoni (L.) Hemsl.
	Tagetes L.
	Tanacetum parthenium (L.) Sch. Bip.
	Taraxacum officinale Webb.
Crassulaceae	*Rhodiola rosea* L.
	Sempervivum tectorum L.
Cupressaceae	*Juniperus communis* L.
Ericaceae	*Calluna vulgaris* (L.) Hull
Geraniaceae	*Geranium macrorrhizum* L.
Iridaceae	*Belamcanda chinensis* (L.) DC
	Iris pseudacorus L.
Labiatae (Lamiaceae)	*Agastache rugosa* (Fisch. et C.A.Mey.) Kuntze
Labiatae (Lamiaceae)	*Ajuga reptans* L.
	Betonica officinalis L.
	Dracocephalum moldavica L.
	Hyssopus officinalis L.
	Lavandula angustifolia Mill.
	Lavandula stoechas L.
	Marrubium vulgare L.
	Melissa officinalis L.
	Mentha aquatica L.
	Mentha longifolia (L.) L.
	Mentha x piperita L.
	Mentha requienii Benth.
	Nepeta cataria L.
	Nepeta x faassenii Bergm.
	Ocimum basilicum L.
	Origanum vulgare L.
	Perilla frutescens (L.) Britton.
	Prunella vulgaris L.
	Rosmarinus officinalis L.
	Salvia nemorosa L.
	Salvia officinalis L.
	Salvia sclarea L.
	Scutellaria baicalensis Georgi.
	Teucrium chamaedrys L.
	Thymus x citriodorus (Pers.) Schreb.
	Thymus serpyllum L.
	Thymus vulgaris L.
Leguminosae (Fabaceae)	*Phaseolus vulgaris* L.
	Trigonella foenum-graecum L.
Liliaceae	*Muscari comosum* (L.) Mill.
Linaceae	*Linum perene* L.
Malvaceae	*Althaea officinalis* L.
Paeoniaceae	*Paeonia lactiflora* Pall.
	Paeonia officinalis L.
Rosaceae	*Agrimonia eupatoria* L.

Tribe	Species
	Alchemilla alpina L.
	Alchemilla xanthochlora Rothm.
	Aruncus dioicus (Walter.) Fernald.
	Filipendula ulmaria (L.) Maxim.
	Fragaria vesca L.
	Potentila anserina L.
	Rosa blanda Aiton.
Rutaceae	*Dictamnus albus* L.
Scrophulariaceae	*Antirrhinum majus* L.
	Digitalis ferruginea L.
	Digitalis grandiflora Mill.
	Digitalis lanata Ehrh.
	Digitalis purpurea L.
	Verbascum thapsus L.
	Veronicastrum virginicum (L.) Farwel.
Tropaeolaceae	*Tropaeolum majus* L.
Umbelliferae (Apiaceae)	*Apium graveolens* L.
	Astrantia major L.
	Crithmum maritimum L.
	Levisticum officinale W.D.J.Koch.
Valerianaceae	*Centranthus ruber* (L.) DC.
	Valeriana officinalis L.
Zygophyllaceae	*Peganum harmala* L.
	Tribulus terrestris L.

The selected range of the vegetable stuff has the advantage that these plants have been already cultivated in the conditions of the Botanical garden in Nitra (HABÁN A KNOLL, 1997; KNOLL ET AL. 2000a) and so the environmental resistance of individual species in the conditions specific for the climate in Nitra is tested (HABÁN, 2000). As for the species of medicinal plants collected through the Index seminum network we focused first of all on resistant taxa. Seeds gained in the previous year of the project were sowed. There is a list of species of medicinal plants collected in the last year through international exchange of seeds and diasporas (Tab. 2).

Table 2.

The list of seeds of medicinal plants collected in 2011 through the Index seminum network

Tribe	Species	Sender
Amaranthaceae	*Achyranthes bidentata* Blume.	Seattle
Araliaceae	*Eleutherococcus senticosus* (Rupr. et Maxim) Maxim	Kaunas
	Eleutherococcus sessiliflorus (Rupr. et Maxim) S.Y.Hu	Kaunas
Asclepiadaceae	*Asclepias incarnata* L.	Seattle
Caprifoliaceae	*Viburnum edule* (Michx.) Raf.	Reykjavik
Compositae (Asteraceae)	*Calendula officinalis* L.	Wisley Genéve
Cucurbitaceae	*Gynostemma pentaphyllum* (Thunb.) Makino.	Seattle
Cyperaceae	*Cyperus esculentus* L.	Kiel
Ephedraceae	*Ephedra americana* Humb. et Bonpl. var. *andina*	Kiel
Gentianaceae	*Swertia japonica* (Schult.) Makino f. *littoralis*	Kyoto
Labiatae (Lamiaceae)	*Leonurus sibericus* L.	Seattle
	Lycopus virginicus L.	Seattle
	Salvia sclarea L. var. *turkestanica*	Wisley
	Salvia fruticosa Mill.	Jibou
	Hyssopus officinalis L. ´*Alba*´	Essen
	Mentha cervina L.	Limoges
Leguminosae	*Glycine max* (L.) Merr.	Dresden
(Fabaceae)	*Lablab purpureus* (L.) Sweet	Dresden
Liliaceae	*Chlorogalum pomeridianum* (DC.) Kunth	Seattle

Tribe	Species	Sender
	Asphodelus albus Mill.	Wisley
Malvaceae	*Callirhoe involucrata* (Torr. et A.Gray.) A.Gray. *Hibiscus sabdariffa* L. *Abelmoschus esculentus* (L.) Moench	Seattle Mainz Kyoto
Nymphaeaceae	*Nuphar advena* (Aiton.) W.T.Aiton	Zürich
Pistaciaceae	*Pistacia terebinthus* L. ssp. *terebinthus*	L´Aquila
Polygonaceae	*Bistorta officinalis* Delabre	Berlin
Primulaceae	*Cyclamen hederifolium* Aiton.	Wisley
Rosaceae	*Cercocarpus montanus* Raf. *Quillaja saponaria* Molina	Ventimiglia Ventimiglia
Rutaceae	*Zanthoxylum americanum* Mill.	Stuttgart
Ulmaceae	*Celtis australis* L. f. *variegata*	Menton
Umbelliferae (Apiaceae)	*Foeniculum vulgare* Mill. *´Purpureum´*	Wisley

There are other subjects cultivating medicinal plants, universities and experimental institutions in Slovakia except of the Botanical garden which handle with collecting and keeping of the medicinal plants. The genetic resources of the medicinal plants in Slovakia are collected in the Gen Bank in Piešťany in Slovakia, which ensures saving of seed samples and the information system of the medicinal plants since 1997 (ČIČOVÁ, 2010). It also participates in active searching for new genetic source of medicinal plants. All collected genotypes are pre-assessed according to the morphological, biological and economic attributes (ČIČOVÁ, 2006).
In 2012 cultivar plots will be created by the collected range of medicinal plants. The plots will be ready for the basic botanic research, as well as for educational purposes and for assessment of the content of the efficacious substances in chosen species. There is an assumption, that the creation of cultivar plots will lead to the confrontation between old conventionally known medicinal plants and new medicinal plants and possible medicinal plants which are the object of the scientific research aimed at botany, pharmacognosy and phytochemistry. Species will be tagged by labels and there will be a list of every species on the plots. Basic information, origin and the way of gaining will be listed as well.

CONCLUSIONS

Already by the foundation of the Botanic Garden it was one of the purposes to create plots with medicinal plants by taking into account the scientific research and education at individual departments of the SUA in Nitra. . As for the layout the plots with medicinal plants were always just diffused or gathered into the groups. Therefore the revival of the collection of medicinal plants and gathering the whole range of medicinal plants and possible medicinal plants according to the climate condition of the experimental territory is realised. The intention of the Botanic Garden of the Slovak University of Agriculture in Nitra is keeping, collecting and studying of the collection of plants according to the international legislative law, agreements and needs of SUA as well as creating the backround for research projects, study and gathering expeditions in Slovakia and abroad. The latest results of research projects can be used in education and in organisation of scientific actions for students, skilled and lay public. Gained genetic sources of medicinal plants as well as evidences from acronyms can in the future complete the range with new genotypes dedicated for research, study, cultivar and practical valuation and exploitation.

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