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Crops for biodiversity conservation

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Abstract: One of the current trends is a return to traditional agro-ecosystems, exploitation of natural resources and preservation of the cultural diversity of nations. Botanic Gardens are important in the protection of genetic resources and natural heritage. Botanical Garden SUA during its existence participated in several projects and research tasks related to the saving of Plant Genetic Resources. Part of its collections are various crop plants, such as medicinal and spice plants, vegetables, fruit trees and various types of plants of the world. In pomological and ampelographic collection of Botanical Garden are registered 728 varieties on an area of 5.75 hectares. The number of registered varieties includes varieties listed in fruits species gene pool: 53 species of old and regional apples and 22 old and regional varieties of pears. The collections of medicinal herbs and kitchen herbs represents 83 kinds of herbs organized in 27 families and 24 species used in folk medicine and medicine. Projects at Botanical Garden SUA aim to expand the gene pool of crop plants for the conservation of biological diversity.

Keywords: diversity, crop plants, botanical garden, gene pool

Introduction and problematic

Biodiversity is in the Convention on Biological Diversity (CBD) characterized as "diversity and variability among living organisms, including terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part" (ELIÁŠ 2000). Each species in the ecosystem as a component of its structure, aside of its size has an important role and their combination provides the ecosystem's ability to prevent disasters or to regenerate after them (MERGANIČOVÁ et al. 2008).

Protecting biodiversity is not just about the protection of flora and fauna in the wild, it is also about protection of agricultural crops and animal breeds - the protection of agricultural biodiversity. In agriculture, there are old varieties

constantly replaced by new, high productive. The main reason for the replacement is lagging profitability of native species.

Currently, the international pressure has increased to protect the genetic variability of crop plants and to preserve the heritage and old landraces, wild and weed species used in that country or region. Discovering and storage of plant genetic resources provide greater variability, suppressing adverse effect monocultures, help conserve natural resources and promote social and economic development of communities and regions.

In the past, protection of genetic resources in Slovakia focused mainly on collecting, recording, evaluation and use of collections of genotypes as the source material for breeding new varieties and hybrids. This collecting was one-sided, with a focus on seed and breeding programs. Only genotypes which meet the current requirements were selected. Unfortunately ecotypes from natural populations that are both old and regional varieties are unattractive in terms of breeding and virtually unusable. (BRINDZA 1995).

The main direction of botanical gardens is a qualified cultivation of plants, their study and presentation of live collections, preservation of wild and cultivated species and transmission of information into education and training process not only for professionals but also public. Botanical Garden SUA, since its founding, participates in research tasks related to the saving of Plant Genetic Resources.

Materials and methods

Botanical Garden of SUA in Nitra is situated in the eastern part of city Nitra and is a part of the Slovak University of Agriculture campus. It is divided into separate units, namely: park, nursery, orchard, greenhouse and vivarium. Except the University vivarium, all parts of Botanical Garden are involved in the collection and storage of the crop, thus helping to preserve diversity.

On the area of 5.75 ha, orchard of Botanical garden demonstrates extensive pomological and ampelographical collection. In the orchard is area with old and landraces fruit trees where are varieties of apples, pears, rowan trees, almonds, peaches, plums, walnuts, cherries and others planted. In the past, the Botanica garden collected various species of fruits and crops significance and valuable for various regions of Slovakia (eg. Rowanberry, Juneberry oval, etc.).The herbal plantations are systematically completed by medicinal and spice plants.

Biological material is gradually supplemented by international seed exchange (Index seminum), authorized collection of natural sites or by a gift or exchange with similar institutions.

Systematic classification, names of families, genera and species in the tables are listed under the New Flora of Czechoslovakia 1 and 2 (DOSTÁL 1989a, 1989b) and by Willis dictionary plants (WILLIS 1966), or corrected under the applicable botanical nomenclature (MARHOLD & HINDÁK et al. 1998).

Results and discussion

Today it is widely known that old and local species, or a variety of local ecotypes are the most valuable part of the genetic diversity. Given their great

diversity they are often a source of original complex of genes for various biological, anatomic and economic traits and characteristics (BRINDZA 1996). The Botanical Garden SUA will therefore work to keep a variety of fruit species that were previously typical of certain areas of Slovakia. In Tab. 1 and Tab. 2 is a list of old and regional varieties of apples (53 varieties) and pears (22 varieties).

Tab. 1. Old and regional varieties of apples

Variety	Site	Variety	Site
Blenheimská reneta	Plot no. 2	Dukát	Plot no. 3
Boskopské	Plot no. 2, č. 3	Jamba	Plot no. 3
Denár	Plot no. 2	Krasava	Plot no. 3
Fieza	Plot no. 2	Marspur Golden	Plot no. 3
Geneva Early	Plot no. 2	Melba	Plot no. 3
Herbertova reneta	Plot no. 2	Pohorka	Plot no. 3
Charlamovské	Plot no. 2	Primula	Plot no. 3
Jadernička šafranová	Plot no. 2	Qinte	Plot no. 3
Kabačka	Plot no. 2	Solivarské x Ontario	Plot no. 3
Kanadska reneta	Plot no. 2	Spartan	Plot no. 3
Krasokvet žltý	Plot no. 2	Vista Bella	Plot no. 3
Lodez	Plot no. 2	Berlepschova reneta	Plot no. 11 C
Matkino	Plot no. 2	Belské ružové	Plot no. 11 C
Min von Hamerschmidth	Plot no. 2	Boskopské	Plot no. 11 C
Mundi	Plot no. 2	Hontianske	Plot no. 11 C
Parkerovo	Plot no. 2	Knížecí zelené	Plot no. 11 C
RedRvift	Plot no. 2	Matkino	Plot no. 11 C
Rubín	Plot no. 2	Oldenburgovo červené	Plot no. 11 C
Sikulské	Plot no. 2	Ontario	Plot no. 11 C
Sudetská reneta	Plot no. 2, č. 3	Panenské	Plot no. 11 C
Summered	Plot no. 2	Parkerovo 794	Plot no. 11 C
Žltá reneta	Plot no. 2	Solivarské	Plot no. 11 C
Astrachan biely	Plot no. 3	Švajčiarské oranžové	Plot no. 11 C
Baumannova reneta	Plot no. 3, no. 11 C	Ušlachtilé žlté 655	Plot no. 11 C
Coxová reneta	Plot no. 3	Wagnerova reneta	Plot no. 11 C
Český ráj	Plot no. 3	Wealthy	Plot no. 11 C
Discovery	Plot no. 3		

Tab. 2. Old and regional varieties of pears

Variety	Site	Variety	Site
Ananaska Courtrayská	Plot no. 1	Kongresovka	Plot no. 1
Kamienka	Plot no. 1	Královna Lujza	Plot no. 1
Grosdemange	Plot no. 1	Charneuská	Plot no. 1
Dekanka Robertová	Plot no. 1	Bergamotka anglická	Plot no. 1
Williamsova červená	Plot no. 1	Krivica (Aureňská)	Plot no. 1
Špinka	Plot no. 1	Boscová flaša	Plot no. 1
Hrdlačka	Plot no. 1	Vila	Plot no. 1
Charles Cognée	Plot no. 1	Júlová	Plot no. 1
Ovsenka	Plot no. 1	Krvavnička červená malá	Plot no. 1
Williamsova semenáč	Plot no. 1	Krvavnička červená väčšia	Plot no. 1
Williamsová	Plot no. 1	Krvavnička zelená	Plot no. 1

In addition to these important species in the collections of the Botanical Gardens are 728 different varieties of fruit trees and vines, represented not only by fundamental kinds of pome, stone fruit and nutshells but also small fruit and less known fruit.

Within the framework of the project Protection and preservation endangered genetic resources of plants in Slovakia, the Botanical Garden protected the genetic resources of medicinal plants. One of the objectives was the collection of seed material in situ concentration and collection in conditions ex situ, including in the collection of the Botanical Garden SUA (HABÁN 1998). Gradually accumulated genetic resources expand and completed therapeutically perspective species. Tab. 3 presents a list of cultivated species of herbs and the Tab. 4 summarizes woody species mainly planted in the past as skeletal greenery, significant also for their substances.

Tab. 3. List of cultivated species of medicinal, aromatic and other herbaceous plants.

Family	Species	Site
Alliaceae	*Allium schoenoprasum* L.	Cultivated nursery
Amaranthaceae	*Amaranthus caudatus* L.	Cultivated nursery, Park
Aristolochiaceae	*Asarum europaeum* L.	Cultivated nursery
Asclepiadaceae	*Asclepias syriaca* L.	Cultivated nursery
Asparagaceae	*Asparagus officinalis* L.	Cultivated nursery
Campanulaceae	*Lobelia siphilitica* L.	Cultivated nursery
Cannabidaceae	*Humulus lupulus* L.	Park
Compositae (Asteraceae)	*Anthemis tinctoria* L. (*Cota tinctoria* (L.) J. Gay)	Cultivated nursery
	Artemisia dracunculus L.	Cultivated nursery
	Bellis perennis L.	Cultivated nursery
	Calendula officinalis L.	Park
	Echinacea angustifolia DC.	Cultivated nursery
	Echinacea pallida (Nutt.) Nutt.	Cultivated nursery
	Echinacea purpurea (L.) Moench.	Cultivated nursery
	Echinacea tennessensis (Beadle) Small	Cultivated nursery
	Echinops ritro L.	Cultivated nursery
	Eupatorium purpureum L.	Cultivated nursery
	*Stevia rebaudiana*Bertoni (L.) Hemsl.	Greenhouse
	Santolina chamaecyparissus L.	Park, Cultivated nursery
	Tanacetum vulgare L.	Cultivated nursery
Crassulaceae	*Rhodiola rosea* L.	Cultivated nursery
	Sempervivum tectorum L.	Cultivated nursery, Park
Equisetaceae	*Equisetum hyemale* L.	Cultivated nursery
Geraniaceae	*Geranium macrorrhizum* L.	Cultivated nursery
	Belamcanda chinensis (L.) DC	Greenhouse
Iridaceae	*Iris germanica* L.	Cultivated nursery
	Iris pseudacorus L.	Cultivated nursery

Tab. 3. – cont.

Family	Species	Site
Labiatae (Lamiaceae)	*Ajuga reptans* L.	Cultivated nursery
	Betonica officinalis L.	Cultivated nursery
	Hyssopus officinalis L.	Cultivated nursery
	Lavandula angustifolia Mill.	Cultivated nursery
	Lavandula stoechas L.	Cultivated nursery
	Melissa officinalis L.	Cultivated nursery
	Mentha aquatica L.	Cultivated nursery
	Mentha longifolia (L.) L.	Cultivated nursery
	Mentha x piperita L.	Cultivated nursery
	Mentha requienii Benth.	Cultivated nursery
	Mentha spicata L.	Park
	Monarda fistulosa L.	Cultivated nursery
	Nepeta cataria L.	Cultivated nursery
	Nepeta x faassenii Bergm.	Cultivated nursery
	Ocimum basilicum L.	Cultivated nursery
	Origanum vulgare L.	Cultivated nursery
	Rosmarinus officinalis L.	Greenhouse, Cultivated nursery
	Salvia aethiopis L.	Cultivated nursery
	Salvia nemorosa L.	Cultivated nursery
	Salvia officinalis L.	Cultivated nursery
	Salvia sclarea L.	Cultivated nursery
	Stachys sylvatica L.	Park
	Teucrium chamaedrys L.	Cultivated nursery
	Teucrium scorodonia L.	Cultivated nursery
	Thymus praecox Opitz. var. *arcticus*	Cultivated nursery
	Thymus vulgaris L.	Cultivated nursery
Leguminosae (Fabaceae)	*Phaseolus vulgaris* L.	Orchard, Cultivated nursery
Liliaceae	*Convallaria majalis* L.	Cultivated nursery
	Lilium martagon L.	Cultivated nursery
	Muscari comosum (L.) Mill.	Cultivated nursery
Linaceae	*Linu mperene* L.	Cultivated nursery
Malvaceae	*Hibiscus moscheutos* L.	Cultivated nursery
Papaveraceae	*Papaver somniferum* L.	Cultivated nursery
Ranunculaceae	*Adonis vernalis* L.	Cultivated nursery
	Actaea pachypoda Elliott.	Cultivated nursery
	Nigella damascena L.	Cultivated nursery
Rosaceae	*Alchemilla xanthochlora* Rothm.	Cultivated nursery
	Amelanchier ovalis Medik	Park
	Filipendula ulmaria (L.) Maxim.	Cultivated nursery
	Fragaria vesca L.	Orchard, Cultivated nursery
Rutaceae	*Dictamnus albus* L.	Cultivated nursery
Scrophulariaceae	*Digitalis ferruginea* L.	Cultivated nursery
	Digitalis grandiflora Mill.	Cultivated nursery
	Digitalis lanata Ehrh.	Cultivated nursery
	Digitalis purpurea L.	Cultivated nursery

Tab. 3. – cont.

Family	Species	Site
	Verbascum thapsus L.	Cultivated nursery
	Veronicastrum sibiricum (L.) Pennell	Cultivated nursery
Solanaceae	*Physalis alkekengi* L.	Cultivated nursery
	Physalis ixocarpa Brot.	Cultivated nursery
	Physalis peruviana L.	Cultivated nursery
Tropaeolaceae	*Tropaeolum majus* L.	Park
Umbelliferae (Apiaceae)	*Ammi visnaga* (L.) Lam.	Cultivated nursery
	Apium graveolens L.	Park
	Astrantia major L.	Cultivated nursery
	Levisticum officinale W.D.J.Koch.	Cultivated nursery
	Pimpinella saxifraga L.	Cultivated nursery
Valerianaceae	*Centranthus ruber* (L.) DC.	Cultivated nursery
Zygophyllaceae	*Peganum harmala* L.	Cultivated nursery
	Tribulus terrestris L.	Cultivated nursery

Tab. 4. List of cultivated woody species of medicinal plants and crops.

Family	Species	Source
Annonaceae	*Asimina triloba* (L.) Dunal.	Cultivated nursery
Apocynaceae	*Vinca minor* L.	Cultivated nursery
Araliaceae	*Hedera helix* L.	Cultivated nursery, Park
Berberidaceae	*Mahonia aquifolium* (Pursh.) Nutt.	Cultivated nursery, Park
Betulaceae	*Betula pendula* Roth.	All area
Buxaceae	*Buxus sempervirens* L.	Park, University campus
Caprifoliaceae	*Sambucus nigra* L.	Orchard
Cupressaceae	*Juniperus communis* L.	All area
Ebenaceae	*Diospyros kaki* Thunb.	Orchard, University campus
Ericaceae	*Calluna vulgaris* (L.) Hull	Cultivated nursery
Grossulariaceae	*Ribes nigrum* L.	Orchard, Cultivated nursery
	Hibiscus syriacus L.	Cultivated nursery
Paeoniaceae	*Paeonia lactiflora* Pall.	Park
	Paeonia officinalis L.	Park
Rhamnaceae	*Ziziphus jujuba* Mill.	Orchard, Cultivated nursery
Rosaceae	*Amelanchier ovalis* Medik	Park
	Prinsepia uniflora Batalin.	Park
	Sorbus domestica L.	Park
	Mespilus germanica L.	Park, Orchard
Sapindaceae	*Koelreuteria paniculata* Laxm.	Park
Solanaceae	*Lycium chinense* Mill.	Cultivated nursery
Taxaceae	*Taxus baccata* L.	Cultivated nursery
Tiliaceae	*Tilia cordata* Mill.	Park
	Tilia platyphyllos Scop.	Park

By constantly bringing together new taxa in the collections of the Botanical Garden we are able to preserve genetic variability. Latest additions summarizes Tab. 5.

Tab. 5. The Biological material for the genetic resources of the crops and potencional species. (in years 2014 and 2015).

Family	Species	Source
Araceae	*Arisaema flavum* (Forssk.) Schott.	Index Seminum
Asclepiadaceae	*Asclepias tuberosa* L.	Gift
Bignoniaceae	*Tecoma radicans* Juss. (Syn.:*Campsis radicans*)	Index Seminum
Caryophyllaceae	*Saponaria officinalis* L.	Index Seminum
Compositae	*Ambrosia trifida* L.	Index Seminum
	Emilia coccinea D.Don	Index Seminum
Cucurbitaceae	*Cucumis sativus* L. ´*Crystal Lemon*´	Collection
	Gynostemma pentaphyllum L.	Index Seminum
Ericaceae	*Arbutus unedo*L.	Gift
	*Arbutus unedo*L.	Collection
Eupteleaceae	*Euptelea pleiosperma* Hook .f. et Thoms.	Index Seminum
Hyacinthaceae	*Urginea maritima* (L.) Baker	Gift
Leguminosae	*Ceratonia siliqua* L.	Index Seminum
	Lespedeza bicolor Turcz.	Index Seminum
	Sophora japonica L.	Index Seminum
Lentibulariaceae	*Pinguicula vulgaris* L.	Gift
Magnoliaceae	*Magnolia macrophylla* Michx.	Gift
Malvaceae	*Abelmoschus esculentus* (L.) Moench.	Index Seminum
	Althaea officinalis L. subsp. *taurinensis*	Index Seminum
Nymphaeaceae	*Nuphar lutea* (L.) Sibth. & SM	Index Seminum
Oleaceae	*Ligustrum lucidum* W.T.Aiton.	Gift
Pistaciaceae	*Pistacia terebinthus* L.	Index Seminum
Podocarpaceae	*Podocarpus lawrencei* Hook.f.	Gift
Rhamnaceae	*Hovenia dulcis* Thunb.	Index Seminum
	Hovenia dulcis Thunb.	Collection
	Ziziphus jujuba Mill.	Collection
Rosaceae	*Quillaja saponaria* Molina	Index Seminum
Sarraceniaceae	*Sarracenia purpurea* L.	Index Seminum
	Sarracenia purpurea L.	Gift
	Sarracenia flava L.	Gift
Solanaceae	*Cyphomandra betaceaea* (Cav.) Sendt.	Index Seminum
	Physalis angulata L.	Collection
	Physalis peruviana L.	Index Seminum
	Physalis philadelphica Lam.	Index Seminum
	Solanum laciniatum Ait.	Index Seminum
	Solanum muricatum Ait.	Collection
	Withania somnifera Dunal.	Index Seminum
	Withania somnifera Dunal	Gift
Umbelliferae	*Cryptotaenia japonica* Hassk.	Index Seminum
(Apiaceae)	*Coriandrum sativum* L.	Collection
Zingiberaceae	*Amomum compactum* Sol. ex Maton	Collection
	Elettaria cardamomum (L.) Maton	Collection

Conclusion

Collection and evaluation of the efficiency of traditional as well as new - introduced species is an important aspect for the popularization and the expansion of the generic base important agriculture plants. Supported development of diversity not only in the wild, but also in agriculture or at farms leads to reduction of biological uniformity of genetic resources.

Our aim is not only the maintenance and distribution of germplasm of crop plants, but also the verification of the economic importance of selected species to a broader genetic basis for the realization of research and scientific tasks in the field of biodiversity and agrobiodiversity, agronomy, agroecology, biotechnology, food processing, and so on.

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