

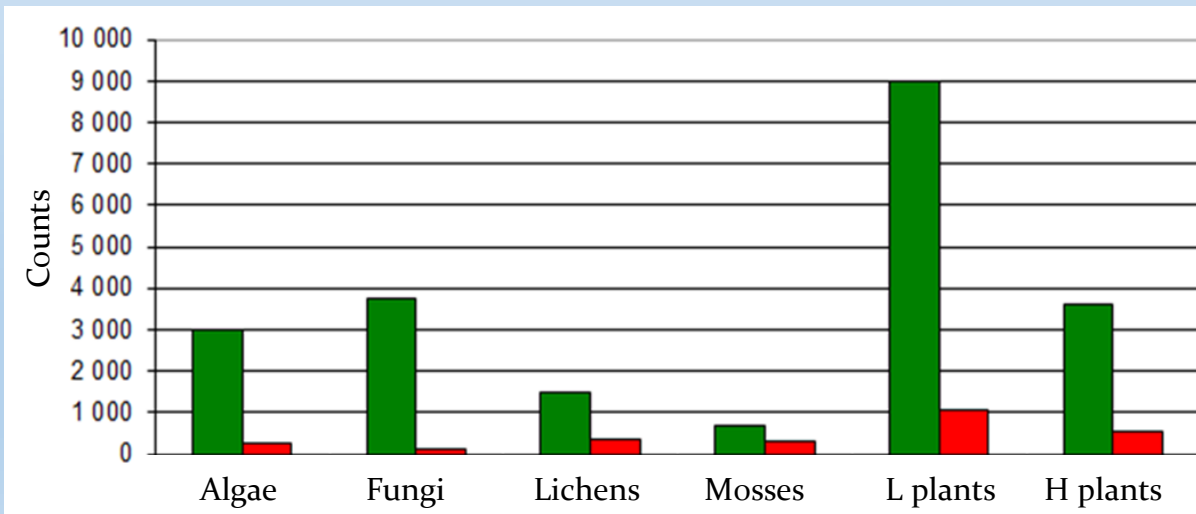
**The bilateral project „An integrated approach of botanical garden and citizen science in the threatened plants conservation“: achievements and implications on the Slovak side**

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# Threatened plant species

- 1047 lower plant species (13,6%), 527 vascular plant species (14,6%) threatened
- mostly peatland, wetland, saline and sandy habitats species
- destruction of natural habitats



Group	Total taxa	CR	EN	VU	Total
Algae	3 008	7	80	196	283
Fungi	3 764	7	39	49	95
Lichens	1 508	140	48	169	357
Mosses	699	47	75	190	312
L Plants	8 979	201	242	604	1047
H Plants	3 619	155	171	201	527

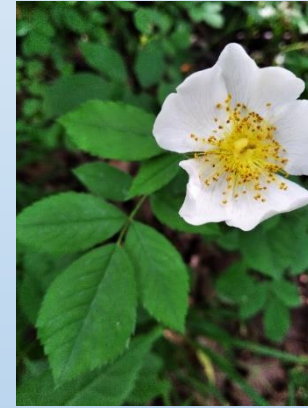
# Plant species conservation in Slovakia

- **State Nature Protection** (Ministry of Environment of the SR) – mostly *in situ* plant species conservation (protection/restoration of the natural habitats)
- **SNP** – recently a project financed from the European structural funds – combined *in-situ* and *ex situ* protection of *Alkanna tinctoria*, *Colchicum arenarium* (sand dunes species)
- **Museum of the High Tatra National Park** – wider experience in the *ex situ* conservation of alpine herbs
- **Slovak Agricultural University** – experiment on *ex situ* conservation of *Carex echinata*, *Carex flava*, *Carex lepidocarpa*, *Eriophorum angustifolium*, *Senecio rivularis* (wetland species)
- **Mlyňany Arboretum** – an attempt to create an exposition of threaten woody plant species decades ago (failed)
- **In 2022** – start of the SRDA project – cooperation with TFRI – focus on 3 woody plant species on both sides

# Project focus

## *Selected plant species*

- ◉ *Crataegus lindmanii* Hrabětová – Lindman's hawthorn (EN)
- ◉ *Rhododendron tomentosum* Harmaja - marsh Labrador tea (EN)
- ◉ *Rosa arvensis* Huds. – field rose (VU)



## *On the Taiwanese side*

- ◉ *Citrus taiwanica* Tanaka & Shimada, *Erythrina variegata* L. and *Polyalthia liukiensis* Hatushima (CR)

## *Propagation ways tested*

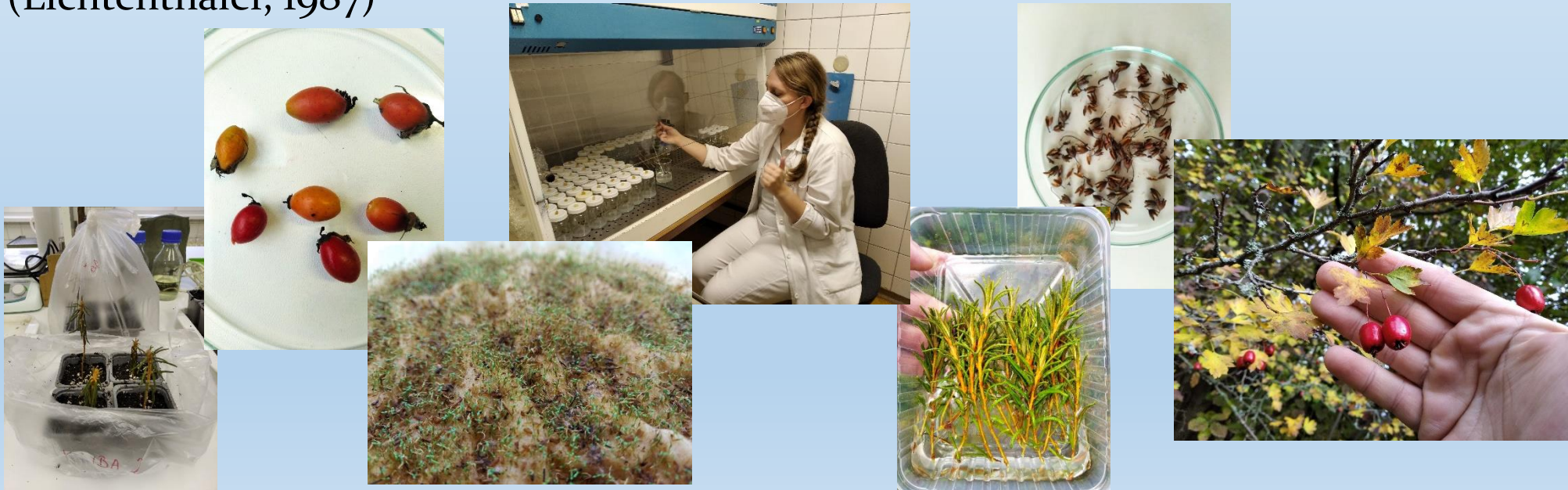
- ◉ seeds, cuttings (substrate, IBA growth stimulator), *in vitro* technology

# Methodology

- **Plant material collection:** 1. *Crataegus lindmanii* – NP Pieniny, Levočské hills  
2. *Rhododendron tomentosum* – NR Klin, NR Medzi bormi  
3. *Rosa arvensis* – NNR Zoborské vrchy
- **Terms of collection:** beginning of summer (cuttings), late autumn (cuttings and seeds)
- **Substrates:** Klasmann Baltica peat, Klasmann Steckmedium (containing perlite), Garden Substrate for Roses (AgroCS)
- **Rooting stimulator:** Rhizopon AA (1% IBA)
- **Cultivation in air-conditioned room:** PAR  $100 \mu\text{mol m}^{-2} \text{s}^{-1}$ , photoperiod 16/8 (summer) or 12/12 h (autumn), temperature 28/23 °C or 22/17 °C and RH50/60% or 60/70%
- **In vitro culture:** 1. initiation media – modified SH (Shenk & Hildebrandt, 1972), WPM (woody plant medium, Lloyd & McCown, 1981), S2 (Standardi & Catalano, 1985), MS (Murashige & Skoog, 1962), 2. multiplication media: modified SH and MS

# Methodology

- **Lab cultivation:** PAR  $50 \mu\text{mol m}^{-2} \text{s}^{-1}$ , photoperiod 16/8, temperature 25/20 °C
- **Propagation approach efficiency:** determined by means of stem growth analysis (in species of all 3 culture types - *Rhododendron tomentosum*, *Rosa arvensis*)
- **Seedling/regenerant fitness:** determined by means of leaf chlorophyll concentration (Lichtenthaler, 1987)



# Results

Species	Collection term	Substrate/Rooting stimulator					
		P -Rhiz	P +Rhiz	K -Rhiz	K +Rhiz	-Rhiz	+Rhiz
<i>Rhododendron tomentosum</i>	7.7.2022	0	0	0	0		
	13.10.2022	50	38	57	38		
<i>Rosa arvensis</i>	1.7.2022					17	0
	14.11.2022					13	25

Table 1: Rooting success in *Rhododendron tomentosum* and *Rosa arvensis* cuttings in respect of the collection term, applied substrate and stimulator. Germination of *Rhododendron tomentosum* seeds levelled at 60% and *Rosa arvensis* achenes at 2%. Abbreviations: P – peat, K – Klasmann TS Steckmedium, Rhiz – Rhizopon AA.

# Results

A	Medium	Initiation efficiency [%]	Medium	Multiplication efficiency [%]
	RTI <sub>1</sub>	37	RTI <sub>1</sub> → RTI <sub>1</sub>	> 90
			RTI <sub>1</sub> → RTI <sub>2</sub>	> 75
	RTI <sub>2</sub>	21	RTI <sub>2</sub> → RTI <sub>2</sub>	> 90
			RTI <sub>2</sub> → RTI <sub>1</sub>	> 75
	RTI <sub>3</sub>	0	x	x
	RTI <sub>4</sub>	0	x	x
B	Medium	Initiation efficiency [%]	Medium	Multiplication efficiency [%]
	RI <sub>1</sub>	60	RI <sub>1</sub> → RM <sub>1</sub>	83
	RI <sub>2</sub>	40	RI <sub>2</sub> → RM <sub>1</sub>	50
	RI <sub>3</sub>	28	RI <sub>3</sub> → RM <sub>1</sub>	0
	RI <sub>4</sub>	57	RI <sub>4</sub> → RM <sub>1</sub>	50

Table 2: Initiation and multiplication efficiency in *Rhododendron tomentosum* (A) and *Rosa arvensis* (B) *in vitro* cultures.



# Results

Species	Cuttings		<i>In vitro</i>		Seeds	
	TSL (cm)	CD (days)	TSL (cm)	CD (days)	TSL (cm)	CD (days)
<i>Crataegus lindmanii</i>	-	-	-	-	-	-
<i>Rhododendron tomentosum</i>	12	194	126	292	0.9	194
<i>Rosa arvensis</i>	198	162	0.8	298	3.5	210

Table 3: Evaluation of the propagation approach efficiency by means of stem growth analysis. Cuttings and seeds of *Rhododendron tomentosum* and *Rosa arvensis* were collected in autumn, explants for *in vitro* cultivation in early summer 2022. Abbreviations: TSL – total stem length, CD – cultivation duration.

# Results

Parameter	Propagation approach		
	Cuttings	Seeds	<i>In vitro</i>
Chlorophyll a+b (mg.g <sup>-1</sup> FW)	2.84	3.28	2.08

Table 4: Chlorophyll concentration in *Rosa arvensis* leaves as a function of the propagation approach.

# Conclusions and Implications

- Propagation of *Rhododendron tomentosum* through stem cuttings and seeds is longer lasting but effective enough
- Despite of lower efficiency of rooting, *Rosa arvensis* regenerants grow very fast; achenes tend to show large dormancy and need to be stratified
- Compared to *in vitro* technique, common propagation ways seem to be faster and cheaper
- *Crataegus lindmanii* can be propagated only generatively after more year lasting stratification
- **Now we can create species *ex situ* deposits of similar genetic structure to natural populations – our final project objective**
- Cooperation offer for Slovak nature protection organisations: *ex situ* conservation of your lists of endangered plant species using our expertise (a common project?)

**Thank you for your  
attention 😊**