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SPECIES STRUCTURE OF PLANTS IN THE BÁB FOREST CLEARCUTS

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In the paper we have summarized the results of a research which was realized in the Báb forest (Veľký Báb, Nitra upland). The target of the research is the evaluation of species composition in the clearcuts in 2012. In the Báb forest, during spring records there were 80 and during summer records 102 taxa of taxons recorded. The woody plants of spring and summer reports were mainly represented by typical forest species. Moreover, these are woody plants of forest open parts and there are also two invasive woody *Ailanthus altissima*, *Robinia pseudoacacia* plants documented. During the summer reports, three new woody plants *Clematis vitalba*, *Lonicera caprifolium*, *Ulmus minor* appeared in the herb layer. Herbs are represented during the spring reports by typical spring ephemeroids, geophytes and forest herbs presenting the spring synusia. During the summer reports, ephemeroids are absent and there were new species, mainly *Alliaria petiolata*, *Convallaria majalis*, *Lithospermum purpurocaeruleum*, *Melica nutans* of forest herbs reported. In the clearcut areas also clearcut, synanthropic, mainly *Cirsium vulgare*, *Lamium purpureum*, *Sambucus ebulus*, *Serratula tinctoria*, *Torilis japonica* and invasive species *Aster lanceolatus*, *A. novi-belgii* agg., *Erigeron annuus* ssp. *annuus*, *Impatiens parviflora* occurred. Generally, we can state that the diversity of clearcut plant taxa is high. Taxa are represented by forest woody plants, woody plants of clearcuts, forest open parts and forest edges. Within clearcut herbs, there are typical forest species of oak-hornbeam forests represented, species of clearcuts and human-influenced posts and there are also invasive taxa found.

Keywords: Báb forest, clearcutting, species composition, changes

The study presents results of the research realized in the clearcuts in the Báb forest in 2012. The Báb forest area belongs to cadastre of the village Veľký Báb and it is situated in Nitra loess upland. This forest is a remnant of original native forest complexes. In the past, it was marked by anthropogenic impacts, especially by short rotation management. Its surroundings were mainly turned into wide-area fields and vineyards (Kubíček and Brechtl, 1970). The Báb forest represents a climax stage of forest succession on loess (Eliáš, 2010a). Two reserve areas can be found here – the National Nature Reserve Báb forest and the Protected Area Báb Park.

In the years 1967 to 1975, the research in the Báb forest was part of International Biological Program and Man and Biosphere program. Evaluated results were published in two publications – Jurko and Duda (eds.) (1971) and Biskupský (ed.) (1975). Currently, 1-hectare research area of the Báb forest is included in the list of studied areas of the ILTER network (International Long-Term Ecological Research). Studies written by Eliáš (2010a, 2010b) belong into a category of newer theses, associated with the Báb forest research. A thesis by Halada et al. (2010) dealt with the assessment of species composition of a particular permanent area. Ferlíková (2009, 2010) focused on the species compositions of clearcuts, and theses by Eliáš, and Pauková (2010), Sileská (2012) dealt with the situation in the Báb forest, more specifically they focused on population-biological characteristics of spring geophytes' population and on further species belonging to a spring synusia.

Fragments of forests in a deforested country, intensively exploited by agriculturers, are exposed to impacts of human activities. These fragments are represented by more or less indigenous vegetation surrounded by disrupted, intensively farmed areas and biotopes with the predominance of synanthropic species. Not only the disturbing influence of humans, but also long-term isolation from indigenous communities markedly influenced their biodiversity. Moreover, they are also exposed to supply of diaspores of alien species from adjacent synanthropic communities and agro-ecosystems (Eliáš, 2010b). This fact also concerns the Báb forest. In November 2006, a one-time line and shelterwood logging was realized and therefore, a new type of post after tree removal was created in the area – a clearcut (Eliáš, 2010b).

The aim of this thesis is to evaluate species composition of the four clearcuts in the Báb forest in the period of 2012. Moreover, the thesis wants to point out and evaluate the difference in the species occurrence between spring and summer period. The theses by Pilková (2011, 2013a) dealt with a structure of plant communities, then it focused on evaluation and comparison of the species composition on two types of habitats – in clearcuts and in forest covers. We included an occurrence of non-indigenous taxa in the Báb forest in these theses Pilková (2012, 2013b). However, this thesis offers a full list and evaluation of the clearcut species in spring and summer period of 2012. The given thesis presents new comparisons and conclusions.

Twelve areas of the size of 20 × 20 m were measured and permanently marked in the four clearcuts. The clearcuts appeared due to logging in November 2006. In each of the clearcuts, there are 3 plots placed in a linear transect (Figure 1).

Material and methods

Phytocenological reléves (PR) were made in 2012:

Spring PR	18., 19.4. 2012	12 PR
Summer PR	28.6., 3.7. 2012	12 PR

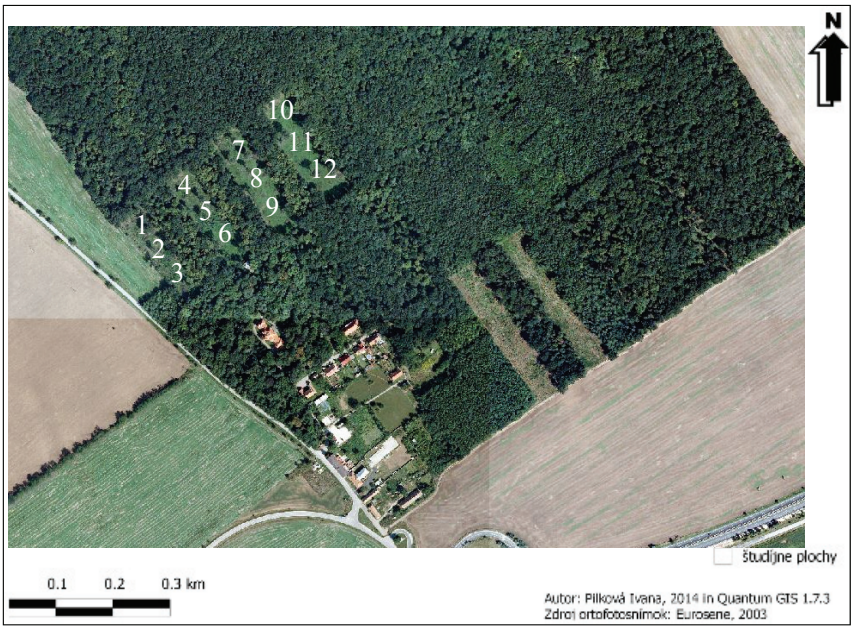

Figure 1 The area of interest Báb forest with marked permanent areas
Source: ILE SAS, branch Nitra

The reléves were put together by standardized phytocenological methods (Moravec et al., 1994) while the following 9-itemed ordinal scale was used (Westhoff and van der Maarel, 1978). The recorded data were afterwards inserted into the database Turboveg (Hennekens and Schaminee, 2001), from which they were subsequently converted to the program JUICE 7.0 (Tichý, 2002). Afterwards, the frequency of occurrence (%) and range of plant species abundances in spring and summer records were calculated in the program JUICE (Tichý, 2002). Nomenclature of the identified taxons is uniformly edited according to Marhold and Hindák et al. (1998).

Results and discussion

In the Báb forest there were 80 taxa of higher plants recorded during the spring records. From these, there were 23 woody plants and 57 herbs. During the summer records, there were 102 taxa recorded – 26 woody plants and 76 herbs (Table 1).

The tree layer, during spring records, was formed by typical forest woody plants of the oak-hornbeam forests: *Acer campestre*, *Carpinus betulus*, *Quercus cerris*, *Q. petraea* agg., *Q. robur* agg. On the other hand, also invasive woody plants *Ailanthus altissima*, *Robinia pseudoacacia* were recorded. The particular woody plants cover of the tree layer is low; its range is from the 1st to the 4th level. The exception is a woody plant, *Quercus petraea* agg.; this species reaches the 8th level of cover on the PP no 4. The tree layer is recorded on the PPs no 3, 4, 5, 6, 7. A higher cover of woody plants in the tree layer is recorded on the PP no 4. The given PP was left without any logging intervention in 2006; and therefore, the most significant secondary succession of all PP is reflected here.

The tree layer, during the summer records, is represented by typical forest but also invasive woody plants that were recorded. To this layer, the woody plant *Acer platanoides* was added during the summer. This woody plant was recorded during the spring records in the shrub layer. The cover of the tree layer of woody plants has its range from the 1st to the 8th level. The cover of the 8th level is reached by the woody plants *Quercus petraea* agg. and *Robinia pseudoacacia* on PP no 3 and 4. Moreover, during the summer records, a change in the occurrence of tree layer woody plants happens on the particular PP. The woody plants in the tree layer are not documented only on the 4 PPs – no. 1, 8, 9, 10.

The highest frequency was achieved by an invasive woody plant called *Robinia pseudoacacia* and it happened during spring recording when the frequency achieved 42 %. During the spring, the given invasive woody plant also achieved a high frequency of 25 %. The same frequency was achieved by a different woody plant called *Acer campestre* and it happened during spring and summer recording. During the summer, *Carpinus betulus* and *Quercus cerris* were also classified as widespread taxa of the tree layer (with frequency of 25 % as well) (Table 1).

The shrub layer, during spring records, is represented by forest woody plants: *Acer campestre*, *A. platanoides*, *Carpinus betulus*, *Cornus mas*, *Euonymus europaeus*, *Lonicera xylosteum*, *Quercus cerris*, *Q. petraea* agg., *Q. robur* agg., *Viburnum lantana*, *Ulmus minor*. Moreover, these are also woody plants of clearcuts and human-influenced posts *Sambucus nigra* and *Prunus spinosa* and invasive woody plants *Ailanthus altissima* and *Robinia pseudoacacia*. All PPs are formed by woody plants in the shrub layer. The cover has a range from the 1st to the 8th level. The highest cover (8th level) is reached by these woody plants: *Carpinus betulus*, *Lonicera xylosteum*, *Quercus cerris*, *Q. petraea* agg., *Viburnum lantana*. The highest cover of woody plants in the shrub layer is on the PPs no. 4, 7, 11, 12.

The shrub layer, during summer records, is also represented by forest woody plants; then there are woody plants of clearcuts and human-influenced posts as well as invasive woody plants like during the spring records. Only one species is added, namely *Sambucus nigra*. The shrub layer occurs on all PP. The cover has its range from the 1st to the 8th level. To the four taxa (*Carpinus betulus*, *Lonicera xylosteum*, *Quercus cerris*, *Viburnum lantana*) recorded during the spring records with their cover level 8, these species are added: *Acer campestre*, *Ligustrum vulgare*, *Quercus robur* agg., *Robinia pseudoacacia*. The highest cover of woody plants in the shrub layer is on the PPs no. 2, 3, 4, 5, 7, 9, 11, 12.

The most spread species in the shrub layer was a woody plant called *Carpinus betulus*, and it was possible to monitor it on all PP (100 % frequency) during both spring and summer

recordings. Then, considering a height of an occurrence rate during the spring and summer, a woody plant *Acer campestre* with 58 % frequency, *Quercus cerris* with 50 % frequency and an invasive woody plant *Robinia pseudoacacia* with 42 % frequency followed. There was a new woody plant found and monitored during spring recordings called Sambucus nigra and the plant also achieved a high frequency of 33 % (Table 1).

Woody plants, during spring records, in the herb layer are also represented by typical forest species: *Acer campestre*, *A. platanoides*, *Carpinus betulus*, *Cornus mas*, *Crataegus laevigata*, *Euonymus europaeus*, *E. verrucosus*, *Hedera helix*, *Ligustrum vulgare*, *Lonicera xylosteum*, *Quercus cerris*, *Q. petraea* agg., *Q. robur* agg., *Swida sanguinea*, *Viburnum lantana*. On the other hand, there are also species of clearcuts as well as forest edges: *Prunus spinosa*, *Rosa canina* agg., *Rubus fruticosus* agg., *Sambucus nigra*. Furthermore, in the herb layer there are also invasive woody plants recorded: *Ailanthus altissima*, *Robinia pseudoacacia* and a run riot amenity woody plant *Mahonia aquifolium*. The cover of these woody plants is in the range from the 1st to 8th level. The highest cover is reached by the woody plants: *Acer campestre*, *Carpinus betulus*, *Ligustrum vulgare*, *Hedera helix*. The highest cover of woody plants in the herb layer is recorded on the PPs no. 4, 7, 8, 9, 11.

Woody plants, during summer records, in the herb layer are represented by the same species as during the spring records. Furthemore, new species were recorded: *Lonicera caprifolium*, *Clematis vitalba*, *Ulmus minor*. The cover of these woody plants is from the 1st to the 8th level. The highest cover is reache by the same woody plants as during the spring records (*Acer campestre*, *Carpinus betulus*, *Hedera helix*), apart from the woody plant *Ligustrum vulgare*. With the highest cover, these species are added to them: *Ailanthus altissima*, *Euonymus europaeus*, *Robinia pseudoacacia*, *Rubus fruticosus* agg., *Ulmus minor*. The highest cover of the woody plants in the herb layer is recorded on the PPs no 1, 2, 3, 4, 5, 7, 9, 10.

Herbs, during spring summer, are represented by spring ephemeroids typical for the oak-hornbeam forest: *Anemone ranunculoides*, *Corydalis solida*, *Ficaria bulbifera*, *Gagea lutea*, *Isopyrum thalictroides*. These species reach the 8th level of cover. The exception is the taxon *Isopyrum thalictroides* that reaches only the 1st level. During the summer records there are not spring ephemeroids present anymore; the species *Ficaria bulbifera* is an exception. This species achieves even the 8th level of cover.

To another typical forest species representing the spring synusia belong: *Ajuga reptans*, *Galium odoratum*, *Galeobdolon luteum*, *Geum urbanum*, *Glechoma hirsuta*, *Melica uniflora*, *Mercurialis perennis*, *Polygonatum latifolium*, *P. multiflorum*, *Pulmonaria officinalis* and violets *Viola reichenbachiana*, *V. riviniana*, *V. hirta*, *V. mirabilis*. The cover of these spring herbs has its range from the 1st to the 8th level. The highest cover was recorded on the PPs no. 1, 4, 6, 7, 9, 10, 11, 12 and herbs *Galeobdolon luteum*, *Glechoma hirsuta*, *Mercurialis perennis*, *Polygonatum latifolium*, *Pulmonaria officinalis*, *Viola reichenbachiana*, *V. hirta*, *V. mirabilis* reached it.

Herbs forming the spring synusia during the spring records are also recorded in the summer; the violet Viola riviniana is an exception because it is absent in this period. To the forest herbs that were added during the summer records belong: *Alliaria petiolata*, *Brachypodium sylvaticum*, *Carex muricata* agg., *Convallaria majalis*, *Dentaria bulbifera*, *Geranium robertianum, Lithospermum purpurocaeruleum, Melica nutans*. The cover of these species has its range from the 1st to the 8th level. The herbs *Brachypodium sylvaticum, Galeobdolon luteum, Geum urbanum, Glechoma hirsuta* and *Pulmonaria officinalis* reached the highest cover on the PPs no. 4, 5, 6, 7, 8, 10, 12.

On the studied PP there, during spring records, are also typical clearcut species: *Bromus benekenii, Calamagrostis epigejos, Fragaria moschata, Humulus lupulus, Hypericum hirsutum, H. perforatum, Lamium maculatum, Milium effusum, Tithymalus cyparissias, Verbascum austriacum, Veronica chamaedrys*. These herbs reach cover from the 1st to the 8th level. The highest recorded level is on the PPs no. 1, 7, 8, 9, 10, 12. It is reached by these herbs: *Bromus benekenii, Calamagrostis epigejos, Lamium maculatum. Tithymalus cyparissias.*

Among the clearcut species there were, during summer records, not only the same species from the spring records documented but also another taxa are added: *Astragalus glycyphyllos, Ballota nigra, Dactylis glomerata, Fallopia dumetorum, Oryzopsis virescens, Poa nemoralis, Securigera varia*. The cover of these taxa is from the 1st to the 8th level on the PPs no 1, 5, 6, 7, 8, 9, 11. The highest cover was reached by *Astragalus glycyphyllos, Ballota nigra, Fallopia dumetorum, Bromus benekenii, Calamagrostis epigejos, Fragaria moschata, Tithymalus cyparissias*. The herb *Lamium maculatum* was recorded only in the 1st level.

To the synanthropical species and species typical for human-influenced posts belong – spring records: *Achillea millefolium, Arctium lappa, A. tomentosum, Carduus acanthoides, Cirsium arvense, Clinopodium vulgare, Galium aparine, Inula conyza, Lactuca serriola, Stellaria media, Urtica dioica, Viola odorata.* The cover of these herbs is in the range from the 1st to the 8th level. The highest level is documented on the PP no. 1. It is reached by these herbs: *Arctium tomentosum* and *Galium aparine*.

To the species typical for human-influenced posts belong the same species as were recorded in the spring records. Other taxa are added to them: *Artemisia vulgaris, Cirsium canum, C. vulgare, Lamium purpureum, Sambucus ebulus, Serratula tinctoria, Silene alba, Solanum dulcamara, Torilis japonica*. The cover of these herbs is from the 1st to the 8th level. The highest level is documented on the PPs no. 1, 2, 3, 6, 7, 8, 9, 10, 11. It is reached by the following herbs: *Carduus acanthoides, Cirsium arvense, C. canum, C. vulgare, Lamium purpureum, Sambucus ebulus, Serratula tinctoria.*

In the clearcut PP, during spring records, there were four invasive herbs recorded: *Aster lanceolatus, A. novi-belgii agg., Erigeron annuus* ssp. *annuus*, Impatiens parviflora. Their cover is from the 1st to the 4th level. The highest level is reached by *Aster novi-belgii* agg. and *Impatiens parviflora* on the PPs no 3 and 5. In the clearcut PP, during summer records there were four invasive herbs recorded; these were the same as in the spring records. Their cover has its range from the 1st to the 8th level. The highest level is reached by the invasive herb Impatiens parviflora on the PPs no. 6, 7, 9.

Table 1 The list of taxons with their frequency of occurrence in % and range of abundances on the clearcuts

Species	Spring PR	Summer PR	Species	Spring PR	Summer PR
Tree Layer (height over 3 m)			*Anemone ranunculoides*	92^{2-2}	–
Robinia pseudoacacia	25^{r-+}	42^{+-2}	*Cirsium arvense*	83^{r-2}	92^{r-4}
Acer campestre	25^{r-5}	25^{r-5}	*Hypericum hirsutum*	67^{r-2}	92^{r-2}
Carpinus betulus	17^{2-3}	25^{r-4}	*Melica uniflora*	58^{r-2}	92^{r-2}
Quercus cerris	17^{+-2}	25^{r-2}	*Impatiens parviflora*	50^{r-2}	92^{+-3}
Ailanthus altissima	17^{2-4}	17^{2-3}	*Ailanthus altissima*	8^{+}	92^{+-3}
Quercus petraea agg.	17^{+-2}	17^{+-2}	*Galeobdolon luteum*	83^{+-2}	83^{r-2}
Ulmus minor	8^{2}	8^{2}	*Rosa canina agg.*	75^{r-+}	83^{r-2}
Quercus robur agg.	8^{r}	8^{r}	*Galium aparine*	83^{r-2}	67^{r-2}
Acer platanoides	–	8^{+}	*Viola odorata*	83^{r-2}	50*r*
Shrub Layer (height up to 3 m)			*Calamagrostis epigejos*	50^{r-2}	83^{+-2}
Carpinus betulus	100^{r-3}	100^{r-4}	*Erigeron annuus* ssp. *annuus*	17^{r}	83^{r-2}
Acer campestre	58^{r-3}	58^{r-4}	*Cirsium canum*	–	83^{2-4}
Quercus cerris	50^{r-2}	50^{+-3}	*Polygonum multiflorum*	75^{r-+}	75^{r-+}
Robinia pseudoacacia	42^{r-2}	42^{+-3}	*Arctium tomentosum*	75^{r-2}	58^{r-2}
Sambucus nigra	–	33^{+-2}	*Viola reichenbachiana*	58^{r-2}	75^{r-2}
Quercus robur agg.	25^{+-2}	25^{2-3}	*Ligustrum vulgare*	75^{r-3}	50^{r-2}
Lonicera xylosteum	25^{+-2}	25^{2-2}	*Astragalus glycyphyllos*	–	75^{r-2}
Ailanthus altissima	25^{r-2}	25^{r-2}	*Gagea lutea*	75^{+-2}	–
Quercus petraea agg.	25^{r-2}	17^{r-2}	*Euonymus europaeus*	58^{r-2}	67^{r-2}
Cornus mas	17^{r-2}	17^{+-2}	*Polygonatum latifolium*	58^{r-2}	50^{r-+}
Euonymus europaeus	8^{2}	8^{2}	*Stellaria media*	58^{r-2}	8^{r}
Viburnum lantana	8^{2}	8^{2}	*Corydalis solida*	58^{2-2}	–
Prunus spinosa	8^{+}	8^{2}	*Glechoma hirsuta*	50^{r-2}	75^{+-2}
Ligustrum vulgare	8^{+}	8^{2}	*Cornus mas*	50^{r-2}	67^{r-2}
Ulmus minor	8^{2}	8^{+}	*Inula conyza*	33^{r-2}	67^{+-2}
Acer platanoides	8^{r}	–	*Quercus cerris*	33^{r-2}	58^{r-2}
Herb Layer (height up to 1 m)			*Cirsium vulgare*	–	58^{r-2}
Pulmonaria officinalis	100^{2-4}	100^{+-2}	*Ballota nigra*	–	58^{r-2}
Geum urbanum	100^{2-3}	100^{+-3}	*Sambucus nigra*	50^{r-2}	50^{+}
Ficaria bulbifera	100^{2-2}	100^{+-2}	*Rubus fruticosus* agg.	42^{r-2}	50^{+-2}
Quercus robur agg.	100^{+-2}	100^{r-2}	*Euonymus verrucosus*	50^{r-2}	33^{r-2}
Carpinus betulus	100^{2-3}	92^{+-2}	*Swida sanguinea*	50^{r-2}	25^{+-2}
Hedera helix	100^{r-2} 100^{+-3}	75^{2-2}	*Brachypodium sylvaticum*	50^{r-2}	17^{+}
Galium odoratum	100^{r-2}	75^{r-2}	*Arctium lappa*	50^{+-2}	8^{r}
Lamium maculatum	100^{2-2}	50^{r-2}	*Poa nemoralis*	8^{+}	50^{+-2}
Viola hirta	92^{+-2}	100^{r-2}	*Securigera varia*	–	50^{r-+}
Acer campestre	92^{+-2}	100^{r-2}	*Urtica dioica*	42^{r-2}	33^{2-2}
Mercurialis perennis	83^{2-3}	100^{r-3}	*Bromus benekenii*	33^{r-2}	42^{+-2}
Viola mirabilis	92^{+-2}	92^{+-2}	*Robinia pseudoacacia*	25^{+-2}	42^{+-2}
Tithymalus cyparissias	92^{+-2}	92^{r-2}	*Quercus petreae* agg.	42^{r-2}	25^{r-2}

Continuation of the table 1

Species	Spring PR	Summer PR	Species	Spring PR	Summer PR
Fallopia dumetorum	–	42^{r-2}	*Mahonia aquifolium*	17^{1}	17^{+}
Viburnum lantana	25^{+-1}	33^{r-+}	*Prunus spinosa*	17^{r-+}	17^{r-+}
Aster novi-belgii agg.	25^{r-2}	33^{r-2}	*Melica nutans*	8^{+}	17^{+-2}
Fragaria moschata	17^{r-+}	33^{2-2}	*Humulus lupulus*	8^{+}	17^{+}
Millium effusum	17^{+-2}	33^{r-2}	*Clinopodium vulgare*	8^{r}	17^{+-2}
Hypericum perforatum	8^{+}	33^{r-2}	*Campanula rapunculoides*	–	17^{r-2}
Carduus acanthoides	8^{r}	33^{r-2}	*Ulmus minor*	–	17^{r-2}
Acer platanoides	33^{r-2}	8^{r}	*Torilis japonica*	–	17^{r-+}
Serratula tinctoria	–	33^{r-2}	*Alliaria petiolata*	–	8^{2}
Clematis vitalba	–	33^{r-2}	*Convallaria majalis*	–	8^{2}
Lithospermum purpurocaeruleum	–	33^{+-2}	*Lactuca serriola*	8^{+}	8^{+}
Ajuga reptans	33^{+-2}	–	*Ajuga genevensis*	8^{+}	8^{+}
Verbascum austriacum	25^{r}	25^{+-1}	*Crataegus monogyna*	8^{r}	8^{+}
Crataegus laevigata	25^{+}	25^{r-+}	*Lavatera thuringiaca*	8^{r}	8^{+}
Sambucus ebulus	17^{+}	25^{2-2}	*Oryzopsis virescens*	8^{+}	8^{+}
Lonicera xylosteum	25^{r-2}	8^{r}	*Achillea millefolium*	8^{r}	8^{r}
Veronica chamaedrys	8^{+}	25^{r-+}	*Carex muricata* agg.	8^{r}	8^{r}
Aster lanceolatus	8^{r}	25^{+-2}	*Holosteum umbellatum*	–	8^{+}
Isopyrum thalictroides	25^{r}	–	*Linaria vulgaris*	–	8^{+}
Artemisia vulgaris	–	25^{r-2}	*Amaranthus retroflexus*	–	8^{+}
Lamium purpureum	–	25^{+-2}	*Echinochloa crus-galli*	–	8^{+}
Solanum dulcamara	–	25^{+-2}	*Erechtites hieracifolius*	–	8^{+}
Lathyrus niger	–	25^{+-2}	*Silene alba*	–	8^{+}
Geranium robertianum	–	25^{r-+}	*Viola riviniana*	8^{r}	–
Roegneria canina	–	25^{r-+}	*Chenopodium hybridum*	–	8^{r}
Vicia angustifolia	–	25^{+}	*Lonicera caprifolium*	–	8^{r}
Tussilago farfara	17^{2-2}	17^{2}	*Dentaria bulbifera*	–	8^{r}

During spring and summer recordings, the highest frequency – 100 % – was achieved by forest herbs such as *Pulmonaria officinalis, Geum urbanum*, then by an efermeroid *Ficaria bulbifera* and by a woody plant in the herbal layer *Quercus robur* agg. Species which achieved the highest frequency of 100 % only in the spring recordings include a woody plant in the herbal layer called *Carpinus betulus*, an evergreen woody plant Hedera helix and two herbs *Galium odoratum, Lamium maculatum*.

During summer recordings, the frequency for the herb Lamium maculatum decreased to 50 %. The opposite situation happened in the case of the herbs *Mercurialis perennis, Viola hirta* and in the case of a woody plant belonging to an herbal layer because it was possible to monitor an increase of a frequency from 92 %, during the spring, up to 100 % during the summer period.

The most spread species (92 % frequency) which occurred during spring and summer recordings include the herbs *Tithymalus cyparissias* and *Viola mirabilis*. Only during summer recordings on the PPs, it was possible to monitor species with such a high frequency (92 %) and it included the taxa *Hypericum hirsutum, Cirsium arvense, Melica uniflora* and an invasive herb called Impatiens parviflora. Species such as *Galeobdolon luteum* (during the spring and the summer as well), *Galium aparine, Viola odorata* during spring and *Rosa canina* agg. *Calamagrostis epigejos* were considered widely spread species during summer. The most significant change happens in an invasive woody plant belonging to an herbal layer called *Ailanthus altissima*. During spring recordings, the woody plant achieved frequency of 8 % and during summer it was a frequency of 92 % (Table 1).

A high frequency was achieved by forest herbs such as *Polygonum multiflorum, Viola reichenbachiana, Glechoma hirsuta* during spring and summer recordings, and then in the herbal layer by woody plants called *Cornus mas, Euonymus europaeus, Ligustrum vulgare. Synanthropic herbs* such as *Arctium tomentosum* a *Inula conyza* were significantly spread as well.

Species with a rare occurrence included herbs such as *Achillea millefolium, Ajuga genevensis, Clinopodium vulgare, Humulus lupulus* and grasses as *Carex muricata* agg., *Melica nutans, Oryzopsis virescens*. A category of less widespread woody plants in the herbal layer of the Báb forest clearcuts included *Crataegus monogyna, Lonicera xylosteum, Prunus spinosa*, the non-indigenous woody plant *Mahonia aquifolium* and the invasive herb *Aster lanceolatus*. The rest of the species are mentioned in Table 1.

On the basis of the results we may claim that the diversity of clearcut plant species is high. In the clearcut PP there are, on one side, typical forest woody plants present; however, then there are also woody plants of clearcuts, forest open parts and forest edges. In the clearcut PP there are also two invasive woody plants. Concerning the cover, typical forest woody plants outbalance in all 3 layers: *Acer campestre, Carpinus betulus, Ligustrum vulgare, Hedera helix, Lonicera xylosteum, Quercus cerris, Q. petraea* agg., *Viburnum lantana*. We state that in the clearcuts, typical forest woody plants are dominant. Due to the overgrowth of the clearcuts and increase of the forest species cover, the species of clearcuts, forest edges and human-influenced posts will recede. However, these can expand to lighten places of the forest vegetation due to dying out of old woody plants.

A difference in the structure of woody plant species between spring and summer records is not remarkable. During the summer records, three new woody plants in the herb layer appeared: *Clematis vitalba, Lonicera caprifolium, Ulmus minor. Moreover*, a change in the cover of the invasive woody plants *Ailanthus altissima* and *Robinia pseudoacacia* emerged. These woody plants have expanded a lot and reached even the 8th level of cover on the PPs no 2, 3, 4 a 5. The reason for their spread is a high sprouting capacity and suitable light conditions in the clearcuts. The PPs no 2 and 3 during the summer records are encroached by overgrowth by shrubs; however, these are regularly cut, therefore, the tree layer does not expand in a bigger extent. The PPs no 4 and 5 were left without any intervention from logging in 2006. On these PPs, the secondary succession is reflected most significantly of all PPs. The woody plants *Ailanthus altissima* and *Robinia pseudoacacia* are also stated in the works from the Báb forest by Halada (2010) and Eliáš (2010a, b).

During the spring records, herbs are formed by typical forest taxa: spring ephemeroids, spring geophytes and spring herbs forming the spring synusia in the oak--hornbeam forests. We may claim that forest herbs, during spring records, are dominant because most of them reach even the 8th level of cover on 8 PPs, and the development and cover of the forest herbs culminates in spring while most of synanthropical and clearcut herbs only begin to wake up in this period. During the summer records, clearcut and synanthropic species are already dominant with regard to cover. These species reach even the 8th level of cover and on almost all 12 PPs, apart from the PP no 12. The invasive herbs *Aster lanceolatus*, *A. novi-belgii* agg., *Erigeron annuus* ssp. *annuus, Impatiens parviflora* reach the 4th level of cover during spring; however, in summer it is even the 8th level in the case of Impatiens parviflora.

Kubíček and Brechtl (1970) from the Báb forest describe woody plants such as: *Acer campestre, Carpinus betulus, Cornus mas, Fagus sylvatica, Hedera helix, Ligustrum vulgare, Quercus cerris, Q. petraea* agg. Next, there are forest taxa: *Melica uniflora, Carex pilosa, Dactylis polygama, Bromus benekenii, Poa nemoralis, Galium odoratum, Galeobdolon luteum, Polygonatum multiflorum, Pulmonaria officinalis, Geum urbanum*. Taxa *Acer campestre, Carpinus betulus, Cornus mas, Hedera helix, Ligustrum vulgare, Quercus cerris, Q. petraea* agg., *Galium odoratum, Galeobdolon luteum, Polygonatum multiflorum, Pulmonaria officinalis, Geum urbanum, Bromus benekenii, Melica uniflora* are also recorded by this research in 2012. In the clearcut PP there were not recorded *Carex pilosa, Dactylis polygama* and the wooden plant *Fagus sylvatica*.

In 2008, authors Halabuk and Gerhátová (2011) carried out a research in the area of the Báb forest and they studied a speed of the decomposition in the case of indigenous and introduced species. The species which are shared with a given work include invasive woody plants *Ailanthus altissima, Robinia pseudoacacia* and an invasive herb *Impatiens parviflora*. In 2008, the authors were able to document herbs like *Alliaria petiolata, Mercurialis perennis* and the woody plant *Acer campestre* from the Báb forest.

To the common species that are mentioned in the works by Ferlíková (2009, 2011) belong: *Urtica dioica, Tithymalus cyparissias, Solanum dulcamara, Lactuca serriola, Achillea millefolium, Ajuga reptans, Astragalus glycyphyllos, Ballota nigra, Cirsium arvense, C. vulgare, Arctium lappa, A. tomentosum, Artemisia vulgaris, Sambucus nigra* and *Rosa canina* agg., *Arctium lappa, A. tomentosum, Carduus acanthoides* were also recorded by Eliáš (2010b). The introduced woody plant *Mahonia aquifolium* was presumably exposed to the Báb forest from the Protected Area Báb park, from the park also mentioned by Eliáš (2010a, b).

The species *Ailanthus altissima, Ballota nigra, Erigeron annuus* ssp. *annuus, Impatiens parviflora, Lactuca serriola, Mahonia aquifolium, Robinia pseudoacacia, Aster novi-belgii* agg. were also recorded by the terrain research in the Báb forest in 2011 (Pilková, 2012). The work by Halada (2010) also confirms the occurrence of some of the taxa, these are namely *Aster lanceolatus, Impatiens parviflora, Lactuca serriola, Lamium purpureum, Erigeron annuus* ssp. *annuus*.

Species on clearcuts consist of, on one side, forest species that were maintained from the coherent forest vegetation. On the other side, there are species of clearcuts, forest open parts, human-influenced posts and invasive taxa. These species such as an invasive herb *Impatiens parviflora* (introduced by researchers), are expanded to the clearcuts by humans,. A big impact on the expansion of these above mentioned species in the clearcut PPs have convenient ways of spread, e.g. by birds (*Mahonia aquifolium*), shooting of seeds to bigger distances (*Impatiens parviflora*). However, the biggest impact on the clearcut species diversity have light conditions and the proximity of anthropically disrupted biotopes (the field next to the 1st clearcut, the PA Báb park, a residential zone Alexander´s yard). Different light conditions: shade and penumbra under shrubs and more massive herbs, light on places without shrubs enable not only the growth of typical forest sciaphilic species but also the growth of photophilous synanthropic species, species of clearcuts, forest open parts and invasive woody plants

and herbs. On the other hand, the proximity of anthropically disrupted biotopes enables a fast supply of diaspores by wind, animals and human.

To the future, there is a possible assumption that photophilous species will recede due to the overgrowth of the clearcuts or they will move to more sun-lit places after dying out of older woody plants. However, invasive species such as *Impatiens parviflora* and *Robinia pseudoacacia* are already now spread also in the overshaded forest vegetation.

Conclusion

The submitted paper summarizes the results of the research which was realized in the locality of the Báb forest in 2012. The research is located on the 12 PPs of four clearcuts.

In the area of interest – in the Báb forest, woody plants were represented by typical forest woody plants; on the other hand, also woody plants of clearcuts, forest edges and human-influenced posts and invasive species were recorded. However, we claim that in the Báb forest, woody plants are dominant concerning the cover. In the clearcut PPs there was a diverse species structure during the spring and summer records documented. While in spring, with regard to their cover and expansion, typical forest herbs of oak-hornbeam forests are dominant (spring ephemeroids, geophytes and forest herbs forming the spring synusia), in the summer period, species of clearcuts and human-influenced posts are dominant. From the forest species, ephemeroids are absent while other spring species persist; however, these are already recorded in the lower cover.

A big impact on the clearcut species structure has the alteration of light conditions (abundant light, alternatively shade and penumbra under shrubs). Therefore, in clearcuts there are sciaphilic forest species as well as photophilous species of anthropogenic posts. Moreover, it is the impact of the surrounding anthropogenic biotopes with their synanthropic and invasive species and the possibility of a fast supply of diaspores.

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