FOLIA OECOLOGICA – vol. 40, no. 2 (2013). ISSN 1336-5266

The shrub and Black Locust communities of chosen parts of the Hron downs, the Slovak Republic

Blažena Benčaťová[1], Ján Koprda[2], Tibor Benčať[3]

[1]Department of Phytology, Faculty of Forestry, Technical University in Zvolen, T. G. Masaryka 24, SK-960 53 Zvolen, Slovak Republic, e-mail: blazena.bencatova@tuzvo.sk
[2]Športová 86, 95152 Slepčany, Slovak Republic, e-mail: Jan.Koprda@ka-group.com
[3]Department of Landscape Planning and Design, Faculty of Ecology and Environmental Sciences, Technical University in Zvolen, T. G. Masaryka 24, SK-960 53 Zvolen, Slovak Republic, e-mail: tibor.bencat@tuzvo.sk

Abstract
Benčaťová, B., Koprda, J., Benčať, T. 2013. The shrub and Black Locust communities of chosen parts of the Hron downs, the Slovak Republic. *Folia oecol*., 40: 157–162.

The scrubland and Black Locust phytocoenoses belong to the substitute communities which constitute an important component in present cultural landscape. They arose and evolved according to certain rules. Their presence and arrangement is mainly dependent on the type of agricultural land. In the study area, around the Arborétum Mlyňany, these systems have become a permanent component of the vegetation. In our article there are given phytocenological and ecological characteristics of scrubland and Black Locust forest stands in the municipalities of Vieska nad Žitavou, Tesárske Mlyňany and Slepčany. Within the scrubland we determined association *Ligustro-Prunetum* R.Tx. 1952 with the ecological variations of *Prunus spinosa* and *Vitis vinifera* and within the Black Locust we determined association *Chelidonio-Robinietum* Jurko 1963, with ecological variant with *Hedera helix* and with facias with *Rubus caesius* and *Vinca minor* and association *Bromo sterilis-Robinietum* Jurko 1963 prov. For the allocation of communities were used numerical methods (JUICE, TWINSPAN), ecological analysis was conducted in the program JUICE. On the basis of the performed ecological analysis we can conclude that the communities are very similar in their ecological claims.

Keywords
the Arborétum Mlyňany, Black Locust, cultural landscape, phytocoenoses

Introduction

The scrubland and Black Locust phytocoenoses belong to the substitute communities which constitute an important component in present cultural landscape. They arose and evolved according to certain rules. Their presence and arrangement is mainly depended on the type of agricultural land. In the study area, around the Arborétum Mlyňany, these systems have become a permanent component of the vegetation. In the past not much attention was paid to the study of both types of communities and even nowadays the syntaxonomy of these communities is not definitely worked out.

Besides Jurko (1964) the study of shrubs in Slovakia was performed mainly by Kontriš (1966) who described the shrub field communities of north-western part of Liptovská kotlina basin. In the recent years the theoretic questions of syntaxonomic position of the shrub communities were studied by Valachovič (2002, 2007). Koprda (2008) described in his diploma thesis the shrub communities of the part of Žitavská pahorkatina hills and the newest paper about hazel communities of the Veľká Fatra Mts was published by Kliment et Jarolímek (2011).

Problem of classification of the Black Locust communities in Slovakia was examined by Ščepka (1982, 1985), Jurko (1963), Jurko et Kontriš (1982), in the recent period by Šimonovič et al. (2002), Benčaťová et Benčať (2005, 2008), Benčaťová et al.157, (2008), Koprda (2008).

The study area is located in the cadastres of villages Vieska nad Žitavou and Slepčany and because of the fact that the paper follows the papers by Benčaťová et Benčať (2005), Benčaťová et al. (2008), characteristic of the territory is described in the mentioned references.

Material and methods

Phytocenological research was performed during the growing seasons of the years 2006–2007. Within the field research and vegetation synthesis was followed the Zürich-Montpellier School method with 7 degree scale abundance and dominance (Braun-Blanquet, 1964). Nomenclature of plants is given according to Marhold et Hindák (1998), nomenclature of syntaxa according to the actual vegetation units of Slovakia by Jarolímek et Šibík (2008).

Phytocenological records were saved in the database program TURBO(VEG) (Hennekens, 2005). Output numeric matrix of the program with the phytocenological records were used as an input data for the next management in the program JUICE (Tichý, 2002) for the following purposes: differentiation of the syntaxonomic units with the program TWINSPAN (Hill, 1979), indirect unimodal gradient analysis DCA and ecological analysis of the communities.

Results and discussion

The following syntaxonomic units were selected with the numeric classification methods in the study area:

- **The scrubland communities**
  Studied scrubland communities syntaxonomically belong to *Rhamno-Prunetea* Rivas-Goday and Borja-Carbonell 1961 family and to the two alliances. *Berberidion vulgaris* Br.-Bl. 1950 alliance includes *Ligustro-Prunetum* R. Tx. 1952 association and *Arctio-Sambucion nigrae* Doing 1962 alliance includes *Anthrisco-Lycietum halimifolii* Jurko 1964 association (Fig. 1).

– ***Ligustro-Prunetum* R. Tx. 1952 association**
The scrubland communities of the association are spread in the whole study area. The most significantly they are represented on the slight slopes, mainly with the western or south-western exposition. Common sign of most of the records of the community is their occurrence on the sites that were in the past intensively used mostly like pastures, alternatively like mown meadows or they are developed like narrow stripes of shrubs among vineyard areas. The sites are affected by intensive human acting and so they were supplied with sufficient supply of nutrients, mainly with nitrogen in the initial phase of their creation.
Association is represented by the poorest scrubland community according to species diversity in the area. The tree layer is negligible, created mainly with the stronger individuals of the shrubs *Prunus spinosa*, *Crataegus monogyna*, or the fruit tree *Cerasus avium*. In the case of older shrubs in the studied area phytocenoses there are *Quercus cerris* and *Robinia pseudoacacia* that infiltrate to the shrubs from the surrounding black locust stands.
The cover of the shrub layer is large, averagely it reaches the value 90%. In the layer there occur mainly three types of shrubs which create typical, nearly impenetrable structure – dominant *Prunus spinosa* species, with associated *Crataegus monogyna* and *Rosa canina* species.
Herb layer is in the most of the records very poor, with the average cover 15%. Herbs are spread especially in the marginal parts of the communities where they are particularly represented with nitrophilous species with high demand for nutrients; *Galium aparine, Geum urbanum, Glechoma hederacea, Anthriscus cerefolium, Urtica dioica* and others. From the grass species there is constantly

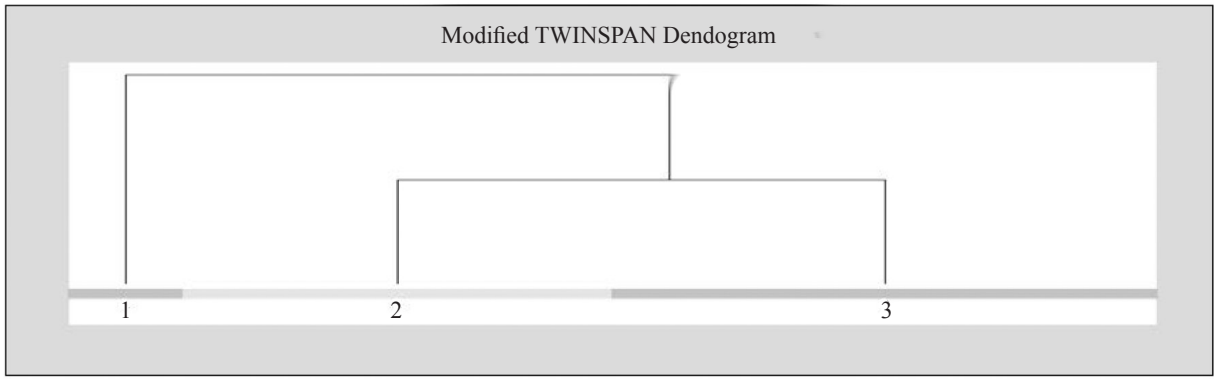

Fig. 1. Dendrogram created from the three groups of records in the scrubland communities representing syntaxonomic units (1st association *Anthrisco-Lycietum halimifolii*, 2nd variant with *Prunus spinosa*, 3rd variant with *Vitis vinifera*).

occurred *Poa nemoralis* species. We also recorded quite high occurrence of the juvenile stages of *Ligustrum vulgare* species, *Prunus spinosa* and *Rosa canina* woody species.

On the basis of certain differences in the habitat conditions, in the floristic composition there were selected two variants within the association: phytocoenoses with predominant *Prunus spinosa* species as an ecological variant with *Prunus spinosa* of the association *Ligustro-Prunetum* R. Tx. 1952. and phytocoenoses with the floristic composition affected with the higher addition of cultural plant species (*Vitis vinifera*), as an ecological variant of association *Ligustro-Prunetum* R. Tx. 1952 association with *Vitis vinifera* which suggests big anthropic influence in these localities.

– ***Anthrisco-Lycietum halimifolii*** **Jurko 1964 association**

The shrubs of the association occupy very small area in the locality as they are located at the top parts of moderate slopes sufficiently warmed by the sun. They create differently wide stripes (2–15 m) at the interface of fields and vineyards ensuring favourable habitat conditions and additional nutrient supplementation from the fertilization of agricultural land.

The cover of the tree layer is negligible and we can find there not high specimens of *Acer campestre* and *Juglans regia.* Average cover of the shrub floor reaches 95 % and the layer is characteristic with mono-dominance of introduced *Lycium barbarum* species which creates dense and impenetrable stands. *Prunus spinosa* and *Rosa canina* species are characterised with high stability with lower cover.

Herb layer is very sparse with the average cover 20%. Inside the shrubs, there only rarely occur herbaceous species, mostly thermophilous ruderal and nitrophilous species of therophytes – *Ballota nigra, Anthriscus cerefolium, Fallopia convolvulus*, *Galium aparine, Geum urbanum*, *Urtica dioica, Arum alpinum* and before the foliage of the shrubs *Veronica hederifolia* and *Lamium purpureum.* From the grass species occurs in the layer mesophyte *Poa nemoralis.*

○ **The Black Locust communities**

The studied Black Locust communities syntaxonomically belong to *Robinietea* Jurko ex Hadač and Sofron 1980 family and to the two alliances. *Chelidonio-Robinion* Hadač and Sofron 1980 alliance includes *Chelidonio-Robinietum* Jurko 1963 association and *Balloto nigrae-Robinion* Hadač and Sofron 1980 alliance includes *Bromo sterilis-Robinietum* Jurko 1963 association (Fig. 2).

– ***Chelidonio-Robinietum*** **Jurko 1963 association**

In the studied territory it is the second most spreading and with the number of species the richest Black Locust community. It occurs especially on the slopes with western exposition and slight tendency. Common feature of all plots is sufficiency of soil moisture and increased mineral content of the soil.

The tree layer is created with the dominant Black Locust completed in some cases with the native oaks (*Quercus cerris*, *Q. robur*). Average cover of the layer is 75% whilst average cover of the shrub layer is 10–55%. Within the species composition there dominates *Sambucus nigra*, another dominant species are *Ligustrum vulgare* and *Robinia pseudoacacia*. The differential species which differentiate one association from the other are represented by introduced *Mahonia aquifolium* and *Prunus cerasus* species which penetrate to the stands from the scrubland communities. *Mahonia aquifolium* species is nowadays considered to be an invasive species and probably it got to the community from the neighbouring Arborétum Mlyňany.

Physiognomy of the herb layer is largely identified with nitrophilous species with the dominant *Chelidonium majus.* The layer is also rich on *Galium aparine*, *Allium vineale*, *Urtica dioica* and others.

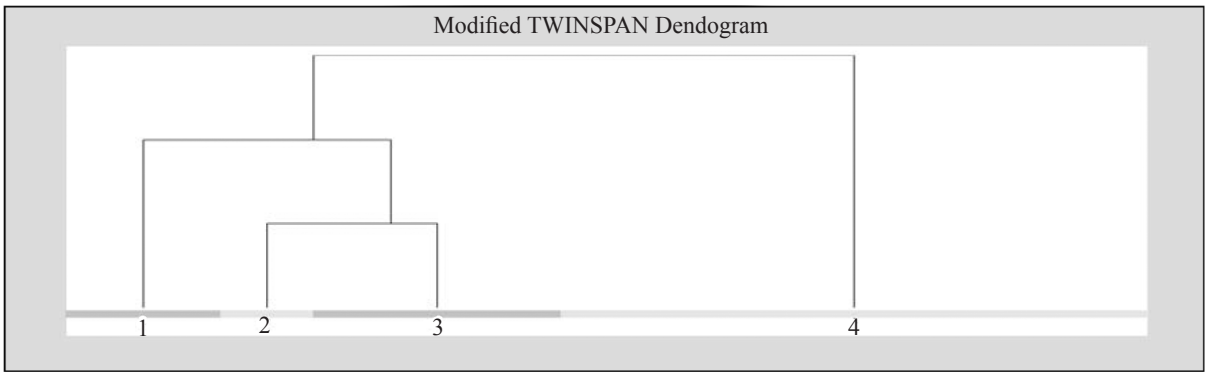

Fig. 2. Dendrogram created from the four groups of records within the Black Locust communities representing syntaxonomic units (1 *Chelidonio-Robinietum* association, 2 facia with *Rubus caesius*, 3 facia with *Vinca minor*, 4 *Bromo sterilis-Robinietum* association).

In the community there is noticeable influence of the time aspect and therefore there is conditional species occurrence on the basis of growing season as well. Early in spring there is visibly increased occurrence *Ficaria bulbifera* species and *Veronica hederifolia* species, but later there dominates *Chelidonium majus* species with the mixture of grasses, especially *Bromus sterilis* species. During the summer period the herb layer becomes dry.

On the basis of certain differences in the phytocenological, ecological and habitat conditions and dominant representation of *Hedera helix* species, but also on the basis of the highest similarity with this association we selected ecological variant with *Hedera helix* with facias with *Rubus caesius* and *Vinca minor* within the association.

– ***Bromo sterilis-Robinietum*** **Jurko 1963 prov. association**

In the studied area it is the most spreading association but regarding the species number it is poorer than previous association. It occurs on the similar habitats regarding exposition and slope tendency but generally on the bright and drier places with sandy and mineral-poor soils.

The tree layer is created with the dominant Black Locust which is, however, a bit lower in its growth. The layer is also rich on *Acer campestre*, *Carpinus betulus*, *Quercus cerris* and *Q. robur* species.

The shrub layer has lower cover (1–50%) and again it is characterised with the domination of *Sambucus nigra* species, constantly also occurs *Robinia pseudoacacia* species and significantly is also represented *Euonymus europaeus* species.

Within the herb layer there is dominant *Bromus sterilis* species, with the lower cover occur nitrophilous *Stellaria holostea*, *Galium aparine*, *Chelidonium majus*, *Arum alpinum*, *Geum urbanum* and *Urtica dioica* species. Compared to the previous association, this association especially differs with *Anthriscus sylvestris*, *Arrhenatherum elatius*, *Ballota nigra*, *Geranium robertianum*, *Lamium purpureum* and *Viola hirta* species. Also in this association there is noticeable seasonal character of the herb layer, significant spring aspect at the beginning of summer (after fading of *Bromus sterilis* species) changes and understorey becomes poor.

Ecological analysis of the study communities

For the purposes of ecological analysis was used the selection into the shrub and Black Locust communities, the communities were compared with each other regarding their demands on different factors of the environment and we found out the following facts.

Demands of both community groups regarding their light requests are quite equal. The numerical values are in the range 5.5–6.4 and they can be evaluated as the half-shade-like or even half-light-like communities. With respect to the temperature they are thermophilic communities, relatively more thermophilic seem to be the shrubs. In the question of continentality both groups can be classified as oceanic or even sub-oceanic, i.e. containing the species that occur in most parts of Central Europe. Demands of both groups regarding their requests on soil moisture are equal, most of the phytocoenoses' species inclines to the dry or even freshly wet soils. In the question of soil reaction there are no differences between the groups. Eco-index 7 characterizes the species of acidic to neutral soils. Regarding the content of nitrogen substances in the soil, both groups can be described as nitrophilous communities.

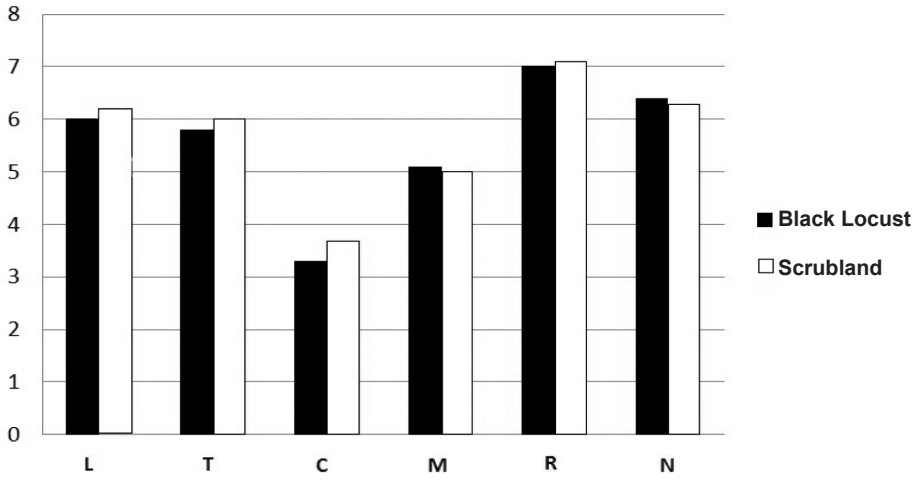

Fig. 3. Comparison of the scrubland and Black Locust communities on the basis of average eco-indexes (L, light; T, temperature; C, continentality; M, moisture; R, soil reaction; N, soil nitrates).

Ecological analysis of the communities confirmed that the scrubland and also Black Locust communities are ecologically similar in the studied area and differentiate with each other only slightly in the individual ecological indicators (Fig. 3).

Conclusion

In the paper we focused on geobotanical and ecological characteristics of the scrubland and Black Locust communities in the Arborétum Mlyňany surroundings which cover quite large areas on this territory. We confirmed the fact that besides aesthetic function the shrubs in the agricultural land also have all-round biological and economic importance. Acquired phytocoenological data represent only a fragment of vegetation diversity of the shrub and Black Locust stands on the territory of Central Požitavie. Despite we hope that the information will contribute to the knowledge about the real state of scrubland and Black Locust communities on the whole territory of Slovakia and we also believe that the paper will help to the deepening of public awareness about the studied area.

Acknowledgements

The work was supported by projects of VEGA Slovakia No. 1/0551/11 and 2/0059/11.

References

Benčaťová, B., Benčať, T. 2005. The black Locust Communities in the Northen Part of „Pohronská pahorkatina“ Hills. *Thaiszia*, 15: Suppl. 1, 191–195.

Benčaťová, B., Benčať, T. 2008. Black Locust communities from Slovak Gate to Danube. *Thaiszia*, 18: Suppl. 1, 3–7.

Benčaťová, B., Benčať, T., Koprda, J. 2008. Agátové spoločenstvá okolia Arboréta Mlyňany [Black Locust communities of the Arborétum Mlyňany surroundings]. In *Dendrologické dni v Arboréte Mlyňany SAV. Zborník referátov z medzinárodnej vedeckej konferencie, Arborétum Mlyňany SAV, 15. – 16. 10. 200*8. Vieska nad Žitavou: Arborétum Mlyňany SAV, p. 167–174.

Braun-Blanquet, J. 1964. *Pflanzensoziologie. Grundzüge der Vegetationkunde*. Wien, New York: Springer. 865 p.

Hadač, E., Sofron, J. 1980. Notes on syntaxonomy of cultural forest communities. *Folia geobot. phytotax*., 15: 245–258.

Hennekens, S. M. 1995. *TURBO(VEG). Software package for input, processing and presentation of phytosociological data*. User's quide. Instituut voor Bosen Natuur,Wageningen and Unit of vegetation Science, University of Lancaster, Lancaster.

Hill, M.O. 1979. *TWINSPAN: a FORTRAN program for arranging multivariate data in an ordered two-way table by classification of the individuals and attributes*. Ithaca, New York: Cornell University, Section of Ecology and Systematics. 90 p.

Jarolímek, I. , Šibík, J. (eds). 2008. *Diagnostic, constant and dominant species of the higher vegetation units of Slovakia*. Bratislava: Veda. 332 p.

Jurko, A. 1963. Zmena pôvodných lesných fytocenóz introdukciou agáta [Change of autochthonous forest phytocoenoses by introduction of Black Locust]. *Československ. Ochr. Prír.,* 1: 56–75.

Jurko, A. 1964. *Feldheckengesellschaften und Uferweidengebüsche des Westenkarpatengebietes.* Biol. Práce*, 10/6.* Bratislava: Veda, p. 5–102.

Jurko, A., Kontriš, J. 1982. Fytocenologická a ekologická charakteristika agátin v Malých Karpatoch [Phytocoenological and ecological characteristic of Black Locust communities in the Malé Karpaty Mts]. *Biologia, Bratislava*, 37 (1): 67–74.

Kliment, J., Jarolímek, I. 2011. European hazel shrubs in the Veľká Fatra Mts: syntaxonomy and nomenclature. *Haquetia*, 12 (2): 149–170.

Kontriš, J. 1966. *Poľné spoločenstvá krovín severozápadnej časti Liptovskej kotliny* [Field shrub communities of north-western part of Liptovská kotlina basin]. Biol. Práce, 12/ 9. Bratislava: Veda, p. 41–78.

Koprda, J. 2008. *Geobotanicko-ekologická charakteristika krovinných a agátových spoločenstiev v k. ú. obcí Slepčany a Vieska nad Žitavou* [Geobotany-ecological characteristic of shrub and Black Locust communities in the cadastre areas of villages Slepčany and Vieska nad Žitavou]. Diploma work. Zvolen: Technical University in Zvolen, Faculty of Ecology and Environmental Sciences. 93 p.

Marhold, K., Hindák, F. (eds) 1998. *Zoznam nižších a vyšších rastlín Slovenska* [List of lower and higher plants of Slovakia]. Bratislava: Veda. 687 p.

Ščepka, A. 1982. Spoločenstvá s agátom bielym (*Robinia pseudoacacia* L.) v južnej časti Východoslovenskej nížiny [Communities with Black Locust in southern part of Východoslovenská nížina lowland]. *Acta bot. slov., ser. A*, 6: 172–181.

Ščepka, A. 1985. Vegetačné pomery južnej časti Východoslovenskej nížiny [Growing conditions of the southern part of Východoslovenská nížina lowland]. *Acta bot. slov., ser. A*, 8: 141–151.

Šimonovič, V., Šomšák I., Kollár, J., Kanka, R., Nikodémová, Z. 2002. Charakteristika spoločenstiev s agátom bielym na Borskej nížine [Characteristic of the communities with Black Locust in Borská nížina lowland]. *Phytopedon (Bratislava)*, Suppl., 1: 211–216.

Tichý, L. 2002. Juice, software for vegetation classification. *J. Veg. Sci.*, 13: 451–453.

Valachovič, M. 2002. Trnkové a lieskové kroviny [Blackthorn and hazel shrubs]. In Stanová, V., Valachovič, M. (eds). *Katalóg biotopov Slovenska.* Bratislava: Daphne – Inštitút aplikovanej ekológie, p. 36–37.

Valachovič, M. 2007. Klasifikácia spoločenstiev krovín na Slovensku – možný koncept riešenia [Classification of shrub communities in Slovakia – possible solution concept]. *Bull. Slov. bot. spol.*, 29: 169–176.

Received December 6, 2012
Accepted April 14, 2013