

## Preliminary Results of Dry and Semi-dry Grassland Succession Research

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**Abstract** – Area of secondary habitats after abandonment of agricultural cultivation is very considerable in Hungary. Having transformed these habitats during succession and regeneration semi-natural grasslands, shrublands and spontaneous woodlands can arise giving refuge to valuable elements of natural vegetation. Secondary habitats and their possible treatments have been studied in Cserhát analysing 50 quadrates in reference to social behaviour types, ecological demands, coenological groups, seed bank type, seed dispersal type and vegetative propagation categories. The data were analysed using multivariate statistics. As result of evaluation six groups of habitats have been formed which differ especially in social behaviour types, coenological groups and seed bank type. The success of regeneration was influenced significantly by the former cultivation, the current disturbance and the ecological characteristics of habitats. According to our results the species richness of herb layer remains for a long time in spite of closure of woody vegetation although the dominance relations alter considerably during the succession.

**Keywords:** shrub spreading / regeneration / naturalness / disturbance

### 1. INTRODUCTION

The previous agricultural cultivation forms determine the habitat structure of hills and mountain in Hungary especially. Secondary habitats of abandoned fields vary in succession stages and in naturalness of vegetation. The earlier botanical researches were focusing on the valuable plants of the flora and the rare associations. Because of the high cover of secondary habitats we have to study the regeneration of these areas more. Study on species composition, regeneration, succession of these habitats has especial importance in botanical and nature conservational respect too.

The habitat descriptions of ÁNÉR (General National Habitat Classification System) category include information for the regeneration potential, which is related close-knit with the secondary succession (BÖLÖNI et al. 2007).

Typical studied ÁNÉR categories in the sample area: P2b: dry shrub vegetation with *Crataegus* and *Prunus spinosa* and *Juniperus communis*, OC: dry- and semi-dry grassland, H3a: slope steppes on stony ground, H5a: closed steppes on loess, clay, tufa, H4: xero-mesophilous grasslands, K2: sessile oak-hornbeam woodlands, L1: closed thermophilous downy oak woodlands, L2a, L2x, M2: sand and loess steppe oak woodlands. The P2b and OC categories have a good or relative good regeneration ability, the regeneration potential of H3a,

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H5a, H4 categories are moderate. The closed forest types (K2, L1, L2a, L2x, M2) which mean the potential climax vegetation in this landscape, stand a very low chance to the full regeneration (SEREGÉLYES et al. 2008, MOLNÁR et al. 2008).

The work of ILLYÉS and BÖLÖNI (2007) included the landscape history, origin, formation, succession connection of slope- and close steppes and xero-mesophilous grasslands.

Secondary forest and shrublands had been studying by CSONTOS and TAMÁS (2005). Their sample areas were abandoned orchards and gardens, which are similar to the studied vegetation in Cserhát. The authors drew attention to the absent knowledge about spontaneous shrub- and tree vegetation.

## **2. MATERIALS AND METHODS**

Species composition of secondary dry and semi-dry habitats and their possible treatments have been studied in Cserhát analysing 50 quadrates in reference to social behaviour types, ecological demands, coenological groups, seed bank type, seed dispersal type and vegetative propagation categories. The research was contained the study of landscape history and most important ecological factors. We used the follow sample category: natural grassland, degraded grassland, grassland infected by invasive plants, open shrubland, closed shrubland, forest-shrubland, forest, grazed grassland, former shrublands with cuted shrub-layer. Field surveys were made with the method of Braun-Blanquet. The data of herb layer were analysed using multivariate statistics, WPGMA and UPGMA method, Bray-Curtis and Sørensen similarity coefficient.

The sample areas are located in the connection of tree micro region (Nógrád-basin, Terényi-hills, Nézsza-Csóvári-hills) in Cserhát. The relief of the study area is diverse, has fragmented surface, it contains low elevated hills. Turkey oak-sessile oak and the hornbeam-sessile oak forests are the nature-like forest remains of the original vegetation. Mostly forests are situated in the range of Romhány-hills, in lower elevated areas are only fragmented parts of it. Big area of Terényi-hills is covered by planted forests and locust-trees. In this area and in Nógrád-basin the secondary grasslands, shrublands, and forests are represented the remains of the nature-like original vegetation.

## **3. RESULTS**

This study is about the species composition of the examined quadrates, which was analysed only by the presence information of the species without respect of dominance. According to this method we detached six groups of habitats, which differ also in social behaviour types, coenological groups and seed bank type. These clusters contain enough samples for the analysis and their members cohere squarely each other.

We characterize the habitat-groups by parameters, which relate to succession and influence the regeneration. The groups were systematized by the naturalness and disturbance. We try to explain the reasons of the characteristic species composition.

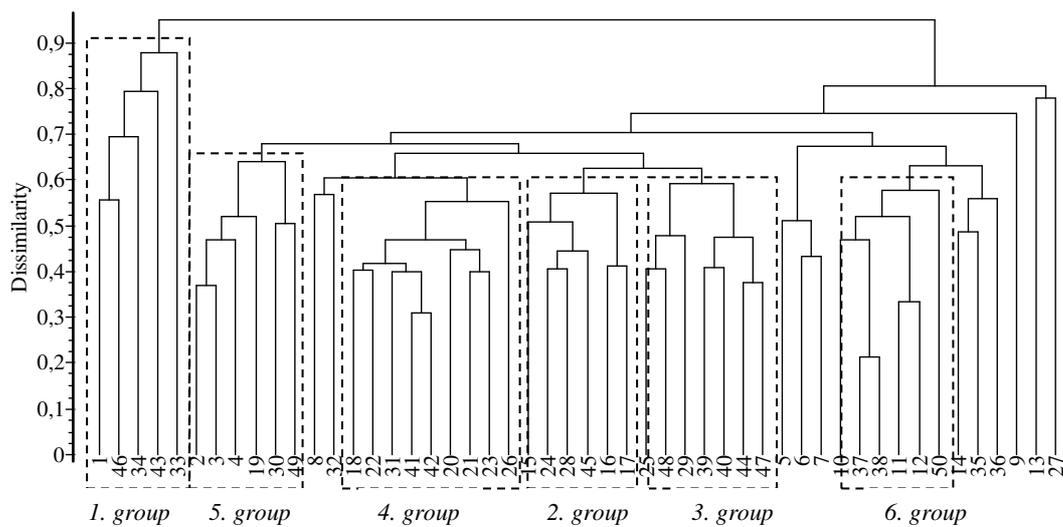


Figure 1. Classification of examined quadrats according to species composition (WPGMA, Sørensen)

### 3.1. Forests

#### Group 1. (1, 33, 34, 43, 46) Figure 1

- Primary origin: turkey oak-sessile oak and the hornbeam-sessile oak forests
- Secondary origin: spontaneous forests on abandoned fields, earlier grazed grasslands
- The herb-layer of this diverse group differ from the opener habitats (scrubland-forest, scrublands, grasslands)

### 3.2. Open habitats (grasslands, shrublands, forests with open canopy layer)

#### 3.2.1. Habitat with higher naturalness

#### Group 2. (15, 16, 17, 24, 28, 45) Figure 2

- Grasslands, habitats with open shrub- and canopy layer
- South, southwest exposition, steep hillsides, warm microclimate
- Abandoned fields, vineyards
- Age : min. 30 years after last agricultural use
- Secondary grazing after the abandonment
- Erosion, thin soil
- Rich shrub layer, big role of the juniper (*Juniperus communis*)

**Characteristic species:** *Bothriochloa ischaemum*, *Festuca rupicola*, *Stipa capillata*, *Dorycnium herbaceum*, *Fragaria viridis*, *Brachypodium sylvaticum*, *Teucrium chamaedrys*, *Eryngium campestre*, *Galium glaucum*, *Hieracium pilosella*, *Taraxacum serotinum*, *Linum flavum*, *Teucrium montanum*, *Inula ensifolia*, *Juniperus communis*, *Ligustrum vulgare*.



Figure 2. Dry shrub vegetation with *Crataegus*, *Prunus spinosa*, *Juniperus communis* and semi-natural dry grassland in the place of former fields and vineyards

**Group 3.** (25, 29, 39, 40, 44, 47, 48)

- Closed shrublands and smaller patches of grasslands between those
- Warm microclimatic conditions, but not so much as the 2. group.
- Temperate soil erosion
- Diverse agricultural origin: vineyards, fields, pastures
- Age : 30 - 50 years after last agricultural use
- Secondary grazing after the abandonment is not typical

**Characteristic species:** *Brachypodium sylvaticum*, *Bothriochloa ischaemum*, *Dorycnium herbaceum*, *Pimpinella saxifraga*, *Picris hieracioides*, *Origanum vulgare*, *Linum tenuifolium*, *Cornus sanguinea*, *Crataegus monogyna*, *Ligustrum vulgare*, *Colutea arborescens*.

**3.2.2. Habitat with higher disturbance, degradation**

Grazed grasslands

**Group 4.** (18, 20, 21, 22, 23, 26, 31, 41, 42)

- Disturbance at present or in the recent past: mainly grazing, less shrub cutting

**Characteristic species:** *Festuca rupicola*, *Fragaria viridis*, *Odontites rubra*, *Pimpinella saxifraga*, *Achillea collina*, *Galium verum*, *Eryngium campestre*, *Trifolium arvense*, *Agrimonia eupatoria*, *Poa angustifolia*, *Scabiosa ochroleuca*, *Rosa canina*, *Crataegus monogyna*, *Prunus spinosa*, *Seseli annuum*, *Thymus* sp., *Centaurea jacea*, *Clinopodium vulgare*, *Arrhenatherum elatius*, *Ononis spinosa*, *Bothriochloa ischaemum*, *Chrysopogon gryllus*.

Habitats effected by other degradation factors

**Group 5.** ( 2, 3, 4, 19, 30, 49)

- Agricultural origin: arable fields
- Grazing after the abandonment
- Different cover value of shrub- and canopy layer
- Degradation factors: invasion of black locust (*Robinia pseudoacacia*), close to pheasant farm, shrub spreading, shrub cutting, treading

**Characteristic species:** *Festuca rupicola*, *Daucus carota*, *Achillea collina*, *Inula salicina*, *Galium verum*, *Trifolium arvense*, *Arrhenatherum elatius*, *Clinopodium vulgare*, *Agrimonia eupatoria*, *Erigeron annuus*, *Cichorium intybus*, *Centaurea jacea*, *Plantago lanceolata*, *Trifolium repens*.

**Group 6.** (10, 11, 12, 37, 38, 50)

- The most members of the group are situated at close quarters
- Agricultural origin: arable fields, vineyards
- Different length period since the abandonment
- Degradation factors: shrub cutting, treating and gnawing of animals, invasion of black locust (*Robinia pseudoacacia*), spreading of chee reedgrass (*Calamagrostis epigeios*)

**Characteristic species:** *Achillea collina*, *Picris hieracioides*, *Knautia arvensis*, *Agrimonia eupatoria*, *Dactylis glomerata*, *Daucus carota*, *Galium verum*, *Hypericum perforatum*, *Poa angustifolia*, *Securigera varia*, *Salvia nemorosa*, *Falcaria vulgaris*, *Melilotus officinalis*, *Vitis vinifera*, *Galium mollugo*, *Inula salicina*, *Centaurea jacea*, *Fragaria viridis*, *Plantago media*, *Erigeron annuus*.

#### 4. CONCLUSION

The species composition of the studied quadrates indicates the secondary origin of the habitats. The shrublands and open spontaneous forests contain a lot of forest- and grassland species at the same time. According to our results the species richness of herb layer remains for a long time in spite of closure of woody vegetation although the dominance relations alter considerably during the succession. If the ecological condition for the shrubs and trees is averse, the secondary, disturbed grasslands have enough time and can regenerate to a natural direction. Spontaneous regeneration is faster and more successful in warm, dry, eroded hillsides than in places which are in better condition. The success of regeneration was influenced significantly by the former cultivation, the time of the abandonment, the current disturbance, the vegetation nearness and the ecological characteristics of habitats.

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#### References

- BÖLÖNI, J. – MOLNÁR, ZS. – KUN, A. – BIRÓ, M. (szerk.) (2007): Általános Nemzeti Élőhelyosztályozási Rendszer. [General National Habitat Classification System.] Vácrátót.
- CSONTOS, P. – TAMÁS, J. (2005): Tájidegen fajok által meghatározott spontán erdősődő területek növényzetének vizsgálata. [Vegetation studies in spontaneous woods dominated by non-native trees.] Kanitzia 13: 69-79.
- ILLYÉS, E. – BÖLÖNI, J. (szerk.) (2007): Lejtősztyepek, löszgyepek és erdőssztyeprétek Magyarországon. [Slope steppes, loess steppes and forest steppe meadows in Hungary.] Budapest.
- MOLNÁR, ZS. – BIRÓ, M. – BÖLÖNI, J. – HORVÁTH, F. (2008): Distribution of the (semi-)natural habitats in Hungary I. Marshes and grasslands. Acta Botanica Hungarica 50: 59-105.
- SEREGÉLYES, T. – MOLNÁR, ZS. – BARTHA, S. – CSOMÓS, Á. (2008): Regeneration potencial of the Hungarian (semi-)natural habitats. Acta Botanica Hungarica 229-248.