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RESEARCH OF RUDERAL WEED VEGETATION IN SZIGETKÖZ

Theses of PhD Dissertation

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I.
INTRODUCTION AND OBJECTIVES

The ruderal areas can be realised a clashing zone, for several reasons. This is the meeting point of the segetal phytocenose, the whole of habitats most heavily exposed to anthropogen forces, and the elements of natural vegetation. The latter ones may be civilisation tolerant species of the ancient, natural vegetation. The influence of agrotechny and herbicides is less felt here or we can describe it as less influential in the life of plant communities. It is a clashing zone in the sense that these areas can be found halfway between urban settlements and agrobiocoenosis.

In the twentieth century the research of Szigetköz accelerated and it became the best explored region of our country. However, this refers especially to tide and flood plain areas in Szigetköz. The flood free area is almost completely exposed to agricultural cultivation. The full and meticulous investigation of segetals in Szigetköz was conducted by Czimber (1992). The ruderals, however, were considered further on unexplored. All these motives got us to make the weed vegetation in the ruderal areas of Szigetköz the subject of our research from 1990. In the present dissertation we would like to feedback on the observations of the past one and a half decade.

Our objective was the floristic analysis of the ruderal weed vegetation in Szigetköz. Moreover, we wanted to show the inter and intraspecific forces between the elements forming the ruderal communities. The research between 1990 and 2003 covered the high tide plains of the full Szigetköz area. We set out from the fact that the structure of the ruderals depends on

the nature of habitat and the stock of species, so all these should be taken into consideration.

1. Our aim was to examine how the systematic situation of species relates to their frequency of presence or rather cover figures.
2. The weed flora, we assume, can be a useful signalling system in climate change research. Thus, we examined the possible change of the weed patterns in accordance with their flora elements and its causes.
3. On account of the above reasons our aim was to analyse the life form spectrum of ruderal weeds.
4. Our objective was to conclude whether the weed pattern conforming to the thermoclimate indicates the effects of global warming.
5. Do the weed species indicate the difference and change between the ground water-level in Upper and Lower Szigetköz?
6. It is our intention to explore to what extent the ruderals degrade compared to the natural state of vegetation.
7. We attempt to demonstrate that the herbaceous knowledge can be integrated into interdisciplinary subjects. Furthermore, we are going to point out the significance of species in cultural history.
8. By revealing the interspecific correlation between weeds we are searching for evidence for the possible connection with microorganisms living in soil.

II.
RESEARCH AND METHOD

1. Location and time of research

The locations of our research were the high tide plain areas that is the ruderal habitats of the flood free area in Szigetköz. For particular location we selected beaten pathsides, banks of ditch, ridges and field margins surrounded by ruderal zones. The survey covered the areas of Upper and Lower Szigetköz either. In case of the field margin ruderals we did a mapping along fields of corn and root crops.

First, we surveyed in the full Szigetköz area between June and August 1990-1991. In Upper Szigetköz we were working on the boundaries of the administrative settlements of Arak, Ásványráró, Darnózseli, Dunaremete, Halászi, Hédervár, Lipót, Novákpuszta and Püski. In Lower Szigetköz the survey was conducted on the boundaries of Dunaszeg, Dunaszentpál, Győr, Győrladamér, Győrújfalu, Győrzámoly, Vámosszabadi, Vének and Zsejke.

The second period between June and August 2001-2003 took place in the full Szigetköz area. This time the mapping included the boundaries of Arak, Darnózseli, Halászi, Lipót and Novákpuszta in Upper Szigetköz and Győrújfalu, Dunaszentpál, Kisbajcs and Zsejke in Lower Szigetköz.

2. The research method

Our choice of research method fell on weed mapping. To the classification of weeds the following works gave us invaluable contribution: *Csapody (1961), Godet (1991), Jávorka (1937), Jávorka – Csapody (1972, 1975),*

Polunin (1981), Radics (1998), Seregélyes – Szollát (é.n.), Simon (1992, 2000), Soó – Jávorka (1951), Soó – Kárpáti (1968), Steinbach (1998, 1999) and *Turcsányi – Siller (é..).* We relied on *Priszter*'s work (1998) as for the terminology of plants.

After reviewing the methodological problems of weed mapping *(Reisinger, 2000; 2001, Németh, 2001)* we decided upon *Braun – Blanquet*'s estimation method. The minimumareal of grassy areas is a 2x2 metres square for most authors. In our research we used the same figure.

In the 1990-1991 periods of collection of data we surveyed 55 sample areas in Upper Szigetköz and 51 in Lower Szigetköz. Consequently, we examined 106 squares altogether. In 2001-2003 we covered 97 sample areas in Upper Szigetköz and 51 in Lower Szigetköz, that is 148 sample areas altogether. On the whole, data from 254 sample areas were evaluated in the full research period (1990-2003).

III.
RESULTS

The research of ruderal weed vegetation in Szigetköz has resulted in the following:

1. On the ruderals in Szigetköz we mapped 144 plant species altogether. In the order of importance of the families the *Asteraceae* stands in the forefront with more than 22 per cent of species then the *Poaceae* follows with a proportion of 15 per cent. Hence, nearly 40 per cent of ruderal species comes from two

families. The *Asteraceae* family shows the highest cover figures thus preceding the *Poaceae* family. We established that the dicotyledon-monocotyledon proportion on the segetals or the ruderals is completely the same. It has been proved that about 25 per cent of ruderal species came from higher developed, better herbicid hardy families. We observed a slight dwindling of biodiversity on the ruderal areas during the decade, yet not a considerable one.

2. It has been established that about 50 per cent of the weeds on the Szigetköz ruderals is a Eurasian flora element (71 species). This figure is more than twice the national average. Suprisingly, the number of Submediterranean elements is two and a half times the national average either, that is 45,8 per cent of all species. We can conclude that the proportion of submediterranean elements has risen on the ruderals in Szigetköz. Behind the rise in proportion the effect of global warming can be assumed.

3. Nearly half of the ruderal plants belong to the hemikryptophyte growth form group. We know it from literary data that the therophyta proportion on segetals reaches 64,6 per cent, but on ruderal areas it exceeds the share of 33 per cent as well. The one year's can adopt better to extremes. They can tide the unfavourable time during seed period. The latter is mainly a feature of Mediterranean plants. The feature of being corticous helps go

through the arid period which is also an attribute of the one year's. In *Ujvárosi*'s system more than 22 per cent of the ruderal species belong to the T4 life form group. Their cover figures reached 21 per cent either. The total number of therophyta one year's was 36,6 per cent of the species surveyed on ruderals, their total cover amounted to 23,1579 per cent. The high therophyta proportions can also be an indicator of global warming.

4. According to the thermoclimate indicator figures the average cover of species in the deciduous forest climate (T5) fell significantly on the ruderals in Szigetköz during the decade (~31%). We found that ninety per cent of the decline was made up of 10 species' cover fall. The cover of *Achillea collina* (- 8,19%), *Poa pratensis* (- 3,6%) and *Calamagrostis arundinacea* (- 3,2%) dropped remarkably. Half of the 10 species is a plant with G1 growth form. The cover rose or exceeded their segetal figures of the following ruderal plants during the decade: *Amaranthus retroflexus, Cynodon dactylon, Setaria viridis, Sorghum halepense.* Either one is a drought-resistant plant with C4 metabolism. During global warming their competition may rise against field crops *(Solymosi, 2005).* Warming is specially favourable for Mediterranean species. The rise in the cover figures of thermophilous weed species points to long-term changes. Out of the 13 most important C_3 weed species the cover of eight fell in the decade under survey. The above data are an indication that global warming has an influence on the Szigetköz area too.

5. On the basis of the W-oecological indicators, our 1991 survey data relate to no change yet. They showed standard ground water-level. The W-figure graphs turn unipolar in case of a ground water-level decrease (*Czimber, 1992*). It appears from the 1991-1999 data that the W-figure graphs changed to unipolar, which indicates that the area had become drier, and the ground water-level varies. We can say that the proportion of hygrophyte ruderal species fell and the number of xerophilous species grew. Comparing the 1991 and the 2001-2003 data it turns out that neither of the hygrophyte species with a major cover indicate growth. The cover figures of hydrophilic species reduced to half in Upper Szigetköz. Except for *Ambrosia artemisiifolia* favouring fresh water balance, whose cover figure grew in Upper Szigetköz. The ambrosia, however, is an arid tolerant sort of species, its subletal hydratation deficit is over 70 per cent. Our presuppositions did not prove significant ground water-level change in Lower Szigetköz. Nevertheless, the data from Upper Szigetköz speak of a ground water-level fall. All in all, the weed species did indicate the ground water-level change between Upper and Lower Szigetköz.

6. The quota of species referring to the degradation of ruderal weed vegetation is 73 per cent. In itself this is not an unexpected figure. Still it is unusual that we surveyed a 71 per cent proportion of species with degradation in the flood plain natural vegetation as

well. The same phenomenon is reported on the white willow parks in Upper Szigetköz by *Kevey (2004).*

7. We pointed out the cultural history and medicinal function of ruderal weed species. By a concrete scripture scientific example it was demonstrated that a new attitude, entirely new modes of abstract language and symbols have come into being with the integration of botanical and biblical knowledge.

8. Literary data referring to micorrhization were found in case of 90 ruderal weed species. That is 67,2 per cent of all the species. The ruderal members of the *Caryophyllaceae* family are not micorrhizated. There are a lot of micorrhizated ruderal species in the *Asteraceae* (69%)*, Lamiaceae* (75%) and the *Leguminosae* (55%) families. The micorrhization rate of the *Poaceae* family is very high (90%). Literary data indicate micorrhization in all species of the *Rosaceae, Apiaceae* and the *Plantaginaceae* families. We have detected seven ruderal weed species whose cover figures along with a relatively high W-figure grew in the more arid Upper Szigetköz. Micorrhization data were found for all the seven species and by increasing the absorbent surfaces this could be an explanation for their coverage. Whereas the *Amaranthus retroflexus* with a W5 figure suffered a significant fall of cover in Upper Szigetköz. Literary data show it is not a micorrhizated type of species. Our interspecific correlation estimates point to the fact that a certain spatial isolation trend is

felt between the micorrhizated and non-micorrhizated weed species. The micro and macroorganisms' relations require further examination.

To sum it up, the new and scientific results of our research are as follows:

- 144 weed species have been found on the Szigetköz ruderals with the *Asteraceae* family standing first as regards the number of species and the cover figures.
- Fifty per cent of the weed species under survey belongs to the Eurasian flora element. The proportion of Submediterranean elements has grown probably for the reason of global warming.
- The drought-resistant plants with C_4 metabolism have gained significance.
- We established that the proportion of hygrophyte ruderal species has fallen.

IV.

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