# DIVERSITY OF SEGETAL CORMOPHYTES AT THREE LOCATIONS WITHIN THE LUNCA MUREȘULUI NATURAL PARK (2013)

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***Abstract:***

*Diversity of cormophytes from 3 sites / location (Bodrog Bezdin and Cenad) belonging to Mureş Floodplain Natural Park is analyzed in terms of number of species, families and biological types. Overall in 2013 I studied 124 parcels, most with cereals (wheat, barley and oats) and corn. The weeding degree is expressed as a percentage (%) of the soil surface covered by aerial parts of plants and their projection on the ground. Vascular flora of weeds is composed by 205 species belonging to 40 botanical families. The average number of weed species per parcel ranges between 16,70 and 19,5, in the case of cereals and 15,25 to 20 in the case of corn and sunflower. Specific biodiversity in the weeds group is poorly correlated or uncorrelated with the soil properties (pH and humus content) and size of the studied parcels.*

***Key words:*** *vascular plants, weed, Mureș Floodplain, Natural Park, Arad*

## INTRODUCTION

Recent studies regarding the flora in Arad County (ARDELEAN, 2006), the Mures Valley (RĂGULESCU, 1995) or of smaller areas from Mures Floodplain Natural Park (e.g. TURCUȘ *et al*., 2011) give little attention to weed species present in crops. Weeds in western Romania were subject to systematic research before 1990 (e.g. BUJOREAN et al., 1971).

Declaring in 2003 the Mures valley from Arad, next to the Hungarian border as the "Mureș Floodplain Natural Park" has not changed the farming of the area significantly nor the consideration of weeds as a component of agro diversity and subsequently of biodiversity of the area. Inventorying the agrodiversity of a natural park in all its aspects, is required for invasive species management, for possible uses of weeds as medicinal plants, protection of possible animal species which can have inter-correlations with the weeds (JACKSON et al., 2013). Through this study, we proposed a detailed approach of weed diversity in three areas / sites from Mures Floodplain Natural Park, a mainly descriptive approach to the species level, while making analysis of the main soil parameters (pH and humus content).

## MATERIAL AND METHODS

The study was conducted between May-August 2013 on three sites: Bodrog, Bezdin and Cenad from Lunca Mureșului Natural Park. The number of crops and fields study are as follows:

*Table 1*

The crops and the number of fields/parcels studied

| Crop | Number of plots | | |
|---|---|---|---|
| | Bodrog | Bezdin | Cenad |
| Wheat | 21 | 10 | 4 |
| Barley | 5 | 21 | 4 |
| Oats | 4 | 2 | 1 |
| Two-row of barley | - | - | 1 |
| Maize | 7 | 25 | 4 |
| Sun flower | 6 | 1 | 2 |
| Colza | 1 | 3 | - |
| Green melon | - | 2 | - |
| Melon | - | 1 | - |
| Potatoes | - | 1 | - |
| Alfalfa | - | 4 | - |
| Cabbage | - | 1 | - |
| Total number of parcels | 48 | 71 | 16 |

On each plot I performed 5 relevées with the size of 2 $m^2$ each, placed on the diagonal of each parcel. The presence of each species was expressed in percentage of soil coverage. For the each parcel I precordeded a summary table of weeding degree, containing the mean coverage (%) for each species. For each crop and each site, I calculated the average number of species (specific diversity) in every plot and the mean coverage (%) of every species.

The identification of species was performed in according to CIOCÂRLAN (2009). The species nomeclature is updated according the Flora Europaea Database (http://rbg-web2.rbge.org.uk/FE/fe.html).

The weed biological category (annual dicotyledonous – Da, perennial dicotyledonous – Dp, annual monocotyledonous – Ma and perennial monocotyledonous– Mp) are taken from CIOCÂRLAN et al., (2004). The life form categories, elements of flora and ecological characterization of species (temperature – T, humidity – U and soil reaction – R) as well as their abbreviation, are in accordance with the ones used by SÂRBU et al. (2013).

The soil parameters (pH, humus and SB) were determined at the OSPA (The Agrochemical and Pedological Office Study) laboratory from Timisoara, based on a common sample from 5 samplings/parcel.

## RESULTS AND DICUSSIONS

The total number of cormophytes species is 205, belonging to 40 botanical families. The highest number of species were identified at Bodrog (161 species) followed by Cenad (151 species) and Bezdin (130 species). It can be seen that the number of weeds species is not correlated either with the number of crops (11 crops on the Bezdin site, the highest value), nor with the number of plots studied (the maxim number was 72 plots studied on Bezdin, followed by Bodrog with 48 plots and Cenad with 16 plots). From the total number of 205 species, approximately half of them (107 species) were identified on all of the three sites studied.

The most of species belong to the *Compositae* family (36 species) followed by *Gramineae* (26 species), *Leguminosae* and *Labiatae* (with 16 species each), *Cruciferae* (14 species) and *Scrophulariaceae* (19 species). *Per* total, 13 botanical families from all 40 are represented by 5 species or more.

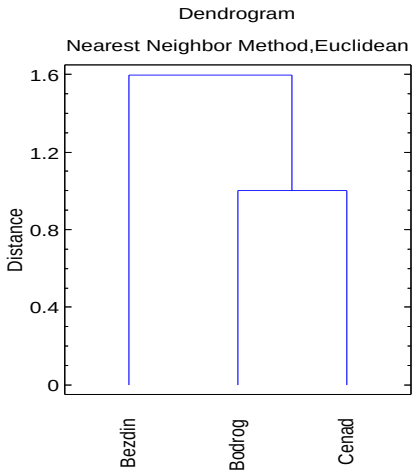
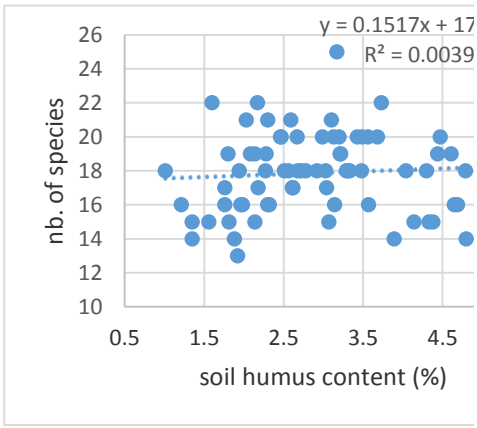


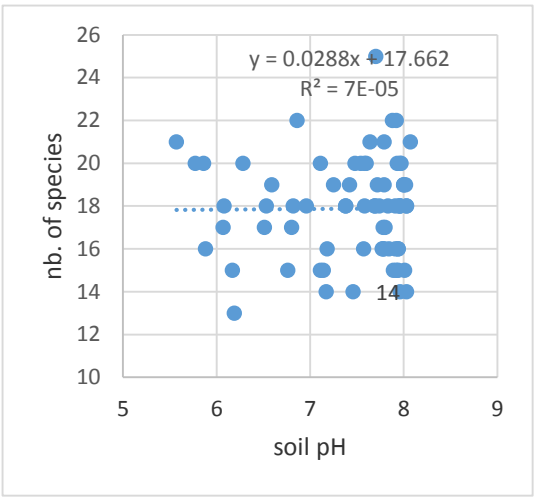

Fig. 1. Dendrogram of segetal flora (2013, the basical framework is present / absent of species on three study sites).

The cluster analysis (Fig. 1.) wich has the basical framework the present/absent of species, highlights the similarity of segetal flora from two sites Bodrog and Cenad, and the a hight euclidian distances segetal flora of Bezdin. The configuration of this dendrogram is due to the smaller number of species from Bezdin site, which compensates for the fact that the highest number of common species for the two sites, Bezdin and Bodrog is 23.

The matrix number of common species is:

| | Bodrog | Bezdin | Cenad |
|---|---|---|---|
| Bodrog | (161) | 23 | 14 |
| Bezdin | 0 | (130) | 0 |
| Cenad | 0 | 0 | (151) |



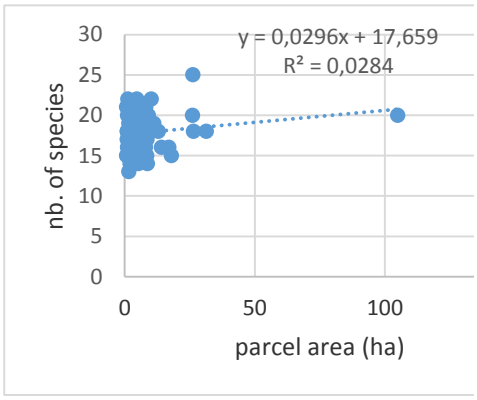




Fig. 2. Correlation of specific diversity (number of species) of weeds in cereal crops (wheat, barley, oats) with the humus content, soil pH and surface of the plot (three sites, 72 parcels, 2013).

The number of weed species from a plot in the case of cereal crops (Fig. 2), is not correlated with the amount of humus (R2 = 0,0039), pH of soil (R2 = 0,00) or the size of parcel (R2 = 0,0284).

Due to the technology of cultures (approximately the same in all of the 72 plots studied), the specific biodiversity of weeds is influenced by other factors, from which the natural reserve of seeds from soil and pre-crop, certainly, plays an important role.

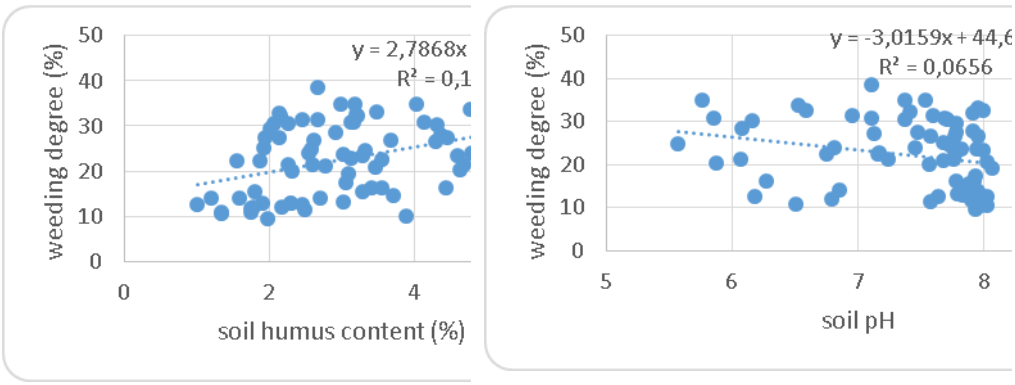



Fig. 3. The correlation of weeding degree of the cereal crops with the amount of humus of soil and with the pH of soil (3 sites, 72 plots, 2013).

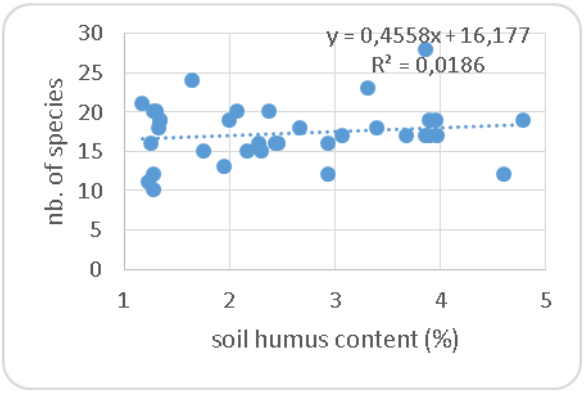
The degree of weeding of cereal cultures is poorly correlated with soil humus content ($R^2$ = 0.1147) and almost noncorrelated with soil pH (Fig. 3).

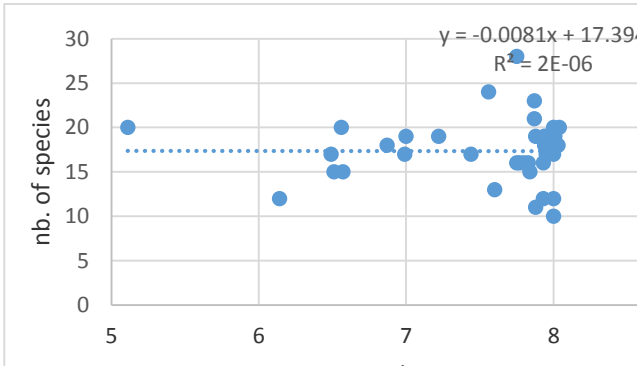
The most common species with the highest participation in cereal cultures are *Anagalis arvensis*, *Anthemis cotula*, *Convolvulus arvense*, *Galium aparine*, *Matricaria perforata* *Stellaria media* and *Viola arvensis.* Maximum values of soil coverage (%) in the case of cereal weeds, do not exceed the 5% threshold per species. The average number of species per parcels was calculated as follows:

| | Bodrog | Bezdin | Cenad |
|---|---|---|---|
| Wheat | 17,95 | 16,70 | 18,50 |
| Barley | 17,00 | 17,76 | 17,75 |
| Oats | 20 | 19,5 | 17 |

The values of weed diversity occurring in wheat, thus appear lower than those found by ARSENE et al. , (2009 ) in cultures from Timiș county: 26.48 species / parcels (in 2006) and 23.08 species / parcels (in 2007).

Unlike cereal crops, in maize, the highest abundance per species is slightly lower (Fig. 4).



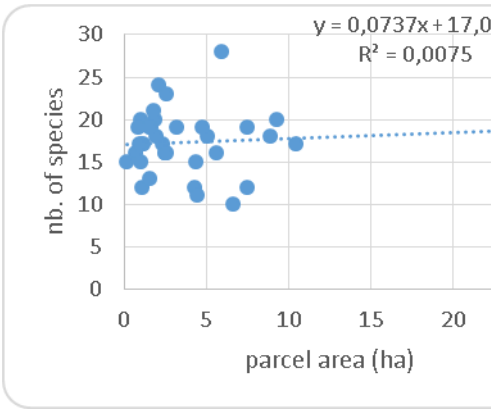




Fig. 4. Correlation of specific diversity (number of species) of weeds from the corn with the humus content, pH of the soil and the surface of the parcel (3 sites, 36 plots, 2013).

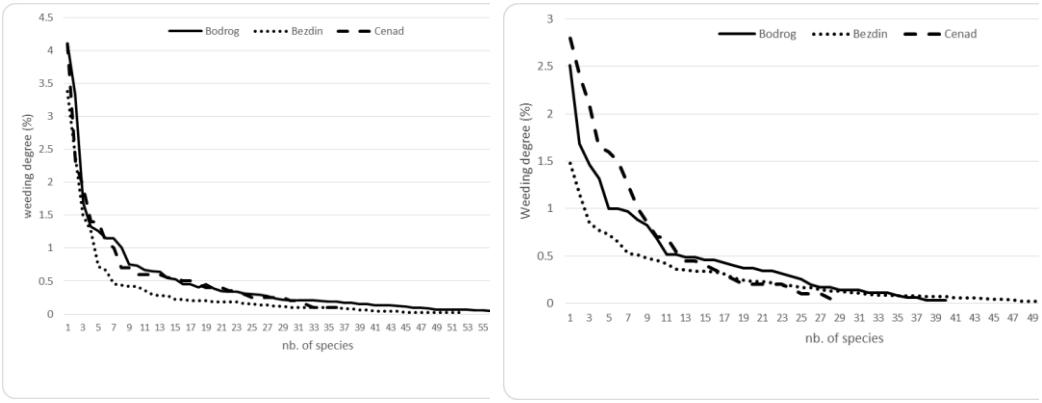



Fig. 5. Distribution of values for the degree of weeding (%) in : a) cereal cultures (72 parcels) and b ) maize (32 parcels) in the 3 sites studied in 2013.

From Fig. 5 (a) it can be observed that the weeding degree drops sharply as the number of species per site increases as the number of species reaches 15, the weeding degree stabilizes between 0,5 and 0. In Fig 5 (b) the trend is simmilar, as the number of corn plants exceeds 15 per site, the weeding degree drops below 0,5, between 20 and 57 corn plants per site, the weeding degree remains almost unchanged, between 0,2 and 0 and according to the data, between 50 and 57 corn plants per site, the weeding degree is nonexistent.

In the maize and sunflower, the most common and most abundant weed species were*: Amaranthus retroflexus, Convolvulus arvensis, Echinochloa crus-galli, Elymus repens, Polygonum persicaria, Portulaca oleracea, Setaria pumila*.

The average number of weed species *per* plot were as follows:

| | Bodrog | Bezdin | Cenad |
|---|---|---|---|
| Maize | 19,0 | 17,2 | 15,25 |
| Sunflower | 19,8 | 20 | 17 |

The specific diversity of weed species in corn is therefore close to the one found by ARSENE et al., (2009) in maize fields in Timiș County in 2007 with 17.54 species / plot, the same authors found a higher value in 2006 with 22.8 species / plot

Situation of adventive species, archeophytes and neophytes alike -*sensu* SÂRBU *et al*., (2013) is as follows:

| | Specia | Bodrog | Bezdin | Cenad |
|---|---|---|---|---|
| 1 | *Abutilon theophrasti* | + | + | - |
| 2 | *Agrostema githago* | - | + | - |
| 3 | *Amaranthus albus* | - | - | + |
| 4 | *Amaranthus retroflexus* | + | - | + |
| 5 | *Ambrosia artemisiifolia* | + | + | + |
| 6 | *Artemisia annua* | + | + | + |

| | | | | |
|---|---|---|---|---|
| 7 | *Asclepias syriaca* | - | - | + |
| 8 | *Centaurea cyanus* | + | - | + |
| 9 | *Datura stramonium* | + | + | + |
| 10 | *Erigeron annus* | + | + | + |
| 11 | *Galinsoga parviflora* | + | + | - |
| 12 | *Lathyrus aphaca* | - | - | + |
| 13 | *Medicago sativa* | + | + | - |
| 14 | *Oxalis stricta* | + | - | + |
| 15 | *Panicum miliaceum* | + | + | + |
| 16 | *Picris echioides* | + | + | + |
| 17 | *Portulaca oleracea* | + | + | + |
| 18 | *Raphanum raphanistrum* | + | + | + |
| 19 | *Sorghum halepense* | + | - | - |
| 20 | *Veronica persica* | + | + | + |
| 21 | *Vicia sativa* | - | - | + |
| 22 | *Xanthium spinosum* | - | - | + |
| | Total species | 17 | 15 | 19 |

In total we identified 51 species in adventitious cultures, most of them (19) at Cenad. The distribution of species on biological categories is are follows:

| | Da | Dp | Ma | Mp | Da-b | Da-p | Pt | Total species |
|---|---|---|---|---|---|---|---|---|
| Wheat | 38 | 16 | 9 | 7 | 3 | 1 | 1 | 75 |
| Barley | 36 | 20 | 7 | 11 | 4 | - | 1 | 79 |
| Oats | 23 | 8 | 3 | 3 | - | - | - | 37 |
| Maize | 30 | 13 | 3 | 4 | - | - | - | 50 |
| Sunflower | 28 | 10 | 5 | 4 | 2 | 1 | 1 | 51 |

Da – annual dicotiledonates, Dp – perenial dicotiledonates, Ma – annual monocotiledonates, Mp – perenial monocotiledonates, Da-b – bianuual dicotiledonates, Da-p – perenial-anuual dicotiledonates.

In all cultures the dominant species are anuual dicoteledonous, aproximately with from thouse 50% species. The number of monocotiledonouss species is greater in cereals cultures than in maize and sunflower, but the difference can be atributed to the greater number of parcels studied.

## CONCLUSIONS

In the cultures of the three sites were found a number of 205 species of cormophytes. Most species have been found at Bodrog (165) while at Cenad were found 155 species and at Bezdin we found 135 species. Depending on the structure of segetal flora, the cluster analysis reveals a similarity between Bodrog and Cenad sites. In the crops of cereals (wheat, barley and oats) were identified 58 species, and in maize 21 species.

The diversity of segetal flora is not correlated or is poorly correlated with key soil properties (humus (%), pH) or plot surfaces.

The average number of weed species per plot in cereal grains, varied from 16.70 (wheat, Bezdin) to 20 (oats, Bodrog) and the main crops (maize, sunflower) from 15.25 (corn, Cenad) to 20 (sunflower, Bezdin).

In cereal crops in terms of biological categories, dominates the Da while in maize are dominant the Da and in sunflower Da.

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