CHARACTERISATION OF SEVERAL AMBROSIA ARTEMISIIFOLIA GENOTIPES FROM BIHOR COUNTY IN THE FLOWERING PERIOD

Author: Erika- Ibolya PAPP[1], Veronica SĂRĂŢEANU [2], Cotuna Otilia[2,3], Durău Carmen Claudia[2], Bojinescu Florina Nicoleta[2]

[1] Secondary School „Nicolae Popoviciu" Beiuş, Bihor County, Romania

[2]Banat's University of Agricultural Sciences and Veterinary Medicine "King Michael I of Romania" from Timişoara, Romania

[3] Station of Agricultural Research and Development Lovrin, Timiş, România

Corresponding author: veronica.sarateanu@gmail.com, cotunaotilia@yahoo.com, sch_carmen_1999@yahoo.com

Abstract. *The importance of the research is due to the consideration that Ambrosia artemisiifolia is an invasive species from the Asteraceae botanical family originating from North America, but spread worldwide, implicitly on the European continent. This has a great capacity of invasion of the anthropic habitats (inhabited areas, vegetable gardens, arable land, roadside etc.) because it has the capacity to produce a very high number of seeds. Ragweed has increased very much its territory in the north-western side of Romania, thus Bihor County is one of the most affected by the invasion of this species mainly to the highly favourable soil and climate conditions. Near to the great land invasion capacity this species produces serious health problems to a great part of the population due to the extremely allergenic pollen that is produced in a very high amount during the flowering period. In literature is mentioned the increase of the incidence of the allergies during the ragweed flowering period, this starting generally from the second half of July till to the beginning of October. The pollen of the species Ambrosia artemisiifolia is one of the main factors that causes allergic rhinitis and also represents one of the major causes of the increase of the incidence of the asthma in the case of the sensitive persons at the summer end. The purpose of the research is to develop an evaluation of several genotypes of Ambrosia artemisiifolia L. from different locations from Bihor County. In the work were analysed too aspects regarding the variability of several morphological features of this species from different sites. Thus there was characterised the correlation among the analysed biological parameters. The studied material is represented by individuals of Ambrosia artemisiifolia collected at the beginning of August 2016 from 10 sites from Bihor County: Biharia, Tulca, Tinca, Hidişelu de Jos, Rabagani, Beiuş, Burda, Uileacu de Beiuş, Totoreni and Ştei. From every site were collected 10 plants and were determined several biometric parameters. The considered parameters were plant height (cm), root length (cm), number of ramifications and the number of male and female inflorescence there being analysed their variability and interrelation using Pearson r value. The data were processed with EXCEL application.*

Keywords*: Ambrosia artemisiifolia, flowering, biometric features, inflorescences, correlation.*

INTRODUCTION

Ambrosia artemisiifolia L. (common ragweed) was first determined at the beginning of 19th century (1838) as weed in U.S.A. according with the notes of WAGNER and BEALS and later in 1860 was identified on the territory of Canada (PALLISER (1963) cited by BERES (1981).

Colonization of common ragweed in Europe from North America took place at the beginning of the First World War with the cereals transport. The explosive spread in Europe started at the beginning of the Second World War. In Europe the biggest populations of ragweed are found Carpathian Basin, northern Italy and France (Rhone Valley) (RYBNICEK *et* JAGER, 2001; BERES, 2004). The most affected countries from Europe are: Hungary, Croatia, Italy and France and is spreading intensely also in Austria, Germany, Swiss and Romania (*A parlagfu - novenyvedelem*, 2009).

In Hungary the presence of common ragweed increased after the reform in agriculture from 1945, respectively associative agriculture. Thus, there have started the commercial exchanges with cereals and agricultural products. Due to these actions the spread of common ragweed spread was mentioned mainly along the railways and along the roads. In 1986 were invaded over 380 thousand hectares and in 2003 this species was identified on 5.4 million hectares, from those 700 thousand massively invaded (TOTH *et al*., 2004; MAKRA *et al.*, 2005).

Common ragweed was mentioned first time in Romania in 1908. After 1880 due to the change of the ownership of an important part of the agricultural land, the clear cuts in the forestry system, associated with the failure of the weed control in crops, along the roadside, have leaded to the intense spread of *Ambrosia artemisiifolia* in agricultural land, invading agricultural crops (sugar beet, potato, sun-flower, maize, tobacco and other crops as hemp, cereals (HODIȘAN, 2003).

Other researches show that common ragweed has a massive presence in Bihor county area and in many locations from north-west, west, centre and north-east of Romania (HODIȘAN *et al*. 2003; HODIȘAN *et* MORAR, 2005; HODIȘAN, 2008; HODIȘAN *et* MORAR 2007, 2008)

Due to the great capacity of common ragweed to produce allergies, 2/3 of the allergic persons are allergic to *Ambrosia artemisiifolia*. The most frequent manifestation of the pollen allergy is allergic rhinitis with symptoms as sneezing, aqueous rhinorrhea, nasal pruritus, nasal congestion and nasal obstruction associated sometimes with allergic conjunctivitis, bronchial asthma or contact dermatitis. These symptoms influence negatively the life quality of the individual, its capacity to develop physical and psychical activities, rest and socialization (KAZINCZI G. *et* AL., 2008).

In Romania, the law no. 62/2018 regarding the control of weed ambrosia and the Gorvernment Decistion no. 707/2018 for the approval of the methodological norms of the application of the law 62/2018 take effect and according with it the citizens have the obligation to prevent, control and destroy the plant ambrosia, otherwise fines may apply.

According with the researches of SĂRĂȚEANU *et* MOISUC (2004) and SĂRĂȚEANU (2010) in the case of grasslands an negative impact have the under-grazing, over-grazing and the lack of the minimal maintenance works by determining the proliferation of the invasive plants species. A series of changes of the environmental conditions are determined by the change of the pressure of several anthropogenic as exploitation manner, fertilisation, maintenance works *etc*.

Ambrosia artemisiifolia enters in disturbed habitats with abandoned arable land forming with other terrophyte species ruderal phytocoenoses (*Sisymbrietalia*, *Onopordetalia*), this phenomenon taking place whenever the available space is unoccupied with competitor species, and light and the other environmental factors are favourable. Common ragweed is known for the capacity to invade agricultural crops (ȚOPA *et* BOȘCAIU 1965; TURENSCHI 1969; SÎRBU 2003, 2008) cited by IANOVICI N. *et* FAUR (2004), IANOVICI *et al*. (2004).

According with the research developed by SĂRĂȚEANU *et al.* (2010) during three years on 7 pasture plots from Valea lui Mihai (Bihor County) it was concluded that once with the increase of the abundance of the species *Ambrosia artemisiifolia* decreases the average number of plant species from the sward, in the same way decreases Shannon biodiversity index and pastoral value.

Common ragweed contains allelopathic compounds that influences the germination of the seeds of superior plants and inhibit the development of the phyto-pathogenic fungi. This capacity has contributed to the rapid spread of *Ambrosia artemisiifolia* and to the invasion o a great areal by this species BRŰCKNER (2001) cited by HODIȘAN *et* MORAR (2008).

MATERIAL AND METHODS

The purpose of the work is to assess the condition of the common ragweed population in Bihor County. In this way there were analysed several biometrical variables of the species in different locations from Bihor County where was mentioned the presence of common ragweed. Thus there were analysed several interrelations between the considered biological parameters of the plants at anthesis, respectively the month August.

A great influence in the spread of common ragweed has the climatic conditions from certain geographical regions. Several characteristics regarding the climatic conditions of Bihor County that determinate the development of common ragweed al presented in the following. A great variety of soils in Crişurilor Plain as leached cambic chernozems, leached chernozems, argillic chernozems, In the Plain Carei - Valea lui Mihai appear leached chernozems, in low hill area the soils are argillic, forest brown soil and forest podzolic brown soil, argillic podzolic soil and in depressions and in depressions are podzolic and sand soils. In the area of Crişene Hills the soils are podzolic and argillic, and in the mountain area the soils are brown acid soil. In the West Plain appear sand dunes respectively on Carei Plain, Valea lui Mihai and Ierului Plain on 25,000 ha. Bihor County has a temperate continental climate entire area being under the influence of the western air masses that are more humid and hotter that are coming from the Atlantic Ocean. In winter have influence on climate the humid air masses from Arctic Ocean and Baltic Sea. During summer are dominant the hotter air masses from Africa and Mediterranean Sea. Multiannual average temperature in Bihor County varies from 6 ºC in mountain area to 10.5 ºC in plain area. Multiannual average temperature of the rainfall amount fallen in Bihor County is from west to east from 500 mm to 1200 mm (http://apmbh-old.anpm.ro/upload/71493_Cap1.Profil%20judetul%20Bihor%202011.pdf).

Ambrosia artemisiifolia is a very aggressive species and the conditions from the Pannonian Basin that provides a favourable environment for development and spread (*A parlagfu - novenyvedelem*, 2009).

The biological material studied is represented by the species *Ambrosia artemisiifolia*, the data being collected in August 2016 in 10 localities from Bihor County: Biharia, Tulca, Tinca, Hidişelu de Jos, Rabagani, Beiuş, Burda, Uileacu de Beiuş, Totoreni şi Ştei (Figure 1).

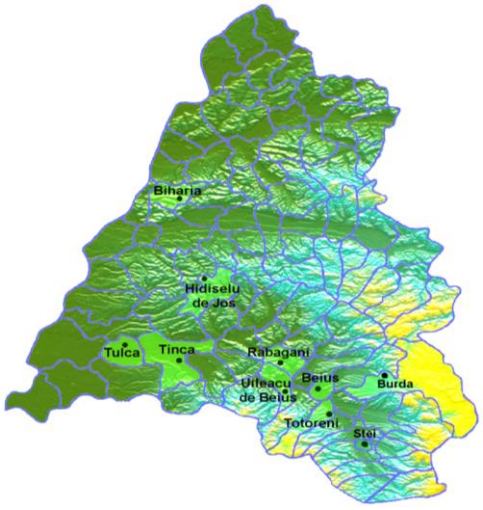

Figure 1 Map of Bihor County with the administrative area of the localities where was collected biological material of *Ambrosia artemisiifolia*.

From every location were collected common ragweed samples consisting in 10 plants per location. Every plant was measured, the analysed biological parameters being plant height (cm), root length (cm), number of ramifications and the number of male and female inflorescences. There was analysed the variability and interrelation of the analysed features using Pearson r value. The data processing was realised using EXCEL.

RESULTS AND DISCUSSIONS

In Figure 2 is presented the variability of the common ragweed plant height in the analysed samples. There can be noticed that variability is relatively low, the difference comparative with the average being insignificant. This fact shows the analysed samples are homogenous considering the plant height. The lowest height of the common ragweed plant was registered at Tulca (76.1 cm) and the greatest at 124.5 cm).

In figure 3 is presented the variability of the root length of the analysed common ragweed samples. This parameter has a high variability comparative with plant heigth. Thus, the shortest root length was measured atTinca (8.11 cm) and the greatest at Biharia (23.1 cm).

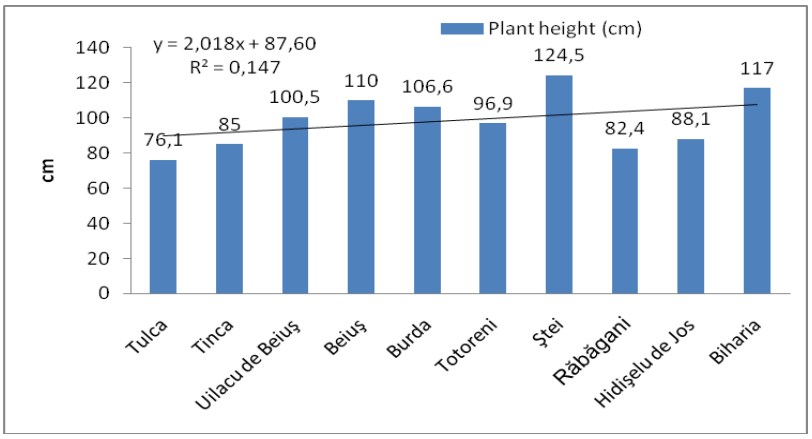

Figure 2. Analysis of common ragweed plant heigth in the analysed samples

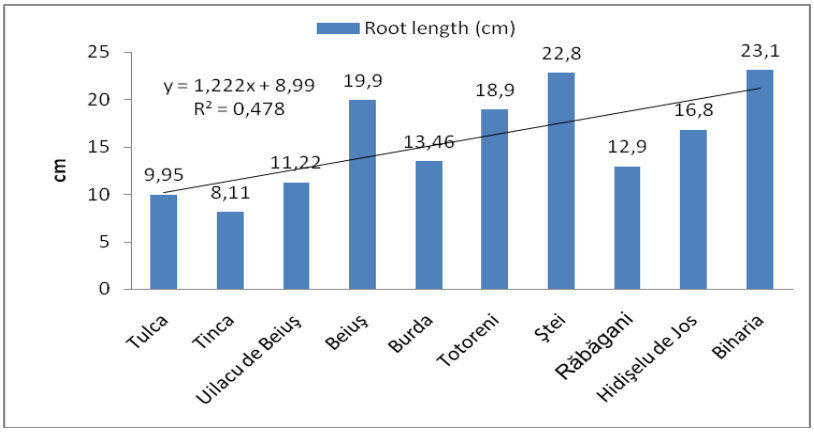

Figure 3. Analysis of common ragweed root length in the analysed samples

In figure 4 is analysed the brances number per plant. This featurehas a relativelly low variability, but the lowest average number of branches per plant registered was 12.2 (Uilacu de Beiuş) and the greatest number of branches per plant was 23,9 (Biharia).

In Figure 5 is presented variability of the male inflorescence number there being well known that they are responsible for the production of allergenic pollen. Variability of this feature is low, the most of the samples having values near to the average value, but several were highlighted by certain values, respectivelly the lowest number of male inflorescences was determined at Răbăgani (45.9) and the greatest at Ştei (154.8).

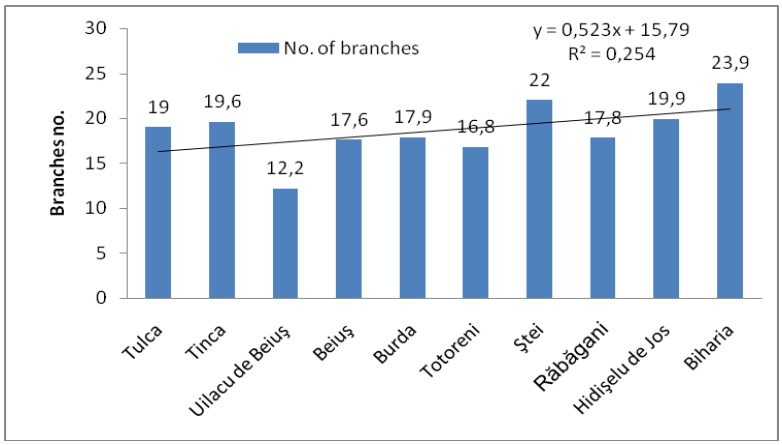

Figure .4. Analysis of common ragweed number of branches per plant in the analysed samples

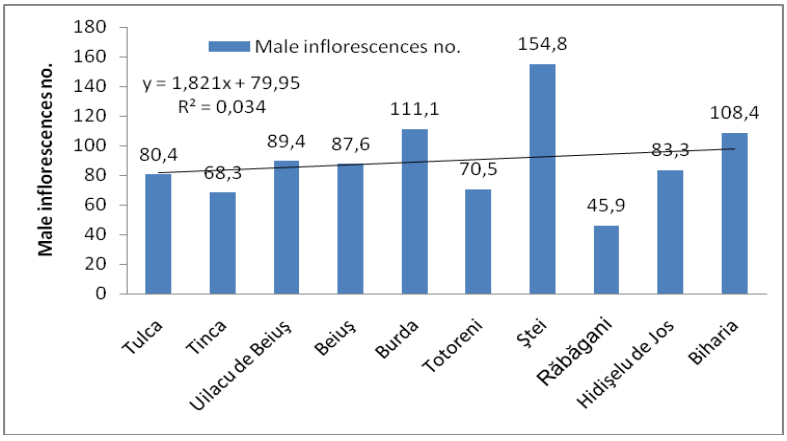

Figure 5. Analysis of common ragweed male inflorescence number in the analysed samples

In Figure 6 is presented the diagram of the variability of the female inflorescence number in the analysed samples of common ragweed plants. Thus, from the diagram results a relativelly high variability of the female inflorescences per plant. The values determined for this feature very very different, the lowest number of female inflorescences being determined at Tinca (151.5) and the greatest at Ştei (697.1).

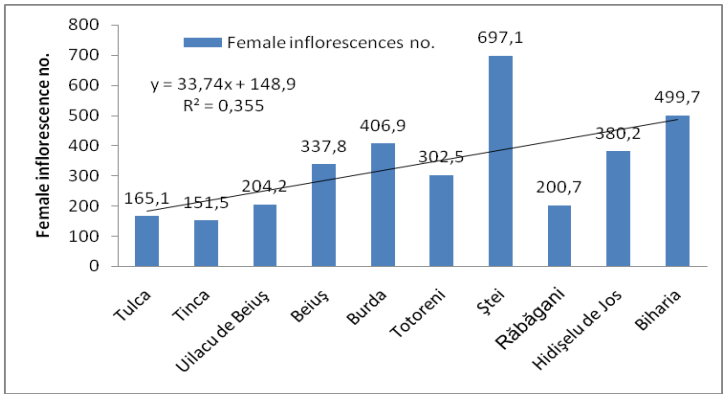

Figure 6. Analysis of common ragweed female inflorescence number in the analysed samples

In August 2019 was analysed also the spread of *Ambrosia artemisiifolia* In Bihor County, the species being noticed in 58 localities. In Figure 7 is presented the spread of the common ragweed in the considered territory, in this way the localities were grouped in 4 areas depending the severity of infestation with this invasive weed species, the most infested being the are no.1 from the vicinity of the border with Hungary

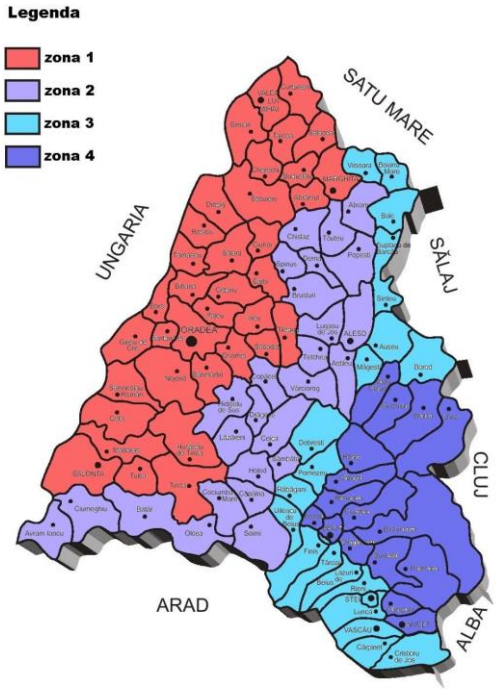

Figure 7. Infestation with *Ambrosia artemisiifolia* of Bihor County (August 2019) (Legend: zona 1 – very infested, zona 2 – medium infested, zona 3 - less infested, zona 4 – very little infested)

In table 1 were calculated the Pearson *r value*, respectively correlation coefficients (two tailed test; $\alpha = 0.05$; $df = n - 2$; $n = 100$; p 0.05 = 0.164; p 0.01 = 0.23; p 0.005 = 0.254) all the obtained values showing a very high positive significance between all the analysed pairs of variables considered.

Table 1

Pearson r-values calculated between the analysed parameters of *Ambrosia artemisiifolia* ($p \geq 0.05$ *; $p \geq 0.01$ **; $p \geq 0.005$ ***)

Specification	Root length (cm)	Number of branches	Male inflorescences number	Female inflorescences number
Plant height (cm)	0.769***	0.417***	0.585***	0.613***
Root length (cm)		0.457***	0.473***	0.586***
Number of branches			0.465***	0.556***
Male inflorescences number				0.850***

CONCLUSIONS

One of the most important morphological features of the species *Ambrosia artemisiifolia* is the number of branches, the importance of this feature consisting in the fact that in the top are forming the male inflorescences and at their base the female inflorescences, in this way as their number is higher the number of the inflorescences from both sexes will be greater.

Common ragweed features with the greatest impact from the point of view of the species spread and land infestation are represented by the great number of female inflorescences. This feature had a great variability, on some plants being determined even more that 1000 female inflorescences (e.g. 1628 female inflorescences per one plant).

Other important feature is the number of male inflorescences, these being responsible by the production of high allergenic pollen amounts that affects the health of humans and animals. This feature had also a high variability, the inflorescences number reaching 298 per plant, but this number is very big having in view that these are spikes with heads, each head containing several staminate flowers that produce great amount of pollen.

All the analysed biological parameters proved to be highly correlated, this meaning that all the chosen features for analysis are influencing strongly the production of pollen and seeds, providing the invasive comportment of this species and the potential for public health threatening.

Thus, all the recommendations regarding the control of common ragweed mention repeated mowing or chemical control to prevent the production of pollen and seeds.

BIBLIOGRAPHY

BÉRES I. (1981): A parlagfő (Ambrosia elatior L) hazai elterjedése, biológiája és a védekezés lehetıségei. Kandidátusi értekezés. Agrártudományi Egyetem, Keszthely.

BÉRES, I. (2004). Integrated weed management of common ragweed (Ambrosia artemisiifolia L.). (Az ürömlevelű parlagfű (Ambrosia artemisiifolia L.) elleni integrált gyomszabályozási stratégiák). Hung. Weed Res. and Technol. 5:3-14.

HODIŞAN N., MORAR G, 2007 - The spreading of the invasive species common ragweed (Ambrosia artemisiifolia L.): a quarantine weed in the north-west of Romania, Lucrări Ştiinţifice USAMVB, p. 499-502.

HODIŞAN N., MORAR G, 2008 - The spread of the invasive species Ambrosia artemisiifolia L. in Romania, between 2005-2007, Bulletin UASVM, Agriculture vol. 65 (1), p. 129 – 134.

HODIȘAN, N., 2003 - Floarea pustei (Ambrosia artemisiifolia L) O periculoasă plantă de carantină, Sănătatea Plantelor, 66/2003 a pg. 39.

HODIȘAN, N., MORAR, G., 2005 - Research regarding apparition and extension of Ambrosia artemisiifolia L. specie in North-West of our country, Buletin Universitatea de Ştiinţe Agricole şi Medicină Veterinară Cluj-Napoca, 61/2005 pg. 228-230.

IANOVICI N., FAUR A. (2004) – Monitorizarea polenului alergen de Artemisia in sud-vestul României, The 2th International Conference "Natural resources and sustainable development", Section "Environment engineering. Ecotoxicology", 23-24 april, Analele Universităţii din Oradea, Fascicula Protecţia mediului, vol. IX, anul 9, pg.213-222.

IANOVICI N., PAHOMI M., FAUR A. (2004) – Artemisia's flowering phenophase dynamic`s (2000-2002), Annales of the University of Craiova, p. 149-154.

MAKRA L., JUHÁSZ M., BÉCZI R., 2005 - The history and impacts of airborne Ambrosia (Asteraceae) pollen in Hungary, Grana, 44(1):57-64.

KAZINCZI, G., BÉRES I., NOVÁK R., BÍRÓ K. (2008): Common ragweed (Ambrosia artemisiifolia L.): A review with special regards to the results in Hungary: I. Taxonomy, origin and distribution, morphology, life cycle and reproduction strategy. Herbologia, 9(1): 55-91.

RYBNCEK, O., JÄGER S. (2001): Ambrosia (ragweed) in Europe. Allergy Clin. Immunol. Int. 13: 60-66.

SĂRĂŢEANU V., 2010 - Ambrosia artemisiifolia L. an invasive weed from ruderal areas to disturbed grasslands, Options Méditerranéen¬nes, în curs de publicare.

SĂRĂŢEANU V., MOISUC A., 2004 - Identification of some herbaceous invasive plant species in Banat's grasslands, Lucrări Ştiinţifice Facultatea de Agricultură. Mirton. Timisoara, Vol. 36, p. 171-176.

TÓTH, Á., HOFFMANNÉ, P., Z., SZENTEY, L., 2004. Ragweed (Ambrosia elatior) infestaiton in Hungary in 2003. Difficulties of decreasing pollen content of the air. 14. Keszthelyi Növényvédelmi Fórum 2004 január 28-30. Abstracts. 69.

*** A parlagfu - novenyvedelem, 45 (8), 2009

*** Law no. 62/2018 regarding the control of the weed Ambrosia from 17 March 2018.

*** Hotărârea de Guvern nr. 707/2018 pentru aprobarea Normelor metodologice de aplicare a Legii nr. 62/2018 privind combaterea buruienii ambrosia.

*** http://apmbh-old.anpm.ro/upload/71493_Cap1.Profil%20judetul%20Bihor%202011.pdf