RESEARCHES REGARDING THE INFLUENCE OF THE SOIL TYPE OVER THE FLORISTIC COMPOSITION OF WEEDS

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Abstract

The experiments were carried out on three types of soil: the argiloiluvial soil at Livada, Satu Mare County, the Chernozem and the peat soil at Berveni, Satu Mare County with the goal to establish the influence of soil type over the floristic composition of the weeds in wheat and maize crops. Also through the experiments we carried out we want to establish the most effective and efficient herbicide for the two crops.

In this paper we present only the influence of soil type over the floristic composition of weeds and over the level of weed infestation for the three types of soil in winter wheat crops.

Key words: soil type, wheat, floristic composition of the weeds, the level of weed infestation.

INTRODUCTION

The soil represents the determining factor in forming the floristic composition of weeds. In soil it is kept the seed reserve of weeds. Due to the mineral and organic compounds, the reaction of the soil and its texture it will grow different weed species that will became indicators of edaphic conditions, adapted to the presence of certain chemicals in excess or sometimes the lack of those chemicals, indicators of a certain pH or particle size structure.

The type of soil which presents a synthetic expression of its characteristics and the influence of climatic factors it is less revealed by the presence of certain weed species but it may be characterized by the presence of some enviromental groups of weeds. (Hilbig,1962;Hilbig, Rau,1972; Guillerm,1969, Ciocârlan,1978). Quoted by Chirilă, 2001.

Knowing the indicating weeds of certain edaphic conditions and also the indicating enviromental groups of weeds permits the relatively accurate assessment of the characteristics of the soil as a preliminary characterization of soil, following that subsequent agrochemical and pedological investigations to certify the field observations and to quantify them. A full study in this sense was ellaborated by Guillerm (1969) which estabilsh a relationship between the spontaneous vegetation and the environment conditions of the cultivated soil in Bas-Languedoc based on very detailed information regarding the tree vegetation , the geology and geomorphology of the studied area demonstrating the complexity of the

problems but also the posibility of spontaneous vegetation of certain segetal species.

The clay-luvisoil is characterized by the presence of "B horizon", more or less developed with a clay content of 33-39%, with low values of hydric conductivity which determines the water stagnation at soil surface. (Kurtinecz, 2016). The Chernozem of the Western Plain of Romania is the most fertile soil in this area and has a floristic composition specific to plants that likes high levels of nitrogen. (Chirilă,2001). The peat soil has a intrazonal localisation and had been formed under the influence of stagnatic waters. The peat soil is very hard permeable for water, but by drainage could become a fertile soil that could close to the fertility of the The Chernozem (Florea,1968).

MATERIAL AND METHOD

The experiments were carried out on three types of soil: the clay-luvisoil, the Chernozem, and the peat soil. Experienţele au fost amplasate pe trei tipuri de sol: argiloiluvial, cernoziom,şi sol turbos. The placement of the experiments was made using the Latin Rectangle Method. The determination of the level of weed infestation in the winter wheat crops was made by counting the weed species in each plot from a 1 square meter area.

Table 1

The Experiment Schema

R3	13	14	15	16	17	18	1	2	3	4	5	6	7	8	9	10	11	12
R2	7	8	9	10	11	12	13	14	15	16	17	18	1	2	3	4	5	6
R1	**1**	**2**	**3**	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

THE CLAY-LUVISOIL

The climatic conditions of forming the clay-luvisoil varies in very large limits. Condiţiile climatice de formare a solului argiloiluvial variază în limite foarte mari. Thus, the multiannual average of rainfall oscillates between 650 -1000 mm, the multiannual average of temperature oscillates between 6-7 ^{o}C and 9-10 ^{o}C and the aridity index between 34-50. Potential evapotranspiration is less than rainfall and the hydrological regime is percolating.

The forming and the development of these soils occured under the forrest of *Quercus petraea* and or with the mix of *Fagus silvatica* well kept

and closed. Along with tree vegetation there is a acidophilic herbal vegetation.

Table 2

The main physicochemical parameters of clay luvisoil at Livada

Horizon	**Ap**	**El**	**EB**	**Bt_1**	**Bt_2**	**Bt_3**
Depth (cm)	0-23	24-34	36-46	53-63	75-85	145-155
1	**2**	**3**	**4**	**5**	**6**	**7**
Clay<0,002mm(%)	21,0	20,4	25,1	39,0	36,0	33,7
DA(g/cm^3)	1,14	1,46	1,50	1,54	1,59	1,61
PT(%)	58	46	44	43	41	41
PA(%)	27	11	12	9	5	6
CO(%)	6,3	5,8	8,1	14,5	13,0	12,1
CC(%)	27,4	24,3	21,4	22,2	22,7	22,0
CU(%)	21,1	18,5	13,3	7,7	9,7	9,8
K sat.(mm/h)	26,82	6,91	1,47	0,39	0,43	0,25
Humus(%)	1,41	0,73	0,46	0,37	-	-
N total(%)	0,16	0,12	0,10	-	-	-
P mobile(ppm)	24,5	4,6	16,4	16,3	-	-
K mobile(ppm)	173	204	196	206	-	-
Al mobile(me/100gsoil)	1,93	1,40	1,10	0,70	0,48	0,22
SB(me/100gsoil)	6,49	7,09	14,24	16,49	15,61	14,26
SH(me/100gsoil)	5,37	5,05	4,15	3,67	2,83	2,63
T(me/100gsoil)	11,86	12,14	18,39	20,16	18,44	16,89
pH(H_2O)	5,19	5,31	5,56	5,70	5,92	6,04
V(%)	54,7	58,4	77,4	81,7	84,6	84,5
Ca^{2+} (% of T)	35,1	39,4	50,9	52,7	57,7	54,8
Mg^{2+} (% of T)	14,2	14,0	23,0	25,3	23,3	26,2
K^+ (% of T)	4,7	4,5	2,9	2,9	2,6	2,4
Na^+(% of T)	0,7	0,5	0,6	0,8	1,0	1,1

The analysis was made at ICPA Bucureşti

THE CHERNOZEM SOIL

The Chernozem soils corresponds the steppe zone, covering in our country an area of aproximate 2 million ha, mostly in Romanian Plain, in Dobrogea, in Western Plain and on lower area in Moldova and in Transilvania.

The natural vegetation under they formed is represented by well developed grassy cover (hayfields) which leaves a large quantity of organgic waste in soil and at its surface (*Festuca valesiaca*, *Avena cristatum*, *Poa bulbosa* etc). In the present, most of the soil are cultivated, and the natural vegetation is preserved only on pastures and hayfields.

The parental material is represented by lőess, lőess material, clays and rarely by sand, clay marl and aluvo-proluvial deposits.

The freatic water is found at high depth (10-20 m) and does not affect the pedogenesis processes. Rarely, it can be found at low depth when wet freatic Chernozem soil is formed.

Table 3

The main physicochemical parameters of Chernozem soil at Berveni

Horizon	**Ap_1**	**Ap_2**	**A/B**	**Bv_1**	**Bv_2**	**Cca**
Depth (cm)	0-19	19-29	29-42	42-58	58-77	77-100
1	**2**	**3**	**4**	**5**	**6**	**7**
Clay<0,002mm(%)	27,5	28,1	28,3	23,8	22,7	18,7
DA(g/cm^3)	1,10	1,27	1,35	1,36	1,34	1,30
PT(%)	58,4	52,0	49,6	49,6	50,3	51,8
PA(%)	29,3	20,1	16,8	18,7	21,1	26,2
CO(%)	11,0	11,4	12,2	9,3	8,3	6,9
CC(%)	26,6	25,1	21,3	22,7	21,8	19,7
CU(%)	15,6	13,7	9,1	13,4	13,5	12,8
K sat.(mm/h)	37,2	11,5	38,2	15,9	14,9	9,2
Humus(%)	3,4	3,3	1,5	1,2	0,8	0,9
N total(%)	0,173	0,165	0,189	0,080	-	-
P mobile(ppm)	24	30	-	-	-	-
K mobile(ppm)	162	149	-	-	-	-
Al mobile(me/100gsoil)	20,6	18,1	15,8	21,3	19,1	15,3
SB(me/100gsoil)	0,8	2,9	2,4	0,0	0,0	0,0
SH(me/100gsoil)	21,4	21,0	18,2	21,3	19,1	15,3
T(me/100gsoil)	0,0	0,0	0,0	0,0	8,0	13,1
pH(H_2O)	7,9	6,7	7,1	8,2	7,9	8,4
V(%)	96,3	86,2	86,8	100,0	100,0	100,0
Ca^{2+} (% of T)	76,2	68,1	67,1	96,7	94,2	93,5
Mg^{2+} (% of T)	16,4	15,3	16,5	-	-	-
K^+ (% of T)	1,4	1,4	1,6	1,4	1,6	2,0
Na^+(% of T)	2,3	1,4	1,6	1,9	4,2	4,5

The analysis was made at ICPA Bucureşti

THE PEAT SOIL

The peat soil is defined by the presence of a peat horizon, thicker than 50 cm in the first 100 cm and a mineral horizon thinner than 20 cm in the first 25 cm.

The eutrophic peat or "lower" peat are formed under the influence of stagnatic waters of freatic nature, waters rich in nutrients. The most important areas with eutrophic peats are in Crasna Plain, in Olt's Meadow in Fagăraş Area, in Lozna's Meadow and in the depression of Ciuc, Giurgeu, Braşov, Bilbor and Borsec(N.Florea 1968).

The peat soil are forming on water saturated area, the excess of humidity is due to the existence of freatic water close to soil surface or even at the soil surface or accumulation and long-time stagnation of rainfall waters at the surface of the soil with depressionary relief in wet climate areas.

The vegetation that creats eutrophic peats consists of the species of Carex, Phragmites, Typha, Juncus, moss(without Sphagnum), Eryophorum,

Calamagrostis, Equisetum. As woody plants, they could occurs: Salix , Betula, (*glutinosa*, *incana*), *Pinus silvestris*, *Picea excelsa*, *Larix sibirica*.

In general the peat is very hard permeable for water. It has low density (specific weight).

The eutrophic peats has neutral reaction slightly alkaline or acidic (pH=5,1-7,6), the content of organic substance is lower (53-94%) than the oligotrophic peats; they are soils with more nutrients: 0,05 – 0,57% P_2O_2; 0,018 – 1,440% K_2O ; 0.525 – 4,023% N total.

RESULTS AND DISCUSSION

The types of soil are formed in different conditions of climate, parent rock, relief, the freatic and stagnating waters. The soil formation process was performed in time.

The clay luvisoil has a medium clay texture. The pH value in natural conditions falls bellow 6, but could fall till 3,5-4,0.

The segetal floristic composition is determined by the physical and chemical, hydric and texture properties of soil.

Table 4

The existing weed species in wheat crops on the clay luvisoil at Livada

Scientific Name	**Popular Name**	**Density pl/m^2**
Matricaria inodora	Muşeţel prost	4
Raphanus raphanistrum	Ridiche sălbatică	2
Sinapis arvensis	Muştar de câmp	5
Polygonum aviculare	Troscot	10
Gypsophila muralis	Vălul miresei	5
Convolvulus arvensis	Volbură,Rochiţa rândunicii	6
Capsela-bursa-pastoris	Traista ciobanului	2
Stellaria media	Rocoină	3
Viola arvensis	Trei fraţi pătaţi	2
Veronica hederifolia	Doritoare	1
Apera spica-venti	Iarba vântului	3
TOTAL		**43**

The Chernozem soil corresponds the steppe zone, being found mostly in Romanian Plain, in Dobrogea, in Western Plain, etc. This soil has a medium texture, well structured. It has a favourable hydric and aerial regime, it is supplied well with humus (over 4%), slightly alkaline reaction (pH 7,2-8) and the alkali saturation level is 90-95%. The chernozem soil it is well and very well supplied with nutrients, featuring the highest natural fertility.

The chernozem soil offers optimal development conditions both field crops and weeds, especially the nitrophilae.

Table 5

The existing weed species in wheat crops on the cernoziom at Berveni

Scientific name	**Popular Name**	**Density pl/mp**
Papaver rhoeas	Mac roşu	60
Adonis aestivalis	Cocoşei de câmp	5
Viola arvensis	Trei fraţi pătaţi	1
Veronica hederifolia	Doritoare	2
Galinsoga parviflora	Busuioc de câmp	2
Lamium purpureum	Sugel	4
Stelaria media	Rocoină	3
Capsela bursa-pastoris	Traista ciobanului	7
TOTAL		**84**

The peat soil is very hard permeable for water. It has a low density (specific weight). The eutrophic peat at Berveni Jud. Satu Mare has a neutral reaction, slightly alkaline or acide (pH 5,1-7,6); the content in organic substance is 86%, it is a soil rich in nutrients. This soil was drained and offers good condtion for field crops and weeds, particulary in dry years.

Table 6

The existing weed species in wheat crops on the peat soil at Berveni

Scientific name	**Popular Name**	**Density pl/m^2**
Papaver rhoeas	Mac roşu	72
Adonis aestivalis	Cocoşei de câmp	2
Viola arvensis	Trei fraţi pătaţi	2
Convolvulus arvensis	Volbură,Rochiţa rândunicii	1
TOTAL		**77**

Making statistical calculation of the total number of weeds on the three types of soil, we found that the lowest level of weed infestation was recorded on clay luvisoil from Livada. The level of weed infestation on chernozem and peat soil is larger than the clay luvisoil and the difference is statistically distinct significant.

Table 7

The influence of soil types over the level of weed infestation

Variant	No of weeds /m^2	**D±**	**Significance**
1.Cernoziom	87,3	54,6	xx
2.Turbă (Peat)	92,0	59,3	xx
3.Argiloiluvial(Mt)	32,7	-	

LSD 5% 14,19 pl/m^2 LSD 1% 32,77 pl/m^2 LSD 0,1% 104,28 pl/m^2

CONCLUSIONS

The types of soil were formed under specific climate and parent rock.

The soil represents the decisive factors for growth and development of weeds and is the main source for weed infestation .

The fertility of soil and its nutrient and humus content, the pH of soil, the content of clay and hydric and physical indices, all are highlighted by the indicator plants.

The floristic composition is specific to each type of soil. Thus, on clay-luvic soil the dominant species are : *Matricaria inodora*, *Polygonum aviculare*, *Gypsophila muralis*, *Raphanus raphanistrum*, *Sinapis arvensis*, *Stellaria media*, *Apera spica-venti* etc.

The chernozem soil is covered by the following most representative weed species: *Papaver rhoeas*, *Adonis aestivalis*, *Galinsoga parviflora*, *Lamium purpureum*, *Veronica hederifolia*, *Viola arvensis*, *Convolvulus arvensis*.

The peat soil by its chemical, physical and hydric features promotes the proliferation of following weed species: *Papaver rhoeas, Adonis aestivalis*, *Viola arvensis*, *Convolvulus arvensis*, *Cirsium arvense*.

The level of weed infestation was the largest for peat soil, with a difference positive distinct significant statistically, as in the case of chernozem soil compared with the clay luvic soil.

REFERENCES

1. Berca M.,2004,Menegmentul integral al buruienilor.Ed.,,Ceres" Bucureşti
2. Berca M.,2011,Agrotehnica-transformare modernă a agriculturii. Ed.,,Ceres" Bucureşti
3. Blaga Gh.,Rusu I.,Udrescu S.,Vasile D.,1996,Pedologie.Ed.didactică şi pedagogic R.A. Bucureşti
4. 4.Brejea R.,2010,Ştiinţa solului.Ed. Universităţii din Oradea
5. Chirilă C-tin.,2001,Biologia Buruienilor Organografie,Corologie,Dinamică,Importanţă. Ed.,,Ceres" Bucureşti 2001
6. Chiriţă D.C-tin.,Păunescu C.,Teaci D.,Solurile Rămâniei.Ed.Agro-Silvică,Bucureşti
7. Domuţa C.,2006,Tehnica experimentală. Ed. Universităţii din Oradea
8. Fritea T.,1998,Cercetări privind efectele colaterale ale utilizării erbicidelor pe soluri acide din nord-vestul ţării.Teză de doctorat,ASAS Bucureşti
9. Fritea T.,Nagy D.,Mondici Susana,Oferta cercetării ştinţifice pentru transfer tehnologic în agricultură,industria alimentară şi silvicultură. Ed.,,Ceres" Bucureşti,2012
10. Guş P.,Rusu T.,Bogdan Ileana,2004,Agrotehnica.Ed.Risoprint Cluj-Napoca
11. Mondici Susana,Fritea T.,2015, Anale INCDA Fundulea,vol LXXXIII 2015
12. .Mondici Susana,Fritea T.,2015 Oferta cercetării ştinţifice pentru transfer tehnologic în agricultură,industria alimentară şi silvicultură. Ed.,,Ceres" Bucureşti,2015
13. Păcurar I.,Sin Gh.,Fritea T.,Dîrja M.,1999,Interrelation soil, tehnological al measures and economics results to strawcereals cultivated in the north west of Transilvania.Simpozion Omagial ,,Agricultura în perspectiva mileniului trei".Ed. .,,OSAMA" Cluj-Napoca

14. Popescu Alexandrina,et.al.,2000, Erbicide combinate aplicate în combaterea buruienilor dicotiledonate anuale şi perene din cultura grâului.Al XII lea Simpozion Naţional de Herbologie.Combaterea integrată a buruienilor .Sinaia 2000
15. Şarpe N.,Ciorlăuş At.,Ghinea L.,Vlăduţu I.,1975,Erbicidele-Principiile şi practica combaterii buruienilor. Ed.,,Ceres" Bucureşti
16. Şarpe N.,Strejan Gh.,1981,Combaterea chimică a buruienilor din culturile de câmp. Ed.,,Ceres" Bucureşti
17. Şarpe N.,1987,Combaterea integrată a buruienilor. Ed.,,Ceres" Bucureşti
18. Şarpe N.,Păunescu A.,et al ,1986,Noi erbicide preemergente şi postemergente pentru grâu.Selectivitatea lor în condiţiile României.Probleme de agrofitotehnie teoretică şi aplicată,ICCPT Fundulea,vol VIII,nr.1,pp19-30.
19. Vlăduţu I.,Fritea T.,Kurtinecz P.,1988,Contribuţii privind combaterea integrată a buruienilor pe solul argiloiluvial din nord-vestul Transilvaniei.Probleme de agrofitotehnie teoretică şi aplicată,ICCPT Fundulea,vol V,nr.2,pp153-177
20. Vlăduţu I.,Fritea T.,Şarpe N.,Verteman Cornelia,1990,Clorsulfuronul domeniu şi limite de utilizare la culturile de câmp din nord-vestul Transilvaniei. Probleme de agrofitotehnie teoretică şi aplicată,ICCPT Fundulea,vol XII,nr.4,pp257-273