Cercetări Agronomice în Moldova
Anul XXXX , Vol. 4 (132) / 2007

REMARKS ON PLANTS INDICATING SOIL CHARACTERISTICS

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Received May 28, 2007

ABSTRACT *– Soil formation is a process of biological nature, because humus, the specific and fundamental soil component, is organic. Soil mapping required the knowledge of soil classification, climate, rock relief and plant species from canopy, which determined the soil formation and evolution. The flower habitat is the most important element from the point of view of soil mapping, because it allows getting practical and synthesis deductions of zonal, interzonal and azonal soil distribution. Frequently, in soil mapping, they specify only the genus of dominant plants (for instance, Festuca sp.and Carex sp.), without the species. For the classification of plants from the spontaneous flora, it is necessary to specify both the species of plants found in the studied habitat and their abundance and dominance. The paper presents only a few plant species belonging to the same genus, which developed on certain soil types with different characteristics.*

Key Words: indicator plants, plant species, soil mapping

REZUMAT - Consideraţii referitoare la plante indicatore ale unor însuşiri ale solurilor. *Procesul de formare a solurilor este, în esenţă, un proces de natură biologică, întrucât componentul specific şi fundamental al solului, humusul, este de natură organică. Cartarea pedologică impune cunoaşterea aprofundată a clasificării solurilor, a unităţilor tipizate de climă, relief, rocă şi a speciilor de plante din cadrul covorului vegetal, care a determinat formarea şi evoluţia solului. Elementul cel mai important din punct de vedere al cartografierii solurilor este arealul floristic, deoarece permite obţinerea unor deducţii practice, cât şi de sinteză de distribuţie zonală, intrazonală şi azonală a solurilor. În mod frecvent, în cartările pedologice se specifică numai genul de plante dominante (ex. Festuca sp., Carex sp.), fără precizarea speciei. În inventarierea plantelor din flora spontană este necesar să se precizeze atât speciile de plante întâlnite în arealul studiat, cât şi abundenţa şi dominanţa acestora. În*

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lucrare se prezintă câteva exemple de specii de plante, care aparţin aceluiaşi gen, dar care se dezvoltă preferenţial pe tipuri de sol cu însuşiri diferite.

Cuvinte cheie: plante indicatoare, specii de plante, cartare pedologică

INTRODUCTION

Soil formation is a process of biological nature, because humus, the specific and fundamental soil component, is organic.

The spontaneous grass and wood vegetation contributes to soil formation due to crop residues that remain in soil or at surface. The superior plants have a great influence on soil formation and evolution by the action of roots and the effect of crown. The tree crown has as effects the change of temperature and evapotranspiration, and the modification of soil chemical characteristics, because of the dissolution of organic compounds from leaves. A well-known example is represented by the coniferous tree *Agathis australis* (*Araucariaceae* family), which gives leaf extracts with high acidity and great power of iron and aluminum ion complexion. Under these conditions, in the habitat delimited by the perimeter covered by the crown of trees, the soil type (bascket podzol) was formed even if there are no podzols in the near habitat (Crăciun, 1996). There is a plant-soil-climatic correspondence between the spontaneous soil layer from a certain climatic zone and the forming soil type (Bucur, 1949).

Because the development of plants from spontaneous flora depends on soil characteristics, the organic material influences the evolution of certain soil characteristics. Identifying and specifying plant genus and species have a great importance in soil mapping. Identifying plant species in soil mapping is important because there are, within the same genus, species developed on different soils; some species belonging to the same genus have a lower height and others, a higher one. Therefore, the supply with organic matter submitted to humification, is different. In some plant species, belonging to the same genus, stems are orthotrope, the stem axis is vertical, and in other species from the same genus, the main and secondary axes are linked to the edaphic substratum. In these cases, the denseness/ square meter is greater in orthotrope species and lower in repent stems, and therefore, the supply with vegetal organic matter will be different. The paper presents a few examples of plant species belonging to the same genus, but which develop preferentially on different soil types.

MATERIALS AND METHODS

Soil mapping needs the profound knowledge of classifying soils, climate units, rock relief and plant species from the vegetal canopy, which have determined soil formation and evolution. Carrying out soil studies require more working stages, such as preliminary, field, laboratory and bureau stages. The field stage includes the

morphological characterization and description of soil profile, soil sampling and registration of data and observations concerning the natural conditions (topo-climate, floristic structure, forms of mesorelief and microrelief). The morphological description of soil units and their delimiting in the field are done according to the standards of soil study elaboration (ICPA, 1987).

The most important element of soil mapping is the floristic habitat (climatic and edaphic), because it allows getting deductions of zonal, interzonal and azonal soil spreading (Bucur, 1949). The directions concerning the morphological description of soil profile also involve the description of plant species, typical of the area occupied by each soil unit. For the presentation of vegetation, the determination of plants per species is required, because, within the same genus, there are species which develop on soils with very different morphological, physical and chemical characteristics. We must also mention the plant species found within the studied habitat and their abundance and dominance. The abundance and dominance have the following values: + below 1%; 1 = 1 – 10%; 2 = 10 – 25%; 3 = 25 – 50%; 4 = 50 - 75%; 5 = 75 -100% (Braun - Blanquett, quoted by Borza et al., 1965).

RESULTS AND DISCUSSION

In certain soil studies, the characterization of vegetation was incomplete, because it presented only the plant genus without mentioning the species. For the characterization of the vegetation, it is also necessary to specify the plant species, because within the genus, there are also plant species that develop on different substrata, and in certain cases, they are indicators of soil types, subtypes or varieties. From the specialty literature and our own observations, we give a few examples on certain cases in which the specification of the name of species was necessary. Table 1 presents a few plant species belonging to the same genus, which develop on soils with different characteristics.

Some plant species, belonging to the *Festuca* genus, developed on Litosols and highly skeletal soils from the alpine region, others on moderately acid soils, such as albic Luvosol. The plant species, which developed under various soil conditions as concerns soil moisture, content, texture, edaphic volume, skeleton content, etc., belonged to *Juncus, Carex,* and *Poa* genera.

In some cases, it was necessary to determine the variety and form, because they developed on biotypes, which were different from the type of the species. Such an example is *Matricaria chamomilla* that grows in meadows, on edge of the roads, in crops and, sometimes, on slightly saline soils, while *salina* grows on moderately to highly salted soils. It can be easily differentiated by its low height (8-16 cm), small anthodia, short radial trident flowers and fleshy leaves. *Polygonum aviculare* grows in cultivated, waste, ruderal, slightly saline land; the *littorale* variant, which grows on saline soils, has by twice longer branches and thicker glaucescent leaves.

Table 1

Plant species developed on certain soils and their height

Genus and species	Soil/biotope type	Observations	Height
Festuca drymeia	Moist soil	Hilly- mountainous region	70-150 cm
F. altissima	Moderately acid Luvisol	Mountainous region	70-120 cm
F. versicolor	Rocky region, meadow	Subalpine-alpine region	15-50 cm
F. pseudovina	Dry salted meadow	Plain-hill region	10-45 cm
Agrostis pisidica	Moist site	Plain region	20-35 cm
A. stolonifera	Moist site	Plain – mountainous region	20-150 cm
A. rupestris	Sandy meadow, gravel	Alpine region	5-10 cm
Poa annua	Ruderal, meadow, pebble	Plain – alpine region	5-30 cm
P. nemoralis	Forest, slide, rocky region	Plain – alpine region	30-90 cm
P. palustris	Moist meadow, marsh	Plain – mountainous region	20-60 cm
P. pratensis	Meadow, forest	Plain – alpine region	30-90 cm
Carex stellulata	Marsh, peat bog	Alpine region	10-20 cm
C. leporina	Moist sandy sites, hayfield	Plain – subalpine region	20-70cm
C. vesicaria	Marsh, peat bog	Plain – alpine region	30-80 cm
Juncus bufonius	Meadow, moist site, salted soil	Plain – alpine region	5-30 cm
J. compressus	Wet meadow and hayfield, peat bog	Plain – lower subalpine region	20-30 cm
J. conglomeratus	Sandy site, marsh, peat bog	Plain – alpine region	30-80 cm
Alnus glutinosa	River meadow	Plain – lower mountainous region	28m
A. viridis	River meadow	Upper mountainous–subalpine region	1-4m
Plantago indica	Psamosol		10-40 cm
P.schwarzenbergiana	Salted soil		6-25 cm
P. maritima	Continental, marine salted soil		15-45 cm
P. holosteum	Limous rocks	Mountainous region	10-30 cm
Polygonum arenarium	Psamosols		20-30 cm
P. persicaria	CZ, GS, LV, EL, PS		20-60 cm
Veronica praecox	Psamosols	Plain-hill region	5-20 cm
*V. hederifolia***	CZ, GS, LV, EL, PS	Plain –mountainous region	8-30 cm
V. anagallis- aquatica	Marshy field, wet hayfield	Plain- subalpine region	10-80 cm
Consolida regalis	Weakly medium saline CZ		20-40 cm

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Genus and species	Soil/biotope type	Observations	Height
C. orientalis	Weakly medium saline CZ, LV, GS	Plain –mountainous region	30-60 cm
Galium aparine[*]	CZ, GS, LV, EL, PS		30-150 cm
G. palustre[*]	Wet site, marsh	Plain –mountainous region	30-100 cm
Lathyrus hirsutus[*]	CZ, GS, LV, EL, PS		30-50 cm
*L. tuberosu*s**	CZ, GS, LV, EL, PS	Plain –mountainous region	50-100 cm
L. paluster	LM, TB marshy hayfield		30-100 cm
Iris halophila	Weakly salinized soils	Plain –lower mountainous region	42-85 cm
I. pseudacorus	LS, TB	Plain-hill region	70-150 cm
I. pumila	Coast meadow	Plain-hill region	10 cm

CZ – Chernozem; GS – Gleysol; LV – Luvosol; EL – Preluvosol; PS – Psamosol;
LM – Limnosol; TB – Histosol; LS – Lithosol
[*] Climbing plants
[**] Repent plants

Scorzonera austriaca grows on grass-covered hills; the *mucronata* variant grows on saline soils and is characterized by a higher height than the species type, and the base leaves are 4-6 times broader (until 25 mm).

In some cases, the hygrophilous species developed on moisture excess soils (Limnosol, Gleysol), but they are also found on apparently dry slope lands. An example was represented by *Phragmites australis* (*communis*) that formed both hygrophilous (*Scirpo – Phragmitetum*) and xerophilous associations, found on slope lands (*Xerophragmitetum*). This is explained by the contribution of additional water at the depth of 1-2 m over a fine textured layer. Under these conditions, the specification of plant association, as well as soil morphological characterization and description are required.

CONCLUSIONS

The floristic habitat (climatic and edaphic) is the most important element from the point of view of soil mapping, because it allows getting practical and synthesis deductions of zonal, interzonal and azonal soil distribution. The directions concerning the morphological description of soil profile also foresee the description of plant species from the present vegetation, typical of the area occupied by each soil unit.

Our examples confirm that for the description of vegetation, it is necessary to determine the plant species, because, within the same genus, there are species developing on soils with very different physical, chemical and morphological characteristics.

In some cases, it is necessary to determine the variety and form, because they develop on different biotopes from the type of the species. Such an example is *Matricaria chamomilla*, which grows in meadows, on the edge of roads, in crops, and sometimes, in slightly saline soils; *salina* grows on moderately to highly saline soils.

There are cases in which hygrophilous species developing on excess moisture soils (Limnosol, Gleysol) are also found on apparently dry slope lands. Such an example is represented by *Phragmites australis*, which forms both hygrophilous (*Scirpo – Phragmitetum*) and xerophilous associations (*Xerophragmitetum*), found on slope lands.

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