Scientific Papers. Series B, Horticulture. Vol. LVII, 2013
Print ISSN 2285-5653, CD-ROM ISSN 2285-5661, Online ISSN 2286-1580, ISSN-L 2285-5653

USE OF ORNAMENTAL PLANTS ON DIFFERENT SOIL TYPES FROM TRANSYLVANIAN PLAIN

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Abstract

The paper include necessary issues to help specialists in landscape architecture to choose dendro-floricol assortment, which exploit the studied maximum potential edaphic conditions, given the multitude of requirements expressed by flower plants to edaphic environment. To highlight the issues shown above it was chosen to exemplify some soil types from Transylvanian Plain where soil conditions are not the best for all ornamental plants. Thus we studied and analyzed the main physico-chemical properties of calcareous soils, sandy, acidic soils and substrates with moisture excess. The main ornamental plants presented in this paper are adapted to these extreme conditions and can be a solution for use in landscaping.

Key words: *soil types, ornamentals, landscape design.*

INTRODUCTION

Soil occupies a well settled place in the biosphere, finding the boundary between two worlds, lithosphere and atmosphere, forming the so-called pedoshere. It is known that the soil has an important influence on health and plant growth rate. The soil has a strong influence on the plants (Reed, 2011). The knowledge of soil types helps in keeping and growing plants effectively and the use of soil type required for plant will be essential in the growth and development of its faster (Paulette et al., 2010).

This paper is based on the study of plants grown on different soil types and it's a helping hand in choosing these for specific conditions or places in the garden.

In most soils, the relative proportion of clay, sand, and silt particles influence its physical and chemical nature. The main exception is peaty soil, which is dark in color and rich in organic matter. Peaty soils are derived from sedges or mosses, which have decomposed in waterlogged conditions. They are acidic and moisture-retentive, providing ideal conditions for acid-loving plants like rhododendrons (Reed, 2011).

Clay soils are fertile but are slow to warm in spring, sticky, and slow-draining after rain, baking hard in dry weather. Silty soils feel silky or soapy and are easily compacted. Sandy soils feel gritty and will not stick together to form a ball (Reed, 2011; Paulette et al., 2010). They are light and free draining and quick to warm in spring, but they will need frequent irrigation and fertilizing. Chalky soils are alkaline, usually pale in color and stony, with chunks of alkaline minerals visible on the surface. They are often shallow and sometimes sticky. The ideal soil type is a loamy one, which has an approximately equal mixture of clay, silt, and sand. Loamy soils are good for the widest possible range of plants (Reed, 2011).

Bellow is presented the studied soil types and the dendro-floricol assortment.

MATERIALS AND METHODS

Soils were analyzed according to the "Methodology of soil study development-ICPA-1987 (Research Institute for Pedology and Agrochemistry) completed by soil classification as SRTS-2012 (Romanian Soil Toxonomy System).

1. Calcaro-rendzic leptosols (WRB – SR-1988) present the next succession of horizons: Am A/R Rrz.

The phisico-chemical properties of calcaro-rendzic leptosols is characterized by: field capacity (CC%) between 23 and 41%; wilting coefficient (CO%) 6-14%; available moisture holding capacity (CU%) 4.5-7.1%; the content of organic matter is middle; the content of N is middle for the entire soil profile 0,172-0,262%; the mobile P is low in the entire soil profile (10-16 ppm); the content of mobile K is middle for Am and low for A/R; cation exchange capacity (T) is 37-38 me/100g soil; degree of base saturation V% is higher 87-92%; the soil pH is slightly alkaline (Buta, 2009).

Due to favorable physicochemical properties, calcaro-rendzic leptosols are distinguished through a very high fertility.

Many of the world's favorite plants occur naturally on alkaline or limestone soils. They include pinks, clematis, and many of the jewel-like alpine plants found growing on the limestone mountains of Europe and Asia. Soils over limestone are almost invariably alkaline in nature, but they can also be very fertile if they are deep and rich in organic matter – a wealth of plants give their ornamental best on such soils (Reed, 2011; Cantor, 2008). For calcaro-rendzic leptosols the following species are recommended: *Chamaecyparis lawsoniana* 'Intertexta', *Fraxinus ornus, Morus nigra, Buddleja sp., Cornus mas, Cotinus coggygria, Deutzia crenata* 'Nikko', *Helianthemum* 'Rhodanthe Carneum', *Potentilla fruticosa* 'Red Ace', *Campsis radicans, Jasminum nudiflorum, Clematis* 'The President', *Asplenium trichomanes, Colchicum autumnale, Dicentra spectabilis, Amarantus caudatus, Dianthus caryophyllus, Cheiranthus cheiri,Alyssum maritimum, Iresine lindenii, Iresine herbstii, Myosotis alpestris, Cercis siliquastrum, Platycodon grandiflorus, Pulsatilla vulgaris, Rudbeckia laciniata* 'Herbstsonne', *Cotoneaster franchetii, Leontopodium alpinum* (Selaru, 2007; Iliescu, 2006).

2. Calcaric arenosols (WRB – SR-1988) present the next succession of horizons: Ap Ao A/R A/B ka.

The phisico-chemical properties is characterized by: field capacity (CC%) between 27 and 39%; wilting coefficient (CO%) 22-23%; available moisture holding capacity (CU%) 3.7-16.10%; the content of organic matter is low for the entire profile; the content of N is low for the entire soil profile 0.112-0.130%; the mobile P is low in the entire soil profile (4-8 ppm); the content of mobile K is middle for Am – 135 ppm and low for A/R – 74 ppm; soil texture is sandy for the entire profile > 57% sand (Buta, 2009).

The recommended dendro-floricol assortment is the following: *Stipa gigantean, Portulaca grandiflora, Salvia splendens, Celosia argentea var. cristata, Delphinium cultorum, Santolina chamaeciparyssus, Hibiscus syriacus, Betula ermanii, Pinus sylvestris* Aurea Group, *Robinia pseudoacacia* 'Frisia', *Cytisus* x *praecox*, *Erica australis, Lavandula pedunculata* subsp. *Pedunculata, Lavatera* x *clementii, Perovskia* 'Blue Spire', *Phlomis fruticosa, Achillea* 'Walther Funcke', *Dictamnus albus, Eremurus robustus, Eryngium* x *tripartitum, Lupinus* 'The Chatelaine', *Oenothera macrocarpa, Ornithogalum umbellatum, Salvia officinalis* 'Tricolor' (Reed, 2011; Toma, 2009).

3. Distric cambisols (WRB – SR-1988) present the next succession of horizons: Ao Bv C.

The majority of acid-preferring plants are originally from woodland areas, and they prefer a cool, more or less shady environment and a soil that is leafy, organic, and moist but welldrained. In nature, such soils are fairly fertile because nutrients are annually replenished by the recycling of fallen leaves. There are also many acid-preferring plants that need or tolerate more open sites in sun, such as witch alder, *Lithodora diffusa* 'Heavenly Blue', and most heather (Reed, 2011; Draghia, 2011).

The phisico-chemical properties of district cambisols is characterized by: field capacity (CC%) between 25 and 32%; wilting coefficient (CO%) 7-10%; available moisture holding capacity (CU%) 25-32%; the content of organic matter is low; the content of N is middle for the entire soil profile 0.150-0.260%; the mobile P is low in the entire soil profile (< 1.2 ppm); the content of mobile K is middle for Ao-Bv (23 ppm); cation exchange capacity (T) is 17-29 me/100g soil; the soil is very acid with a pH between 4.3-4.6 (Buta, 2009).

For district cambisols are recommended the following species: *Abies lasiocarpa* var. *arizonica* 'Compacta', *Acer japonicum* 'Aconitifolium', *Cercis canadensis* 'Forest Pansy', *Camellia japonica* 'Lady Vansittart', *Calluna vulgaris, Dryopteris filix-mas*, *Erica cinerea* 'Romiley', *Hamamelis* 'Brevipetala', *Magnolia liliiflora* 'Nigra', *Magnolia stellata*, *Pinus sylvestris* 'Gold Coin', *Rhododendron luteum, Skimmia japonica* 'Rubella', *Vaccinium vitis-idaea, Deschampsia flexuosa* 'Tatra Gold', *Gentiana sino-ornata, Lilium superbum* (Cantor, 2008; Reed, 2011; Toma 2009).

4. Hyperskeletic leptosol (WRB – SR-1988) present the next succession of horizons: Ao R.

There are recommended species which tolerate very sandy, stony, or shallow and alkaline soils. Hot and dry sites present a challenge to plant survival, not only because of the obvious lack of moisture needed for growth, but also because the leaves of many plants – even some committed sun-lovers – scorch in very hot sun, particularly where the water supply is short or unreliable (Reed, 2011).

The phisico-chemical properties of hyperskeletic leptosol are characterized by: field capacity (CC%) between 10 and 20%; the content of N is very low for the entire soil profile 0.70 ppm; the mobile P is low in the entire soil profile (< 1.5 ppm); the content of mobile K is low for the entire profile (67-120 ppm) (Buta, 2009).

Plants for these sites: *Adonis vernalis*, *Alyssum-saxatile, Gleditsia triacanthos* 'Rubylace', *Robinia* x *slavinii* 'Hillieri', *Caragana arborescens* 'Nana', *Cytisus multiflorus, Lavandula dentate, Phlomis purpurea, Allium hollandicum* 'Purple Sensation', *Amaryllis belladonna, Anthemis tinctoria* 'E.C. Buxton', *Catananche caerulea* 'Major', *Echinops ritro* 'Veitch's Blue', *Festuca glauca* 'Blaufuchs', *Fritillaria imperialis, Gaillardia* x *grandiflora* 'Kobold', *Geranium cinereum* 'Ballerina', *Oenothera speciosa* 'Rosea', *Papaver orientale* 'Allegro', *Tulipa praestans* 'Unicum', *Verbena bonariensis, Viola x wittrockiana, Ajuga reptans, Sedum sp., Anemone cornaria, Oxalis adenophylla, Lobelia erinus, Saxifraga cuneifolia* (Reed, 2011; Iliescu, 2006; Selaru, 2007, Chelariu, 2011).

5. Haplic gleysols (WRB – SR-1988) present the next succession of horizons: Ao AGo Gr.

The plants which are developing well on this type of soils are known as moisture-lovers, but they are often sold as bog plants. This can be misleading, since many moisture-loving plants will not tolerate totally waterlogged soils. Boggy soil saturated with water is usually better for shallow-water, or marginal aquatic plants. These plants can also be used to surround ponds or pools to bridge the gap between water and land. Here, they will mask the edge of the water in an attractive way, and if the water is still clear, plants like *Salix alba* 'Britzensis' or *Lysichiton camtschatcensis* give more than double the value when their form is reflected in its mirrorlike surface (Reed, 2011).

The phisico-chemical properties of haplic gleysols are characterized by the followings: clay has high values of 22.8% in Aow horizon, and lower in A/Go horizon (21.63%); the content of N is high for the entire soil profile 0,500% in the first cm; the mobile P is low in the entire soil profile (1.2-0.2 ppm); the content of mobile K is low (7-15 ppm); cation exchange capacity (T) is 13-21 me/100g soil; degree of base saturation V% is lower 40-60%; the soil pH is acid 5.2-5.4 (Buta, 2009).

Plant species recommended for this soil type are the following: *Metasequoia glyptostroboides, Salix alba* 'Britzensis', *Cornus alba* 'Elegantissima', *Rhododendron* 'Bow Bells', *Vaccinium corymbosum, Astilbe* x *crispa* 'Perkeo', *Carex pendula, Darmera peltata, Filipendula rubra* 'Venusta', *Fritillaria meleagris, Gunnera manicata, Hosta* 'Frances Williams', *Iris versicolor* 'Kermesina', *Lobelia cardinalis, Hemerocallis flava, Iris sibirica, Lysichiton americanus, Lythrum salicaria* 'Feuerkerze', *Matteuccia struthiopteris, Pontederia cordata, Primula japonica* 'Postford White', *Rheum palmatum* 'Atrosanguineum', *Rodgersia pinnata* 'Superba', *Sagittaria latifolia* (Reed, 2011).

CONCLUSIONS

This paper aimes to support experts in landscaping for choosing dendro-plants flower assortment depending on restrictive soil conditions.

For example were chosen five soil types, as the most representative with calcareous substrates, sandy, acidic, skeletic and excess moisture.

Depending on restrictive soil conditions has been established an assortment of dendro-floricol plants which is suitable for landscape design.

REFERENCES

Buta M., 2009. Aprecierea calitativa a solurilor din dealurile Cojocna Sic subunitate a Campiei Transilvaniei. PhD thesis, Cluj-Napoca.

Reed C., 2011. Plants for places. Dorling Kindersley Limited Publishing House, UK.

Cantor M., 2008. Plante ornamentale de interior. Todesco Publishing House, Cluj Napoca.

Chelariu E.L., 2011. Evaluation of the assortment of grasses decorative by leaf. Bulletin USAMV Cluj – Napoca, Seria Horticulture, Vol. 68 (1), p. 548.

Draghia L., Chelariu L., 2011. Floricultura speciala. Ion Ionescu de la Brad Iasi Publishing House.

Iliescu Ana-Felicia, 2006. Arhitectura peisagera. Ceres Publishing House, Bucharest.

Paulette L., Buta M., 2010. Notiuni teoretice de cartare si bonitare a terenurilor agricole, Risoprint Publishing House, Cluj-Napoca.

Selaru E., 2007. Cultura florilor de gradina. Ceres Publishing House, Bucharest.

Toma F., 2009. Floricultura si arta florala. Vol. I-V. Invel Multimedia Publishing House, Bucharest.

***WRB (World Reference Base for Soil Resources).