

УДК 712.422(476-25)

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RESULTS OF INVENTORY AND PROMISING DIRECTIONS OF THE EXTENSION OF THE COLLECTION COMPOSITION OF FLOWERLESS PLANTS OF THE PARTERRE PART OF THE BOTANICAL GARDEN OF BSTU

The paper presents the results of the study of species and garden forms in the collection of decorative deciduous trees of the Botanical Garden Ground of Belarusian State Technological University, introduced in 2003–2010. The systematic affiliation of grown trees and shrubs was refined, the qualitative and quantitative characteristics of plants, determining their decoration, growth and condition of the culture were evaluated. The phytopathological state of hardwood identified pathogens of leaves and shoots of plants was studied. The approaches to creating the long-term range of ornamental deciduous woody plants for introduction goal for the botanical garden of BSTU are given, making it possible to test them in Belarus in order to introduce into the culture.

Introduction. In the planting of greenery of Belarus rather limited assortment of flowerless woody plants presented by several dozen kinds of trees and bushes are used. From the point of view of the increase of decorativeness of planting introduction into the culture of different kind and especially decorative forms of plants of this group which in recent years are widely represented in garden centers on the territory of our republic is perspective. In the parterre part of the botanical garden of BSTU in the period from 2003 to 2010 the collection of flowerless woody plants was created. The aim of this work is the clarification of the systematic belonging of the plants of the collection, assessment of their safety, decorativeness and condition in compositions and also the development of the long-term perspective plan of species introduction and decorative forms for the expansion of the collection planting composition.

Main part. The vast majority of seedlings of the examining trees and bushes were obtained in 2003–2010 in the garden centers of Minsk and were foreign planting material with closed root system. Seedlings of the European white birch “*Betula pendula Roth./Laciniata*”, wych elm “*Ulmus glabra Huds. U. scabra Mill./Camperdownii*”, Norway maple “*Acer platanoides/Globosum*”, European mountain ash “*Sorbus aucuparia/ Pendula*” purchased in 2008 in the nursery-garden of the Central botanical garden of the NAS of Belarus were exception.

The results of the inventory held in 2012 in the parterre part of the botanical garden of the BSTU showed that flowerless woody plants are presented in 35 species and 45 decorative forms relating to 20 genus and 14 families. The collection comprises of the species and garden forms of barberry, birch, spindle tree, elder, elm, hornbeam, dogwood, honeysuckle, willow, pea tree, cotoneaster, maple,

hazel, basswood, ninebark, broom, mountain ash and mulberry. A total number of growing plants of the examining group is 139.

Undertaken studies show that for the expired period of time the following plants came out of the collection: red leaves birch (2 pcs.), European white birch ‘*Betula pendula/Laciniata*’ (1 pc.), European beech ‘*Fagus sylvatica/ Purpurea Dawyck*’ (2 pcs.), European hornbeam ‘*Carpinus betulus/ Pendula*’ (1 pc.) and ‘*Purpurea*’ (1 pc.), goat willow ‘*Salix caprea/ Kilmarnock*’ (1 pc.), Norway maple ‘*Acer platanoides/ Auratum*’ (1 pc.), European mountain ash ‘*Sorbus aucuparia/ Magnifica*’ (1 pc.), European mountain ash ‘*Sorbus aucuparia/ Pendula*’ (2 pcs.), robinia (*Robinia pseudoacacia*) ‘*Tortuosa*’ (1 pc.), European mountain ash ‘*Sorbus aucuparia/ Fastigiata*’ (2 pcs.), barberry ‘*Berberis L. / Aurea*’ (2 pcs.), barberry ‘*Berberis L. / Erecta*’ (1 pc.), barberry ‘*Berberis L. / Red Pillar*’ (3 pcs.), Tartarian dogwood ‘*Cornus sibirica / Elegantissima*’ (1 pc.), cornelian cherry ‘*Cornus mas*’ (1 pc.), cotoneaster ‘*Cotoneaster Ehrh.*’ (3 pcs.), cotoneaster ‘*Cotoneaster gen. / Little Gem*’ (3 pcs.), European hazel ‘*Corylus avellana / Contorta*’ (2 pcs.). Loss of growing plants was observed because of their insufficient winter resistance, for example, robinia (*Robinia pseudoacacia*) / ‘*Tortuosa*’ or as a result of mechanical damages to woody plants. Some perfect decorative plants, for example, European hornbeam ‘*Carpinus betulus/ Purpurea*’ disappeared as were stolen. Total number of lost plants is 31 or 18,2% from the total number of planted flowerless trees and bushes.

Besides, in collectable plantings in autumn 2012 overground part of some grafted plants of European white birch ‘*Crispa*’ and ‘*Purpurea*’, sycamore maple ‘*Leopoldii*’, Norway maple ‘*Drummondii*’, English field maple ‘*Pulverulentum*’, ash-leaved maple ‘*Auratum*’, European mountain ash ‘*Pink Veil*’ was presented by the developed from

base of plant stock suckers and almost complete faded parts of grafts.

Design-deciduous trees and bushes in planting of greenery usually have a background role for floricultural crop, living fence and solitaires on the lawn [1]. They are appreciated for the original shape of the crown, beautiful colors and leaves texture. In the assortment of the examining collection number of species with green and "colored" leaves is about equal (Figure 1). There is predominance of poecilophyllous (for example, horse chestnut '*Albo-variegata*') – 15% and red-leaved (for example, European beech '*Purpurea Dawyck*') – 13%. 9 and 4% of plants have yellow (field elm '*Wredei*') and grey-green color of leaves correspondently. Besides, 7 species (13,2%) of design-deciduous plants have parted blade (European white birch '*Crispa*', staghorn '*Dissecta*' etc.).

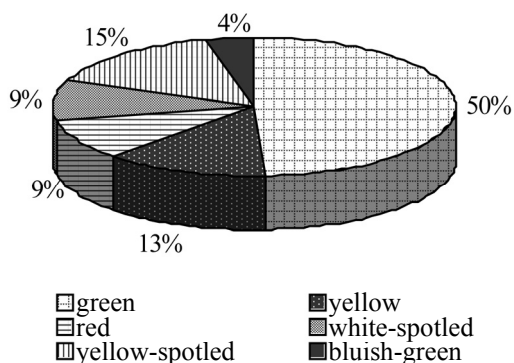


Fig 1. Spreading of the design-deciduous plants on leaves color in collection planting of the parterre part of the BSTU botanical garden

Shape of the crown is one of the important indexes of the decorativeness of woody plants. This index is especially important for the plants with green leaves. Examination of the assortment of the design-deciduous woody plants revealed that species and ornamental shapes with spherical (Norway maple '*Globosum*' and others) and weeping (for example, European white birch '*Crispa*') types of the crown are the most widely presented (by 17% each) (Figure 2). Species with oval shape of the crown (wych elm, mountain ash and others) is 13%. The same number of plants hasn't got a vivid direct growing trunk and has a creeping crown (bunchberry dogwood, cotoneaster '*Eichholz*' и others). Plants with wide spreading crowns (15%) give rankness and volume to the planting and well fit into the landscape of free shape botanical compositions (e.g., ash-leaved maple '*Flamingo*'). A number of species with columnar (English oak '*Fastigiata*' etc.) and cone-type crown (basswood '*Wratislaviensis*' etc.) correspondently makes 11 and 6%. There are also brushwood plants with an egg-shaped crown (e.g., European hazel '*Purpurea*'). Plants with curved and curled

branches and trunks have an attractive view. In the parterre part of the botanical garden such plants are the representatives of two species: weeping willow '*Tortuosa*' and goat willow '*Kilmarnock*'. European hazel '*Contorta*' could have become a good addition to these plants but unfortunately they failed to preserve this plant.

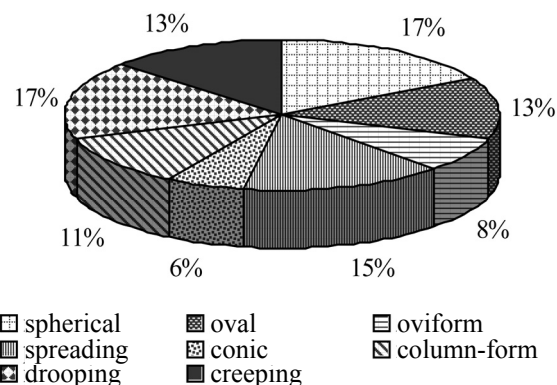


Fig. 2. Spreading of the design-deciduous plants on the shape of the crown in collection planting of the parterre part of the BSTU botanical garden

Many plants of the parterre part of the BSTU botanical garden combine decorative quality of leaves with perfect decorativeness in blossom and fruiting period. These are the representatives of the genus: Barberry, Euonymus, Elderberry, Dogwood, Honeysuckle, Pea tree, Ninebark, Green broom, Mountain ash, Mulberry. 54,3% of design-deciduous species of the collection showed increase of decorativeness of the plants in the period of blossom and 50,9% – in the period of fruiting.

Assessment of the phytopathological condition of woody plants of the collection showed that symptoms of disease initiated by powdery mildew, spot disease, scab and leaves rust are the most often occurred on the leaves and browses.

Most often plants were injured by powdery mildew, initiated by the agents *Microsphaera berberidis* (barberry, species and types), *Microsphaera vanbruntiana* (European elder), *Microsphaera lonicera* (goat-leave honeysucker), *Erysiphe flexuosa* (horse chestnut). Decorativeness of plants significantly decreases leaf spot initiated by fungi: p. *Phyllosticta* (cotoneaster, mountain ash, species and ornamental types), p. *Melampsora* (willow, species and ornamental types), p. *Cylindrosporium* (horse chestnut), p. *Rhytisma* (Norway maple), p. *Septoria* (small-leaved lime, species and ornamental types), p. *Gleosporium* (mountain ash, species and ornamental types) [2].

Taking into account phytopathological situation assessment of the general condition of design-deciduous plants in the compositions was made. The overwhelming majority of the plants under examination have a good amount of growth, are

yearly in blossom and bear fruit, tolerant to winter colds. (Figure 3). Number of plants in excellent condition is 45,3%, in good condition - 38,4%. Stagnation, evident damage symptom by insects and diseases are observed at the plants in satisfactory condition (13,5%). There is 2,8% of design-deciduous plants in unsatisfactory condition.

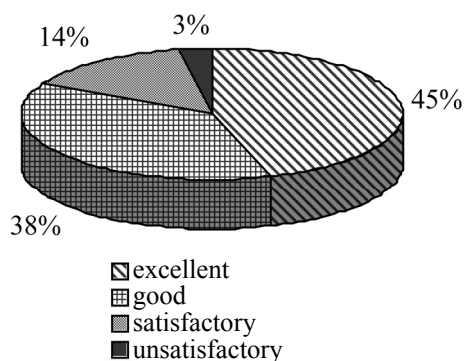


Fig. 3. Spreading of the design-deciduous plants on the condition criteria in the parterre part of the BSTU botanical garden

Within the research a perspective assortment of design-deciduous woody plants for the renewal of the collection planting of the parterre part of the BSTU botanical garden are developed. It consists of 34 species and ornamental forms belonging to 14 families and 19 genus (Barberry, Birch, Euonymus, Elder, Beech, Elm, Gleditschia, Dogwood, Oak, Mespilus, Cotoneaster, Maple, Horse chestnut, Hazel, Mountain ash, Fustic, Currants, Indian currant, Sumach).

Enlargement of the assortment is planning due to the increase of the number of ornamental kinds

differ by the diverse color and leaf blade shape, size and crown shape, effective flowering and fruiting. It is offered to examine plants with red-purple leaf color (barberry '*Red Pillar*', European beech '*Purpurea Dawyck*', smoke tree '*Royal Purple*') and yellow leaf color (European beech '*Dawyck Gold*', field elm '*Wredei*', black locust '*Sunburst*', maple ash '*Auratum*', European hazel '*Aurea*'). Design-deciduous species with divided leaves, for example, such as European white birch '*Crispa*', red elder '*Tenuifolia*', staghorn '*Dissecta*' can provide the compositions with elegance and lightness.

Conclusion. During the research composition of species and garden types of design-deciduous woody plants of the parterre part of the BSTU botanical garden is studied. Systematic belonging of the introduced in 2003-2010 plants is specified. Qualitative and quantitative index of cultivating trees and bushes specifying their growth and condition is established.

Perspective assortment of the design-deciduous woody plants for introduction in the BSTU botanical garden presented by 34 species and garden types with perfect decorativeness during the whole vegetative period and tolerance to hardiness including winter period is developed. It makes possible to examine them in Belarus.

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Received 22.01.2013