

IDENTIFYING WOODY PLANTS-ERGASIOPHYTES IN THE SETTINGS OF THE BOTANICAL GARDEN OF BELGOROD STATE UNIVERSITY IN RUSSIA

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Article Information

Editor(s):

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Reviewers:

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(2) Peter Kessels Dadzie, Kumasi Technical University, Ghana.

Received: 27 May 2020

Accepted: 03 August 2020

Published: 11 August 2020

Original Research Article

ABSTRACT

A long-term (2007–2018) inventory of the collection of woody plants of the Botanical Garden of the Belgorod State University (NRU “BelSU”, Belgorod, Russian Federation) identified 145 introduced tree species which are able to disseminate by seed and vegetative modes in local conditions of the region. Data on species-ergasiophytes in parks and private gardens were also used in the study. The spatio-temporal aspect was accounted for the classification of alien introduced woody species according to the degree of their naturalization. Among them, the largest number of species is represented by epiphyte-colonophytes (60.0%), agriophytes-ephemerophytes (22.0%) and epiphytes-ephemerophytes (10.0%). Colonophytes-agriophytes that account for 8.0% are represented insignificantly.

The most “dangerous” for the region’s natural biocenoses introduced species running wild from the culture are: *Acer negundo*, *Amorpha fruticosa*, *Caragana arborescens*, *Cerasus vulgaris*, *Elaeagnus angustifolia*, *Fraxinus pennsylvanica*, *Hyppophae ramnoides*, *Lonicera tatarica*, *Parthenocissus inserta*, *Prunus cerasifera*, *Robinia pseudoacacia*, *Sambucus nigra*, *S. racemosa*, *Ulmus pumila*.

Keywords: Introduction of plants; ergasiophytes; phytocenosis; self-sowing; dissemination; botanical garden.

INTRODUCTION

The independent spreading ability of introduced plants in new habitats indicates a high degree of their adaptation to new environmental conditions [1,2,3,4,5,6,7,8,9]. A large number of foreign

species grow in the collections of botanical gardens, which are able to run wild under new conditions, form self-seeding, or propagate vegetatively [10,11,12]. This suggests that they are potential elements of the invasive component of the flora of a particular region [13]. Therefore,

observations and studies aimed at identifying the bioecological potential of cultivated introduced plants allow us to determine their ability to self-renew and resettle. In this regard, such monitoring studies must be carried out in all botanical gardens ([14], Hasan, et al. 2020). Potential of complete feed formulated from local raw materials on beef cattle performance [4].

The objective of this study was to identify woody plants in the Botanical Garden of Belgorod State University, which are able to spread in the natural biocenoses of the region as ergasiophytes running wild from the culture.

MATERIALS AND METHODS

From 2007 to 2018, the researchers studied the collection of woody plants of the Botanical Garden of Belgorod State University. They used conventional methods [15,16,17,11]. Basic terms and concepts were used according to ([1,17], N'diaye, & Kankou, (2020)). Sorption of Aspirin from Aqueous Solutions using Rice Husk as Low Cost Sorbent.

RESULTS AND DISCUSSION

As a result of 2007-2018 studies of the plant collection of the Botanical Garden of Belgorod State University, as well as in the natural habitats of the region, 164 species of viable self-sowing woody plants were identified. Further, according to the criteria cited by the authors of the Black Book (2010), the most "dangerous" invading species for the natural ecotopes of the region were identified. These include: *Acer negundo* L., *Amorpha fruticosa* L., *Caragana arborescens* Lam., *Cerasus vulgaris* Mill., *Elaeagnus angustifolia* L., *Fraxinus pennsylvanica* Marshall, *Hyppophae ramnoides* L., *Lonicera tatarica* L., *Parthenocissus inserta* (Kern.) K. Fritsch, *Prunus cerasifera* Ehrh., *Robinia pseudoacacia* L., *Sambucus nigra* L., *S. racemosa* L., *Ulmus pumila* L.

Also, as a result of the wide landscaping of the region, some species were noted in semi-natural ecotopes of the region (shelterbelts, parks), as well as occasionally found in natural ecotopes. These species include (5): *Aesculus hippocastanum* L.,

Cotinus coggigria Scop., *Padus mahaleb* Borkh., *Prunus domestica* L., *Ptelea trifoliata* L.

And finally, plant species were found that are actively spreading on the territory of the botanical garden by seeds or vegetative propagation, occupying vast areas. These include mainly North American plants: *Amelanchier alnifolia* Nutt., *A. canadensis* (L.) Medik., *A. floribunda* Lindl., *A. sanguinea* (Purch.) DC., *A. spicata* (Lam.) C. Koch., *Campsis radicans* (L.) Seem., *Cerasus besseyi* Lunell., *Cornus stolonifera* Michx., *Crataegus arnoldiana* Sarg., *C. canadensis* Sarg., *C. crus-galli* L., *C. densiflora* Nutt., *C. douglasii* Lindl., *C. flabellate* (Bosc.) C. Koch., *C. holmesiana* Sarg., *C. pringlei* Sarg., *C. rotundifolia* Moench., *C. submollis* Sarg., *Crataegus × prunifolia* (Poir.) Pers (*C. crus-galli* × *C. macracantha*), *Elaeagnus argentea* Purch., *Gymnocladus dioicus* (L.) C. Koch., *Mahonia aquifolia* (Pursh) Nutt., *Padus sirotina* (Ehrh.) Agardh., *P. virginiana* (L.) Mill., *Physocarpus opulifolius* (L.) Maxim., *Rhus trilobata* Nutt., *Rhus typhina* L., *Ribes aureum* Pursh., *Robinia viscosa* Vent., *Rosa nutkana* Presl., *R. woodsii* Lindl., *Shepherdia argentea* Nutt., *Spiraea douglasii* Hook., *S. latifolia* (Ait.) Borkh., *Symphoricarpos albus* (L.) Blake., *S. occidentalis* Hook., *Vitis labrusca* L., *V. riparia* Michx., *V. rupestris* Scheele, *Vitis × hybrida* (*V. labrusca* × *V. vinifera*) "Isabella" (natural hybrid). However, there are many representatives of European and East Asian plants: *Acer pseudoplatanus* L., *Ailanthus altissima* (Mill.) Swingle., *Alnus incana* (L.) Moench., *Amygdalus ledebouriana* Schlecht., *Aralia mandshurica* Rupr. et. Maxim., *Artemisia abrotanum* L., *Berberis coreana* Palib., *B. heteropoda* Schrenk, *B. vulgaris* L., *Carpinus betulus* L., *Catalpa ovate* G. Don., *Celastrus orbiculata* Thunb., *C. scandens* L., *C. strigillosa* Nakai., *Cerasus avium* Moench., *C. tomentosa* (Thunb.) Wall. *Chaenomeles japonica* (Thunb.) Lindl., *Ch. maulei* (Mast.) C.K. Schneid., *Clematis vitalba* L., *Cornus alba* L., *Crataegus chlorocarpa* Maxim., *C. pentagyna* Waldst. & Kit. Ex Willd., *C. sanguinea* Pall., *C. turkestanica* Pojark., *Euonymus nana* Bieb., *Forsythia viridissima* Lindl., *F. ovata* Nakai., *F. suspense* (Thunb.) Vahl., *Juglans manshurica* Maxim., *J. regia* L., *Laburnum anagyroides* Medik, *Lonicera caprifolium* L., *L. olgae* Rgl. et Schamalh., *Ribes*

alpinum L., *Rosa amblyotis* C.A. Mey., *R. acicularis* Lindl., *R. multiflora* Thunb., *R. pendulina* L., *R. rugosa* Thunb., *Sambucus sibirica* Nakai., *Securinega suffruticosa* (Pall.) Rehd., *Sorbaria sorbifolia* (L.) A. Br., *Sorbus mougeottii* Soy-Willem. et. Godr., *S. sibirica* Hedl., *Spiraea chamaedryfolia* L., *S. flexuosa* Fisch. ex Cambess., *S. hypericifolia* L., *S. salicifolia* L., *S. trilobata* L., *Tilia europaea* L., *T. platyphyllos* Scop., *Vitis amurensis* Rupr., *V. coignetiae* Pulliat ex Planch., *V. flexuosa* Thunb.

The classification of alien species according to the degree of naturalization proposed by A. Ya. Grigorievskaia et al. (2004) includes the spatio-temporal aspect, as well as the ability of species to populate habitats, different in ecological and phytocenotic parameters. Therefore, we divided all tree species that are wild on the territory of the Botanical Garden into four groups:

1. Ephemero-epiphyte is a species found in secondary habitats as a result of periodical introduction of diaspores or an extended period of germination of the introduced seeds of one drift (for example, *Padus virginiana*, *Physocarpus opulifolius*, *Rhus typhina*) (10% of species).
2. Ephemero-agriphyte is a species periodically introduced into natural habitats but not settling there for a long time (for example, *Cotinus coggigria*, *Padus mahaleb*, *Prunus domestica*, *Ptelea trifoliata*) (22% of species).
3. Colonophyte-epiphyte is a species that stays more or less firmly in secondary habitats, but does not disseminate further (for example, *Ailanthus altissima*, *Juglans manshurica*, *J. regia*, *Sorbaria sorbifolia*) (60% of species).
4. Colonophyte-agriphyte is a species that grows in natural habitats for a long time, but does not disseminate to other places (for example, *Elaeagnus argentea*, *Ribes aureum*, *Robinia viscosa*) (8% of species).

Such detailed classification allows us to characterize the degree of naturalization of alien species and their distribution history.

CONCLUSION

The collection of dendroflora of the Botanical Garden of Belgorod State University included 145 viable self-seeding and vegetative mobile alien tree species identified during the research period (2007-2018). The spatio-temporal aspect was accounted for the classification of alien introduced woody species according to the degree of their naturalization. Among them, the largest number of species is represented by epecophyte-colonophytes (60.0%), agriophytes-ephemerophytes (22.0%) and epecophytes-ephemerophytes (10.0%). Colonophytes-agriophytes that account for 8.0% are represented insignificantly.

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ACKNOWLEDGEMENTS

The research was carried out with the financial support of the Ministry of science and higher education of the Russian Federation (agreement No. 075-15-2020-528).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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