



ADVENTIZATION OF DENDROFLORA OF THE OREL RIVER VALLEY (UKRAINE)

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The purpose of our study is to establish the features of the adventization of the flora of trees and shrubs in the valley of the Orel River. As a result of geobotanical studies it was established that the tree-shrub vegetation in the valley of the river. The eagle is represented by natural forests, artificial plantations and semi-natural plantations, among which natural forests of oak (*Quercus robur*) and artificial plantations of pine-tree (*Pinus sylvestris*) and black locust (*Robinia pseudoacacia*) are predominant. It was revealed that within the taxonomic composition of the dendroflora of the valley of the Orel River (95 woody and shrubby species) the adventive fraction consists of 33 species (35%), which belong to 18 families. Within the area studied, 17 species were naturalized into the adventitious fractions of dendroflora. By origin in the adventive fraction of dendroflora the species with Asian (10 species – 30%) and North American (10 species – 30%) primary areas predominate. Other microelements are represented by single species and 4 species – with an unidentified primary area (anecophytes). Six woody-shrubby species show invasive activity in phytocenoses of the valley of the Orel River. They are invasive neophytes: *Robinia pseudoacacia* L., *Acer negundo* L., *Ulmus pumila* L., *Elaeagnus angustifolia* L., *Amorpha fruticosa* L., *Partenocissus quinquefolia* (L.) Planch. Now they are naturalized and actively infect various types of biotopes: the coastal zones of the Orel River and its tributaries, beams, natural and artificial forests, and more recently – lands that are withdrawn from agricultural use. The intensive adventitization of the dendroflora of the valley of the Orel river was discovered. It shows the anthropogenic transformation of this territory. The introduced neophytes have recently been actively naturalized and are the part of the natural phytocoenosis, changing their structure, which poses a threat to natural biodiversity. This requires further monitoring studies of the state of the flora of this territory, as well as observations of naturalization processes and the build-up of the invasive ability of adventive species.

Keywords: adventisation; naturalization; invasive activity; anthropogenic transformation

Introduction

The problem of adventitization of flora in the modern period is one of the most urgent and acquires a global scale, as it leads to their unification and transformation of the structure. Invasion of alien species can cause significant loss of natural biological diversity and even cause economic damage and pose a danger to human health. In this connection, the advective fractions of flora and the trends in the naturalization and invasive activity of adventitious species in the modern period are carefully analyzed by researchers from different countries (Baranovsky, 1998; Richardson et al., 2000;

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Protopopova et al., 2002; Pyšek et al, 2012; Baranovski et al., 2016; Berg et al., 2016; Gudžinskas et al., 2016; Sadlo et al., 2017).

In the modern period, it is believed that the expansion of plant areas and the increased invasive ability of adventitious species in virtually all regions of the world are the consequences of years of anthropogenic pressure and global climate change (Protopopova et al., 2007; Walter et al., 2009; Fuentes, 2015; Lykholat et al., 2017). A significant number of naturalized and invasive adventitious species in new areas for themselves under favorable conditions go through the path: introduction – naturalization – invasiveness (INIC) (Pyšek et al, 2012). This is especially true of woody and shrubby adventitive species, which almost all were once introduced, that is, they belong to the ergasophytes.

Materials and methodology

Route geobotanical studies of woody-shrubby groupings of the valley of the river Orel were held in 2015. The names of species are given according to the modern Ukrainian nomenclature editions (Mosyakin and Fedoronchuk, 1999). The adventitious status and primary area (migraine) are determined on the basis of scientific papers (Protopopova, 1991, 2002; Pyšek et al., 2012). The degree of naturalization of species and invasive activity are given exclusively for the area of research based on their own observations.

Results and discussion

Tree and shrub vegetation in the valley of the Orel River is represented by natural forests, artificial plantations and semi-natural groupings that do not create a continuous vegetation cover, but have a fragmentary nature of location. This is due to the anthropogenic impact and salinization of the soils of the valley of the river Orel, which limits the development of woody and shrubby vegetation. Among the woody-shrubby groupings of the valley of the river the eagle is dominated by natural forests of oak (*Quercus robur* L.) and artificial plantations of pine-tree (*Pinus sylvestris* L.) and black locust (*Robinia pseudoacacia* L.) are predominant.

According to previous studies, the taxonomic composition of the dendroflora of the valley of the Orel River includes 95 woody (23 species) and shrubby (10) species (Baranovsky et al., 2017). In this case, the adventive fraction consists of 33 species (35%) belonging to 18 families (Table 1). The predominant families that have the highest species saturation are: Rosaceae – 7 species (21%), Salicaceae – 4 (12%) and Fabaceae – 3 (9%).

By origin in the adventive fraction of dendroflora species with Asian (10 species – 30%) and North American (10 species – 30%) primary areas predominate. Other microelements are represented by single species and 4 species – with an unidentified primary area (anecophytes).

Within the investigated territory, 17 species (52%) were naturalized into the adventitious fractions of dendroflora, 82% of neophytes (14 species) and 18% of archeophytes (3 species). The participation of casual species is 48% (16 species), of which 88% are neophytes (14 species) and 12% archeophytes (2).

Among the naturalized species, species with North American and Asian primary ranges are dominant – 41% (7 species) and 35% (6), respectively.

Table 1 The adventive fraction of tree and shrub vegetation

Species within the family boundaries	Naturalized / Invasive				Casual	
	biomorphs	migroelement	archaeophytes	neophytes	archaeophytes	neophytes
1	2	3	4	5	6	7
Pinaceae <i>Pinus pallasiana</i> D. Don	Arb	MIT	-	-	-	+
Aceraceae <i>Acer negundo</i> L. <i>Acer pseudoplatanus</i> L.	Arb Arb	NA E	- -	+/ -	- -	- +
Anacardiaceae <i>Cotinus coggygria</i> Scop.	Fr	M	-	+	-	-
Caesalpiniaceae <i>Gleditsia triacanthos</i> L.	Arb	NA	-	+	-	-
Caprifoliaceae <i>Lonicera tatarica</i> L. <i>Sambucus racemosa</i> L.	Fr Fr	As E	- -	- +	- -	+ -
Elaeagnaceae <i>Elaeagnus angustifolia</i> L. <i>Hippophae rhamnoides</i> L.	FrArb ArbFr	M EAs	- -	+/ -	- -	- +
Fabaceae <i>Amorpha fruticosa</i> L. <i>Caragana arborescens</i> Lam <i>Robinia pseudoacacia</i> L.	Fr Fr Arb	NA As NA	- - -	+/ + +/ +	- - -	- - -
Grossulariaceae <i>Ribes aureum</i> Pursh	Fr	NA	-	-	-	+
Juglandaceae <i>Juglans regia</i> L.	Arb	MAs	-	+	-	-
Moraceae <i>Morus alba</i> L.	Arb	As	+	-	-	-
Oleaceae <i>Fraxinus lanceolata</i> Borkh.	Arb	NA	-	+	-	-
Rosaceae <i>Armeniaca vulgaris</i> Lam. <i>Cerasus mahaleb</i> (L.) Mill. <i>Cerasus tomentosa</i> (Tumb.) Wall. <i>Cerasus vulgaris</i> Mill. <i>Malus domestica</i> Borkh. <i>Padus serotina</i> (Ehrh.) Ag. <i>Prunus domestica</i> L.	Arb FrArb Fr Arb Arb Arb Arb	Anec As As Anec Anec NA Anec	- - - - - - -	- - - - - + -	- - - + + - -	+ + + - - - +

Continue the Table 1

Species within the family boundaries	Naturalized / Invasive				Casual	
	biomorphs	migroelement	archaeophytes	neophytes	archaeophytes	neophytes
1	2	3	4	5	6	7
Salicaceae						
<i>Populus deltoides</i> Marsh.	Arb	NA	-	-	-	+
<i>Populus × canadensis</i> Moench	Arb	NA/Hybr.	-	-	-	+
<i>Populus italica</i> (Du Roi) Moench	Arb	As	-	-	-	+
<i>Salix fragilis</i> L.	Arb	As	+	-	-	-
Simarubaceae						
<i>Ailanthus altissima</i> (Mill.) Swingle	Arb	As	-	+	-	-
Solanaceae						
<i>Lycium barbatum</i> L.	Fr	As	+	-	-	-
Tiliaceae						
<i>Tilia platyphyllos</i> Scop.	Arb	E	-	-	-	+
Ulmaceae						
<i>Celtis occidentalis</i> L.	Arb	NA	-	-	-	+
<i>Ulmus pumila</i> L.	Arb	As	-	+/+	-	-
Vitaceae						
<i>Parthenocissus quinquefolia</i> (L.) Planch.	Fr	NA	-	+/+	-	-

Fr (Frutex) – bush; Arb (Arbor) – tree. Migroelement (primary area): As – Asian; E – European; M – Mediterranean; NA – North American; IT – Iranoturan; Anec – anecophytes

Six woody-shrubby species show invasive activity in phytocenoses of the valley of the Orel River. They are exhibited by the invasive neophytes: *Robinia pseudoacacia*, *Acer negundo*, *Ulmus pumila*, *Elaeagnus angustifolia*, *Amorpha fruticosa*, *Parthenocissus quinquefolia*. Now they are naturalized and actively infect various types of biotopes: the coastal zones of the Orel River and its tributaries, beams, natural and artificial forests, and more recently – lands that are withdrawn from agricultural use. According to recent studies, active processes of naturalization of such neophytes as *Padus serotina*, *Cotinus coggygria* and *Celtis occidentalis*, recorded for natural and artificial forests. These species are included in the checklist of the adventive species of the Dnipropetrovsk region (Baranovski et al., 2016).

Conclusions

Significant adventization of the dendroflora of the valley of the Orel River shows the anthropogenic transformation of this territory. The introduced neophytes have recently been actively naturalized and are part of the natural phytocoenosis, changing their structure, which poses a threat to natural biodiversity. This requires further monitoring studies of the state of the flora of this territory, as well as observations of naturalization processes and the build-up of the invasive ability of adventive species.

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