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NEOPHYTES IN THE LOWER FLOODPLAIN OF THE JIU RIVER, DOWNSTREAM OF CRAIOVA, ROMANIA

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ABSTRACT

Neophytes are those allochthonous plants that were introduced into a certain geographical region after 1500. The present study aimed to make an inventory of all species of neophytes in the Jiu River floodplain, downstream of the municipality of Craiova, because these places are the most vulnerable to the zoo-anthropogenic factor. The field studies concerned all the natural, anthropized habitats and cultivated lands in the Jiu floodplain, between the municipality of Craiova and the point of the mouth of the Jiu River into the Danube. Following the research carried out, a scientific inventory was made that includes 152 plant taxa. They were analysed from the taxonomic point of view, biological forms, geographical elements, lifespan, introduction pathways, ecological indices and degree of invasiveness. The 152 taxa belong to 30 botanical families and 68 genera. The annual species have the best representation. On the one hand, the large areas occupied by the agricultural land in the Jiu floodplain and the numerous species that are introduced for ornamental purposes and then escaped from cultivation contribute to this. Over 50% of the taxa identified are invasive species or those that show invasive potential. A high percentage of the species are introduced deliberately.

INTRODUCTION

Global changes based on anthropogenic activity on the biosphere lead to the invasion of allochthonous organisms (Hulme et al. 2009).

Research targeting this category of plants has been known for almost half a century at European level. In Romania, the interest in invasive alien species, implicitly neophyte species, intensified after 2000 when they took on a large scale, both nationally and in Oltenia region. Until this period, neophyte plants were found in various flora and vegetation works, either in the floristic perspective of the researched areas, or in the composition of the phytocoenoses of various plant associations. Specialized papers containing valuable information about neophyte species in Romania and implicitly in Oltenia region appear after 2005 (Anastasiu et al. 2005, 2019, 2024, Costache & Răduțoiu 2005, Oprea et al. 2005, Hodișan & Morar 2008, Anastasiu & Negrean 2007, 2009, Sârbu & Oprea 2011, Răduțoiu & Stan 2013, Răduțoiu & Popescu 2020, Niculescu et al. 2022, Georgescu & Luchian 2023, Camen-Comănescu et al. 2023, Răduțoiu & Niculescu 2023, Răduțoiu et al. 2024, Răduțoiu 2024, Răduțoiu & Băloniu 2024).

A valuable paper dealing with this category of neophyte plants in the river basin is the one developed by Șușnia & Sîrbu (2024).

The primary objective of this study was to compile a floristic inventory of all neophyte species in the lower floodplain of the Jiu River. This research constitutes a segment of a more comprehensive study concerning neophyte species across the major river basins of Oltenia.

MATERIAL AND METHODS

Investigated area. The analysed territory is located in the south-west of Romania, in the historical region of Oltenia, and corresponds to the lower sector of the Jiu River, downstream of the municipality of Craiova, up to its confluence with the Danube River (Fig. 1). The research mainly concerned the floodplain of the Jiu River.

From a hydrographic point of view, the analysed sector is dominated by the Jiu course, which has a meandering character, with wide, asymmetrically developed meadows, predominantly on the left side of the river. The secondary hydrographic network is represented by canals, secondary arms, lakes and wetlands, which contribute to the diversity of habitats and the dynamics of riparian ecosystems. Near the confluence with the Danube, the meadow widens, and the influence of the hydrological regime of the river becomes evident. The climate is temperate continental with sub-Mediterranean influences, manifested by hot and dry summers and relatively mild winters.

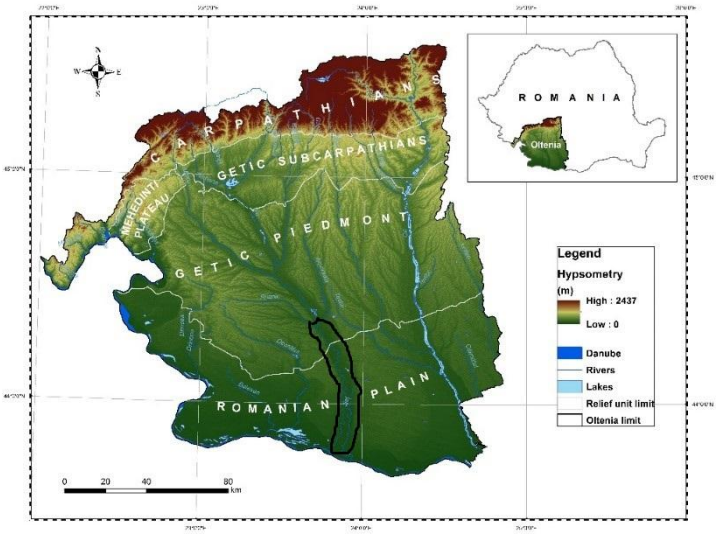


Figure 1. Map with the delimitation of the researched territory (Source: GIS processing according to Topographical Map, 1:25,000)

Materials. The present study was based on data from the literature and field research carried out from spring 2025 to September 2026. At the end of the study, these data were corroborated to have an overview of all neophytes in the Jiu floodplain, downstream of Craiova. The species nomenclature is according to Euro+Med (2006-) and Sârbu et al. (2013). In the list of neophyte flora, taxa were listed alphabetically within genera and families. The latter were treated in systematic

order (Sârbu et al. 2013). For each identified taxon, the following are presented: scientific name, popular name, botanical family to which it belongs, biological form, lifespan, geographical origin, introduction pathways, dispersal way of fruits/ seeds, ecological indices and degree of invasiveness.

The identified flora was analysed in terms of taxonomy, biological forms, geographical elements, lifespan, introduction pathways, ecological indices and degree of invasiveness.

Abbreviations: Fam. – Family; Ph-M – megaphanerophyte – tree; T – Therophyte; H – Hemicryptophyte; Ph-n – nanophanerophyte – shrub; Ht – hemiterophyte; G – geophyte; Ph-l – phanerophyte liana; Eur. – Europe; S – South; E – East; N – North; Afr. – Africa; As. – Asia; trop. – Tropical; Md. – Mediterranean region; intr. Acc. – accidentally introduced; intr. del. – deliberately introduced; forest. – forestry; orn. – ornamental; alim. – food; melif. – melliferous; ind. – industrial; fodder; st. inv. – invasive status; acc. – accidental; o – casual; n – naturalized; i. – invasive;

RESULTS AND DISCUSSIONS

Results

1. ***Pinus nigra*** J. F. Arnold subsp. ***nigra*** – Fam. Pinaceae. Ph-M; Eur. SE; intr. del. (forest., orn.); st. inv.: o.

2. ***Nigella sativa*** L. – Fam. Ranunculaceae. T; Md. (As. V, Eur. S); intr. del., cond., arom.; st. inv.: o.

3. ***Ulmus pumila*** L. – Fam. Ulmaceae. Ph-M; As. C, E, SE; intr. del. orn, for; st. inv: o.

4. ***Morus alba*** L. – Fam. Moraceae. Ph-M; As. E; intr. del, alim, ind., orn; st. inv.: n.

5. ***Morus nigra*** L. – Fam. Moraceae. Ph-M; As. SV; intr. del. alim., ind., orn.; st. inv.: n.

6. ***Mirabilis jalapa*** L. – Fam. Nyctaginaceae. T; Am trop; intr. del.orn; st. inv.: o.

7. ***Portulaca grandiflora*** Hook. – Fam. Portulacaceae. T; Am. S; intr. del. orn; st. inv.: o.

8. ***Amaranthus albus*** L. – Fam. Amaranthaceae. T; Am. N; intr. acc; st. inv: i.

9. ***Amaranthus blitoides*** S. Watson – Fam. Amaranthaceae. T; Am N; intr. acc; st. inv: i.

11. ***Amaranthus caudatus*** L. – Fam. Amaranthaceae. T; Am S; intr. del. orn; st. inv.: o.

12. ***Amaranthus crispus*** (Lesp. & Théven.) J.M. Coult. & S. Watson – Fam. Amaranthaceae. T; Am S; intr. acc; st. inv.: i.

13. ***Amaranthus deflexus*** L. – Fam. Amaranthaceae. H; Am S; intr. acc; st. inv.: i.

17. ***Amaranthus powellii*** S. Watson – Fam. Amaranthaceae. T; Am N; intr. acc; st. inv.: i.

18. ***Amaranthus retroflexus*** L. – Fam. Amaranthaceae. T; Am N; intr. acc; st. inv.: i.

19. ***Atriplex hortensis*** L. – Fam. Chenopodiaceae. T; As temp; intr. delib.alim; st. inv: o.

21. ***Bassia scoparia*** (L.) A. J. Scott – Fam. Chenopodiaceae. T; As temp; intr. delib. orn; st. inv: i.

22. ***Bassia sieversiana*** (Pallas) W. A. Weber – Fam. Chenopodiaceae. T; As; intr. acc; st. inv.: i.

23. ***Dysphania ambrosioides*** (L.) Mosyakin & Clemants – Fam. Chenopodiaceae. T; Am trop; intr. del., arom., med; st. inv.: i.

28. ***Malus domestica*** Borkh. – Fam. Rosaceae. Ph-M; As C; intr. del. alim; st. inv.: o.

30. ***Prunus cerasus*** L. – Fam. Rosaceae. Ph-M; Eur SE, As V; intr. del.; alim; st. inv.: o.

31. ***Prunus domestica*** L. subsp. ***domestica*** – Fam. Rosaceae. Ph-M; As V; intr. del. alim; st. inv.: o.

34. ***Amorpha fruticosa*** L. – Fam. Fabaceae. Ph-n; Am N; intr. delib. orn; st. inv.: i.

35. ***Cytisus scoparius*** (L.) Link – Fam. Fabaceae. Ph-n; Eur C, V-Md; intr. delib. orn., furaj; st. inv: o.

36. ***Gleditsia triacanthos*** L. – Fam. Fabaceae. Ph-M; Am N; intr. delib. orn., forest; st. inv: n.

37. ***Medicago sativa*** L. – Fam. Fabaceae. H; As C; intr. delib. furaj; st. inv.: n.

39. ***Pisum sativum*** L. subsp. ***sativum*** – T; As V–Eur SE; intr. delib.alim; st. inv.: o.

40. ***Robinia pseudoacacia*** L. – Fam. Fabaceae. Ph-M; Am N; intr. del. orn., melif., forest; st. inv.: i.

42. ***Oenothera biennis*** L. – Fam. Onagraceae. Ht; Am N; intr. del. orn; st. inv.: i.

43. ***Oenothera depressa*** E. Greene – Fam. Onagraceae. Ht; Am N; intr. acc; st. inv: i.

46. ***Oenothera suaveolens*** Pers. – Fam. Onagraceae. Ht; Am N; intr. acc; st. inv.: i.

47. ***Elaeagnus angustifolia*** L. – Fam. Onagraceae. Ph-n; As temp, Eur E; intr. delib., orn., forest; st. inv.: i.

48. ***Ailanthus altissima*** (Mill.) Swingle – Fam. Simaroubaceae. Ph-M; As E; intr. del. orn.; st. inv.: i.

49. ***Acer negundo*** L. – Fam. Aceraceae. Ph-M; Am N; intr. del., orn., forest; st. inv.: i.

50. ***Oxalis corniculata*** L. – Fam. Oxalidaceae. Ht; As E; intr. del., orn; st. inv.: i.

51. ***Oxalis dillenii*** Jacq. – Fam. Oxalidaceae. Ht; Am N; intr. acc; st. inv.: i.

52. ***Oxalis stricta*** L. - Fam. Oxalidaceae. H; Am N; intr. acc; st. inv.: i.

53. ***Parthenocissus inserta*** (A. Kerner) Fritsch - Fam. Vitaceae. Ph-l; Am N; intr. delib.; orn; st. inv.: i.

54. ***Vitis vinifera*** L. - Fam. Vitaceae. Ph-l; As SV–Md; intr. del. alim., ind; st. inv.: o.

57. ***Euphorbia maculata*** L. – Fam. Euphorbiaceae. T; Am N; intr. acc.; st. inv.: i.

59. ***Euphorbia prostrata*** Aiton – Fam. Euphorbiaceae. T; Am N; intr. acc; st. inv.: n.

63. ***Brassica rapa*** L. ssp. ***oleifera*** – Fam. Brassicaceae. T–Ht; Md; intr. delib. oleif; st. inv.: o.

76. ***Citrullus lanatus*** (Thunb.) Mansf. – Fam. Cucurbitaceae. T; Afr NV; st. inv: o.

77. ***Cucurbita pepo*** L. – Fam. Cucurbitaceae. T; Am N, C; intr. delib., furaj., alim.; st. inv: o.

79. ***Abutilon theophrasti*** Medik. – Fam. Malvaceae. T; As; intr. acc; st. inv.: i.

80. ***Alcea rosea*** L. – Fam. Malvaceae. H; As SV; intr. del., orn; st. inv.: o.

83. ***Fraxinus americana*** L. – Fam. Oleaceae. Ph-M; Am N; intr. del., orn, forest; st. inv.: o (ocazional).

84. ***Fraxinus pennsylvanica*** Marsh. - Fam. Oleaceae. Ph-M; Am N; intr. del., orn., forest.; st. inv.: n.

85. ***Datura stramonium*** L. – Fam. Solanaceae. T; Am N; intr. acc; st. inv.: i.

86. ***Datura wrightii*** Regel - Fam. Solanaceae. T; Am N; intr. del., orn.; st. inv.: o.

87. ***Lycium barbarum*** L. (*L. halimifolium* Mill.; *L. vulgare* Dunal) – Fam. Solanaceae. As E; intr. del., orn.; st. inv: i.

88. ***Lycopersicon esculentum*** Mill. – Fam. Solanaceae. T; Am S; intr. del., alim.; st. inv.: o.

89. ***Nicotiana alata*** Link & Otto - Fam. Solanaceae. T(H); Am S; intr. del., orn.; st. inv.: o.

90. ***Petunia × atkinsiana*** D. Don (*P. axillaris* (Lam.) Britton, Sterns & Pogg. × *P. integrifolia* (Hook.) Schinz & Thell.; *P. hybrida* Vilm.) - Fam. Solanaceae. T; Am S; intr. del., orn.; st. inv.: o.

93. ***Ipomoea purpurea*** Roth (*Pharbitis purpurea* (Roth) Voigt.) - Fam. Convolvulaceae. T; Am trop; intr. delib., orn.; st. inv.: o.

94. ***Cuscuta campestris*** Yunk. – Fam. Convolvulaceae. T; Am N; intr. acc; st. inv: i.

96. ***Paulownia tomentosa*** Steud. – Fam. Scrophulariaceae. Ph-M; As E; intr. del. (orn.); st. inv.: o.

97. ***Veronica peregrina*** L. - Fam. Scrophulariaceae. T; Am N; intr. acc; st. inv.: n.

98. ***Veronica persica*** Poir. – Fam. Scrophulariaceae. T; As V; intr. acc; st. inv.: i.

101. ***Mentha spicata*** L. ssp. ***spicata*** (*M. viridis* L.) L.; *M. crispa* L.) – Fam. Lamiaceae. H; Atl.-Md; intr. delib., med., arom.; st. inv.: n.

106. ***Symphoricarpos albus*** (L.) S.F. Blake – Fam. Caprifoliaceae. Ph-n; Am N; intr. delib., orn.; st. inv.: o.

107. ***Ambrosia artemisiifolia*** L. – Fam. Asteraceae. T; Am N; intr. acc; st. inv.: i.

110. ***Artemisia annua*** L. – Fam. Asteraceae. T; As, Eur SE; intr. delib. (arom., insectifug); st. inv.: i.

111. ***Bidens frondosus*** L. – Fam. Asteraceae. T; Am N; intr. acc; st. inv.: i.

112. ***Calendula officinalis*** L. – Fam. Asteraceae. T-Ht; Md; intr. delib., orn., med.; st. inv.: o.

113. ***Coreopsis tinctoria*** Nutt. – Fam. Asteraceae. T; Am N; intr. del. (orn.); st. inv.: o.

114. ***Cosmos bipinnatus*** Cav. - Fam. Asteraceae. T; Am C; intr. delib., orn.; st. inv.: o.

116. ***Erigeron annuus*** (L.) Desf. ssp. ***annuus*** – Fam. Asteraceae. Ht; Am N; intr. acc; st. inv.: i.

118. ***Erigeron canadensis*** L. (*Conzya canadensis* (L.) Cronq.) – Fam. Asteraceae. T; Am N; intr. acc; st. inv.: i

119. ***Galinsoga parviflora*** Cav. (*G. quinqueradiata* Ruiz et Pav.) – Fam. Asteraceae. T; Am N; intr. acc; st. inv.: i.

120. ***Galinsoga quadriradiata*** Ruiz & Pav. (*G. hispida* Benth.; *G. ciliata* (Raf.) S. F. Blacke) – Fam. Asteraceae. T; Am N; intr. acc; st. inv.: i.

122. ***Helianthus annuus*** L. – Fam. Asteraceae. T; Am. N; intr. delib., ind.; st. inv.: o.

123. ***Helianthus tuberosus*** L. – Fam. Asteraceae. G; Am. N; intr. del., orn., furaj.; st. inv.: i.

125. ***Helminthotheca echioides*** (L.) Holub (*Helminthia echioides*) (L.) Gaertn.; *Picris echioides* L.) - Fam. Asteraceae. T-Ht; Md; intr. acc; st. inv.: i.

127. ***Matricaria discoidea*** DC. (*Chamomilla suaveolens*) (Pursh) Rydb.; *Matricaria suaveolens* (Pursh) Buchenau non L.; *Matricaria matricarioides* auct.) - Fam. Asteraceae. T; Am. N; intr. acc; st. inv.: i.

128. ***Rudbeckia laciniata*** L. – Fam. Asteraceae. H; Am N; intr. del., orn.; st. inv: i.

129. ***Solidago canadensis*** L. – Fam. Asteraceae. H; Am N; intr. delib., orn.; st. inv.: i.

132. ***Xanthium orientale*** L. ssp. ***italicum*** (Moretti) Greuter – Fam. Asteraceae. T; Am. N; intr. acc; st. inv.: i.

133. ***Xanthium spinosum*** L. – Fam. Asteraceae. T; Am. S; intr. acc; st. inv.: i.

135. ***Elodea nuttallii*** (Planch.) H. St. John – Fam. Hydrocharitaceae. Hd; Am. N; intr. acc; st. inv.: i.

138. ***Iris germanica*** L. - Fam. Iridaceae. G; Md E; intr. del., orn.; st. inv.: o.

139. ***Commelina communis*** L. - Fam. Commelinaceae. T; As temp; intr. delib., orn.; st. inv.: o.

141. ***Eleusine indica*** (L.) Gaertn. - Fam. Poaceae. T; Afr., As. trop; intr. acc; st. inv.: n.

142. ***Lolium multiflorum*** Lam. – Fam. Poaceae. Ht; Md; intr. del., furaj.; st. inv.: o.

143. ***Panicum capillare*** L. - Fam. Poaceae. T; Am. N; intr. acc; st. inv.: i.

144. ***Panicum dichotomiflorum*** Michx. - Fam. Poaceae. T; Am N; intr. acc; st. inv.: i.

147. ***Secale cereale*** L. – Fam. Poaceae. T; As V-Caucaz; intr. del., alim., furaj., st. inv.: o.

148. ***Setaria italica*** (L.) P. Beauv. – Fam. Poaceae. T; As, Afr.; intr. del., furaj.; st. inv.: o.

150. ***Sorghum halepense*** (L.) Pers. – Fam. Poaceae. G; Md Afr., As.; intr. acc.; st. inv.: i.

151. ***Triticum aestivum*** L. – Fam. Poaceae. T; As V-Caucaz; intr. del., alim., furaj.; st. inv.: o.

152. ***Zea mays*** L. - Fam. Poaceae. T; Am N; intr. del., alim., furaj.; st. inv.: o.

Discussions

When comparing these results with those from similar studies in Romania (Șușnia & Sîrbu 2024), minor differences are observed regarding the percentages of species originating from the Americas, as well as the distribution of life forms and modes of introduction. In the area we investigated, these categories show slightly higher values.

The analysis of the floristic inventory highlights the presence of a number of 152 taxa. They belong to 30 botanical families and 68 genera. The family with the

most taxa, both in terms of genera and species, is Asteraceae or Compositae. This is followed at a great distance by Poaceae, Fabaceae, Solanaceae and Chenopodiaceae. It is worth noting that although the Amaranthaceae family has only one genus, it has 7 species, with a good representation in the field.

Regarding the analysis of the lifespan, it can be seen that the annual species hold a significant representation (Fig. 2). The relatively large number of annual taxa can also be explained by the numerous species introduced for ornamental purposes.

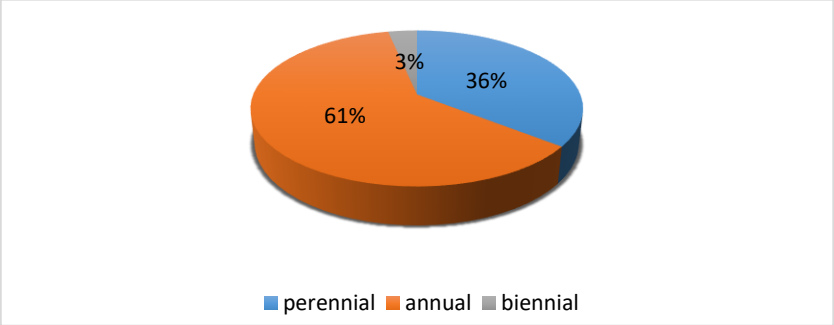


Figure 2. Spectrum of lifespan (orig.)

The spectrum of biological forms shows that the first place is occupied by therophytes, the second place being phanerophytes, which demonstrates the existence of favourable conditions for the installation of forest vegetation, forests (megaphanerophytes) and bushes (nanophanerophytes), these having a good representation in the studied territory (Fig. 3).

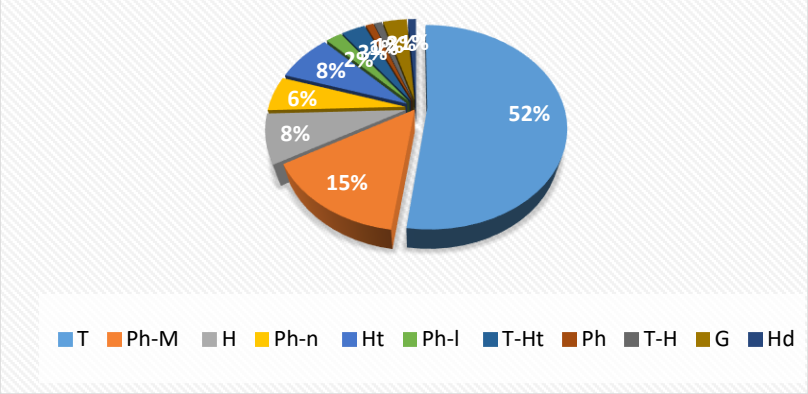


Figure 3. Spectrum of biological forms (orig.)

The analysis of geographical elements highlights the predominance of those originating in America (59 %), especially North America. These are followed by Asian (with 28 %) and Mediterranean (8 %). The rest of the categories have an insignificant share (Fig. 4).

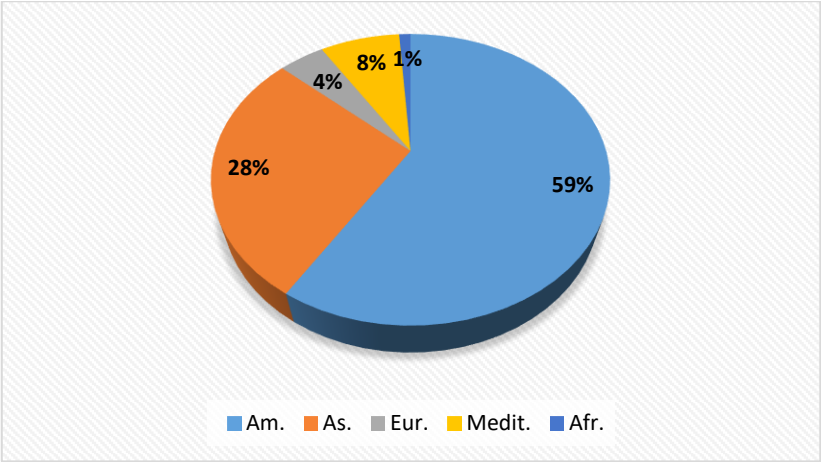


Figure 4. Spectrum of geographical elements (orig.)

As for the introduction of the neophyte species identified in the Jiu floodplain, downstream of the municipality of Craiova, it can be said that over 60 % are introduced deliberately and about 40 % accidentally (Fig. 5).

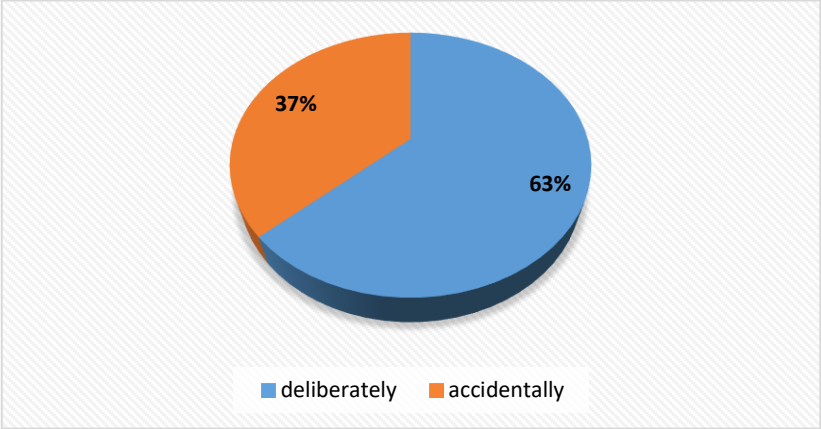


Figure 5. Analysis of the introduction pathways (orig.)

Following the analysis of the degree of invasiveness of all species of neophyte vascular plants in the researched territory, it can be said that more than half of them are invasive taxa or manifest the invasive potential in the area (Fig. 6). About 40 % are casual and a very small number are naturalized (about 10 %).

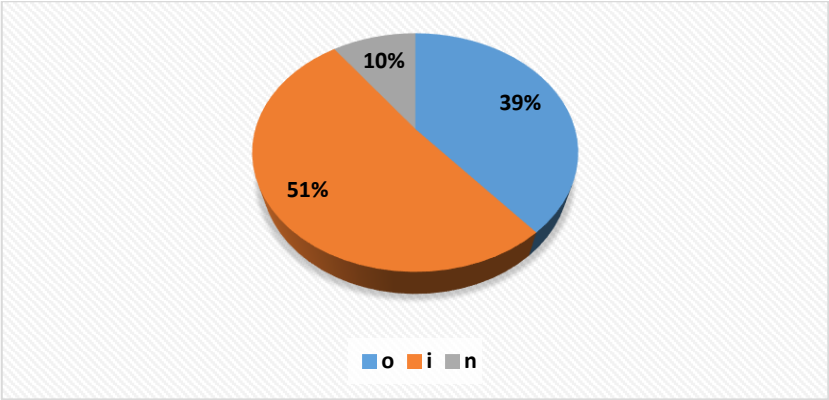


Figure 6. Invasiveness status analysis (orig.)

CONCLUSIONS

The results obtained from the research carried out on the neophytes of the lower floodplain of the Jiu River can be the premise for larger studies at the level of the Oltenia region, in order to make a complete inventory with this category of plants. The floristic inventory totals a number of 152 taxa. Their analysis highlights the following aspects: most of the representatives belong to the Asteraceae family (about 12 %); annual species have the highest presence (61 %); those of American origin predominate (59 %). Regarding the introduction of the identified neophyte species, it can be said that over 60% are introduced deliberately and related to the degree of invasiveness - over half are invasive taxa or show invasive potential. The floristic inventory also brings together species of interest to the European Union: *Elodea nuttallii*, *Ailanthus altissima*.

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*** Topographical Map, 1:25,000; Elevation: Shuttle Radar Topography Mission, 30 m. GIS processing.