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CONSIDERATIONS REGARDING THE ALIEN PLANTS FROM MOLDAVIAN FLORA (ROMANIA), DELIBERATELY INTRODUCED BY MAN

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Summary: The most plant species cultivated in Moldavia (Romania) for various uses aren't native in this territory. Their introduction by man, from various geographical regions, started long time ago, in ancientness, and now it is also in a continuous evolution. The most of these plants are met in crop only but a small proportion of them, escape from crops (they turn to wildness), becoming elements of the spontaneous flora. Such plants named hemerophytes can cause peculiar damages to the natural or anthropic invaded ecosystems and their knowledge represents an essential support in the rational management of the biological immigration and invasion. After consulting a great lot of bibliographic sources and based on the field observations of the author in the last years, it results for the Moldavian territory a number of 169 vascular hemerophytes, among which 21.3% have an invasive character, 15.4 % are naturalized ones, and 63.3% are only occasional escaped from crops. The paper gives informations about geographical provenance of these species; period, place and reason of their introduction; types of affected habitats; first mention in the wild, and their current spreading in Moldavia.

Key words: alien plants, hemerophytes, introduction mode, invasive status.

The deliberately introduction by man of useful plants, from a geographical region to the other one, started long time ago, in Neolithic era, at the same time with the beginnings of the plant cultivation, occupation that gradually was extended from some domesticity centers of the wild plants (Proximal-Oriental, Chinese, Central-American, South-American, North-American, Neo-Guinean [20]), on all geographical regions populated by man. This phenomenon was determined by a lot of causes: the continuous extension of the cultivated fields; the frequent man's migrations from a geographical region to the other one (that began since antiquity); the movements of the troops in wars; the colonization of new territories; the extension of the trade etc.

Some of the cultivated plants introduced by man into a certain geographical region, after a more or less long phase of naturalization, escaped from culture, first on anthropic habitats, then on semi-natural and natural ones, they becoming constituents of the spontaneous flora in their adoptive country. Such alien (non-native, exotic) plants deliberately introduced by man into a certain area are known as *hemerophytes*, in contrast to the accidentally introduced ones, that are known as *xenophytes* [1; 10; 33; 35].

The constitution of alien (hemerophytic or xenophytic) floras got a remarkable magnitude at global level, since the second half of the last millenium, as a result of the intensification of the man's movement around the world, after the great geographical discoveries were possible. For this reason, the year 1500 is considered as a conventional limit between *archaeophytes* (plants immigrated before 1500) and *neophytes* (plants immigrated after 1500, till now) [10; 33 etc.].

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Material and method

The list of the alien plant species from Moldavia, deliberately introduced by man (hemerophytes), is based on a great lot of bibliographic sources, numerous herbarium data (IASI), and the field observations of the author in the last years. In the appreciation of the species' invasive status we took in consideration their chorology in Moldavia, the occupied habitats and their capacity of reproduction and formation of stable populations, without the human intervention. Thus, the species was grouped in three categories, namely: *casual*, *naturalized* and *invasive* [32]. We have utilized the nomenclature after Tutin et al. (eds) 1964-1980 [40]; Ciocârlan 2000 [6], and Oprea 2005 [29].

Abbreviations: arh-archaeophyte; **neo**-neophyte; **habit**-habitat (**h**-human-made (anthropic), **sn**-semi-natural, **n**-natural); **intr**.: introduced as…(**orn**-ornamental, **alim**-alimentary, **med**-medicinal, **fodd**-fodder, **arom**-aromatic, **spi**-spicy, **ol.**-oleaginous, **mell**-melliferous, **antieroz**.-anti-erosion, **tinct**.–tinctorial, **forest**-forestry, **ser**.–sericicultural, **text**-textile, **ins**-insecticide; **other**-other uses); **chorology**: **s**-single locality, **r**-rare (2-5 localities), **sp**-sporadic (> 5 localities, but not in abundance), **la**-locally abundant, **c**-common (in all territory, in abundance); **Moldavian counties**: **VN**-Vrancea, **GL**-Galaţi, **VS**-Vaslui, **BC**-Bacău, **NT**-Neamţ, **IS**-Iaşi, **BT**-Botoşani, **SV**-Suceava; **first mention**- first mention as a wild plant.

Results and discussions

As a result of our investigations, we find out that the hemerophytic flora of Moldavian territory includes 169 vascular species (with 22 species moreover in relation to anterior evaluations [37]), including 9 subspecies and 1 variety, from 126 genera. These taxa belong to 53 plant families among which the best represented are the next: *Asteraceae* (20 species), *Fabaceae* (18 species), *Poaceae* (11 species), *Brassicaceae* (10 species), *Lamiaceae* (10 species), *Rosaceae* (9 species), *Malvaceae* (6 species), *Solanaceae* (6 species), *Polygonaceae* (5 species) and *Chenopodiaceae* (5 species).

Geographical origin. The most hemerophytic alien species in the flora of Moldavia originate from Mediterranean basin (32.5%), Asia (30.2%) and America (26.6%), while a small percentage of them have their origin in Central, West and South Europe (5.91%), Africa (4,14%), or in the pan-tropical regions (0.59%) (**Fig. 1**), as follows:

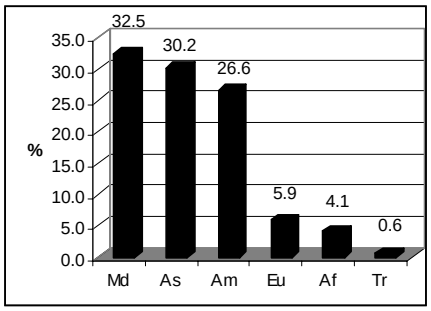

Fig. 1 Geographical origin of hemerophytes

– Asian species: *Ailanthus altissima, Callistephus chinensis, Commelina communis, Glycine max, Hemerocallis fulva, Koelreuteria paniculata, Lycium barbarum, Malva verticillata, Morus alba, Phytolacca esculenta, Polygonum aubertii, P. orientale, Polystichum falcatum, Reynoutria japonica, R. x bohemica, Rosa rugosa, Spiraea japonica* (E Asia); *Caragana arborescens, Thladiantha dubia* (NE Asia); *Acorus calamus, Duchesnea indica, Impatiens balsamina, I. glandulifera* (SE Asia); C*amelina sativa (?), Panicum miliaceum, Ulmus pumila* (C & E Asia); *Artemisia dracunculus, Atriplex hortensis, Dracocephalum moldavica, Elaeagnus angustifolia, Fagopyrum esculentum, Gypsophila acutifolia, G. elegans, Kochia scoparia, Medicago sativa, M. x varia (?), Triticum aestivum* (C Asia); *Artemisia annua, Avena barbata, A. sterilis* subsp. *ludoviciana, A. strigosa, Secale cereale* (C and SW Asia); *Anethum graveolens* (S Asia); *Balsamita major, Cannabis sativa* subsp.

sativa (SW Asia); *Carthamus tinctorius, Lonicera tatarica, Prunus armeniaca, P. cerasus, P. domestica, Setaria italica* (W Asia);

– Mediterranean (including sub-Mediterranean) species: *Alcea rosea, Allium ampeloprasum, Amaranthus lividus, Antirrhinum majus, Armoracia rusticana, Borago officinalis, Brassica rapa* subsp. *rapa* & subsp. *oleifera, Briza maxima, Calendula officinalis, Castanea sativa, Chenopodium foliosum, Colutea arborescens, Dianthus barbatus* subsp. *barbatus, Eruca vesicaria, Euphorbia lathrys, E. oblongata, Hemerocallis lilioasphodelus, Hyssopus officinalis, Iberis umbellata, Lallemantia iberica, Lathyrus sativus, Lavatera olbia, L. trimestris, L. cretica, Lolium multiflorum, Lonicera caprifolium, Lunaria annua* subsp. *annua, Lupinus albus, Malva moschata, Melissa officinalis, Mentha spicata, M. x gentilis* (?), *M. x piperita* (?), *Morus nigra, Narcissus poeticus* subsp. *poeticus, Nigella damascena, N. sativa, Papaver somniferum, Pisum sativum, Raphanus sativus, Reseda odorata, R. phyteuma, Rubia tinctorum, Ruta graveolens, Salvia officinalis, Satureja hortensis, Silybum marianum, Sinapis alba* subsp. *alba, Spartium junceum, Stachys byzantina, Tanacetum parthenium, Trigonella caerulea, T. foenum-graecum, Vicia articulata, V. sativa* subsp. *sativa.*

– American species: *Acer negundo, Amaranthus hypochondriacus, Amorpha fruticosa, Asclepias syriaca, Aster x salignus, A. x versicolor, Catalpa bignonioides, Coreopsis tinctoria, Datura inoxia, Echinocystis lobata, Euphorbia marginata, Gleditsia triacanthos, Helianthus annuus, H. decapetalus, H. tuberosus, Juglans nigra, Lupinus polyphyllus, Oxybaphus nyctagineus, Panicum capillare, Parthenocissus inserta, P. quinquefolia, Phacelia tanacetifolia, Phytolacca americana, Rhus typhina, Robinia pseudacacia, Rudbeckia laciniata, Sagittaria latifolia, Solidago canadensis, Tradescantia virginiana, Vitis vulpina* (N America); *Cosmos bipinnatus, Cucurbita pepo, Tagetes patula, Zinnia elegans* (C America); *Amaranthus cruentus, Chenopodium ambrosioides, Ipomoea hederacea, I. purpurea, I. tricolor, Lycopersicon esculentum, Mirabilis jalapa, Nicandra physalodes, Nicotiana alata, Portulaca grandiflora, Solanum tuberosum* (S America).

– European species: *Ribes rubrum* (W Europe); *Cymbalaria muralis, Portulaca oleracea* (S Europe); *Brassica nigra* (S & W Europe); *Cyclamen purpurascens, Lilium bulbiferum* (C Europe); *Artemisia abrotanum, Juglans regia* (C & SW Europe); *Aesculus hippocastanum* (Balc.); *Prunus cerasifera* (Pont.-Balc.).

– African species: *Chenopodium schraderianum, Phalaris canariensis, Sorghum sudanense, Vicia faba* (Africa); *Citrullus colocynthis, Coriandrum sativum, Saxifraga cymbalaria* var. *cymbalaria* (N Africa & W Asia).

– Pan-tropical species: *Vallisneria spiralis.*

Place and period of plant introductions. The introduction of exotic plants on the Moldavian territory, mainly from Central-Western Asia and Mediterranean basin, started long time ago, at the same time with the expansion of the proximal–oriental Neolithic agriculture towards the western region of the Mediterranean basin, and, through the Danube valley, toward Central and NW Europe [20].

Various species native from Central or Western Asia (*Triticum dicoccon*, *T. aestivum*, *T. durum*, *Hordeum vulgare, H. distichon, Panicum miliaceum, Cannabis sativa, Prunus insititia*), Mediterranean basin (*Vicia ervilia, Pisum sativum*), Southern Europe (*Triticum spelta*), Pontic-Balcanic regions (*Prunus cerasifera*), Northern Africa (*Vicia faba*) and so on, were already cultivated in the IV-III millennium b.ch., by Neolithic populations from Moldavia [27].

This introduction of exotic plants was gradually made by farmers, traders, navigators, missionaries, diplomats, lovers of flowers, healers, settlers, on the same time with the extension of agricultural fields, rise of urban localities and progress of gardening.

After the retreat of Romans from Dacia, the destructions and the instability due to the frequent invasions of migratory races, for almost a millennium and a half, stopped this process [43] which got a new magnitude only after the consolidation of the Moldavian state, when, around the palaces, mansions, inns or monasteries, but also in the crops, more and more plant species began to be introduced from more and more distant regions (especially from Eastern Asia, America etc.).

Since the 19th century, the introduction of exotic plants got a quicker course, especially after 1856, when A. Fătu founded at Iaşi the first botanical garden in Romania. In that garden, up to 1870 year, over 2350 vascular plant species were cultivated [12], about 50% of them with an exotic provenance. From the same period, a lot of parks of monarch or boyar palaces also date; on such places, competent gardeners from Germany, Switzerland or other occidental countries, planted numerous exotic species of trees, shrubs, and lianas, as for instance at Văleni-Neamț (58 exotic taxa) [4], Climeşti-Neamț (18 exotic taxa) [18], Țibăneşti-Iaşi (28 exotic taxa) [19] etc.

Nowadays, this process is also in a continuous progress, thousands of exotic plants being introduced and kept in culture into various didactic or scientific collections (botanical gardens, didactic or experimental lots of some universities or research institutions), public or private gardens and parks, along the streets, into crops, nurseries, cemeteries etc.

In present, some of the most important introduction centers of exotic (cultivated) plants in Moldavia are as follows:

– Botanical Garden Iaşi: in 1995, here they were cultivated 3522 exotic plant taxa, which originated from all floristic domains of the world: Holarctic (1830 taxa), Neo-tropical (1222 taxa), Palaeo-tropical (357 taxa), Australian-Antarctic (67 taxa), Pan-tropical (46 taxa) [36];

– Dendrological parks Hemeiuş and Dofteana (Bacău county), where there are 1411, respectively 677 woody plant taxa, for the most part with an exotic origin [22; 23];

– Botanical Garden Galați (although it was recently founded - in 1992, it already shelters over 2500 plant taxa);

– Public or private gardens and parks from various localities. The ornamental woody flora of a number of 43 urban localities from all Moldavia includes 403 species [25], the most of them being exotics. In Vrancea county, 177 (83%) of the 214 ornamental plant species, which are cultivated in different rural and urban localities [7], have an exotic provenance, too. In the northern part of Moldavia, 76 exotic ornamental species was identified, and 5 of them were already escaped from culture [21].

– Research institutions for agricultural plants (Podu Iloaiei, Bacău, Secuieni, Suceava etc.);

– Sylvan or horticultural nurseries;

– Firms what trade in ornamental plants or designing and making centers for green spaces etc.

Among all these species which were introduced in the culture, along the time, only a small percentage have escaped from the gardens or crops (they have returned into wildness), becoming ephemeral or permanent components of the spontaneous flora on this area. In the hemerophytic flora of Moldavia, the archaeophytes have a smaller proportion (53 species) in comparison with the neophytes (116 species), as a result of a more accelerated introduction of exotic plants in the past few centuries in comparison with the ancient or medieval periods.

We include in the archaeophytes category, those old cultivated plants, which meantime have become subspontaneous ones, as the majority of hemerophytic species with Central or Western Asian, Mediterranean, Central or Southern European origin (*Armoracia rusticana, Atriplex hortensis, Brassica nigra, B. rapa, Calendula officinalis, Eruca vesicaria, Fagopyrum esculentum, Juglans regia, Melissa officinalis, Panicum miliaceum, Portulaca oleracea, Tanacetum parthenium, Vicia articulata* etc.). The neophytes are especially represented by American species as well as by the majority of species native from Eastern Asia, Africa and other far-away regions, and which have reached Europe only after the great geographical discoveries were possible, starting with the 15 th-16th centuries.

Purpose of plant introductions. Analyzing the purpose of introduction of these plants into culture, we find that the majority of them were introduced as ornamental plants (100 species), so we can confirm that horticulture is a major factor of continuous enrichment of alien flora [13; 17 etc.]. Less species were introduced for other uses: alimentary (29 species), medicinal (23 species), fodder (22 species), aromatic and spicy (19 species), oleaginous (9 species), melliferous (7 species), tinctorial (5 species), forestry and anti-erosion (5 species) etc. (**Fig. 2**).

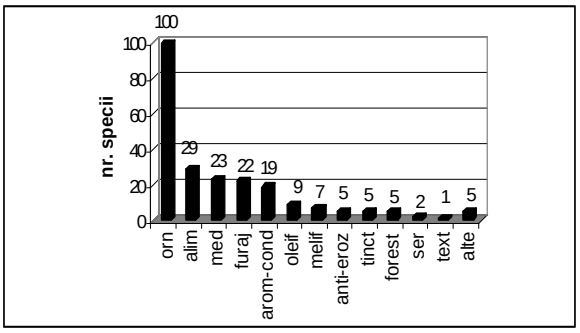

Fig. 2 Purpose of plant introduction

Certainly, a lot of species can be found in two or more categories. For instance, *Balsamita major, Borago officinalis, Calendula officinalis, Malva verticillata, Salvia officinalis* are both ornamental and medicinal plants; *Brassica rapa* subsp. *rapa*, *Cucurbita pepo, Pisum sativum, Panicum miliaceum* were introduced both as alimentary plants and for their fodder values etc.

At the same time, some hemerophytes (for instance, at Iaşi, *Euphorbia oblongata* [34]) were initially introduced not for a certain practical utility, but for the enrichment of some scientific or didactic collections (botanical gardens, dendrological parks etc.).

The habitats affected by invasion of hemerophytes are firstly the human-mad ones (surrounding of private or public garden, roadsides, railways, train stations, rubbles, waste depots, wastelands etc.). On these sorts of habitats, the majority of alien plants escaped from culture were met. Less species (proving a high capacity of competition against the native plants or as a result of some structure disturbances of the plant communities) are able to penetrate not only in the human-made habitats but also in the semi-natural or natural ones (banks, ruderal meadows, bushes, canals, ponds, and respectively, meadows, forests, rivers, everglades), as the next: *Acer negundo*, *Acorus calamus*, *Ailanthus altissima*, *Amorpha fruticosa*, *Armoracia rusticana*, *Cyclamen purpurascens*, *Echinocystis lobata*, *Helianthus tuberosus, Impatiens glandulifera, Lolium multiflorum*, *Lycium barbarum*, *Medicago sativa*, *Melissa officinalis*, *Parthenocissus inserta*, *P. quinquefolia*, *Polystichum falcatum*, *Reynoutria japonica, R. x bohemica*, *Robinia pseudacacia*, *Sagittaria latifolia*, *Saxifraga cymbalaria* var. *cymbalaria*, *Solidago canadensis*, *Spiraea japonica*, *Tanacetum parthenium*, *Trigonella caerulea*, *Vallisneria spiralis*, *Vicia sativa* subsp. *sativa* etc.

The invasive status. Taking into account their present-day spread on the area, state of populations and affected habitats, we consider that among the 169 alien species, deliberately introduced by man in Moldavia, 36 species (21.3%) have an **invasive character**, they being able to reproduce themselves, without human intervention, and to extend their area, both on anthropic and semi-natural or natural habitats. We give below an alphabetical list of invasive hemerophytes from Moldavia:

Acer negundo: neo; intr.: orn, forest; habit.: h, sn, n; orig.: N America; spread: VN.sp, VS.sp, GL.sp, BC.sp, NT.sp, IS.sp, BT.sp, SV.r; first mention: 1958 (leg.: 1952)-Fârțăneşti (GL) [2].

Ailanthus altissima: neo; intr.: orn; habit.: h, sn; orig.: East Asia; spread: VN.sp, GL.sp, VS.sp, BC.sp, NTsp, IS.sp-la, BT.r; first mention: 1906 -Iaşi (IS) [34].

Amaranthus lividus: arh.; intr.: alim (acc.?); habit.: h; orig.: Md; spread: VN.sp, GL.sp, VS.r, BC.sp, NT.sp, IS.sp, BT.r, SV.r; first mention: (1835) 1853-Moldavia [11]; 1842-1848 (as *A. blitum* L.)-Moldavia [16]; 1938-Aroneanu (IS) [30].

Amorpha fruticosa: neo; intr.: orn; habit.: h, sn; orig.: N America; spread: VN.r, GL.sp, VS.r, BC.r, NT.r, IS.sp-la, BT.r, SV.r; first mention: 1898-Iaşi (IS) [15].

Armoracia rusticana: arh.; intr.: spi; habit.: h, sn; orig.: SE Europe-W Asia; spread: VN.sp, GL.sp, VS.sp, BC.sp, NT.sp, IS.sp, BT.sp, SV.sp; first mention: 1836-Moldavia [8]; (1835)1853 (as A*rmoracia vulgaris*)-Brateş (NT) [11].

Artemisia annua: arh. (?); intr.: arom, ins; habit.: h; orig.: C, SW Asia; spread: VN.c, GL.c, VS.c, BC.c, NT.c, IS.c, BT.c, SV.c; first mention: 1842-1848-Moldavia [16].

Brassica nigra: arh.; intr.: spi, med; habit.: h; orig.: S, W Europe.; spread: VN.sp-la, GL.sp, VS.sp, BC.sp, NT.sp, IS.sp, IS.sp-la, BT.sp-la, SV.sp-la; first mention: 1842-1848 (as *Sinapis nigra*)-Moldavia [16].

Chenopodium foliosum: neo; intr.: alim; habit.: h; orig.: Md; spread: BC.r, NT.sp, IS.sp, BT.s, SV.sp; first mention: 1836 (as *Blitum virgatum*)-Moldavia [8]; 1841-Neamț Monastery (NT) [38].

Duchesnea indica: neo; intr.: orn; habit.: h; orig.: Asia; spread: IS.s-la; first mention: 1871 (as *Fragaria indica*)-Iaşi (cult.) [12]; 1949-Iaşi (IS) [14]. Although it is cited only from Iaşi county, this species can be considered as an invasive one, taking in consideration their whole naturalization, and their continuous extension through the urban spaces of Iaşi [44].

Echinocystis lobata: neo; intr.: orn (acc. ?); habit.: h, sn, n; orig.: N America; spread: VN.r, GL.r, VS.sp, BC.sp, NT.sp, IS.sp, BT.sp-la, SV.sp; first mention: 1968-Bănceşti (VS) [39]; 1971 (leg. 1964-herb. IASI)-Izvorul Muntelui (NT) [45].

Eruca vesicaria: arh.; intr.: ol.; habit.: h; orig.: Md; spread: VN.r, GL.sp, VS.sp, BC.s, IS.sp, BT.r; first mention: 1938-Aroneanu, Cristeşti (IS) [30].

Gleditsia triacanthos: neo; intr.: orn; habit.: h ; orig.: N America; spread: VN.sp, GL.sp, VS.sp, BC.r, NT.r, IS.sp, BT.sp; first mention: 1898-without locality (cult.) [15]; 1934-Iaşi (IS) [34].

Helianthus decapetalus: neo; intr.: orn; habit.: h, sn, n; orig.: N America; spread: VS.sp-la, BC.sp-la, NT.s, IS.s, BT.s; first mention: 1972-Măgura, Letea (BC) [24].

Helianthus tuberosus: neo; intr.: orn, fodd; habit.: h, sn, n; orig.: N America; spread: VS.r, BC.sp-la; NT.s, IS.r; first mention: 1841-Moldavia [38]; 1945-Cucuteni (IS) [41].

Impatiens glandulifera: neo; intr.: orn; habit.: h, sn, n; orig.: Asia-Himalaya; spread: VN.s, BC.r, NT.r, IS.s, SV.sp; first mention: 1972-Broşteni (SV), Comăneşti, Brusturoasa (BC) [24], Vama (SV) [28].

Kochia scoparia: arh.; intr.: brooms, orn; habit.: h; orig.: Asia; spread: VN.sp-la, GL.c, VS.sp-la, BC.r, NT.r, IS.sp-la, BT.r; first mention: 1841 (as *Chenopodium scoparia*) –Moldavia [38]; (1835) 1853-Moldavia [11]; 1938-Iaşi (IS) [30].

Lolium multiflorum: neo; intr.: fodd; habit.: h, sn; orig.: Md; spread: VN.r, VS.r, BC.r, NT.r, IS.r, BT.r, SV.sp; first mention: 1939-Slănic (BC), Neamț Monastery (NT) [32].

Lycium barbarum: neo; intr.: orn; habit.: h, sn; orig.: E Asia; spread: VN.c, GL.c, VS.c, BC.c, NT.c, IS.c, BT.c, SV.c; first mention: 1842-1848 (as *L. europaeum*)-Moldavia [16].

Medicago sativa: neo; intr.: fodd; habit.: h, sn, n; orig.: Asia; spread: VN.sp, GL.sp, VS.sp, BC.sp, NT.sp, IS.sp, BT.sp, SV.sp; first mention: 1841-Galați (GL) [38].

Medicago x varia: neo; intr.: fodd; habit.: h, sn, n; orig.: x; spread: VN.sp, GL.r, VS.s, BC.r, NT.sp, IS.sp, BT.sp, SV.r; first mention: (1835)1853 (as *M. media*)-Moldavia [11]; 1926- Nemțișor basin (NT) [5].

Melissa officinalis: arh.; intr.: med, mell, arom; habit.: h, sn, n; orig.: Md; spread: VN.r, GL.r, VS.r, BC.r, NT.r, IS.r, BT.r, SV.r; first mention: 1842-1848-Moldavia [16]; 1863-Focşani (VN), Bacău (BC), Neamț (NT) [9].

Morus alba: arh.; intr.: orn, alim, ser, ind; habit.: h, sn; orig.: E Asia; spread: VN.sp, GL.sp, VS.sp, BC.r, NT.r, IS.sp, BT.sp, SV.r; first mention: Edel (1835)1853-Moldavia [11]; 1841-Moldavia [38].

Panicum capillare: neo; intr.: orn, fodd; habit.: h; orig.: N America; spread: VN.r-la, GL.sp-la, VS.r-la, IS.r-la, SV.r; first mention: 1983-Socola (IS) [26].

Panicum miliaceum: arh.; intr.: alim, fodd; habit.: h; orig.: Asia; spread: VN.sp-la, GL.r, VS.s, BC.r, NT.r, IS.sp-la, BT.s; first mention: 1836-Moldavia (cult.) [8]; 1923-Războeni (NT) [31].

Parthenocissus inserta: neo; intr.: orn; habit.: h, sn; orig.: N America; spread: NT.r, IS.r; first mention: 2006-Iaşi (IS), Bicaz (NT) (inedit).

Parthenocissus quinquefolia: neo; intr.: orn; habit.: h, sn ; orig.: N America; spread: VN.s, IS.r; first mention: 1945-Miroslava (IS) [41].

Portulaca oleracea: arh.; intr.: alim (acc. ?); habit.: h; orig.: S Eur.; spread: VN.c, GL.c, VS.c, BC.c, NT.c, IS.c, BT.c, SV.c; first mention: (1835)1853-Moldavia [11]; 1842-1848-Moldavia [16].

Reynoutria japonica: neo; intr.: orn; habit.: h, sn, n; orig.: E Asia; spread: VN.s, BC.s, NT.sp, IS.r, SV.r; first mention: 1971 (leg.: 1969)-Lunca Bistricioarei (NT) [45].

Reynoutria x bohemica: neo; intr.: orn; habit.: h, sn, n; orig.: x (E Asia); spread: NT.r-la, IS.s; first mention: 2006-Broşteni, Galu (NT), Iaşi (IS) (inedit).

Robinia pseudacacia: neo; intr.: orn, forest, mell; habit.: h, sn; orig.: N America; spread: VN.c, GL.c, VS.c, NT.c, IS.c, BT.c, SV.c; first mention: (1835)1853-Moldavia [11]; 1836-Moldavia [8].

Setaria italica: arh.; intr.: fodd; habit.: h; orig.: Asia; orig.: W Asia; spread: VN.r, GL.sp, VS.sp, BC.r, IS.sp, BT.s, SV.r; first mention: 1836 (as *Pennisetum germanicum*)-Moldavia [8]; 1883-Adjud (VN) [3].

Solidago canadensis: neo; intr.: orn; habit.: h, sn; orig. N America; spread: VN.r, VS.r, BC.r, NT.r, IS.r-la, BT.r; first mention: 1898-Dragomireşti (NT) (cult.) [15].

Tanacetum parthenium: arh.; intr.: orn; habit.: h, sn; orig.: Md; spread: VN.r, GL.r, VS.sp, BC.sp, NT.s, IS.r, BT.r, SV.s; first mention: (1835)1853-Moldavia [11]; 1841-Moldavia [38].

Thladiantha dubia: neo; intr.: orn; habit.: h; orig.: NE Asia; spread: VS.r, BC.sp, NT.r, IS.r, BT.r, SV.s; first mention: 1947-Iaşi (IS) [42].

Trigonella caerulea: arh ?; intr.: fodd; habit.: h, sn, n; orig.: Md; spread: GL.r, VS.sp, BC.sp, NT.r, IS.sp-la, BT.s; first mention: (1835)1853 (as *Melilotus coerulea*)-Moldavia [11]; 1898-Bacău (BC) [15].

Vicia sativa subsp. ***sativa***: arh.; intr.: fodd; habit.: h, sn, n; orig.: Md; spread: VN.c, GL.c, VS.c, BC.c, NT.c, IS.c, BT.c, SV.c; first mention: 1836 (as *V. angustifolia*)-Moldavia [8]; 1883-Bârlad (VS), Ferăstrău, Verşeşti (BC) [3].

Other 26 species (15.4%) can be considered as naturalized ones, as they form stable populations without human aid, especially on the anthropic habitats, although they haven't shown till now a great capacity for expansion. Populations of these species are sometimes locally in abundance and if the future evolutions of genetic, ecologic and anthropic factors will be favorable to them, they can be considered as potential invasive ones: *Acorus calamus, Atriplex hortensis, Calendula officinalis, Callistephus chinensis, Cannabis sativa* subsp. *sativa, Chenopodium schraderianum, Commelina communis, Cosmos bipinnatus, Cymbalaria muralis, Dianthus barbatus* subsp. *barbatus, Dracocephalum moldavica*, *Elaeagnus angustifolia, Ipomoea purpurea, Juglans regia, Malva verticillata, Mentha spicata, Morus nigra, Oxybaphus nyctagineus, Phacelia tanacetifolia, Phalaris canariensis, Phytolacca americana, Polygonum aubertii, P. orientale, Prunus cerasifera, Saxifraga cymbalaria* var. *cymbalaria, Sinapis alba* subsp. *alba.*

Nevertheless, the most part of the hemerophytic flora (63.3%) is constituted by ***casual*** species, which have been cited, as sub-spontaneous ones, by different authors till now, only from few localities; their persistence on the anthropic or natural habitats someway still depends on human activity, either through the making or maintaining of some favorable conditions of substratum (ground disturbance and manuring) or through their continuous introduction into area (throwing wastes with seeds or vegetative organs; cultivation year by year, constant import of the seeds etc.).

In present, in our country there are very few restrictions regarding the import of plant species for culture. Our quarantine legislation mainly pursues pests, pathogens, as well as some weeds or weed seeds. There aren't any regulations concerning the valuation of invasion risk of a plant species before its introduction in culture, as a function of its biological, ecological and genetic features.

The introduction of exotics for varied uses into gardens, parks, crops, experimental plots etc., must get a problem of responsibility for horticultural, agricultural and sylvan institutions or enterprises, commercial firms, people or local communities which are implied in this process.

Otherwise, our satisfaction to admire the beauty of an exotic species at our place, or to profit by alimentary or medicinal qualities of the other, could turn against us through the damages caused by the invasive plants escaped from culture, regarding of the biodiversity, structure and function of natural or anthropic ecosystems and human activity.

A continuous monitoring of those species with tendency to escape from culture serves as an early warning system for prevention of new invasions; it may also indicate the immediate actions that need to be taken to eradicate certain species at an early stage, before they become established over a broad geographical area, or to control those species with a particularly invasive and aggressive character.

Conclusions

- Hemerophytic flora from Moldavia includes 169 vascular species, which are native especially from Mediterranean basin, Asia and America;
- Deliberately introduction of these species by man was made mostly for their ornamental value, but also for other uses (alimentary, medicinal, fodder, aromatic etc.), or to enrich some scientific or didactic collections;
- The most species (63.3%) are casually met as sub-spontaneous ones, but an important part of species (21.3%) are invasive in anthropic and natural habitats, they causing marked damages, and other 15.4% of them are naturalized ones, they being able to become invasive in short time if the future evolutions of genetic, ecologic and anthropic factors will be favorable to them;
- These data may represent an useful support in the rational management of the biological immigration and invasion in our country.

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