International periodic scientific journal
ONLINE
www.sworldjournal.com

SWORLD Journal

ISSN 2227-6920

Biology

Issue j116 (10)
Volume 01
May 2016

Published by:
Scientific world, Ltd.

With the support of:

Moscow State University of Railway Engineering (MIIT)
Odessa National Maritime University
Ukrainian National Academy of Railway Transport
State Research and Development Institute of the Merchant Marine of Ukraine (UkrNIIMF)
Institute for Entrepreneurship and morehozyaystva
Lugansk State Medical University
Kharkiv Medical Academy of Postgraduate Education
Alecu Russo State University of Bălţi
Institute of Water Problems and Land Reclamation of the National Academy of Agrarian Sciences

ISSN 2227-6920 (Online)

This volume contains research papers of scientists in the field of Biology.

Please use the following format to cite material from this book (*italics indicate the fields to change to your data*):

Author(s), 'Title of Paper," in SWorld Journal, Issue j116 (10), Vol.01 (Scientific world, Ivanovo, 2016) – URL: http://www.sworldjournal.com/e-journal/j11601.pdf (date:...) - *page - Article CID Number*.

Published by:
Scientific world, Ltd.
e-mail: orgcom@sworld.education
site: www.sworldjournal.com

Paper Numbering: Papers are published as they are submitted and meet publication criteria. A unique, consistent, permanent citation identifier (CID) number is assigned to each article at the time of the first publication.

J11601-001

Horshkova L.M., Koval L.V.

INTRODUCTION AND ACCLIMATIZATION OF PLANTS IN THE CONDITIONS OF NORTH-EASTERN REGION OF UKRAINE

Oleksandr Dovzhenko Hlukhiv national pedagogical university

Introduction. The history of introduction and acclimatization have more than 10 thousand years when humanity first began growing of species of plants in the conditions of human settlements. This difficult process of cultivation of an introduced plants lasts to our time, causing global both positive and negative changes in a social-geographical environment. In our time development the rural and the forest economy, green building, pharmaceutical industry is impossible to imagine without permanent introduction of new species, forms and sorts [6].

At the same time willful migration of plants, their acclimatization forbidden, as experiments with seeds or nursery transplants of plants can be accompanied by transference of causative agents of illnesses, insects-wreckers, overgrew weeds, that caused forming of new ecological complexes with the sharply impoverished flora, undermines agrarian economics and country on the whole [1, 4].

A definition for **introduction of plants** is totality of methods and receptions for the successful passing of process of adaptation to the new terms. An **introduced plant** is a species that is living outside of its native habitat.

A definition for **acclimatization** is an organism adjusting to a gradual change in temperature, ph, humidity, light and other abiotic factors [6].

Introduction and acclimatization of plants are in the conditions of north-eastern region of Ukraine investigated on the example of collection area of botanical garden of local value "Yampilskij".

Aim of work: on the basis of the complex analysis of flora of the collection area of botanical garden of local value "Yampilskij" to give a list of plant species for introduction to the culture in the conditions of north-eastern region of Ukraine.

Material and methods. Floristic research was executed with the field research route method and the complex of accepted methods of comparative floristry (taxonomical, biomorphological, geographical) [5, 7].

The north-eastern region of Ukraine is located near the boundary of forest and forest-steppe physic-geographic and vegetation zones. It is geographical position is within N 51^{o} 21′-51^{o} 59′ (North latitude), E 33^{o}10′-34^{o}15′ (East longitude) and belongs to Sumy region Yampil, Shostka, Seredino-Buda districts.

According to T. L. Andrienko (1977) this territory belongs to the Shostka geobotanical districts. The climate of the region is temperate-continental with average temperatures +18,5^{0}C in July and –7,5^{0}C in January. Precipitation is 625 mm/year. The soils are mainly gray and dark gray forest, sod-podzolic under broadleaf oak-maple-linden forests; sandy soils can be somewhere seen [2].

Results. According to our data the flora of the collection area includes 165 species of vascular plants belonging to 139 genera, 57 families (table 1).

Table 1.

Main proportions of the flora of the collection area of botanical garden

PHYLUM, class	Families		Genera		Species	
	No	%	No	%	No	%
PINOPHYTA	1	1,7	1	0,7	1	0,6
MAGNOLIOPHYTA Magnoliopsida	49	85,9	124	89,2	142	86
Liliopsida	7	12,2	14	10	22	13,3
Total	57	100	139	100	165	100

The leading families according to species richness are *Asteraceae* (20; 21,9%), *Lamiaceae* (15; 16,4%), *Liliaceae* (10; 10,9%), *Rosaceae* (9; 9,8%), *Brassicaceae* (7; 7,6%), *Solanaceae* (747,6%), *Ranunculaceae* (6; 6,5%), *Crassulaceae* (6; 6,5%), *Apiaceae* (6; 6,5%), *Geraniaceae* (5; 5,4%).

Generally they consist of 55, 5 % species and of 20,1 % genera. The leading genera according to species richness are *Geranium* (5; 17,8 %), *Physalis, Sedum* (4; 14,2%), *Salvia*, *Fritillaria, Tulipa* (3; 10,7%), *Rosa, Lilium, Nicotiana, Rhaphanus* (2; 7,1%) (table 2).

Table 2.

Leading families and genera of the collection area of botanical garden

Families	species	%	Genera	species	%
Asteraceae	20	21,9	*Geranium*	5	17,8
Lamiaceae	15	16,4	*Physalis*	4	14,2
Liliaceae	10	10,9	*Sedum*	4	14,2
Rosaceae	9	9,8	*Salvia*	3	10,7
Brassicaceae	7	7,6	*Fritillaria*	3	10,7
Solanaceae	7	7,6	*Tulipa*	3	10,7
Ranunculaceae	6	6,5	*Rosa*	2	7,1
Crassulaceae	6	6,5	*Lilium*	2	7,1
Apiaceae	6	6,5	*Nicotiana*	2	7,1
Geraniaceae	5	5,4	*Rhaphanus*	2	7,1
Total	91	100		28	100

After composition of leading families the flora of collection area is close to floras of Mediterranean (high rank of *Lamiaceae, Liliaceae*), and also South America (high rank of *Solanaceae*).

After belonging to the certain climatic terms is close to arid areas and desert (high rank of *Crassulaceae, Apiaceae, Brassicaceae*).

Simultaneously with that, the high rank of families of *Asteraceae, Ranunculaceae* specifies on belonging of considerable part of species for Holarctic Regiontemperate zone

In the spectrum of the biomorphological structure in studied flora the most of plants is herbaceous – 138 species (83,63%). Among them the herbaceous polycarps make up 88 (53%), monocarps – 34 (21%), biennial monocarps – 16 (10%). Other forms are trees – 4 (2 %), shrubs – 15 (9 %), bushs and half-bushs – 8 (5 %).

According to Raunkiaer's forms in the flora of the collection area hemicryptophytes prevail – 80 (48%), other forms have: phanerophytes – 13 (8%), chamaephytes – 25 (2,71 %), geophytes – (27; 16 %), hydrophytes – 1 (0,6%), terophytes – 37 (22 %).

It testifies to the favourable terms of cultivation of plants that take place from territories with a temperate climate.

The introduction flora of the collection area varies of origin. According to results of the basis of studied flora is comprised by the species of different physic-geographic and vegetation zones of Ukraine (97; 59%). Thus, for example, **Carpathians** (*Echinops ritro* L., *Dorycnium phaeum* L.), **Crimea (***Dorycnium herbaceum* Vill., *Geranium purpureum* Vill.), **Steppe (***Mentha micrantha* Litv., *Stachys angustifolia* Bieb.), **Polesye (***Thymus serpyllum* L., *Ajuga reptans* L.).

The species of **Mediterranean** origin consists 16 species;10% (*Majorana hortensis* Moench., *Lavandula angustifolia* Mill.); **North America** – 12; 7% (*Echinacea purpurea* L., *Solidago graminifolia* L.); **South America** – 8; 5% (*Cucurbita moschata* Duch., *Portulaca grandiflora* Hook.).

For 4 species; 2% present the groups of plants of the **Asian** origin (*Perilla frutescens* L.), **Europa (***Lunaria annua* L)., **China (***Rheum palmatum* L.). Iran: 3 species, 2% **(***Anethum graveolens* L.). Groups are with an origin from **Brasil (***Arachis hypodaea* L.), **Japan (***Physalis pubescens* L.) and **Eurasia (***Pastinaca sativa* L.) had for 2 species (1%). On 1 species (0,6%) present **Altai (***Bergenia crassifolia* L.), **India** (*Impatiens balsamina* L.), **Caucasus** (*Sedum spurium* Bieb.), **Mexica** (*Nicotiana rustica* L.). For the 7 species; 4% an origin is not set.

Thus, in the collection area are present plants almost from all regions of earth.

For the analysis of the practical using of plants following groups represented: plants that lie on the surface of soil, floral-decorative plants, medical plants, plants of radioprotection action, exotic plants, rare plants.

Plants that lie on the surface of soil – undersized, widespread plants, that serve for creation of plots of land, look like living carpets in landscape: *Sedum spurium* Bieb., *S. ruprechtii* Omelcz., *S. annuum* L., *S. acre* L., *Phlox drummondii* Hook., *P. paniculata* L., *Leontopodium alpinum* Cass., *Calluna vulgaris* L., *Myosotis caespitosa* K., *Aegopodium podagraria* L., *Thymus serpyllum* L., *Sempervivum tectorum L., S. ruthenicum* Lehm., *Adonis vernalis* L., *Saxifraga stellaris* L., *S. paniculata* Mill., *Helianthemum canum* L., *Iberis amara* L., *Draba sibirica* Pall., *Cyclamen europaeum* L., *Arabis pendula* L., *Ajuga reptans* L.

Floral-decorative plants – species that is used in a floral-decorative production: *Gaillardia pulchella* Foug., *Rosa rubrifolia* Vill., *R. pygmaea* Bieb., *R. minimalis* Chrshan., *Petunia hybrid* hort., *Clematis recta* L., *Chrysanthemum coronarium* L.,

Hosta lancifolia Engl., *Lychnis chalcedonica* L., *Dianthus deltoides* L., *L. condidum* L., *Heuchera sanguine* Engelm., *Statice Limonium bonduellii* Lest, *Statice Limonium sinuatum* (L.) Mill., *Malva silvestris* L., *G. hybridus* Hort., *Tulipa biflora* Pall., *T. quercetorum* Klok., *Narcissus pseudonarsissus* L., *N. poeticus* L., *Achillea collina* J. Becker, *Tanacetum millefolium* L. and other.

Medical plants – a wide group of species, organs or parts of that are raw material for the receipt of facilities that is used in folk, medical or veterinary practice in curative or prophylactic aims: *Digitalis lanata* Ehrh., *Althaea officinalis* L., *Betonica officinalis* L., *Oenothera biennis* L.., *Dracocephalum thymiflorum* L., *Phytolacca americana* L., *Lavandula angustifolia* Mill., *Scutellaria galericulata* L., *Salvia splendens* Ker., *Salvia officinalis* L., *Agrimonia eupatoria* L., *Polemonium caeruleum* L., *Mentha micrantha* Litv., *Melissa officinalis* L., *Silybum marianum* L., *Saponaria officinalis* L., *Malva moschata* L., *Aconitum odontandrum* Wissiuj., *Cynoglossum officinale* L., *Symphytum officinale* L., *Sanquisorba officinalis* L., *Primula veris* L., *Origanum vulgare* L., *Acorus calamus* L., *Calendula officinalis* L., *Alchemilla vulgaris* L., *Nepeta cataria* L., *Cichorium endivia* L., *Rhodococcum vitis-idaea* L., *Calluna vulgaris* L., *Chelidonium majus* L. and other.

Plants of radioprotection action – species that is used for the leadingout of radionuclides from the organism of man: *Althaea officinalis* L., *Melissa officinalis* L., *Bergenia crassifolia* L., *Ocimum basilicum* L., *Calendula officinalis* L., *Inula helenium* L., *Hyssopus officinalis* L., *Potentilla erecta* L., *Radiola linoides* Roth., *Oenothera biennis* L., *Echinacea purpurea* L., *Rheum palmatum* L., *Silybum marianum* L., *Ruta hortensis* Mill., *Carum carvi* L., *Majorana hortensis* Moench., *Origanum vulgare* L. and other.

Exotic plants – species from other regions of earth, that is used with the aim of optimization of way of life: *Thladiantha dubia* Bunge, *Macleaya cordata* Willd., *Vitex agnus-castus* L., *Duchesnea indica* Andr., *Amaranthus hypochondriacus* L., *Cyperus esculentus* L., *Luffa cylindrica* (L.) M. G. Roem., *Stachys lanata* Jacq.

Rare plants – species threatened with destruction as a result of human activity impact. Species from the list of guard of plants of the Sumy region: *Valeriana rossica* P., *Tulipa schrenkii* Regel, *Gladiolus imbricatus* L., *Lilium martogon* L., *Clematis recta* L., *Polemonium caeruleum* L., *Inula helenium* L. [3].

The botanical garden of local value "Yampilskij" conducts great activity for distribution of cultural species of plants with economic-valuable signs on the walks of life of north-eastern part of Ukraine.

Conclusions

1. The inventorization of plant species of the collection area of the botanical garden of local value "Yampilskij" was produced.

2. Accoding to taxonomic structure the flora of collection area is similar to the flora of Mediterranean, South America. At the same time, high level of *Asteraceae, Ranunculaceae* specifies on belonging of considerable part of species to Holarctic Regiontemperate zone.

3. The biomorphological structure is rather typical of the regional floras of Holarctic Regiontemperate zone. In the spectrum of life forms prevail herbaceous polycarps over other forms and hemycryptophytes over other forms. The increasing

of level of cryptophytes specifies on the presence in the flora of representatives of subtropical territories.

4. The geographical analysis testifies that in the collection area grow plants almost from all regions of earth. It specifies to considerable potential of region for cultivation an introduced plants.

5. The groups of plant species with different economic-valuable signs were selected: plants that lie on the surface of soil, floral-decorative, medical, plants of radioprotector action, exotic and rare plants.

Acknowledgements. We would like to express our deep gratitude to the methodologist of the botanical garden of local value "Yampilskij" Anna Vladimirovna Apenko for the opportunity to carry out our research and her consultations.

References

1. Abbot R.J. Plant invasions, interspecific hybridization and the evolution of new plant taxa / R.J. Abbot // Trends in Ecology and Evolution. – 1992. – Vol. 7. – P. 401 – 405.

2. Andrienko T.L. Geobotanichne raionuvannia Ukrainskoyi RSR (Geobotanical zonning of Ukrainian RSR) / T.L. Andrienko (ed.) – Kyiv, Naukova Dumka; 1977. – 302 pp.,.

3. Andrienko T.L. Zapovidni scarby Sumschyny/ T.L. Andrienko (ed.) – Sumy: 2001, – 207 p.

4. Falinski J.B. Invasive alien plants and vegetation dynamics / 4-th International conference on the ecology of invasive alien plants. Abstract Book. – (Berlin, 1-4 Oktober, 1997) / Falinski J.B. – Berlin, 1997. – P.16.

5. Raunkiaer C. Life formas of plants and statistical plant geography / C. Raunkiaer – New York; London, 1934. – 352 p.

6. Sikura J.J. Introduction of plants / J.J. Sikura, V.V. Kapustian – Kyiv: Phytosociocentr – 2003. – 280 c.

7. Schmidt V.M. Mathematical methods in botany / V.M. Schmidt – L.: 1984. – 285 p.

J11601-002

[1]Nesterova N.G., [2]Voytsekhyvskaya O.V.

ESTIMATION OF STRESS-SUSTAINABILITY OF WOODY PLANT SPECIES TO HIGH TEMPERATURES AND DROUGHT

[1]National university of life and environmental sciences of Ukraine, Kiev
[2]Taras Shevchenko National University of Kyiv, Kiev

Abstract. Determined in cancellation of leaf apparatus of woody plant species under conditions of transition zone control for street plantings. Established oscillatory nature of damaged leaves of woody plant species by high temperatures and drought. As promising for growing metropolis in the city Kiev were recommended such plants as P. nigra, A. carnea and R. pseudoacacia.

Key words: high temperature, drought resistance, adaptation, woody plant species.

Introduction. Stress effect of high temperatures induces dehydration and drying, the appearance of burns, disruption of chlorophyll synthesis, respiration, thermal denaturation of proteins, coagulation of cytoplasm and death of plants [2, 7]. By action of atmospheric and soil drought there is significant growth retardation and massive damage of the leaves [5]. Drought resistance is the ability of plants to endure significant water deficit conditions by maintaining a high water potential of tissues and functional stability of cellular structures [4, 6]. With this in mind, the main goal of our work was to determine the extent of damage of woody species by high temperatures and drought in different environmental conditions of growth.

Selecting of ecological conditions of growth performed according to the methods [1]. The objects of the research were served woody plant species (7 − 10 individuals each species) 30-40 years of age, that are the most common in street and park plantings in the city Kyiv, including *Aesculus hippocastanum* L., *Aesculus pavia* L., *Tilia cordata* L., *Tilia platyphyllos* Scop., *Acer platanoides* L., *Acer saccharinum* L., *Quercus robur* L., *Populus nigra* L., *Fraxinus excelsior* L., *Robinia pseudoacacia* L. and *Betula pendula* Roth. As the control were selected conventionally clean zone № 1 − Botanic Garden of NULES of Ukraine; № 2 − Golosiivskyi and Mariinsky Parks of Kyiv and Botanical Garden of Acad. O. Fomin Taras Shevchenko National University of Kyiv and № 3 − street green plantations near to motorways with heavy traffic (Chervonoarmiyska and Gorkogo streets, 40th of Jovtnja street and Nauky Ave.).

For researching morphological parameters were selected five formed undamaged leaves from the south-east side of woody plant species in 9 − 10 hours p.m. Their resistance to high temperatures and drought were determined by the method of visual assessment of leaves damaging by a five-point scale [8]. Results of researches have been processed by statistical methods and applications using *MS Excel* 2003 [3].

It was found that the interaction of woody plants with atmospheric air mostly provided through the total area of leaves, which amounts 4-7 m^2 per 1 kg wet weight Therefore, the size and area of leaf surfaces play a significant role in the assimilation

of light energy and organic and mineral substances. Researches have shown the dynamic indexes of total area of leaves apparatus in plants in different ecological zones. In the experiments, the total area of leaves apparatus in woody species decreased from zone № 1 (control) to № 2, whereas the lowest values of leaves area were typical for street planting area № 3.

Were found the differences of leaves apparatus of woody plant species in different ecological zones. Thus, the most significant decrease in the total area of leaves was registered in *A. hippocastanum* (zone № 1 − 691 cm^2, № 3 − 444 cm^2) and *A. platanoides* (589 cm^2 to 459 cm^2). However, a significant decrease in the surface area of leaves apparatus was detected for woody plant species, the surface area of leaves in the control zone № 1 was higher in comparison with other species. With the transition from the park area № 2 to control zone № 1, the total leaf area was increased and in street plantings – decreased (tabl. 1).

1. Area puff device woody plant species in ecological zones increase number 1, 2 and 3 cm^2

Types of trees	Leaf blade		
	№ 1	№ 2	№ 3
A. hippocastanum	691,3±4,7	554,2±7,8	443,8±6,1
A. carnea	502,5±6,5	466,3±3,2	404,0±7,0
A. saccharum	584,9±3,4	508,6±4,3	477,1±4,0
A. platanoides	589,2±2,8	513,9±6,5	458,7±4,6
T. platyphyllos	311,6±5,5	278,5±5,8	221,0±2,5
T. cordata	270,9±3,1	227,1±2,8	201,4±3,0
P. nigra	241,4±1,2	198,4±3,0	168,5±6,4
B. pendula	122,1±1,4	113,7±2,5	104,7±1,3
Q. robur	277,1±6,8	236,8±3,6	199,3±1,2
F. excelsior	264,1±4,8	215,3±2,8	176,3±5,7
R. pseudoacacia	102,4±1,7	90,5±3,1	78,3±3,7

Were determined that at high temperatures and drought occur dehydration, drying, offensive of burns, death and reducing of the total surface of leaves of woody species of plants. Various anomalies were specific for each species and depended to a large extent on the characteristics of environmental conditions of their growth. Thus, plants of *P. nigra* were more resistant to high temperatures and drought that in urban street plantings (zone № 3) had an average score of damage 3, and in the park area − 2. In control plants of *P. nigra* there is not exposed an essential thermal damage and burns, which were at 1 point. Plants of *A. carnea* are also proved to be relatively resistant to high temperatures and drought, irrespective of growing conditions. The degree of damage, which practically unchanged: control plantings had 1 point, and in the park and street plantings − 2. Plants of *A. platanoídes* were extremely susceptible to high temperatures, in which in control (zone № 1) nearly half (48 %) were found

with damaged crown, and in street plantings − 90 %. Level of damage in the control zone № 1 was 3 points, urban zone − 5 points.

However, plants of *A. saccharinum* marked a greater degree of resistance to high temperature than *A. platanoides.* Level of crown damage of *A. saccharinum* in urban street plantings averaged 4 points, park zone and the control − 2. Plants of *B. pendula* in the ecological conditions of growth were most sensitive to a long absence of a rainfall and high temperatures of air. In control zone by the scale of damage they had 3 points, and in the park area and street plantings – 5 (tabl. 2).

2. Viability of woody plant species in ecological zones increase number 1, 2 and 3 points

Types of trees	№ 1	№ 2	№ 3
A. hippocastanum	4	5	5
A. carnea	1	2	2
T. platyphyllos	1	3	5
T. cordata	1	3	5
A. platanoides	3	3	5
A. saccharum	2	2	4
P. nigra	1	2	3
Q. robur	2	4	5
B. pendula	3	5	5
F. excelsior	2	4	4
R. pseudoacacia	1	2	2

Were examined the dynamics of physiological response of *Q. robur* plants to high temperature and drought. Thus, in the control area damage by high temperature and thermal burns were fixed in 30 %, which corresponds to 2 points. However, in the areas of № 2 and № 3 plants of *Q. robur* resistance to high temperatures and drought depends on habitat conditions. In the park zone and the Botanical Garden of Acad. O. Fomin Taras Shevchenko National University of Kyiv woody species had 4 points of damage. In harsher ecological conditions of growth (street plantings), they are also had a similar point of damage, and in some cases − even 5.

The vast majority of *A. hippocastanum* have been very strongly damaged by high temperature and drought (5 points), and they are less adaptable to changing conditions of existence. It is shown that in the control plantings this indicator was 4 points, and in urban areas 95 % of woody plant species were with dried leaves and withered crown.

Conclusion. The total area of leaves of woody plant species under the conditions of transition from the control zone to the park zone − grows, but in street plantings − decreases. Woody plant species differ significantly in level damage of leaves by high temperatures and drought. Plants of *R. pseudoacacia* by high air temperatures were poorly damaged. The intermediate level of damage was observed in plants of *A. saccharinum and F. excelsior.* High level of damage to the heat and

drought in urban areas were plants of *T. cordata* and *T. platyphyllos*; very strong − *B. pendula, A. platanoides and A. hippocastanum*. Thus, in green construction we recommended to use plants of *P. nigra, A. carnea and R. pseudoacacia,* that characterized by a high degree of resistance to high temperatures and drought.

References:

1. *Bulygyn N.E.* Fenologycheskye nabljudenyja za drevesnymy rastenyjamy. ─ L.: LTA. 1979. ─ 96 s.

2. *Genkel' P.A.* Fyzyologyja zharo- y zasuhoustojchyvosty rastenyj. – M.: Nauka. 1982. – 280 s.

3. *Dospehov B.A.* Metodyka polevogo opyta. − M.: Kolos. 1973 − 336 s.

4. *Gnativ P.S.* Girkokashtan zvychajnyj u L'vovi i pytannja jogo ekologichnoi' stijkosti u mis'kyh nasadzhennjah // Nauk. zap. Derzh. krajeznavch. muzeju. - L'viv. 2007. - Vyp. 23. - S. 75-84

5. *Emel'janov L.G.,* Ankud S.A. Vodoobmen y stress-ustojchyvost' rastenyj. – Mynsk: Nauka y tehnyka. 1992. – 144 s.

6. *Loseva A.S.,* Petrov-Spyrydonov A.E.Ustojchyvost' rastenyj k neblagopryjatnym faktoram sredy. – M.: MSHA. 1988. – 42 s.

7. *Mjullenajzen B.* Syndrom stressa. Kazan': KGU. 1993. – 135 s.

8. *Pjatnyckyj S.S.* Praktykum po lesnoj selekcyy. M.: Sel'hoz. lyt., zhurn. y plakatov. 1961. − 148 s.

Article sent by 29.03.2016

CONTENTS