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DETERMINATION OF THE CONTENT HEAVY METALS IN OF INTRODUCED TREE STAND OF ASTANA CITY

Abstract

Nowadays, the importance of determining the numericalvaluation of environmental and genetic structure of populations of woody tree species in dealing with the introduction, without any doubt, is recognized by many researchers. The growing numbers of works associated with the introduction, examination of geographic cultures focused on the study of interspecific, inter- and intrapopulation, subpopulation genetic structure of quantitative and qualitative attributes which are important for forestry production and industrial wood processing.

Key words: heavy metals, caraganaarborescens, introduced.

Introduction

An introduction is a transfer of plants from one region to the region where they were missing with the use of impactmethods to the nature. The possibility of introduced plants to acclimate was pointed out by many researchers [1,2]. However, the naturalization (the transfer of plants to the similar habitats) was more recognized for a long time, which also denies the ability of the plant to adapt to the new conditions .

In 1868, at the initiative of the nobility, the local intelligentsia, amateur gardenersfrom Voronezh, Kharkov, Penza province, as well as Nicholas Botanical Garden,plants, which are several varieties of apple, grape, lilac, oak, marpleplatanoides, mountain ash, horse chestnut , quince, ailanthus, Japanese acacia,were brought. It was the spontaneous introduction. In 1868,Vernenskaya Grove was established by order of the GeneralGovernorKolpakovsky and the scientist and forester E.O. Baum. By 1879 it had an area of 152 acres, including a forest nursery. In 1871,the seeds of pine and larch were produced, and, in 1874,seeds of white and yellow acacia, hawthorn, ash, mulberry were experimentally planted. In the same year, Moscow received seeds of Pinuspinaster, P.peuce, P. strobus, P. cembra, Thujaoccidentalis, Juniperusvirginiana [3,4,5,6].

Climatic conditions

Factors and ecological conditions of soil formation and landscape environment. The geographical position of Astana is led by the severity of extreme continental climate and its instability. Winter is cold and long with a steady snowing. Summer is relatively short, but hot with low precipitation and strong evaporation. Sharp continental climate is due to the remoteness of the area from major water ponds and the closeness to the desert and semi-desert areas of Central Asia and the polar regions of Siberia.

Material and methods

Basic methods of introduction and acclimatization of plants

After studying the flora of Central America (1799-1804) A. Humboldt drew attention to the relationship between the distribution of plants and climatic conditions. He was the first topoint out that the acclimatization of plants should take into account not just the average temperature but the amount of temperature above 0 ° C during the growing season. For successful acclimatization it should not be less than it was at home conditions. Humboldt paid attention to other climatic factors of habitats of plants, such as average temperature, humidity, pressure and air transparency. He believed that these factors would affect the distribution of plants. In this regard, he suggested the vertical and horizontal zonation of vegetation. Humboldt proposed the method of gradual acclimatization of plants, later called the step acclimatization, which is moving plants from one climate to another, by growing them at intermediate stations [7,9,10].

Results and discussion

Evaluation of introduced species on biomorphological parameters of leaf blades

Plants growing in a large city are influenced by many different factors. It is especially painful for plants to tolerate exposure to man-made factors, an essential condition of civilization. Conditions of the natural habitat of plants are radically different from those of the city.

The plants which weregrown at the best environments adapt and often survive in extreme conditions by changing not only the biological and physiological processes, but biological and morphological parameters, the anatomical structure that is reflected in the change of habitus, shape and size of the leaf blades, fruit, etc.

The length of the leaf blades The length of the leaf blades is the main parameter which determines their size and shape. We studied the length of the leaf blades of 13 species of plants which were growing at three test sites. Research and statistics of materials are given in Tables 1, 2, 3. The value of the error in mean showsrelatively narrow confidence limits, which indicatesa highly accurate obtained value. The arithmetic means was calculated as a criterion for evaluation of the entire group of plants.

On the first test site, all plants formed a complete leaf blade except Acer ginnala, on the second site - all the plants, and the third section - Juglansmandshurica and Saraganaarborescens did not form leaf blades. Length of the leaf blades ofFraxinus excelsior L., which was planted on the test sites, varies within the following limits: 1test site - 66.90 mm, 2 test site - 71.27 mm, 3 site - 86.00 mm. Populussimonii had the longest leaves on the first test site - 55.83 mm.

Prunusdivaricata, Salix babilonica, Saraganaarborescens, Populussimonii, Radusaviumare the leaders on the length of the leaf blades of the first test site.

Ranking the objects of study according to the length of leaves revealed the plants which had maximum value: Amorphafruticosa, Phellodendronamurense, Gleditsiatriacanthos, Acer ginnala, Mahoniaaquifolia, Juglansmandshurica, Forsythia xintermedia Zabel . According to the arithmetic meandata they formed the longest leaves on the second site.

Only one type of test plant has the highest value of the length of the leaves in all three areas - a Fraxinus excelsior L. The weak development of the parameters of the leaf blades on the third experimentall site is most likely connected with the relative rigidity of the environment in this area of research. All three sites are located in the parks, recreation areas; ecofactor complex and mainly watering had a positive effect on the development and status of the leaf blades, which is reflected on the length in this case.

Percentage ratio of the number of plants with a maximum length of leaf blades on test site: 1 test site (5 of 12 plants with formed leaves) - 41.67%, 2 test site (7 of 13 plants with formed leaves) - 53.85%, 3 test site (1 of 11 plants with formed leaves) - 9.09%. Plants which were planted on the 1 test site (located in the park near the Presidential Park near Palace of Peace and Reconciliation) and the second test site (located in the park near the shopping and entertainment center "Khan Shatyr") even by visual inspection showed a better rate.

It is important to mention the differences of maximum and minimum average of leaf length in Phellodendronamurense between sites. The first site’s leaf length is 75.57 mm, the second’s - 84.23 mm, the length of the leaves of the third portion is 48.63 mm. The range of variation is observed at the level of 35.60 mm. In Salix babilonica the limit of variability of arithmetic mean is equal to 38.34 mm, in Forsythia xintermediaZabel - 22,20 mm.

The trait variability scale according to S.A.Mamaeva levels is estimated by the values of the coefficients of variation and refers to the low, medium and upper level. On the first test site the medium level of variation is dominated - 6 of 12 cases (one kind of plant has not formed leaves - Acer ginnala). According to the second site results 7 plants have the low level of variation, 5 plants – the medium level, the upper level - 1 plant. In the third site there were 4 cases of low level variation, 5 cases of medium variation and 2 cases of upper variation of the 11 plants which have formed leaves.

Table 1 – Length and width of the leaf blades of inducted woody plants on the 1 test site

№	Name of woody plant species	Arithmetic mean M±m, мм	Variabilityindex, Cy, %	Testaccuracy, P, %	Limits	
					min	max
1	Caraganaarborescens (f. pendula)	20,80±0,65 10,03 ± 0,26	17,08 14,44	3,12 2,64	14 7	25 13
2	Prunusdivaricata	34,13±1,59 14,87 ± 0,70	25,58 25,86	4,67 4,72	20 10	50 22
3	Amorphafruticosa	22,80±0,91 9,83 ± 0,45	21,85 25,20	3,99 4,60	11 7	30 13
4	Phellodendronamurense	75,57±2,20 32,73±0,70	15,96 11,72	2,91 2,14	60 27	102 40
5	Gleditsiatriacanthos	28,33±1,17 11,57±0,34	22,66 15,89	4,14 2,90	15 8	36 14
6	Salixbabilonica	88,17±4,18 10,77±0,50	25,95 25,34	4,75 4,63	55 8	145 18
7	Acerginnala	- -	- -	- -	- -	- -
8	Mahoniaaquifolia	42,10±0,87 21,70±0,77	11,31 19,52	2,07 3,56	35 15	52,0 30,0
9	Juglansmandshurica	49,20±1,09 25,30±065	12,17 14,15	2,22 2,58	41 19	63,0 32
10	Populussimonii	55,83±2,08 34,00±1,38	20,43 22,23	3,7 4,08	29 21	75 47
11	ForsythiaxintermediaZabel	39,37±1,57 20,50±0,80	21,05 21,29	3,84 3,89	20 10	49 25
12	Padusavium	59,43±1,63 32,13 ± 0,48	14,93 8,26	2,74 1,51	46 29	74 37
13	Fraxinusexcelsior L.	66,90±1,69 18,43 ± 0,69	13,81 20,38	2,52 3,72	50 14	80 25

Table2 – Length and width of the leaf blades of inducted woody plants on the 2 test site

№	Name of woody plant species	Arithmetic mean M±m, мм	Variabilityindex, Cy, %	Testaccuracy, P, %	Limits	
					min	max
1	Caraganaarborescens	16,10 ± 0,64 8,37 ± 0,13	21,66 8,44	3,95 1,54	10 7	21 9
2	Prunusdivaricata	33,07 ± 1,20 13,40 ± 0,63	19,92 25,75	3,64 4,70	21 8	43 20
3	Amorphafruticosa	28,63 ± 0,57	10,91 13,31	1,99 2,06	23 9	33 13

		10,93 ± 0,23				
4	Phellodendronamurense	84,23±1,53 35,17±0,83	9,95 12,97	1,82 2,37	73 31	100 45
5	Gleditsiatriacanthos	36,97±1,59 13,43±0,49	23,53 19,95	4,30 3,64	24 10	57 18,0
6	Salixbabilonica	79,27±3,95 9,87±0,42	27,32 23,22	4,99 4,24	50 6	108,0 13
7	Acerginnala	44,70±0,98 39,93±1,07	11,98 14,69	2,19 2,68	37 27	54 47
8	Mahoniaaquifolia	44,53±0,92 27,10±0,75	11,28 15,20	2,06 2,77	37 20	52 34
9	Juglansmandshurica	51,17±1,38 28,40±0,85	14,74 16,43	2,69 3,00	39 15	65 36,0
10	Populussimonii	51,37±1,61 33,00±1,14	17,18 18,91	3,14 3,45	35 20	65 42
11	ForsythiaxintermediaZabel	62,07±2,62 31,57±1,28	23,13 22,26	4,22 4,06	33 9	84 42,0
12	Padusavium	52,10±0,96 31,93±0,90	10,12 15,45	1,85 2,82	45 25	60 40
13	Fraxinusexcelsior L.	71,27 ± 1,44 21,87±0,87	11,10 21,89	2,03 4,00	58 14	82 36

Table 3 – Length and width of the leaf blades of inducted woody plants on the 3 test site

№	Name of woody plant species	Arithmetic mean M±m, мм	Variability index, Cy, %	Testaccuracy, P, %	Limits	
					min	max
1	Caraganaarborescens (f. pendula)	- -	- -	- -	- -	- -
2	Prunusdivaricata	30,53 ± 1,10 12,93 ± 0,55	19,79 23,19	3,61 4,23	20 8	39 18
3	Amorphafruticosa	24,03±1,10 9,53 ± 0,45	24,98 25,80	4,56 4,71	15 5	30 16
4	Phellodendronamurense	48,63±2,16 25,70±1,18	24,30 25,10	4,44 4,58	29 16	65 38
5	Gleditsiatriacanthos	22,50 ± 1,06 11,27±0,53	25,83 25,72	4,72 4,70	13 5	31 15
6	Salixbabilonica	49,83 ± 2,37 6,47±0,22	26,03 18,61	4,75 3,40	30 5	66 8
7	Acerginnala	31,77 ± 0,82 25,10±0,73	14,09 15,85	2,57 2,89	25 20	41 33
8	Mahoniaaquifolia	36,47 ± 0,88 18,97±0,55	13,17 15,96	2,40 2,91	29 15	44 24
9	Juglansmandshurica	- -	- -	- -	- -	- -
10	Populussimonii	44,90 ± 1,64 24,37±0,69	19,98 15,55	3,65 2,84	30 17	60 30

11	ForsythiaxintermediaZabel	61,57 ± 0,96 33,17±1,31	8,57 21,60	1,56 3,94	53 27	70 59
12	Padusavium	53,90 ± 2,15 30,23±1,43	21,82 25,90	3,98 4,73	32 15	70 41
13	Fraxinusexcelsior L.	86,00 ± 1,60 30,73±0,46	10,17 8,23	1,86 1,50	73 25	104 35

Accuracy of the experiment, which shows the correct formulation and implementation of research in all cases, is within an acceptable range and does not exceed 5%. Maximum and minimum limits, which are the limits can vary within wide range, determines the data indicated in the tables of arithmetic means of 13 kinds of plants.

The width of the leaves. As well as the length, width of the leaves is the main parameter that creates the appearance of plants, reflecting in its shape and area (Table 1, 2, 3). Leaf width determines its elasticity and promotes opposition to external influence of the nature. During the dry season the leaves of some plants fold their edges, thereby reducing the exposure to the sun and minimizing the rate of evaporation while increasing water-holding capacity. The width of the leaves is a regulatory mechanism and has great practical significance.

Depending on the site the width leaves of Prunusdivaricata varies within the following limits: 1 site - 14.87 mm, 2 site - 13.40 mm, 3 site - 12.93 mm. Fraxinus excelsior L. has the widest leaves formed on the third section - 30.73 mm.

Leading positionsaccording to the length of the leaf blades of the first test siteare occupied by Saraganaarborescens, Prunusdivaricata, Salix babilonica, Populussimonii, Radusavium.

The highest values of the arithmetic means of the width of the second site of leaves belong toAmorphafruticosa, Phellodendronamurense, Gleditsiatriacanthos, Acer ginnala, Mahoniaaquifolia, Juglansmandshurica.

In the third site, only two species, a Fraxinus excelsior L. and Forsythia xintermediaZabel, have a predominance of the width of the leaf blade.

Percentage ratio of the number of plants with a maximum length of leaf blades on the first site is 38.47%, in the second site - 46.16%, and the third site - 18.19%.

The average level of variation coefficients dominates on the first and third sitesin 8 cases.The width of the leaf blades of the studied plants have a low, medium and upper level of variability, measured by the values of the variation coefficients according to the scale of variability. On the first site the medium level of variationis 5 cases out of 12, a low level - 4 cases out of 12, an upper level is 3 out of 12 cases (Acer ginnala has not formed leaves). According to the second site results 5 plants have the low level of variability, 8 plants - theaverage level, and no plants have an upper level. In the third site, 2 types of experimental plants did not form leaves (Saraganaarborescens, Juglansmandshurica), 1 case with low level of variation, 8 cases of medium variation and 3 cases of upper variation. Limits vary widely.

Accuracy of the experiment in all cases is less than 5% level, which indicates the high accuracy of the experiments.

From the tables and visual observations we can say that the subjects are characterized by linear parameters of the leaf blades. The wide range of studied plants is characterized by a high degree of environmental heterogeneity. Differences were found in all areas which are mostly characterized as significant within the same type ofplanting. However, significant differences were found among species growing on different sites. Relatively favorable conditions for planting in the park area, which is protected from the negative effects of transport and other human impact, had a positive effect on the growth and development of plants, in general, and on the change in individual organs, in particular.

Conclusion

The following conclusionscan be made based on performed studies:

1. Analysis of the current range of Astana woody plants and forest nursery JSC "Astana Zelenstroy" indicates lack of species diversity. The identified lack admits introduction events in Astana. Based on the study of biological characteristics of woody and shrubby plants,anassortment of 50 woody species can be used in landscaping Astana was formed.

2. Test landings of 13 of 50 species of woody plant introductionswereconductedin Astana. Plants imported from the JSC "Forest Nursery"ofAlmaty region located 53 km east of Almaty. Pilot group of plantswas planted on three experimental sites: *Caragana arborescens (f. pendula); Prunus divaricate; Amorpha fruticosa; Phellodendron amurense;Gleditsia triacanthos; Salix babilonica; Acer ginnala; Mahonia aquifolia; Juglans mandshurica; Populus simonii; Forsythia x intermedia Zabel; Padus avium; Fraxinus excelsior L.*

The separation of plants for three sites will allow for further full comparative observations of introduced plants growth and development.

The greatest impact of the complex environmental factors were felt by plants of the third test site, which are reflected in the linear parameters of the studied plants.

Thus, we can conclude that the plants which were planted in the environmental sections produce the leaf blades differentiated by the linear parameters. Considering the uniformity of the studied plants we can say that the identified differences in the experiments are strongly influenced by environmental conditions.

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АСТАНА ҚАЛАСЫНДАҒЫ ИНТРОДУЦИЯЛАНҒАН АҒАШТАРДА АУЫР МЕТАЛДАРДЫҢ ЖИНАҚТАЛУЫН АНЫҚТАУ

Интродукция - бұл ағаш және бұталы өсімдіктерді бұрын өспеген жаңа аумақтарға көшіріп отырғызу, сол арқылы аймақтың өсімдік флорасы аясын кеңейтіп, жаңа өсімдік түрлерінің ассортиментімен толықтыру.

Кілт сөздер: ауыр металл, сары қараған, интродукцент.

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ОПРЕДЕЛЕНИЕ СОДЕРЖАНИЯ ТЯЖЕЛЫХ МЕТАЛЛОВ В ИНТРОДУЦИРОВАННЫХ ДРЕВОСТОЯХ ГОРОДА АСТАНЫ

Интродукция - это перенесение растений из одних районов в другие, где они отсутствовали, с применением методов воздействия на их природу.
Ключевые слова: тяжелых металл, акация желтая, интродукцент.

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ЮВЕНИЛЬНАЯ УСТОЙЧИВОСТЬ СОРТОВ ПШЕНИЦЫ И ЯЧМЕНЯ К ВОЗБУДИТЕЛЮ ТЕМНО-БУРОЙ ПЯТНИСТОСТИ

Аннотация
В статье приведены результаты изучения ювенильной устойчивости коммерческих и перспективных сортов пшеницы и ячменя к возбудителю темно-бурой пятнистости листьев. Установлено, что все изученные сорта пшеницы являются сильно и средневосприимчивыми к болезни в период проростков. Это может привести к большим потерям урожая в случае появления эпифитотии, т.к. изученные сорта пшеницы широко возделываются в производственных посевах страны.
Ключевые слова: пшеница, ячмень, *Bipolarissorokiniana*, изолят, инокулюм, сорт, устойчивость, генотип.

Введение

Одним из факторов снижения урожая зерновых культур является поражаемость ее болезнями.К числу наиболее вредоносных и распространенных болезней пшеницы и ячменяотносится темно-бурая пятнистость листьев, возбудителем которого является несовершенный гриб *BipolarissorokinianaSacc.*Инфекция проявляется в виде темно-бурых, коричневых штрихов, пятен или широких полос.При сильном развитии наблюдаются сплошные побурение одного или двух междоузлий, отмирание боковых стеблей[1].На листьяхпроявляется в виде округлых, овальных или удлиненных темно-бурых пятен, а на восприимчивых сортах в годы эпифитотий пятна сливаются и листья погибают. Потери урожая от поражения темно-бурой пятнистостью могут достигать 20-30%[2].

Темно-бурая пятнистость листьев встречается во всех регионах возделывания зерновых культур и заметно проявляется во влажные годы. Возбудитель болезни широко специализирован,поражает 52 родов семейства злаковых, а также 15 родов незлаковых растений[3].В республике Казахстан и в странах СНГ, очень мало сортов, устойчивых к темно-бурой пятнистости. Многие казахстанские сорта пшеницы, обладающие стабильной урожайностью,высоким качеством зернаи экологической пластичностью,в фазах взрослых растений отличаются восприимчивостью к гельминтоспориозным пятнистостям [3, 4]. В связи с этим использование устойчивых или выносливых к болезням сортов является одним из основных направлений в селекции зерновых культур к болезни. Целью наших