UDK 712.253:712.41

SPECIES COMPOSITION AND QUANTITATIVE CONTENT OF THE TREES IN STREET PLANTINGS OF THE CITY OF SUMY

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Key words: Street plantings, dendro-flora structure.

Problem setting. One of the environment components, which compensates for the air pollution by transport emissions are planting along streets and roads. Their gas productive and gas dust absorbing potential and soundproofed properties depend on the structure, species composition, age and plantings. The degree of reduction of air pollution depends on the structure of street tree plantings and varies from 4-7% (for single-row plantings of trees) to 60-70% (for multi-trees and shrub plantings) [4, 7].

Fulfilling the protective functions of plants planted along streets and roads bear high technogenic stress – so the conditions of their growth are significantly transformed. The reasons reducing the vitality of plants in roadside plantings to be noted are, first of all, air pollution and soil. The harmful effect of pollutants in solid, gaseous and aerosol forms impact the assimilation organs. Contaminants falling on the leaves (fir) often form plaque, which reduces the flow of radiation required for photosynthesis, clogs the stomata, have toxic effects on leaf tissue, causing chlorosis or necrosis, which reduces the photosynthetic activity of plants [7]. Pollutants, falling into the ground from the air, and while applying the anti-sleet reagents in the winter, change its structure, physical and chemical properties (porosity, moisture capacity, pH, heavy metals , hydrocarbons , ions of sodium, chlorine , sulfates , nitrates , etc. .)

The most pressing is the issue of street planting which occupy most part of the city square. They are faced with residential and public buildings; they connect

areas into single urban system by means of transit network of traffic and pedestrian routes. The urban population spends a lot of time in the streets [8]. In this regard, one of the most important urban problems is the choice of type of planting and selection range, depending on the functional purpose: the protection of pedestrians and buildings from excessive insulation, dust, wind, creating a stylistic exterior of the streets or solving the planning problems.

Analysis of major studies and publications discussing the problem. In Sumy the comprehensive studies of street tree plantings have not been conducted until recently. Green areas in the city are unevenly distributed in some areas the vegetation is quite poor. The average availability of public green areas is 16.5 m ² per capita. Today the number of green spaces in the city has steadily decreased due to increasing of the density of building construction. Alongside with the general trend of green areas reduction in the last 15-20 years the range of plants used for the city landscaping has not changed.

In Sumy, as in most settlements of Ukraine, the comprehensive inventory of green space with the assessment of the health and resilience of species to the combined action of unfavorable factors and suitability of these species for use in landscaping has not been done. Current situation requires a critical analysis of the existing range of species used in Sumy landscaping taking into consideration their quantitative composition and living conditions.

Conditions and methods of research. Sumy City is one of the largest industrial cities in Ukraine. Rail ways, high ways and air routes connect it with the other cities of Ukraine, Russia and other countries. The city area was populated long ago. The population from the formation of the city up to present has increased almost 100 times. According to the historical records there were 2700 people in 1660 in Sumy, in 1970 - 166.3 thousand, in 2003 - 297.3 thousand in 2012 – 269.2. The largest number of residents in the city was numbered in 1993 and stated 307,1 thousand, the population density in the city is 3.06 thousand people per 1 km2.

Sumy is the city with developed chemical, machinery and equipment, light and food industry, construction industry. Industrial enterprises occupy more than 4

hectares, containing 38% of the city. Ecological situation in Sumy in the last decade did not cause catastrophic changes in the environment, it was stable. The content of harmful substances in the air and the soil is within the maximum limits. The main pollutants so far are the vehicles [10].

Sumy is located in the temperate continental climate conditions, characterized by uneven distribution of rainfall during the vegetation period and seasons, hot dry summer and moderately cold winter with unstable snow cover and precipitations. Climatic conditions are typical for forest-steppe zone of Ukraine: the average annual temperature is 7.7 °C, the average length of the frost-free period is 157 days. The average long-term rainfall during the years of research is 550.3 mm. During the year the prevailing winds are South-East (November to April) and North-West (May to October).

In general the weather conditions in Sumy during the years of studies were typical. Winter temperature was favorable for the overwintering of perennial and annual plants. Fluctuations in average temperatures and rainfall during the vegetation period were not critical and did not affect the plant growth and development.

The research was carried out in accordance with the scientific curriculum of the Department of Landscape and Forestry of Sumy National Agrarian University "Study of green areas in the inhabited settlements in the North-Eastern part of the forest-steppes of Ukraine in order to establish the ways of optimizing the natural environment" (state registration number is 01090000346).

This work was based on the materials collected during the vegetation period of 2010-2012 in the central residential areas of the city of Sumy. The objects of the research are woody plants growing on the urban area plantations, particularly on the street plantations. Mostly detailed studied were the areas of central traffic arteries of the city (Fig. 1).

Street planting is a diverse category in its purpose and location, it includes single-row planting of trees between the roadways and sidewalks on one or both sides of the streets, planting between the roadways and the sidewalks in two or more rows, dividing lanes on the roadway streets (single row and multi- row) fit between sidewalks and buildings, boulevards, landscaping embankments and multi -row plantings, landscaping of public transportation stations and stops and so on. [21] Sumy is characterized by single-row planting along the road side parts.

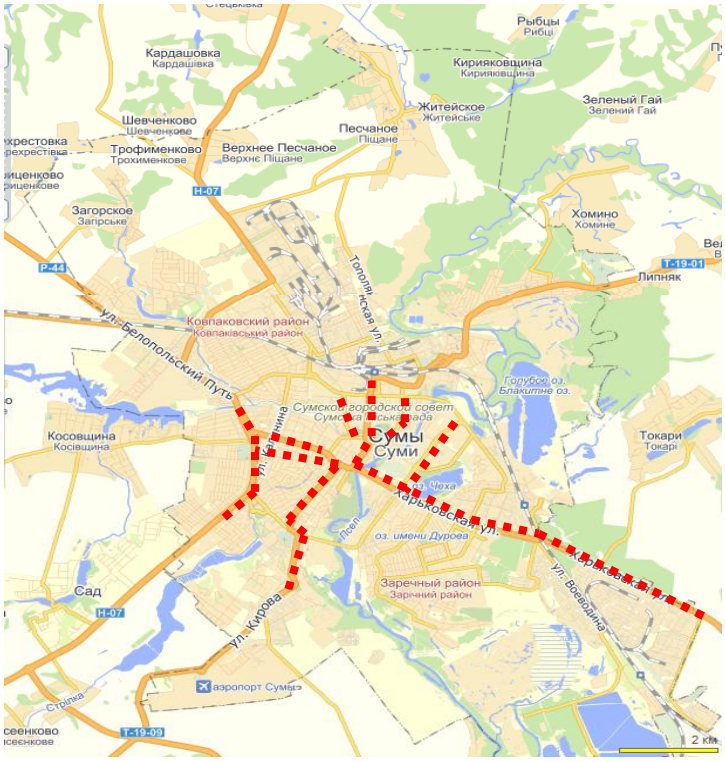

Figure. 1. Location of the streets which were to be studied within the city of Sumy

We have, with varying degrees of detail, studied woody street planting in 14 streets with different class of load. When conducting the field studies we used the methods generally recognized in Forestry and geo-botanies. Names of taxons were refined by the S. Mosyakin, M. Fedorczuk and O. Lipa.

Results of the research. Parks areas in Sumy occupy 624.3 hectares, accounting for 7% of the total area of the city. We have been surveyed tree plantation in the area 9.8 hectares.

Analysis of roadside plantings in Sumy showed relatively low species diversity of woody plants in plantings along streets and roads. The list of dendro-flora found during the study of streets Petropavlivska, G. Kondratiev, Gorky, Kharkivska, Dzerzhinska, Pershotravneva, Cooperatyvna, Viskresenska, Zhovtneva, Ilyinska, Proletarska and Lushpy and Shevchenko avenues, are shown in Table 1.

Table 1. Species content of dendro-flora in the roadside plantings of Sumy

№	Name of the taxon (family / species)	
1	2	3
1	***Aceraceae***	*Acer negundo* L.
2		*Acer platanoides* L.
3		*Acer pseudoplatanus* L.
4		*Acer saccharinum* L.
5	***Betulaceae***	*Alnus incana* (L.) Moench.
6		*Betula pendula* Roth.
7	***Cupressaceae***	*Juniperus virginiana* L.
8	***Fabaceae***	*Robinia pseudoacacia* L.
9	***Fagaceae***	*Quercus robur* L.
10		*Quercus rubra* L.
11	***Hippocastanaceae***	*Aesculus hippocastanum* L.
12	***Oleaceae***	*Fraxinus excelsior* L.
13		*Fraxinus pennsylvanica* Marsh.
14	***Pinaceae***	*Picea excelsa* Link
15		*Picea pundens* Engelm.
16		*Pinus sylvestris* L.

17	***Rosaceae***	*Padus avium* Mill.
18		*Padus serotina* (Ehrh.) Ag.
19		*Sorbus aucuparia* L.
20	***Salicaceae***	*Populus alba* L.
21		*Populus nigra* L.
22		*Populus pyramidalis* Rozier.
23		*Populus tremula* L.
24		*Salix alba* L.
25		*Salix fragilis* L.
26	***Tiliaceae***	*Tilia cordata* Mill.
27		*Tilia platyphyllos* Scop.
28	***Ulmaceae***	*Ulmus laevis* Pall.

The structure of tree plantations along the streets represented 28 species belonging to 12 species. The most diverse family is *Salicaceae* (6 species) and *Aceraceae* (4 species). Other families are represented by one or two species.

The share of the eight participating families, most common in the street plantings in Sumy is shown in the diagram (Fig. 2).

According to the results of the field study of plantings in 14 main streets of the city of Sumy the largest share belongs to limes *Tilia* L. (40 %), *Acer* L. (22 %), *Aesculus* L. (до 19 %) and *Populus* L. (10 %), other species are used less frequently and their share in the plantings is less than 5%.

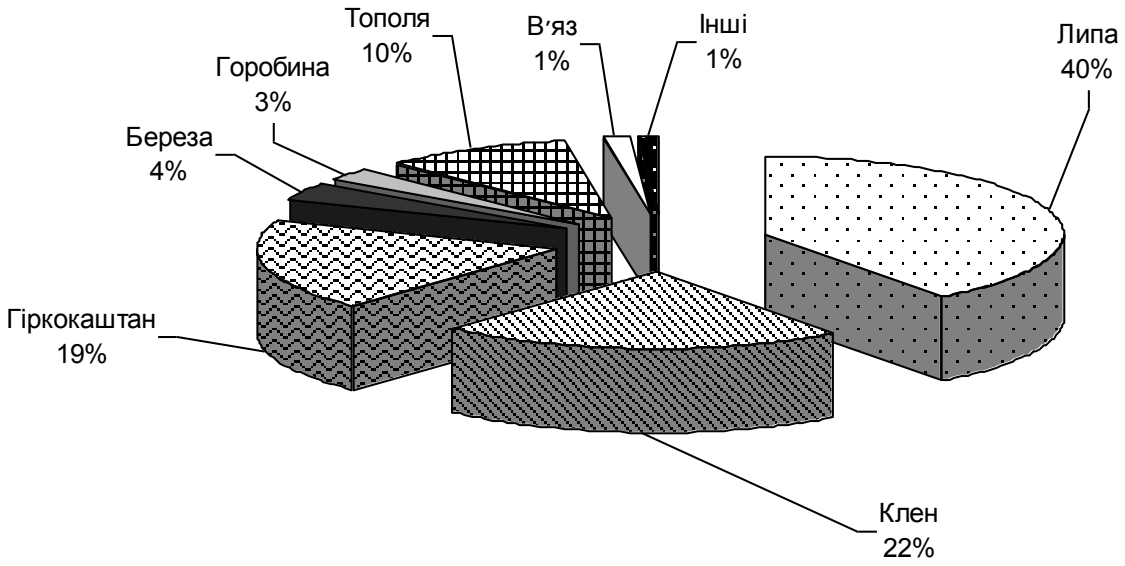

Figure 2. Structure of tree plantings in the streets of Sumy

It should be noted that dendro-flora of street plantings, unfortunately, includes only four species of the *Pinophyta* class, representing 1.12% of the total list, other angiosperms belong to the *Magnoliophyta* class. As pine trees have certain advantages in shaping of both environmental and aesthetic framework of the city, because they remain green throughout the year, such low percentage of this group in landscaping of roads and streets should be compensated by planting in other urban areas, such as squares, parks, in the surrounding areas and more.

Analysis of the literature shows that the situation with plantings of roadside strips are common to most populated cities of the former Soviet Union [6, 9]. For example, the cities of Belarus are characterized by the dominance of lime *Tiliaceae* (35 %), *Aceraceae* (20 %), *Hippocastanaceae* (22 %), and the pine trees comprise less than 2% of the total species diversity [1, 4, 5].

Supported by the ecological characteristics listed in the "Area-based range of trees and shrubs of Ukraine", approved by the State Committee for Construction, Architecture and Housing Policy of Ukraine on April, 24, 1998, the dominant species of street trees in Sumy belong to the gas and dust proof, soil fertility dependant, low resistant to the soil salinity [2]. Thus, the resistance of the

identified species of dendro-flora of street plants to unfavorable conditions of urban environment is relatively low.

Conclusions:

1. Dendroflora street stands in the center of Sumy represented by 28 species of trees (including *Magnoliophyta* - 24 species and *Pinophyta*, - 4 species) belonging to 16 genera and 12 families.

2. The largest share of participation in the landings were the families of *Tilia* L. (40%), *Acer* L. (22%), *Aesculus* L. (19%) and *Populus* L. (10%), others - used less frequently and their share in the stands less than 5%.

3. In quantitative terms, from street stands the most widely represented: *Tilia cordata* Mill., *T. platyphyllos* Scop., *Aesculus hippocastanum* L., *Populus nigra* L., *P. pyramidalis* Rozier., *Acer platanoides* L. and others.

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