

# SPECIES COMPOSITION, STRUCTURE AND QUALITY STATUS OF HEDGES IN BUKOVYNIAN CARPATHIAN REGION OF UKRAINE

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## Abstract

Object of the study are hedgerows in settlements of Ukrainian Bukovynian Carpathian region (Chernivtsi region of Ukraine). The species and quality composition, spatial, age and ecological structure and ornamental value of hedges. The formation of hedges as an element of landscaping the urban ecosystems of the Ukrainian Bukovynian Carpathian region occurred due to the influence of a number of objective (natural and anthropogenic) and subjective factors (traditions, socio-economic conditions and long-term plans for the development of the region, financing of activities for the formation and care of plantings in green spaces). The dendroflora of hedges of urban areas is represented by 32 species of woody plants from 24 genera and 15 families. *Carpinus betulus* L., *Buxus sempervirens* L., *Cornus alba* (L.) Opiz. and *Ligustrum vulgare* L. are most often used to form hedges. The vast majority of hedges is formed from one species (Chernivtsi – 98.3 %, other towns and villages – 71.1 %), and they are mainly single-row (Chernivtsi – 83.8 %, other towns – 58.2 %, villages – 70.2 %). In the settlements of the region, trimmed hedges predominate (Chernivtsi – 92.1 %, other towns and villages – 75.5 %). Most hedges are mean-height hedges (Chernivtsi – 65.8 %, other towns and villages – 66.9 %). For the formation of a curb hedge, *Spiraea media* Schmidt., *Buxus sempervirens*, *Ligustrum vulgare* are most often used. For first time, comprehensive studies of hedges in the settlements of Chernivtsi region of Ukraine (Bukovynian Carpathian region) were carried out according to their species composition, system, age and environmental structure, height and constitution. The features of functioning in urban ecosystems are established. A comprehensive assessment was made regarding the quality status and ornamental value of hedges in the green zones.

**Key words:** dendroflora, decorativeness, functionality of hedges, landscaping, urban.

## Introduction

In the general structural and functional organization of urban ecosystems, a special environment-creating and recreational role is played by complex green zones.

The formation of aesthetically attractive urban landscapes and street plantings involves the creation of hedges of various species composition, spatial structure and functional purpose, as an integral part of urban gardening (Myronchuk 2018, Carli-

er and Moran 2019).

The historical development of hedge use as an element of urban green spaces, including improvement of the environment, is directly related to urbanization processes, human economic and industrial activities, as well as the development of landscaping.

Hedgerow is one of the oldest elements of landscape gardening art, the history of which dates back thousands of years, and the first records date back to about 2000 BC (Bilous 2001, Aleksandrova 2003, Kucheryavyi 2018, Myronchuk 2018). It is an integral part of urban green spaces and plays an important role in protecting various objects and structures from the negative effects of both natural and anthropogenic factors, which is confirmed by other authors (Bilous 2001, Kucheryavyi 2001, Kurnytska and Myronchuk 2011).

The issues of the vitality of hedges of various species composition and spatial structure, as well as the analysis of their adaptive features in the urban environment, are highlighted in a number of scientific works (Hill 1979, Brooks and Agate 1998, Bird and Robson 1999, Chernyshenko 2001, Gutsulyak et al. 2006, Avramenko 2012, Larionov et al. 2015, Carlier and Moran 2019).

The role of hedges in solving environmental problems of urban environment has been studied by a number of scientists, who, among the most important environmental functions of hedges, generally distinguish sanitary-hygienic, barrier, and phytocidal functions (Uleiskaya and Komar-Temnaya 2002, Sapelin 2011, Avramenko 2012, Myronchuk 2018).

Hedges in urban ecosystems, like all other vegetation, experience adverse effects by urban development, which consists, first of all, in the violation of the technology of creation and mechanical dam-

age, as well as in the untimely carrying out agrotechnical measures for the care of woody plants. As a result of this, a reduction in the vitality of plants and their resistance to adverse natural and anthropogenic factors occurs (Burda 1991, Brooks and Agate 1998, Bird and Robson 1999, Chernyshenko 2001, Avramenko 2012, Larionov et al. 2015, Myronchuk 2018).

Impairment of the vital functions of plants in an urban environment occurs due to changes in the physical and mechanical properties of soils, diminishing of their fertility, and the presence of a high content of building inclusions in the soil profile. Soil contamination and the presence of asphalt pavement lead to a change in the temperature, air and water regimes of the soil, which negatively affects the vital activity of soil microflora and the state of vegetation cover – inhibition of growth and development, and sometimes complete destruction (Oreszczyn and Lane 2000, Larionov 2015, Logachyova and Soldatova 2015, Myronchuk 2018). A study of the growth, development, and vital functions of various woody plants under urban conditions and which can be used in hedges showed changes in morphological parameters, ecological plasticity, functional and vital condition (Uleiskaya and Komar-Temnaya 2002, Sapelin 2011, Myronchuk 2018, Carlier and Moran 2019).

Scientific studies of green areas in urban environment prove the significant natural landscape potential of hedges. However, the lack and inadequacy of measures for maintenance and care of hedges lead to a loss of ornamental value, sanitary-and-hygienic functions, and the appearance of less valuable plant species in their composition (Hill 1979, Oreszczyn and Lane 2000, Chernyshenko 2001, Hessayon 2007, Kurnytska and

Myronchuk 2011).

The development of effective environmental and rehabilitation agrotechnical measures and timely care of hedges in urban ecosystems will contribute to improving their qualitative condition and ornamental value, increasing resistance to adverse conditions of an urban environment (Hill 1979, Kucheryavyi 2003, Myronchuk 2018).

Scientists have not analysed the species composition, biocological and spatial structure, and the quality status of hedges in urban ecosystems of Ukrainian Bukovynian Carpathian region, either.

The purpose of the study is to assess (determine) the ecological and biological features, functionality of hedges in urban ecosystems of Chernivtsi region of Ukraine (Bukovynian Carpathian region) and to suggest recommendations for the formation of hedges in the urban

environment.

## Object

The objects of the studies are hedges of urban ecosystems in Chernivtsi region of Ukraine (Bukovynian Carpathian region) (Fig. 1). It is divided into three physical-geographical regions: Prut-Dniester elevated lowland forest-steppe, Prut-Sirets elevated hilly forest meadow and Pokut-Bukovynian Carpathians. According to the peculiarities of the relief, these physical-geographical regions represent plain, foothill and mountainous parts (Gutsulyak et al. 2006).

The climatic conditions are influenced by surface nature, therefore, in the mountains it is always colder and with more precipitations, in the plains – warmer and drier. The average annual air tempera-



Fig. 1. Bukovynian Carpathian region of Ukraine.

ture is +6 °C (from +8 °C in the northeast to +3 °C in the southwest). In winter it is cold, the average temperature in January is -5 °C. In the plains it can reach -32 °C, and in the mountains frosts below -40 °C are observed.

The average rainfalls in winter are 100–250 mm, which is almost three times less than in summer. During the whole cold period of the year in the east of Chernivtsi region less than 125 mm of precipitations falls, in the central part – 125–150 mm, in the foothills – 175–200 mm, and in the mountains – 250–300 mm and more. In winter in the plain part winds blow in different directions, but are dominated by north-western, western, south-eastern, eastern, which account for about 80 % of winds in all directions.

Summer is moderately warm. The average air temperature does not change much in July – from +15 °C (in the mountains) to +19 °C (in the east). The highest recorded air temperature reached 38 °C. The lowest ones in summer were recorded in the plain in June +3 °C, in July – +7 °C, in August – +4 °C, and in the mountains – -3 °C, 1 °C and -2 °C, respectively.

In summer there is a lot of precipitation (400–700 mm and more). Most precipitation falls in the mountains. At the same time, there are often showers and thunderstorms. Especially heavy rainfall falls from June to August.

The average annual temperature for Chernivtsi is +7.9 °C. The average temperatures of the warmest and coldest months – July and January – are 19.3 °C and 5.0 °C, respectively. The period without frosts lasts mostly 153 days.

The average annual rainfall in Chernivtsi is 712 mm. Precipitation falls mainly in the form of rain during the warm period in an average of 505 mm. From November to March precipitation is about 207 mm

(Antonov 1999, Gutsulyak et al. 2006).

The growing season in Chernivtsi region ranges from 224 to 253 days (Myronchuk 2013).

In total, an inventory and accounting of 283 hedges along the main streets and in the plantings of 95 settlements of Ukrainian Bukovynian Carpathian region was carried out (11 towns – Chernivtsi, Novodnistrovsk, Khotyn, Storozhynets, Vyzhnytsa, Novoselytsia, Kitsman, Hertsa, Vashkivtsi, Zastavna, and Sokyriany, 7 townlets – Berehomet, Vartykivtsi, Hlyboka, Kelmentsi, Nepolokivtsi, Luzhany, and Kostryzhivtsi, and 77 villages). Species composition, systematic, spatial, age and ecological structure, quality status and ornamental value of hedges were investigated.

## Methods

In the city of Chernivtsi, an inventory was carried out and the species composition and structure of 117 hedges were analysed, and in other settlements of Bukovynian Carpathian region – 166.

The inventory was carried out on the basis of cartographic documents by route method in accordance with the requirements of 'Instructions for the technical inventory of green spaces ...' (Verkhovna Rada of Ukraine 2001). Following data was recorded: item number, date of study, geographical area, settlement and street, length, average height and width, species composition and age of plants, rows, spatial structure and method of formation, decorative value and quality condition.

The species composition of hedge plants was identified in accordance with the domestic nomenclature (Dobrochaeva et al. 1987, Zayachuk 2014). Their eco-

logical structure was analysed in accordance with the 'Guide to plants ...' (Yelin et al. 1984, Myronchuk 2018). The quality of hedges of urban ecosystems was classified as 'good', 'satisfactory' and 'unsatisfactory'. The qualitative condition was established on the following signs:

'Good' – trees or shrubs that are part of the hedge are healthy, normally developed, thick foliage, evenly distributed on the branches, normal size and colour without signs of disease and wounds, damage to trunks and skeletal branches, the type of hedge – integral without breaks. 'Satisfactory' – trees or shrubs are healthy, but with signs of slow growth, with unevenly developed crown, few leaves on the branches, there is little mechanical damage, the appearance of the hedge – openwork or with breaks. 'Unsatisfactory' – trees or shrubs are much weakened, trunks are crooked,

crowns are underdeveloped, there are dry and withering branches, the growth of annual shoots is insignificant, technically damaged trunks, presence of phytopathological diseases, the hedge is not intact, fragmentary.

It is known that the hedge is a normal planting of trees and shrubs, so the assessment of its ornamental properties begins with an assessment of the structural unit that forms it. A score for the ornamental value of hedges was carried out on a modified scale for assessing the ornamental characteristics of shrubs (Andrushko and Tereshkin 2012, Myronchuk 2014). To assess ornamental plants which influence its attractiveness, first of all, indicators such as crown density, shoot colour, leaf shape and colour, time and duration of flowering, the size, colour, and aroma of fruit are taken into account (Table 1).

**Table 1. Determination of hedge decorative value.**

<b>Signs of decorativeness</b>		<b>Points</b>
<b>1.</b>	Architectonics of shrubs or tree	
	Openwork	3
	Dense	6
<b>2.</b>	Colour of shoots	
	Common (gray, brown, black)	1
	Original (red, brown, light brown, buff)	3
<b>3.</b>	Foliage	
<b>3.1.</b>	Terms of leafing	
	End of May	1
	Late April – Early May	2
	Until the beginning of April	3
	Evergreen leaves	4
<b>3.2.</b>	Timing of leaf fall	
	Early leaf fall (September)	1
	Average duration (October)	2
	Preservation of leaves before frost	3
	Evergreen leaves	6
<b>3.3.</b>	Texture of leaves	
	Matte	1
	Glossy	3

<b>Signs of decorativeness</b>		<b>Points</b>
<b>3.4.</b>	Colour of leaves	
	Green	1
	Another (red, yellow) with a shade	4
<b>3.5.</b>	Seasonal foliage colour change	
	Does not change	1
	Colour changes in autumn	2
	Colour changes throughout the growing season	3
<b>4.</b>	Flowering	
<b>4.1.</b>	Duration of flowering	
	Flowering inconspicuous, absent	0
	Short-term (1–2 weeks)	1
	Medium-term (up to 4 weeks)	2
	Long-term (more than a month)	3
<b>4.2.</b>	Size of inflorescences, flowers	
	Flowering inconspicuous, absent	0
	Small	1
	Large	2
<b>4.3.</b>	Inflorescence colour set-off against the background of foliage	
	Missing	0
	Weakly expressed	1
	Pronounced	2
<b>5.</b>	Fruiting	
<b>5.1.</b>	Preservation of fruits	
	Fruits are invisible, absent	0
	Fruits fall off quickly	1
	Fruits are stored until winter	2
	Fruits are stored until the next season	3
<b>5.2.</b>	Nature of fruit type	
	Fruits are solitary	1
	Fruits are collected in clusters	2
<b>5.3.</b>	Fruit size	
	Small (up to 3 cm)	1
	Large (more than 3 cm)	2
<b>5.4.</b>	Contrast colour of fruits on a background of leaves	
	Missing	0
	Weakly expressed	1
	Pronounced	2
<b>6.</b>	Aroma	
	Missing	0
	Weak	1
	Strong	2

To determine the exact number of points of ornamental hedge, the decorativeness of the species that are part of it is first determined. Further, we propose to evaluate such ornamental features as: type of hedge – moulded, unformed; assessment of species decorativeness, score; deviation from the specified form, %; distance of structural units per 10 m; height of the hedge exposure from below, m; hedge shape – straight, natural, wavy, stepped, chaotic, combined; perception of the hedge against landscape background; living wall and complex hedge (Myronchuk 2018).

Based on the modified scale (Myronchuk 2018), were distinguished green hedges of various degrees of decorative value: very high degree – 40–49 points; high degree – 36–40; medium degree – 30–35; low degree (less than 23 points).

## Results and Discussion

The formation of hedges as an element of landscaping of settlements of Ukrainian Bukovynian Carpathian region was due to the influence of a number of objective – natural and anthropogenic, and subjective

factors – long-term plans for settlements' development, the amount of funding for the formation of urban green areas and planting care, traditions and socio-economic conditions of the region's development.

The study of hedges during 2010–2016 (283 hedges along the main streets and in plantings with a length of 35,231 m in 95 settlements of the region) showed the popularity of this element of gardening in the formation of green urban areas and their diversity in many ways.

The results of the inventory showed that the majority of hedges were formed in public areas – 64.3 %. In the territories of limited use, their share is 33.6 %, and in the territories of special purpose – 2.1 %.

The dendroflora of hedges is represented by a total of 32 species of woody plants from 24 genera and 15 families (Table 2). The following families lead in taxonomic composition: Rosaceae Juss. – 7 species, Sapindaceae Juss. – 3 species, and Oleaceae Lindl. – 3 species. The rest of the families are represented by only one or two woody species.

The diversity of species composition of hedges primarily depends on their functional purpose and the cost of

**Table 2. Systematic composition.**

Group	Class	Number of			
		orders	families	genera	species
City of Chernivtsi					
Pinophyta	Pinopsida	1	1	1	1
Magnoliophyta	Magnoliopsida	8	10	13	15
Other settlements of the region					
Pinophyta	Pinopsida	1	2	3	4
Magnoliophyta	Magnoliopsida	10	10	16	23
In total, in the settlements of Bukovynian Carpathian region of Ukraine					
Pinophyta	Pinopsida	1	2	3	4
Magnoliophyta	Magnoliopsida	10	13	21	28
In total		11	15	24	32



planting material. Hedges with *Buxus sempervirens*, *Physocarpus opulifolius* (L.) Maxim., *Cornus alba*, *Spiraea media*, and *Spiraea vanhouttei* (Briot) Zabel are usually formed near enterprises and government institutions (urban landscaping). Less commonly used are *Symphoricarpos albus* Blake, *Cornus sanguinea* (L.) Opiz., *Thuja occidentalis* L., and *Picea abies* (L.) Karst., there occur hedges formed from *Parthenocissus quinquefolia* (L.) Planch. In suburban landscaping, cheaper species – *Carpinus betulus*, *Ligustrum vulgare* and *Syringa vulgaris* L. – are often used (Fig. 2).

An analysis of the species composition of hedges showed that the following species are more often used: *Carpinus betulus* – 19.4 %, *Buxus sempervirens* – 19.1 %, *Cornus alba* – 17.0 %, *Ligustrum vulgare* – 12.0 %, *Physocarpus opulifolius* – 6.7 %. Less common are hedges from *Spiraea media* – 5.0 %, *S. vanhouttei* – 3.5 %, and *Symphoricarpos albus* – 2.8 %. Individually used are *Robinia pseudoacacia* L., *Tilia cordata* Mill., and *Tilia platyphyllos* Scop.

The vast majority of hedges are formed from one tree species – 98.3 % in Chernivtsi and 71.1 % – in other settlements of the region. The share of mixed hedges in small towns and villages is 28.9 %, and

in Chernivtsi – only 1.7 %. Sometimes in hedges, there are tree species uncharacteristic for their formation – *Acer negundo* L., *Tilia cordata*, *Acer platanoides* L. This is due to the close proximity of the location of such hedges to protective forest belts or forest stands, which can give a natural renewal of woody plants.

The city of Chernivtsi is characterized by single-row hedges – 83.8 %. The proportion of two-row hedges is 13.7 %, and that of three-row hedges is only 2.5 %. In other settlements, the share of two-row hedges is higher – 35.4 % in towns, and 29.8 % in rural areas. Four-row hedges in the green spaces are practically absent – only 0.9 % in small towns (Table 3). This is due to the density development of the city of Chernivtsi and the lack of necessary space for formation of multi-row hedges.

In the settlements of the region, trimmed hedges predominate – 92.1 % in Chernivtsi and 75.5 % in other towns and villages. Hedges from tree species such as *Spiraea media*, *S. vanhouttei* and *Symphoricarpos albus* predominate among the untrimmed ones. Due to the lack of proper care, some trimmed hedges passed into the untrimmed category – those from *Carpinus betulus*, *Physocarpus opulifolius*, *Picea abies* and even with *Buxus sempervirens*.

**Table 3. Number of hedge rows in settlements.**

Number of rows	Number of hedges, %		
	Chernivtsi	Other settlements	
		cities, district centres	townlets and villages
1	83.8	58.2	70.2
2	13.7	35.4	29.8
3	2.5	5.5	-
4	-	0.9	-
In total	100	100	100



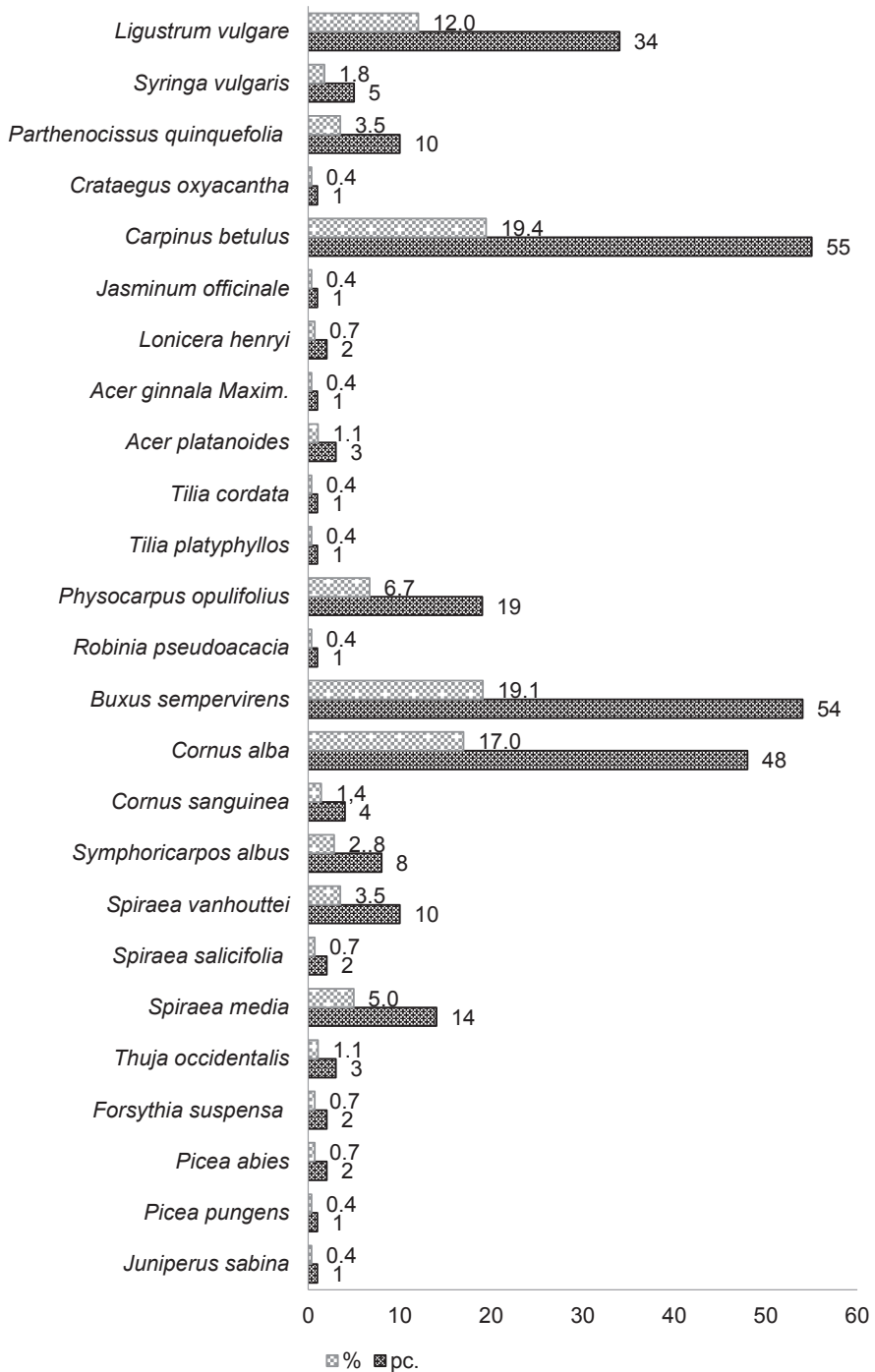


Fig. 2. Number of hedges by plant species.

Mean-height hedges are predominant in towns and villages – 65.8 % in Chernivtsi and 66.9 % in other settlements. This is primarily due to the significant number of hedges created from *Carpinus betulus*. The share of curb hedges is insignificant – 7.7 % in Chernivtsi and 4.8 % in other settlements (Fig. 3).

In Chernivtsi, the following shrub species are most often used to form a curb hedge: *Spiraea media*, *Buxus sempervirens*, *Ligustrum vulgare*, which makes up 44.4 % of all hedges in the city.

According to the age structure, hedges in the age group of 11–30 years dominate in the settlements, the share of which in urban areas is 82.0 %, while in rural – 51.8 %. In small towns and villages, a significant portion of hedges is 31–40 years old – 38.5 %, while those over 50 years old are practically absent – only 0.6 % in rural areas (Fig. 4).

An analysis of the ecological structure of hedges, which makes it possible to determine the dependence of plants on en-

vironmental factors, showed that in terms of substrate nutrient status, the most common is the group of mesotrophic woody plants – 56.2 %. The share of megatrophic ones is 37.5 %, and the share of undemanding for soil conditions oligotrophic tree species is insignificant – 6.3 % (Fig. 5A). In terms of soil substrate moisture content, the group of mesophytic woody plants predominates in the region's hedges – 43.8 %. The proportion of hydrophytic plants here is the smallest and amounts to only 1.6 % (Fig. 5B).

An analysis of the quality status of hedges showed that most of them can be classified as 'good' – 41.0 % in Chernivtsi and 40.4 % in other settlements. Partial or complete reconstruction is required for 22.2 % of hedges in Chernivtsi and 28.3 % in other towns and villages (Table 4). Poor quality ones are characterized by the presence of dry twigs and leaves, bareness of leaves and reduction in the fence density, mechanical damage to woody plants.

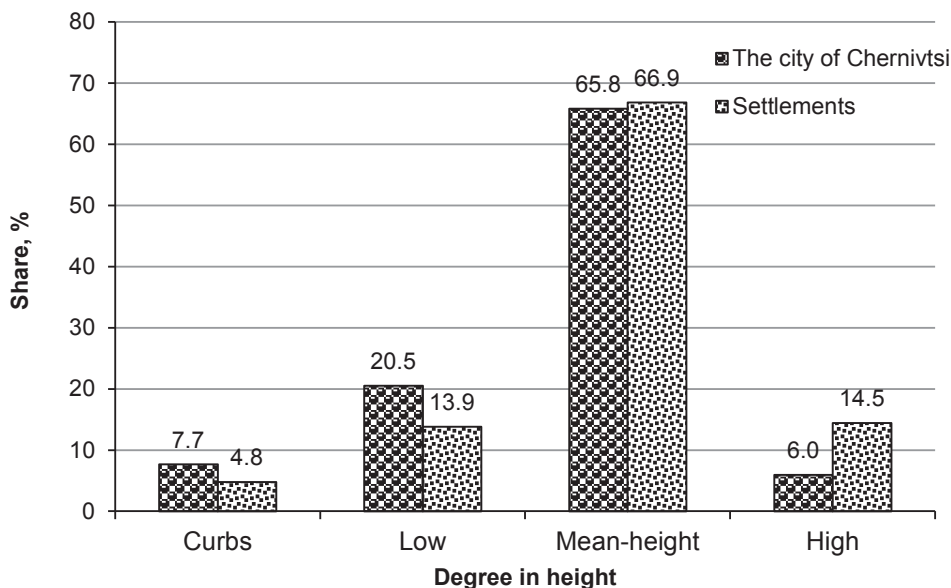


Fig. 3. Height structure of hedges.

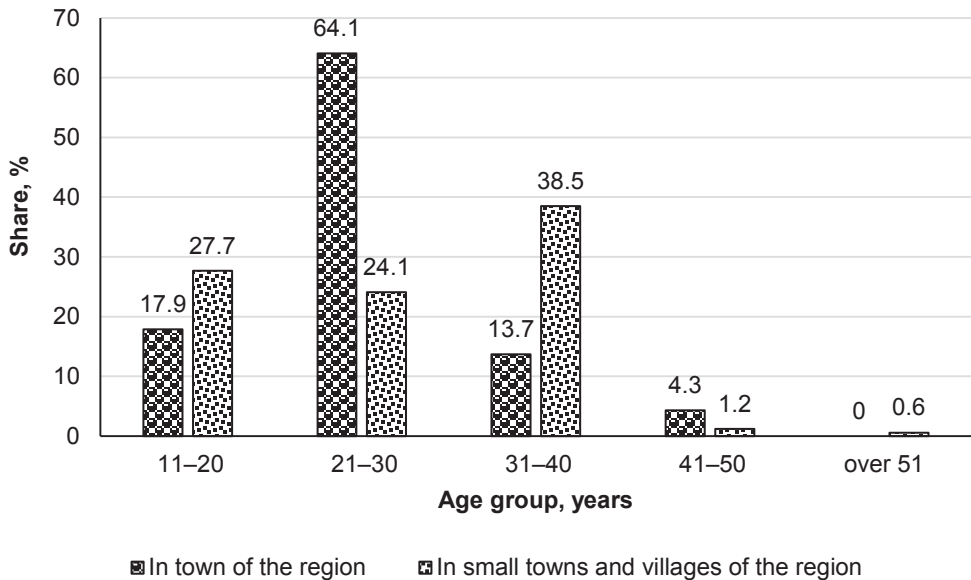


Fig. 4. Age structure of hedges.

Table 4. Quality status of hedges.

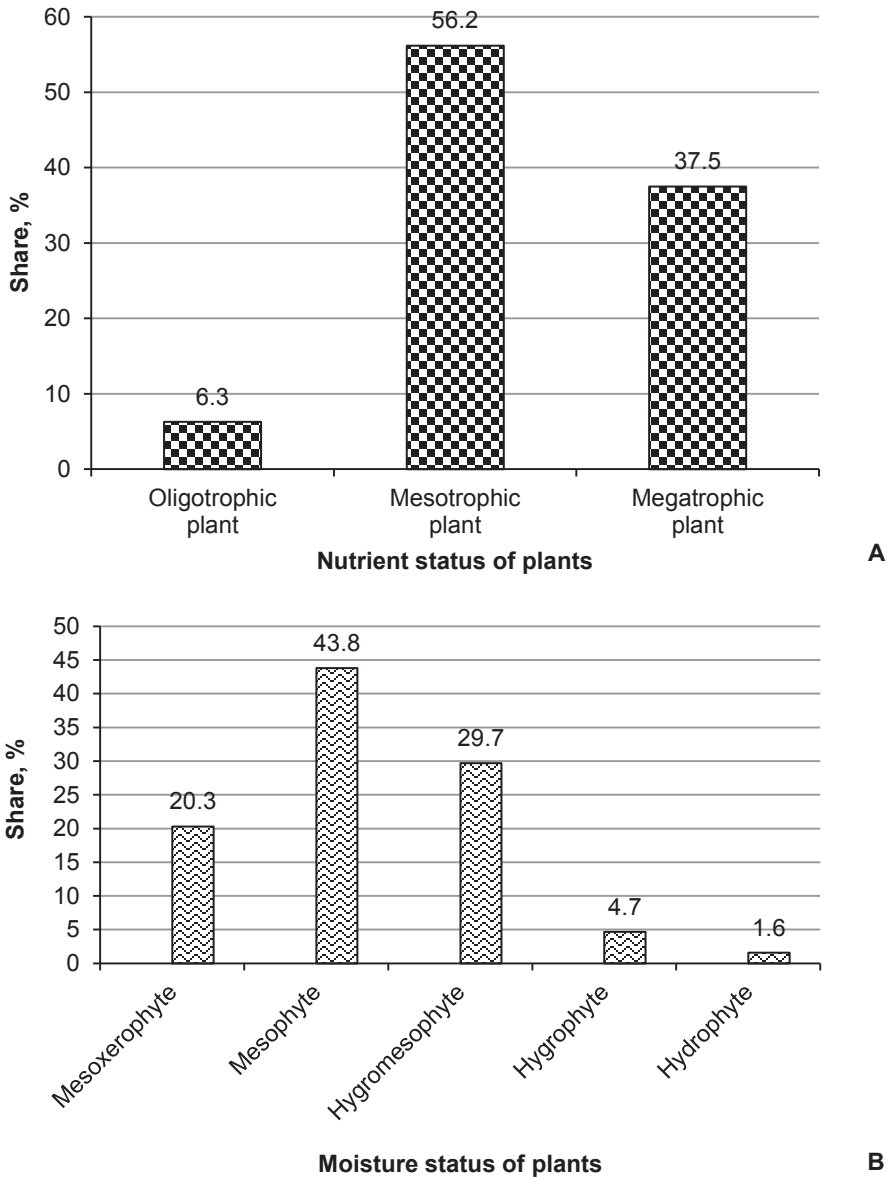
Quality status	City of Chernivtsi	Other settlements of the region
	Number of hedges, %	
Good	41.0	40.4
Satisfactory	36.8	31.3
Unsatisfactory	22.2	28.3
Total	100	

Table 5. Quality of hedges depending on the level of illumination.

Quality status	Illuminated		Half-shade		Shade	
	number, pcs	% within the group	number, pcs	% within the group	number, pcs	% within the group
Good	84	55.3	30	28.8	3	11.1
Satisfactory	41	27.0	47	45.2	8	29.6
Unsatisfactory	27	17.7	27	26.0	16	59.3
In total	152	100	104	100	27	100

Quality of hedges directly depends on the intensity of illumination of plants. With good lighting, the proportion of hedges with an unsatisfactory quality rating is 17.8 %. But in the shade, the proportion of such hedges increases to 59.3 % (Table 5).

In addition, major causes for 'unsatisfactory' quality of hedges are problems of agrotechnical nature both at the stage of creation and in the process of care and operation (non-compliance with the technology of creation, schedule of care and formation, incorrect or not systematic prun-



**Fig. 5. Ecological structure of hedges: A. regarding substrate nutrient status; B. regarding substrate moisture content.**

ing, untimely implementation of measures for protection against phyto-diseases and insect pests, lack of proper financing of works).

The ornamental value of a particular

woody plant depends both on the inherited ornamental features and on individual characteristics. An integral assessment of the above-mentioned signs made it possible to determine the ornamental value

of the formed hedges. In general, hedges formed from *Ligustrum vulgare*, *Lonicera xylosteum* L., *Philadelphus coronaries* L., *Symphoricarpos albus*, *Spiraea media*, *S. vanhouttei*, *Cornus alba*, *C. sanguinea*, *Buxus sempervirens*, *Picea abies* and *P. pungens* are characterized by the highest ornamental value in the settlements (more than 30 points).

One can single out hedges formed from *B. sempervirens*, which do not lose their ornamental value throughout the year and emit a pleasant aroma during flowering. The hedges from *Cornus alba* and *C. sanguinea* look exotic. Eye-catching and attractive are hedges with *L. vulgare* and *S. albus*.

## Conclusions

Hedges, as a component of landscaping of urban areas of Bukovynian Carpathian region of Ukraine, are mostly formed in public areas (64.3 %) and perform mainly the functions of delimiting space and improving the attractiveness of urban green areas.

The dendroflora of the settlements is represented by 32 species of plants from 24 genera and 15 families. In the taxonomic composition the leading families are Rosaceae Juss., Sapindaceae Juss., and Oleaceae Lindl.

Most hedges in the region are formed from one tree or shrub species (Chernivtsi – 98.3 %, other towns and villages – 71.1 %). *Carpinus betulus*, *Buxus sempervirens*, *Cornus alba* and *Ligustrum vulgare* are most often used for their creation.

In the settlements single-row hedges predominate (Chernivtsi – 83.8 %, other towns – 58.2 %, villages – 70.2 %). Most hedges are trimmed ones (Chernivtsi – 92.1 %, other towns and villages

– 75.5 %). In the absence of proper care, they pass into the category of untrimmed ones (with *Carpinus betulus*, *Physocarpus opulifolius*, *Picea abies* and *Buxus sempervirens*). In untrimmed hedges, species such as *Spiraea media*, *Spiraea vanhouttei* and *Symphoricarpos albus*, etc. are predominant.

Mean-height hedges are predominant (Chernivtsi – 65.8 %, other towns and villages – 66.9 %). The share of curb ones is insignificant (Chernivtsi – 7.7 %, other towns and villages – 4.8 %). *Spiraea media*, *Buxus sempervirens*, *Ligustrum vulgare* are most often used for curb hedge formation.

Most hedges in the settlements of Bukovynian Carpathian region belong to the category of 'good' in terms of quality status (Chernivtsi – 41.0 %, other towns and villages – 40.4 %). A significant number of them are characterized by 'unsatisfactory' condition (Chernivtsi – 22.2 %, other towns and villages – 28.3 %), which indicates the need for their partial or complete reconstruction. Under conditions of sufficient lighting, hedges with 'unsatisfactory' state make up 17.8 % compared to the share of ones growing in the shade (59.3 %).

It is advisable to use the research results in order to: solve issues of improving the process of forming new hedges in urban ecosystems; development of measures to improve their structure and functionality; choose an assortment of woody plants for creating hedges; form hedges that are complex in structure and rich in species diversity; enhance the ornamental value of landscape gardening compositions; develop landscape-architectural models for creating hedges of various functional purpose in an urban environment. Therefore, the aspects of systematic composition, structural features, condition and ornamental value of hedges in the

plantings of the city of Chernivtsi and other settlements of Bukovyna will contribute to the processes of creation and formation of resistant, steady-state and aesthetic plant communities in the urban environment.

The formation of new hedges must be carried out with the help of trees or shrubs that have high aesthetic qualities and environmentally friendly to microclimatic and soil conditions of the urban environment: *Aronia melanocarpa* (Michx.) Elliott, *Berberis thunbergii* DC, *Euonymus europaeus* L., *Euonymus fortunei* L., *Ulmus glabra* Huds., *Weigela hybrida* Jaeg. f. 'Variegata', *Viburnum opulus* L., *Cotoneaster lucidus* Schldl., *Acer japonicum* Thunb., *Prunus laurocerasus* L., *Mahonia aquifolium* (Pursh) Nutt., *Cotinus coggygia* Scop., *Prunus spinosa* L. and others.

To increase the area of greenery in cities, it is advisable to create new hedges – mobile hedges (Myronchuk 2018), living walls and wallpaper, using the latest technology. For formation of mobile hedges in the settlements of Chernivtsi region it is advisable to use the following species of woody plants or shrubs: *Pinus mugo* Turra., *Spiraea japonica* L., *Taxus baccata* L., *Thuja occidentalis* f. 'Danica', f. 'Timy Tum', *Berberis thunbergii*, etc.

The development of the scientific foundations for creating and forming hedges, proper financing and timely implementation of hedge care activities will contribute to the processes of creating aesthetically attractive and highly decorative elements of landscape gardening art in an urban environment.

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