UDC 582.475:630*231/232

FEATURES OF PINE GROWTH IN PLANTATIONS AND NATURAL PROTECTIVE FOREST STANDS

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The features of pine growth in plantations and natural stands have been researched. It's approved the capability of afforestation ravine and gully land naturally. Stocktaking pine growth in diameter and height of these stands showed that in the first decades of self-seeding saved not only created stands of natural origin, but had a definite advantage in energy growth compared with growth stands of artificial origin at this stage.

Keywords: erosion control plantings, pine plantations, natural stands, ravine-beam lands, self-seeding, growth.

Statement of the problem. There are distribution the common processes of water erosion in Right-Bank Dnieper region, which has the effect of shrinking and fertility of arable and meadow lands, silting of river beds, deterioration of shipping and sanitary state of the most important waterway of Ukraine – the Dnieper river and its tributaries. The most radical measure preventing the adverse effects of erosion is afforestation of eroded areas. The most common species for afforestation of eroded ravine and gully lands proved to pine, which is undemanding to different growth conditions, has high plastic root systems that alter the structure depending on soil and water conditions. On the eroded lands of Rright-Bank Dnieper most appropriate way to afforestation and reforestation reasonably considered by creating artificial plantations as areas for afforestation are mostly former farmlands. However, because of the need for conservation of species, tin and genetic diversity and increase the biological stability and productivity of tree species, recently it's widely promoted the use of the natural course of development of forest biocenosis.

Analysis of recent researches and publications. Review of the literature [3, 6] showed that the Right-Bank Dnieper to the recent major study on forest reclamation of eroded lands were concentrated mainly near Kanev dislocations. Less attention was paid so much ravine and gully systems along Dnieper, where in 1964 was created Hydro

meliorative station (now - the State enterprise "Rzhyschiv forestry"), whose task was the introduction of complex erosion (hydraulic and agroforestry) measures in Obukhov, Kaharlyk and Mironivskyi districts of Kyiv region. Therefore, the establishment of high anti-erosion pine plantations within this state enterprise is very important.

The aim of the study was to establish the characteristics of the growth of Scots pine in natural and artificial stands as an example erosion control plantings in Right-Bank Dnieper.

Methods of Researches. Closing samplings and determination of forest were performed in artificial and natural protective stands in accordance with applicable regulations and generally accepted in the forest inventory methods [1, 2, 5, 7]. Exploring the success of natural regeneration under the canopy stand was performed using a linear method [8]. At various stages of processing raw data additionally were applied mathematical, statistical and graphical tools of MS Excel.

Results and discussion. According to the vegetation zone, the area of research relates to the Northern part of the Right-bank Forest-steppe zone, and is geographically - to the Kanev-Rzhyschiv area, located in the Eastern part of the physiographic region "Kyiv plateau", with a very difficult terrain, dissected by river valleys, gullies and ravines. Forest Fund area of research focuses directly along the Kanev Reservoir (radical right bank of the Dnieper). The climate of the study area is continental with warm summers and relatively mild winters, favorable for the growth and development of forest vegetation, forming stands high and high performance. Most common on the upper slopes and plateau watersheds were washed weakly and black versions of chornozems with powerful humus horizons. High washed options of dark gray and gray podzolic soils with low humus horizon occupy the southern slopes of the curved displays. Site conditions characterized pine sites advantage of the most favorable for the cultivation of pine. The largest share belongs ecotope C_2 and 55.4 % is forested areas.

Analysis of departmental materials and pine plantations survey showed that almost all protective forest plantations established on former agricultural lands eroded areas. Forest plantations were created by planting 1-2-year-old seedlings in rows under the sword Kolesova. Primary tillage on cultivated areas held mechanized, furrows

(strips), and mortise plows and contour terracing. The most common scheme of plantations was mixing 3 rows of pine trees range from 1 maple, acacia white or green ash.

Modeling dynamics of average height, diameter, the amount of cross-sectional area, number of stems in dependence of age have been done to analyze the growth of artificial pine stands. The essential reason for disparities in the tables run growth Y.M. Savich (1968) which best reflect the growth pine stands of artificial origin are features eroded cultivated areas. Comparison of the course of growth pines high in fresh oak sites with data tables run growth shows that growth pine aged 15 to 55 years is a significant difference (Fig. 1).

In young stands it exceeds the tabulated values of I^b growth class, but later begins to deviate from the line I^b, and then I^a class of growth downward, especially in middle-aged stands.

Effect of slope exposure on the growth of pine plantations was more pronounced than that of their swiftness. In plots a clear advantage slopes north direction (Table 1).

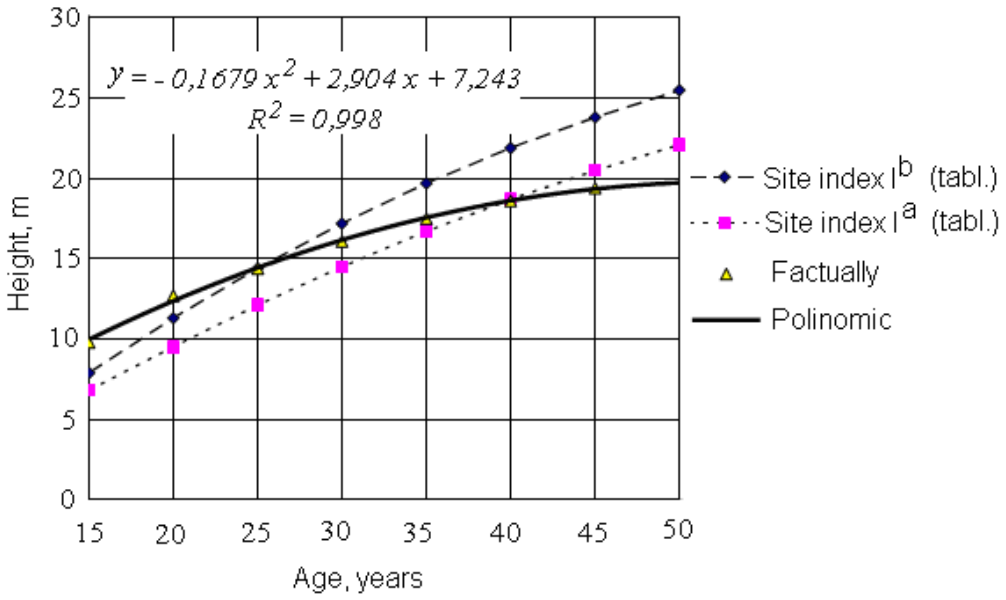

Fig. 1. Dynamic of growth in height of pine on eroded lands in C_2

1. Indicators of pine growth in plantations in the ravine and gully slopes of different exposures and agility

Number of sample	Composition of plantations	Age, years	Part of slope	Exposition of slope	Agility of slope, degree	Average	
						diameter, sm	height, m

8	10Сз + Язл, Клг	34	middle	SW	4	18,0	14,8
9	10Сз + Клг, Бп	36	middle	NW	6	21,0	17,5
14	10Сз	38	middle	S	12	21,0	17,2
17	10Сз1Гз	42	middle	SW	14	22,0	19,8
18	10Сз, од. Клг, Гз,	41	middle	NW	10	23,0	20,5
20	10Сз, од.Дз,Язл	35	middle	SW	18	22,0	17,6
28	10Сз+Бп, од. Дз	36	middle	NE	12-25	23,7	20,8

The plantations on plowed terraces are characterized the best growth (Table 2). This is due to the fact that plowed terraces due to reverse bias creates favorable soil **moisture** and its fertility increases due to additional revenues during plowing upper topsoil. On locked terraces can also be created favorable moisture, but soil fertility deteriorates by partial removal of the humus horizon terrace slopes. Even lower rates of artificial plantations created in soil treated by furrows. The 38-39-year-old plantations where cultivation of soil before planting performed by stripes the average diameter on 10,5-23,2 % lower than in younger 34-37-year-old artificial plantations created on plowed terraces, average height - less on 6,9-10,9 %. The 47-year-old plantation where seedlings landed in furrows, the average diameter is 11.5% lower than the corresponding index in 44-years plantations on plowed terraces.

2. Indicators of pine growth s in plantations established in areas with different ways of soil cultivation

Number of sample	Composition of plantations	Age, years	Method of soil cultivation	Average	
				diameter, sm	height, m
6	8Сз2Клг	36	plowed terraces	20,0	17,0
18	10Сз, од. Клг, Гз, Дз	41	plowed terraces	23,0	20,5
19	10Сз, од. Дз	41	locked terraces	20,0	19,0
20	10Сз, од. Дз, Язл	35	locked terraces	18,0	15,6
22	10Сз+ Клг	37	plowed terraces	19,0	18,4
23	10Сз+Язл	34	plowed terraces	18,1	15,9
26	10Сз+Дз	44	plowed terraces	26,0	19,3
27	10Сз, од. Клг, Бп	47	furrows (stripes)	23,0	20,4
29	10Сз	38	furrows (stripes)	14,6	14,8
31	10Сз, од. Язл	39	furrows (stripes)	16,2	16,4

The results showed that the course of growth of artificial pine stands on eroded

lands is decreasing type. This is due to the fact that the layout of seedlings to ravine and gully land is very varied (from 1.5 x0, 7 m to 4,0 x0, 75 m), but almost always planting density less than that of the plain terms. During the growth of stands they begin thinning because of the negative impact of natural factors. Thus, higher productivity observed in protective artificial pine plantations on the upper slopes of northern exposure.

The success of natural regeneration of tree species depends on the availability of sources of seed, adequacy crop seeds, soil replacement maturity, a criterion which is the state of the forest floor, and the conditions for further growth and development of self-seeding. Sources of natural pine seed cultivated areas on eroded lands are almost always absent and appear only after reaching the age of bearing forest species. Maluga V.M. [4] doing account of natural regeneration of pine on the slopes of the ravine of Kanev dislocations concluded that the renovation is possible, though often self-seeding pines already for the third and subsequent years dies completely, especially on the southern slopes of sun exposures. Researcher is not completely rejecting the possibility of natural regeneration on the slopes of ravines, but finds it difficult.

The records of seedlings under artificial pine canopy of young and middle-aged plantations showed that at the time the account self-seeding pines was available only in some SP 4, 14, 15, 29, is the individuals or small clumps in the windows, gaps or edges. In young plantations after closing gentle forms rather thick (up to 1.5-2.5 cm) litter of twigs, needles, deciduous precipitation of secondary rocks, which prevents access to the self-seeding roots of moisture and soil nutrients, causing almost always self-seeding pines decline.

Extremely kind to environment eroded former farmland turned 17-year-old pine plantations in the tract "Horseshoe" on plots number 30 in Mironovka afroforestry. There is the natural pine stand on 3.3 hectares. Highlight situated in the basin at an angle north-western and south-eastern slopes of up to 10^{o}. In the valley on both sides of the ravine slopes adjacent impetuosity 17-19^{o}, which are 38-39-year-old artificial pine stands (plots number 29 and 31), established by planting seedlings in soil prepared strips tractor plows. Due to early fruiting pine in these plantations, and held in a hollow primary tillage strips for planting mulberry black self-seeding pines survived,

overcoming competition grass. At the time of registration of 17-year-old plantation was 9P1Ml adjacent 38 and 39-year-old artificial plantations – 10P with sporadic mixed with other hardwoods.

Stocktaking pine growth in diameter and height (Fig. 2 and 3) in these stands indicates that in the first decade of self-seeding saved not only created stands of natural origin, but also has an advantage in energy growth compared with growth stands of artificial origin at this stage.

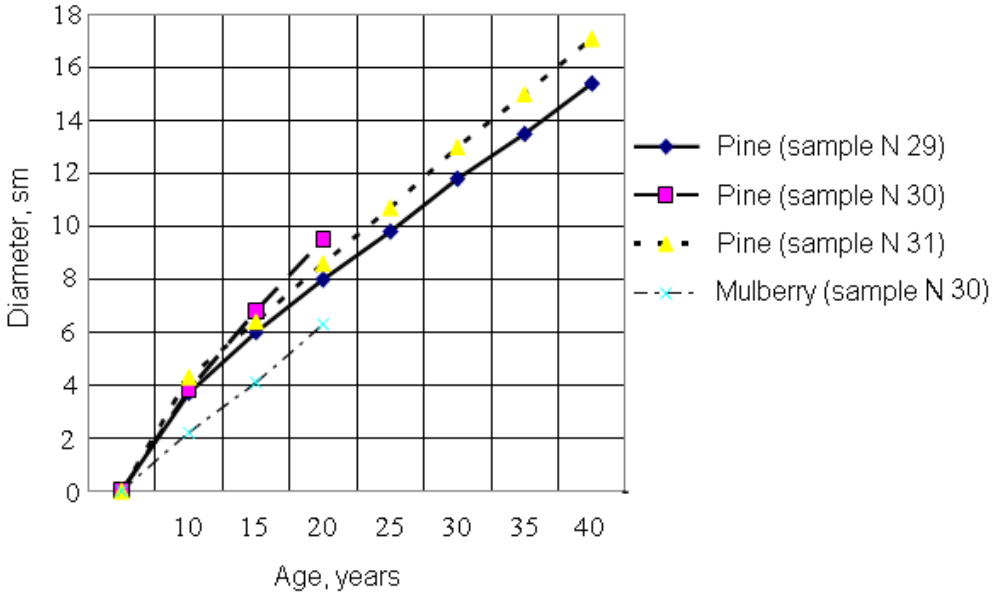

Fig. 2. Dynamic of growth in diameter of pine in natural stands and plantations

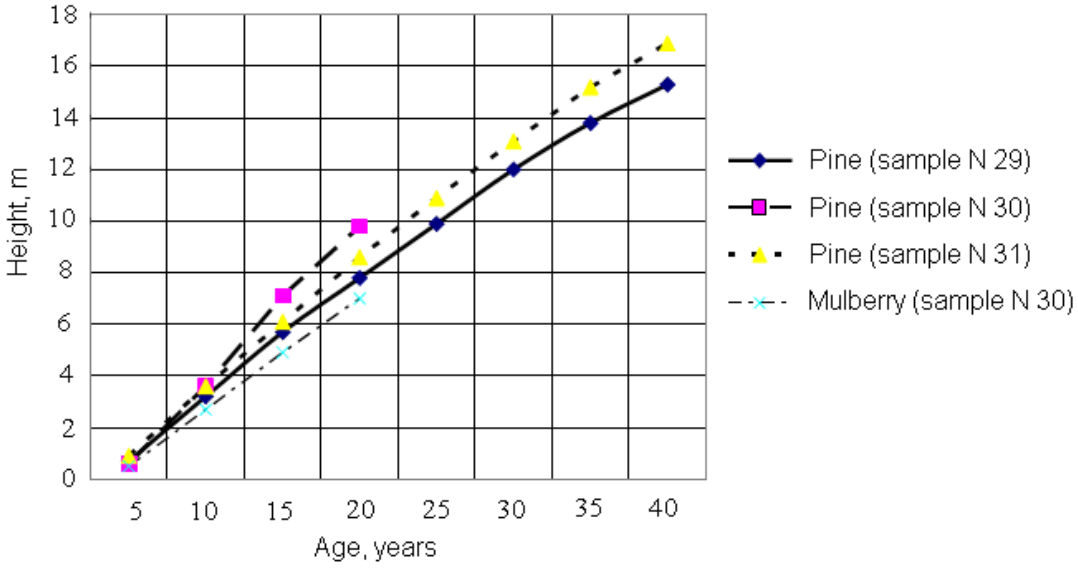

Fig. 2. Dynamic of growth in height of pine in natural stands and plantations

Of course, this advantage was a result of better soil fertility in the basin where the

thickness of humus increased by humus washed off from the surrounding steep slopes of the ravine.

Studies have shown that black mulberry in its biological and economic properties can be used as a valuable component of the various types of protective plantations, including eroded soils and eroded areas. Relative drought resistance and its ability to develop a deep root system determine the value of mulberry as concomitant species on the slopes of the southern exposures where other hardwoods are not always used successfully.

Conclusion. Researches of growth and biometrics of artificial pine stands have shown their advantages in comparison with natural plantings. However, the study of the possibility of creating naturally protective pine plantations in the ravine and gully lands yielded positive results. Obviously, this process is very different from natural regeneration of tree species on the plains, much more complex and more problematic, needs more attention and creativity during the complex forest management. However, the factor of greater stability of natural spaces and better fulfill their protective function must compensate for the respective areas complications forest growing process of forest stands.

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