

FEATURES OF GROWTH OF CRIMEAN PINE TREES IN DEPENDENCE ON THEIR LOCATION IN FOREST PLANTATION

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The results of research of influence of remoteness are resulted from the edge of a forest of planting of trees of Crimean pine on the middle indexes of their height, diameter and current increase after a height.

Crimean pine, Scots pine, height of trees, increase after height, diameter of trunk, hearth of root sponge.

Low wooded of territory of Ukraine, especially its steppe part is required by strengthening of attention to the questions of steppe afforestation and maintenance of the existent forests. Creation of forest cultures in the conditions of Eastern Steppe of Ukraine is problematic even at considerable financial and resource charges. It is predefined, foremost, by unfavorable climatic terms at the considerable varying of soils types on the different elements of landscape. From the moment of maiden attempts of creation of forest cultures plenty of types of arboreal species was utilized in this region (in 1939), including a Crimean pine (*Pinus Pallasiana* Lamb.) [1, 2, 3].

On territory of the Lugansk region from 1.01.1999 to 1.01.2008 the area of forest plantations of Crimean pine grew in more than 50 % – from 0,7 to 1,5 % and made 2583,8 hectares. Here a forest area is busy at a Scots pine (*Pinus sylvestris* L.) abbreviated (to 68704 hectares).

By the state on 2008 forest plantations of Crimean pine characterized by such indexes: middle ages – 25 years, bonitet – 2,5, density – 0,66, stocked – 83 m³ per 1 ha. Thus, forest plantations with density 0,5–0,7 occupy 72,3 %, with a bonitet II and higher – 53,7 %, III–IV – 40,7 %; that grow in dry sudubrava – 60,8 % from total forest area covered of this species.

As in the region of researches a study of growth and development of forest plantations with participation of Crimean pine conducted only on the initial stages

of their forming, the study of the modern state of these forest plantations, when it is possible objectively to estimate efficiency of the use of arboreal species and measures which were applied at creation of forest cultures is actually.

Purpose of researches is a study of features of growth and development of Crimean pine, as one of major coniferous exotic species in Eastern Steppe of Ukraine.

Materials and method of researches. The mixed forest plantation of Scots pine with Crimean pine and elm, located in a quarter 11, kind. 15 of Mikolaiv forest district of "Lugansk forestry" is served as object of researches. Type of soil – turf developed sandy and sandy clay on eluvium of sandstones and chalk. Type of forest terms – fresh subor. Age of forest plantation – 27 years, composition – 5Sp4Cp1Elm. Placing of plant beds is 3,0x0,5 – 1,0 m. Chart of mixing of species – by wings with the duty of six rows of pine-tree and one row of elm. In the row of placing of Crimean pine and Scots pine tree is arbitrary. Density of stand – 0,8. A care cutting was not conducted in this forest plantation. But at many trees a population was cut away apexes willfully on «new-year trees».

Researches were conducted after traditional methods for forestry and forest mensuration. Thus fixings the indexes were determined separately for the rows of stand from the edge into forest plantation.

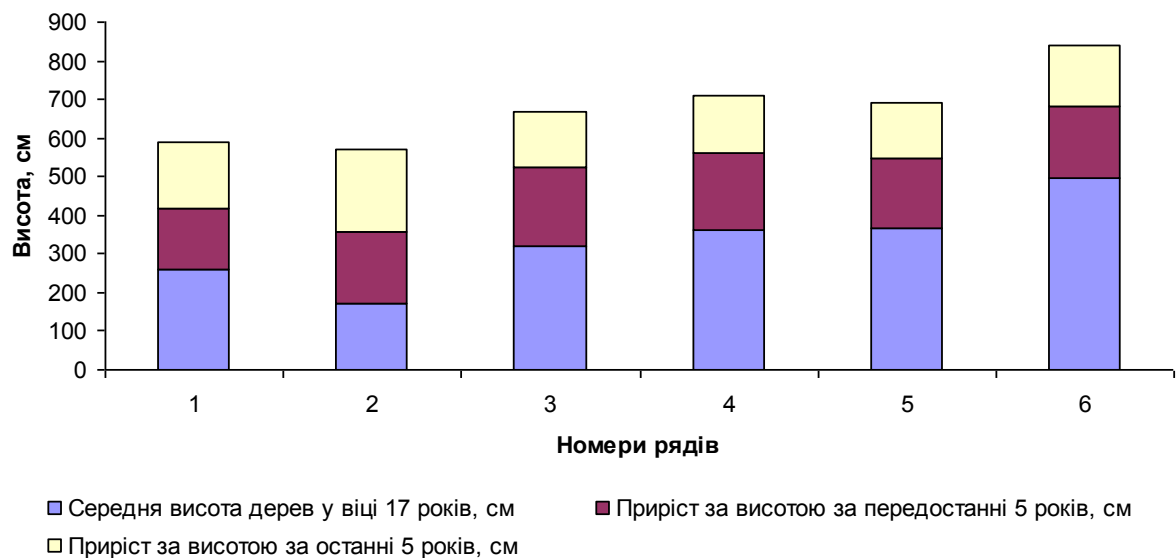
Results of researches. It was set that Crimean pine trees unlike a Scots pine not struck a root sponge (*Heterobasidion annosum* (Fr.) Bref.) quite in the probed terms. Thus, even the multiple cutting away of apexes of trees does not result in their death. At that time, as such operating on the trees of Scots pine trees causes them strong weakening, or death. In this connection, in such soil terms it is expedient to create forest cultures with predominance of Crimean pine. As evidently from the results of researches which are resulted in a table and on picture, the trees of first and second rows differed the less indexes of medium-height ($5,9 \pm 0,33$ m and $5,7 \pm 0,39$ m), comparatively with trees which grow in the depth of forest stands ($6,7 \pm 0,21$ – $8,4 \pm 0,43$ m).

That touches middle diameters; clear dependence on the location of trees from the edge of a forest is shortage after this index.

Indexes of growth of Crimean pine trees are depending on position of row in planting

Category of trees	Middle indexes				
	Height, m	Diameter, cm	Increase after height, cm per 1 year		
			for the before last 5 years	for the last 5 years	for the last 10 years
1 row					
All	5,9±0,33	13,4±0,94	31,4±1,97	34,4±1,57	32,9±1,26
With cut away apexes	5,9±0,39	14,0±0,88	29,9±1,99	34,4±1,79	32,1±1,26
With non cut away apexes	5,9±0,66	13,7±0,82	40,5±6,47	34,0±2,45	37,3±3,45
2 row					
All	5,7±0,39	13,7±0,91	37,0±1,94	42,9±2,18	41,1±1,53
With cut away apexes	5,4±0,39	13,3±1,01	34,8±2,00	40,3±2,22	37,5±1,51
With non cut away apexes	6,6±0,73	14,3±1,85	50,5±4,62	58,5±5,53	54,5±3,63
3 row					
All	6,7±0,21	13,7±0,91	40,8±2,77	29,5±2,40	35,2±1,96
With cut away apexes	6,7±0,24	12,8±1,46	41,2±3,22	29,6±2,83	35,4±2,28
With non cut away apexes	6,7±0,22	13,2±1,12	39,0±4,58	29,0±3,32	34,0±3,14
4 row					
All	7,1±0,35	13,7±0,91	40,4±1,78	24,3±1,24	32,3±1,27
With cut away apexes	7,2±0,43	14,8±0,91	40,5±2,00	24,8±1,50	32,7±1,46
With non cut away apexes	6,9±0,61	10,8±1,70	40,0±3,84	22,8±2,19	31,4±2,58
5 row					
All	6,9±0,29	11,9±1,62	36,2±1,79	28,8±1,49	32,5±1,19
With cut away apexes	6,9±0,28	12,5±0,63	35,6±1,82	28,1±1,28	31,9±1,16
With non cut away apexes	7,0±0,84	11,2±2,35	38,3±5,00	31,0±5,05	34,6±3,56
6 row					
All	8,4±0,43	15,7±0,83	36,8±2,48	31,7±1,70	34,2±1,52
With cut away apexes	7,8±0,62	15,0±0,89	31,6±3,26	34,0±2,48	33,8±2,06
With non cut away apexes	9,1±0,98	16,5±1,55	43,3±3,35	28,8±2,11	34,8±2,26

Undulating character of change of this index is visible with advancement inward of stand: in particular the trees of the first two rows have a middle diameter according to $13,4 \pm 0,94$ cm and $13,7 \pm 0,91$ cm, the third and fourth row is $13,7 \pm 0,91$ cm, fifth – $12,2 \pm 0,77$ cm, and sixth – $15,7 \pm 0,83$ cm. Are obviously that the most indexes of height and diameter at the trees of sixth row caused of his joins to the row of elm which in the probed terms was badly saved, that provided a pine-tree the greater area of feed and the best luminosity of crowns. In same queue, the well developed trees of sixth row are shade the trees of nearby fifth row, that negatively affected for their indexes: they for them the lowest.



Medium-height and increases after the height of Crimean pine trees depending on their location from the edge of a forest plantation

There are not reliable differences between the indexes of trees with cut away apexes and with not cut away apexes.

Research of increase of trees height, which, as known, it depends from: a species and its internal properties, density and age of stand, and also from a climate, soil and other external terms, in particular from intervention from a man [4], allow to draw a conclusion, that for the last 10 years the lowest increase was observed at pine-trees first, fourth and fifth rows ($32,9 \pm 1,26$ cm), and most – $41,1 \pm 1,53$ cm –

at the trees of the second row. As far as advancement into stand this index had wave character and hesitated from $32,3 \pm 1,27$ to $35,2 \pm 1,96$ cm. Such character of change of increase of height it is necessary to take after creation of forest plantations and to the location of rows in relation to the sides of the world.

Analyzing the indexes of increase for two last five-year periods, it is possible to see that trees at back of stand reduce intensity of growth after height. At the last 5 years they have this index scope from $24,3 \pm 1,24$ cm in a year to $31,7 \pm 1,70$ cm in a year, and for previous five-year period – from $36,2 \pm 1,79$ cm to $40,8 \pm 2,77$ cm per 1 year. Opposite the trees of two forward rows have intensity of increase after height, increased: at previous 5 years he made $31,4 \pm 1,97$ – $37,0 \pm 1,94$ cm in a year, and for the last – $34,4 \pm 1,57$ – $42,9 \pm 2,18$ cm in a year. Substantial difference it is not discovered between the indexes of increase between heights of trees with cut away apexes and trees with not cut away apexes.

Conclusions

1. Unlike a Scots pine, Crimean pine trees is not struck a root sponge (*Heterobasidion annosum* (Fr.) Bref.), in the fresh subor conditions of Eastern Steppe of Ukraine. In this connection, in such soil terms it is expedient to create forest cultures with predominance of Crimean pine trees.
2. The trees of edge of the forest part (1 and 2th rows) in a time of researches (age of stand – 27 years) were marked the less indexes of medium-height (comparatively with trees which grow in the depth of stand). In relation to middle diameters clear dependence on the location of trees from the edge of a forest is not set.
3. Trees at depth of stand reduce intensity of growth after height, and in the edge of a forest rows intensity of increase after height, opposite, increased in a time of researches.
4. There are not reliable differences between heights of trees with cut away apexes and trees with not cut away apexes.

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