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EFFECT OF THE CURRENT SOIL MINERALIZATION EFFECT ON BASIC INCREMENT OF PINE UNDERGROWTH HEIGHT AFTER STRIP-GRADUAL FELLINS

Mineralization of soil is one of the important part in the formation of a new generation of forest after the strip-gradual fellings. Different ways of mineralization have not the same effect on the formation of natural seeding and undergrowth. Removal of upper layer of soil humus has a positive effect on natural seeding, but a negative one on further undergrowth formation.

Introduction. As a result of fellings the removal of mature timber from forest area takes place. However, in the course of their planning is necessary to provide options for the formation a new, economically valuable stands of natural or artificial origin instead of parent forest stand.

Thus, during strip-gradual fellings an integral part of reforestation activities is the implementation of measures to promote natural regeneration in the form of soil mineralization on cleared areas to create the conditions that contribute to natural seeding of commercially valuable tree species [1, 2].

The appearance and further development of natural seeding of commercially valuable species is affected by many factors of anthropogenic and natural origin.

Natural factors, in turn, may be biotic and abiotic [3]. Edaphic factors, such as rich soil in nitrogen and mineral elements formed in the process of mineralization of soil nanorelief, largely determine the success of a new generation of forest [4]. In the formation of plow furrows and stirring of upper humus layer of soil by the cultivator, there have been unequal redistribution of nutrients on the site being restored.

The aim of the study was to assess basic increment of pine undergrowth height after stripe-gradual felling and measures contributing to natural regeneration in the form soil mineralization with furrows and mixing of soil humus upper layer by means of cultivator.

Research methods. The object of research is the area in heathy pine forest with the first strip-gradual felling being maid in forestry Dokudovskoye of GFE “Lida forestry”.

In the course of research there have been used conventional methods being common for forestry and forest inventory.

Results. First stripe- gradual two-stage felling in Dokudovskoye forestry was made in 2002. Before the felling stand had the following silvicultural-taxation characteristics: composition 10C, heather pine forest type, type of site condition – A_2, quality class – II, density 0.5, average height – 21.0 m, average diameter – 26.0 cm, forest yield – 190 m^3/ha [5, 6].

Width of strips being cut and left untouched during the first stripe-gradual felling is 30 m. Felling was carried out using conventional logging equipment: when felling there have been used gasoline-powered saws Husqvarna 268, bucking was done on cut strip, skidding was made by means of a tractor with rope-choker TTR 401.

As measures to promote natural regenerations soil mineralization have been made by plow PKL - 70 in aggregation with MTZ-82 and cultivator CLB-1.7 in aggregation with the same tractor in the two tracks.

At the time of registration (autumn 2012) benign pine undergrowth have been formed in the area formed. When transferring it huge class to comprised 19.5 thousand p. / ha. Among them a large specific gravity is common for species of 9 years (about 49% of the total pine undergrowth) and 10-year species (about 31%), the proportion of 8- and 11-year species is insignificant – 14% and 6% respectively. It follows that the remaining species of pine undergrowth has been formed mainly in the year and a year after the first stripe-gradual felling and activities providing natural regeneration. Undergrowth of previous generation occurs, therefore, in the process of cutting and measures undertaken to promote its safety is proved to be significant. One should also pay attention to the fact that the 11-year-old pine undergrowth species are located only on soil being mineralized by means of cultivator.

Fig.1 shows the variation of increment of 9-year-old pine undergrowth on the bottom of the furrow on bare soil and between the furrows and soil mineralized by cultivator CLB-1.7 in aggregate with MTZ-82.

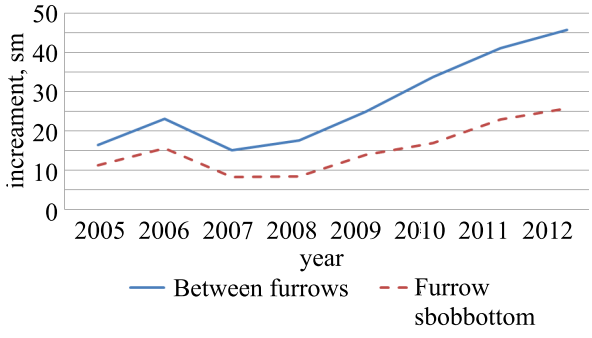

Fig. 1. Increment of pine undergrowth different locations

As you can see, the value of increment of pine undergrowth is varied. It tends to increase its average increment from 2009 to 2012, it can result from favorable climatic conditions of growing seasons.

Also 2007 and 2008 can be considered to be unfavorable for the formation of pine regrowth, since its development was influenced by limiting factors such as lack of moisture.

Doing analysis it is clearly seen the difference between the growth rate of pine undergrowth at the bottom of the furrow on bare soil and between the furrows after soil mineralization by cultivator CLB-1.7. The growth rate of pines is higher in the area with soil mineralization made by cultivator since the upper humus layer is mixed with the mineral soil layer and it is not removed during activities providing natural regeneration. Undergrowth in this location is not lacking in nitrogen and ash elements in soil unlike species which are formed soil lacking in humus on the bottom of the furrow. Also in this location draining the soil layer is less intensive than after soil mineralization by plow PKL-70.

Minimum difference in increment of pine undergrowth is seen between location on the bottom of the furrow on bare ground and treated with in the first years of life. The growth rate of undergrowth in different locations varies more significantly. The maximum difference being observed in the record year (2012) and reaches for individual species of pine 20 cm.

Fig. 2 shows the distribution of increment of pine undergrowth for the entire period of his life in percent's of its total height.

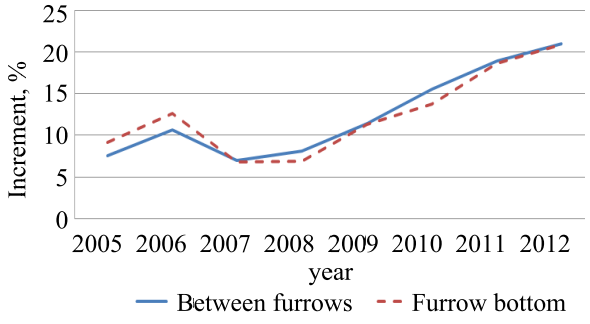

Fig. 2. Increment of 9-year-old pine undergrowth in different locations

As you can see, increment of pine undergrowth on the bottom of furrows on bare ground in the first years of life was more intensive than increment occurring between furrows. Minimum percent of increment is also observed in 2007–2008.

Fig. 3 shows the dynamics of increment for 10 -year-old pine undergrowth at the bottom of the furrow on bare soil and between the furrows with mineralization of soil cultivator after first strip-gradual felling.

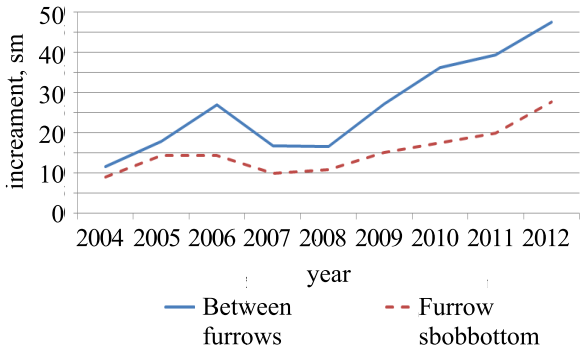

Fig. 3. Increment of 10-year-old pine undergrowth in different locations

As you can see, increment of 10-year-old pine undergrowth in different years was not the same. Its minimum value is observed at initial stage of undergrowth formation, in the first years of life. Species that were located on the bottom furrow on bare ground, even at this time, are lack of nutrients. These substances were in humus soil layer which was removed in the process of mineralization. It should be noted that 2007–2008 are unfavorable for normal growth pine undergrowth. After 2009 there is a tendency to increase its base increment.

Increment of undergrowth between the furrows after soil mineralization by cultivator is much higher than on furrow bottom on bare soil. Thus, a minimum difference of increment comprises 2.7 cm i in 2004, maximum – about 20 cm in 2012.

Fig. 4 shows the growth dynamics of pine undergrowth in percent of its total height.

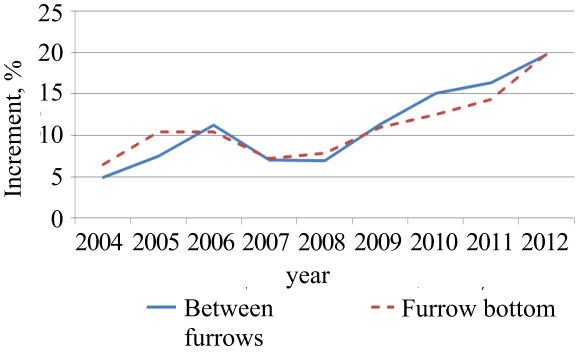

Fig. 4. Increment of 10-year-old pine undergrowth in different locations

The figure shows that more intensive increment of pine undergrowth at the bottom of the furrow on bare soil is observed in the first years of life (up to 2006) , increment of undergrowth between the furrows in the first years of life is less

intensive, but by 2006 they leveled. Minimum percentage of increment in all locations is also observed in 2007–2008.

Species of 11-year-olds are found only between the furrows on mineralized soil by cultivator.

Increment dynamics of 11-year-old pine undergrowth is similar to the previously discussed cases, in the first years of life it is slight, and then we can see an increase till 2007–2009. This period was characterized by unfavorable weather factors, after 2009 there is a tendency to increase the increment of pine undergrowth.

Eight-year pine species are found on the bottom of the furrow on bare soil.

Annual increment in height of 8-year-old species of pine undergrowth varies, the minimum is also observed in 2007–2008, after which there is a tendency to an increase.

Conclusion. During strip-gradual fellings being made for obtaining a new generation of economically valuable forest species it is very important to carry out soil mineralization. Different methods of soil miniralization have not the same influence on the formation of natural seeding and undergrowth. Removing the upper humus layer has a positive effect on the appearance of natural seeding, but a negative impact on the further formation of the undergrowth, while mixing it with mineral soil has positive effect on the appearance of natural regeneration of commercially valuable species and its further development.

Thus, the annual increment in height is greater for species formed on interfurrows space after the soil mineralization by cultivator CLB-1.7 in aggregation with MTZ-82 than for pine undergrowth growing on the bottom of the furrow on bare soil after being mineralized by plow PKL-70. The difference in annual increment reached more than 20 sm.

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