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INFLUENCE OF WEEDS ON THE GROWTH CONDITIONS AND BIOMETRIC PARAMETERS OF SCOTS PINE

Results of researches of influence of weeds on the content of nutrients and a humus of the upper plough layer of soil at cultivation seedlings of Pinus silvestris are resulted. Regularity of change of biometric indicators of Pinus silvestris seedlings depending on presence of weeds is established. It is revealed, that carrying out of weedings positively influences growth of a top part of seedlings and not revealed influences on growth of root systems.

Introduction. The negative influence of weeds affects production and organizational activity of agricultural and forestry enterprises. Weed vegetation complicates soil cultivation, because draught resistance of soil tilling implement increases by 30%. Absorbing huge amount of water, weeds decrease humidity of root habitable layer by 2–5% [1]. Caused by weeds soil evaporation reduces soil temperature by 3–4ºC, which stimulates soil microorganisms activity weakening, as a result decomposition processes of organic substance and nutrients supply for cultivated plants slow down [7]. Cultivation of soil that is grown by couch-grass consumes especially much labour and time.

Taking into account cost of weeds control, damage from weeds exceeds losses caused by pests and plant diseases. The damage brought to the economy of some countries by weed vegetation takes the second place after damage caused by soil erosion [2]. According to the opinion of international experts, the world Yield loss caused by weeds, diseases and pests reaches 30–50% of biological yield [3].

Main part. The researches were conducted in basic forest nursery of Negorelsky experimental forestry station, in seedling section for cultivating 1-year old seedling of Scots pine. The testing sites were laid out in the Yields of 1-year old seedling of Scots pine. Average soil samples were taken from plough horizon on ten testing sites, ten samples minimum from each testing site. Five of the testing sites were weeded away regularly, the others weren't. Soil samples were taken in summer (July) and in autumn (October), 2011, for the further analysis of the main chemical properties.

Soils humus content was determined according to the method of I.V. Tyurin in V.N. Simakov's modification; pH in KCl – using pH-meter HI 931400; labile forms of Phosphorus – according to the method of A.T. Kirsanov, labile forms of exchangeable potassium – according to the method of A.D. Maslova using flame photometer [5]. The statistical analysis of the received results was conducted according to practical standards [6] with the help of Statistics package Statistica 6.0. Significant t-test criterion is highlighted in the Tables by boldface type.

On the examined territory the soil is sod-podzolic contact gley weakly podzolized sandy loam on mellow clay interchanged by sands, on the depth more than 1 m underlied by light morainic clay loam.

For the results of weed vegetation's influence on chemical properties of soil's upper plough horizon in options with and without eradication see Table 1.

While Scots pine seedlings cultivation the humus content in humus horizon during vegetation period gradually decreases. This refers both to soil with and without eradication (Table 1).

However weeds in major degree influenced on the humus content, which was found out during analysis of soil samples taken both in July and September, and this was confirmed by significant difference (Student's t-test is 3.86 and 3.82 accordingly).

When analyzing weeding influence on pH in upper humus horizon, no significant difference between soil with and without eradication was noticed.

As appears from Table 1, pH is slightly lower in the plough horizon where seeds are controlled than in the areas without seeds control. It can be explained with microbiological processes with high intensity which resulted in release of organic acids to the soil. However it isn't confirmed by significant difference.

While analyzing seeds influence on labile forms of phosphorus in upper plough horizon, there was determined a significant difference between soils with and without seeds control.

In the areas with seeds control the content of labile forms of phosphorus is higher. But in summer root systems of seeds release into the soil a significant amount of organic acids that force out labile forms of Phosphorus from the soil absorbing layer. In this regard there is approximately equal quantity of labile forms of Phosphorus in the areas with and without weeds control.

Table 1

Soils chemical properties in plough horizon

Season	Variants of the experiment	Mean value	Mean error	Experiment precision, %	Experiment precision error, %	*t*-test
Humus level, %						
June	With weeding	2.31	0.05	3.82	1.11	3.86
	Without weeding	1.88	0.08	4.76	1.39	
September	With weeding	2.18	0.05	4.13	1.21	3.82
	Without weeding	1.71	0.04	2.65	0.77	
pH value						
July	With weeding	5.2	0.16	3.33	0.97	1.10
	Without weeding	5.0	0.09	1.85	0.53	
September	With weeding	4.9	0.23	4.79	1.40	2.57
	Without weeding	4.8	0.25	4.46	1.30	
Content of moving forms of phosphorus, mg/100 g soil						
July	With weeding	14.3	0.06	4.96	1.45	1.37
	Without weeding	12.0	0.05	3.88	1.13	
September	With weeding	12.9	0.27	4.88	1.43	4.47
	Without weeding	7.8	0.24	3.36	0.98	
Exchange potassium content, mg/100 g soil						
July	With weeding	15.3	0.26	4.94	1.45	7.53
	Without weeding	10.4	0.25	3.50	1.02	
September	With weeding	12.6	0.05	3.88	1.13	5.96
	Without weeding	6.5	0.04	2.61	0.76	

Therefore during the summer period no significant difference was revealed. Intensive consumption of Phosphorus from the soil was noticed in the latter half of the summer period, which additionally explains a significant difference in the phosphorus content in the soil.

While analyzing the influence of weeds on the exchangeable potassium content in the upper plough horizon there was also determined a significant difference between soils with and without seeds control.

It can be seen in Table 1 that in the areas with seeds control the exchangeable potassium content is higher.

This difference was determined both in summer and in autumn, and in the summer period the difference was higher. On the whole, the exchangeable potassium content decreases during planting material cultivation, weeds absorb a significant amount of it from the soil.

Though there is an opinion that a considerable part of nutrients absorbed by weeds isn't alienated from the soil, it's true only partially. Only early ripening weeds leave a considerable part of absorbed nutrients in the soil.

In forest nursery manual eradication helps to clear fields from weeds, but along with weeds a large part of nutrients leaves the soil. Nutrients are accumulated in seeds of weeds, in their root system, rootstocks of perennials and don't return to the soil for long time.

Weed plants consume moisture and reduce nutrition area for cultural plants; besides, they mechanically shade cultural seeds. Strong shading impedes regular growth of cultural plants, they stretch and get weak and fragile. Also there is a danger of lodging of Yields due to heavy rain [7].

There are the biometrical properties of seedling grown in the areas of two types – with and without manual weeding application during the vegetation season shown in Table 2.

Table 2

Biometric parameters of aerial and underground parts of Scots pine seedlings grown in Negorelsky forest nursery

Parameter	Experimental areas without weed control		Experimental areas with weed control	
	$M \pm m$	υ, %	$M \pm m$	υ, %
Aerial part, cm	6.21 ± 0.22	25.21	7.56 ± 0.29	20.15
Root system lenght, cm	8.90 ± 0.40	32.13	8.08 ± 0.47	30.84
Root neck diameter, mm	0.88 ± 0.04	30.19	1.21 ± 0.04	19.48
Fir-needle mass 100 pcs. seedling, g	11.44	–	14.47	–
Stipes mass 100 pcs. seedling, g	8.08	–	10.22	–
Root system mass100 pcs. seedling, g	3.88	–	3.63	–

Table 2 shows that in comparison with the areas without weed control, manual weeding has a positive effect on growth and size of seedlings. For example, average aerial part of Scots pine seedlings grown on the territory with weed control is higher by 22%.

The same refers to root neck diameter and mass of 100 pcs – they are both more by 26.5%. Root system length and mass are an exception; they have less than 10% difference with plants that weren't eradicated, and the difference can't be significant.

It's known that the coefficient of consumption of fertilizers nutrients by cultural plants averages 30-40%. Weeds sharply reduce this number by consuming large amount of fertilizers nutrients. For example, the coefficient of consumption of fertilizers nutrients by windlestraw, corn mayweed, frost blite, field mustard, bindweed, catchweed reaches 56-70%. The content of nutrients in weeds is higher than in cultural plants [1].

The application of fertilizers, as we know, leads to change of specific structure of weeds and their harmfulness because of development of the species which use nutrients better. According to the nutrition conditions requirements it's possible to distinguish following ecological groups of weed plants: nitrogen-positive (frost blite, wild radish, Canada thistle, common orache), potassium-positive (frost blite), phosphate-positive (dock-leaved persicaria, duck wheat, creeping thistle) [1].

Conclusion. Soils analysis highlights that weeds control has a positive influence on soil fertility, and nutrition elements content is higher in the soils where regular eradications are carried out.

An essential part of modern highly intensive agriculture is made up by its chemicalization and implementation of fertilizers. However, one of the factors constraining large yield of planting material even if applying sufficient quantity of mineral fertilizers is weed infestation.

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