

УДК 630*232+630*232.324.3

V. V. Nosnikov, PhD (Agriculture), assistant professor (BSTU);
A. P. Volkovich, PhD (Agriculture), assistant professor (BSTU);
A. V. Yurenaya, PhD (Agriculture), senior lecturer (BSTU);
V. A. Yarmolovich, PhD (Biology), assistant professor (BSTU);

EFFICIENCY OF PRESOWING TREATMENT OF PINE AND SPRUCE SEEDS WITH EMISTIM-C DRUG

Influence of Emistim-C drug on seeds germination of common pine and common spruce was studied both in vitro and in the open soil conditions. Its protective properties against seedlings infectious lodging were examined. On the basis of the comparative analysis of germination of seeds treated with Epin and soaked in water a conclusion is drawn that Emistim-C has a stimulating influence on seeds germination, and a bigger effect is observed when treating the common spruce seeds and long-term storage seeds. The best results were shown by the dosage of 2 ml/l. The drug protective properties against infectious lodging are a little bit lower than that of the fungicide Raksil, however, the last does not possess the effect of growth processes stimulation. Treatment by this drug in the open soil had reliable influence on better development of root systems, and also on the planting stock height.

Introduction. Seeds of wood species and shrubs are characterized by high physiological activity during their development and maturation. There is a considerable amount of mobile carbohydrates and nitrogen compounds which accumulate in it in the seed maturation process in the form of starch, protein and fat. During the seed maturation its physiological activity slows down, the seeds germ ceases to grow. For the seed germination it is necessary to create conditions at which its growth processes will begin again [1].

Effect of different germination factors on seeds of different kinds of plants is different, as well as seeds requirements are different to these factors. All mature seeds are at rest which is directed on prevention of their premature germination. Seed dormancy can be deep and forced. The knowledge of reasons of the seed dormancy permits to develop and apply different methods of its overcoming by special presowing treatment. Special substances – stimulators – have the stimulating effect on seeds germination and seedlings growth of some species. Gibberellin, Heteroauxin, Epin, etc. are growth stimulators. During recent years an increasing amount of various drugs having stimulating effect on seeds makes its appearance.

Main part. Studies of Emistim-C drug were done in laboratory and in field conditions. In laboratory its influence on seeds germination and on reduction of such widespread disease of coniferous species seedlings as infectious lodging was studied. Seeds sprouting was carried out on laboratory the equipment of German corporation Rumed during 15 days according to the STANDARD 13056.6-97 [2].

Seeds were soaked beforehand during 10 hours in the drug solution concentration of 1, 2, 4 ml/l. Soaking in water was taken as control, and growth stimulator Epin was taken as standard, it is applied in forestry for presowing seeds treatment. The results of presowing seeds treatment of common spruce are given on fig.1, a. The best results

showed the dosage of 2 ml/l. It is noticeable that the drug accelerated the seeds germination at the initial stage, and that led to the seeds germination energy increase up to 83 %. As the spruce seeds were of high quality, the stimulator treatment had no effect on the terminal germinating ability.

To study the drug influence on common pine they took seeds which were stored for a long time and had lower sowing qualities (Fig. 1, b).

As in the previous case, the best results had the dosage of 2 ml/l. Two other proportions at the initial stage were comparable with the control variant; however, at the moment of the experiment completion they increased the seeds germinating ability on 6-8 %. On the whole pine is less responsive to the growth stimulator in comparison with spruce. Freshly gathered pine seeds germinate well and quickly without any help. Spruce germinates more slowly, therefore the stimulating effect is more pronounced.

At long-term storage or at violation of its rules there is lowering of growth processes, and, accordingly, the stimulator action is more pronounced.

Also comparing of Emistim-C with stimulator Epin was done. The results are similar to the given above (Fig. 2, a; 2, b).

Stimulating action of the drug of 2 ml/l at the initial seeds germination stage is clear from Fig. 2, a, and it exceeds that of Epin. Then their action becomes even, but remains higher than that of the drug with norm of 1 ml/l and 4 ml/l. For pine the 2 ml/l drug action is comparable with the action of Epin.

Also there was done the drug bio-protective properties estimate towards the causative agent of seeds infectious lodging. Common pine seeds sowing was done into soil in the laboratory, they were infected beforehand with the infectious lodging. The results are given in fig.3. 10 days after sowing it became clear that the seeds, soaked in 2 ml of the drug on 1 liter of water, gave the biggest amount of shoots, and that testifies to the stimulating effect.

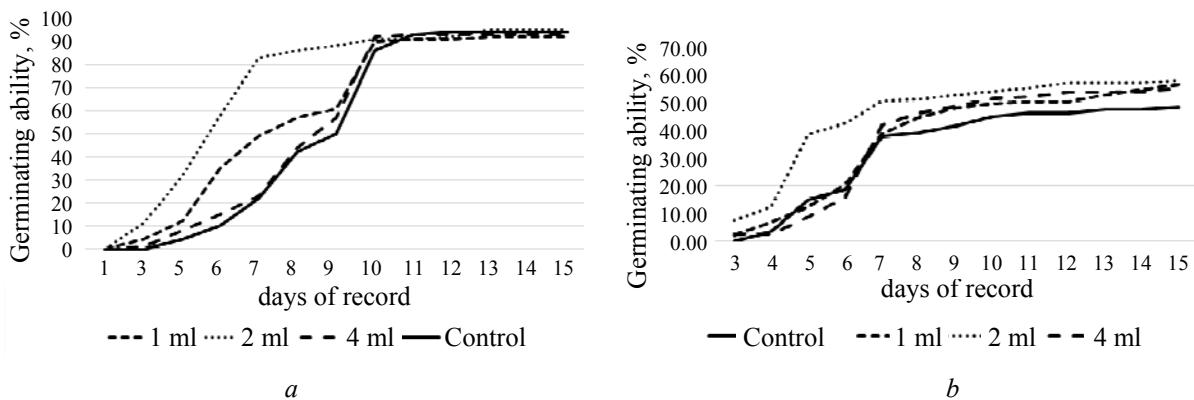


Fig. 1. Seeds germinating ability:
a – of common spruce; b – of common pine

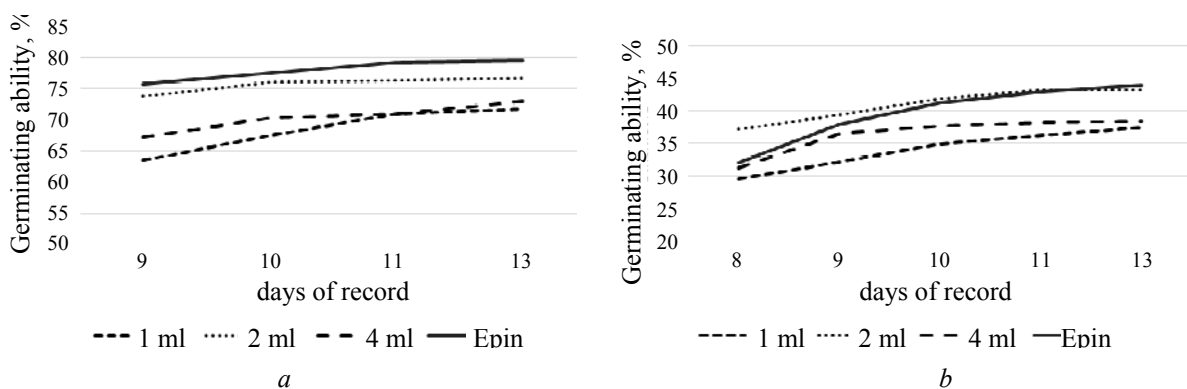
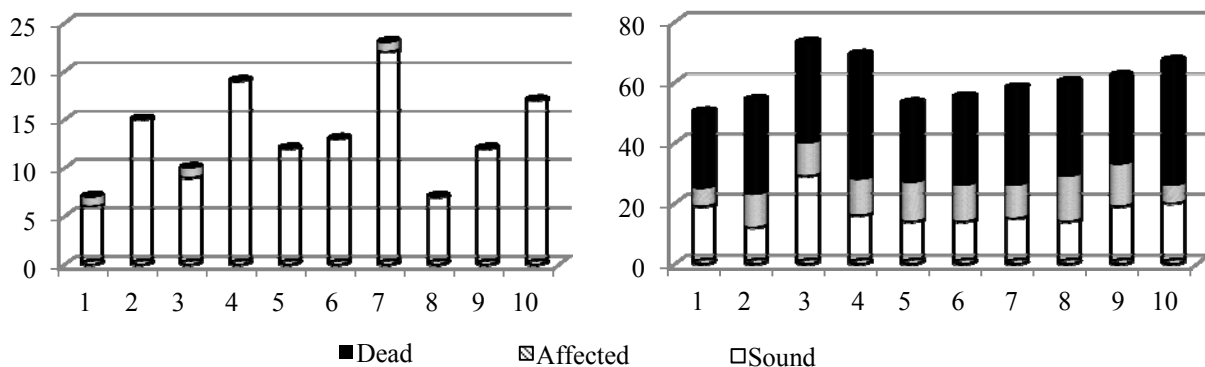


Fig. 2. Seeds germinating ability:
a – of common spruce; b – of common pine



Notes: 1 – Dry seeds; 2 – Soaked in water; 3 – Standard (Raksil); 4 – Manganese solution; 5 – 0.5 ml/l of drug; 6 – 1 ml/l; 7 – 2 ml/l; 8 – 3 ml/l; 9 – 5 ml/l; 10 – 10 ml/l

Fig. 3. Number of common pine seeds shoots

In a month a considerable loss of plants from disease was observed. There is increase of preserved plants with the increase of Emistim-C drug dosage. However, the best results had the standard – fungicide Raksil. It is necessary to note that in field conditions there is no such high infectious background. A faster coming out of plants from ground as in variant of 2 ml/hectare, together with preventive treatment will permit to raise considerably the seedlings preservation.

Sowings treatment of common pine and common spruce by Regoplant in 2012 showed that the most effective is treatment of vegetating plants with the drug application rate of 50 ml/hectare (Table 1).

The drug field tests were done on the basis of the forest nursery SFI “Novogradok forestry enterprise”. Seeds soaking of common pine in 0.2 % solution of Emistim-C (2 ml on 1 liter of water) led to 4 days shortening of the soil stage of seeds germination.

Table 1

Biometric indices of the planting stock of common pine and common spruce

Experiment	Little trunk height, cm	Root system length, cm	Little trunk diameter, cm	Needle mass, gr	Little trunk mass, gr	Root system mass, gr
Common pine						
25 ml/hectare	4.98	9.00	1.20	10.14	3.28	5.63
50 ml/hectare	5.50	9.03	1.27	10.27	3.38	6.30
100 ml/hectare	5.18	8.77	1.17	9.67	3.19	4.24
Control	4.42	9.06	1.05	8.95	2.94	4.77
Common spruce						
25 ml/hectare	2.94	7.81	0.71	4.23	1.24	1.89
50 ml/hectare	3.15	7.74	0.85	4.55	1.37	1.92
100 ml/hectare	3.01	7.40	0.77	4.18	1.26	1.90
Control	2.41	7.23	0.71	4.10	1.12	1.85

In 8 days from the sowing moment there were many shoots of common pine on the treated plot. There were no shoots on the non-treated plot. Digging of the sowing lines showed that the seeds germinated and would appear on the surface very soon. The treated sowings of common spruce began to germinate, it took the form of land cracking along the sowing lines. The non-treated sowings were in the initial stage of germination. They had a sprout, but the little trunk formation yet did not begin.

Shoots on the treated plots were characterized by bigger mass (Table 2).

Plants treated with Emistim-C had intense green colour, more developed root system, and it was expressed in presence of roots of the third order, while on the control plots the shoots only started to form the root system of the second order. There were no symptoms of infectious lodging

both on the treated plots and on the control plots where the fungicide Maxim was applied.

Table 2

Mass of 100 seedlings on the treated and non-treated plots, gr

Plot number	Plot	
	treated	non-treated
1	0.98	0.86
2	0.92	0.84
3	0.96	0.84

At the same time the plants spraying by solutions Emistim-C and Regoplant was done with norm of 20 and 50 ml/hectare accordingly. Peat Oksidat was used as the standard. The results are given in table 3.

Table 3

Biometric indices of common pine and common spruce seedlings

Experiment variant	Height, cm		Diameter, cm		Root system length, cm		100 seedlings mass, gr	
	$H \pm m$	$t_{0.95}$	$D \pm m$	$t_{0.95}$	$L \pm m$	$t_{0.95}$	over-ground part	under-ground part
Common pine								
Control	6.61 ± 0.11	–	0.46 ± 0.019	–	10.13 ± 0.40	–	8.40	1.34
1	7.12 ± 0.19	-2.92	0.52 ± 0.014	-2.47	12.62 ± 0.24	-5.53	10.03	2.06
2	7.55 ± 0.14	-5.63	0.57 ± 0.013	-5.25	12.36 ± 0.25	-4.88	10.89	2.47
3	6.89 ± 0.14	-1.74	0.51 ± 0.013	-1.53	12.05 ± 0.22	-4.39	9.12	2.12
4	7.05 ± 0.13	-2.97	0.48 ± 0.036	-1.49	11.95 ± 0.21	-4.12	9.84	2.14
5	7.04 ± 0.12	-2.84	0.45 ± 0.031	0.94	10.45 ± 0.23	1.12	9.07	1.48
Common spruce								
Control	3.85 ± 0.07	–	0.47 ± 0.008	–	7.26 ± 0.27	–	2.78	0.64
1	4.11 ± 0.08	-2.31	0.52 ± 0.009	-5.07	8.96 ± 0.27	-4.21	3.75	1.06
2	4.46 ± 0.06	-6.40	0.57 ± 0.010	-7.66	9.96 ± 0.36	-6.03	4.15	1.59
3	4.07 ± 0.06	-2.33	0.52 ± 0.006	-4.88	6.95 ± 0.22	0.99	3.56	1.22
4	4.14 ± 0.07	-2.61	0.50 ± 0.008	-2.31	8.78 ± 0.29	-3.98	3.70	1.18
5	4.09 ± 0.07	-2.45	0.48 ± 0.009	1.18	8.14 ± 0.23	-2.18	3.22	1.13

Notes: 1 – presowing Emistim-C; 2 – presowing Emistim-C + after-germination Emistim-C; 3 – after-germination Emistim-C; 4 – after-germination Regoplant; 5 – presowing treatment + after-germination treatment by peat Oksidat; reliable differences are marked with the bold type.

It is clear from the table that the presowing treatment raises reliably the planting stock height in comparison with non-treated seeds and is comparable to peat Oksidat treatment. Besides, presowing co-treatment with after-emergence one by the drug Emistim-C shows the best results, however separate after-emergence treatment raises the biometric parameters insignificantly. After-emergence treatment had no reliable influence on the common pine seedlings diameter. Treatment by stimulators had a significant influence on the root system development. The length increased reliably, however the mass of overground and underground plants parts is a more important index. The treated sowings exceeded the control variants considerably on underground part mass, and that indicates a more developed root system. It is the unquestionable advantage as the seedlings establishment at relocation depends on the root systems development.

Conclusion. Thus, the drug Emistim-C showed a high efficiency at the seeds presowing treatment, and that was expressed in seeds germination terms

shortening and in increase of overground and underground parts of the planting stock. After-emergence treatment has a high potential, but it is necessary to determine in addition the best periods for its conducting to raise efficiency and to use further such kind of treatment together with the presowing one. Early-spring drug application in coniferous species sowings is also of interest to lower the risk of development of fungal diseases and to stimulate the growth processes.

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Received 20.03.2014