Seed size, mass and biopolymer-based film coating effect on Scots pine (*Pinus sylvestris*) germination in natural and semi-controlled condition

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Limiting factors for seed germination in natural conditions differs from the ones in controlled conditions. Seed germination may be influenced by seed mass, size, sowing depth, nursery, and also artificial germination improvements made as a seed coating. However, coating treatment is commonly offered mostly for crops, but knowledge about using this method for woody plants is limited. By using seed coating from naturally degradable biopolymer no negative impact on the environment is caused because it does not contain microplastics.

METHODS

Scots pine (*Pinus sylvestris)* seeds from two nurseries were selected, seeds from the first origin were tested untreated un treated, but seeds from the second were tested only untreated. Seeds were covered with a thin-film coating for easy storage and sowing, which also captures water and swells up to 50 times to improve germination in dry conditions (Fig.1). Seeds were sowed in mineral forest soil (Fig.2) and in Petri dishes (Fig.3), both methods were carried out in three repetitions.

Fig.1. *P. sylvestris* seeds with (T) and without (C) film coating treatment

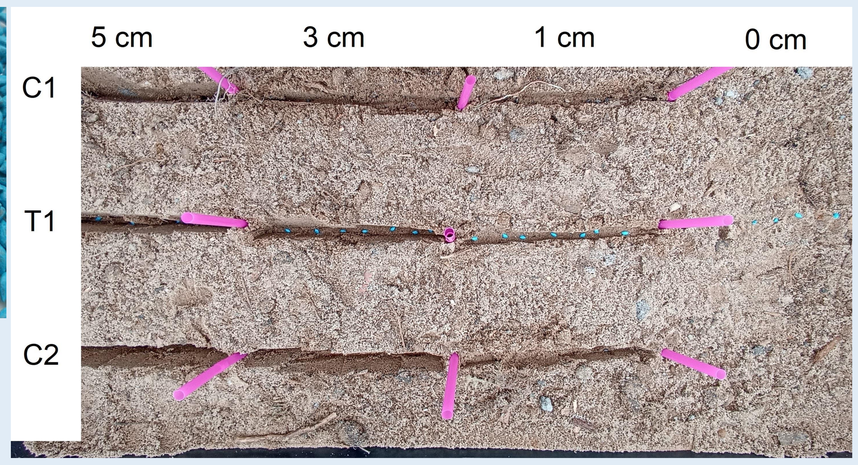

Fig.2. In different depths and treatments sowed *P. sylvestris* seeds (C1- control 1st nursery, T1- treatment 1st nursery, C2- control 2nd nursery)

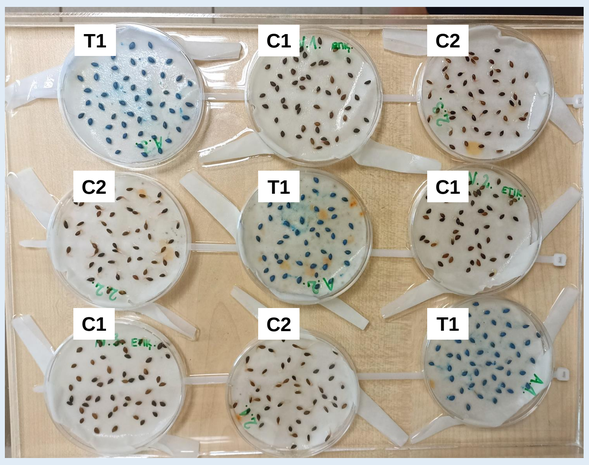

Fig.3. Seed germination tested in Petri dishes on filter paper

RESULTS AND DISCUSSION

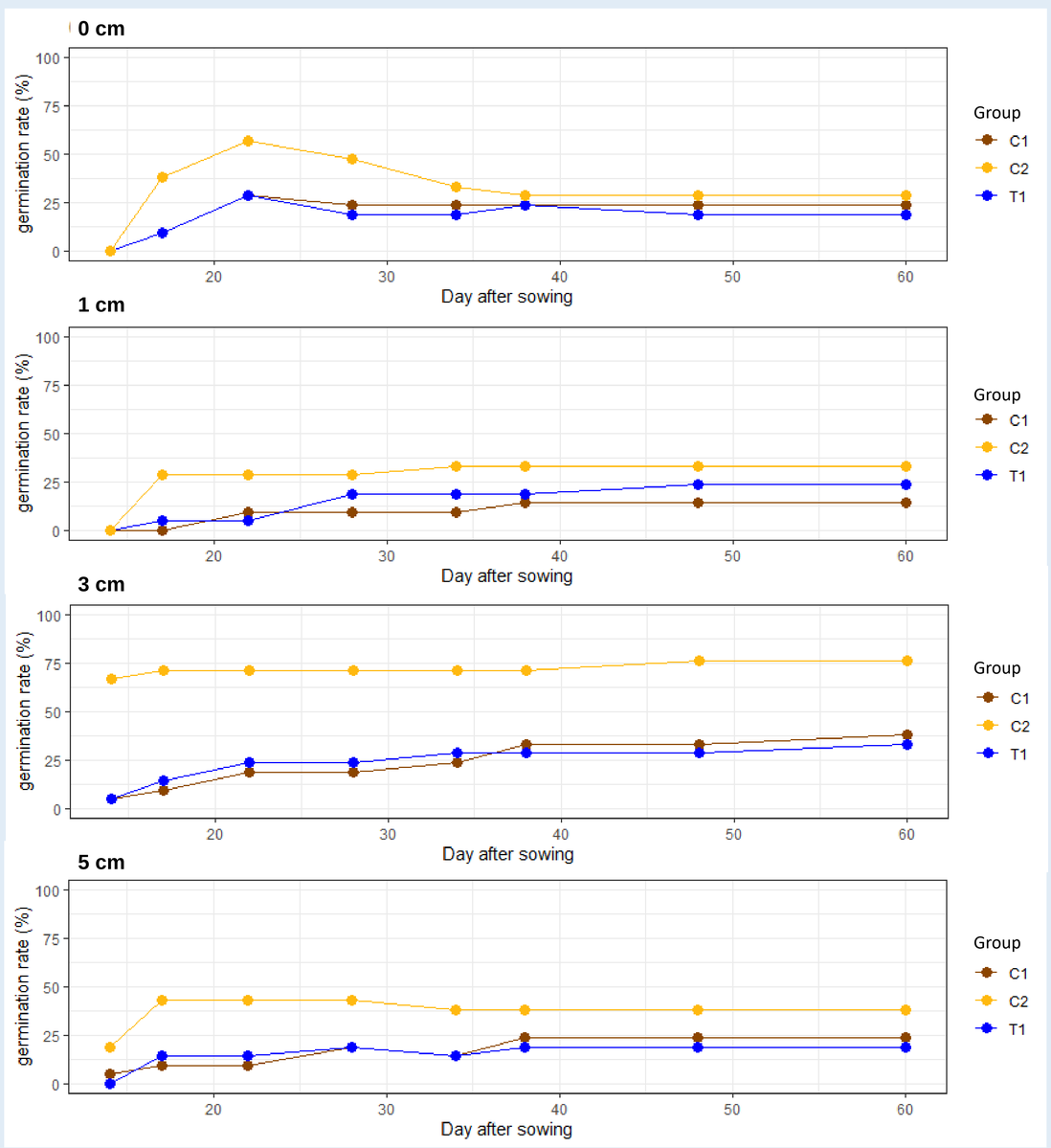

Fig.4. Treated and control group seed germination rate depending from the day of sowing (C1- control 1st nursery, T1- treatment 1st nursery, C2- control 2nd nursery).

The highest germination rate in mineral soil for all groups was in the class with 3 cm burial (Fig.4). All classes except the unburied (0 cm) showed significant differences between plantations, but not between the control and treated group. Seeds in the untreated group in 1 cm burial had significantly reduced germination rate which did not appear in the treated group.
Germination rate for seed from 2nd nursery (C2) was higher, although the mean mass and size was lower (Figs,5,6). Coating slightly increased the mass and area of seed, but it was not significant (Figs.5,6,). The germination rate of the seeds in the Petri dishes does not vary significantly depending to the group (Table1). Highest value was for the second seed plantation. Seeds treated with coating has a lower germination energy in the first week, while the total number of sprouting seeds is similar to the untreated group.

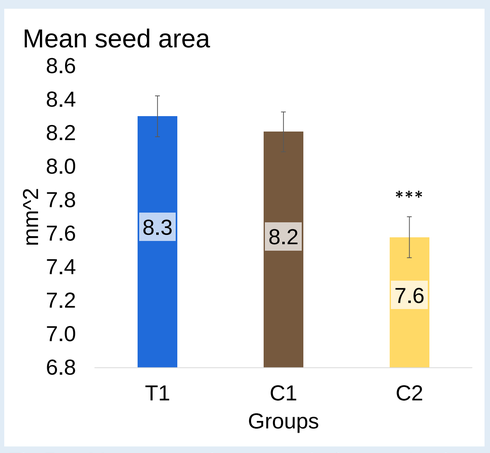

Fig.5. Mean seed area before planting depending on treatment group.

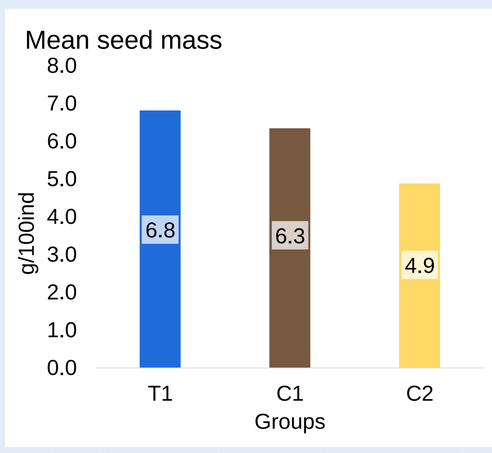

Fig.6. Mean seed mass before planting depending on treatment group

Table 1.
Mean seed germination rate in Petri dish depending on time and treatment group (C1- control 1st nursery, T1- treatment 1st nursery, C2- control 2nd nursery).

Group	Mean germination rate (%)		
	1st week	2nd week	3rd week
C1	85	80	84
C2	68	75	78
T1	42	64	74

CONCLUSIONS

1. The biopolymer coating of the seed in the Petri plates reduced germination energy during the first stage of sprouting, but the total number of germinated seeds was similar to control;
2. Although in most cases coating did not have a significant impact, seeds in 1 cm buried class (which is more subjected to drought than 3 cm and 5 cm classes) had a significant lower seed germination in control group, but not in treated;
3. Seed origin and size is more important than seed coating in terms of seed germination rate.
4. We assume that an experimental trial in a natural environment is necessary to improve knowledge of the effect of seed coating;

AIMS FOR FUTURE

We have established experimental trial in Scots pine forest after logging, to test seedling morphology (above and below ground mass) and germination rate.


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