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EFFECT OF SOME NEW MONOQUATERNARY SALTS OF BENZO[F]QUINOLINE ON GERMINATION AND SEEDLING GROWTH OF NORWAY SPRUCE (PICEA ABIES (L.) KARSTEN)

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Abstract

Studies to test the effect of some new monoquaternary salts of benzo[f]quinoline on germination and seedling growth of Norway spruce were conducted in controlled temperature room and results showed that germination percentage, shoot and root lengths and fresh weights varied as a function of concentration and structure of each investigated compound. Thus, lots of 50 seed samples of spruce were treated with $5 \cdot 10^{-5}$ – $1 \cdot 10^{-3}$ molar solutions of benzo[f]quinolinium bromides (S1-S4) for 1 hour. A blank with bidistilled water was also carried out. After a 21 day period of germination in the presence of the investigated compounds, the spruce hypocotyls and radicles were cut from the seeds, and their length measured. Higher concentrated solutions of the investigated compounds exhibited highly inhibitory activity on spruce germination, while the lower concentrations resulted in a stimulating action, especially for the radicles length. All results are statistically validated. The benzo[f]quinolinium monoquaternary salts were previously prepared by treatment of benzo[f]quinoline with reactive bromides derivatives according to Kröhnke's method. Elemental analysis and IR, ¹H-NMR spectra proved their structure. First evaluations were conducted on three replicates of 50 seeds at six treatments. Seeds were collected from plants growing in forests, and were then stored in a dry chamber at 15°C. Each seed lot was characterized for dried weight (12%). Surface sterilized (commercial hypochlorite 67.2 mmol kg⁻¹ for 10 min) seeds were treated with 5 mL of $5 \cdot 10^{-5}$ - 10^{-3} molar solution of benzo[f]quinolinium derivatives (S1-S4) for 1 hour, and sown in Petri dishes on filter paper together with the treatment solutions. Seed imbibition was initiated in the test tubes by adding 5 mL of distilled water (Blank, B) or benzo[f]quinoline salt solutions. Seeds were maintained in the growth chamber at constant temperature and humidity regimes (21°C and 95%, respectively) and under illumination (12h/24h) until embryo elongation (hypocotyls and radicles) was establish. A seed with visible coleorhizae was considered germinated.

The following compounds were used in this study:

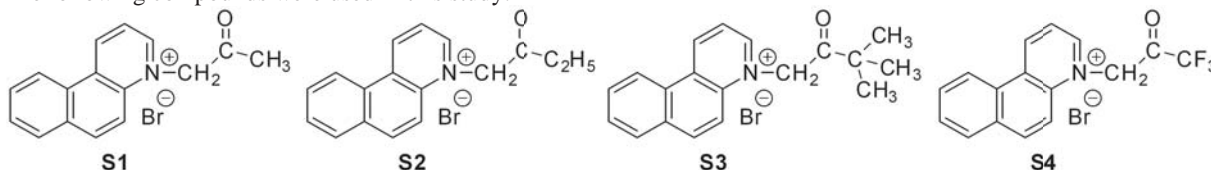


Figure 1. Some monoquaternary salts of benzo[f]quinoline derivatives tested on spruce seed

In this study the effect of some new monoquaternary benzo[f]quinolinium salts on germination and seedling growth of Norway spruce were investigated. Germination rate, the length of hypocotyls and radicles varied as a function of concentration and structure of each investigated compound. Some derivatives of 4-(2-oxopropyl)benzo[f]quinolin-4-ium bromide (S1); 4-(2-oxobutyl)benzo[f]quinolin-4-ium bromide (S2); 4-(3,3-dimethyl-2-oxobutyl)benzo[f]quinolin-4-ium bromide (S3); 4-(3,3,3-trifluoro-2-oxopropyl)benzo[f]quinolin-4-ium bromide (S4) that were investigated in this paper act specifically on Norway spruce germination causing also changes of the height and weight of the resulted plantlets, depending on the concentration and the type of compound. The strongest stimulatory effect is observed in the case of 4-(3,3-dimethyl-2-oxobutyl)benzo[f]quinolin-4-ium bromide.

Keywords: Monoquaternary salts; benzo[f]quinoline; Norway spruce; germination rate.

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