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DOES TYROSINE INCREASE TREE GROWTH AND RESISTANCE TO FROST?

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by

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A recent investigation¹ on the free amino-acids in some forest plants has revealed that in ligneous forest plants tyrosine makes up a large part of the free amino-acids. Shikimic acid, a common precursor of aromatic amino-acids and of lignin, could be detected in measurable amounts only in the plants containing large amount of free tyrosine in their leaves. From these results, when interpreted in the light of the studies made by Bradfute and McLaren², Flaig³, and Winter⁴, it was postulated that apart from being important to plant growth itself tyrosine may play a specific rôle in the resistance to frost of young shoots. The present investigation was carried out to substantiate the hypothesis.

Preliminary testing of tyrosine effect on growth of two-year-old Picea mariana (Mill.) and its resistance to frost has revealed that daily addition of tyrosine (conc. ^{0.05M} ~~0.05M~~) for ten days had a marked beneficial effect on height growth (Table 1).

Table 1. Average height of 2-year-old black spruce before and after addition of tyrosine (conc. 5 M)

Period	No. of samples	Water only av. height (mm)	Water plus tyrosine ** av. height (mm)	"t" values	Significance
Before	10	71.8 ± 8.1	70.8 ± 8.8	.150	N.S.
After	10	89.4 ± 7.8	101.9 ± 9.7	4.210	H.S.

** Expressed as means + standard error.

For P = 0.05, "t" = 2.262; For P = 0.01, "t" = 3.250.

In order to test their resistance to frost, these seedlings were submitted to a temperature of -10°C for 24 hours. The needles of the

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seedlings growing in soil where tyrosine was added remained alive, soft and attached to the twigs whereas those of the control seedlings died immediately, became very hard and dropped rapidly.

A second experiment was done to determine whether tyrosine at 2 concentrations has an effect on survival of black spruce seedlings. For the purpose of reducing the interactions between tyrosine and soil nutrients, washed silica sand was used as substrate. The experiment comprised thirty pots distributed as follows: 10 control, 10 at 0.1 gm of tyrosine and 10 at 0.2 gm of tyrosine. All plots were kept under the same greenhouse conditions and had equal quantities of water added. After 8 weeks all the trees growing in untreated silica were dead, possibly of starvation, while those in the treated substrate were all alive and growing. However, some of the seedlings growing in sand where 0.2 gm of tyrosine was added showed an abnormal colouration, indicating limitation in the quantitative use of tyrosine as a growth stimulant.

Further investigations on the effects of tyrosine on tree growth and resistance to frost are under investigation.

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