Auburn University Southern Forest Nursery Management Cooperative

RESEARCH REPORT 98-1

SOLUBLE SILICON IS NOT EFFICACIOUS AGAINST THE FOLIAR PATHOGEN RESPONSIBLE FOR FUSIFORM RUST

by
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INTRODUCTION

Greenhouse studies have reported that the use of nutrient solutions amended with soluble silicon resulted in cucumber and rose remaining free of powdery-mildew (*Sphaerotheca fuliginea*) and root rots caused by the fungi *Pythium aphanidermatum* and *Fusarium oxysporum*. Interestingly, extracts from the common horsetail (*Equisetum arvense* L.), a species with over 15% of its dry weight composed of silica, have been applied as a drench to protect crops against plant pathogens by gardeners for centuries. This research was conducted to determine if the use of soluble silicon can reduce infection by *Cronartium quercuum* f.sp. *fusiforme* on loblolly pine seedlings. If effective against rust, nursery managers may have had another method to minimize the losses due to this disease.

MATERIALS & METHODS

Loblolly pine seeds were sown in containers in a Pro-Mix potting media in the spring of 1996 and again in 1997. Nine levels of soluble silicon ranging from 0 to 4000 PPM were applied to the pine seedlings as a foliar application 14 and 7 days prior to inoculation. After treating the seedlings with the silicon, they were delivered to the Forest Service fusiform rust screening center in Asheville, North Carolina, where the seedlings were exposed to the fungal pathogen under uniform disease inducing conditions. A Bayleton® treatment was included in the study as the standard fungicide treatment (control). The effectiveness of silicon treatments against fusiform rust was determined by counting the number of galls formed on seedling stems 6 months after inoculation. Seedling dry weights were used to determine if treatments had any affect on seedling growth.

RESULTS

Based on these two trials, the use of silicon as a protectant against fusiform rust is not as effective as Bayleton®. The combined data for the two-year experiments had the percentage infection ranging from the lowest at 12% on the Bayleton® treated seedlings to 37% on those seedlings receiving no silicon treatment (0 ppm) (Table 1). While a few silicon treatments had infection levels near that of the Bayleton® (50 & 200 ppm @ 26 and 21), the amount of infection was not significantly less than those seedlings that received no silicon.

Table 1. Percent of loblolly seedlings with galls, healthy, seedling mortality and shoot dry weight 6 months after inoculation with *Cronartium quercuum* f.sp. *fusiforme*: 1996 & 1997 data.

Treatment	Galls (%)	Healthy (%)	Mortality (%)	Dry weights (g)
Bayleton®	12.7*	87.3*	1.1	27.5
0 ppm	37.2	62.8	1.0	28.6
50 ppm	26.7	73.3	0.5	26.5
100 ppm	35.1	64.9	0.0	25.9
200 ppm	21.0	79.0	0.5	29.1
400 ppm	36.7	63.3	0.5	25.6
500 ppm	34.6	65.4	1.5	27.1
1000 ppm	28.1	71.9	1.1	25.0
2000 ppm	30.5	69.5	1.6	30.0
4000 ppm	29.3	70.7	0.5	27.8

* Significantly better when compared to all other treatments

MANAGEMENT IMPLICATIONS

Although soluble silicon has been shown to be a cost effective alternative to pesticides on some plant species, we were not able to duplicate this effectiveness for rust control on Loblolly pine seedlings. For this reason we have no further plans to pursue research with this product and do not recommend its use for the control of fusiform rust in conifer nurseries.