A MICROBIAL INOCULANT FOR CONIFERS AS AN ALTERNATIVE TO METHYL BROMIDE FUMIGATION

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Rapid regeneration is the key to maintaining or increasing the current level of productivity in North America's forest industry. At the nursery, one of the most important factors related to successful regeneration is production of high-quality seedlings. Seedlings with healthy root and shoot systems and large stem diameters survive better and grow faster after outplanting. In container and bareroot nurseries seed and soil-borne diseases reduce the number of seedlings and limit root growth resulting in reduced overall seedling quality. Under the more stressful conditions of the reforestation site, these poorer quality seedlings do not perform well, and the diseases that accompany the seedlings to the reforestation site continue to negatively affect seedling growth. In the United States, fumigation with methyl bromide has been used extensively for managing soil-borne pests in bareroot nurseries. However, because methyl bromide is an established ozone depleting substance, the EPA has taken action to prohibit its production and importation after January 200 1.

Agrium Inc- is currently developing an environmentally friendly microbial inoculant (biofungicide) as an alternative to the disease control aspects of methyl bromide fumigation. The biofungicide is formulated as a liquid that contains live cells of a naturally occurring, nonphytotoxic, nonpathogenic, rhizosphere bacterium, Burkholderia cepacia strain Ral-3. The inoculant has a broad spectrum of activity against pathogenic seed and soil-borne fungi, including *Pythium, Fusarium, Cylindrocarpon, Botrytis, Rhizoctonia,* and Armillaria, and stimulates seedling growth at reforestation sites.

In trials conducted in commercial bareroot nurseries, strain Ral-3 applied as a seed treatment increased the density of Loblolly pine seedlings by 20% (Table 1), compared to the nonfumigated, noninoculated control at 5 weeks after sowing (WAS). In comparison, methyl bromide fumigation increased seedling density by only 10%. Interestingly, the highest seedling density occurred when seeds were treated with Ral-3 and sown into methyl bromide fumigated soil. Other trials conducted in commercial bareroot nurseries not fumigated for at least 4 years, showed that seed treatment with Ral-3 increased the density of Slash pine seedlings by 8% at 5 WAP and Loblolly pine seedlings by 17% at 9 WAP. These preliminary results suggest that the biofungicide containing A cepacia strain Ral-3 may be an effective alternative to methyl bromide fumigation for disease control in conifer nurseries.

Table 1. Strain Ral-3 as a seed treatment compared to methyl bromide fumigation, Loblolly pine 1996

	Weeks after	Seedlings per square foot			
Location	planting	Control	Ral-3	MBr	MBr+Ral-3
Georgia	5	9.3	11.1	11.7	14.2
Alabama	5	17.2	20.3	17.5	19.7
Mean		13.3	15.7(20)	14.6(10)	17.0(28)
Georgia	24	9.3	9.3	11.8	13.4
Alabama	24	18.0	18.9	17.3	20.0
Mean		13.7	14.1(3)	14.6(7)	16.7(22)

Numbers in brackets are percentage increases compared to the control. MBr - methyl bromide fumigation

Table 2. Strain Ral-3 as a seed treatment in nurseries not fumigated with methyl bromide for at least four years, 1996

	Conifer		Seedlings per square foot			
Location	type	Treatment	2 WAP	4 WAP	5-6 WAP	9-9 WAP
South Carolina	Loblolly pine	Control	13.4	27.4	28.5	28.5
		Ral-3	16.5(23)	32.6(20)	33.4(17)	33.4(17)
Florida	Slash pine	Control	36.4	39.2	37.5	37.2
		Ral-3	39.9(10)	42.2(8)	41.3(12)	40.3(8)

Numbers in brackets are percentage increases compared to the control. WAP = weeks after planting.