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Phytoremediation of Alberta oil sand tailings using native plants and fungal endophytes

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Fungal endophytes colonize host plants without causing disease. Some endophytes confer plant tolerance to harsh environments. One such endophyte, Trichoderma harzianum strain TSTh20-1, was isolated from a plant growing on Athabasca oil sand tailings. Tailing sands are a high volume waste product from oil sand extraction that the industry is required to remediate. Tailing sands are low in organic carbon and mineral nutrients, and are hydrophobic due to residual polyaromatic hydrocarbons. Typically, tailing sands are remediated by planting young trees in large quantities of mulch plus mineral fertilizer, which is costly and labour intensive. In greenhouse trials, TSTh20-1 supports growth of tomato seedlings on tailing sands without fertilizer. The potential use of TSTh20-1 in combination with native grasses and forbs to remediate under field conditions is being assessed. Twenty-three commercially available plant species are being screened for seed germination and growth on tailing sands in the presence of TSTh20-1. The best candidates from this group will be used in greenhouse and small scale field trials. Potential mechanisms that contribute to endophyte-induced plant growth promotion, such as plant hormone production, stress tolerance, mineral solubilization, and uptake are also being assessed. As well, TSTh20-1 appears to be remarkably frugal in its nutrient requirements and the possibility that this attribute is characteristic of other plant-fungal endophytes from harsh environments is under study.