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Differential sensitivity of fungi to lithium chloride in culture media

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ABSTRACT

Forty species of fungi, representing a range of ecological and taxonomic groups, were tested for their ability to grow on agar media amended with lithium chloride (LiCl) at 1.5, 3 and 6 g l^{-1}. Species of *Trichoderma* varied considerably in their sensitivity to LiCl; at one week on 6 g l^{-1} LiCl medium, the growth of seven species of *Trichoderma* was considerably inhibited; however, by three weeks at this level, four of the species tested were able to attain ≥30 % of control growth. Of the seven species tested, an isolate of *T. viride* was the most sensitive to LiCl in agar. Eleven other imperfect fungi also showed a range of ability to grow on agar amended with LiCl, from total inhibition to complete lack of inhibition. Six ascomycete fungi were greatly inhibited by LiCl at all levels; however, an isolate of *Chaetomium globosum* was highly tolerant of LiCl. Seven basidiomycete wood-decay fungi were quite sensitive to LiCl in agar, showing total to nearly total inhibition even at the lowest level; however, after three weeks, an isolate of *Postia placenta* was nearly uninhibited except at 6 g l^{-1}. Five ectomycorrhizal basidiomycete fungi were totally inhibited by all levels of LiCl; however, one ectomycorrhizal imperfect fungus (*Cenococcum graniforme*) was able to grow at 3 g l^{-1} and was uninhibited at 1.5 g l^{-1}. Four zygomycete fungus isolates were nearly unaffected in their growth by all levels of LiCl.

Introduction

Lithium chloride (LiCl) is a non-toxic, alkali metal salt that is soluble in water; in its solid state, it is a white, odourless substance that resembles table salt. It is commonly used as a desiccant, as well as in metallurgy and pyrotechnics (Budavari *et al.* 1989). Lithium chloride was reported by Kado & Heskett (1970) for use in culture media to increase the efficiency of isolating plant pathogenic bacteria from soil (e.g. *Agrobacterium*, *Corynebacterium*, and *Erwinia* spp.). Its selective nature is due to the salt differentially affecting the permeability of bacterial membranes. During the course of their work, LiCl at 5–7 g l^{-1} was also noted to inhibit fungal colonies that otherwise would obscure the observation of bacterial colonies (Kado & Heskett 1970).

Trichoderma spp. can be aggressive colonizers of agar plates when attempting to isolate specific fungi from various substrates. Species of *Trichoderma* are ubiquitous in soil and rotten wood, and are also parasites of other fungi (Samuels 1996); therefore, they are naturally present wherever fungi exist. In the authors' experience, *Trichoderma* spp. are common contaminants in agar plates when attempting to isolate wood-decay fungi from rotten wood and ectomycorrhizal fungi from root tips and mycelial strands.

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Following Kado & Heskett's (1970) work, Wildman (1991) showed that LiCl at 6 g l^{-1} could be used to inhibit the spore germination and growth of *Trichoderma* spp., increasing the efficiency of isolating other fungi from soil dilution plates; however, the sensitivity of *Trichoderma* to LiCl was not uniform among species in the genus. Based on the latter paper, LiCl has been used in malt agar plates to prevent overgrowth by *Trichoderma* spp. when isolating wood-inhabiting stain and decay fungi. However, at 6 g l^{-1} it has been observed that LiCl has the ability to significantly inhibit wood decay and other fungi as well; therefore, 1.5–3 g l^{-1} was adopted as a moderate level of LiCl to inhibit *Trichoderma* spp. when attempting to isolate stain and decay fungi from very decayed wood.

Benomyl™ (Du Pont, Wilmington, Delaware) is also a common media amendment used in wood-decay and ectomycorrhizal fungus isolation laboratories, but along with preventing the growth of fast-growing imperfect fungi, such as *Trichoderma* spp. (Johnson 1995; Worrall 1991), Benomyl™ also prevents the isolation of ascomycete fungi, which also cause stain and decay in wood. Rose Bengal is another media amendment used to inhibit fast-growing fungi, while allowing slower-growing fungi and bacteria to be isolated (Jarvis 1973; Mycological Society of America, Mycology Guidebook Committee 1974). Aside from the two papers cited in the previous paragraph, there appears to be little additional information on the use of LiCl in culture media to inhibit *Trichoderma* spp. or other fast-growing fungi. The purpose of this study was to expose a range of ecological and taxonomic groups of fungi to various levels of LiCl in agar to assess its use as an amendment to selectively inhibit *Trichoderma* spp. and possibly other fast-growing, contaminating fungi.

Materials and methods

The base medium used for all tests was 2 % malt agar (2 M), prepared by suspending 20 g malt (Bacto™, Difco, Lawrence,

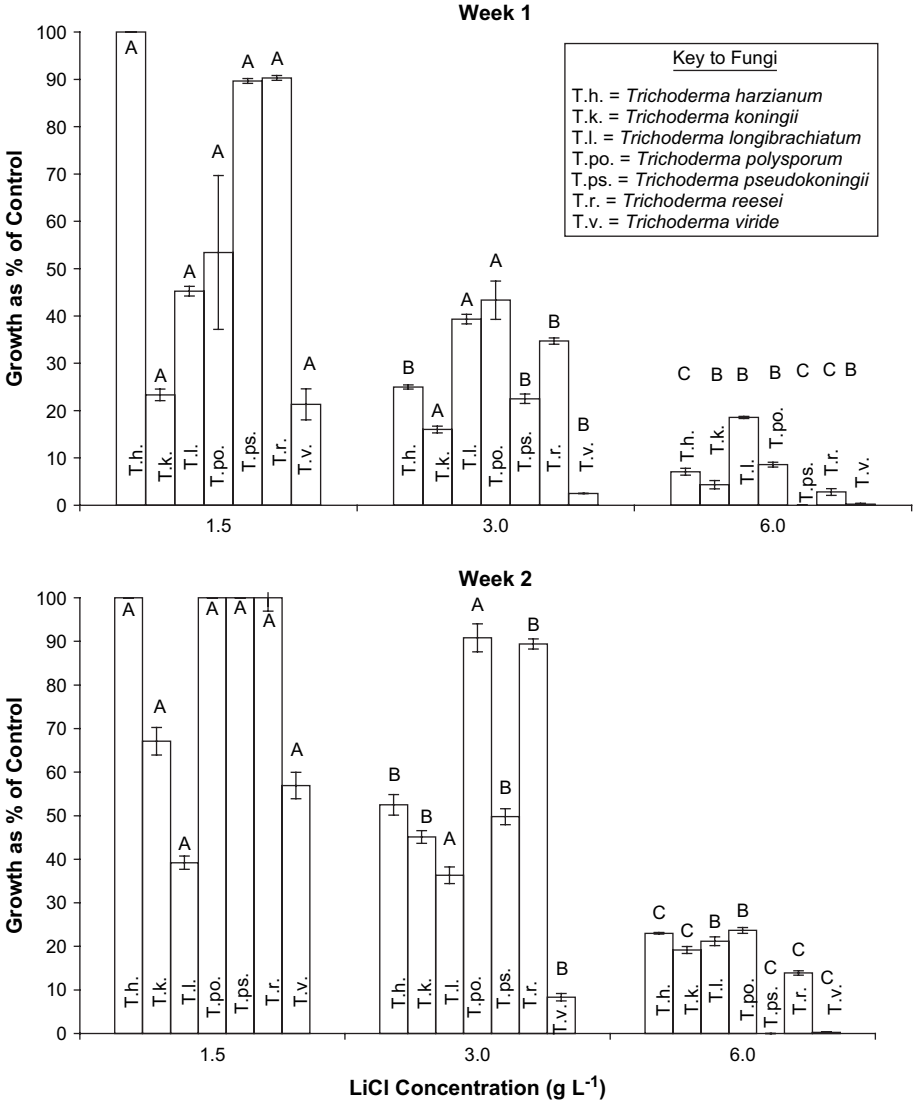

Fig 1 – Growth as percent of control of seven species of *Trichoderma* after 1 and 2 weeks on 1.5, 3.0, and 6.0 g L^{-1} LiCl-amended media. Mean growth of 3 plates. Error bars represent one standard deviation. Letters above columns compare individual fungi by LiCl level within week ($p \leq 0.05$).