TRANSFER OF HEAT TOLERANCE AND OTHER CHARACTERISTICS BY PROTOPLAST FUSION IN *TRICHODERMA* SPECIES

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Abstract

Several *Trichoderma virens* (*Gliocladium virens*) strains give good biocontrol activity against *Rhizoctonia solani* on cotton seedlings. However, these strains lack several characteristics that are required to make them commercially viable. For example, most cannot survive an entire season on the roots of a cotton plant in Texas. Also, the ability to control diseases early in the season is reduced by cool weather. Diseases such as damping-off by *Pythium* species and *Thielaviopsis* root rot are of particular interest. Other species of *Trichoderma* have tolerance to higher and lower temperatures than *T. virens*, but are not as effective as biocontrol agents on cotton. Protoplast fusion is a method that has been used in *Trichoderma* to successfully incorporate desirable characteristics and improve biological control efficacy. We used three effective biological control strains of *T. virens* in protoplast fusions with two cold tolerant strains of *T. harzianum* and a heat tolerant strain of *T. pseudokoningii* in an effort to develop improved biological control strains. Fourteen isolates that were stable through multiple transfers were obtained. One isolate was obtained that sectored into two distinct types after several transfers. Of eight fusants between *T. virens* and *T. pseudokoningii*, seven were morphologically *T. virens* and one was *T. pseudokoningii*. The *T. pseudokoningii* fusant had greater biological control activity against *Rhizoctonia solani* on cotton than the *T. pseudokoningii* parent and grew equally well at 40° C. All of the *T. virens* fusants grew significantly faster than the *T. virens* parent at 40° C. One of the seven *T. virens* fusants was significantly reduced in biological control activity compared to the *T. virens* parent. The *T. virens* and *T. harzianum* fusions yielded three *T. virens* isolates and three *T. harzianum* isolates. They also yielded one isolate that originally was morphologically *T. harzianum*, but after five transfers on selective media, sectored into *T. harzianum* and *T. virens*. The three *T. virens* fusants did not differ significantly from the *T. harzianum* parent in biological control activity against either *R. solani* or *Pythium ultimum*. However, one *T. virens* fusant grew significantly faster than the parent strain at 10° C. All of the *T. harzianum* fusants grew more slowly at 10° C than the *T. harzianum* parent. Some of the isolates obtained also differed from the morphologically similar parent in other characteristics, such as fungicide resistance and/or production of secondary metabolites. These results indicate that protoplast fusions can be used to alter heat tolerance in *Trichoderma* and that a variety of progeny can be isolated from these fusions. The above mentioned isolates are being tested for their ability to remain viable and effective in storage. Further fusions are being performed to incorporate other characteristics into isolates, and isolates are being tested for their ability to control other diseases.

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