


Chapter 31

Trichoderma Use as Seed Treatment for Promoting the Growth of Young Argan Seedlings

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ABSTRACT

Seed treatment with Trichoderma spp. has shown to enhance plant growth and alleviate abiotic stress, but its application on endemic species, such as argan (Argania spinosa), remains underexplored. This study investigates the effect of a Trichoderma spp. bioformulation on argan seedling growth under greenhouse conditions over 12 months. Significant improvements were observed in treated seedlings, including increased length, dry matter of both root and shoot, and branch number. Root and vegetative fresh weights reached 12 g and 14 g, respectively, compared to 2 g and 3 g in control plants. Additionally, root and vegetative lengths were 44 cm and 74 cm, respectively, outperforming control seedlings at 35

DOI: 10.4018/979-8-3693-8980-5.ch031

cm and 25 cm. Treated seedlings also showed a higher number of branches and crown diameter, with survival and colonization rates of *Trichoderma* spp. in root tissues reaching 95%. These results suggest that *Trichoderma* spp. seed treatment can significantly promote the growth and development of young argan seedlings.

1 INTRODUCTION

At various soil levels, telluric microflora is very varied. The majority of representatives of this microflora are beneficial, while others are real enemies that hinder the development and growth of plants.

Fungi of the *Trichoderma* genus, known since 1887 for their antagonistic properties, have been used as biological control agents against a broad spectrum of telluric phytopathogens (Ouazzani-Touhami, 1994 ; Davet, 1986 ; Mouria, Ouazzani-Touhami, Douira, Benkirane, Mlaiki, & El-Yachioui, 1997 ; Mouria, Ouazzani-Touhami, Mlaiki, El Yachioui, & Douira, 1997 ; Hmouni, Massoui, & Douira, 1999). In addition, they were identified as phyto-stimulators and biological control agents against phytopathogenic agents (Chliyah et al., 2014 ; Ouazzani Chahdi et al., 2014 ; Najoua et al., 2022 ; Azeddine, Ouazzani Touhami, Selmaoui, Benkirane, & Douira, 2024 ; Azeddine et al., 2024). *Trichoderma* genera acts mainly by producing antimicrobial compounds or by parasitizing pathogenic plants (Mouria, Ouazzani-Touhami, & Douira, 2013 ; Mouria, Ouazzani-Touhami, Mouria, Benkirane, & Douira, 2015).

Some species of *Trichoderma* have physical interaction with plants that have beneficial effects on the growth of vegetative and root parts, availability of nutrients, improvement of yields and disease resistance (Mouria, Ouazzani-Touhami, & Douira, 2013 ; Yedidia, Benhamou, & Chet, 1999 ; Mouria, Ouazzani-Touhami, & Douira, 2007 ; Kribel et al., 2019a ; Kribel, Qostal, Ouazzani Touhami, & Selmaoui, 2019b ; Kribel, Qostal, Ouazzani Touhami, Selmaoui, Chliyah, Benkirane, Achbani, & Douira, 2020 ; Soufiani et al., 2022 ; Qostal et al., 2020a ; El Kaissoumi et al., 2022 ; El Kaissoumi et al., 2024 ; Chang, Chang, Baker, Kleifeld, & Chet, 1986 ; Yedidia, Benhamou, Kapulnik, & Chet, 2000 ; Martinez et al., 2001 ; Shores, Harman, & Mastouri, 2010 ; Harman, 2006). The effectiveness of *Trichoderma* depends on its ability to combat pathogenic fungi, which depends on the amount of inoculum present in the soil (Mouria, Ouazzani Touhami, & Douira, 2005).

According to several studies, soils inoculated by fungi of the *Trichoderma* genus protected crops and create a healthy environment so that vegetation can develop normally (Vinale et al., 2008). These fungi secretly secure active molecules which stimulate plant growth and ensure their protection against pathogens. The presence of *Trichoderma* in the ground plays both a preventive and curative role (Vinale et al., 2008). Some species of *Trichoderma* are considered as endophytes which establish a relationship with plant roots, which improves root growth, productivity, resistance to abiotic stress and facilitates assimilation and use of nutrients (Vinale et al., 2008).

The present study aimed to examine how treatment of argan seeds with an isolate of *Trichoderma* sp. can improve the growth parameters and development of argan plants in nurseries.

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