

The Effects of Dark Septate Endophytic Fungi on Chickpea Drought Tolerance

N. Bazghaleh^{1,2}, C. Hamel^{1,2}, J.D. Knight², Y. Gan^{1,2}

¹ Semiarid Prairie Agricultural Research Centre, Swift Current SK, S9H 3X2

² Dept. of Soil Science, University of Saskatchewan, Saskatoon SK, S7N 5A8

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Abstract

Dark septate endophytic (DSE) fungi represent a diverse group of root-colonizing fungal species that are common in environments with strong abiotic stress, such as semiarid prairie regions where their abundance in roots can exceed mycorrhizal fungi. Some DSE fungal species have the ability to benefit host plant growth under water stress conditions. Here we tested the effects of 49 DSE species on chickpea biomass growing under water limiting condition. Three DSE fungal species including *Hypocrea lixii*, *Geomyces vinaceus* and *Mortierella alpina* significantly increased the biomass of chickpea. However the majority of the DSE species did not significantly affect plant biomass and some species decreased that.

Introduction

Dark septate endophytic (DSE) fungi are a diverse group of fungi that colonize root tissues (1). Most DSE fungi belong to Ascomycota, but some are Basidiomycetes (2). Root colonization by DSE fungi has been reported to cause a variety of responses from negative to neutral and positive depending on the combination of plant-fungus species and environmental conditions (3). Evidence suggests that some endophytic fungi can facilitate nutrient and water uptake under drought conditions (4). We hypothesized that some endophytic fungal species can promote chickpea growth under water limiting condition. The effects of 49 DSE species on chickpea biomass were tested and a few species improved it.

Material and Methods

CDC Frontier chickpea was inoculated with each of the 49 DSE fungal. Seeds were surface sterilized and pre-germinated. Each seedling was inoculated with four plugs of active fungal mycelium and planted in 4 liter pots containing calcined clay while receiving granular rhizobial inoculant *mezorhizobium ciceri*. The treatments were arranged in a randomized block design and replicated four times in the greenhouse. Plants were watered with distilled water, fertilized with Long-Ashton nutrient solution, and were kept under water limiting conditions. After three months plants were harvested, root colonization was assessed and their biomass was measured.

Results and Discussion

Three DSE fungal species including *Hypocrea lixii*, *Geomyces vinaceus* and *Mortierella alpina* significantly increased the biomass of chickpea growing under drought conditions (Fig.1).

These three fungal species can potentially improve CDC frontier chickpea growing under drought condition in the field. However the majority of the DSE species did not significantly affect plant biomass and some species decreased that.

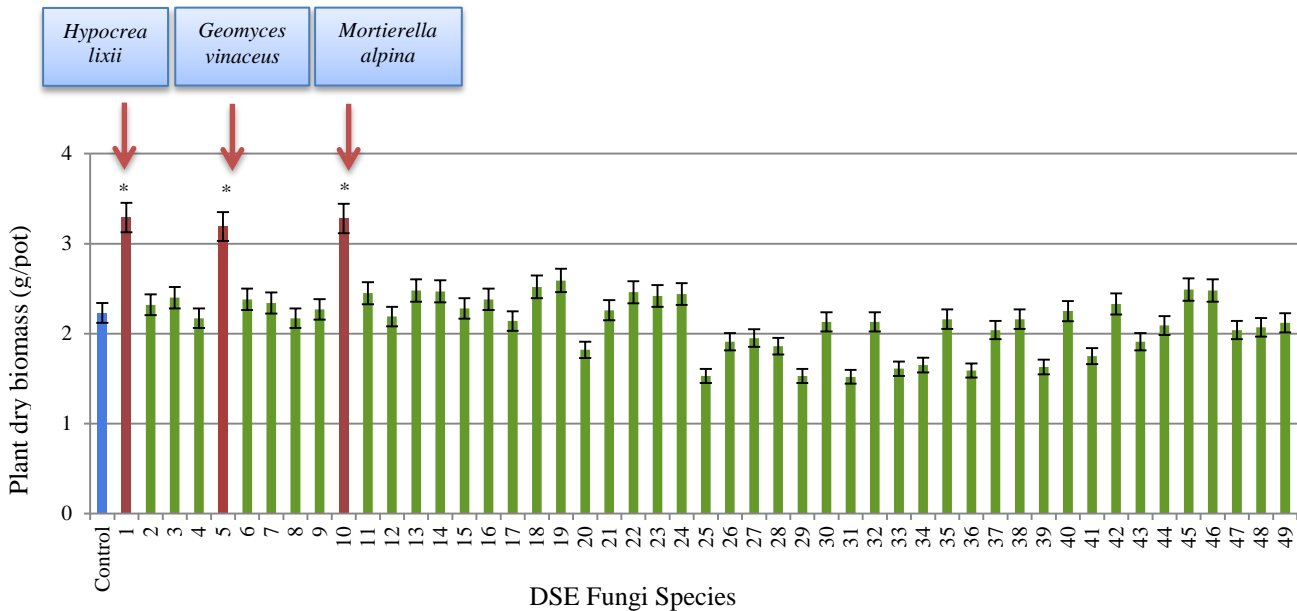


Figure 1. The effects of DSE fungi on chickpea biomass growing under water limiting condition

Conclusions

Hypocrea lixii, *Geomyces vinaceus* and *Mortierella alpina* are endophytic fungal species that can improve chickpea growth under drought condition. DSE effects on chickpea growth vary from mutualism to parasitism depending on the fungal species.

References

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