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1-Introduction

- Carrot is one of the most important vegetable crops in the world.
- As any other plant roots, carrot roots are colonized by a wide variety of endophytes fig.(1,2). However, knowledge of how these communities are assembled or how they interact with plants to affect plant fitness are not well understood.
- Plant genotype and soil management practices are two factors likely to affect endophyte structure in carrot roots.
- Our goal** Determine how carrot genotype and soil management interact to influence endophyte structure and potential activity.

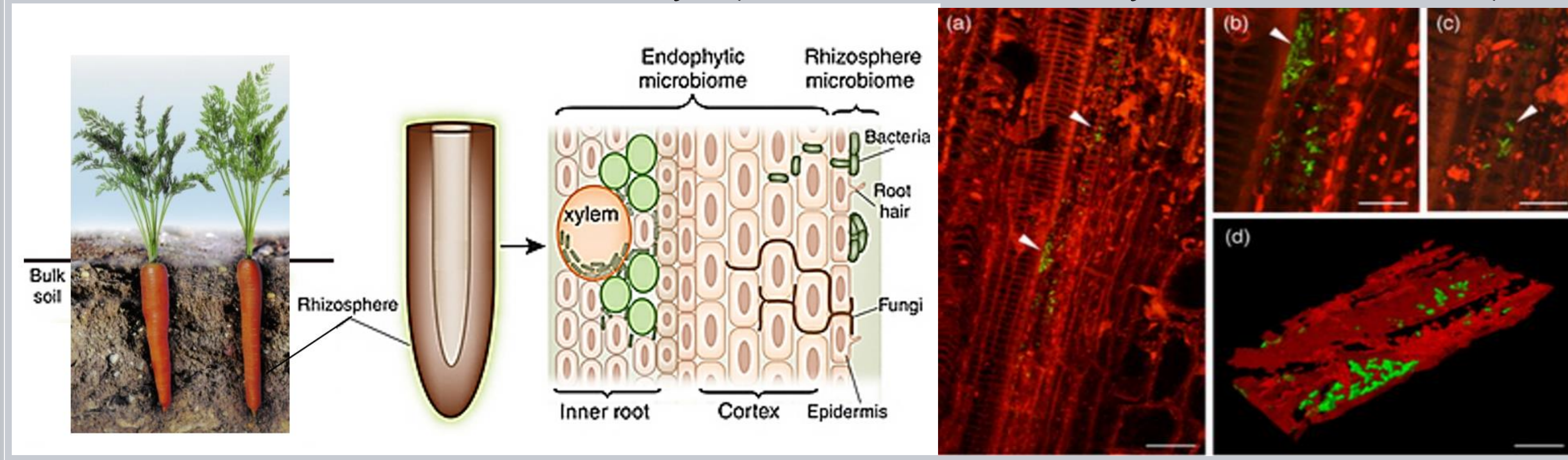


Fig (1): Modified from Hirsch, P.R. & Mauchline, T.H. Who's who in the plant root microbiome? Nat. Biotechnol. 2012, 30, 961-962. Fig (2): GFP tagging of grapevine endophytes. Compant et al., 2008. FEMS microbiology ecology 63, 84-93.

2-Methods

2.1-Carrot genotypes

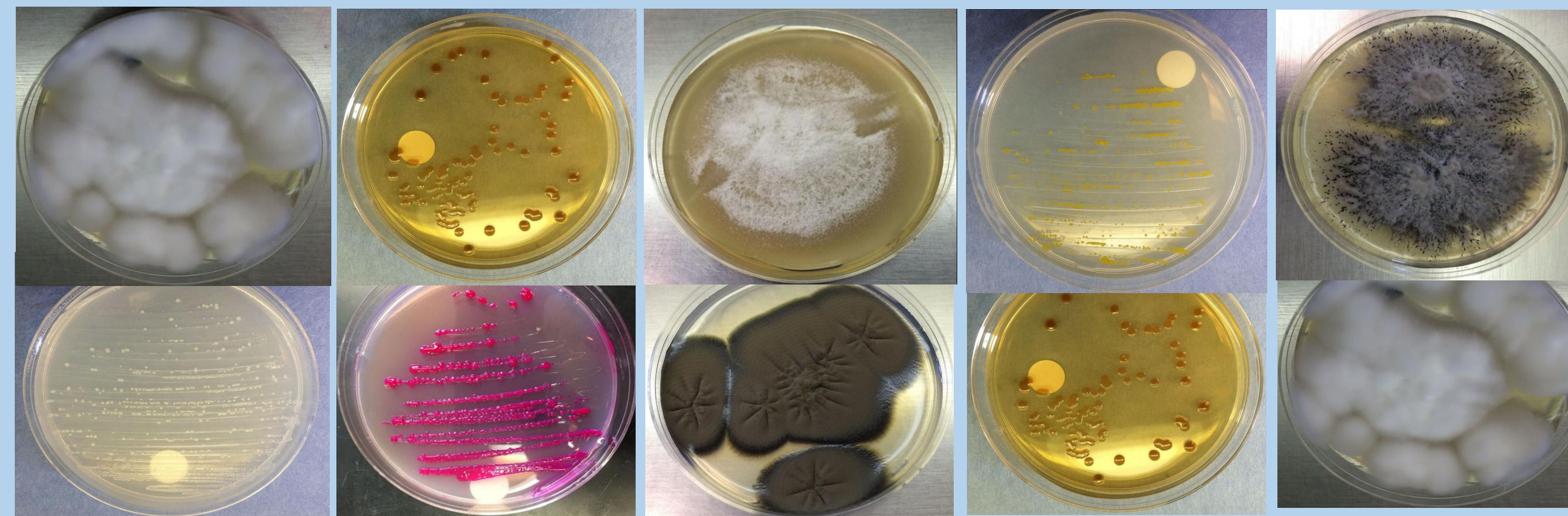
- Karotan Europe
 - Exp Nb3999 Brazil/ Europe
 - Exp OY191 Asia
 - Exp Y8519 Turkey
 - 2Exp B0252 Syria
 - Brsilia Barzil
 - Exp P6306 Asia
 - NSFF Europe
 - Red Core Chantenay Europe
- Organic management
Versus
Conventional management

2.2-Carrot samples

- Nine carrot genotypes from wide genetic backgrounds were grown in conventional or organically managed crop systems and roots collected to quantify endophyte community structure.
- Cultural fungal and bacterial endophytes were isolated and quantified using semi-selective media, and identified using low throughput sequencing.
- In vitro antagonistic test between culturable bacterial endophytes and *Alternaria dauci* (the causative pathogen of carrot leaf blight) on P.D.A media were investigated.

3-Results

3.1-Culturable endophyte diversity

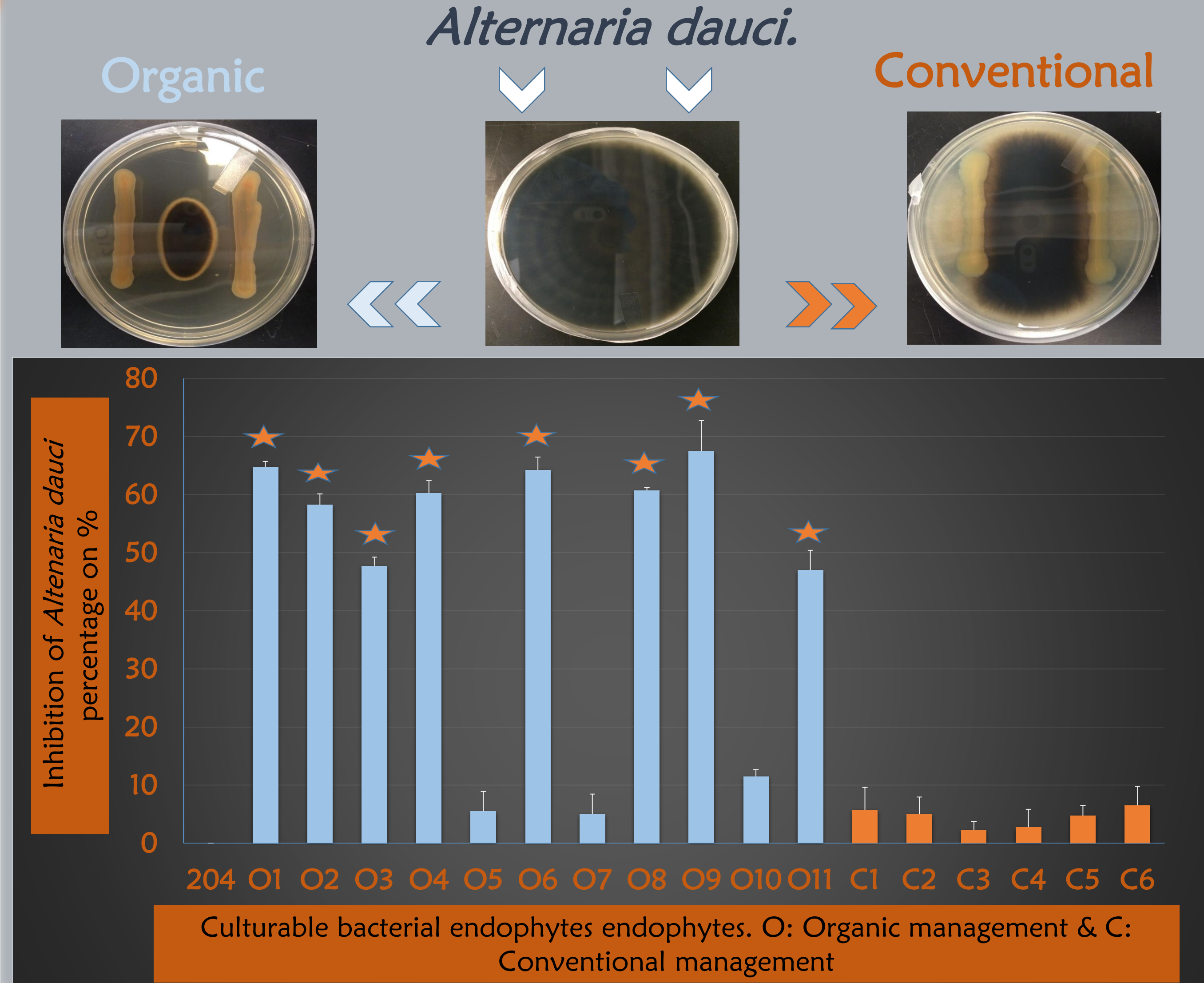


- Organic management
- Uncultured Ascomycota / *Epicoccum spp.*
 - Uncultured Phyllachoraceae/ *Colletotrichum Colletotrichum coccodes.*
 - Uncultured *Engyodontium spp.*
 - Uncultured *Stenotrophomonas spp.*
 - Paenibacillus spp.*
 - Rhizobium giardinii*
 - Methylobacterium spp.*
 - Uncultured *Pseudomonas spp.*
 - Pseudomonas fluorescens*
 - Pseudomonas oleovorans*
 - Pseudomonas brassicacearum*
 - Stenotrophomonas maltophilia*
 - Uncultured *Xanthomonas spp.*
 - Xanthomonas Oryzae*
 - Clamidosporium cladosporioides*
 - Uncultured *Cladosporium*
 - Bacillus megabacterium*
 - Rhizobium etli*
 - Xanthomonas campestris*
- Conventional management

3.2: Endophytes abundance on R2A media for oligotrophic bacteria

Entry	Conventional	Organic
Exp 0191	3 X 10 ³	2.2 X 10 ¹⁰
Exp 6306	2.75 X 10 ⁴	8.0 X 10 ⁹
Turkey	2.1 X 10 ⁴	2.0 X 10 ⁸
Exp 3999	8.12 X 10 ⁷	2.0 X 10 ⁸
Karotan	4.3 X 10 ³	4.5 X 10 ⁸
NSFF	1.9 X 10 ⁵	4.5 X 10 ⁸
Brasilia - Brazil	1.8 X 10 ⁵	2.0 X 10 ⁸
Red Core	1.3 X 10 ³	6.5 X 10 ⁸

3.3 In vitro bacterial endophytes antagonism with *Alternaria dauci*.



- Most of the bacterial endophytes isolated from carrot roots grown under organic condition showed in vitro significant inhibition of *Alternaria dauci* growth on P.D.A. media comparing to control.

4-Conclusion & future directions

4.1-Conclusion

- Carrot endophytes are more abundant & diverse in roots grown under organic than conventional management practices.

4.2-Future directions

- Quantify other activity of cultural isolates, and further characterize diversity using high-throughput sequencing.
- Determine how endophyte community structure influences the plants ability to withstand biotic stress from pathogens.

5-Reference

- Chaparro, J. M., A. M. Sheflin, D. K. Manter and J. M. Vivanco (2012). "Manipulating the soil microbiome to increase soil health and plant fertility." *Biology and Fertility of Soils* 48(5): 489-499.
- Sugiyama, A., J. M. Vivanco, S. S. Jayanty and D. K. Manter (2010). "Pyrosequencing assessment of soil microbial communities in organic and conventional potato farms." *Plant Disease* 94(11): 1329-1335.