Can we predict arbuscular mycorrhizal inoculation effects on vine plants?

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1.Introduction

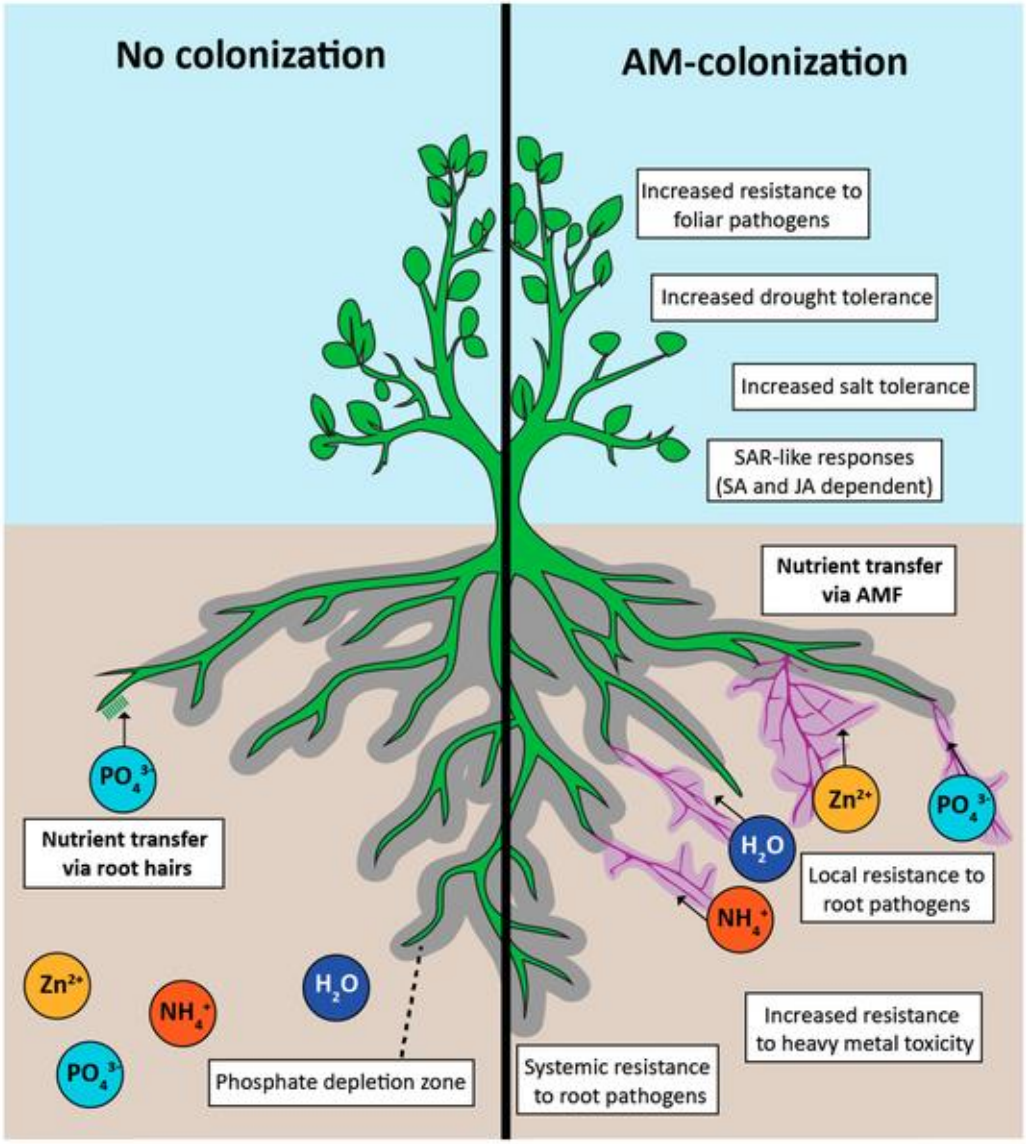

Photo by Rubén Moreno-Díaz

Jacott, C. N., Murray, J. D., & Ridout, C. J. (2017). Trade-offs in arbuscular mycorrhizal symbiosis: disease resistance, growth responses and perspectives for crop breeding. *Agronomy*, *7*(4), 75

1.Introduction

ARBUSCULAR MYCORRHIZAL FUNGI - AN ESSENTIAL TOOL TO SUSTAINABLE VINEYARD DEVELOPMENT: A REVIEW

Gheorghe Cristian Popescu *

Review Article | Published: 01 September 2015

Arbuscular mycorrhiza symbiosis in viticulture: a review

Sophie Trouvelot, Laurent Bonneau, Dirk Redecker, Diederik van Tuinen, Marielle Adrian & Daniel Wipf

Agronomy for Sustainable Development **35**, 1449–1467(2015) | Cite this article

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Arbuscular Mycorrhizal Symbiosis as a Promising Resource for Improving Berry Quality in Grapevines Under Changing Environments

frontiers in Plant Science

Nazareth Torres, M. Carmen Antolín and Nieves Goicoechea*

1.Introduction

Companies sell inoculums to improve vine cultivation

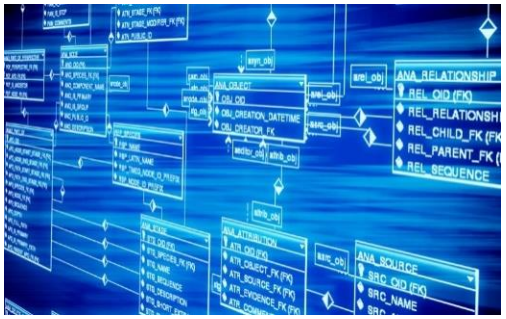
Advantage of Mycorrhiza for vineyards

- Robust and resistant vines
- Optimized nutrient supply
- Increased plant growth
- High-quality yields
- Increased sugar and essence content

myco gel

But, what can we learn from scientific experiments where vine plants where inoculted with arbucular mycorrhiza fungi?

2. Materials and Methods



- Articles published from 1980 to 2019 in the Google Scholar
- **Keywords:** mycorrhiza*, inocul*, vineyard*, rootstock*

We collected mean values of plant with and without mycorrhizal inoculation considering:

- Country
- Experimental conditions
- Rootstocks
- Mycorrizal Species
- Response variable

We calculated the Inoculation Dependency (ID), following the same calculation method than the mycorrhizal dependency [18].

$$ID\ (\%) = 100\ (Xi - Xn)/Xi$$

where Xi is the mean value of the response variable of mycorrhizal inoculated plant and Xn is the mean value of the response variable of non-mycorrhizal inoculated plant.

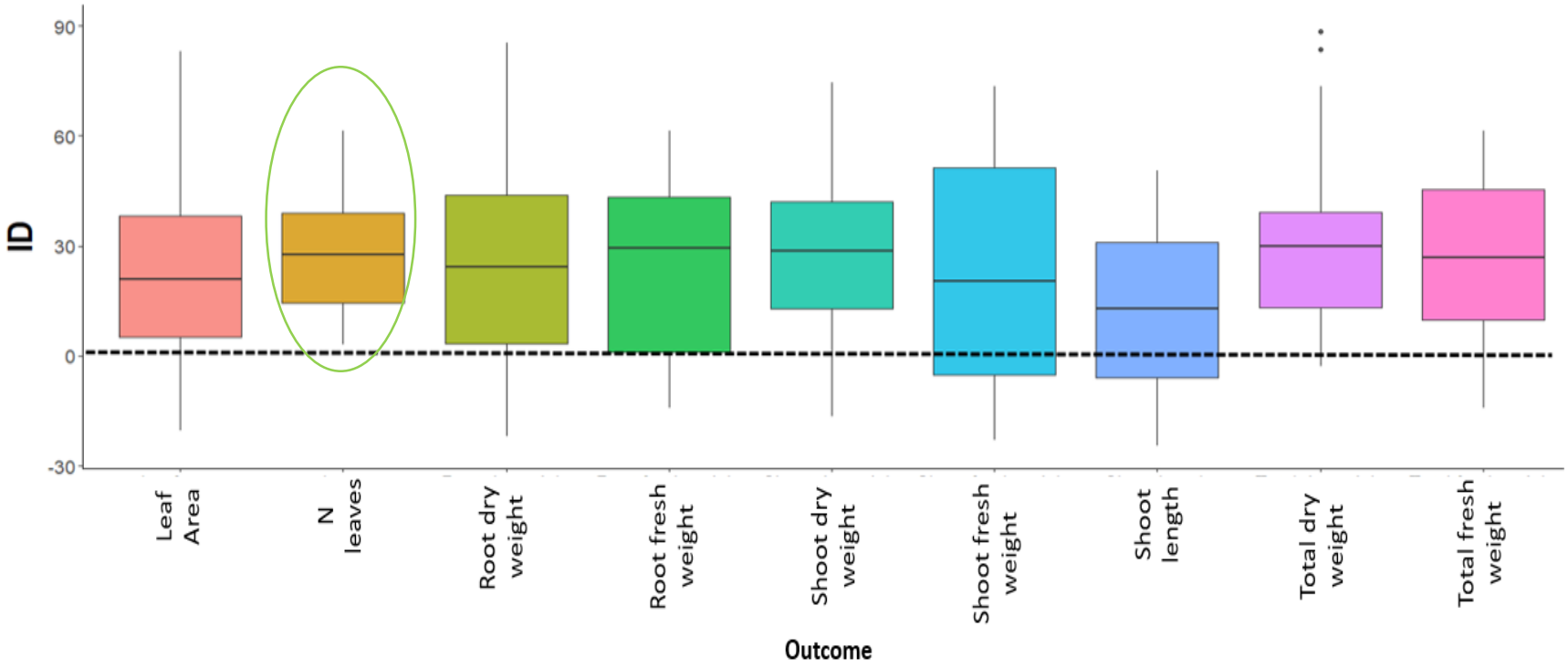
3. Results

23 publications,
106 experiments
359 comparison

ID> 20	56.27%
0<ID<20	27.86%
ID≤0	15.88%

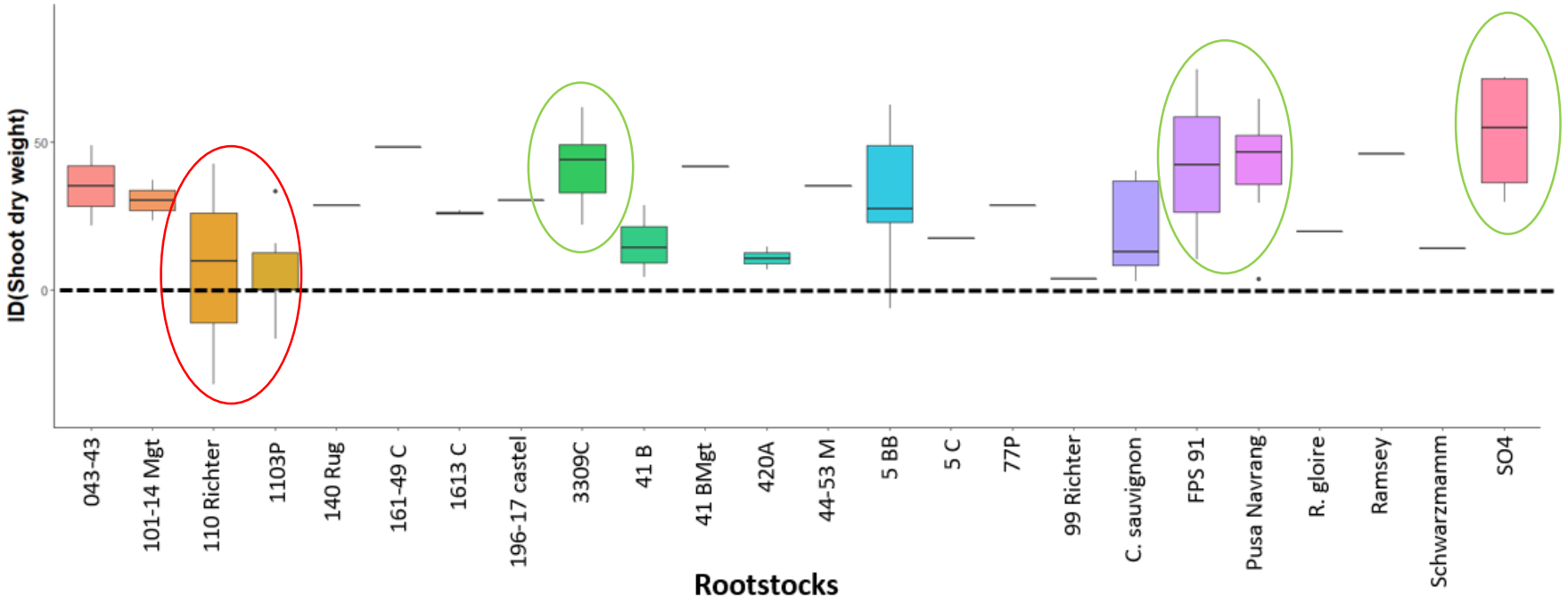
Greenhouse	76.92%
outdoor conditions	27.86%
Fiel conditions	15.88%

3. Results and discussion



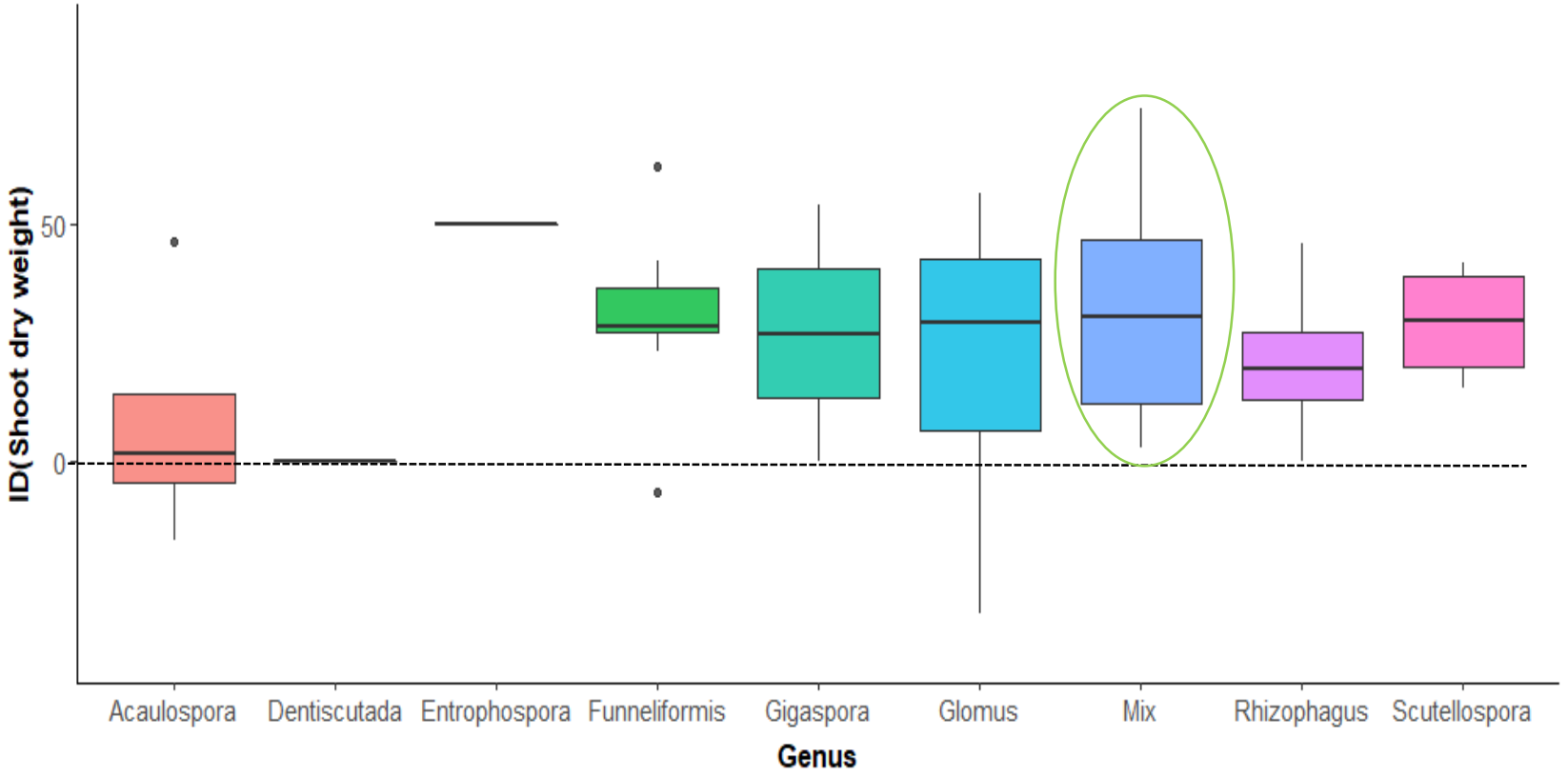
- Only the number of leaves showed no negative values.
- There are important variability.
- Different rootstock-AMF combinations can generate an increase, but also a decrease in the same specific parameter such as leaf area.
- The same inoculum in the same plant can have a greater effect on specific parameters than others.

3. Results



- 50% of rootstock were study only in one experiment
- We can observe that the response of different rootstocks was very diverse.
- Two high stress resistant rootstock (110 Richter and 1103P) present some negative effect.
- The rootstocks showing the greatest positive effect on shoot dry weight were 3309C, SO4, and FPS91.

3. Results



- It is observed that several species combination (Mix) shows a slightly more positive effect with respect to the rest of the experiments where species of the same genera were used.
- Fungi species preferences toward rootstocks can also affect mycorrhizal efficiency. For example, *Glomus aggregatum*, seemed to have a higher affinity for 161-49 Couderc than 196-17 castel (Aguín et al . *Am. J. Enol. Vitic.* **2004**, *55*, 108–111).

5. Conclusions

- The effect of mycorrhizal inoculation in the vineyards is context-dependent. There are several works in which neutral and even negative responses of certain combinations of rootstocks, mycorrhizae and environmental conditions are shown.
- Our data indicate that resistant rootstocks could be less favored by inoculation, the mixture of several species of AMF could have more positive effects, while the species of the genus *Aculospora* more negative.
- This study has demonstrated the need for previous pilot tests to determine the effect of a specific mycorrhizal species on certain rootstocks in specific culture conditions before being able to advise its use.