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Seed coating with arbuscular mycorrhizal fungi as an ecotechnological approach for sustainable production of common wheat

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BioGreenhouse

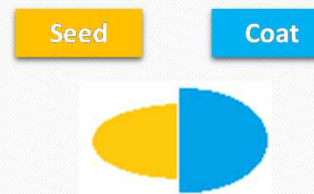
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INTRODUCTION

- In a meta-analysis of field studies from 1975 to 2013 it was concluded that field inoculation with AMF significantly improved wheat dry weight, P , N and Zn uptake and increased grain yield by 20% (Pellegrino et al. 2015 - Soil. Biol. Biochem.)
- Yet despite the proven benefits of AMF to wheat, there are no apparent feasible technologies available for their application in open agricultural fields
- Broadcasting of inoculum is NOT economically viable, because non-targeted spreading of inoculum over large areas results in high cost per plant
- Seed coating is a technique in which finely-ground solids or liquids are adhered around the seed with a coating material

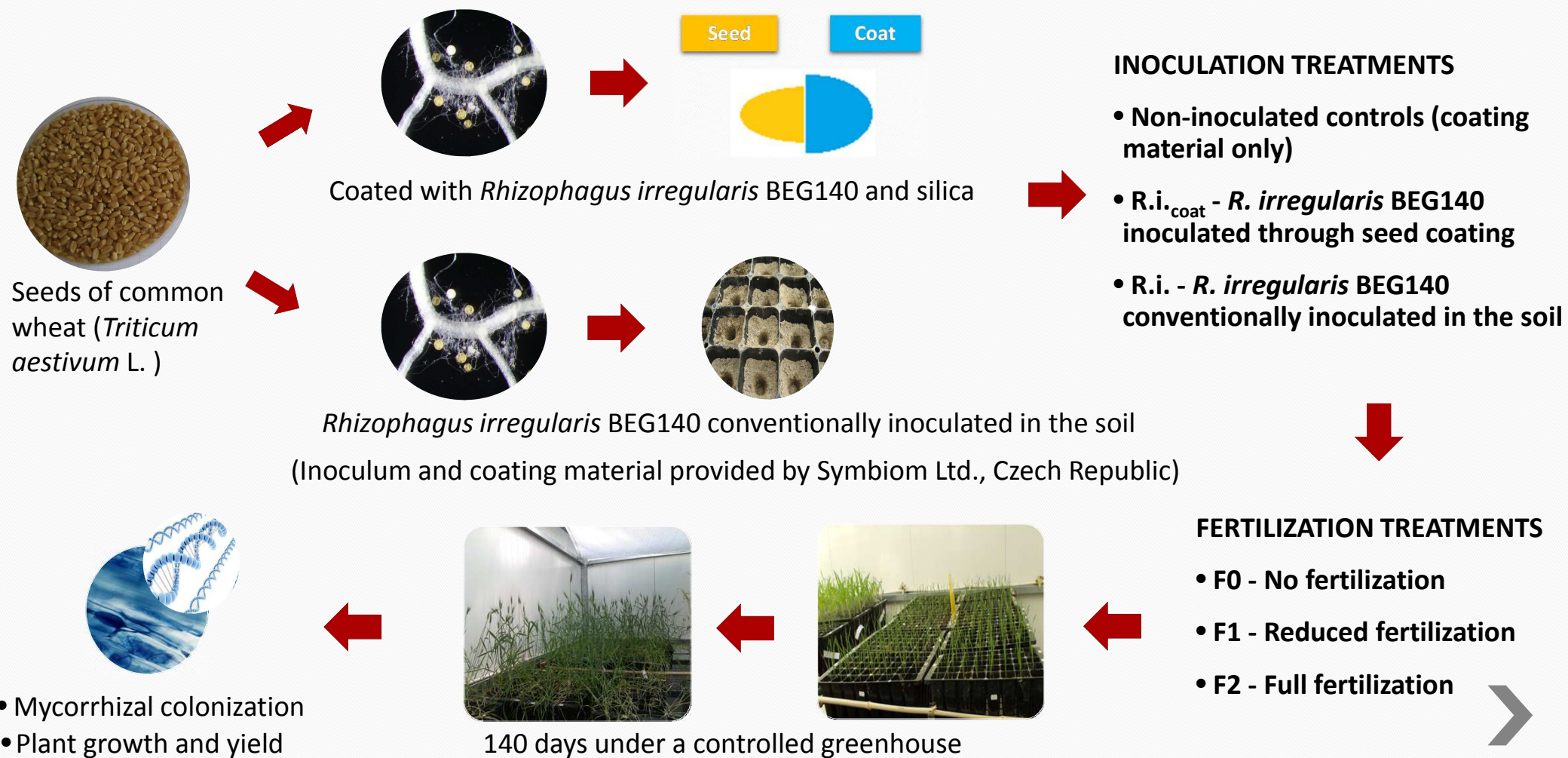


AIM

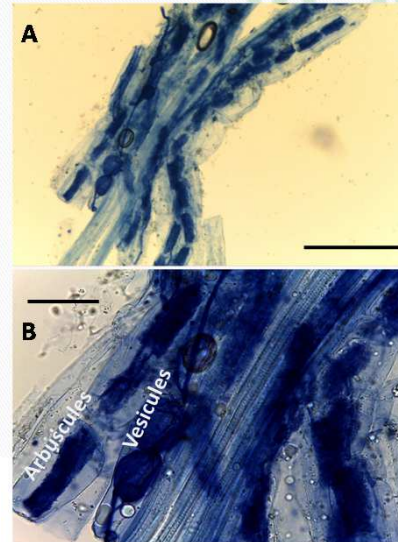
To assess whether seed coating with AMF inoculum is a feasible inoculation system for field production of common wheat



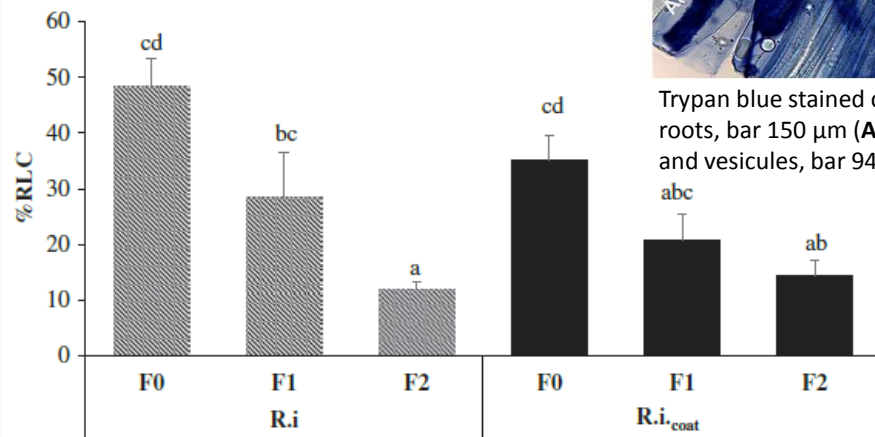
MATERIAL AND METHODS



RESULTS



Trypan blue stained colonised wheat roots, bar 150 µm (A), arbuscules and vesicles, bar 94 µm (B).



No significant differences between plants conventionally inoculated in the soil (R.i.) and those inoculated via seed coating (R.i.coat)

Inoculation	Fertilization	Shoot dry weight (g)	Seed spike dry weight (g)
Control	F0	0.14 ± 0.01 a	0.05 ± 0.01 a
	F1	0.51 ± 0.05 bc	0.15 ± 0.03 b
	F2	0.46 ± 0.03 b	0.13 ± 0.02 b
R.i.	F0	0.17 ± 0.01 a	0.06 ± 0.01 a
	F1	0.54 ± 0.05 bcd	0.23 ± 0.02 c
	F2	0.58 ± 0.05 cd	0.23 ± 0.04 c
R.i.coat	F0	0.15 ± 0.01 a	0.06 ± 0.01 a
	F1	0.60 ± 0.02 d	0.23 ± 0.02 c
	F2	0.50 ± 0.01 bc	0.20 ± 0.01 c

Two-way ANOVA *F* values and significances

Inoculation (I)	3.3 *	11.1 ***
Fertilization (F)	177.2 ***	71.0 ***
I x F	1.7 ns	1.8 ns

- Mycorrhizal inoculation improved the yield in F1 and F2 treatments compared with non-inoculated controls
- No significant differences in yield between F1 and F2 treatments
- Application of chemical fertilizer can be reduced in inoculated plants

CONCLUSIONS

- Seed coating with AMF may be as effective as conventional soil inoculation and may contribute to reduce the utilization of chemical fertilizers
- The application of AMF via seed coating is proposed as an ecotechnological approach for sustainable agricultural wheat production

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