

Testing microbial inoculants and precrop effect on organic potato in Hungary

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Introduction

ÖMKi takes part in WP3 „Novel agroecosystem management strategies and tools” of the SolACE project, in which we examine the effects of rotation and inoculation treatments on organic potato under a combination of stress conditions. The same experiment is also performed by Agroscope in Switzerland, in a conventional farming system.

Location

The experiment is performed in Hungary (Budapest-Soroksár) at the Experimental and Research Farm of the Szent István University, under organic cultivation (Fig. 1). The size of the field is approx. 3500 m².



Fig 1. The experimental field at Budapest-Soroksár, 2019

Materials and Methods

Rotation trial: Randomized complete block design is applied with 4 replications. The size of parcels is 12 m². 4 different potato genotypes are tested: *Cara*, *Pentland Dell*, *Agria* and *Charlotte*. Treatments: pre-crops (soybean and rye), irrigation (irrigated and non-irrigated parcels) and N supply (no N and sufficient N).

Inoculation trial: Randomized block design with 2 replications. The size of parcels: 22,5 m². 4 different potato genotypes are tested: *Desirée*, *Sarpo Mira*, *Pentland Dell* and *Maris Piper*. Treatments: microbial inoculants (three different consortia), irrigation (irrigated and non-irrigated parcels) and P supply (no P and sufficient P).

The following measurements were performed:

- Complete soil characterization before planting
- Phenological and plant height measurements
- Plant chlorophyll content (SPAD chlorophyll meter)
- Multispectral and thermal aerial imaging (Fig. 4)
- Stomatal conductivity (Licor instrument)
- Soil microbial activity measurements (conducted by AIT)
- Total yield per plot and per genotype
- Classical tuber size classification on total yield of parcels (Fig. 5) and number of tubers per plant
- Tuber starch (dry matter) content
- Tuber N (rotational trial) and P (inoculation trial) content
- Soil Nmin and P content after harvest

Statistical analyses was conducted using SPSS.



A meteorological station was installed at the trial site using the „Metagro” system to monitor rainfall and soil moisture, and to provide a precise calculation of necessary water quantities for optimal potato irrigation (Fig. 2, 3).

Fig 2. Meteorological station on the field

Discussion and Outlook

Yield differences between genotypes can partly be explained by the different vegetation lengths of varieties, as late harvest genotypes such as *Sarpo Mira* were harvested together with earlier cultivars. P level of soil was very high at the trial site, thus optimal P treatment effects were not detectable. Analyses of further data, such as tuber quality is in progress. Experiments will continue in 2020 in close cooperation with Agroscope in order to follow up precrop and inoculant effects.

First results – Rotation trial

Figure 3 shows the 2019 yield results of the rotation trial. Significant differences (ANOVA) could be detected between the yields of tested genotypes ($p=0.000$), irrigation ($p=0.004$) and N treatments ($p=0,003$). However, no significant difference was found between the yields of forecrop treatments ($p=0,661$).

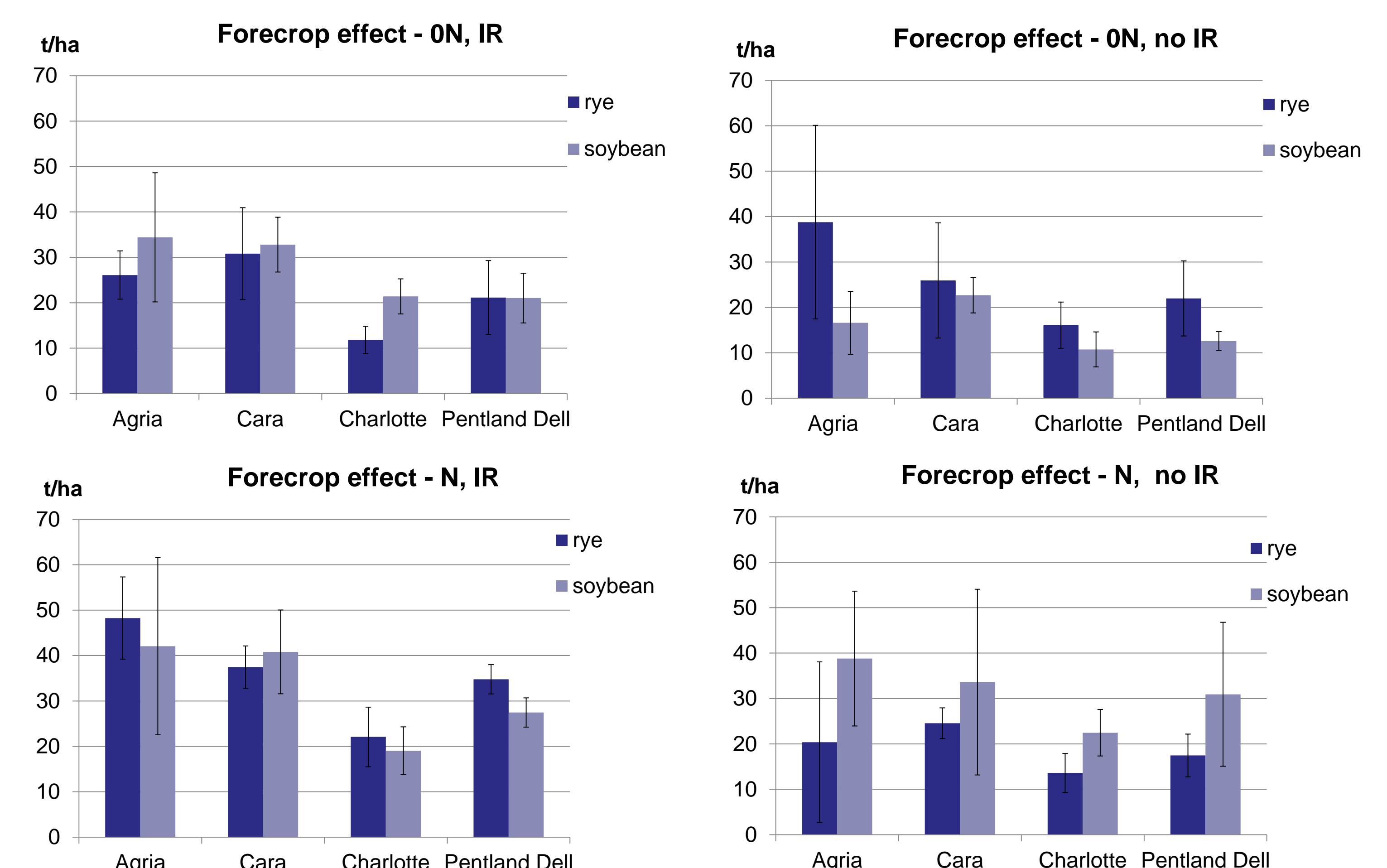


Fig 3. Effect of forecrop on yield (t/ha) of genotypes

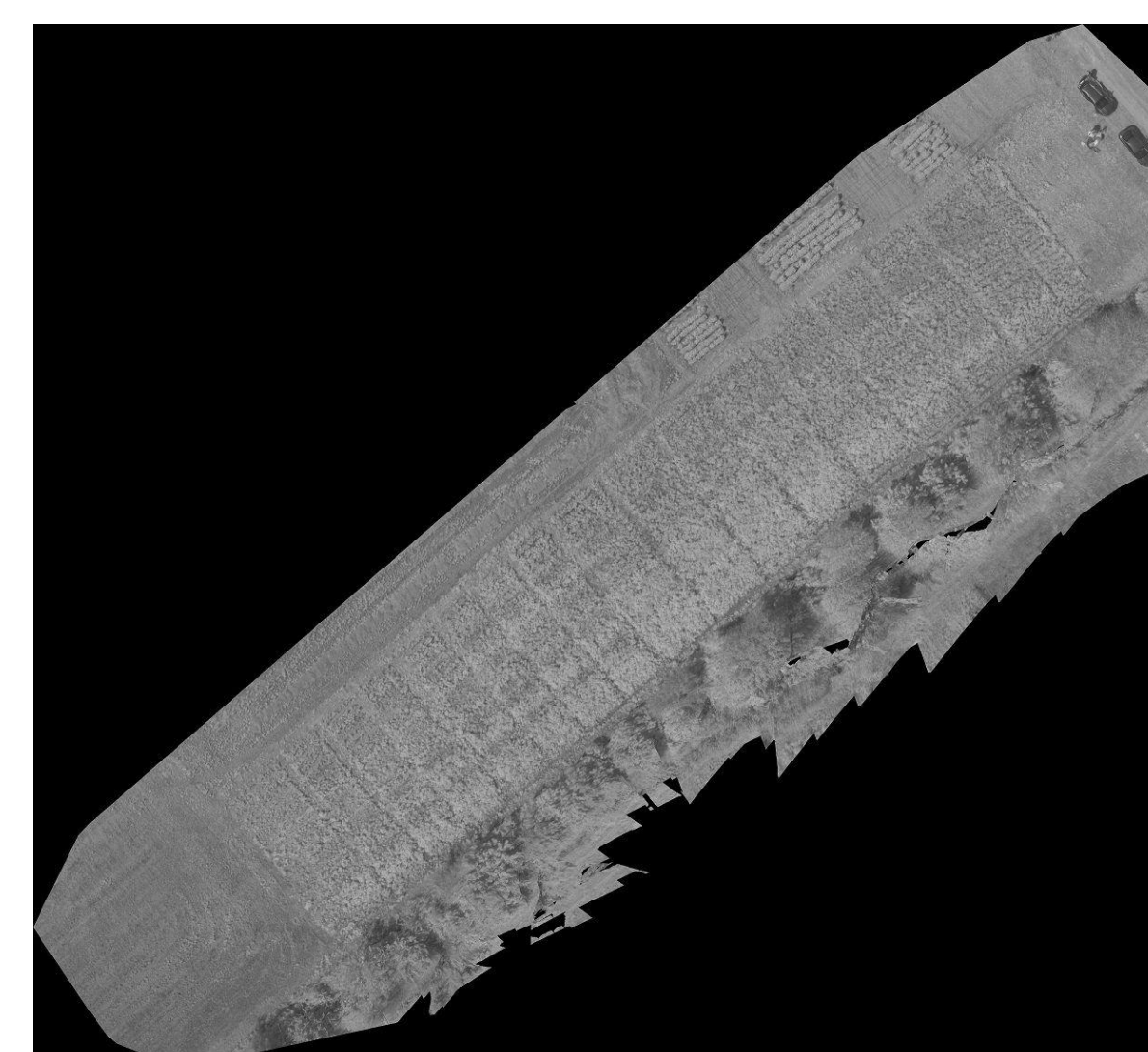


Fig 4. View of the trial on orthophoto (red-edge recording)

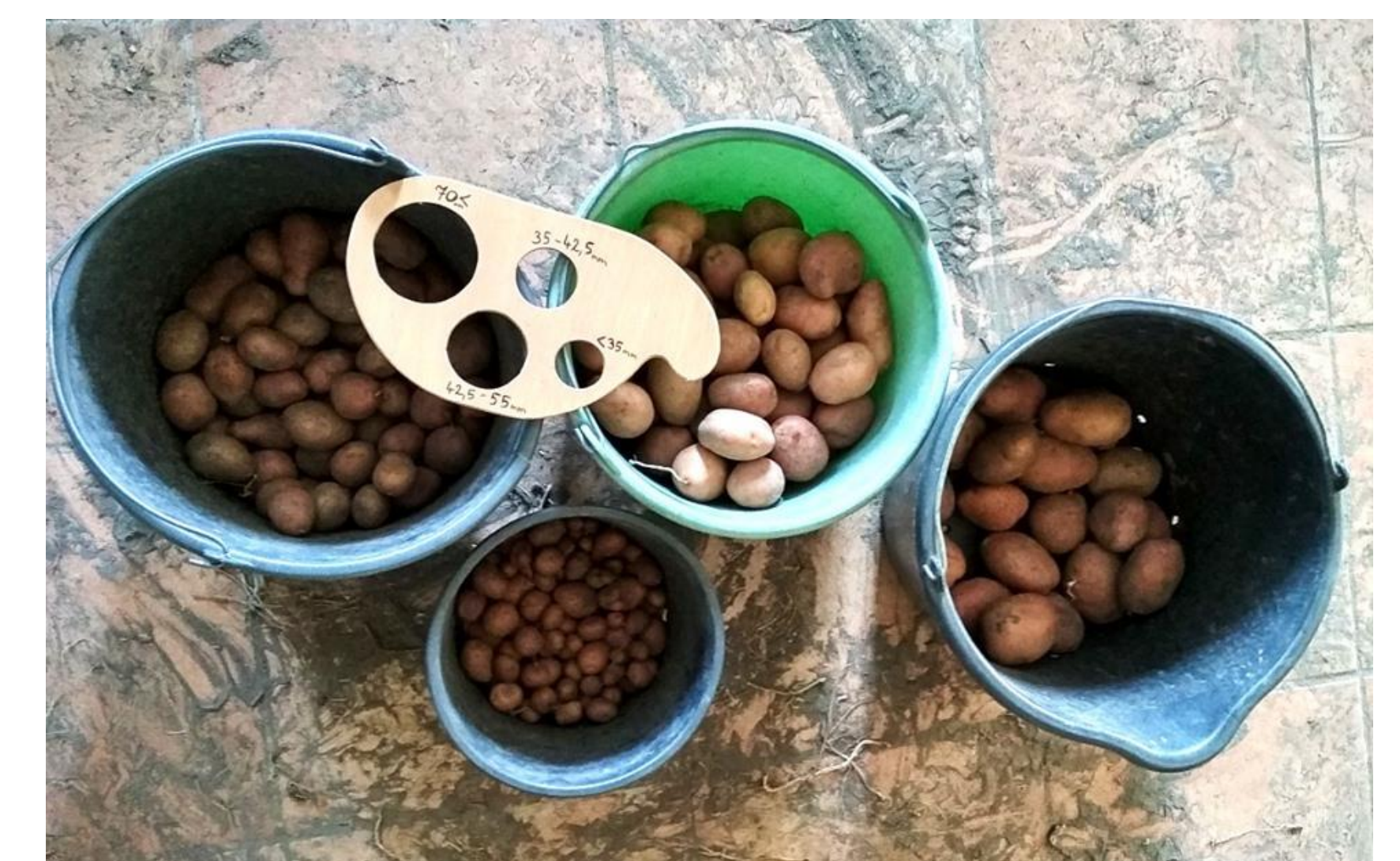


Fig 5. Tuber size classification

First results – Inoculation trial

Figure 6 shows the 2019 yield results of the inoculation trial. Significant differences (ANOVA) could be detected between the yields of tested genotypes and irrigation treatments (both $p=0.000$) No significant difference was found between the yields of P and inoculant treatments.

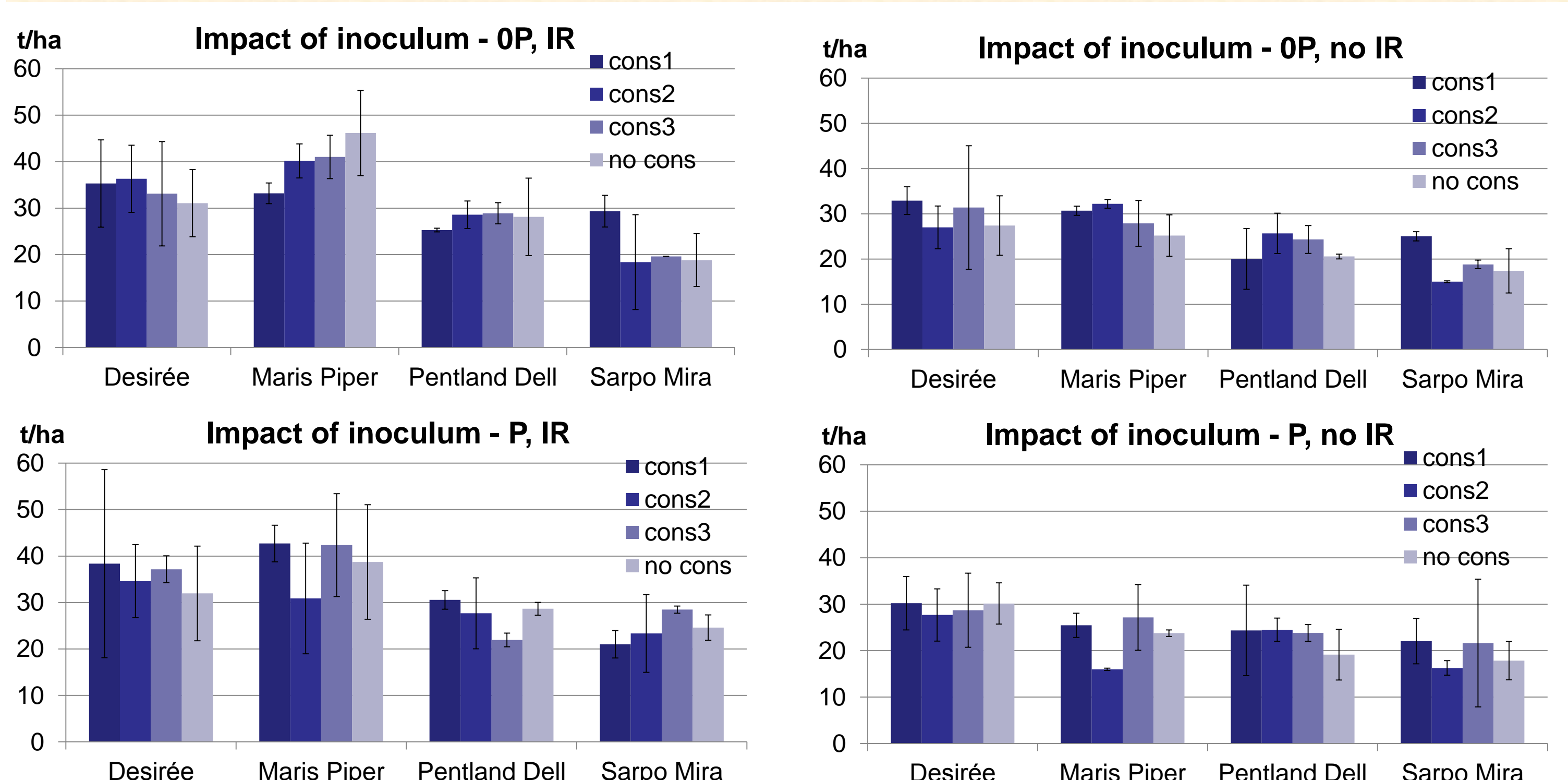


Fig 6. Effect of inoculation treatments on yield (t/ha) of genotypes