



Frontier in soya bean cropping systems in Central Europe: Exploiting plant growth-promoting rhizobacteria for stable and resource-efficient production (FisBea)

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Background

- Domestic soybean production in Europe is becoming increasingly important to reduce the over-reliance on imports
- Central Europe has ideal growing conditions for soybean cultivation
- Soybean nodulation efficiencies are frequently low in these areas

Objectives

- Examine the extent to which the symbiotic performance of adapted soybean rhizobia (ASR) is impacted by varying soil moisture conditions
- Test feasibility of using ASR to enhance soybean yield in North-east Germany

Isolation, sequencing & characterization of ASR



Fig. 1 Map detailing the soil sampling sites in the Northeast of Germany

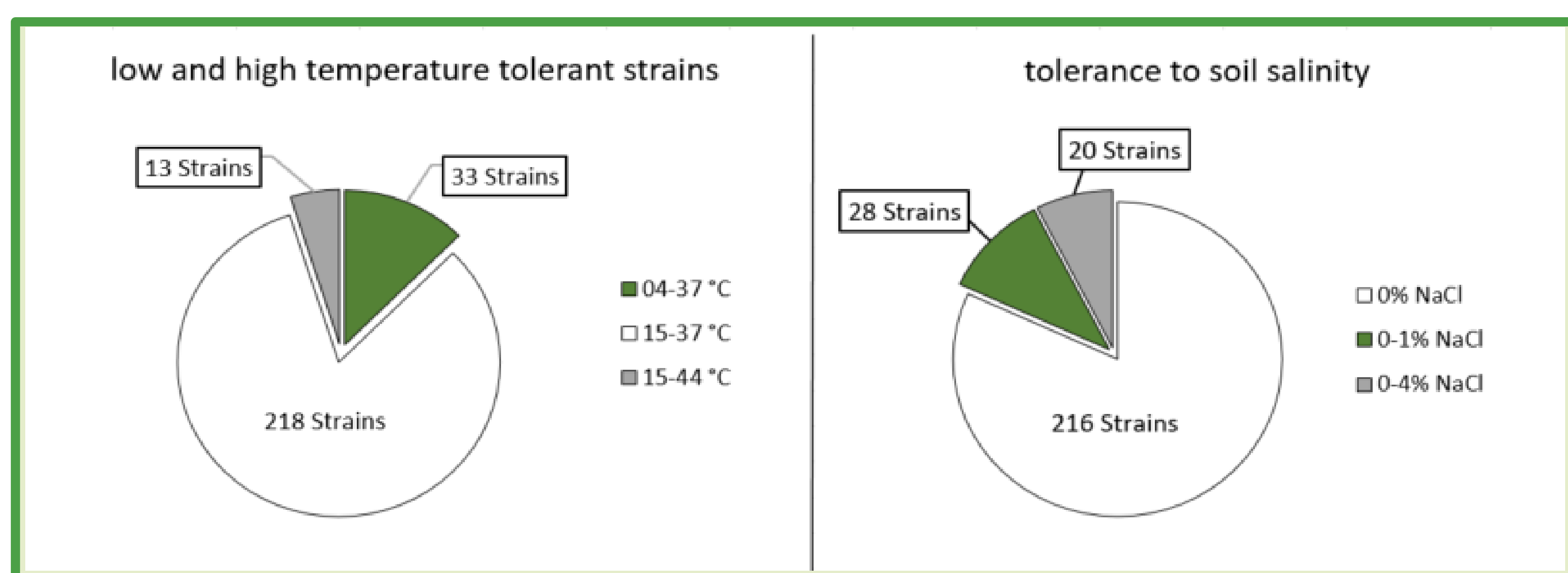


Fig 2. Abiotic stress tolerance of soybean rhizobia isolated

Table 1. Characteristics of selected strains to stress factors

Strain	Sampling site	MSLA	Slow growing	Temperature (°C)	pH
GMF14	Müncheberg	<i>Bradyrhizobium sp.</i>	+	4-37	4.5-10
GMM36	Müncheberg	<i>Bradyrhizobium sp.</i>	+	15-37	4.5-10
GEM96	Fehrow	<i>Bradyrhizobium sp.</i>	+	15-37	4.5-10



Testing nodulation efficiency of ASR under greenhouse conditions

Results

Table 2. *P*-values for nodulation and green biomass at flowering

Treatment	Nodule number	Nodule weight (g)	Green biomass (kg ha ⁻¹)
Water supply	0.006	<.0001	0.163
Bradyrhizobia	<.0001	<.0001	0.034
Water supply * Bradyrhizobia	0.283	0.018	0.429

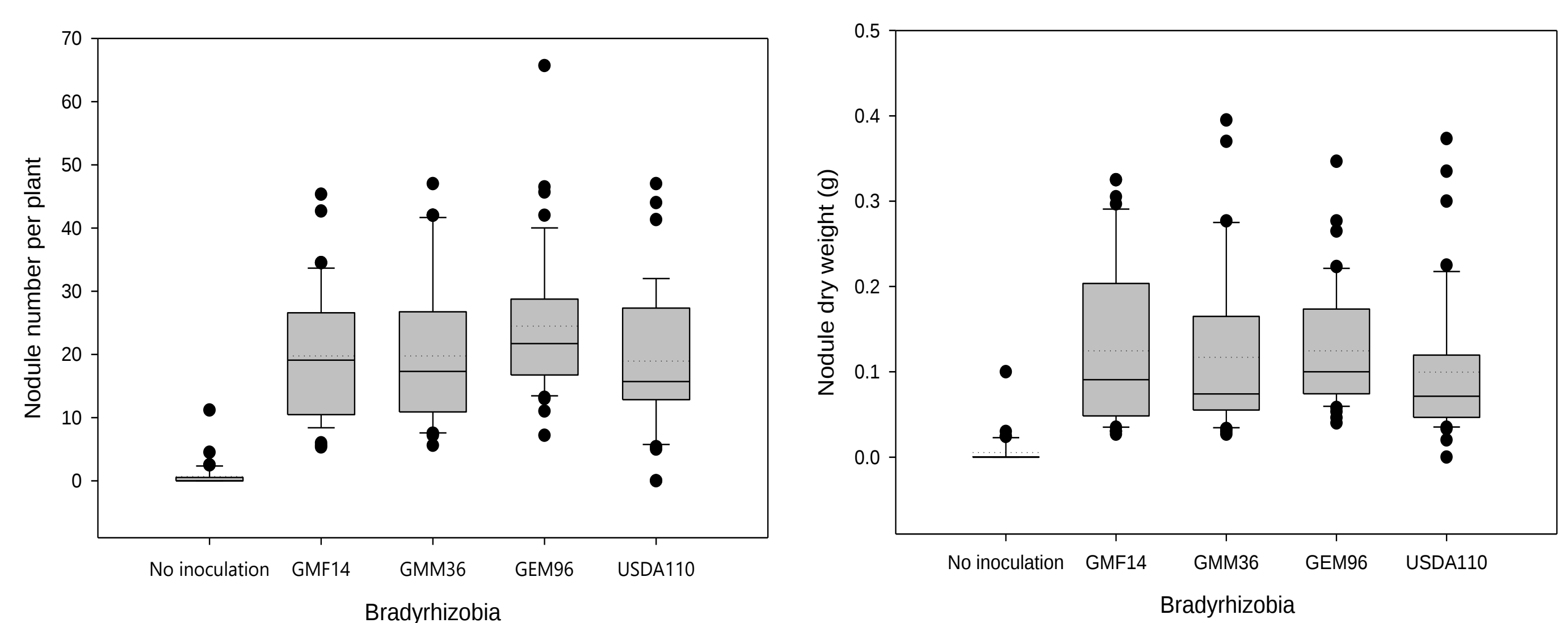


Fig. 3 Effects of inoculation with selected ASR on nodulation in irrigated and rainfed conditions



Assessment of soybean performance following inoculation with selected ASR strains under field conditions

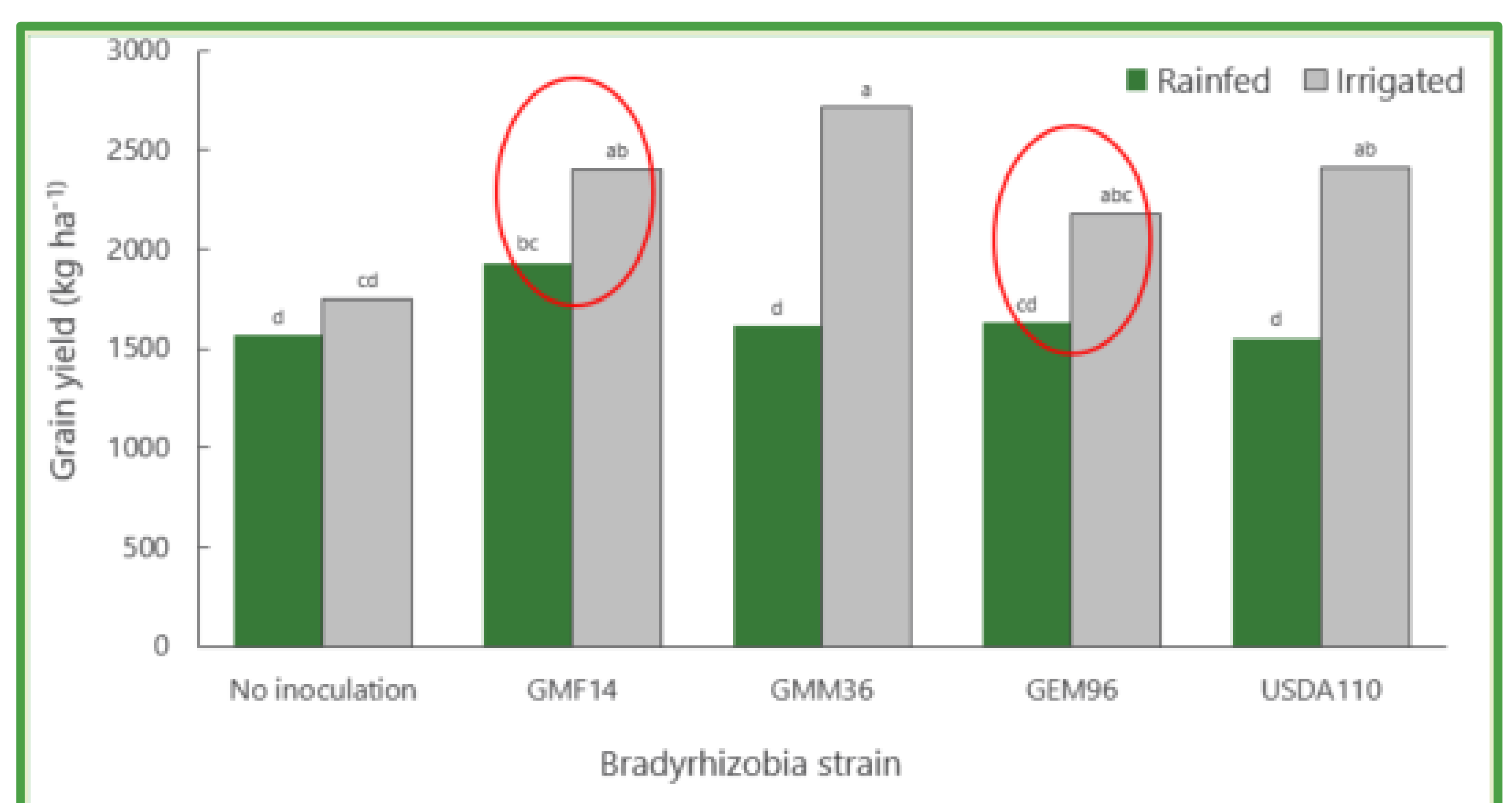


Fig. 4 Grain yield after inoculation with different ASR in irrigated and rainfed conditions

Adapted soybean rhizobia outcompeted the commercial USDA110 inoculant in drought conditions in Müncheberg

Related Papers

- Omari et al., 2022. Enhanced Soybean Productivity by Inoculation With Indigenous Bradyrhizobium Strains in Agroecological Conditions of Northeast Germany. *Frontiers in plant science*.
- Yuan et al., 2020. Characterization of Rhizobia for the Improvement of Soybean Cultivation at Cold Conditions in Central Europe. *Microbes and Environments*.