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BREEDING FOR IMPROVED SOYBEAN *BRADYRHIZOBIA* SYMBIOSIS FOR COOL GROWING CONDITIONS IN CENTRAL EUROPE

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Soybean has gained significant attention in Europe for the production of high quality protein for human consumption as well as for feed in recent years. Under climatic conditions such as Central Europe, low temperature is the major factor limiting soybean growth and symbiotic nitrogen fixation. Therefore, the biological nitrogen fixation shall be improved by breeding for cold tolerant soybean genotypes and by selecting adapted *Bradyrhizobia* strains. The aim of the study is to identify (i) *Bradyrhizobia* strains that show improved nodulation under cool growing conditions and (ii) *Bradyrhizobia* x soybean interactions that can be exploited for breeding for improved symbiosis.

In pot trials we have tested twelve different *Bradyrhizobia* inoculants and one inactivated control on three early soybean varieties (maturity group 000) at three different temperature regimes (14/10°C; 16/12°C; 22/20°C). The number of nodules, root and shoot biomass as well as chlorophyll content were assessed after six weeks. In parallel four commercially available inoculants and one non-inoculated control were tested on the three soybean varieties under organic and conventional growing conditions in Central Germany. Number of nodules was assessed six weeks after sowing and at beginning of flowering. Yield, thousand kernel weight and protein content were assessed at harvest. The most promising *Bradyrhizobia* strains from the pot trial have been multiplied and are currently tested on 20 different soybean varieties under 16/12°C temperature regime and will be verified in field trials in 2013 and 2014.

In the pot trials we found a significant inoculant x temperature interaction for the number of nodules and chlorophyll content. In addition we found significant inoculant x variety interactions at 14/10°C and at 16/12°C. At 14/10°C the highest number of nodules was obtained with the strain USDA 30 and the variety Protina (8.5 nodules per plant), whereas at 16/12°C one commercial product yielded highest number of nodules with the variety Bohemians (21.2 nodules per plant). Comparing different commercial inoculants with three different soybean varieties under organic and conventional farming conditions revealed that one product was inefficient to produce nodules resulting in dramatic reduction in soybean yield and protein content. Based on the present results it can be concluded that the choice of adapted inoculants is as important as the choice of adapted soybean varieties. Further results of the running projects will be discussed.