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Nutritional priming of *Pisum sativum* cv. Sirus and Messire to rhizobia and mycorrhiza

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Introduction

Pisum sativum L. is one of the most important sources of dietary protein for both human and livestock in the world. Its production, however, is constrained with a complex abiotic and biotic stress. The demand for imported high priced protein (soybean) as well as pea increased and will surge from time to time. A major bottleneck in its production is the lack of dependable yield that results from complex interaction between *P.sativum* and biotic stress such as *Mycosphaerella pinodes* (Berk. and Blox.). This disease is the most prevalent and economically important pathogen of P. sativum worldwide. Recent efforts to improve yields of field peas by inoculating with N2-fixing bacteria and arbuscualr mycorrhiza fungi (AMF) have been partially successful. Furthermore, reports regarding co-inoculation of Rhizobium and P solubilizing fungi on field pea commercial cultivar Sirius are rare. Changes of pathogenicity and/or virulence ability of *M. pinodes* affected by morphological and chemical composition of the host plant can be resulted from the symbiotic association of *P.sativum* with microsymbionts. The objectives of the initial phase of our study were to determine whether inoculation with a combination of the *R. leguminosarum* bv. viceae strains and the fungus *G. mosseae* would induce some morphological characteristics as well as exploration of nodulation and mycorrhizal colonization of roots and further N and P uptake by *P. sativum* plants.

Methodology

Treatments were: (1) two controls (US, unsterilized; SC, sterilized substrates), (2) four microbial inoculants (a) +M, mycorrhioza); (b) +PR, peat based Rhizobium; (c) +MPR, mycorrhiza and peatbased Rhizobium; (d) LR, liquid Rhizobium alone; and (3) NP, Nitrogen + Phosphorus fertilizers. Plant height was measured before harvesting. Shoot dry matter, leaf area (LA), N and P nutrient-absorption were determined after harvesting. Data were analyzed with one-wayfactorial ANOVA tests (SPSS18.0).

Fig. 1: Experimental setup

Results and discussion

In this study, there were significant differences among treatments (< 0.05) in plant height, leaf area index (LAI), biomass dry matter yield (DMY) (Fig. 3), node number and NP uptake (data are not presented here). Rhizobium inoculated plants had similar plant height, node number, leaf area index and dry mater yield to NP. That might be resulted from markedly increased plant N yield in the root nodules. An increase in plant growth and nitrogen fixation by rhizobacteria was reported by Dashti et al. (1998). Nevertheless, plants that received NP were the tallest (64 cm?) in relation to other treatments. The minimum recorded values were in the two control treatments. In this particular study, the variations of either the co-inoculation of rhizobia and mycorrhiza or a single mycorerrhiza were not large enough but better than the controls.

Fig. 2: Root nodulation

In conclusion our preliminary results showed that inoculation with Rhizobium treatments had a more stimulating effect than control and mycorrhizal treatments on NP uptake, growth and development of plants. That will probably lead to enhance a defense mechanism of field peas against M.pinodes.

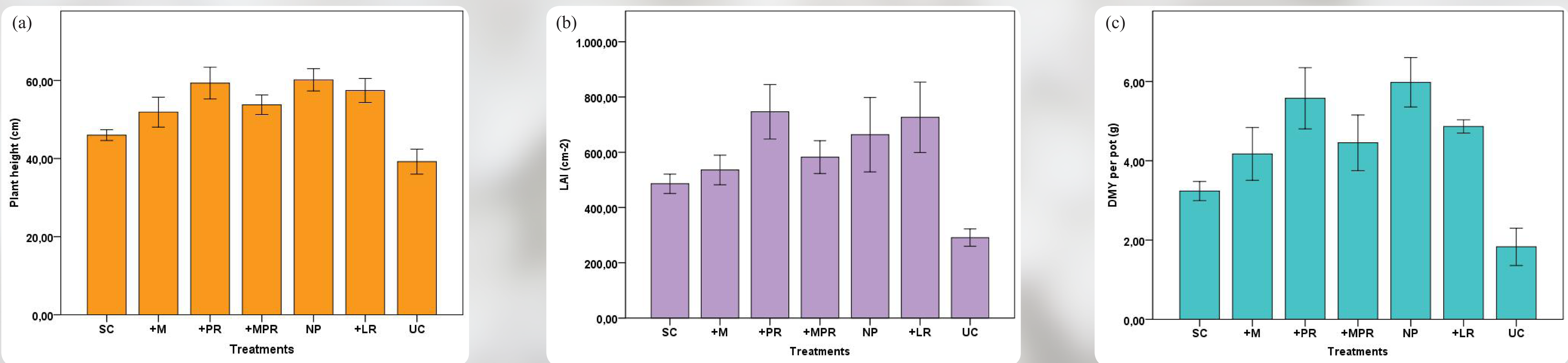

Fig. 3: Effects of plant nutrient acquisition on plant height (a); leaf area (LA) (b); and dry matter yield (c). Error bars indicate S.E (n = 6).

References

Dashti N, Zhang F, Hynes R, Smith DL. (1998): Plant growth promoting rhizobacteria accelerate nodulation and increase nitrogen fixation activity by field grown soybean [Glycine max (L.) Merr.] under short growing seasons, Plant soil 200: 205-213.