

A fungal-bacteria consortium improves morphological and nutritional status of lettuce

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Several biotechnological innovations can help to achieve higher productivity in agriculture, with lower input costs and in a way that does not cause environmental impacts, such as microbiological biofertilizers. To increase its beneficial effects for the plants, a biofertilizer formed by a consortium of microorganisms containing ecologically diverse strains, may be more effective than the use of single strains, due to their complementary characteristics. Thus, the aim of this work was to compare the effects of the fungus *Serendipita indica* and the rhizobacteria *Herbaspirillum seropedicae* isolated or in consortium, in the plant-growth promotion of lettuce plants. The microorganisms were first co-culture in vitro to assess their negative or positive effects. Lettuce plantlets were then inoculated with *S. indica* and *H. seropedicae* (isolated or in consortium) and grown in greenhouse for 60 days. We analyzed plant morphology parameters (shoot and root fresh and dry matter, and water content) and shoot macro and micronutrient content. The *in vitro* interaction between *S. indica* and *H. seropedicae* was considered positive, since the growth of the fungus was stimulated by 57 % when co-cultured with the rhizobacteria. Inoculation with the consortium significantly increased shoot fresh and dry weight (56 and 236 %), root fresh and dry weight (54 and 149 %) and shoot and root water content (44 and 46 %) when compared to the control. All morphological parameters were also stimulated by the consortium when compared to plants inoculated with the isolated fungus or the rhizobacteria. The contents of P, K, Ca, Mg, Na, S, Ni, Cu, Zn, Cr, Fe, Mn, Al and Ba were significantly increased in the shoot of lettuce plants inoculated with the consortium in relation to the control and plants inoculated with *S. indica*. When comparing the inoculation with the consortium and inoculation with *H. seropedicae*, there was no significant difference only in the contents of P, S, Z, Cr, Fe and Al. These results clearly demonstrate a high potential of the consortium formed by *S. indica* and *H. seropedicae* to be used as a biofertilizer, which will be effective in promoting plant growth, reducing the use of chemical fertilizers and also as a strategy of biofortification of plant macro and especially micronutrients.

Key words: *Serendipita indica*; *Herbaspirillum seropedicae*; biostimulant; plant growth promotion.

Consórcio de microrganismos promove crescimento de alface

Diversas inovações biotecnológicas podem aumentar a produtividade na agricultura, com menores custos e baixo impacto ambiental, como os consórcios de microrganismos. Comparamos os efeitos do fungo *Serendipita indica* e da rizobactéria *Herbaspirillum seropedicae* isolados ou em consórcio, no crescimento de alface. Foram analisados os parâmetros morfológicos e o conteúdo de macro e micronutrientes da parte aérea. A inoculação com o consórcio aumentou significativamente todos os parâmetros morfológicos e a maior parte do teor de nutrientes da parte aérea, quando comparado aos tratamentos isolados e plantas não inoculadas. Esses resultados demonstram um alto potencial deste consórcio para ser utilizado como biofertilizante.

Palavras-chave: *Serendipita indica*; *Herbaspirillum seropedicae*; bioestimulante; promoção do crescimento vegetal.

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