

Publication

Spatial Arrangement and Biofertilizers Enhance the Performance of Legume-Millet Intercropping System in Rainfed Areas of Southern India

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Author(s) Singh, Devesh; Mathimaran, Natarajan; Sekar, Jegan; Vaiyapuri Ramalingam, Prabavathy; Perisamy, Yuvaraj; Raju, Kathiravan; Raj, Rengalakshmi; King, Israel Oliver; Nanjundegowda, Thim-megowda Matadadoddi; Baiyapalli Narayanswamy, Manjunatha; Nayakanahalli Chikkegowda, Bhavitha; Siddegowda, Savitha Matakere; Joseph Bagyaraj, Davis; Mäder, Paul; Boller, Thomas; Kahmen, Ansgar *

Author(s) at UniBasel Kahmen, Ansgar ; Singh, Devesh ; Boller, Thomas ;

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Intercropping is a well-established practice to enhance the yield in low-input agriculture, and beneficial microbes such as arbuscular mycorrhizal fungi (AMF) combined with plant growth promoting rhizobacteria are being used as an effective and sustainable measure to improve yields. In this study, we tested if biofertilizers can not only enhance the yield of crops in monoculture as has previously been demonstrated but can also enhance the yield of intercropping systems. We hypothesized that because AMF can form common mycorrhizal networks (CMN) that can transfer nutrients and water between different plant species, biofertilization can balance belowground competition between crop species and promote thus overall yields in intercropping systems. In our study, we used a pigeon pea (PP)-finger millet (FM) intercropping system that we grew for two consecutive growing seasons (2016/17 and 2017/18) at two contrasting sites in Bengaluru and Kolli Hills, India. We also tested if the spatial arrangement (i.e., different arrangement of component plants with similar plant density in intercropping system) of intercropped plants, using either a row-wise or a mosaic design, influences the effect of biofertilizers on yield and water relations of the PP-FM intercropping system. Our results demonstrate that intercropping can improve the straw and grain yield of PP and FM compared to the respective monocultures and that intercropping effects vary depending on the site characteristic such as climate and soil type. The spatial arrangement of component plants affected the total, straw, and grain biomass in intercropping treatments, but this effect also varied across sites. Most importantly, the results from the 2017/18 growing season clearly demonstrated a positive effect of biofertilizer on biomass Singh et al. Performance of Intercropping in Rainfed Areas yield, and this effect was irrespective of site, spatial arrangement, mixed or monoculture. Our study therefore shows that yield increase in intercropping systems can further be improved through the application of biofertilizers.

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