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Soil microflora and enzyme activities in rhizosphere of Transgenic Bt cotton hybrid under different intercropping systems and plant protection schedules

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Field experiments were conducted over three rainy seasons of 2005-06 to 2007-08 on a Vertisol at Dharwad, Karnataka, India to study the effect of intercropping and plant protection schedules on productivity, soil microflora and enzyme activities in the rhizosphere of transgenic Bt cotton hybrid. The experiment consisted of four intercropping systems namely, Bt cotton + okra, Bt cotton + chilli, Bt cotton + onion + chilli and Bt cotton + redgram with four plant protection schedules (zero protection, protection for Bt cotton, protection for intercrop and protection for both crops). Observations on microbial populations and enzyme activities were recorded at 45, 90, 135 and 185 (at harvest) days after sowing (DAS). Averaged over years, Bt cotton + okra intercropping had significantly higher total productivity than Bt cotton + chilli and Bt cotton + redgram intercropping system and was similar to Bt cotton + chilli + onion intercropping system. With respect to plant protection schedules for bollworms, protection for both cotton and intercrops recorded significantly higher yield than the rest of the treatments. Population of total bacteria, fungi, actinomycetes, P-solubilizers, free-living N2 fixers as well as urease, phosphatase and dehydrogenase enzyme activities increased up to 135 days of crop growth followed by a decline. Among the intercropping systems, Bt cotton + chilli recorded significantly higher population of microorganisms and enzyme activities than other cropping systems. While Bt cotton with okra as intercrop recorded the least population of total bacteria and free-living N2 fixers as well as urease activity. Intercropping with redgram resulted in the least population of actinomycetes, fungi and P-solubilizers, whereas Bt cotton with chilli and onion recorded least activities of dehydrogenase and phosphatase. Among the plant protection schedules, zero protection recorded maximum population of microorganisms and enzyme activities. This was followed by the plant protection schedule taken up for main crop and for intercrops, but was least in the insecticide sprayed to both the crops. Data on interaction of intercropping and plant protection schedules indicated that Bt cotton with chilli as intercrop and with zero plant protection showed the highest population of P-solubilizers, N2 fixers as well as urease and phosphatase activities at 135 days of crop growth. Similarly, population of total bacteria, fungi and actinomycetes were highest in the treatment of Bt cotton + chilli + onion with zero protection but were on par with the treatment Bt cotton + chilli with zero protection at 135 days of crop growth. Dehydrogenase activity was found to be the highest in the treatment of Bt cotton + redgram with zero protection at 135 days of crop growth. Our studies showed harmful effects of insecticide sprays on soil microflora and enzyme activities.