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Biodiversity Interactions Between C3 and C4 Plants under Agroforestry Cropping System

Authors : Ezzat Abd El Lateef

Abstract : Agroforestry means combining the management of trees with productive agricultural activities, especially in semiarid regions where crop yield increases are limited in agroforestry systems due to the fertility and microclimate improvements and the large competitive effect of trees with crops for water and nutrients, in order to assess the effect of agroforestry of some field crops with citrus trees as an approach to establish biodiversity in fruit tree plantations. Three field crops, i.e., maize, soybean and sunflower, were inter-planted with seedless orange trees (4*4 m) or were planted as solid plantings. The results for the trees indicated a larger fruit yield was obtained when soybean and sunflowers were interplant with citrus. Statistically significant effects ($P<0.05$) were found for maize grain and biological yields, with increased yields when grown as solid planting. There were no differences in the yields of soya bean and sunflower, where the yields were very similar between the two cropping systems. It is evident from the trials that agroforestry is an efficient concept to increase biodiversity through the interaction of trees with the interplant field crop species. Maize, unlike the other crops, was more sensitive to shade conditions under agroforestry practice and not preferred in the biodiversity system. The potential of agroforestry to improve or increase biodiversity is efficient as the understorey crops are usually C4 species, and the overstorey trees are invariably C3 species in agroforestry. Improvement in interplant species is most likely if the understorey crop is a C3 species, which are usually light saturated in the open, and partial shade may have little effect on assimilation or by a concurrent reduction in transpiration. It could be concluded that agroforestry is an efficient concept to increase biodiversity through the interaction of trees with the interplant field crop species. Some field crops could be employed successfully, like soybean or sunflowers, while others like maize are sensitive to incorporate in agroforestry system.

Keywords : agroforestry, field crops, C3 and C4 plants, yield
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