CROP PRODUCTION PRACTICES, SOILBORNE DISEASE AND ROOT COLONIZING FUNGI

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In an effort to better understand the impacts of methyl bromide fumigation and crop production alternatives on soil health, the incidence soilborne disease and root colonizing fungi were studied in duplicate experiments established on a conventional and organic vegetable farm. The conventional farm had been cultivated to pepper (*Capsicum annum*) since 1957 and fumigated with methyl bromide since 1973. The organic farm was certified in 1994 and cultivated annually to a diverse mixture of vegetables and herbs. In 1999, an experiment was initiated on both farms where pepper was produced in replicated field plots using soil solarization or conservation tillage into the stubble remaining from a previous crop of the tropical legumes iron-clay pea (*Vigna unguiculata*) or sunn hemp (*Crotolaria juncea*). Soil fumigation with methyl bromide:chloropicrin was included as a treatment in the conventional farm. Plots were split with ½ receiving 67 tons per ha of urban plant debris. The experiment was repeated in 2000 in the same plots.

The incidence of soilborne disease varied from 14 to 97% in plots on the conventional farm and from 0 to 38% in plots on the organic farm. Disease was reduced after application of urban plant debris, except in fumigated plots where an increase in disease was observed. Root colonization by arbuscular mycorrhizal (AM) fungi ranged from 0 to 24% in the conventional farm and 0 to 5% in the organic farm and was highest on the sunn hemp cover crop. Transplanting pepper seedlings directly into the sunn hemp stubble did not improve AM colonization of pepper.

Pepper roots were sampled between 13 and 35 days after transplanting. A total of 8,417 fungal colonies were isolated from 1st order (root tips), 2nd order (lateral roots) and crown tissue. The taxonomic grouping (genus and/or species) was identified for 99% of the isolates. Twenty nine taxa were identified from the organic farm in 1999 and 2000. In the conventional farm, 31 and 30 taxa were identified in 1999 and 2000, respectively. Similarities in the number of taxa (richness) and values for the Shannon-Weaver index (diversity) were observed between the organic and conventional farm. However, a significant interaction between farm, year, and production practice was observed (Fig 1). Of the eight fungal taxa most commonly observed in this study, their frequency of isolation was higher and more consistent from the organic farm. While communities of root colonizing fungi may be impacted as a result of extensive fumigation with methyl bromide, a permanent loss in the diversity of root colonizing fungi may not occur.

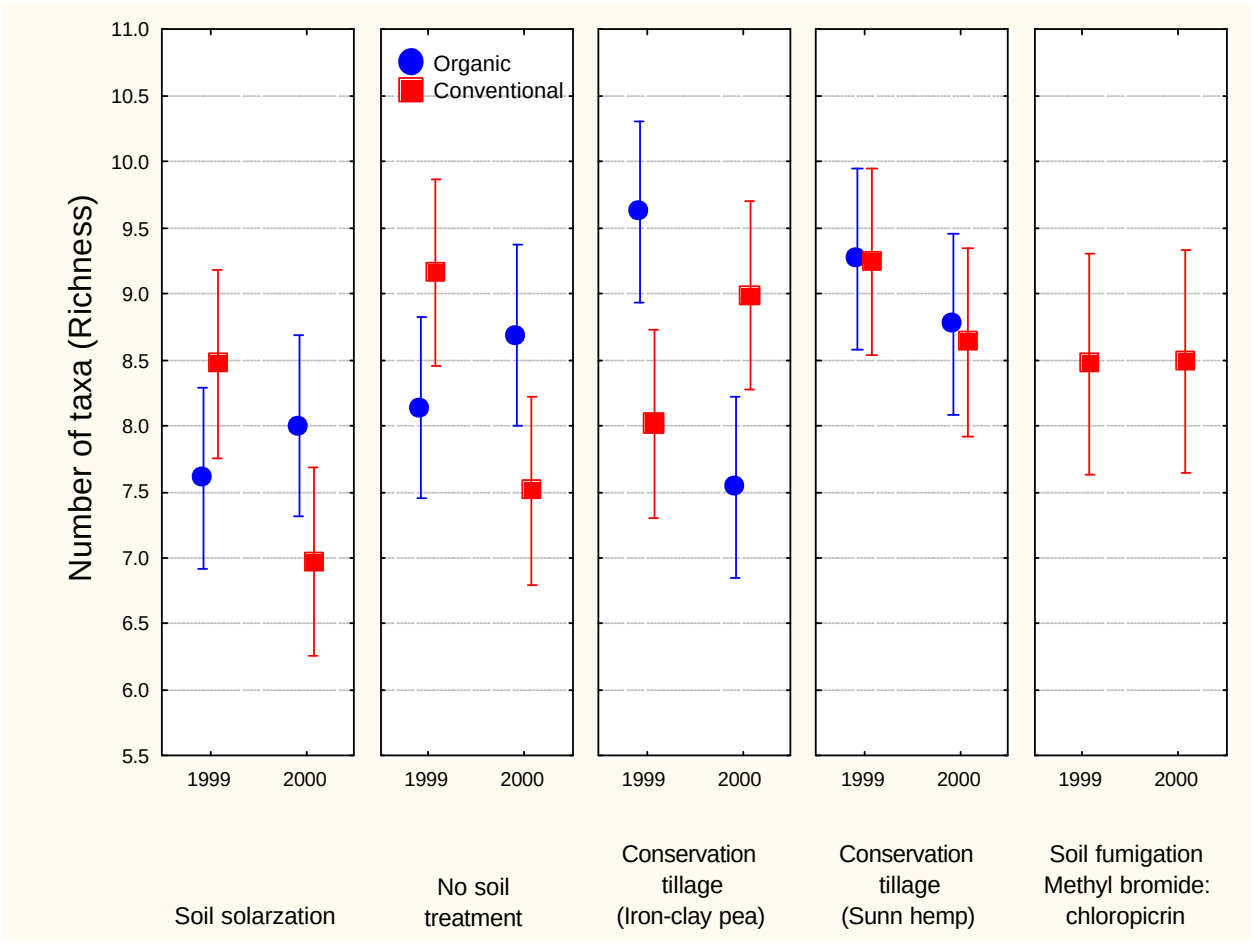

Figure 1. The effect of farm, year, and crop production practice on the number of fungal taxa (richness) isolated from pepper roots.

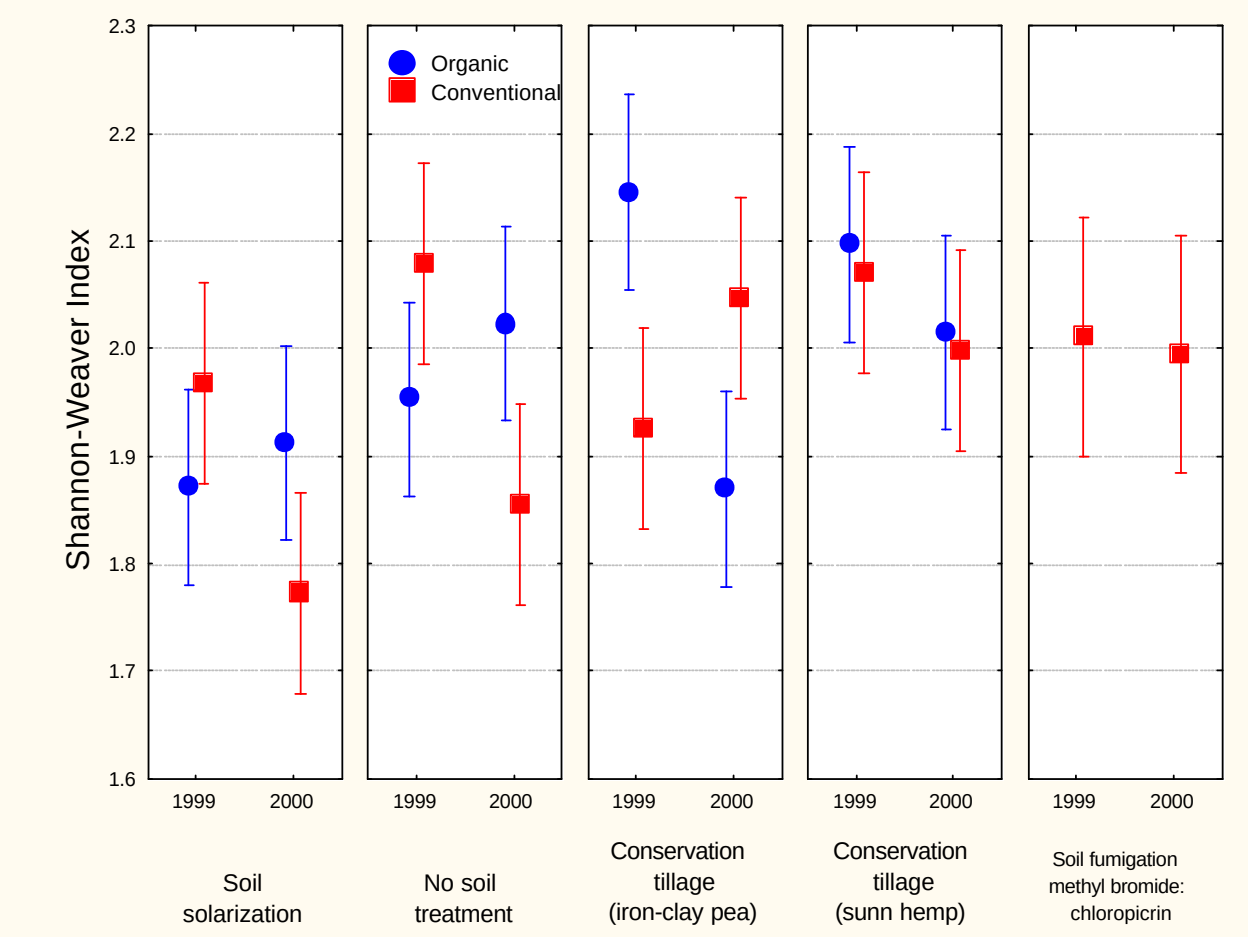

Figure 2. The effect of farm, year, and production practice on the diversity of fungi isolated from pepper roots.