IMPORTANT BIOLOGICAL COMPONENTS TO BE INCLUDED IN THE SEARCH FOR ALTERNATIVES TO THE USE OF METHYL BROMIDE IN MEXICO

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The current and future rate of Methyl bromide use in Mexico is reviewed, emphasizing the effect of the pass out provision. In 1980, 86 and 91, Mexico imported 400, 600 and 700 Tons., respectively. In 1995, 96 and 97, 3357, 2918 and 3130 Tons. It is clearly an ever-increasing rate of use and it would appear that the Methyl Bromide prohibition has only stimulated its consumption and use in Mexico; as if such prohibition has merely serve the purpose of propaganda in favor of the intensification of its use.

Brief description of three traditional Mexican agroecosystems where Methyl Bromide has never been used or needed is presented as well as the research work carried out to demonstrate the suppressive nature of their soils to several important soil-borne plant pathogens. The soils of Chinampa system suppress *Pythium aphanidermatum, Rhizoctonia solani* and two species of plant parasitic nematodes. The soil of the "popal" agroecosystem practiced in the lowlands region of Tabasco State, Mexico, for corn production suppresses the incidence and damage of *Pythium* spp and a number of antagonistic microorganisms isolated from these soils are very promising in biological control projects. A crop rotation system for corn production, using *Mucuna deeringiana*, also practiced in the lowlands region of Tabasco State, Mexico, drastically reduced the incidence and damage of soil-borne diseases to corn, due to several beneficial effects of the rotation, such as nitrogen biological fixation, huge addition of organic matter to the system, direct and indirect inoculum density reduction of *Pythium* spp and, above all, a very dynamic root colonization by mycorrhizal fungi of the corn crop, following the rotation.

Considering that soil-borne diseases are phenomena of high complexity, that should not be investigated or managed as if they were cause-effect relationships, but rather as the result of numerous interactions among the soil microorganisms, the plant and the environment; increasing complexity of antagonistic microorganisms was induced in steam sterilized soil, in Mason jars, using a). six antibiotic producing fungi, or b). six mycolitic fungi, or c). six antibiotic bacteria. The microorganisms were allowed to grow for a 3 months period. These soils were used as a germination substratum for *M. deeringiana* seeds. Also, combinations were established using a+b, a+c, b+c, or a+b+c, The seedlings were transplanted in heavily *Fusarium oxysporum fs radicis lycopersici* infested soil, in plastic 4 k pots. Two controls consisted in pots to which no *Fusarium* was added or pots maintained with no *M. deeringiana* during the five months of *M. diringiana* growth. Tomato seedlings were transplanted after the *M. deeringiana* plants were chopped down and were maintained until fruiting stage.

A remarkable effect was observed among treatments: the higher the number of microorganisms, the higher the *M. deeringiana* plants vigor, something that could be recognized as a root growth promoting effect on the part of the complex induced antagonistic microflora. Although preliminary and greenhouse obtained results, tomato plants were destroyed in the pots with *Fusarium* infested soil to which no *M. deeringiana* plants were planted, whereas, in those treatments including *M. deeringiana* germinated in substratum containing increasing numbers of antagonistic microorganisms, were increasingly healthier and productive.

Very many soil microorganisms have the potential of antagonizing soil-borne plant pathogens but fail in bringing about biological control because of the natural soil homeostasis, that precludes the establishment of an introduced, augmented species. It would appear that by using plants like *Mucuna*, of vigorous root growth that allows for the establishment of balanced complexes of antagonistic microorganisms along its rhizosphere, would be the best way to get these biological control agents successfully established in the soil system.

Finally, The search for plants with allelopathic properties with high potential for reducing the impact of certain soil-borne plant pathogens, including nematodes is described. Acetone extracts of two plants showed *in vitro* drastic growth reduction of pathogens as *Phytophthora capcisi, Pythium ultimum, Sclerotium rolfsii* and *Rhizoctonia solani*. One of them turned out to be very effective when added as a soil amendment, in reducing incidence and damage of *P. capcisi* to tomato under greenhouse conditions. The common or scientific names of these plants can not be mentioned at this time in order to protect these wild plants species from over-exploitation that might result in their destruction.

There are alternatives to the use of Methyl Bromide that can be successfully implemented most everywhere in the world, whenever there is enough economy to invest in their adoption and, if everyone is still using Methyl Bromide is because it is still available and still very cheap. If we really want the development and adoption of Methyl Bromide alternatives, there is only one speedy way to achieve it… developed countries should stop producing it and stop commercializing it in developing countries.

In developing countries there is a vast knowledge, in our traditional agroecosystems, about how to handle soil borne diseases problems without using chemicals. The absence of methyl bromide in the market, will certainly be the best stimulus to the ingenious search of integrated pest management strategies with an strong emphasis on biological components.