ANNEXURE I

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S-07. P-294. Mycoflora associated with certain medicinal plant parts are affected by fungi. These deplete valuable nutrients and contaminate them with several toxins. Among all the mycotoxins, aflatoxins have been studied extensively with regard to their toxic effects on plants and human beings. Carcinogenic potential of aflatoxins have been reported. These may be harmful to various organisms such as the liver, kidney and gastrointestinal tract. Aflatoxins B₁ and B₂ can be converted to aflatoxins G₁ and G₂. During storage of medicinal plant parts if conditions are moist and temperature ranges between 25 and 30 °C the production of mycotoxins is higher. Ten samples of medicinal plants were analyzed for the percentage incidence of fungal contaminants. The association of fungi producing aflatoxins was determined. Incidence of Aspergillus flavus was found higher in Terminalia chebula, Asparagus racemosus and Emblica officinalis. Occurrence of Aspergillus niger was found higher in T. bellarica followed by Glycyrrhiza glabra, Punica granatum, Citrus medica 9 fruit rind) dried fruits of E. officinalis, Piper longum, T. chebula, Piper nigrum, Rauwolfia tetraphylla and A. racemosus. The presence of aflatoxin B₁ was detected in all the medicinal plant materials.
ANNEXURE II

Diseases of Fruit Trees: Recent researches and Eco-friendly Management: 2009

Diseases of Papaya and strategies for their effective management

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The papaya (Carica papaya L.) is rapidly becoming an important fruit internationally, both as fresh fruit and as processed products. Its latex is used for tenderization of meat. Fruits are rich source of sugar and Vit. A. Some of the Indian varieties include Honey dew, Coorg honey dew, Washington, Pusa delicious, Co-1, Co-6. papaya is stacked by various fungal, viral and bacterial pathogens. Fusarial rots and anthracnose fruit rot cause havoc.

Postharvest handling and storage methods are described in detail. Fruits can be stored between 10 and 16 °c for more than 15 days. Seal – packaging with low density polyethylene retarded the development of peel color and prevented the softening of fruit. Plastic film wraps were more effective than waxing in reducing the waterloss. Hot water treatment alone or in combination with fungicides was recommended. Biological control of Papaya with Bacillus subtilis and Pseudomonas cepacia are recommended during postharvest phase to prevent the fruit rot in storage.
ANNEXURE III

Management of Fungal Plant Pathogens

Mechanism of Action in arbuscular Mycorrhizal symbionts to control Fungal Diseases

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Currently the world over, especially in developing countries, maintenance of soil fertility and control of plant diseases have become crucial issues in meeting the biomass needs for food, fodder and fuel, as well as preserving a clean environment. An ideal fertile soil is characterized not only by microbiological processes that are maintained in equilibrium. More than 905 of land plants are estimated to form arbuscular mycorrhizal (AM) associations with soilborne fungi in the phylum *Glomeromycota*. They have a wide host range, yet certain host and fungal combinations are more effective from either the perspective of the fungus, i.e. greater spore/ hyphae production, or from that of the host, i.e. enhanced growth, nutrient acquisition or pathogen resistance. Besides improving uptake of phosphorus, AM fungi improve plant health through improved resistance to various biotic and abiotic stresses. Of particular importance is the bioprotection conferred to plants against many soil borne pathogens, such as species of *Aphanomyces, Cylindrocladium, Fusarium, Macrophomina, Phytophthora, Pythium, Rhizoctonia, Sclerotium, Thielaviopsis* and *verticillium*, as well as various nematodes by AM fungal colonization of the plant roots.

Achieving the effective and sustainable control of plant diseases remains a formidable challenge for all agricultural systems. Despite the continued release of resistant cultivars and pesticides, pathogens still cause crop damages and losses that exceed 12% worldwide. Studies have shown that root rot in wheat caused by *S. rolfsii* was prevented by the inoculation of *Glomus fasciculatum*. Reduced quantum of lesioned roots was found in take – all diseases caused by *Gaumannomyces graminis tritici* due to *G. deserticola* in wheat. The association of *G. radiatum* with apple has been studied in the USA. It was found that soil borne fungi, *Cylindrocarpon*, *Pythium* and the parasitic nematode, *Pratylenchus* spp., were common with replant diseases of apple. In this disease, young trees are stunted and develop fewer branches than healthy trees.

The exact mechanisms by which AM fungal colonization confers the protective effect are not completely understood, but a greater understanding of these beneficial interactions is necessary for the exploitation of AM fungi in organic and / or sustainable farming systems. The mechanisms employed by AM fungi in indirectly to suppress plant pathogens include enhanced nutrition to plants; morphological changes in the root; increased lignification; changes in the chemical composition in the mycorrhizosphere. Bioprotection within AM fungal – colonized plants is the outcome of complex interactions between plants, pathogens and AM fungi. In this chapter, the different diseases of cereals, pulses fruits and vegetables and the potential mechanisms by which AM fungi contribute to bioprotection against plant soil borne pathogens are discussed.


Symposium ----  Mycorrhizal Symbiosis
ANNEXURE IV

Role of seed borne Fungi on Percentage Germination of Three Varieties of Castor (Ricinus communis L.) and their Growth Performance by Incorporation of AM fungi

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India is one of the leading producers of castor. The oil of castor (Ricinus communis L.) is used in pharmaceuticals, medicine and industries related to soap, paint, and lubricants etc. Agricultural scientists in the country have developed a large number of hybrid varieties exploiting hybrid vigor. The studies were undertaken to assess the occurrence of seed borne mycoflora at different temperatures, when the seeds were stored for one year in different types of containers in Baroda, India.

Seed health ensures a better crop in the field. Seed storage is a serious problem in tropical countries. The experimental results showed association of 19 different fungi with three different varieties of castor. Presence of seed mycoflora reduced percentage seed germination to 10 in GCH4, 20 in Avani 41, and 38 in local var. after storage at 25°C. It was 13% in GCH4, while germination reduced to 7 and 12% in Avani 41 and local var. when stored to one year at 10°C.

The growth of plants is influenced by Mycorhizal Symbiosis. AM fungi not only provide nutrients and vital minerals necessary for growth but also provide water balance and protection from phytopathogens. To assess the role of AM fungi on growth enhancement a pot experiment was performed. In which AM consortium was added and increase in plant biomass was recorded in all the treatments. After 90d of growth the numbers of leaves were 9 as compared to 8 in control plants of local var. The leaves were 14 in other two var. after 90 d, five percent wilting was recorded in control plants of local var., in other plants no such symptoms were recorded.