SUMMARY AND CONCLUSIONS

CHAPTER X

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The present thesis incorporates studies on the phytoalexins and other post infectional compounds of eight trees of Gujarat, India, of which (1) Tectona grandis Linn. (2) Cassia fistula Linn. (3) Morinda tomentosa Heyne (4) Madhuca indica Gmel and (5) Anogeissus latifolia wall. are seen in the wild state in the forests and the remaining i.e. (6) Mangifera indica Linn. (7) Eucalyptus globulus Labill. and (8) Syzygium cumini (L.) skeels are seen wild and in cultivation.

Leaf spot disease was found to occur in all the trees studied. The pathogenic fungi from the leaves of the different trees which were isolated and identified were maintained on PDA medium. Pathogenicity tests were performed to establish the pathogenicity of the different fungi. The leaves of the plants were analysed for qualitative chemical changes, taking place after infection. Induction of phytoalexins was studied in all the trees using a pathogenic and also a non-pathogenic fungus. The pathogenic fungus varied with the plant species and the non-pathogenic fungus used was Fusarium solani (Mart.) Sacc. The antifungal activity of the phytoalexins were studied by mycelial growth, spore germination and germ tube bioassays.

The fungi isolated from the infected leaves are :
(1) Curvularia clavata Jain (Tectona grandis) (2) Colletotrichum

gleosporoides (Penzig) Penzig and Sacc. (Morinda tomentosa and Madhuca indica (3) Alternaria alternata (Fr.) keissler (Eucalyptus globulus and Anogeissus latifolia) (4) Aspergillus niger van Tieghem (Cassia fistula, Mangifera indica and Syzygium cumini).

In Tectona grandis, pre-infectional compounds such as phenol were found to be antifungal. The fungal infected leaves of this plant contained 3,4'-dimethoxyquercetin, coumarins, ferulic acid and phenol instead of syringic and synapic acids, 4'-OMe apigenin and luteolin in the healthy leaves. p-hydroxybenzoic acid was the phytoalexin produced in response to a non pathogen.

The methoxylated flavonols 3'4'-diOMe quercetin and 4'-OMe kaempferol in Morinda tomentosa and 4'-OMe quercetin, 4'-OMe kaempferol and 7,3'4'-triOMe quercetin in Cassia fistula were replaced by hydroxylated compounds such as quercetin and kaempferol in the infected leaves. In addition, o-coumaric acid was present in place of p-coumaric in diseased leaves of the latter plant.

In Mangifera indica and Eucalyptus globulus, the fungal infected leaves showed no chemical changes. But in E.globulus phytoalexin induction with a pathogen resulted in the production of a coumarin whereas in Mangifera indica, a xanthone glycoside, mangiferin, leached out in response to a non pathogen.

A glycoflavone was found to be present in the infected leaves of Anogeissus latifolia while it was absent in the healthy leaves. The infected leaves of Madhuca indica contained myricetin in place of 4'-OMe myricetin while a phenolic acid, gentisic acid was found to be present in infected leaves of Syzygium cumini. An antifungal quinone was also produced in response to the pathogenic fungus in S. cumini.

Increase in concentration of phenolics in infected leaves were noted in Tectona grandis, Cassia fistula, Morinda tomentosa, Syzygium cumini and Anogeissus latifolia.

CONCLUSIONS

1) Phytoalexins are produced by most of the plants studied. In the plants where phytoalexins were not located, their presence is strongly doubted.
2) Phenolics form the majority of phytoalexins detected. Flavonoids are the most common phenolics behaving as phytoalexins.
3) Fungal infection brings about an increase in production of phenolics and a number of qualitative chemical changes.
4) In Tectona grandis the leaves were found to be infected inspite of the presence of preformed antifungal compounds (phenol) probably due to the insufficient

concentration of this compound necessary to inhibit the pathogen.

5) Existing biosynthetic pathways are altered as in the case of Cassia fistula, Morinda tomentosa, and Madhuca indica as a result of infection.

6) Compounds that are less toxic or non-toxic such as methoxylated compounds are made more toxic hydroxylated compounds in the infected leaves.

7) New biosynthetic pathways were initiated for the production of phytoalexins in E.globulus, S.cumini and T.grandis.

8) Phytoalexins are produced in T.grandis, S.cumini E. globulus, C. fistula, Mangifera indica and Morinda tomentosa.

9) Sensitivity of the different fungi varies with a phytoalexin.

HIGHLIGHTS

1) New host records from India :

   (a) Curvularia clavata Jain on living leaves of Tectona grandis Linn.

   (b) Collectotrichum gleosporoides (Penzig) Penzig Penzig and Sacc. on living leaves of Morinda tomentosa Heyne and Madhuca indica Gmel.

   (c) Aspergillus niger van Tieghem on living leaves of Cassia fistula.

2) Phytoalexins from Tectona grandis, Cassia fistula Eucalyptus globulus, Syzygium cumini, Morinda tomentosa and Mangifera indica have been reported for the first time.

They include p-hydroxybenzoic acid from Tectona, a coumarin from Eucalyptus, a quinone from Syzygium, a xanthone from Mangifera, and quercetin and kaempferol from Cassia and Morinda.

3) A few post infectional compounds, other than the phytoalexins, produced in Tectona grandis, Anogeissus latifolia, Syzygium cumini and Madhuca indica have also been reported in this thesis. These compounds include a flavonol (3,4'-dimethoxyquercetin), a phenolic acid (Ferulic acid) in Tectona grandis, gentisic acid in Syzygium cumini, a glycoflavone in Anogeissus latifolia and myricetin in Madhuca indica.

4) The process of demethylation as one of the immediate responses of the plant to fungal infection has been identified.