

X-6. STUDIES ON SOME OXIDATIVE ENZYMES AND THEIR ISOZYMES IN *CINNAMOMUM* LEAF GALL DEVELOPMENT

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Pathological, abnormal or a typical growths result in plants that are susceptible to a variety of factors or stimuli. Insect or mite-incited abnormal growths in plants are usually called galls or cecidia. In galls, there is transformation of normal healthy cells into the ones that have revolted against the discipline of the system and thus grow in an uncontrolled and irregular manner at the site of the gall.

The plant galls aroused the curiosity of man from the early christian era since they were commonly used for medicinal and tanning purposes. Recently, the problem of insect galls in plants has been reviewed by Rohfritsch and Shorthouse (1982). Many workers have reported the role of growth regulators, phenolic compounds and oxidative enzymes in plant galls (Purohit et al., 1980; Weiler and Spanier, 1981; Tandon and Arya, 1982). The present investigation was undertaken to study the effect of mite attack on activities of peroxidase, polyphenol oxidase and IAA-oxidase, their isozymes, and phenolic contents in various stages of gall development on leaves of *Cinnamomum tamala*. The galls were coterogized into young, green mature, and brown galls, and completely transformed leaf.

The phenolic compounds abundantly present in *Cinnamomum* plant probably

inactivated the enzymes selected for the present study. Therefore, a number of antioxidants like cysteine, β -mercaptoethanol, ascorbic acid, glutathione, and polyvinyl-pyrrolidone were added in the various buffers used. Optimum enzyme activities were obtained in extracts prepared in phosphate buffer (0.2M, pH 6.0) having 5% polyvinyl pyrrolidone.

The polyphenol oxidase activity and O-dihydroxy and total phenols increased during gall development in contrast to the normal leaf tissue. However, a reverse picture was obtained for activities of peroxidase and IAA-oxidase. The enzyme polyphenol oxidase regulates the level of different phenolics by converting monophenols (electron acceptors) to O-diphenols (electron donors) to quinones (strong electron acceptors). Many natural phenols are known to influence the synthesis and oxidation of IAA. Probably there also exists a relationship between the structure of phenols and their effects on IAA oxidation (Lee et al., 1982).

During the present investigation, isozyme bands of peroxidase, polyphenol oxidase and IAA-oxidase showed a relationship with gall development. A correlation between the qualitative and quantitative assays of enzymes was also observed. The normal leaf tissue showed 5 specific peroxidase isozyme bands

which were not at all found in other cases. These bands might be responsible for higher activity. On the other hand, gall tissues had less isozyme bands, a feature which is consistent with their low peroxidase activities. There was a difference in the pattern of peroxidase bands amongst the various categories of galls. A few bands in gall tissues were shown to have identical Rf values for peroxidase and polyphenol oxidase, probably representing a case of dual activity of isozymes. The number of polyphenol oxidase isozyme bands in case of the gall tissues was high as compared to the normal, which is in line with higher activity in the former. The normal tissue had one band characteristic of it, whereas two new bands appeared following mite attack. These new bands were probably responsible for gall development. The brown gall and completely transformed tissues showed

one band specific to these stages of development. In the case of IAA-oxidase two bands were observed in both normal and gall tissues except for brown gall and completely transformed tissue in both of which a different pattern was noted. Of the two IAA-oxidase bands, common to both normal and gall tissues, the intensity of one was quite less in the gall tissues. This observation is in conformity with low IAA-oxidase activities. The green mature gall and completely transformed tissues exhibited a new band characterizing these stages of gall development.

A conclusion can be drawn from the present study that increased polyphenol oxidase activity and its isozyme bands in gall tissues probably resulted in higher amounts of phenolic compounds, latter in turn altered the activities of peroxidase and IAA-oxidase, resulting in abnormal proliferation of gall tissues.

References

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