



Quantitative Estimation of Phenolics and Related Enzymes in Entomogenous Galls of *Salvadora persica* L.

Swati Joshi* and Suman L Sharma

Plant Pathology, Tissue Culture and Biotechnology Lab., Department of Botany,
University of Rajasthan, Jaipur – 302004, India

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Abstract: Quantitative estimation of phenolics and related enzymes in insect induced galls (leaf, stem and flower) of *Salvadora persica* were studied. The contents of total phenols, o- dihydroxy phenol, peroxidase and polyphenol oxidase activities in galls and normal counter parts of *Salvadora persica* were measured. Total phenols, o-dihydroxy phenol and peroxidase were recorded higher in gall tissues while poly phenol oxidase activities were recorded higher in normal counter parts as compared to gall tissues.

Keyword: *Salvadora persica*, Total phenols, o-dihydroxy phenol, peroxidase polyphenol oxidase.

Introduction

Galls are pathologically developed cells, tissues and organs of plants, which have mainly arisen due to hypertrophy and hyperplasy, usually under the influence of gall inducing agent. Entomogenous galls (Zoocecidia) are pathologically developed abnormal growths, which originate as a result of chemical or mechanical insect stimuli. The Entomogenous galls are the oldest known toxic effects on the plant body. They were recognized in ancient times and used for medicinal purposes and in dyeing industry. Insect induced galls vary in size from about few mm to several cm in diameter. *Salvadora persica* is an evergreen drought tolerant tree that grows very well on coastal sand dunes, marginal to high saline waste lands with or without water logging, ravines and saline / alkaline dry zones. The plant has a life upto 100 years. Three types of insect induced galls on *Salvadora persica* L. have been reported. They are the leaf and flower galls induced by *Eriophyes* sp. belonging to order Acarina, while stem galls induced by *Thomasiniana salvadorae* Rao that belongs to order Diptera.

Present study was thus, undertaken on physiological changes in disease plant parts. Due to insect attack the metabolism of total phenols and o-dihydroxy phenol changes considerably. Enzyme activities of peroxidase and polyphenol were also estimated.

Materials and Methods

Samples of *Salvadora persica* L. (Leaf, stem and flower galls with their normal counterparts) were collected from Ramnivas garden, Maharaja's college and adjoining areas of Jaipur and Bhartpur. Material was fixed in F.A.A. and 70% alcohol. Fresh, fixed and dried material of normal and gall counterparts were used for various experimental studies.

Total phenolic contents were estimated by Bray and Thorpe (1954) method. Ortho-dihydroxy phenolic contents were determined following the method of Johnson and Schall (1952). Blank comprised of 80% ethanol. Total phenol and ortho-dihydroxy phenolic contents were calculated from a standard curve prepared from different concentrations of catechol. The results were expressed as mg/g fresh weight of tissue.

Peroxidase activity was determined by the method given in Worthington Enzyme Manual (1972) using 0.2 M phosphate buffer (pH = 6.1), 1.0 mM of H₂O₂ and 2.0 mM o-dianisidine (dissolved in 30% methanol). Polyphenol oxidase activity was assayed by Palmer (1963) method using DL-DOPA in 0.033M Phosphate buffer at pH 7. Activity of PO and PPO was expressed as change in absorbance/min/g fresh weight of tissue.

*Corresponding Author:

Dr. Swathi Joshi,

Plant Pathology, Tissue Culture and Biotechnology Lab.,
Department of Botany, University of Rajasthan,
Jaipur – 302004, India

Results and Discussion

The results are presented in Fig.1 and Fig. 2. The phenolic contents were more in gall tissues as compared to normal counterparts. Different classes of phenolic substances act as plant defenses against microorganisms and herbivores (Harbone, 1993, 1999). Accumulation of phenols in diseased plants is a known phenomenon in several host-pathogen interactions (Pridham, 1965; Arya and Shekhawat, 1981). These are defensive chemicals involved in protecting the invading organism (Shankara *et al.*, 2007). Increased level of phenols in diseased tissues suggests that there was acceleration of phenol synthesizing pathway with the invasion of pathogen. Similar results have been reported by several workers (Bansal *et al.*, 2006; Meena *et al.*, 2008).

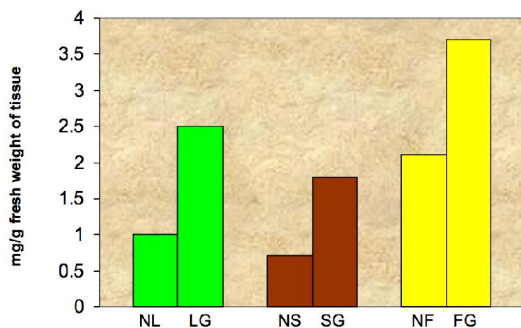


Fig.1: Estimation of total phenol contents in normal and gall tissues.

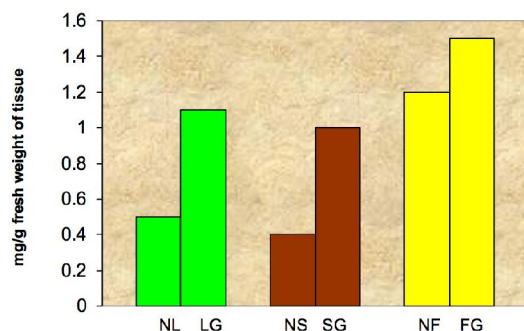


Fig.2: Estimation of o-dihydroxy phenol contents in normal and gall tissues.

High peroxidase activity was observed in gall tissues as compared to normal tissues (Fig.3). Increased peroxidase activity was associated with resistance reaction, which could be due to increased phenol concentration, where phenols were cofactor of peroxidase and hence influenced resistance in the host. Increased peroxidase in *Sesamum indicum* infected with *Curvularia phaseoli* have been reported by Purohit *et al.*, (1980).

Joshi *et al.*, (2009) reported high peroxidase activity in leaf gall of *Salvadora persica*.

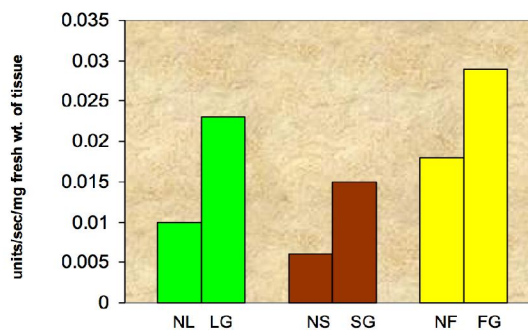


Fig.3: Estimation of peroxidase activity in normal and gall tissues.

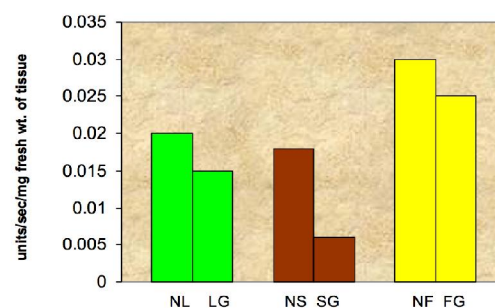


Fig.4: Estimation of polyphenol oxidase activity in normal and gall tissues.

Polyphenol oxidase activity was higher in normal tissues as compared to gall tissues (Fig. 4). Polyphenol oxidase is also known as DOPA (1,3,4-dihydroxy-phenyl alanine) oxidase, tyrosinase, catecholoxidase and potato oxidase. This enzyme catalyses the oxidation of monophenols and ortho dihydroxy phenols. The enhanced polyphenol oxidase activity might result in the augmented rate of oxidation of phenolics that participate in the defense reaction of host. Arora and Patni (2001) and Singh *et al* (2005) also reported increased activity of polyphenol oxidase in gall tissues.

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