

HISTOCHEMICAL STUDY OF LIPIDS IN FLOWER GALLS OF *CALLIGONUM POLYGONOIDES L.*

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ABSTRACT

Galls are plant tumors they have been known since mythical and biblical times. Galls are neoplastic growths resulting from the reactions of plant species to various kinds of stimuli. Diverse species of insects which infect plant tissues to spend a part of their life cycle cause gall formation. Gall morphogenesis is the result of interaction between morphogenetic control of the plant body and the insect factor (Miles ,1968). Thus, the galls are unique examples of complex interactions and mutual adaptation between the host and pathogen caused by cellular hypertrophy and hyperplasy. Galls are pathologically developed cells, tissues or organs of plants that have risen mostly by hypertrophy and hyperplasy under the influence of parasitic organisms like bacteria, viruses, fungi,nematodes,mites or insects.

Keywords: *Galls, Neoplastic, Hypertrophy, Hyperplasy.*

Introduction

Galls are neoplastic growth resulting from the reactions of plant species to various kinds of stimuli. Diverse species of insects which infect plant tissues to spend a part of their life cycle cause gall formation. Galls are unique examples of complex interactions and mutual adaptation between the host and pathogen caused by cellular hypertrophy and hyperplasy.

Parasitic organisms like bacteria, virus, fungi, nematode, mites, insects and mechanical irritation, wounds, genetic constitution chemicals also induce gall formation. Insects, by far are the largest known group of gall inducers. Gall formation by insects, requires a tissue stimulating action, supplied by the cecidozoa, at the site of feeding or oviposition. The abnormal uncontrolled growth of gall is essentially a host reaction to parasite. This host parasite interaction is closely associated with the reproduction of parasite and is based on the nutritional dependence of the pest on the host as well as the localization of the cecidozoa by the host. For successful survival, the cecidozoa utilises two basic adaptive strategies (1) hypertrophy and hyperplasia (2) transformation of differentiated tissues into meristematic tissues. The cellular realignment due to hypertrophy in early stages of feeding often results in the establishment of gall form.

Insect and might induced galls (zooecidia) are very wide spread and most interesting types of growth abnormalities found in plants. Main gall insects belong to the orders Hymenoptera, Diptera and Homoptera. Large number of galls are also formed by mites (Acarina) and a few species of Coleoptera and Lapidoptera.

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Initiation and exploitation of plant tissues leading to the formation of plant galls by insects is considered as a highly developed form of phytophagy. The feeding process of these insects are important in influencing the type of phytohemata produced. The contents of watery saliva vary among insects and the components that cause phytohemata also probably differ. It has been reported that some cecidogenic insects contain the natural phytohormone IAA in pertinent tissues. Actual biosynthesis of IAA from tryptophan has also been demonstrated in the salivary gland of cecidogenic insects. Thus, current information strongly suggests that IAA is the principal chemical inducer of cecidogenesis. Specific mixture of amino acids, peptides and proteins also occurs in the pertinent tissues of gall forming insects, specific characteristics enzyme mixtures also involves.

Calligonum polygonoides L. is an important plant of arid and semi arid regions. In western Rajasthan "Phog" is the common name for *Calligonum polygonoides* L., which belongs to family polygonaceae. It is a rigid almost leafless shrub. Its wood is used in building huts, wells etc. The branches are eaten by camels. The buds called 'lasson' are used by the villagers as food. The decoction of the plant after boiling is used as a gargle for the sour gums. The coal prepared from this plant is used by iron-smith etc. Gautam and Bishnoi (1991) have studied the influence of root and shoot extracts of some desert plants on seed germination of *Calligonum polygonoides* L.

The flowers are pinkish, fasciculate in the axils of ocreae. This plant of great economic importance suffers from flower galls induced by an unknown mite. In severe infection complete inflorescence converts into gall. The flower galls of this plant are induced by an unknown mite (*Eriophyes* spp.) of the order Acarina. The galls are prevalent in Jaipur, Jodhpur and Sikar districts of Rajasthan. The galls generally develop from January to March. Galls are globose, irregular and smooth. They are pinkish, 5 to 20 mm in diameter. Generally all the flowers in an inflorescence are galled and it becomes difficult to make out individual flower galls, since the flower galls almost merge into each other. These flower galls have been chosen for the present study. The plant is propagated by seeds. Many biochemical changes take place at the infection site in plants during establishment of host parasite relationships. Some of the biochemical changes tend to disturb the equilibrium favouring the abnormal growth. It is there for necessary to understand these biochemical changes in situ. Qualitative histochemical studies on localization of various chemicals provide an insight into the biochemical phenomenon at the cellular level and is of immense value in studies involving physiology of parasitism and also in evaluating the histopathological aspects of host parasite relationship.

Materials and Methods

The histochemical studies of the insect and mite induced galls has been studied by many workers (Raman and Anantha krishnan ,1983; Gopinathan, 1987; Anil Kumar, 1996; Kant 2000). Rey et al., (1980), Raman and Gopinathan (1986) have reported accumulation of lipids in nutritive tissues of midge galls of *Ficus* spp.

The present study was undertaken to compare in situ localisation of various metabolites in flower galls of *Calligonum polygonoides* L. Total lipids were localized by the method given by Chiffale and Putt (1951). Firstly Sudan III dye was prepared by dissolving 0.7 g of Sudan III dye in 100ml of ethylene glycol. The solution was heated to 100-110°C and stirred thoroughly. The dye was filtered through whatman No. 42 filter paper and stored in a brown bottle. Fresh hand cut sections were placed in ethylene glycol for 3- 5 minutes and subjected to occasional shaking. The sections were then transferred to the Sudan III dye and stained for 5 to 7 minutes. These sections were once again transferred to ethylene glycol and distilled water and shaken for 2 - 3 minutes. After a thorough washing for 3 - 5 minutes and distilled water, the sections were mounted in glycerine and photo micrograph.

Results and Discussion

Fats, oils and waxes stand Orange in colour. In normal flower tissue of *Calligonum*, lipids were mostly localized in mesophyll of tepals. Gall tissue showed presence of lipids in the cells around gall chamber and inner layers of mesophyll of tepals.

Lipids are heterogeneous group of compounds that are insoluble in water but soluble in non-polar organic solvents. Fats oils and waxes are stained orange with Sudan III dyes.

The abundance of lipids in nutritive tissue could be related to continuous wounding as a result of feeding activity of the cecidozoa which alters the metabolic pathway to synthesize more lipids near the feeding area. These lipids are in turn utilised by the cecidozoa to maintain their life activities for a considerable period.

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