

Histochemical Study of Starch in Flower Galls of *Calligonum polygonoides* L.

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ABSTRACT

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. Not only foreign organism, but also mechanical irritation, wounds, genetic constitution, certain chemicals, various amino acids, excessive indole acetic acid and other plant growth hormones commonly induce the formation of galls.

Keywords : *Galls, parasite, cecidozoa, hypertrophy, hyperplasia.*

Introduction

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. host.

For successful survival, the cecidozoa utilizes two basic adaptive strategies (i) Hypertrophy and Hyperplasia, (ii) 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 (Ananthakrishnan, 1984). Zweigelt (1931) purports the theory that the object of gall formation is to neutralize the toxins produced by the insect, thus favouring the survival of the host. According to Cook (1923) by forming a gall, the plant protects itself from an injury which is not sufficient enough to cause death. Mani (1964) believed that the host plant nullifies the pathogenic effect of the cecidozoa with the help of the adaptations brought about by the pathogen, and compels it to become an extremely specialized feeder.

Although the precise mechanism of cecidogenesis with a profound level of host specificity by the insect and a characteristic insect specific response by the plant is not yet clearly understood (Southwood, 1973), it is somewhat apparent that the cecidogenic interaction normally involves plant growth hormones or similar substances (Osborne, 1973). In saw-fly induced galls on willow (Mc Calla et al., 1962), a fluid secreted along with the ovipositor during the egg laying process is presumed to be responsible for gall induction. The growth of the gall stopped if the larva was removed. Experiments using radioactive tracers have shown that cecidogenic Homoptera inject the saliva into the plant while feeding (William and Benson, 1966; Markkula and Laurema, 1971). Reviewed growth occurs when extracts of the accessory glands were provided artificially. The factors involved in the gall development need satisfactory answers.

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Plant galls or tumour diseases of economically important plants are very harmful and cause tremendous loss of revenue.

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, much branched 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 sore-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. These flower galls have been chosen for the present investigation. This plant is propagated by seeds.

Material & Methods

To understand the physiological changes in terms of morphology, histochemical studies were carried out. These studies are useful in providing information regarding the distribution and accumulation of various metabolites and enzymes in the tissue organ.

Starch was localized by Iodine-potassium iodide (IKI) reaction method of Johansen (1940).

Preparation of IKI Solution

2.0 g of potassium iodide was dissolved in 100.0 ml distilled water and then 0.2 g of iodine was dissolved in it.

Procedure

Fresh hand cut sections were placed in IKI solution for a few minutes and then mounted in the same solution and observed.

Observations and Results

In *Calligonum polygonoides* L. normal flower starch grains (black deposits) were present in outer mesophyll of tepals and vascular region. Whereas in flower gall tissues higher concentration of starch was present in vascular region and around the gall cavity.

Starch is the most important carbohydrate reserve in the plant. It is intracellular and occurs as granules in membrane bound cytoplasmic organelles (chloroplasts and amyloplasts). Due to staining with KI starch appears as blue to black granules.

In normal flower of *Calligonum polygonoides* starch was present in outer mesophyll and vascular region, whereas in flower galls higher concentration of starch was found in vascular region and around gall cavity. Presence of starch near the gall cavity suggests that the mite may be utilising starch as food material.

The 'Insect' galls are unique example of complex interactions and mutual adaptation between the host and the pathogen characterized by cellular hypertrophy and hyperplasy. Plant galls are of much economic significance and several galls are used in medicines.

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In *Calligonum polygonoides* Linn. normal flower starch was found in outer mesophyll and vascular region. While in gall it was observed around gall cavity.

References:

- Gautam, D.D. and S. Bishnoi, 1991. Influence of root and shoot extracts of some desert plants on seed germination of *Calligonum polygonoides* Linn. and *Lasiurus indicus* HENR. J. Phytol Res. 4 (2) pp.177-181.
- Johansen, D.A. 1940. Plant microtechnique. McGraw Hill Book Co., Inc., New York, pp.523.
- Kuster, E. 1911. Die gallen der Pflanzen, Ein Lehrbuch für Botaniker und Entomologen. Leipzig. pp 437.
- Mani, M.S. 1948. Cecidozoa and Zooecidia from India. J. Asiatic Soc. Bengal (Sci.), 14:27-197.
- Mani, M.S. 1964. Ecology of plant galls. Dr. W. Junk. Publishers, The Hague: 434.
- Miles, P.W. 1968. Insect secretions in plants. Ann. Rev. Phytopath., 6 :137-164.
- Ramakrishna Ayyar, T.V. 1920. Psyllid galls exhibited with remarks on India psyllidae. Rep. Proc. Thrid ent. Meet. Pusa., pp. 1030-1031.
- Ramakrishna Ayyar, T.V. 1928. A contribution to our knowledge of the Thysanoptera of India. Mem. Dept. Agr. Ind. Ent., Ser., 10:215-316.
- Saxena, R.D. 1942. Anatomical studies on Indian plant galls Part I. J. Roy. Asiatic Soc. Bengal, Vol. VIII, 12-19.
- Sunder Raman, 1924. A contribution to the study of Indian Zooecidia. J. Ind. Bot. Soc., 4:1-17, 34-39.
- Whaley, W.G., Mericle L.W. and Heimsch, C. 1952. The wall of meristematic cell. Am. J. Bot. 39:20-26.

