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Study of anatomical alterations in mango leaf due to gall infestation

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ABSTRACT

Gall causing insect Procontarinia matteiana leads to the different anatomical alterations. The tissue damage includes palisade layer, xylem and phloem. Egg laying induces the gall formation. Larval development leads to the formation of larval chamber. Starch deposition occurs in the tissues nearby the chamber. Undifferntiation of conducting tissues was also observed. Hyperplasia and hypertrophy in patisade layer was observed in the tissues of the mango leaf.

Keywords: Leaf Gall , *Procontarinia matteiana*, Hyperplasia,

INTRODUCTION

A gall is a cumulative expression of a suite of adaptations achieved by the host plant for accommodating the inducing insect. In principle, a gall provides nutrition and shelter to the inducing insect and in few taxa, to its progeny as well. The insect activates a perturbation in growth mechanisms and alters the differentiation processes in the host plant, modifying the plants architecture to its advantages.

A majority of gall inducing insects stimulate the host-plant tissue to develop into galls by their action, whereas species of hymenoptera trigger gall development via oviposition even the vascular tissues can be modified by gall induction, so that they supply nutrients and water subsurving the needs of the inducing insect

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Material and Methods

Infested leaves of selected mango trees from the field were collected and washed properly with tap water for permanent preparations. Fresh leaves were selected for section cutting. Transverse sections of leaf were firstly transferred to the watch glass with distilled water. Then the sections were stained with saffranin for 3 minutes. These sections were washed with distilled water, then passed through a graded series of alcohol for dehydration i.e. from 30% alcohol to absolute alcohol. Then the sections were stained with light green for 1 min. lastly the sections were transferred to xylene for clearing & then mounted in D.P.X

Results

In present work, the mango trees were infested with midge fly *Procontarrinia matteiana*. Egg laying itself initiates altering the shape and size of the tissues of leaves.Egg hathes to a larva.The larva when starts growing in size, it needs space and also protection, which is provided by hyperplasia and hyperyrophy of different tissues of the leaf (Fig.1). In present work, the hyperplasia resulted into the destruction of the chloroplast. Cell lysis was noticed in different areas of the plant tissues (Fig.2).This damage is due to the larval activity. Lateron the larval chamber was formed (Fig.3), which increases with

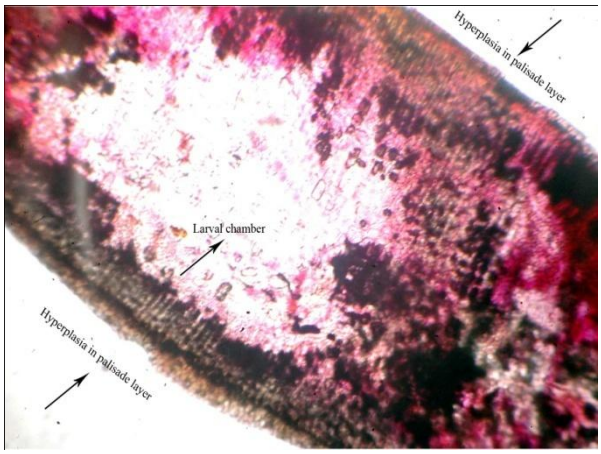

Figure-1. Hyperplasia in Palisade Layer

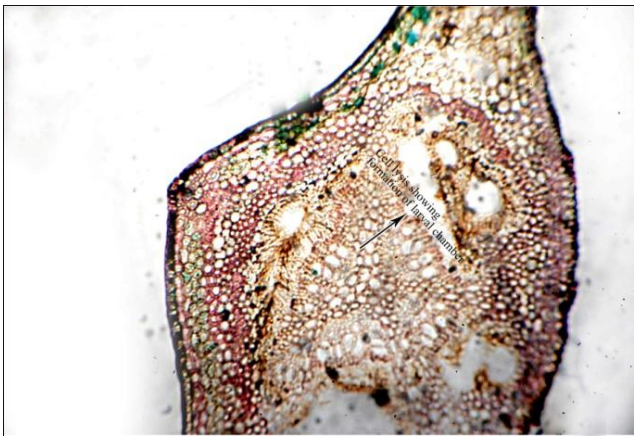

Figure-2. Cell Lysis and formation of Larval Chamber

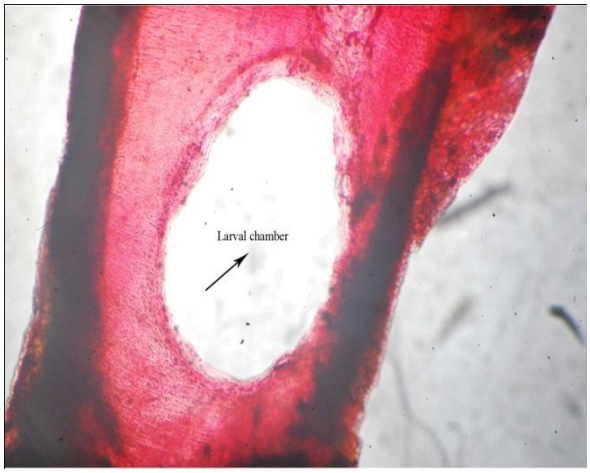

Figure-3. Larval Chamber

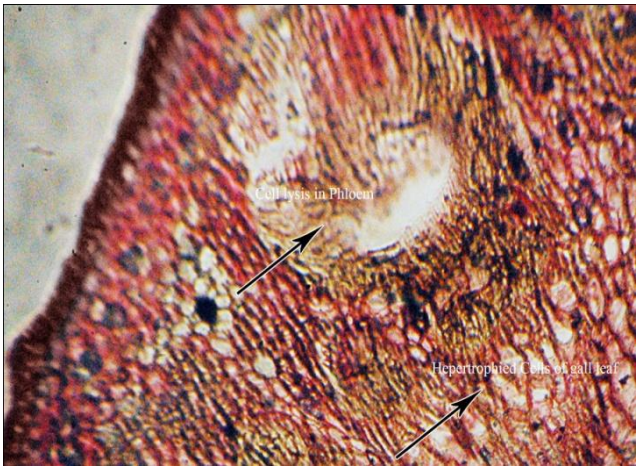

Figure-4. Undifferentiation in conducting Tissues

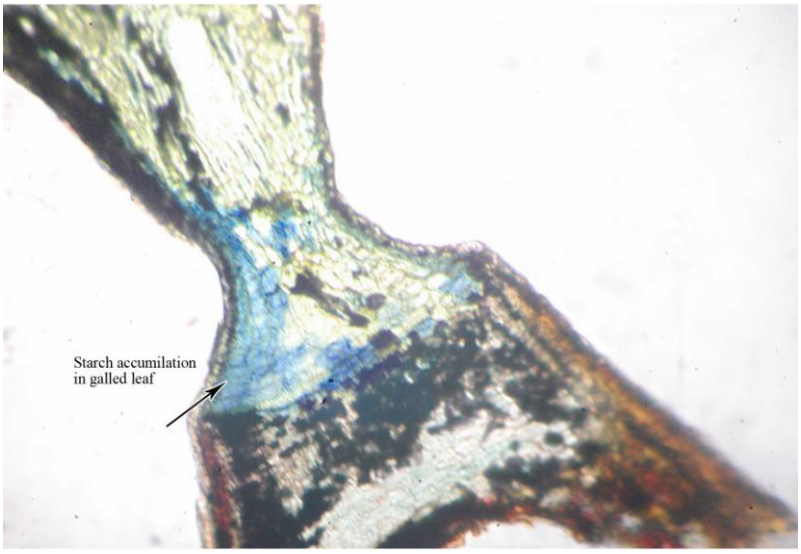

Figure-5. Starch Deposition

the size of developing larvae. Conducting tissues of the plant xylem and phloem were also observed to be damaged (Fig.4).Hypertrophy of the cells was noticed in the leaf tissues like palisade soft mesophyll tissue layer where gall formation takes place. Deposition of starch grains was observed near the larval chamber vessel elements xylem and phloem were not clearly seen (Fig.5).

DISCUSSION

Gall infestation leads to the alteration in the plant tissues. Gall forming midge, when attacks the leaves of the mango tree, initially it does not make much difference in the normal tissues, but with the tissues alter due to feeding activity.

Eggs of *Procontarinia matteiana* (midge fly)deposited on the leaves triggers the induction of gall .The larval stages feed on the leaf, where the eggs are deposited and stimulates gall development by translocating a chemical stimulus on the leaf surface. Mc. Calla *et al (*1962), while working on the leaf gall induced by sawflies, he observed that the initial stimulus for the initiation of gall formation comes from the fluid formed in accessory glands of female which is injected at the time of egg laying. The saliva causes the lysis of the upper epidermis and mesophyll. This stimulus brings about hypertrophy of the cells next to the location of the deposited eggs. In the present investigation, undifferentiation in the vascular elements xylem and phloem was observe. The non-differentiation of these lignified cells was also observer in the ambrosia galls induced by an unidentified species of cecidomyidae on leaves of *Baccharis concinna* (Arduin and Kraus, 2001) and may indicate that the energy otherwise used to differentiate lignified cells is deviated to other gall requirements. Phlomatic bundles indicate the establishment of a photosynthetase drain to the gall tissues. (Rohfritsch, 1992; Sa *et al.,* 2009)

Numerous starch grains were found throughout the mesophyll of the round gall. This starch may provide a rich source of food for the midge larvae.

Galls are considered a significance drain of leaf resources (Fay et al., 1993; Nayman and Julkunen-Tiito, 2001). Accumulation of food material such as starch was seen in cells may be functioning as the nutritive tissues. The galler have the potential advantage in insect plant relationships and morphological developmental and chemical aspects tend adequate support to the adaptive value of insects.

Conflict of Interests:

The authors declare that there is no conflict of interests regarding the publication of this paper.

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