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Innovation The Research Concept

Quantitative Estimation of Primary Metabolites in Insect induced Leaf galls of *Ficus roxburghii*

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Abstract

This Paper reports the quantitative estimation of some metabolites in insect induced leaf galls of *Ficus roxburghii.* The parameters assayed were total soluble sugar, reducing sugar and starch compared to normal tissues. Galls showed significantly higher content of total soluble sugar, reducing sugar and starch.

Keywords: Total soluble sugar, Reducing sugar, Starch, *Ficus roxburghii.*

Introduction

Ficus roxburghii is found in forests, where it propagates as an epiphyte on other trees specially widely found in uplands and plane area. The wood of fig trees is often soft and the latex precludes its use for many purposes. It was used to make mummy caskets in ancient Egypit. It is also an important host to lac insects.

Aim of the Study

The present investigation is concerned with the leaf galls of *Ficus roxburghii* induced by the Depteran, *pauropcella.* Higher concentration of carbohydrates around gall cavity has been observed by several workers in *Prosopis* rachis gall (Arora and Patni, 2001), in *Ficus* leaf gall (Singh, 2006).

Materials and Methods

Normal and heavily galled *Ficus roxburghii.* Leaf of equal size was collected from Sodala region or university campus of Rajasthan Jaipur and their biochemical study was done.

Estimation of Total Soluble Sugar

The amount of total soluble sugars was estimated by phenol sulphuric acid reagent method (Dubois et al., 1951). 500 mg each of fresh normal and galled plant material was homogenized with 10.0 ml of 80 percent ethanol. Each sample was centrifuged at 2000 rpm for 20 minutes. The supernatants were collected separately to 1.0 ml of alcoholic extract; 1.0 ml of 5% phenol was added and mixed. Then 5.0 ml of 96% sulphuric acid was added rapidly. Each tube was gently agitated during addition of sulphuric acid and then allowed to stand in water bath at 26-30^{0}C for 20 minutes. The OD of the characteristic yellow orange colour thus developed was measured at 490 nm in a spectrophotometer after setting for 100% transmission against the blank, standard curve was prepared by using known concentrations of glucose. The quantity of total sugar was expressed as mg/g fresh weight of tissue.

Estimation of starch

Estimation of starch was carried out by the method of McCready *et al.* (1950). The residual mass obtained after the extraction of total soluble sugars of normal and gall plant material was suspended in 5.0 ml of distilled water and subsequently 6.5 ml of 52% perchloric acid was added to the residue after stirring of the mixture, the contents were centrifuged for 20 minutes at 2000 rpm. The supernatant was decanted and collected and the whole procedure was repeated thrice. Supernatant of each step were then poured and the total volume was made up to 100.0 ml with distilled water. The mixture was then filtered through Whatman filter paper (No.42). 1.0 ml aliquot of this filtrate was analyzed for starch content following the same procedure as that of total soluble sugars. Quantity of starch was calculated in terms of glucose equivalent and factor 0.9 was used to convert the value of glucose to starch. Quantity of starch was expressed in terms of mg/g fresh weight of tissue.

Estimation of Reducing Sugar

Estimation of reducing sugar was done by the method of Miller (1972). 500 mg plant material was treated with 10.0 ml of 80% ethyl alcohol. Sample was centrifuged at 2000 rpm for 20 minutes. 1.0 ml of extract was collected separately in test tube. To this 1.0 ml DNSA (3-5-dinitro salicylic acid) reagent was added. The mixture was heated for 5 minutes in boiling water bath. After the colour had developed, 1.0 ml of 40% sodium-Rochelle salt was added when the contents of the tubes were still warm. The tubes were cooled under running tap water. Absorbance was measured by spectrophotometer at 515 nm against the standard prepared from glucose. The quantity of reducing sugars was expressed as mg/g fresh weight of tissue.

Results

The results are presented in Fig. A-C. Total soluble sugar contents were more in leaf gall of *Ficusroxburghii.* (young, mature and) as compared to normal counter parts. Mature gall tissues showed slightly higher amount of total soluble sugar contents than young and old galls. Reducing sugar content was more in normal plant tissue as compared to galls. In gall, maximum reducing sugar was recorded in mature leaf galls of *Ficus roxburghii.* than young and old galls. it decreased slowly as the galls old. Total starch contents were recorded more in young leaf galls as compared to their normal counter parts. It decreased in mature and old galls of *Ficus roxburghii.*

Discussion & Conclusion

The quantity of total solubal sugar was considerably high in gall tissue as compared to normal tissue. According to Mehrotra and Agrwal (2003), sugar has large numbers of stereo-isomer, because they contain several asymmetric carbon atoms (Lindhrost and Thisbe, 2003).Galls have often been described as physiological sinks. Increase in sugar contents in galls might be due to accumulation of these substances. The accumulation may involve the translocation of soluble sugars from the neighbouring healthy tissues to physiological sink. This view is supported by the findings of Shaw and Samborski (1956). High sugar contents in young and mature galls may be due to increased metabolic activity under stress which may in turn be responsible for additional synthesis of sugar.

Similarly carbohydrates may also accumulate by depletion of starch due to the activated alpha-amylase activity and other enzymes, Garg and Mandhar (1975) Shekhawat (1980) and Purohit (1980) also reported increased activity of alpha amylase along with increased sugar contents.

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