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Short communication

QUANTITATIVE ESTIMATION OF CARBOHYDRATES IN INSECT INDUCED AND FUNGAL INFECTED LEAF GALLS OF PONGAMIA PINNATA

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ABSTRACT: Galls are outgrowths on the surface of leaf caused by invasion of various organisms like Bacteria, Fungi, Insects, Parasites and Mites. Galls are plant tissue which is controlled by the insect. The amount of total soluble sugar and reducing sugar in fungal infected galls of Pongamia pinnata leaves were estimated by phenol sulphuric acid Method and Miller Method respectively. Fungal infected galls showed significantly lower contents of total soluble sugar and reducing sugar when compared to normal galls

Key words: Galls, reducing sugar, Pongamia pinnata.

INTRODUCTION

Pongamia pinnata belongs to a family known as Fabaceae common on tropical and temperate Asia like India, China, Japan, Nepal, Australia and Pacific Islands. Galls are often seen in Pongamia pinnata leaves and fruits. Pongamia pinnata has medicinal value. In traditional system of medicine leaves are used in eczema, scabies, leprosy, piles and ulcers [1]. Leaves are also used in Rheumatic pain [2]. Pongamia pinnata seeds are used in biodiesel production [3]. A gall is actually a plant tissue that has developed as the result of feeding or other activity by insects or mites [4]. Insect gall formation is uncommon and specific to only certain plants [5]. Some galls act as 'physiological sinks', concentrating resources in the gall from the surrounding plant parts [6]. Galls may also provide the insect with physical protection from predators [7][8]. Pongamia pinnata is one of such plant. There are few studies about the biochemical studies on the levels of sugars in gall tissues. However, such reports in Pongamia leaves infected with fungus have not been recorded. Hence, we have conducted biochemical studies in leaves of Pongamia infected with fungus. The results were compared.

MATERIALS AND METHODS

Fungal infected young galled leaves of equal size were collected from the local areas of Hyderabad, Andhra Pradesh, India during January 2012. Biochemical studies from gall affected leaves were conducted. These studies included estimation of total soluble sugar and reducing sugars by Phenol Sulphuric acid reagent method and by Miller method [10] respectively.

Estimation of total soluble sugar

The amount of total soluble sugars was estimated by Phenol sulphuric acid reagent method (Dubois et al., 1951).

500mg each of fresh normal and fungal infected gall was homogenized with 10ml of 80% ethanol. Then each sample was centrifuged at 2000rpm for 15-20 min. The supernatant were collected separately, to 1ml of alcoholic extract, 1ml of 5% phenol solution was added and mixed. Then 5ml of 96% sulphuric acid was added. Each tube was gently agitated during the addition of the acid and then allowed to stand in a water bath at 25-30°C for 20minutes. The OD of the characteristic yellow orange color thus developed was measured at 490nm in a spectrophotometer. Simultaneously a standard curve was prepared by using known concentration of glucose. The amount of sugar was expressed as mg/g fresh weight of tissue.

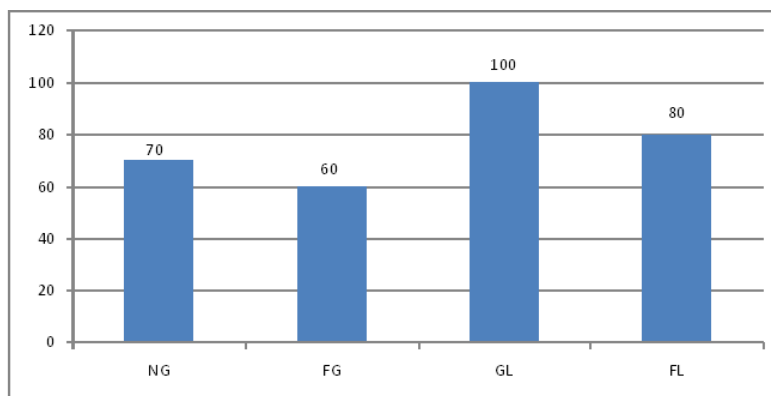
Estimation of reducing sugar

The amount of reducing sugar was done by the method of Miller (1972) [10]. 500mg of fresh normal and fungal infected gall was treated with 10ml of 80% ethanol. In 3ml of alcoholic extract, 3ml of DNSA (3, 5-Dinitro-salicylic acid) reagent was added. The mixture was heated in a boiling water bath for 5 minutes. After the color had developed 1ml of 40% Rochelle salt was added when the contents of the tubes were still warm. The tubes were cooled under running tap water. Absorbance was recorded using spectrophotometer at 515nm. The amount of reducing sugar was calculated using standard curve prepared from glucose. The amount of reducing sugar was expressed as mg/g fresh weight of tissue.

RESULTS AND DISCUSSION

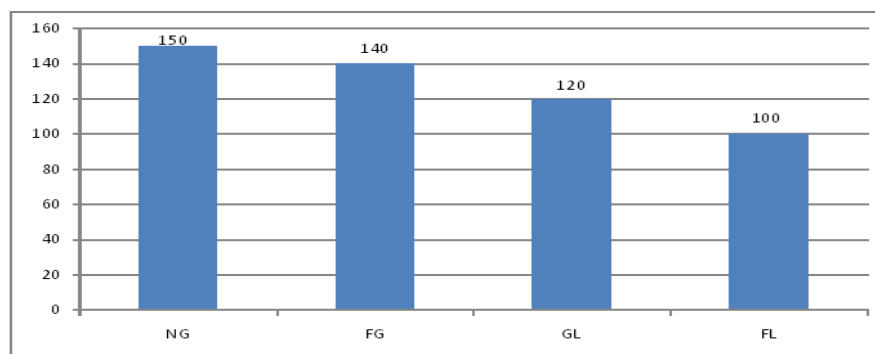
There was a slight decrease in total soluble sugars in galls infected with fungus. The levels of reducing sugar in infected gall tissue showed decrease compared to controls [11]. Further the experiments were also conducted with Pongamia leaves infected with fungus. Reducing sugar levels exhibited more substantial reduction. These results are shown in graphs

(A and B). Sugars are very important biochemical nutrients for the plants. If abundantly existing, these are detected naturally by various other micro-organisms like bacteria, fungi, insects etc. So once infected, inside the host tissue these organisms utilize the excess sugars present in the plant for their growth and sustenance [12].



* NG – Normal Gall * FG – Fungal Infected Gall * GL – Gall Removed Leaf * FL – Gall Removed Fungal Leaf

Fig – A : Estimation of Total soluble sugar



* NG – Normal Gall * FG – Fungal Infected Gall * GL – Gall Removed Leaf * FL – Gall Removed Fungal Leaf

Fig – B : Estimation of Reducing sugar in normal and Fungal infected gall

CONCLUSION

Therefore, from the present investigation we can conclude fungal infected galls cause a change in quantities of metabolites.

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