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Research article

ESTIMATION OF LEVELS OF CARBOHYDRATES IN MEALEY BUG (*Maconellicoccus hirsutus*) INFECTED STEM OF HIBISCUS ROSA SINENSIS

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ABSTRACT: Mealey bug (*Maconellicoccus hirsutus*) causes dreadful infection in *Hibiscus rosa sinensis*. Infections are highly virulent and alters biochemical components of the species. Therefore an attempt has been made to evaluate the alteration of biochemical components in Hibiscus stem at various stages of infection. The results reveal that partial infected stem had shown 14.2% increase in its total soluble sugars whereas highly infected had shown 40% decrease. The results also show that total soluble sugars had increased significantly (14%) in highly infected stem and noticeable increase (3%) in partial infected.

Key words: Mealey bug, *Hibiscus rosa sinensis*, infection, Total soluble sugars, Total reducing sugars.

INTRODUCTION

It has long been recognized that levels of carbohydrates in plants have significantly influenced by infection and carbohydrate metabolism alters accordingly by rate of infection (Hwang *et al.*, 1983 and Salt *et al.*, 1986). The pink hibiscus mealybug, *Maconellicoccus hirsutus* (Green) (Hemiptera: Sternorrhyncha: Pseudococcidae) is a serious and invasive pest of cotton and Hibiscus rosasinensis in Pakistan and India (Hodgson *et al.*, 2008 and Akintola and Ande, 2008). Shree and Umesh (1989) have noticed a significant increase in the tundra affected *M. macroura* and *M. australis*. Similar reductions were observed in the Vietnam mulberry variety infested by mealy bugs (Umesh *et al.*, 1989). Bose *et al.*, (1992) found significant reduction in the non-reducing sugars and total reducing sugars in the leaves of K2, S30, S36, S40 and S54 mulberry varieties infested by *M. hirsutus*. The total reducing sugar was reduced in mulberry varieties, infected with leaf-roller (*Diaphania pulverulentalis*) (Mahadeva and Nagaveni, 2011; Narayanaswamy, 2003). The reducing sugars were decreased in M5 and V1 but, it was increased in MR2 and S36 due to hopper burn (Mahadeva and Shree, 2003). Similar reductions of sugar contents were observed in jassids infested Mysore local and S54 mulberry varieties (Shree and Mahadeva, 2005). Latha (1999) showed a drastic increase in the total reducing sugars of thrips infested leaves in four indigenous and four exotic mulberry varieties. Sathya *et al.* (2002b) observed changes in the reducing and non-reducing sugars in the leaves of K2, S13, S34 and S36 and V1 mulberry varieties due to thrips infestation.

So, the present experiment has taken up to estimate the levels of carbohydrates in mealey bug (*Maconellicoccus hirsutus*) infected pink Hibiscus stem at various stages of infection.

MATERIALS AND METHODS

The present experiment was conducted in Department of Biotechnology, Gokaraju Rangaraju Institute of Engineering and Technology, Bachupally, Hyderabad, Andhra Pradesh by collecting Mealey bug (*Maconellicoccus hirsutus*) infected pink Hibiscus stem from the garden of Envirotec industry, IDA, Uppal, Hyderabad. Total soluble sugars were estimated according to Dubois *et al.*, (1951) and reducing sugars by Miller (1972).

Estimation of Total soluble sugars

500 mg of freshly cut healthy, partial infected and highly mealey bug infected Hibiscus stem was separately homogenized with 10 ml of 80% ethanol. After centrifugation at 2000 rpm for 15-20 min by using Remicentrifuze the supernatant was collected. To this 1ml of alcoholic extract 1ml of 5% phenol solution was added. Than 5 ml of 96% sulphuric acid was added by gentle agitation and then allowed to stand in a water bath at 25-30°C for 2min. The OD values were measured at 490nm by using Systronics spectrophotometer. A standard graph was prepared by using known concentration of glucose and the amount of sugar was expressed in mg/g.

Estimation of reducing sugars

500 mg of freshly cut healthy, partial infected and highly mealey bug infected Hibiscus stem was separately homogenized with 10 ml of 80% ethanol. After centrifugation at 2000 rpm for 15-20 min by using Remicentrifuze the supernatant was collected. To this 3ml of alcoholic extract 3ml of DNSA (3,5-Di nitro salicylic acid) was added. The mixture was heated for 5 min in a water bath kept at 25-30 °C. After the color was developed 1 ml of 40% Rochelle salt was added. The tubes were cooled in running tap water and the absorbance was recorded by using Systronics spectrophotometer at 515 nm. The amount of reducing sugar was calluclated by using standard graph prepared from glucose and expressed as mg/g.

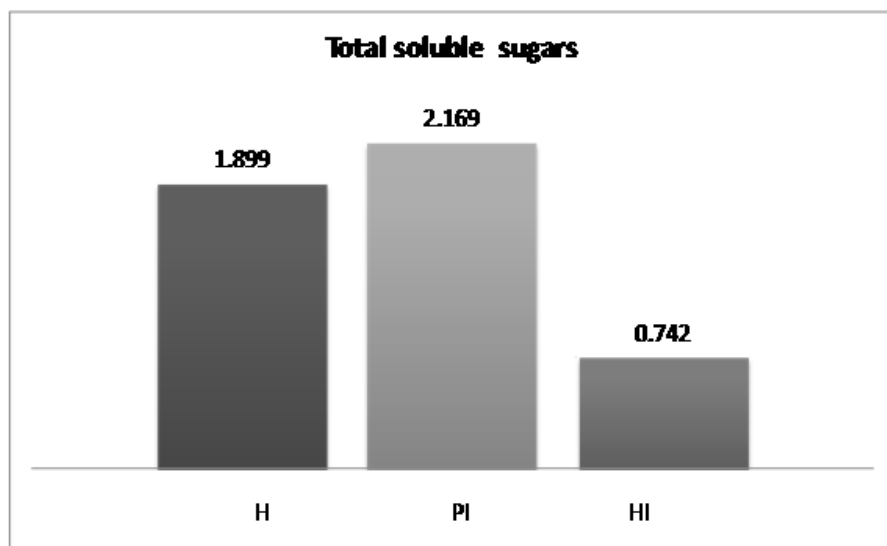
RESULTS AND DISCUSSION

Table 1 explains the impact of mealy bug infection on biochemical components like total soluble sugars and reducing sugars in pink hibiscus. In comparison with the healthy control the partially infected Hibiscus stem have shown 14.21% increase in its total soluble sugars whereas the highly infected had shown 40% decrease (fig:1). Narayanaswamy (2003) observed 31.34% increase in the sugar contents of M5 mulberry leaves due to leaf roller infestation. The total soluble sugars were increased by 35% and 36% in the Kajali and Kanva-2 mulberry varieties respectively (Mahadeva and Nagaveni 2011). Carbohydrates got increased in tobacco stem infected with blue mold (Charitha Devi and Radha, 2012). The results also show that the highly infected Hibiscus stem had shown 66% low value of total soluble sugars in comparison with partially infected stem. Decrease of total sugars in a highly infected host tissue is due to the excess utilization of sugars by the organisms for their growth and sustainability (Sheen and Anderson, 1974). Decrease in carbohydrate content in the highly infected plant can be correlated with the increase in glucose 6 phosphate de hydrogenase activity and 6 phosphogluconate dehydrogenase in nematode infected soyabean (Salt et al., 1988; Gupta et al 2010).

Table 1: Impact of Mealey bug infection on biochemical components in Pink Hibiscus.

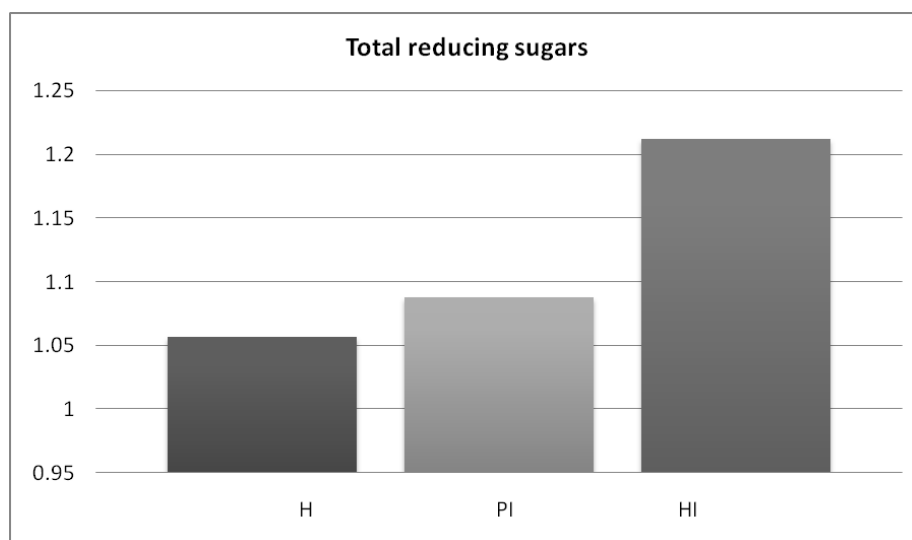
Source	Healthy (control)	Partially infected	Highly infected
Total soluble sugars (mg/g)	1.899	2.169	0.742
Reducing sugars (mg/g)	1.057	1.088	1.212

When compared with healthy control the partial infected Hibiscus had shown least increase (3%) in reducing sugar content whereas the highly infected had shown significant increase (14%) (fig:2). A significant increase of reducing sugars were recorded in mulberry leaves of MR2 variety infected with leaf-roller (*Diaphania pulverulentalis*) (Mahadeva and Nagaveni, 2011). High carbohydrate content correlates with high infections in plants (Horsfall and Dimond, 1957). The results show that highly infected had shown 11.4% increase in reducing sugar content over the partial infected. Alteration in the reducing sugars may be due to reduction in leaf lamina and malformation of leaves in pest affected plants resulting in less productivity (Shree and Umesh, 1989).



H → Healthy, PI → Partially infected, HI → Highly infected

Fig 1: Impact of Mealey Bug Infection On total soluble sugars In Pink Hibiscus.



H → Healthy, PI → Partially infected, HI → Highly infected

Fig 2: Impact of Mealey Bug Infection on Total reducing sugars In Pink Hibiscus.

CONCLUSION

Thus in conclusion, mealey bug infection on pink Hibiscus increases total sugars in partially infected and decreases in highly infected whereas the reducing sugars were increased profoundly in highly infected with a least increase in partial.

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