Estimation ofReducing and Non-reducing Sugar in healthy and PokkahBoeng Infected Cane Varieties

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Abstract

In sugarcane the most abundant sugar present in the form of sucrose. Sucrose is a disaccharide which is made by the condensation of glucose and fructose. So, the present study was designed to analyze the consequences of pokkah boeng disease on the level of reducing and non-reducing sugars present in healthy as well as in infected canes. Reducing and non-reducing sugar were found better in healthy sugarcane in comparison to infected sugarcane. The data presented having an useful information on impurity removal strategies by which resistant capacity was develop with the increased metabolic activity in the healthy sugarcane, while it may lead to susceptibility due to decreased level of reducing sugar in diseased sugarcane.

Key words: *Sugarcane, disease, Fusarium moniliforme, reducing sugar, non-reducing sugar*

Introduction

The five industrially important species of genus *Saccharumviz., Saccharum officinarum, S. sinense, S. barberi, S. robustum, S. spontanuem. Saccharumofficinarum* is widely and preferably cultivated in India because of its high sucrose content. Amongst more than 120 sugarcane growing countries, India is second highest producer next to Brazil (Babu, 2010).

Sugarcane contribute in the economy being a most valuable cash crop of the world also having some industrial value (Kumar *et al.* 2018). Out of the total white crystal sugar production, approximately 70% comes from sugarcane. It provides useful raw material to industries which utilize its different parts to produce sugar, jaggery, Khandsari and some agro-byproducts *viz*., ethanol,chemical, ethanol, cattle feed, etc. for socio-economic development of the rural and urban population.

Pokkah boeng and stem rot disease of sugarcane is majorly caused by an important soil-borne pathogenic fungi*i.e.,Fusarium moniliforme*(Keeping, 2006;

Govender *et al*., 2010). Following resistant cultivars of sugarcane have been recommended by the scientists, these are Co 0238, Co 0118, CoS 08279, CoS 8436, CoS 08272, CoS 96268, CoSe 03234, CoSe 98231, CoSe 01235 and CoSe 92423. In addition, mid-late cultivars namely CoS 96275, CoS 97261, CoSe 95422, UP 05125, CoS 98259, CoSe 01424, CoS 91230, CoS 92263, CoS 94257, and two varieties *viz*., UP 9530, CoSe 96436 have also been recommended for waterlogged areas.

Reducing sugar plays an efficientpart in all the growth phases of sugarcane especially during germination, tillering and ripening stages Zhang *et al.* (2001a, b). Their level is critical at the time of maturity which is determined by a significant drop in the level of reducing sugar in storage tissue and also enhanced photorespiration due to any abiotic and biotic factors may reduce accretion of sugar in the canes (Binbol *et al*. 2006; Gawander 2007). It is therefore important status of reducing sugar which is the governing factor in sugarcane growth processes and quality maintenance. Reducing sugar namely glucose, fructose and other in alkaline solution have the ability to reduce cupric oxide to cuprous oxide. The amount of Copper reduced is proportional to the quantity of sugar present. Given the above, the present study is designed to analyze the consequences of this disease on the quantity and quality of reducing as well as non-reducing sugars present in healthy as well as in infected canes.

Material and Methods

Five varieties of sugarcane including standards *viz*. CoS8432,CoS8436, CoS98259, CoLk8102, CoSe01434were apparently selected for the present study. Experimental studies were done by inoculating the selected sugarcane varieties with the test pathogen *i.e.,Fusarium moniliforme* under natural environmental conditions having favourable temperatureand relative humidity.

Alkaline potassium ferricyanide method was used to determine the quantity of reducing sugar present in healthy as well as infected canes of the selected varieties (Chiranjivirao and Asokan, 1974)and thenpreceded by the modified process of Das *et al*. (2010) to determine the reducing sugar content. Data presented in Table-1 revealed that reducing sugar in all the test varieties of sugarcane was high in healthy canes in comparison to that of diseased canes.

Table-1: Estimation of Reducing Sugar between healthy and infected cane

S. No.	Varieties	RS%

		Healthy	Disease
1.	CoS 8436	0.939	0.731
2.	CoS 8432	0.881	0.871
3.	CoS 98259	0.896	0.831
4.	CoLk 8102	0.912	0.844
5.	CoSe 01434	0.791	0.728

Reducing sugar is a valuable facet that pertain to the soluble inorganic content in the sugarcane. Jackson *et al.* (2008) observed during their experim that reducing sugars ratio would enhance the probability of sucrose losses effectively, thereby removal strategies of resistant capacity are developed to metabolic contact of the healthy sugarcane. However, pokkah boeng infection changes the metabolic activity in sugarcane.

Non-reducing sugar in healthy and infected cane varieties

Both healthy and infected samples were completely crushed in 80% alcohol by using mortar and pestle. The crushed samples wereseparately transferred in to the test tubes and incubated at 60^0C in a water bath for 15 minutes followed by cooling and centrifugation for 10 minutes at 5000 rpm. Take two test tubes in which supernatants were decanted. Again few ml of 80% alcohol was added after centrifugation into the residue left and mixed thoroughly using a glass rod and to be incubated at 60^0C in water bath for 15 minutes then cooled and was centrifuged for 10 minutes at 5000 rpm. The supernatant, thus, obtained was added to the previously kept tubes for the purpose. The whole procedure will be carried out 2 to 3 times againjust to take out the soluble sugar completely. The total volumes of the supernatants were made up to 10ml for each sample by adding distilled water. Here, the supernatants were discarded and in the residue part, 2 ml of sterilized distilled water was poured in to each one. It was stirred well with a glass rod and then boiled in the water bath for 15 minutes. The test tubes were cooled and 2 ml of perchloric acid (9.2N) was added to the mixture in each test tube and was shaken for 15 minutes. The mixture was then centrifuged at 5000 rpm for 15 minutes. The supernatant was kept in test tubes separately and process was repeated for 2 to 3 times as well as collect the supernatants after each treatment. The total supernatant volume was made to 10 ml. The result data on non-reducing sugar as

determined in healthy and diseased samples of test sugarcane varieties is given in Table-2.

Table- 2: Estimation of Non-Reducing Sugar between healthy and infected cane

S. No.	Varieties	NRS %	
		Healthy	Disease
1.	CoS 8436	1.121	0.974
2.	CoS 8432	1.058	0.964
3.	CoS 98259	1.329	0.819
4.	CoLk 8102	1.119	0.874
5.	CoSe 01434	1.564	0.818

Both reducing and non-reducing sugar were found better in healthy sugarcane in comparison to infected sugarcane.

Conclusion

Reducing and non-reducing sugar are indicative of the quality and is important in determining the flavor of sugarcane juice and their by-products. The above data having an useful information on impurity removal strategies by which resistant capacity was develop with the increased metabolic activity in the healthy sugarcane, while it may lead to susceptibility due to decreased level of reducing sugar in diseased sugarcane.

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