EFFECT OF DISTILLERY SPENT WASH ON SUGAR CONTENT OF *STEVIA REBAUDIANA* BERTONI

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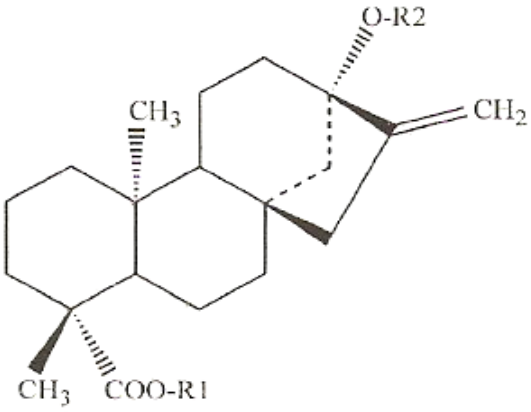
Abstract: *Stevia*, a plant of Paraguay, belongs to family Asteraceae. *Stevia rebaudiana* is a non- caloric, sweetener economically important medicinal plant used for a number of medical treatments. The plant consists of steviosides which are 250-300 times sweeter than ordinary table sugar. The steviosides are non-caloric and hypoglycemic. In India, distilleries are important part of industry, produce wastewater called spent wash. The distillery spent wash is rich in organic and inorganic salts that could be used as irrigation water. The present investigation has been conducted to demonstrate effect of distillery spent wash on sugar content of plant.

Keywords: *Stevia*, Sugar content, Distillery spent wash, Steviosides

INTRODUCTION

Stevia rebaudiana Bertoni, a native plant of Paraguay, is a member of family Asteraceae. It is a herbaceous, perennial herb growing in semi humid and sub tropical (Brandle and Starratt, 1998). *Stevia* is used for a number of medical treatments such as hypoglycemic, hypotensive, antiviral, antifungal, antibacterial, digestive tonic, weight loss programs, fatigue, depression, wound healer, tooth decay etc. (Sarika and Arora, 2009).
(steviosides and rebaudiosides) which are 250-300 times more sweet than ordinary table sugar (Lester, 1999).A number of plant chemicals have been investigated from *Stevia. Stevia* come in attention due to its natural, non-caloric sweetener commonly called as glycosides (steviosides and rebaudiosides) which are 250-300 times more sweet than ordinary table sugar (Lester, 1999).. The two main glycosides are stevioside, 5-10% of the dry weight of the leaves and rebaudioside A (R-A), 2-4 % of the dry weight of the leaves. Yield of sweetening compound in leaf tissue can vary according to method of propagation, day length (Metivier and Viana, 1979) and agronomic practice (Shock, 1982).



Central structure of steviosides and related compounds

There are about 579 sugar mills and 285 distilleries in India. Apart from sugar and alcohol, these factories generate many by-product and waste material (Sindhu *et al*., 2007). Molasses a by-product of sugar industry is being used as a raw material in distilleries for the production of alcohol, which gives considerable income to these industries. However, for every liter of alcohol production about 10-15 liters of wastewater known as spent wash is produced. About 40 billion liters of spent wash is generated from distilleries in India (Chidankumar *et al*., 2009). Spent wash is acidic and loaded with organic and inorganic salts. Being plant origin, the spent wash contains considerable amounts of plant nutrient and organic matter (Sindhu *et al*., 2007). Spent wash in acidic effluent rich in organic carbon , K , Ca, Mg and S, considerable amount of N, P, traces of micronutrient *viz* Fe, Mn, Zn and Cu and traces of sugar are also observed (Saliha *et al*.,). The distillery industrial spent wash is non-toxic, biodegradable, purely of plant origin and nutrients (Alam *et al*., 2008).

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Distillery spent wash is used for irrigation purpose in many countries including India. Irrigation with distillery wastewater seems to be an attractive agricultural practice, which not only augment crop yield but also provides a plausible solution for the land disposable of the effluent (Samuel, 1986). The present investigation had been done to analyzed effect of distillery spent wash on sugar content of *Stevia rebaudiana.*

MATERIAL AND METHOD

For raising the crop, vegetative method was used. Propagules that are stem cuttings were propagated and sampling was done fortnightly from 60 to 135 days of growth. Plants were treated with different concentration of spent wash collected from M/S Sir Shadilal Distillery and Chemical Works, Mansoorpur, Muzaffarnagar (5.0, 10.0, 15.8, 25.1, 36.6 and 39.8%). Plants treated with ordinary water treated as control.

Dried leaves were extracted with 100 ml of hot water for 2 hours at 70^0C. The extract was filtered with Whatman No. # 1 filter paper and the clear solution were concentrated to 40 ml on a rotatory evaporator at 60^0C and 20 mm pressure. The pH of this concentrate was brought down to pH 3.5 with fumaric acid. It was filtered and pH is readjusted to 10 with dilute sodium hydroxide. A pasty mass was separated out. It was filtered and pH is readjusted to 8.5 with the addition of potassium aluminum sulpahte (alum). The solution was clear and completely clarified. It was let stand for servel hours and distilled with n-butanol (Pasquel *et al.,* 2000).

RESULT AND DISCUSSION

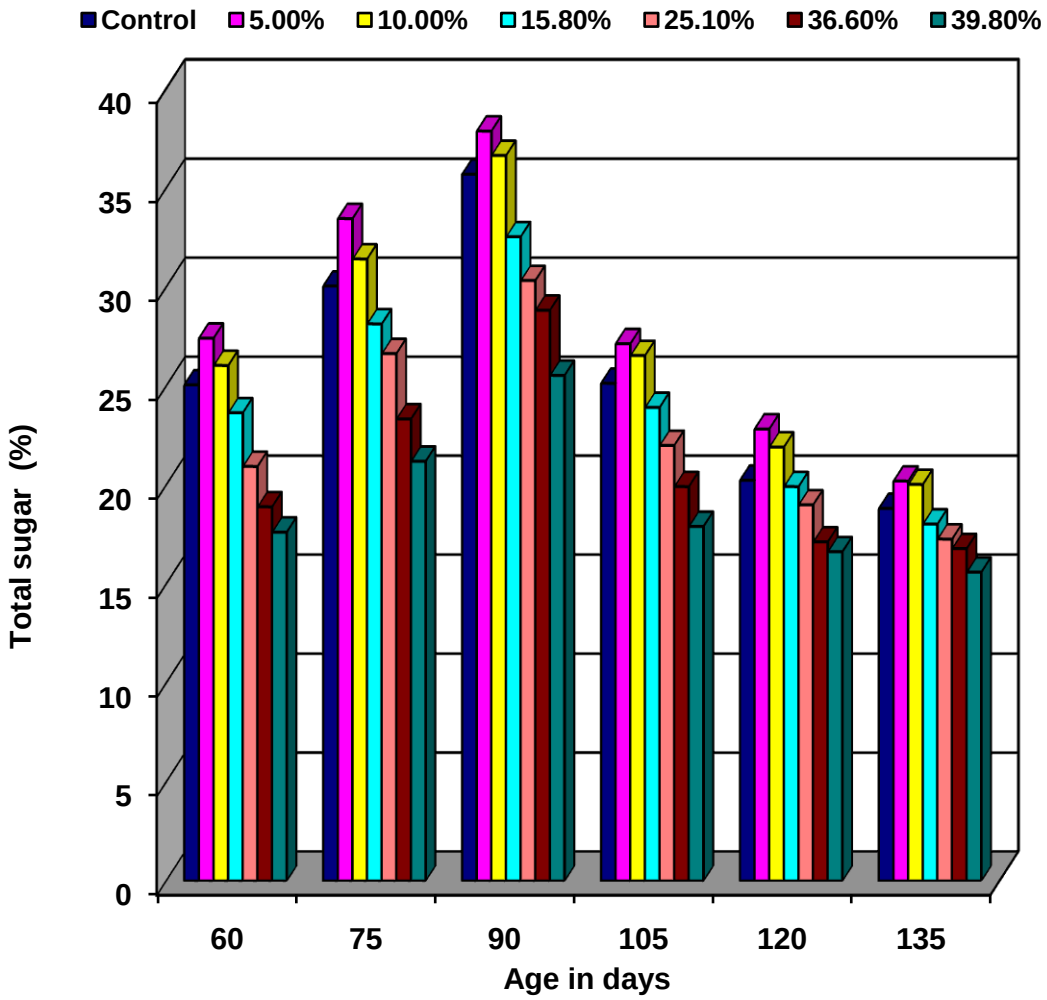
Total sugars of leaf of *Stevia rebaudiana* increase from 60 to 90 days of growth and thereafter decreases form 105 to 135 days of growth. Total sugars was found to be slightly more in the presence of 5.0% and 10.0% spent wash in comparison to the control whereas in the presence of 15.8% spent wash, the same was slightly lower thanthat of control. Decrease in sugar content after 90 days of growth may be due to initiation of flowering in the plant.

TOTAL SUGARS (%) OF LEAF

Concentration of spent wash	Age in days					
	60	75	90	105	120	135
Control	25.04±0.02	30.03±0.02	35.68±0.09	25.12±0.03	20.22±0.02	18.80±0.80
5.0%	27.40±0.03	33.44±0.06	37.86±0.10	27.12±0.08	22.81±0.01	20.18±0.25
10.0%	26.02±0.04	31.40±0.05	36.63±0.12	26.52±0.04	21.90±0.30	20.01±0.41
15.8%	23.63±0.21	28.12±0.20	32.52±0.01	23.90±0.01	19.90±0.32	18.01±0.50
25.1%	20.92±0.03	26.62±0.02	30.31±0.31	21.98±0.02	18.98±0.03	17.25±0.54
36.6%	18.88±0.03	23.32±0.09	28.81±0.08	19.90±0.08	17.11±0.06	16.77±0.05
39.8%	17.60±0.08	21.18±0.08	25.52±0.07	17.89±0.09	16.61±0.08	15.58±0.06

Values are mean ± S.E

Decrease in the total sugars of leaf as flowering commences has been reported by many workers (Shock, 1982; Lester, 1999). Harvesting is suggested to be done before flowering as, sugar content was higher just before flowering (Bian, 1981). Increase in the biomass of inflorescence form 105 to 135 days of growth in higher concentrations of spent wash with simultaneous decrease in the sugar content supports this view. Total sugars decrease in rest of the spent wash concentrations used (15.8% to 39.8%). The extent of decrease in total sugars of leaf increases with the increase in the concentration of spent wash.



Total sugars (%) of *Stevia rebaudiana* Bertoni at different days interval treated with different concentrations of spent wash.

Decrease in total sugars under the treatment of these concentrations was probably due to deficiency of potassium and phosphorus in this concentration. Utumi *et al.*, 1999 reported that deficiency of K and P decrease the sugar content of leaf of *Stevia rebaudiana*. Das *et al.*, 2006 studied effect of N, P and K on sugar content in *Stevia*. They observed that application of NPK fertilizers enhances total biomass as well as sugar content in *Stevia* plants. The sweetening effect of these compounds is purely by taste; they are undigested and the body absorbed no part of the chemical. They are therefore of no nutritional value (Hutapea *et al*., 1997).

The present investigation has been carried out to observe effect of spent wash on sugar content of *Stevia.* It may be concluded that low concentration of spent wash increase the sugar content of plant and hence recommended.

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