



# Egyptian



# Sugar Journal

**Sugar Technology Research Institute  
( STRI ) Assiut University**

***Vol. 10 ( 2018 )***

**Published by  
*Sugar Technology Research Institute (STRI)*  
Assiut University**


***[http://www.aun.edu.eg/sugar\\_tec\\_institute/Arbic/index.php](http://www.aun.edu.eg/sugar_tec_institute/Arbic/index.php)***

**e-mail: [sugar\\_stri\\_1995@yahoo.com](mailto:sugar_stri_1995@yahoo.com)**

**e-mail: [stri1544@gmail.com](mailto:stri1544@gmail.com)**

**abstracts available online**

## *contents*

<b>Title</b>	<b>Type of Section</b>	 <b>Page</b>
<b>Cleaning of Clogging Central Tube in Juice Clarifiers.</b> <i>Adel M. Kamal El-Dean et. al.....</i>	<b>Chemistry</b>	<b>1 - 16</b>
<b>Studies on Aroma Sources in Ethanol During Fermentation and Distillation.</b> <i>Ali A. Abdel-Hafez et. al.....</i>	<b>Industrial Fermentation</b>	<b>17 - 37</b>
<b>Hydrothermal, Solvolysis and Catalytic pyrolysis of Kraft lignin.</b> <i>Abdel-Aal M. Gaber et. al.....</i>	<b>Chemistry</b>	<b>39 - 61</b>
<b>Sludge reduction in wastewater of beet sugar industry using the effective microorganisms in Abu Qurqas sugar factory .</b> <i>Nader Shehata Doas et. al.....</i>	<b>Environmental</b>	<b>63 - 82</b>
<b>Studies on Improvement of Clarified Sugar Cane Juice to Minimize Evaporator Scales Through a New Method of Treatment.</b> <i>Adel M. Kamal El-Dean et.al.....</i>	<b>Chemistry</b>	<b>83 -108</b>
<b>Kinetic Modeling and Experimental Study on of a Premixed Charge Compression Ignition Engine Fueled with Premixed Ethanol–Diesel Fuel Blends.</b> <i>A. M. El zahaby et. al.....</i>	<b>Engineering</b>	<b>109 -140</b>
<b>Correlation, stepwise regression and path-coefficient analyses in new crosses of sugarcane.</b> <i>A. Abo-Elwafa, et. al.....</i>	<b>Agriculture</b>	<b>141 -161</b>
<b>Evaluation of 36 Sugarcane Genotypes Performance for Some Agronomic Traits at Seedling Stage.</b> <i>Walied Eldesouky, et. al.....</i>	<b>Agriculture</b>	<b>163 -182</b>
<b>Genetic Variance, Heritability and Genetic Advance for Some Agronomic Traits in Some Sugarcane Genotypes.</b> <i>Walied Eldesouky, et. al.....</i>	<b>Agriculture</b>	<b>183 -204</b>

## **Cleaning of Clogging Central Tube in Juice Clarifiers**

**Adel M. Kamal El-Dean<sup>(a)</sup>, M. M. M. Abd El.Wahab<sup>(a)</sup>, Hashim M. Yassin<sup>(b)</sup> and Muhammad Abd El.Rahman Abdullah<sup>(b)</sup>**

*(a) Department of Chemistry, Faculty of Science, Assiut University*

*(b) Egyptian Sugar and Integrated Industries Company, Armant Sugar factories*

---

### **Abstract**

This research aims to remove the solid sediments that completely blocked the central distribution pipe in the juice clarifiers. These sediments can't be removed by traditional methods such as crushing or heating, due to the special condition of the pipe inside the clarifier, its narrow diameter and vertical position. Therefore chemical methods were used to solve this problem. A new technique was used in this process through a mixture of sodium hydroxide and hydrogen peroxide solution. There are many experiments and attempts to find the most suitable way of addition and also the final required concentrations 1: 1 dilution for both solutions and the diluted sodium hydroxide solution (48%) was added firstly and after 24 hours a solution of hydrogen peroxide was added with twice the amount of sodium hydroxide.

This work was based on the fact that the decomposition of hydrogen peroxide in the alkaline medium accompanied by release of oxygen, occurrence of effervescence and rise of impurities up to the surface of the solution in an exothermic reaction.

This method which has been succeeded in removing the sediments from the pipe of length up to 7 meters, can be considered as a new addition in the field of chemical removal of sediments.

---

## **Studies on Aroma Sources in Ethanol During Fermentation and Distillation**

**Ali A. Abdel-Hafez<sup>1</sup>, Abdel-Naser. A. Zohri<sup>2\*</sup>, Osama M. Ahmed<sup>3</sup> and Ahmed H. Farahat<sup>3</sup>**

<sup>1</sup>*Department of Chemistry, Faculty of Science, Assiut University, Egypt.*

<sup>2</sup>*Department of Botany & Microbiology, Faculty of Science, Assiut University, Egypt.*

<sup>3</sup>*Abo-Qurqas distillation factory, Egyptian Sugar and Integrated Industries company, Minia, Egypt.*

*\*Corresponding author: Abdel-Naser A. Zohri email: [zohriassiut@yahoo.com](mailto:zohriassiut@yahoo.com)*

---

### **Abstract**



The bad smell of alcohol is caused by different aroma compounds, so we aimed to report herein the analysis of physico-chemical structures of beet and cane molasses used for ethanol production in Abo – Qurqas distillation factories, Egypt for determination of their chemical compounds which may be considered as a source of bad odor in ethanol production. Also, the effect of distillation and storage period of ethanol on developing of aroma compounds in ethanol was studied.

*Key words: Aroma, ethanol, beet and cane molasses.*

---

## **Hydrothermal, Solvolysis and Catalytic pyrolysis of Kraft lignin**

**Abdel-Aal M. Gaber, Adel M. Kamal El-Dean and Ahmed S. Ibrahim**

*Chemistry Department, Faculty of Science, Assiut University, Assiut 71516, Egypt*

---

### **Abstract**

Kraft lignin were subjected to hydrothermolysis and solvolysis at 400- 450 °C in the presence of water and water/ethanol with ratio 1:1 v/v gave rise to methanol, phenol (XVII), 2,3-dihydrobenzofuran (IX), 3-methyl-p-anisaldehyde (XIII), 5-styryl-2,3-dihydrobenzo furan (XII), 3-(4-hydroxy-3-methoxyphenyl) propanoic acid (VII), 1-(4-hydroxy-3,5-dimethoxyphenyl) ethanone (acetosyringone) (XXIII) and 3,4-dimethoxy cinnamic acid (XXII) , respectively in addition to phenolic monomers and other compounds. On the other hand, Kraft lignin on catalytic pyrolysis under reflux in the presence of CrCl<sub>3</sub> and HCl as a catalyst under the same conditions leads to the formation of 2-methoxyphenol (guaiacol) (XV), 4-(4-propylcyclohexyl) phenol (XXVII), 2,6-dimethoxyphenol (syringol) (XVI), 2-hydroxy-3-methoxybenzaldehyde (vanillin) (XIV), 1-(4-hydroxy-3,5-dimethoxyphenyl) ethanone (acetosyringone) (XXIII) and 4-(2-cyclohexylpropyl)-2-methylphenol (XXXI). A free radical dominant reaction pathway is proposed to explain the products formation. Various products are formed by bond cleavages and secondary reactions.

*Keywords: Hydrothermal; Solvolysis; Catalytic pyrolysis; Kraft lignin; Free radicals*

---

# Sludge Reduction in Wastewater of Beet Sugar Industry Using the Effective Microorganisms. In Abu Qurqas Sugar Factory

Nader Shehata Doas<sup>1\*</sup>, Mahmoud A. Ghandour<sup>2</sup>, Mohamed Hemida Abd . Alla<sup>3</sup>, Mohamed Abu El. Kassem Mohamed<sup>4</sup>, and Osama M. Ahmed<sup>5</sup>.

<sup>1</sup>*Egyptian Ministry of Environment affairs of Egypt, (EEAA) Assiut Branch.*

<sup>2</sup>*Chemistry Department, Faculty of Science.*

<sup>3</sup>*Botany and Microbiology Department, Faculty of Science,*

<sup>4</sup>*Mining and Metallurgy Engineering Department, Faculty of Engineering, , Assiut University; Assiut 71516,*

<sup>5</sup>*Abu Qurqas sugar factory*

*\*Corresponding author: Nader Shehata Doas*

*Tel.: +201224064206; fax: e-mail address: ndoas77@gmail.com*

*Running title: Reduction of sludge in the sugar industry by the effective microorganisms*

---

## Abstract

The use of effective microorganisms (EM) for reducing volumes of sewage sludge has Often been suggested as feasible in either wastewater treatment plants or on-site wastewater treatment systems such as septic tanks. The organisms are supposed to eliminate the volumes of sludge produced, with the benefits of reduced sludge handling, and consequently lower costs and decreased impacts upon the environment. Application of EM technology has been attempted for treatment of industrial wastewater resulted from Abu Qurqas Sugar Factory, in Menya Governorate at the Beet season. The physical and chemical characteristics of sugar industry wastewater, including pH values, the solid contents were reduced by application of EM formulation. The reduction rate values were increased with increasing the incubation period. The results of the present study indicate that effective microorganisms, improve the wastewater quality by decreasing the solid contents which means decreasing in the sludge content. The results indicated that, the optimum period of application EM to decrease the sludge content should be around 20 days.

*Keywords: Wastewater sludge, Effective microorganism, Industrial wastewater treatment, Sludge volume, Sugar factory effluent.*

---

## Studies on Improvement of Clarified Sugar Cane Juice to Minimize Evaporator Scales Through a New Method of Treatment

Adel M. Kamal El-Dean<sup>(a)</sup>, M. M. M. Abd El- Wahab<sup>(a)</sup>, Hashim M. Yassin<sup>(b)</sup>  
and Muhammad Abd El -Rahman Abdullah<sup>(b)</sup>

(a) *Department of Chemistry, Faculty of Science, Assiut University*

(b) *Egyptian Sugar and Integrated Industries Company, Armant Sugar factories*

---

## **Abstract**

In this work we aimed to reduce the evaporator scales deposition, which considered as a one of the biggest problems facing sugar industry. It reduce the heat transfer coefficient in the evaporators and cooking bodies, and thus reduce the sugar extraction factor for these stages and increase the energy consumption, hence increase the cost of the industrial process through the cost of removing these deposits. The source of these deposits the input juice to evaporators and its components (ash – impurities – non sugars.....etc) .The improvement of the clear juice specification with decreasing its unwanted components, this make consequently reduce the probably evaporators deposits. This improvement process was carried out through a new method of purification ( treatment – clarification).This method was established on the phenomena of spontaneous flotation which happened when the mixed juice was treated with a mixture of lime and hydrogen peroxide. Some industrial techniques was used to convert the spontaneous flotation to an industrial process and a new approach in the field of sugar extraction.

---

## **Kinetic Modeling and Experimental Study of a Premixed Charge Compression Ignition Engine Fueled with Premixed Ethanol–Diesel Fuel Blends**

**A. M. El Zahaby<sup>(1)</sup>, M. El Kelawy<sup>(1)</sup>, A. E. M. Nassib<sup>(2)</sup> , M. A. E. Aly <sup>(3)</sup>  
and S. M. El-Malla <sup>(4)</sup>**

*(1) Department of Mechanical Power Engineering, Tanta University, Tanta, Egypt.*

*(2) Department of Mechanical Engineering, Faculty of Engineering, Assiut University.*

*(3) Manager, Delta Sugar Company.*

*(4) Delta Sugar Company, El- Hamoul, Kafr El-Sheikh.*

---

## **Abstract**

The combustion process in the Premixed Charge Compression Ignition (PCCI) engine is basically restricted by the in-cylinder charged mixture components. However, the homogeneity of the charged mixture is determining the quality and process of the chemical reaction during the auto-ignition process. In the present work, the engine experimental setup is equipped with a new fuel system in order to produce a perfect commixture of diesel/ethanol aerosol at different blends ratio. The obtained results are used to validate the simulations data of the PCCI ignition. Prediction is performed using a detailed kinetic reaction mechanism. The simulation study is achieved to predict the auto-ignition timing and the combustion characteristics of the PCCI engine

fueled with different blends of ethanol and diesel at different volume percentage. The premixed ratio of the ethanol in the ethanol/diesel fuel blends is used to control the auto-ignition timing and the combustion characteristics at different engine air/fuel ratios. The main pathway of this work is to study the influence of engine operating parameters which including the premixed ratio, fuel-air equivalence ratio on the combustion performance of PCCI engine. These effects are studied and traced through the simulation result data of the in-cylinder pressure, temperature, and heat release at different premixed ratios of ethanol-diesel fuels blends of 0, 10, 20, 30,40 and 50% (by volume). The obtained results show that by increasing the premixed ratio of ethanol in diesel fuel commixture in the range up to 50% will decrease the peak cylinder pressure and temperature and decrease the combustion duration time. The Brake Specific Energy Consumption (BSEC) decreases as the ethanol content increases and the brake thermal efficiency Increases significantly with the addition of ethanol to the fuel mixture. The combustion temperature inside the engine cylinder decreases as the ethanol content of the fuel mixture increases, The higher the ethanol content of the fuel mixture, the higher the nitrogen oxides (NO<sub>x</sub>). Carbon monoxide (CO) and hydrocarbon (HC) emissions increase slightly in low loads and decrease in high loads as a result of cooling effect and the higher latent heat of vaporization of ethanol.

**Keywords:** *PCCI engine; Diesel/Ethanol Blends; Chemical Kinetics Mechanism; Engine Emission Control*

---

## **Correlation, Stepwise Regression and Path-Coefficient Analyses in New Crosses of Sugarcane**

**A. Abo-Elwafa<sup>1\*</sup>, K. Sleem<sup>2</sup>, A. M. Abo-Salama<sup>1</sup>, H. Nosaer<sup>2</sup>**

*<sup>1</sup>Assiut University & <sup>2</sup> Egyptian Sugar and Integrated Industries Company (ESIIC)*

*e-mail author: atif59eg@yahoo.com*

---

### **Abstract**

Analysis of variance revealed significant differences among evaluated sugarcane crosses for stalk length and diameter, stalks number/stool, stool weight, mean stalk weight, pith and brix. The differences among male half-sib families and females within male were highly significant for those traits denoting the presence of additive and non-additive genetic variance. The obtained results illustrate the different genetic make-up among crosses. Consequently, it provides good materials for further selection for desirable genotypes.

Highly positive significant correlation coefficient values were recorded between stool weight and each of stalk length and stalks number/ stool in plant cane and first ratoon crops, respectively. Also, this trend could be found between pith and each of stalks number/ stool and stalk weight in first ratoon crop. Moreover, positive significant correlation coefficient estimates found between stalk weight and each of stalk length and stalk diameter in the first ratoon crop. Non-significant positive and weak correlation values were obtained between brix and stalk weight as well as stalk diameter in plant cane and first ratoon crops, respectively. Otherwise, brix was negatively correlated with each of stalk length, stalks number/ stool, stool weight and pith, respectively.

It is clear from stepwise regression that the first model includes only stalks number/stool and gave high  $R^2$  of 0.452 and 0.863 in plant cane and first ratoon crops, respectively. Moreover, the fitted model no. 2 includes stalks number/stool and stalk diameter with  $R^2$  close to unity ( $=0.989$ ) in first ratoon crop. Consequently, this model is superior one and could be used to determine those two traits for selection to high stalk yield in sugarcane. Meanwhile, the high  $R^2$  of 0.956 in plant cane crop resulted in model 4 which includes stalks number/stool, stalk length, stalk diameter and pith. This different finding comparing to the first ratoon crop may be due to different canopy and environmental interaction in both cane crops. The expected sugar yields for all fitted stepwise models were insignificant different relative to the actual sugar yield in the two successive crops as revealed by t-test which tend to be zero in some models. Moreover, the correlation coefficients between expected and actual yield of stalk weight were positive, very high and close to the unity in the first ratoon crop. These results display the effectiveness of stepwise regression analysis to determine the strongest trait(s) to in contribution to high stalk yield from cane components in sugarcane.

Also, the path-coefficient analysis exhibited two remarks should be taken an interest issue i.e. *a*) the direct and indirect effects of stalks numbers/stool were increased from plant cane crop to first ratoon crop. This result was coupled with *b*) the residual factors ( $1-R^2$ ) were decreased from plant cane crop to first ratoon crop. These results indicate that the genes controlling the stalks number/stool and stalk weight in the current path analysis tend to the maximum genetic expression and could be generally a function of cane stool weight. Consequently, the selection should be directed to both of them to express maximum cane yield of sugarcane.

**Key Words:** *Correlation, stepwise regression, path-coefficient and sugarcane*



# **Evaluation of Some Sugarcane Genotypes Performance for Some Agronomic Traits at Seedling Stage**

**Walied Eldesouky<sup>(a)</sup>, Adel.M.Abou-salama<sup>(b)</sup>, Elmhdy Teama,<sup>(b)</sup>  
and Hassan M. Nosear<sup>(a)</sup>**

*(a) Egyptian Sugar and Integrated Industries Company,  
(b) Faculty of Agriculture, Assiut University*

---

## **Abstract**

The present study was carried out at breeding station of Hawamdia Sugar Cane Research Station (HSCRS), to study the response of the 36 genotypes of sugarcane the artificial flowering. And estimate the genetic potential of six families of sugarcane during the cultivation in the first selection stage. The investigated traits were stalk length , stalk diameter, stalk weight, stalk number/stool, stool yield, brix and pith. The results showed significant differences among the selected genotypes under the investigated photoperiod treatments. However, it was apparent that under 90 day photoperiod treatment, 11 genotypes revealed differential response to development stage, flag stage and full emergence stage. while 10 genotypes responded under 75 day photoperiod treatment. 7 genotypes responded under 105 day photoperiod treatment. 3 genotypes responded under 60 days and 13hr treatment, 2 genotypes responded under 13.15hr treatment and 5 genotypes responded under 90 days. Analysis of variance of six bi-parental crosses revealed significant differences among evaluated full-sib families for all studied traits. The variation among families were higher in magnitude than within family for all traits. 14 full-sib families, i.e. 94/181-1x 87/29-1, 94/181-1 x EN3-4, 94/181-1 x EH16-1, 82/4-21 x 2006/170-40,82/4-21 x EH128-2,82/4-21 x IK84,82/4-21 x B36-21,82/4-21 x EI45-43,PH7115 x B36-21,2004/119-2 x 2005/287-1,2004/119-2 x CP82/1592,EN3-4 x CP57-614,G10 x 2006/294-11and G10 x PR1013were the best families for most studied characters.

**Keywords:** *Sugarcane, Maturity, Girth, Photoperiod induction, Family selection, Individual selection, Heritability, Genetic advance, Hybridization.*

---

## **Genetic Variance, Heritability and Genetic Advance for Some Agronomic Traits in Some Sugarcane Genotypes**

**Walied Eldesouky<sup>(a)</sup>, Adel.M.Abousalama<sup>(b)</sup>, Elmhdy Teama,<sup>(b)</sup>  
and Hassan M. Nosear<sup>(a)</sup>**

*(a) Egyptian Sugar and Integrated Industries Company,*

## Abstract

The present study was carried out at the breeding station of Hawamdia Sugarcane Research Station (HSCRS), Giza, Egypt to examine the response of the 36 sugarcane genotypes of sugarcane for floral induction. and evaluate the genetic potential of six families of sugarcane during the cultivation in the first selection cycle for seven traits,i.e., stalk length , stalk diameter, stalk weight, stalk number/stool, stool yield, brix % and pith . The analyses of the variance of sex comparisons of the bi-parental showed that there were statistical differences among the families that were estimated for all characteristics under this study. Differences between families were higher than differences within the family for all studied traits. 14 full-sib families, i.e. 94/181-1x 87/29-1, 94/181-1 x EN3-4, 94/181-1 x EH16-1, 82/4-21 x 2006/170-40,82/4-21 x EH128-2,82/4-21 x IK84,82/4-21 x B36-21,82/4-21 x EI45-43,PH7115 x B36-21,2004/119-2 x 2005/287-1,2004/119-2 x CP82/1592,EN3-4 x CP57-614,G10 x 2006/294-11 and G10 x PR1013 were the best families overall other full-sib families for most studied characters, indicating the efficient of selection within these families. High genetic coefficient of variation estimates (GCV %) were observed for stalk weight (26.82%), stalk number per stool (20.00%) and stool yield (35.38%), indicating the effectiveness of selection among evaluated families for these traits and selection within families for the other traits in the next stage would be more effective. Genetic gains expected from selection of the top 50% among families followed by a 20% individual genotype selection within elite families would be much larger than those expected from simple mass selection of the best 10%. The combined family and within family selection were about 15.5, 1.4, 21.00, 2.16, 10.3,4.18 and 0.05 times better than individual selection alone for stalk length, stalk diameter, stalk weight, stalk number per stool, stool yield , Brix, and pith, respectively.

**Keywords:** *sugarcane, Artificial flowering, Girth, Mutrity, Family selection, Individual selection, Heritability, Genetic advance.*