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# **Sugar Cane and Sugar Research at National Cereals Research Institute, Badeggi, Nigeria: Time for Collaboration with Egypt's Sugar Groups**

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## **Abstract**

National Cereals Research Institute situated on Lat 09°45' N, Long 6°07' E at an Altitude of 70.57m above sea level has the national mandate for genetic improvement of sugar cane and five other crops. Thus, National Cereals Research Institute, Badeggi has been involved in Research and Development (R & D) of sugar cane for the past 3 and 4 decades respectively. During this period, seven indigenously bred varieties have been released for use by the Nigerian sugar industries. The research efforts on sugar have also witnessed the development of 10 tons per day (10tcd) brown sugar processing technology for cottage level sugar production. In striving to achieve these novel technologies, various stakeholders were collaborated with spanning from the Federal Government, Agencies of Governments at the Federal, state and local levels and the universities with little or no input from the Nigerian Sugar Industry. Due to some encountered deficiency in key areas for sugar cane and sugar research and production, the Institute finds imperative to seek worthy collaborators in Egypt's sugar groups in biotechnology and sugar technologies for the development of suitable varieties for sugar and ethanol production and the time for this synergy is now. This paper highlights what NCRI has been able to archive in the past decades on sugarcane and sugar research and areas needing urgent collaboration with relevant Egypt technocrat in sugar cane and sugar.

***Keywords: Sugar cane and sugar R &D, Indigenously bred cane varieties, Collaborative efforts, Nigeria.***

# Development and Testing of a Tractor-Drawn Sugarcane Billets Planter

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## Abstract

Research on mechanization of sugarcane production however, is very low especially in the area of planting and currently there exists no known mechanical sugarcane planter in Nigeria. As a result, a mechanical planter was designed and fabricated. The main objective of the study is to develop and evaluate the performance of a tractor- drawn sugarcane planter. The planter was designed, fabricated and tested in the Agricultural and Bioresources Department of The Federal University of Technology, Minna. It consists of a frame, hopper, cane seed metering device, delivery funnel, furrow opener, furrow covering/press wheel as well as drive wheels which transmits power to the metering device through chain drive arrangement. The performance tests of the fabricated machine were carried out using four levels of cane seed lengths (250mm, 300mm, 350mm and 400mm) at four levels of operational speeds (6km/h, 8km/h 10km/h and 12km/h) and with four levels of cane diameters (16mm, 20mm, 24mm and 28mm). Field capacity, seed rate, cane seed damage, miss index, multiple index and quality of feed index were measured. It was observed that the operational speed of the machine varies directly with machine capacity and miss index. While cane diameter varies directly with miss index, it had no significant effect on machine capacity. The machine was found to perform optimally at 10km/h operational speed, 300mm cane seed length and 28mm cane diameter. At this optimal speed level, the machine had field capacity of 0.53ha/h (4.24ha/day) and miss index of 20.8%. The developed machine could reduce drudgery involved in manual sugarcane planting and save about substantial amount of labour and operating time.

**Keywords:** *Feed index, Multiple index, Mechanical planter, Miss index*

# **Recent Achievements of Egyptian Sugarcane Breeding Program**

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## **Abstract**

Egyptian sugarcane breeding program depends upon natural flowering and artificial flowering. Natural flowering at El-Sabahia Agriculture Research Station (31.2° N latitude), Alexandria, Egypt is used to evaluate number of sugarcane germplasm for natural flowering ability and determine their flowering dates. The natural flowering season extends from November, 1<sup>st</sup> to the end of June.

Artificial flowering conducts at Giza Agriculture Research Station (30.01° N latitude), Giza, Egypt and used to estimate the number of inductive cycles for inducing the desirable parents from the available germplasms in the program to flower and synchronize their flowering dates to make planed crosses. Fuzz produced from planed crosses is used to establish the seedling stage, which follow by other selection stages to develop improving sugarcane variety.

Increasing the size of the germplasm collection, promising clones at all selection stages and registration of Giza.3 and Giza.4 varieties were the recent achievements of the breeding program. In addition to, resistant to smut disease Giza.3 and Giza.4 varieties have high cane and sugar yields. Besides, Giza.3 is an early mature variety and Giza.4 is a moderate mature variety.

***Keywords: Sugarcane, Breeding program, Crossing, Selection and flower photoperiod .***

# **Five Years' Performances of Three key Players in the Restart Journey of the Nigeria Sugarcane and Sugar industry**

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## **Abstract**

Nigeria with suitable land and excellent edaphic environment for sugar cane production has not been lucky in the sugar business. Even with the potential to produce up to 30 million metric tons of sugar cane yielding 3.0 million metric tons of sugar from well over 800,000 ha of suitable land for sugar cane cultivation, this has not been attained. The country's sugar industry totally collapsed in the late 20<sup>th</sup> century and was privatized between 1999 and 2002. Consequently, a deliberate sugar policy known as the backward integration (BIP) stemmed from the Nigeria Sugar Master Plan (NSMP) was conceived by the government through the National Sugar Development Council (NSDC) in 2012 to stimulate investment in the sugar industry. The implementation of the BIP was deliberately assigned to the three major privately owned sugar refineries in the country namely Dangote, BUA and Golden Sugar Company to drive its implementation in full. The Dangote group tagged its plan "Sugar for Nigeria Project" under the BIP plan to produce 1.5 to 2.0 MT/PA refined sugar from locally grown sugar cane in 10 years across various sites. The BUA Group invested in large scale sugar cane production in the country to deepen local sugar production through the acquisition of the Lafiagi Sugar Company Ltd in Kwara State in 2008. However, full transfer to BUA was not done till 2014. The Sunti Golden Sugar Company also initiated a five year development plan in order to be fully integrated in the BIP plan and hit self-sufficiency in commercial sugar production by 2023. This paper highlights the growth status and challenges faced by the three pioneer sugar companies mid-way in their participation in the BIP to take Nigeria to the status of a sugar producing country by 2023.

**Keywords:** : *Nigeria sugar cane and sugar industry, Total collapse, Commercial sugar production, Sugar self-sufficiency, Three pioneer sugar companies.*

# **Opportunities of cooling crystallization for white sugar production**

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## **Abstract**

Sugar cooling crystallization process was used for low sugar grade crystallization that carried out under certain conditions of higher supersaturation levels for further sugar crystallization after evaporating crystallization by decreasing sucrose solubility through temperature reduction. Recently there is a great interest with utilization of cooling and flash evaporation crystallization for white sugar production for energy cost saving in the sugar industry. This study is focusing on the utilization of an advanced sugar crystallization program to determine cooling crystallization parameters and conditions such as massecuite brix, crystal content and working temperature and pressure. A series of cooling crystallization experiments were conducted on a sugar crystallizer pilot at Al-khaleej sugar company “AKS” through 2017, 2018 seasons. Theoretical and practical simulation results are presented for sharing and discussions.

***Keywords: cooling crystallization, Sugar production.***

# Impact of Bulk and Nanoparticles Zinc Oxide Foliar Application on Sugar Beet Yield and Quality under Different Irrigation Fertilization Levels

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## Abstract

A field experiment was conducted at Abou El Ghar village, Kafr El Zayat district, Gharbiya Governorate, Egypt during 2016- 2017 and 2017-2018 seasons. The aim of this study to evaluate the influence of bulk and nanoparticles zinc oxide on growth and some biochemical characteristics of sugar beet (*Beta vulgaris L.*). The experiment was laid out using strip-plot design with three replications. Zinc oxide concentrations (control, 100, 200, 300 ppm) were arranged horizontally while nitrogen fertilizer (60, 80 and 100 Kg N/fed). Was allocated vertically.

The main results could be summarized as follows:-

1. foliar spray of nanoparticles zinc oxide had a significant effect on root fresh weight/plant, root yield, gross sugar yield, sucrose %, and recoverable sugar % in both seasons. As well as, had a significant effect on root/top ratio, in the second season only and had a significant effect on recoverable sugar yield in the first season only.
2. The best concentration of nanoparticles zinc oxide for sugar beet was 300 ppm with the highest root and sugar yields.
3. Increasing nitrogen rates from 60 to 100 kg N/fed. significantly increased the most studied characters under study such as, root fresh weight/plant, top fresh weight/plant in the second season also, sugar beet yields (root and top) as well as sugar losses in molasses. On the other direction, quality parameters such as sucrose %, purity, quality index significantly decreased by increasing nitrogen levels as nitrogen level increased. Moreover, root/ top ratio and harvest index decreased as nitrogen level increased.
4. It could be concluded that nitrogen fertilizer level at 100 Kg N/fed. and foliar sprayed zinc oxide nanoparticles at a concentration of 300 ppm is a recommended treatment for maximizing sugar beet yield. Otherwise, fertilization sugar beet plants by 60 kg N/fed. with 200 ppm produced the highest mean values of studied quality traits.

**Keywords:** *Sugar beet, Foliar application, Nitrogen fertilization, Zinc nanoparticles*



# Power Quality Improvement of Sugar Factories DC Motor Drive Using Hybrid Filter

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## Abstract

Power quality management is the main problem facing industry today. This problem is mainly due to the generation of electric network harmonics. The growing use of variable speed Drives produces a large amount of harmonics in distribution systems because of the non-sinusoidal currents consumed by these drives. It is well known that for better quality of power, the voltage and current waveforms should be sinusoidal. But in actual practice it is somewhat distorted and this phenomenon is called "Harmonic Distortion". Voltage harmonics are generally present in the utility power supply network. Even though electronic and non-linear devices are flexible, economical and energy efficient, they may degrade power quality by creating harmonic currents consuming excessive reactive power. Harmonic can be reduced using filters. Two types of filters have been utilized for harmonic distortions suppression namely passive and active filters. The present paper provides a method for designing a new hybrid (passive and active) power filters to reduce harmonic distortion and hence improve the power factor, reduce the cost and overcome all above problems. The simulation results certificate that the present hybrid filter (HAPF) causes perfect harmonics and reactive power compensation characteristics. In this case the total harmonic distortion (THD) meet standard values according to the IEEE 519/1992. The practical results of the studied dc motor drive system have been validated and compared with computer simulation MATLAB model results. The simulation results of this non-linear studied system have been carried out with MATLAB Program 2010.

**Keywords:** *Harmonic suppression, Hybrid Filter, MATLAB 7, 10 Power Quality, Shunt Active Power Filter, Total Harmonic Distortion*

# Mordant Yellow 12 Dye Removal from Wastewater Using Low Cost Modified Sugarcane Bagasse as an Adsorbent

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## Abstract

The adsorption behavior of mordant yellow 12 (4-amino phenyl azo salicylic sodium salt) (MY12) from aqueous solutions using low cost adsorbent citric acid or tartaric acid treated Sugarcane bagasse (SCB) was carried out. The experimental results have been investigated according to Langmuir and Freundlich isotherms. The effect of initial concentration of the dye, biosorbent dosage, temperature, contact time and pH were involved in the experiments. It was reported that the maximum removal percentage of MY12 was 95.2 % at pH 2.8 and contact time 40 minutes. The removal percentage decreases, as the concentration of the dye increases. Similar trend was found with the pH factor. The maximum biosorption capacities  $q_e$  of MY12 by SCB was 8.2 mg g<sup>-1</sup>. It was concluded that; bagasse can be used as an efficient adsorbent material for the removal of organic dyes from aqueous solutions.

**Keyword:** Adsorption, MY12, Sugarcane Ba