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# **Yield and Quality of Three Sugar Beet Varieties as Affected by Titanium Dioxide Nanoparticles Foliar Application and Nitrogen Fertilization**

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## **Abstract**

A field experiment was conducted at Mallawi Agriculture Research Station Farm –(latitude of 27.73 ° 28' N and longitude of 30.83° 95' E) El-Minia Governorate, Egypt in two successive seasons of 2016/2017 and 2017/2018 to find out the influence of nitrogen fertilization and Titanium dioxide nanoparticles TiO<sub>2</sub> on yield and quality of three sugar beet varieties. Varieties exhibited significant differences in root length and sugar recovery in the two growing seasons, whereas the differences in TSS% were not significant. The differences among varieties in pol% and sugar yield were significant only in the second and the first growing season, respectively. Nitrogen fertilization had significant effects on root length, pol%, sugar recovery and sugar yield in both seasons, meanwhile it has a significant effect on TSS% only in the first season. TiO<sub>2</sub>NP concentrations had significant effects on root length, pol%, sugar recovery and sugar yield in the two growing seasons, meanwhile it has insignificant effect on TSS% in both seasons. The second order interaction had insignificant effect on root length, TSS% and sugar yield in both seasons, meanwhile it has significant effects on pol% and sugar yield in the two growing seasons. Under conditions of the present work, it is recommend to fertilization Hercule or Kawemira sugar beet varieties by 60 or 80 kg N/fed. and 300 or 200 ppm TiO<sub>2</sub>NP to produce the best quality as well as the highest sugar yield/fed.

***Keywords: Sugar beet; Nitrogen; Fertilization; Titanium dioxide ;Varieties***

**Biotechnological  $\beta$ -glucan Production from Returned Baker's Yeast  
and Yeast Remaining after Ethanol Fermentation**

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## **Abstract**

The aim of this work was performed to develop a milder and cost effective extraction procedure for Beta-glucan (BG) from two types of *S. cerevisiae*, the returned Baker's yeast "RBY" and yeast remaining after ethanol fermentation "EFY" using different chemical extraction steps. The current results revealed that the carbohydrate percent in yeast biomass was considerably increased by the different extraction steps (from 37.64 to 92.41% and from 41.37 to 93.46% in case of RBY and EFY, respectively). On the other hand, the percent of protein in yeast biomass was decreased by the different extraction steps (from 41.91 to 1.28% and from 36.32 to 1.15% in the two cases, respectively). The extracted dry biomass in the two cases were analysed by Fourier Transform Infrared (FTIR) spectra. This method of  $\beta$ -glucan extraction steps has been shown to produce great yields of  $\beta$ -glucan with maintaining their purity and native structure.

**Keywords:** *Saccharomyces cerevisiae, Baker's yeast, Ethanol fermentation yeast,  $\beta$ -glucan, production.*

# Production of Polyhydroxyalkanoate by Local Strain of *Bacillus megaterium* AUMC b 272 Utilizing Sugar Beet Wastewater and Molasses

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## Abstract

Development of polyhydroxyalkanoates (PHAs) as a potential substitute material to some conventional plastics has drawn much attention due to their biodegradable and compatible properties. The potential applications of PHA in various industries and in the medical field are encouraging. Nevertheless, the production cost of PHA has been a major drawback. Consequently, scientific effort have been made to overcome the high cost of the substrates used in the bio-production. In this study, sugar beet industry wastewater without and with beet molasses was used as potential low cost substrate for production of the biopolymer PHA by a local bacterial strain. This strain was selected after screening of 30 bacterial isolates for PHA production and was identified according to 16S rRNA gene sequencing as *Bacillus megaterium* AUMC b 272. The maximum PHA formed by this strain reached to 4.053 g/L with a recovery yield equal to 41.79 % of the bacterial biomass using modified mineral salt medium (MSM) medium containing 6 % beet molasses as sole carbon source and 0.5 g/L ammonium oxalate as a nitrogen source. The initial pH of the medium was adjusted at 8.5. Cultures were incubated at 200 rpm and 37° C for 24 hrs. On the other hand, the bacterial strain produced negligible levels of PHA when grown on the same medium constituents under the same conditions with replaced distilled water and molasses by sugar beet wastewater. While the PHA concentration reached to 0.828 g/L with recovery yield 20.58 % of biomass in the same medium under the same conditions after replacement of distilled water by sugar beet wastewater. It is worthy to mention that the COD in the sugar beet wastewater medium at the end of fermentation period was removed by 69 %. Characterization of the obtained PHA was achieved using Fourier transform-infra-red spectroscopy (FT-IR) and gas chromatograph mass spectrometric (GC-MS). Accumulation of considerable levels of PHA as well as high levels of COD removal from sugar beet wastewater strongly introduced this biotechnological process as valuable method for production of PHA as biodegradable biopolymer from sugar beet industry wastewater in presence of beet molasses as potential low cost substrates and, at the same time, for biological treatment of industry wastewater.

**Keywords:** *Polyhydroxyalkanoates, Production, Sugar Beet Wastewater, Sugar Beet Molasses, Bacillus megaterium.*

## **Kraft Pulping of Date Palm Rachis from Egypt**

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### **Abstract**

Non-wood fiber is one of the major sources for the pulp and paper industry due to their abundance and cost-effectiveness. Kraft pulping of date palm rachis from date palm trees from Ques city in Egypt was carried out under different conditions, and pulps with variable yields and mechanical properties were obtained. The date palm rachis gave best yields and mechanical properties more than bagasse and less than soft wood. Kraft pulping of date palm rachis with 14%,17% and 20% cooking liquor (which contains 90% sodium hydroxide and 10% sodium sulfide ) and 12% for bagasse. Bleaching of pulps was carried out in three stages with chlorine dioxide gas in two stages and hydrogen peroxide in the middle stage, rachis pulps were obtained of high brightness and strength properties suitable for use in writing and printing papers. Beating of bleached pulps was done for comparison between date palm rachis, bagasse and wood pulps.

**Keywords:** *Date palm rachis; Bagasse; Papermaking; Chemical composition; Pulping with additives; Bleaching; Beating.*

## **Green Synthesis of n-Butyl Acetate in the Liquid Phase Using Natural Silica as a Novel, Highly Efficient and Stable Catalyst**

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### **Abstract**

In this paper, the liquid phase esterification of acetic acid with n-butanol was investigated over natural silica as a novel catalyst. The catalyst was characterized by XRF, XRD, and nitrogen sorption analysis. The effect of different parameters such as reaction time, molar ratio, catalyst dosage and calcination temperature on the esterification reaction was studied. The results show that, natural silica catalyst exhibited excellent catalytic performance with a selectivity of 100% to n-butyl acetate formation and the maximum yield obtained in batch method is 86%. This yield is

successfully improved to a higher value nearly to 100% with a reactive distillation column.

**Keywords:** *n-Butyl Acetate; Natural Silica; XRF; XRD.*

## Chemical Composition of Three Types of Low-grade Dates in Upper Egypt

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### Abstract

The aim of the study was to determine the chemical composition of low-grade dates for three types of palm cultivated in Egypt (*Phoenixdactylifera L.*). in order To assess their sugars, crude protein, crude fat, ash and the moisture. The dates were rich in sugar (71.9–81.5% dry weight), while ash represented (2–2.31%). they contained low concentration of protein and very low concentration of fat (3.37–3.86% and 0.19–0.26%, respectively), and moisture content (9-11%). Although the mineral contents varied widely, all varieties could be an important source of potassium. These results show that dates are nutritious and can play a major role in human nutrition and health. The high content of sugars found in low-grade dates makes significant chance of use it to produce of bio-alcohol.

**Keywords:** *Chemical composition; Low-grade dates; Dates in Egypt; Bio-alcohol.*

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المقدمة :

تعانى مصر من وجود فجوة غذائية نتيجة عجز المعروض من الإنتاج المحلى لمواجهة الاحتياجات الاستهلاكية المتزايد منها، والذي يؤدي تذبذب إنتاجه والزيادة المستمرة في الكميات المستهلكة إلى عدم ثبات أسعاره المحلية، حيث أن الإنتاج المحلى من السكر بلغ حوالى 2.249 مليون طن عام 2018/2017<sup>(1)</sup>، فى حين بلغ الاستهلاك المحلى منه حوالى 3.230 مليون طن

في نفس العام ، مما يعنى وجود فجوة تبلغ حوالى 981 طن تمثل نحو 43.62% من جملة الإنتاج، وتقدر نسبة الاكتفاء الذاتى بنحو 69.63% لنفس العام (9) (10) .

مشكلة البحث:

انحصرت مشكلة البحث في قياس اثر الاختلافات بين الأسعار المحلية والعالمية ، وكذلك قياس اثر السياسة السعرية الزراعية علي إنتاج واستهلاك السكر ومحاولة الوصول إلي سياسة زراعية تؤدي إلي تخفيض الأعباء علي منتجي المحاصيل السكرية ، وكذلك قياس مؤشرات الكفاءة الاقتصادية المتمثلة في صافى التأثير على مستوى المنتج والمستهلك ، وعلى المجتمع ككل .  
الهدف من البحث:

يهدف هذا البحث إلي التعرف علي اثر التغيرات السعرية بين الأسعار المحلية والعالمية للسكر في مصر وقياس اثر تلك التغيرات علي كل من المنتجين والمستهلكين ، من خلال تقدير نموذج التوازن الجزئي للتعرف علي مؤشرات الحماية السعرية لكل من المنتجين والمستهلكين ، وتقدير مؤشرات الكفاءة من خلال تقدير صافي الخسارة للمنتج والمستهلك والخسارة الاقتصادية في المجتمع وكذلك قياس مؤشرات الرفاهية لكل من المنتجين والمستهلكين بالإضافة إلي رفاهية المجتمع ، وكذلك التعرف علي التغير في عوائد الحكومة ، والتغير في حصيله النقد الأجنبي

## Oligosaccharides Production by *Leuconostoc holzaapfelii* Strain S7 Using Sugar Cane Molasses as Fermentation Medium

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### Abstract

Oligosaccharides (OS) are considered as functional food and prebiotics. They employed in food, feed, pharmaceutical and agricultural applications as well as used as cosmetics and immune-stimulating agents. Oligosaccharides may be isolated from natural sources or chemically synthesized, but the prices are high. An alternative approach to oligosaccharide synthesis is to use microbial production. The high cost of OS production is the major restriction in the industrial production. So, this study was aimed to produce OS by *Leuconostoc holzaapfelii* strain S7 using sugar cane molasses as low cost fermentation medium. The yields of OS by this bacterial strain reached to 21.55, 28.82, 37.35, 44.23 and 30.93 g l<sup>-1</sup> when used sugar cane molasses at

concentrations of 130, 160, 200, 262 and 290  $\text{g l}^{-1}$ , respectively, comparing with 64.80  $\text{g l}^{-1}$  OS formed by the same strain grown on modified sodium gluconate medium at 7 pH fortified by 80  $\text{g l}^{-1}$  sucrose and 5  $\text{g l}^{-1}$  of a mixture of equal weight of each of yeast extract, peptone & beef extract, incubated at 25°C for 72 hours. Chemical characterization of the obtained OS was achieved using Fourier Transform-Infra-Red spectroscopy (FT-IR) and Liquid Chromatography-Mass Spectrometric (LC-MS). Also, their melting point and monosaccharides content in extracted product were determined. It could be concluded that sugar cane molasses used in the current study was suitable as low cost medium for production of OS by the tested bacterial strain with considerable yield level.

***Keywords: Oligosaccharides, polysaccharides, bacteria, molasses, fermentation.***