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Effect of boron concentrations and application time on the productivity and quality of some sugar beet cultivars

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Abstract

Tow field experiment was carried out during 2015/ 2016 and 2016/ 2017, seasons at the Agronomy Department Experimental Farm, Agriculture Faculty, Assiut University to study the effect of foliar spray by boron concentrations at different application times on the productivity and quality of some sugar beet cultivars. Experiment was laid out in randomized complete block design (RCBD) using split plot arrangement with three replications. Boron concentrations (0, 40, 80 and 120 ppm) were arranged horizontally, while times of application (45, 60 and 75 days after planting) were arranged vertically. The multi-germ sugar beet cultivars ,i.e., Kawemira, Gloria and Farida were allocated in sub –plots. The results showed that boron concentrations had a highly significant effect on root length, root diameter, root fresh weight, root yield (ton fed⁻¹), pol %, sugar recovery %, sugar loss %, recoverable and loss sugar yields (ton fed.⁻¹) traits in both seasons except the effect on pol % in the first season which was insignificant. Sprayed sugar beet plants with high boron concentration (120 ppm) produced the highest mean values of previous traits in both seasons except the quality traits (Pol, sugar recovery and sugar loss %) in the first season which were reacted significantly to 40 ppm boron concentration. Furthermore, the effect of application time on the studied traits was insignificant except root length in the first season, sugar recovery % in both seasons and root fresh weight in the second season which were significant. Moreover, sugar beet cultivars exhibited highly significant effect on all studied traits in both seasons. Gloria sugar beet cultivar surpassed the other two cultivars with regard to yield and its attribute traits. On the contrary, Kawemira and Farida cultivars produced the highest mean values of quality traits as compared to Gloria cultivar. Also, the most first order interactions involved in this respect showed a insignificant influence on previous traits. Otherwise, the second order interaction had a significant or highly significant effect on most studied traits in both seasons. The highest mean values of recoverable sugar yield fed⁻¹(5.93 and 5.83 tons fed.⁻¹ in the two respective seasons) were obtained from 120 ppm boron concentration sprayed at 60 days after planting to Kawemira cultivar plants in the first seasons and Farida cultivar in the second season.

Keywords: Sugar beet, Boron foliar application, Root and sugar yields, sugar quality, cultivars.

Application of nano-hydroxyapatite in sugar cane juice clarification

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Abstract

In this study, the application of nano-hydroxyapatite (NHA) in the clarification of mixed cane juice "MJ" were investigated via batch experiments in pilot scale. Control points (pH, doses, retention time, color, and turbidity) of this process were evaluated compared with traditional sulfitation process. The results were evaluated using statistical T- test. The results showed that the most proper pH, doses and retention time are 7.5, 300 ppm, and 1.5 hr, respectively. Since, applying such values led to significant reduction in turbidity and color of clear juice (55 % and 19 % respectively) compared with traditional sulfitation and phosphation process. These results mean a predicted soft scale formed in the evaporators, lower in color of produced sugar , higher sugar recovery, removing the cost of sulfur, and minimize the cost of calcium oxide to the half. The results were discussed via properties of hydroxyapatite and its highest surface area that adsorbs denatured proteins, prevent formation of melanoidin coloring compounds and promote clarification efficiency.

Keywords: Hydroxyapatite nanoparticles (NHA), clarification, mixed juice

"MJ", clear juice "CJ".

Effect of hydroxyapatite nanoparticles on the behavior of calcium, silicate, and phosphate in cane juice treatment

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Abstract

In this study, hydroxyapatite nanoparticles (HAP), $\text{Ca}_5(\text{PO}_4)_3(\text{OH})$, were synthesized via wet-chemical precipitation methods. Physico-chemical properties of nanoparticles were characterized using high-resolution Transmission Electron Microscope (HR-TEM), X-ray Diffraction (XRD). The application of the synthesized adsorbent in clarification of mixed cane juice "MJ", were investigated via batch experiments in pilot scale. The effect of (HAP) on the behavior of dissolved non sugars "calcium, silicate, and phosphate compounds", compared with that effect of traditional sulfitation process were evaluated. The results show a significant difference in the removal of silica, 51.34% in the case of using hydroxyapatite nanoparticles, where as 36.25 % removal with traditional sulfitation method. And 38.3 % lowering in the remaining calcium content in the clarified juice CJ was achieved. Moreover, 16 ppm of P_2O_5 content in CJ after using hydroxyapatite nanoparticles, compared with 6 ppm P_2O_5 in the CJ resulted from traditional sulfitation process. These results mean a predicted soft scale formed in the evaporators, overcoming the hard to boiled masecuite "HTB" phenomenon, and lower sugar losses in final molasses. The results were discussed via, physico-chemical properties of hydroxyapatite nanoparticles, that affect coagulation and flocculation of flocs formed.

Keywords. Hydroxyapatite nanoparticles (HAP); clarification; mixed juice "MJ"; clear juice "CJ".

Potentiality of Some Yeast Isolates for Electricity Generation from Sugarcane Molasses

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Abstract

Microbial fuel cells (MFCs) are considered simple and robust technology in the field of wastewater treatment as well as electricity generation. Middle term application can be foreseen at market valueprices. This technology might become certified as a prospective new technology for conversion of organic wastes to electricity. In the current study, a total of 40 yeast isolates were collected from 20 samples of sugarcane molasses. Twenty one yeast isolates were examined for their potentiality to produce electricity from sugarcane molasses. All isolates had the ability to produce electricity. Four of them (isolates number: MY 9, MY10, MY18 and MY19 were considered as high producers. They yielded power density with 59.858, 61.25, 52.8125 and 47.432 mW/m², respectively. Yeast isolate MY10 from sugarcane molasses showed the highest power density (P) (61.25 mW/m²), highest current (I) (0.175mA/m²) and highest voltage (V) (350mV/m²). This isolate was identified based on 18S rRNA sequences as *Meyerozyma guilliermondii* and deposited in the Gene bank nucleotide sequence database under accession numbers KY624417.

Keywords: Microbial fuel cells; Bioelectricity generation; Sugarcane molasses; Yeasts.

Isolation and partial purification of invertase from different Baker's and distillery *Saccharomyces cerevisiae*

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Abstract

Invertase enzyme from different commercial kinds of Baker's and distillery *Saccharomyces cerevisiae* was isolated and partially purified as crude enzyme by salt stress process and ethanol precipitation. The lyophilization takes place for the enzyme isolated from activated distillery *S. cerevisiae*. The activities of partially purified invertase isolated from the different five baker yeasts under study ranged between 975 and 1801 IU/ml/min. While the activities of enzyme isolated from distillery yeasts before and after activation were 120 and 1100 IU/ml/min. The activity of lyophilized partially purified powder of enzyme isolated from activated distillery yeast was 19300 U/g. The K_m and V_{max} values of the enzyme isolated from activated distillery yeast were 7.56 mg/ml and 294.12 IU/ml/min, respectively. These results were compared to those values of invertase isolated from Egyptian active dry Baker's yeast and the commercial invertase data sheet with sample of sweetase 20 p enzyme obtained from Germany stern enzyme company. The results recorded in this paper clearly appeared that the active powder invertase could be obtained from activated distillery yeast by easy and inexpensive method.

Key words: Invertase, Isolation, Partial purification, Distillery yeast, *Saccharomyces cerevisiae*

A Study on the Factors Affecting Biomass Formation by a highly Kojic acid Producer Fungal Isolate from Sugarcane Molasses

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Abstract

Nowadays microbial production of natural products represent a hot spot point in our environment and become an alternative way to chemical synthetic. In our research *Aspergillus flavus* No. 3 shows a great power in both biomass and kojic acid production. Plackett–Burman design utilize Egyptian sugarcane molasses as a sole carbon source giving kojic acid production of 0.82 (predicted 1.04) g/l to 24.65 (predicted 23.74) g/l, consuming sugar at 27.33 (predicted 26.96) % to 89.87 (predicted 87.46) % and forming dry biomass between 3.6 (predicted 3.8) g/l and 28.2 (predicted 28.05) g/l. The maximum kojic acid (24.65 g/l) and biomass value (28.2 g/l) obtained at 25°C; 9, 5 days of incubation, pH 3, 5; 0.5%, 2% inoculum size and shaking rate at 150 rpm using fermentation medium (g/l) of sugarcane molasses, 60; yeast extract, 7, 3; KH₂PO₄, 2; ZnSO₄.7H₂O, 0.001 and MgSO₄.7H₂O, 1, respectively.

Keywords: Kojic-acid; Biomass; *Aspergillus flavus*; Sugarcane molasses, Optimization conditions; Plackett-Burman Design.

Study on photogeneration of hydrogen peroxide over Ag/TiO₂ catalysts in water

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Abstract

In the present study, catalytic photogeneration of hydrogen peroxide has been carried out in the presence of Ag-TiO₂ catalysts by using a batch reactor with a UV (36 watt) lamp. A series of Ag-TiO₂ catalysts (0.25 - 5 %) was synthesized by wet impregnation method and with a doping content up to 5.0 wt % Ag at different calcination temperature (200, 300, 400 and 500°C). The physic-chemical characteristics of the synthesized catalysts were characterized by powder X-ray diffraction (XRD), and Fourier transform infrared spectroscopy (FT-IR). The photocatalytic activity of Ag-TiO₂ was evaluated in the H₂O₂ photogeneration in aqueous solution in presence of formic acid under UV light illumination. The concentration of photogenerated H₂O₂ was estimated iodometrically. The results revealed that the yield of H₂O₂ photogeneration at optimum reaction conditions (176 ppm) was achieved.

keywords : Photocatalysis, Titanium dioxide, H₂O₂ catalytic photogeneration, Ag dopant, Anthraquinone auto-oxidation, Superoxide, Hydroxyl radicals, UV irradiation.

Evaluation of sugar cane genotypes under different row spacing

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Abstract

The present study was carried out at El-Mattana Agricultural Research Station (Latitude of 25.17° N and longitude of 32.33° E), Luxor Governorate, Egypt during 2014/2015 and 2015/2016 growing seasons to find out the Sutable row spacing (80 , 100 and 120 cm) on yield and quality of two promising sugarcane varieties viz. G.2003-47 and G.2003- 49 compared with the commercial variety (G.T. 54-9). The results indicated significant differences among tested genotypes in stalk height, cane yield in plant cane and first ratoon crops, while stalk diameter and sugar yield exhibited significant differences only in first ratoon. Row spacing had a significant effect on number of millable cane / m², cane and sugar yields /fed in the plant cane and first ratoon crops , while it had a significant effect on stalk height only in plant cane crop. The row spacing of 120 cm exerted the highest number of milable cane / m², stalk height, and sugar yield in plant cane and first ratoon crops, as well as stalk diameter, cane yield, brix, richness and reducing sugars in plant cane only. Moreover, the check cultivar recorded the highest mean value of sugar yield in first ratoon crop, when planted at 120 cm row spacing. On the other hand, the 80 cm inter row-spacing gave the highest mean values of purity and sugar recovery % in both plant cane and first ratoon crops and brix, sucrose and richness in first ratoon only. The significant linear effects were found for number of millable cane / m² , stalk height, cane yield, sugar yield and reducing sugar with the rate of row spacings.

Keywords : *Sugarcane, Row spacing, Cane yield and Sugar yield.*