Sugar

NPARR, 8(2), 2017-407 Subcritical carbon dioxide-water hydrolysis of sugarcane bagasse pith for reducing sugars production

The aim of present study was to obtain total reducing sugars (TRS) by hydrolysis in subcritical CO$_2$-water from sugarcane bagasse pith (SCBP), the fibrous residue remaining after papermaking from sugarcane bagasse. The optimum hydrolysis conditions were evaluated by $L_{16}(4^5)$ orthogonal experiments. The TRS yield achieved 45.8% at the optimal conditions: 200 °C, 40 min, 500 r min$^{-1}$, CO$_2$ initial pressure of 1 MPa and liquid-to-solid ratio of 50:1. Fourier transform infrared spectrometry and two-dimensional heteronuclear single quantum coherence nuclear magnetic resonance were used to characterize hydrolysis liquor, treated and untreated SCBP, resulting in the removal of hemicelluloses to mainly produce xylose, glucose and arabinose during hydrolysis. The severity factors had no correlation to TRS yield, indicating that the simple kinetic processes of biomass solubilisation cannot perfectly describe the SCBP hydrolysis. The first-order kinetic model based on consecutive reaction was used to obtain rate constants, activation energies and pre-exponential factors [Liang, J., Chen, X*., Wang, L., Wei, X., Wang, H., Lu, S. and Li, Y (School of Chemistry and Chemical Engineering, Guangxi University, Nanning, China) Bioresource Technology, 2017, 228, 147-155].

NPARR, 8(2), 2017-408 Application of biocides in the process of sucrose extraction from sugar beet: Effect on sucrose content, number of Leuconostoc colonies and wet pulp characteristics

This research investigated the application of different extraction biocides in the sugar beet processing stages. The simulation of industrial processes of sugar beet extraction and beet pulp pressing is conducted using the laboratory-scale equipment. Statistical significance analysis of influence of input factors on observed responses is performed by response surface method (Box-Behnken design). Special interest was dedicated to the biocide influence on the wet pulp pressability characteristics. Multiple effects of application of chlorine dioxide on quality parameters of intermediates (diffusion juice sucrose content and number of Leuconostoc colonies, wet pulp pressability) are compared to the standard biocides used in sugar industry. Results indicate that the application of chlorine dioxide corresponded with the best pulp pressing characteristics with 5–15% more efficient mechanical dewatering of the wet pulp compared to the other samples, significantly affecting the potential energy consumption. The use of chlorine dioxide lowered the potential energy consumption in the range from 168 to 335 MJ per tonne of wet pulp. All the biocides used in this study showed remarkable biocide effectiveness against mesophilic bacteria Leuconostoc mesenteroides reducing the number of colonies in the range from 82 to 99% [Šereš, Z*., Maravić, N., Rakić, D., Dokić, L., Nikolić, I., Šoronja-Simović, D. and Đorđević, M (University of Novi Sad, Faculty of Technology, Bul. Cara Lazara 1, Novi Sad, Serbia) LWT - Food Science and Technology, 2017, 75, 17-24].

NPARR, 8(2), 2017-409 Pilot scale dilute acid pretreatment of rice straw and fermentable sugar recovery at high solid loadings

The aim of this work was to study the dilute acid pretreatment of rice straw (RS) and fermentable sugar recovery at high solid loadings at pilot scale. A series of pretreatment experiments were performed on RS resulting in >25 wt% solids followed by enzymatic hydrolysis without solid-liquid separation at 20 and 25 wt% using 10 FPU/g of the pretreated residue. The overall sugar recovery including the sugars released in pretreatment and enzymatic hydrolysis was calculated along with a mass balance. Accordingly, the optimized conditions, i.e. 0.35 wt% acid, 162 °C and 10 min were identified. The final
glucose and xylose concentrations obtained were 83.3 and 31.9 g/L respectively resulting in total concentration of 115.2 g/L, with a potential to produce >50 g/L of ethanol. This is the first report on pilot scale study on acid pretreatment of RS in a screw feeder horizontal reactor followed by enzymatic hydrolysis at high solid loadings [Kapoor, M., Soam, S., Agrawal, R., Gupta, R.P., Tuli, D.K. and Kumar, R* (DBT-IOC Centre for Advance Bioenergy Research, Research & Development Centre, Indian Oil Corporation Limited, Sector-13, Faridabad, India) Bioresource Technology, 2017, 224, 688-693].

NPARR. 8(2), 2017-410 Effects of free sugars on blood pressure and lipids: A systematic review and meta-analysis of nutritional isoenergetic intervention trials

Background: Sugar has been suggested as a central risk factor in the development of noncommunicable diseases. Objective: We assessed the evidence of the effects of free sugars compared with complex carbohydrates on selected cardiovascular disease risk factors. Design: We conducted a systematic review and meta-analysis of intervention trials to compare diets that provide a given amount of energy from free sugars with a control diet that provides the same amount of energy from complex carbohydrates. The primary outcomes were: blood pressure, total cholesterol, low-density lipoprotein (LDL) cholesterol, high-density lipoprotein (HDL) cholesterol, triacylglycerols, apolipoproteins A-I and B, or very low-density lipoprotein cholesterol. Body weight was also recorded but was not a primary outcome of the studies. Results: In all, 28 studies involving 510 volunteers were included. When free sugars were substituted for complex carbohydrates, no significant increases were detected in systolic or diastolic blood pressure, and no heterogeneity was observed. There were significant increases in HDL cholesterol, LDL cholesterol, and triacylglycerols, although for LDL cholesterol and triacylglycerols there was significant heterogeneity between studies and evidence of publication bias. After adjustment for missing studies, these increases lost significance. Subgroup analyses showed that diets providing the largest total energy intake and energy exchange enhanced the effect of free sugars on total and LDL cholesterol and triacylglycerols. The increase of triacylglycerols was no longer significant when studies with the highest risk of bias were excluded or when only randomized trials were considered. Free sugars had no effect on body weight. Conclusions: In short- or moderate-term isoenergetic intervention trials, the substitution of free sugars for complex carbohydrates had no effect on blood pressure or body weight and an unclear effect on blood lipid profile. Further independent trials are required to assess whether the reduction of free sugars improves cardiovascular disease risk factors [Fattore, E*., Botta, F., Agostoni, C. and Bosetti, C (Department of Environmental Health Science, IRCCS-Istituto di Ricerche Farmacologiche Mario Negri, Milan, Italy) American Journal of Clinical Nutrition, 2017, 105(1), 42-56].

NPARR, 8(2), 2017-411 Utilization of algal sugars and glycerol for enhanced cephalosporin C production by Acremonium chrysogenum M35

In our previous study, glycerol was utilized as an additional carbon source for the production of cephalosporin C (CPC) by Acremonium chrysogenum M35. In this study, algal sugars extracted from the third-generation biomass were utilized in the CPC production for the first time. The CPC production improved about twofold when using the algal sugars as the carbon source. The complex medium including algal sugars and glycerol was utilized, and 7·3 g l⁻¹ CPC production was achieved in a 250-ml shaking flask. To determine the important variables for the CPC production, Plackett–Burman design was carried out and 6·18 g l⁻¹ of CPC was estimated under the numerically optimized conditions. Under the optimized conditions, the CPC production was performed in
a 5-l scale bioreactor, affording CPC production at a rate of 7·1 g l⁻¹. Moreover, 6·7 g l⁻¹ CPC was produced using crude glycerol as the substrate. Significance and Impact of the Study: Microalgae are the biomass containing various components, such as carbohydrates, lipids, and amino acids. In this study, carbon sources contained in microalgae were obtained by acid extraction, and cephalosporin C (CPC), a β-lactam antibiotic intermediate, was produced by using Acremonium chrysogenum M35. In addition, the increase of CPC production was not distinct for A. chrysogenum M35 with algal sugars as the only carbon source; therefore, glycerol was added, increasing the CPC production. Thus, cheap residues such as algal sugars form microalgal and glycerol from biodiesel process could be used as the alternative sources for the production of various products [Lee, J.H., Yoo, H.Y., Yang, X., Kim, D.S., Lee, J.H., Lee, S.K., Han, S.O. and Kim, S.W* (Department of Chemical and Biological Engineering, Korea University, Seoul, South Korea) Letters in Applied Microbiology, 2017, 64(1), 66-72].

NPARR, 8(2), 2017-412 The Role of fructose, and specifically sugar-sweetened beverages, in pediatric nonalcoholic fatty liver disease

The prevalence of nonalcoholic fatty liver disease (NAFLD) among US children and adolescents is rising, with diet identified as a risk factor. The clinical burden of pediatric NAFLD makes it a serious health concern. The aim of this review was to explore the association between fructose consumption, specifically sugar-sweetened beverage intake, and NAFLD and the effect of fructose on associated risk factors. The relationship that fructose may have with NAFLD and its related risk factors may highlight whether certain dietary constituents should be altered among those with NAFLD [Patusco, R.*, Smith, T.J. and Ziegler, J (Rutgers, School of Health Professions, Graduate Programs in Clinical Nutrition, Rutgers, the State University of New Jersey, Newark, NJ, United States) Topics in Clinical Nutrition, 2017, 32(1), 27-46].

NPARR, 8(2), 2017-413 Strategy for dual production of bioethanol and D-psicose as value-added products from cruciferous vegetable residue

In this study, fermentable sugars and D-fructose were produced from cruciferous vegetable residue by enzymatic method without the use of either chemical or mechanical mechanisms. Production of D-psicose was effectively converted from hydrolyzed D-fructose in cabbage residue by D-psicose-3 epimerase; the presence of the borate increased the conversion rate by about two fold, and ethanol production yield was 85.7% of the theoretical yield. Both products, bioethanol and D-psicose, were successfully separated and purified by pervaporation and cation exchange chromatography, and their recovery yields were approximately 87% and 86.2%, respectively [Song, Y., Nguyen, Q.A., Wi, S.G., Yang, J. and Bae, H.-J (Department of Bioenergy Science and Technology, Chonnam National University, Gwangju, South Korea) Bioresource Technology, 2017, 223, 34-39].

NPARR, 8(2), 2017-414 Utilization of residue from cassava starch processing for production of fermentable sugar by enzymatic hydrolysis

The aim of this study was to characterize and perform enzymatic hydrolysis of cassava peeling residue (peel and inner peel), mainly composed of peels and small pieces. Residue was sanitized, dried at 55 °C for 24 hours and ground. The obtained flour showed pH of 4.85; 72.53 g 100 g⁻¹ moisture; 5.18 mL 1M NaOH 100 g⁻¹ acidity; 60.68 g 100 g⁻¹ starch; 1.08 g 100 g⁻¹ reducing sugar; 1.63 g 100g⁻¹ ash; 0.86 g 100 g⁻¹ lipid and 3.97 g 100 g⁻¹ protein. Enzymatic hydrolysis was carried out by means of rotational central composite design, analyzing the effects of concentrations of α-amylase enzyme
(10 to 50 U g starch⁻¹), and the amylglucosidase enzyme (80 to 400 U g starch⁻¹) on variable responses: percent conversion of starch into reducing sugars (RSC) and soluble solid content (SS). Highest values of RSC (110%) and SS (12 °Brix) were observed when using the maximum concentration of amylglucosidase and throughout the concentration range of α-amylase. Enzymatic hydrolysis of cassava peel is feasible and allows the use of hydrolysate in fermentation processes for the production of various products, such as alcoholic drinks, vinegar, among others [Souto, L.R.F., Caliari, M.*, Soares Júnior, M.S., Fiorda, F.A. and Garcia, M.C (Department of Food Engineering, School of Agronomy, Universidade Federal de Goiás – UFG, Goiânia, GO, Brazil) Food Science and Technology, 2017, 37(1), 19-24].

NPARR, 8(2), 2017-415 D-Psicose, a sugar substitute, suppresses body fat deposition by altering networks of inflammatory response and lipid metabolism in C57BL/6J-ob/ob mice

D-Psicose, a rare sugar, not only has very low caloric value but possesses anti-adipogenic properties. Here, we identified target genes in adipose tissue affected by D-psicose by transcriptomic analysis and provided mechanistic explanations for the anti-adipogenic effect. C57BL/6J ob/ob mice were fed with a control or 5% D-psicose diet for 12 weeks. D-Psicose decreased final body weight, adipose tissue mass, adipocyte size, and serum total cholesterol levels. We identified 103 differentially expressed genes involved in inflammatory response, molecular transport, and lipid metabolism consequent to D-psicose administration. Genes related to inflammation and adipo/lipogenesis were significantly down-regulated, whereas those associated with β-oxidation were up-regulated by D-psicose. Our data suggest that Fos, Mmp3, Fgf21, and Abcd2 might be key target genes associated with D-psicose-induced changes in lipid metabolism and subsequent chronic inflammatory responses. D-psicose is thus a promising sugar substitute possessing a direct gene-regulatory function related to the suppression of body fat deposition [Kim, S.-E.*, Kim, S.J., Kim, H.-J. and Sung, M.-K (Department of Food and Nutrition, Sookmyung Women's University, Seoul, South Korea) Journal of Functional Foods, 2017, 28, 265-274].

NPARR, 8(2), 2017-416 A new sugar ester from the roots of Acanthus ilicifolius

A new compound, 1,2-di-(syringoyl)-β-D-glucopyranose, together with erigeside C, were isolated from the roots of Acanthus ilicifolius. The structure of the new compound was elucidated by extensive spectroscopic methods, including 1D, 2D NMR and HRESIMS spectroscopic data. The cytotoxic activities of these compounds were evaluated against HepG2, A-549, and HeLa cells in vitro. However, none of them showed cytotoxic activities [Lin, N., Yi, B., Li, J., Zhang, W. and Zhang, X.P* (Department of Pharmacy, General Hospital of People’s Liberation Army (187 hospital), Haikou, China) Records of Natural Products, 2017, 11(1), 74-76].

NPARR, 8(2), 2017-417 Sucrose modulates insulin amyloid-like fibril formation: Effect on the aggregation mechanism and fibril morphology

Co-solutes, such as sugars, are used in in vitro protein aggregation experiments to mimic crowding and, in general, complex environments. Sugars often increase the stability of the native protein structure by affecting inter- and intramolecular protein-protein interactions. This, in turn, modifies the protein self-assembly pathways. Using a combination of fluorescence spectroscopy, synchrotron radiation circular dichroism and transmission electron microscopy, we study the kinetics of formation and structural properties of human insulin fibrils in the presence of sucrose. The presence of sucrose results in a delay of the onset of fibrillation. Moreover, it leads to a dramatic change in both the morphology and overall amount of fibrils.
Our results emphasize that the detailed composition of protein surroundings likely influences not only the fibrillation kinetics but also the balance between different species, potentially determining fibril strains with different biological activities. This aspect is crucial in the etiology of pathologies associated with amyloidosis. [Marasini, C*., Foderà, V. and Vestergaard, B (Department of Drug Design and Pharmacology, University of Copenhagen, Universitetsparken 2, Copenhagen, Denmark) RSC Advances, 2017, 7(17), 10487-10493].

NPARR, 8(2), 2017-418 A kinetic model of one-pot rapid biotransformation of cellobiose from sucrose catalyzed by three thermophilic enzymes

Cellobiose is a zero-calorie functional sweetener and a potential healthy food/feed additive. Current production methods of cellobiose from high-purity cellulose always suffer from low product yields and high separation costs. Here one-pot biotransformation composed of three thermophilic enzymes sucrose phosphorylase (SP) from Thermoanaero-bacterium thermosaccharolyticum, glucose isomerase (GI) from Streptomyces murinus, and cellobiose phosphorylase (CBP) from Clostridium thermocellum was designed to convert sucrose to cellobiose. To reveal the underlying relationship within the three enzymes and optimize reaction conditions, a kinetic model was developed. Model simulation predicted the optimal SP:GI:CBP enzyme loading ratio in terms of enzyme unit was 0.5:1.0:1.5. The enzyme cocktail with the optimal ratio converted 100 mM sucrose to 62.3 mM cellobiose within 10 h. Model simulation also found out that the optimal phosphate concentration was approximately 10.3 mM for 100 mM sucrose, which was validated by experimental data. This study could assist the sugar industry to diversify the production of new value-added products from sucrose. [Zhong, C*., Wei, P. and Zhang, Y.-H.P (College of Biotechnology and Pharmaceutical Engineering, Nanjing Tech University, Nanjing, China) Chemical Engineering Science, 2017, 161, 159-166].

NPARR, 8(2), 2017-419 Efficient production of lactulose from whey powder by cellobiose 2-epimerase in an enzymatic membrane reactor

In this study, the gene encoding cellobiose 2-epimerase from Caldicellulosiruptor saccharolyticus (CsCE) was successfully expressed in Bacillus subtilis WB800. After the fermentation medium optimization, the activity of recombinant strain was 4.5-fold higher than the original medium in a 7.5 L fermentor. The optimal catalytic pH and temperature of crude CsCE were 7.0 and 80 °C, respectively. An enzymatic synthesis of lactulose was developed using cheese-whey lactose as its substrate. The maximum conversion rate of whey powder obtained was 58.5% using 7.5 U/mL CsCE. The enzymatic membrane reactor system exhibited a great operational stability, confirmed with the higher lactose conversion (42.4%) after 10 batches. To our best knowledge, this is the first report of lactulose synthesis in food grade strain, which improve the food safety, and we not only realize the biological production of lactulose, but also make good use of industrial waste, which have positive impact on environment. [Wu, L., Xu, C., Li, S., Liang, J., Xu, H. and Xu, Z* (State Key Laboratory of Materials-Oriented Chemical Engineering, Nanjing, China) Bioresource Technology, 2017, 233, 305-312].

NPARR, 8(2), 2017-420 Honey, trehalose and erythritol as sucrose-alternative sweeteners for artisanal ice cream. A pilot study

The use of sucrose-alternative sweeteners in ice cream production could satisfy requirements of modern consumers focused on natural and nutritionally balanced foods. The aim of this work was to fill the gap in basic knowledge about the effects of honey, trehalose, and erythritol on the properties of artisanal ice cream. A milk-based sucrose-sweetened ice cream was produced as reference sample (REF), using then the alternative sweeteners to partially (50%) or totally (100%) substitute sucrose. With respect to REF, honey-containing ice cream mix revealed a
The total substitution of sucrose with trehalose and erythritol led to a melting rate (2.07 and 1.56 g/min, respectively) significantly lower than REF (2.75 g/min), a very high firmness (508 and 725 N vs. 4 N), and a higher extrusion temperature (−7.1 and −5.3 °C vs. −9.3 °C). The results of this study represent a guideline for the successfully utilization of honey, trehalose, and erythritol in peculiar ice cream formulations (e.g. non-sweet or low-calorie products) [Moriano, M.E. and Alamprese, C* (Department of Food, Environmental and Nutritional Sciences (DeFENS), Università degli Studi di Milano, via G. Celoria 2, Milan, Italy) LWT - Food Science and Technology, 2017, 75, 329-334].

**NPARR, 8(2), 2017-421 Effect of disaccharides of different composition and linkage on corn and waxy corn starch retrogradation**

The effect of disaccharides of different monosaccharide compositions and linkages on corn and waxy corn starch long-term retrogradation was investigated using differential scanning calorimetry (DSC), wide X-ray diffraction (WXRD), and molecular dynamic (MD) simulation. The disaccharides consisted of sucrose (glucose-fructose, α-1, 2 glycosidic bond), lactose (glucose-galactose, β-1, 4 glycosidic bond), and maltose (glucose-glucose, α-1, 4 glycosidic bond). DSC data showed that ΔH (melting enthalpy of retrograded starch) was reduced with the addition of sugars (maltose > lactose > sucrose > glucose > galactose > fructose). The WXRD results revealed that the disaccharides inhibited starch retrogradation. In addition, MD simulation, which was adapted to predict the interaction of disaccharides and starch, confirmed that the disaccharides reduced starch retrogradation [Wang, L*., Xu, J. , Fan, X. , Wang, Q., Wang, P., Zhang, Y., Cui, L., Yuan, J. and Yu, Y (Key Laboratory of Eco-Textiles, Ministry of Education, Jiangnan University, 1800 Lihu AVE, Wuxi, Jiangsu, China) Food Hydrocolloids, 2016, 61, 531-536].

**NPARR, 8(2), 2017-422 Miracle fruit: An alternative sugar substitute in sour beverages**

High sugar consumption has been related to several chronic diseases and thus, many alternative sweeteners have been extensively researched. However, there is still controversy regarding the harmful effects of their consumption, mainly regarding the use of artificial sweeteners, controversy which increases the demand for natural sweeteners, such as miracle fruit. This tropical plant grows in West Africa is named for its unique ability of changing a sour taste into sweet. Therefore, this study aimed to characterize the temporal profile of miracle fruit to assess its sugar substitute power in sour beverages through time-intensity and temporal dominance of sensations tests. For this, unsweetened lemonade and lemonades with sugar, sucralose and previous miracle fruit ingestions were evaluated. We noted that the dynamic profile of lemonade ingested after miracle fruit ingestion indicates that it seems to be a good sugar substitute, since it provides high sweetness intensity and persistence, reduced product sourness and an absence of aftertastes. The miracle fruit also provided a sensory profile similar to that of sucralose, an established and recognized sugar substitute. The results of this study provide important information for future applications of miracle fruit as a sugar substitute in sour beverages, providing an alternative use for a natural substance as a sweetening agent [Rodrigues, J.F., Andrade, R.D.S., Bastos, S.C., Coelho, S.B. and Pinheiro, A.C.M* (Federal University of Lavras, Department of Food Science, DCA/UFLA, Lavras, MG, Brazil) Appetite, 2016, 107, 645-653].

**NPARR, 8(2), 2017-423 Diabetic cardiomyopathy: The case for a role of fructose in disease etiology**

A link between excess dietary sugar and cardiac disease is clearly evident and has been
largely attributed to systemic metabolic dysregulation. Now a new paradigm is emerging, and a compelling case can be made that fructose-associated heart injury may be attributed to the direct actions of fructose on cardiomyocytes. Plasma and cardiac fructose levels are elevated in patients with diabetes, and evidence suggests that some unique properties of fructose (vs. glucose) have specific cardiomyocyte consequences. Investigations to date have demonstrated that cardiomyocytes have the capacity to transport and utilize fructose and express all of the necessary proteins for fructose metabolism. When dietary fructose intake is elevated and myocardial glucose uptake compromised by insulin resistance, increased cardiomyocyte fructose flux represents a hazard involving unregulated glycolysis and oxidative stress. The high reactivity of fructose supports the contention that fructose accelerates subcellular hexose sugar-related protein modifications, such as O-GlcNAcylation and advanced glycation end product formation. Exciting recent discoveries link heart failure to induction of the specific high-Affinity fructose-metabolizing enzyme, fructokinase, in an experimental setting. In this Perspective, we review key recent findings to synthesize a novel view of fructose as a cardiopathogenic agent in diabetes and to identify important knowledge gaps for urgent research focus [Delbridge, L.M.D*, Benson, V.L., Ritchie, R.H. and Mellor, K.M (Department of Physiology, University of Melbourne, VIC, Australia) Diabetes, 2016, 65(12), 3521-3528].

NPARR, 8(2), 2017-424 High-fructose diet is as detrimental as high-fat diet in the induction of insulin resistance and diabetes mediated by hepatic/pancreatic endoplasmic reticulum (ER) stress

In the context of high human consumption of fructose diets, there is an imperative need to understand how dietary fructose intake influence cellular and molecular mechanisms and thereby affect β-cell dysfunction and insulin resistance. While evidence exists for a relationship between high-fat-induced insulin resistance and metabolic disorders, there is lack of studies in relation to high-fructose diet. Therefore, we attempted to study the effect of different diets viz., high-fat diet (HFD), high-fructose diet (HFS), and a combination (HFS + HFD) diet on glucose homeostasis and insulin sensitivity in male Wistar rats compared to control animals fed with normal pellet diet. Investigations include oral glucose tolerance test, insulin tolerance test, histopathology by H&E and Masson’s trichrome staining, mRNA expression by real-time PCR, protein expression by Western blot, and caspase-3 activity by colorimetry. Rats subjected to high-fat/fructose diets became glucose intolerant, insulin-resistant, and dyslipidemic. Compared to control animals, rats subjected to different combination of fat/fructose diets showed increased mRNA and protein expression of a battery of ER stress markers both in pancreas and liver. Transcription factors of β-cell function (INSIG1, SREBP1c and PDX1) as well as hepatic gluconeogenesis (FOXO1 and PEPCK) were adversely affected in diet-induced insulin-resistant rats. The convergence of chronic ER stress towards apoptosis in pancreas/liver was also indicated by increased levels of CHOP mRNA & increased activity of both JNK and Caspase-3 in rats subjected to high-fat/fructose diets. Our study exposes the experimental support in that high-fructose diet is equally detrimental in causing metabolic disorders [Balakumar, M., Raji, L., Prabhu, D., Sathishkumar, C., Prabu, P., Mohan, V. and Balasubramanyam, M (Department of Cell and Molecular Biology and Dr. Rema Mohan High-Throughput Screening (HTS) Lab, Madras Diabetes Research Foundation & Dr. Mohan’s Diabetes Specialties Centre, WHO Collaborating Centre for Non-Communicable Diseases Prevention & Control, Gopalapuram, Chennai, India) Molecular and Cellular Biochemistry, 2016, 423(1-2), 93-104].
Dynamics of sugar-metabolic enzymes and sugars accumulation during watermelon (*Citrullus lanatus*) fruit development

We analyzed sugar accumulation and the activities of sugar-metabolic enzymes in ripening fruits of three cultivars of watermelon; a high-sugar type “w2”, a low-sugar type (“w1”), and their hybrid. In “w2”, the glucose and fructose contents were higher than the sucrose content in the earlier stage of fruit development, and fruit growth was accompanied by increases in glucose, fructose, and sucrose contents. The sucrose content increased substantially after 20 days after anthesis (DAA) and it was the main soluble sugar in mature fruit (sucrose:hexoses ratio, 0.71). In “W1”, the fructose and glucose contents were significantly higher than the sucrose content in mature fruit (sucrose:hexoses ratio, 0.25). Comparing the two parent cultivars, sucrose was the most important factor affecting the total sugar content in mature fruit, although glucose and fructose also contributed to total sugar contents. The fructose and glucose contents in the fruit of F1 were mid-way between those of their parents, while the sucrose content was closer to that of “W1” (sucrose:hexoses ratio in F1, 0.26). In the early stage of fruit development of “W2”, the activities of acid invertase and neutral invertase were higher than those of sucrose synthase and sucrose phosphate synthase. After 20 DAA, the acid invertase and neutral invertase activities decreased and those of sucrose synthase and sucrose phosphate synthase increased, leading to increased sucrose content. In “W1”, the activities of acid invertase and neutral invertase were higher than those of sucrose synthase and sucrose phosphate synthase at the early stage. The sucrose synthase and sucrose phosphate synthase activities were lower in “W1” than in “W2” at the later stages of fruit development. The patterns of sugar accumulation and sugar-metabolic enzyme activities during fruit development in F1 were similar to those in “W1” [Zhang, H*. and Ge, Y (Anhui Key Laboratory of Plant Resources and Biology, School of Life Science, Huaibei Normal University, Huaibei, Anhui, China) *Pakistan Journal of Botany*, 2016, 48(6), 2535-2538].