August 2022

International Society of Sugar Cane Technologists
Founded 1924

Bulletin

Welcome to the ISSCT Bulletin for August 2022, in which we collect latest ISSCT updates, along with news, research, and past and upcoming events related to sugar cane technology.

Contents

ISSCT News

Webinars

Since the last issue of the ISSCT Bulletin in mid-July, two webinars have been held by the Co-Products Commission on 28 July and the Molecular Biology Section on 2 August. These events have been attended by 45 members from 16 countries for Co-Products and 43 from 20 countries for Molecular Biology.

The links to access recordings of these events on Cloud have been communicated to all participants.

Three more webinars will be held by the Entomology Section (see below), by the Agriculture Commission in late August and the Factory Processing Section on 29 September. We encourage our members to register for these events. The announcement for the Entomology Webinar has been finalised and already emailed to our members. The announcements for the two other webinars will be emailed when ready.

ISSCT Entomology Webinar

THEME:
Advances in Proactive and Non-chemical Sugarcane Insect Management
Thursday 18 August 2022, 11:00 AM GMT

As part of the series of Webinars that will be organized by the ISSCT in 2022 for its different disciplines,
the **Entomology** Webinar of the Biology Commission will be held on Thursday 18 August 2022 from 11:00 AM GMT to 2:00 PM GMT.

Registration
The Registration Form for the Webinar may be accessed through this link.

The Webinar is only open to compliant members of ISSCT. When you register for the webinar, your registration will be checked against ISSCT membership and payment records, and you will receive an e-mail with the meeting details (Username and Password to access the Webinar). If you have outstanding membership dues, you will be asked to pay these online before your registration is approved. The Individual Membership dues are USD 140 and may be settled through the following link:

http://members.issct.org/appform/issct_india_2022.aspx

Programme
Introduction by Julien Beuzelin, Chair ISSCT Entomology Section

- **From Endemic to Exotic Pests of Sugarcane – Preparing for the Unexpected.** Kevin Powell, Sugar Research Australia, Meringa, Queensland, Australia

Abstract: The Australian sugarcane industries major insect pests are the canegrubs, comprising 20 species. Most of the species are endemic and have been controlled primarily using insecticides. However, the industry relies solely on the use of a single neonicotinoid, imidacloprid, for control of the larvae. This product has been used for two decades and has been very successful. However, neonicotinoids are under scrutiny and other alternatives including biorationals are being explored. Screening of such alternatives needs to occur to provide sufficient scientific evidence of efficacy, persistence and reduced environmental consequences. In Australia, a new 4-year research project is currently focusing on developing rapid in situ and in field screening methods to improve the selection of sustainable alternatives to imidacloprid.

In 2012 a newly described cane disorder called Yellow Canopy Syndrome (YCS) was described from Cairns in Far North Queensland. Despite multiple research projects the direct cause of YCS has yet to be determined. However, there is increasing evidence, most notably from both insecticide and variety trials, that invertebrates are likely to be involved in YCS expression. Recent studies on YCS have utilised novel and existing sampling procedures to determine which invertebrates are likely to be involved and how climatic conditions impact their abundance. These studies have highlighted for the first time not only potential invertebrates involved in YCS but also the diversity of invertebrates present in the sugarcane ecosystem. Some of the effective monitoring methods developed will

be utilised to ensure that future management approaches are utilised only as and when required.

With the exception of canegrubs, the Australian Sugarcane industry has relatively few endemic pests of economic significance but due to its close proximity to other cane growing countries is at risk of exotic pest incursions through either wind dispersal or movement of infested plant material. Strict biosecurity regulations and regular monitoring in Far North Queensland have so far limited this risk. However, the fall armyworm (FAW), *Spodoptera frugiperda*, was detected in 2020 in Queensland and is now established in various Australian states. FAW has so far caused no economic loss to cane but this incursion highlights the risk of future exotic Lepidopteran incursions such as sugarcane moth borers. Australia is also concerned about potential future incursions of Hemipteran vectors of pathogens. The focus of Australian research on exotic pest threats has included both on shore and offshore work (with collaborators in Asia and the Pacific) on preparedness including optimising diagnostic and detection techniques and incursion management approaches.

An overview of the SRA entomology research program and its highlights in relation to endemic and exotic pests and their sustainable management will be provided.

- **From Augmentative Biological Control to Conservation Efforts in Colombia.** Germán Vargas, Centro de Investigación de la Caña de Azúcar de Colombia, Cali, Colombia

Abstract: The sugarcane stem borers, *Diatraea* spp., are considered the most important pests in sugarcane in Colombia and management is achieved by releasing egg and larva parasitoids. In general, *Diatraea saccharalis*, is the species with the widest distribution in the Western Hemisphere and can be found infesting sugarcane from the U.S. to Argentina. In Colombia, the main species in sugarcane are *D. saccharalis*, distributed all over the country; *D. indigenella*, recorded in western regions, *D. busckella*, found all over the country; *D. lineolata*, recorded in the departments of Tolima, Magdalena, Valle and Choco; and *D. tabernella*, registered in western areas of Colombia and relatively recently in the Cauca River Valley (CRV).

In many sugarcane growing areas in the neotropics, the main component for pest management has been biological control since the introduction of *Lixophaga diatraeae* from Cuba to Louisiana in 1915, which, even though unsuccessful, was followed by several successful examples in other countries in the region. In Colombia, there have been efforts towards the biological control of *Diatraea* spp.

since the early 1970s. *Trichogramma* spp. were the first parasitoids to be released, followed by releases of *Cotesia flavipes* that did not show adaptation to the conditions of the CRV and by the importation several tachinid flies. Some parasitoids showed interesting results whereas others never adapted to the Colombian conditions and particularly to the CRV, which is the most industrialized sugarcane growing area of the country. After the 1980s and up to this date, the study of losses under the CRV conditions, population dynamics, sampling procedures, and alternative methods of control has contributed to the development of a biological control program that has allowed to respond to unexpected population changes and to keep *Diatraea* spp. at population levels minimizing their economic impact.

This presentation will provide an overview of sugarcane stem borer ecology under the conditions of the CRV in Colombia and discuss the experiences accumulated over four decades of implementing augmentation biological control as the main tool of IPM. This presentation will also discuss possible future actions to face climate change and changes in production practices while promoting conservation biological control. In this regard, the behaviour of the wild larval parasitoid of sugarcane borers in Colombia, *Genea jaynesi,* was observed under manipulation of broadleaf flowering weeds growing on field edges. It was found that conservation of broadleaf flowering plants was associated with higher abundance of *G. jaynesi* adults. In addition, field collections of *Diatraea* spp. larvae across the CRV between 2015 and 2019 revealed that 50% of all parasitized individuals of the four borer species (*D. saccharalis, D. indigenella, D. busckella* and *D. tabernella*) were attacked by *G. jaynesi*; indicating its importance and prevalence in the natural regulation of these pests. A series of concerted efforts have been implemented to demonstrate to sugarcane growers the advantages of maintaining plant shelters, hedge rows, and areas of preservation as source of food for natural enemies and conserving associated fauna to promote conservation biological control as an alternative to augmentation biological control for a more environmentally friendly sugarcane production system.

- **A Novel Approach to the Sterile Insect Technique for *Eldana saccharina* Management in South Africa.** Lawrence Malinga, South African Sugarcane Research Institute, Mount Edgecombe, South Africa

Abstract: In South Africa, the stalk borer *Eldana saccharina* (eldana) is an indigenous pest that significantly reduces sugarcane yield. Severe economic losses due to eldana in the South African sugarcane industry are estimated at approximately US$60 million annually. Researchers at the South African Sugarcane Research Institute (SASRI) have conducted research over many years

to develop tools to enable sugarcane growers to sustainably manage this pest according to integrated pest management principles, with the sterile insect technique (SIT) being one of these tools.

SIT is a species-specific and environmentally benign method of insect control that depends on the release of sterile insects. The success of the SIT programme around the world can be ascribed to the fact that it has been based on an understanding of the developmental stages, behaviour, and population dynamics of the target species. Before embarking on area-wide integrated pest management programmes involving suppression of insect pests using SIT, consideration of the technical and economic feasibility of the approach is essential.

The SIT is commonly implemented by releasing partially sterile male insects into the wild. These partially sterile males then compete with wild males for mating with the wild females. After mating, the wild females that mated with the sterile male will produce some fertilized F1 eggs. F1 generation adults in the field are then sterile, and this is known as F1-inherited sterility. This will result in the eradication, reduction, containment, or prevention of the targeted pest population. Irradiation of the insects is done using gamma-ray or x-ray that irradiates the insects' reproductive cells.

SASRI has been involved in the rearing of eldana since the 1970s, and for nearly two decades, the institute has been conducting SIT research on eldana control. Due to the unavailability of a nearby irradiation facility, SASRI is pioneering a novel approach to SIT. Instead of irradiating moths and releasing these directly, as in traditional SIT, the first-generation offspring are mass-reared and released. Significant progress has been made in understanding the factors and variables affecting the quality and the field performance of released moths. Valuable lessons learned from the preliminary SIT research have revealed that: (i) male moths irradiated at the dose of 200 Gy are as sexually competitive as wild males; (ii) the F1 population has a desirable male bias and greater 'fitness' than its irradiated parent; (iii) long-distance transportation for irradiation has no impact on pupal emergence; and (iv) weekly release of sterile F1 male moths in controlled cages reduces eldana populations and their damage to sugarcane. With a successful proof of concept, the SIT programme has the potential to be a viable control measure for eldana in sugarcane production.

- **Bt Sugarcane in Brazil: Development, Efficacy Evaluation, Commercial Implementation, and Future Perspectives.** Caroline Sakuno, Centro de Tecnologia Canavieira, Piracicaba, São Paulo, Brazil

Abstract: Sugarcane is cultivated on about 26 million ha in more than 100 countries worldwide and Brazil is the largest producer of sugarcane, with a projected contribution of 37% to the world's production by 2028. The production of this crop has increased in recent decades and consequently, losses from attacks by the sugarcane borer, *Diatraea saccharalis*, the main pest of the crop, have also increased. In 2017, the Center of Sugarcane Technology (Centro de Tecnologia Canavieira [CTC], Piracicaba, São Paulo, Brazil) released commercially the first genetically modified (GM) sugarcane variety in Brazil. This variety, CTC20BT, produces the Cry1Ab protein for the control of *D. saccharalis*. The commercial process to develop a GM crop has been broadly established through the last decades after the first GM crop approval in 1994. This process has continuously evolved to adapt to technological advances, such as genome editing tools. A commercial pipeline to develop a GM crop includes five phases: I) gene discovery: prospect and evaluate candidate genes for desirable traits, II) proof of concept: vector design, crop transformation and transgene tests for agronomic features and efficacy (greenhouse and field), III) early development: commercially transformation and selection of events with the desirable trait and equivalent of superior characteristics as the conventional crop variety, IV) advanced development: risk assessment studies and dossier preparation and V) pre-launch: regulatory submission, product development, and pre-marketing.

Since the first release, four sugarcane varieties have been approved commercially. To confirm the efficacy of this material, we conducted evaluations under field and greenhouse conditions using natural and artificial infestations with *D. saccharalis*, which showed evidence of control of the borer. In addition, bioassays with fresh leaf tissues and 25-fold dilution bioassays were performed in the laboratory throughout the crop cycle. Molecular mechanisms involved in cry resistant plants were accessed by global expression analysis (RNAseq) indicating differentially expressed pathways involved in the induction of proteins related to insect defence. Assessment of environmental effects of Bt sugarcane by analysis of soil microbial communities showed that the use of GM plants did not affect the structure and diversity of these communities, further emphasizing the biosafety of Bt sugarcane. These proof-of-concept studies allowed the assessment of efficiency in embryogenesis and plant regeneration, transformation efficiency, control efficiency and recovery of events, and performance relative to conventional sugarcanes indicating the reliability of Bt technology for this crop. Lessons from the use of other Bt crops have provided clear evidence that implementing an effective insect resistance management (IRM) strategy is the key to delaying the evolution of resistance. Therefore, since the commercial launch, monitoring has been conducted using sentinel plots and F2 screen to detect resistant genotypes in field insect populations. In addition to the frequent monitoring of commercial technologies, efforts are currently focused on the

launch of new varieties with new modes of action, resistance to other pest complexes, and tolerance to herbicides. Thus, the result of these technologies is a lower production cost compared to conventional sugarcane, meeting the industry's demand for higher quality and yield.

The facilitators are:
Julien Beuzelin (University of Florida, USA), Cecilia Easdale (Ledesma, Argentina), and Nichanun Kernasa (Kasetsart University, Thailand).

- **Discussion**
- **Q&A Session**
- **Conclusion**

Language
The Webinar will be conducted in English.

Further information
For further information, please contact Julien Beuzelin at jbeuzelin@ufl.edu or the ISSCT Secretariat at issct@intnet.mu

Please click here for short biodata on the presenters

ISSCT XXXI Congress

The preparations for the ISSCT XXXI Congress which will be held from 20 to 23 February 2023 in Hyderabad, India are proceeding well. The website which has been in operation since early July, may be through the following link: https://issctcongressindia2023.in/

The website contains all relevant information on Registration for Congress, Pre and Post Congress Tours, Social Programme, Trade Exhibition and other aspects.

ISSCT XXXI Congress Newsletter 1

As previously mentioned, the Congress Newsletter 1 may be accessed through the following link.
https://issct.org/2022/04/18/issct-xxxi-congress-newsletter-1/

It contains detailed information on the Congress itself and the related activities i.e. Pre and Post Congress Tours, Social and Cultural events, Accompanying Persons'

Programme, Trade Exhibition, Hotel Accommodation, Visa, Call for Papers and Posters, Registration Fee and the composition of the various committees that have been set up to organize and manage the Congress.

ISSCT XXXII "Centennial" Congress

The organisation of the ISSCT XXXII "Centennial" Congress has been discussed at the level of the Executive Committee and TPC during two meetings held on 21 June and 26 July 2022. Two working groups have been set to consider various aspects of this important event and have submitted their reports which were examined during the second meeting. It is to be recalled that the ISSCT was created in Hawaii in 1924. No date has yet been fixed for the Congress, but the Affiliated Societies have been encouraged to make bids for the hosting of the event. The deadline for receipt of bids is 20 January 2023 as per ISSCT Constitution. Further communications will be made to members in the forthcoming issues of the Bulletin.

Sugar Cane News

Raízen And ASR Group Partner To Create World's First Sustainable And Fully Traceable Supply Chain, With Non-GM Raw Cane Sugar Backed By Independent Certification

	Supply Chain Market	**August 3, 2022**	**https://www.supplychainmarket.com/doc/raizen-and-asr-group-partner-to-create-worlds-first-cane-sugar-backed-by-independent-certification-0001**
	Raízen, the world's largest sugar exporting company, and ASR Group, the world's largest refiner and marketer of cane sugar, announce a partnership that sets the standard for sustainable raw cane sugar supply chains globally. The unprecedented multi-year agreement between the partners creates the world's first fully physically traceable and 100 percent non-genetically modified (non-GM) certified supply chain. The partnership stretches from Raízen's sustainably certified sugarcane farms and bioenergy parks in Center-South Brazil, all the way to supporting the well-loved brands that make up ASR Group's cane sugar consumer products in North America and Europe.		

Bonsucro to launch digital learning web app with the International Finance Corporation

	Bonsucro	**June 30, 2022**	**https://bonsucro.com/bonsucro-to-launch-digital-learning-web-app-with-the-international-finance-corporation/**
	Bonsucro has partnered with the International Finance Corporation (IFC) to create a digital learning tool to engage with smallholder farmers in India in order to develop their capacities on the Bonsucro Production Standard for Smallholder Farmers. *The digital tool will take the form of a web-based app, hosted on our website www.bonsucro.com. The app will also be accessible through smartphones and tablets. This resource will provide digital tools and training content on the Bonsucro Production Standard for Smallholder Farmers and Calculator, including topics around sustainable farm management and efficiency.* *The app will be available for free in both English and Hindi, and will be accessible on-demand for smallholder farmers to use at their own convenience.*		

Why French firm Tereos is investing in Brazilian biogas [Brazil]

	BN Americas	**July 27, 2022**	**https://www.bnamericas.com/en/interviews/why-french-firm-tereos-is-investing-in-brazilian-biogas**
	Sugar and alcohol producer Tereos has partnered with Lemon Energia – a marketplace that connects sustainable energy generators to small and medium-sized businesses – to supply electricity generated from biogas to firms in Brazil.		

	The energy will come from the production of the French company's pilot biogas plant, located at its Cruz Alta industrial unit in Olímpia, São Paulo state. *In this process, vinasse, a waste product from production of ethanol from sugarcane, is digested by bacteria, generating biogas.*

80th Annual Convocation of Sugar Technologist's Association of India Concludes in Goa [India]

KRISHI JAGRAN	**Krishi Jagran**	**July 30, 2022**	**https://krishijagran.com/news/80th-annual-convocation-of-sugar-technologist-s-association-of-india-concludes-in-goa/**
	On the 28th & 29th of July 2022, the 80th Annual Convocation of The Sugar Technologists Association of India was held at Dr. Shyama Prasad Mukherjee Indoor Stadium in Goa. Sadhvi Niranjan Jyoti, Minister of State, Ministry of Consumer Affairs, Food and Public Distribution, and Rural Development, praised the sugar industry's efforts in carrying forward the Government of India's policies, which resulted in the targeted 10% ethanol blend in petrol. *Sudhanshu Pandey, Secretary (Food & Public Distribution), Government of India, suggested that the Indian Sugar Industry develop a product portfolio in order to capitalize on the potential of the entire sugarcane value chain. Many other value-added products can be made from sugar industry by-products, and the industry must work on new technologies to develop them in the future in order to generate more revenue streams and reduce reliance on sugar revenues. We need to develop a "Self-Sustainable" model to meet the captive sugar requirement while also meeting the ethanol requirements for 20 percent blending, he said.*		

PTPN trials soybean-sugarcane intercropping in East Java – [Indonesia]

The JP	**The Jakarta Post**	**July 13, 2022**	**https://www.thejakartapost.com/indonesia/2022/07/31/ptpn-trials-soybean-sugarcane-intercropping-in-east-java.html**
	State-owned plantation-firm PT Perkebunan Nusantara (PTPN) and Yogyakarta-based Gadjah Mada University (UGM) have started a trial intercrop soybean and sugarcane in East Java. PTPN III production-and-development director Mahmudi said that trials are being done at a 20-hectare planting area in Lampung with the Bogor Institute of Agriculture (IPB) and a total of 30 hectares in East Java with UGM. "We're looking for the maximum productivity with minimum cost," Mahmudi said at one of the planting fields owned by Jatiroto sugar company in Lumajang, East Java, on Tuesday.		

Dangote Championing Sugar Industrialisation Through Massive Capacity Expansion Drive [Nigeria]

LEADERSHIP	**Leadership**	**August 1, 2022**	**https://leadership.ng/dangote-championing-sugar-industrialisation-through-massive-capacity-expansion-drive/**
	Achieving Nigeria's sugar sufficiency has been one of the cardinal priorities of the federal government since the introduction of the National Sugar Master Plan (NSMP) in 2008. Dangote		

	Sugar Refinery has committed itself to driving this master plan by massively increasing its production capacity with Savannah and Nasarawa Sugar Companies,. *There is no doubt that the National Sugar Master Plan (NSMP) road map requires strategic implementation especially in partnership with the private sector to drive the suger self-sufficiency in Nigeria as it is expected that strict compliance to the NSMP can save the country from spending about $700 million in foreign exchange.*

Government to distribute free Sugarcane seedlings [Tanzania]

THE CITIZEN	**The Citizen**	**July 19, 2022**	**https://www.thecitizen.co.tz/tanzania/news/national/government-to-distribute-free-sugarcane-seedlings-3885086**
	The government is set to spend Sh1.8 billion annually on sugarcane seedling in its ambitious plan for the free distribution of high yielding varieties. *This was revealed on Monday, July 18, by the Agriculture minister Hussein Bashe during his tour in Kilosa District where he met with sugarcane stakeholders in response to the country's move to revolutionise the value chain of sugarcane production, to meet country's sugar demand.* *"In alignment with the Kilombero Sugar Company expansion project, which will see a threefold increase in cane supply from small-scale growers, from the current 600,000 tonnes to 1.7 million tones. So, you need to be ready to meet your share," Mr Bashe said.*		

USDA Proposes Rule To Classify Sugarcane as a Bioengineered Food [USA]

THE NLR	**The National Law Review**	**July 1, 2022**	**https://www.natlawreview.com/article/proposed-rule-could-make-sugarcane-subject-to-same-national-bioengineered-food**
	Proposed Rule Could Make Sugarcane Subject to the Same National Bioengineered Food Disclosure Standard Burdens as Sugarbeet *As covered on this blog, on July 24, 2020, the Agricultural Marketing Service (AMS) of the United States Department of Agriculture (USDA) recommended the addition of a new crop, "Sugarcane (insect-resistant)," to the List of Bioengineered Foods (the List). AMS also recommended amending the existing listing for "squash (summer)" to "squash (summer, virus-resistant)," and sought information about bioengineered (BE) versions of cowpea and rice. As of January 1, 2022, the date when all regulated entities were required to comply with the National Bioengineered Food Disclosure Standard (NBFDS; discussed here), the use of a listed food or ingredient produced from an item on the List would require a BE food disclosure unless a regulated entity has records demonstrating that the food or ingredient they are using is not BE. When a crop is not on the List (as is currently the case for sugarcane), a BE disclosure is required only if the entity has actual knowledge that a food or food ingredient that it uses is BE.*		

Latest Research

Diversification of Sugar Crops for Value Addition

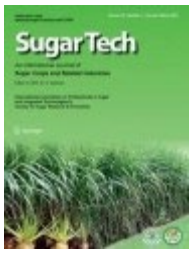
Sugarcane and sugar crops (sugar beet, sweet sorghum, palms, stevia) are rich source of food (sucrose, jaggery and syrups), fiber (cellulose), fodder (green leaves and tops of cane plant and beet roots, bagasse, molasses, pulp and press mud), fuel and chemicals (bagasse, molasses, syrup and juice and alcohol). It is now an established fact that sweeteners from sugar crops are undoubtedly the most paying proposition for economic sustainability; it is better to produce value-added products by diversification and utilizing the by-products of the sugar crops and sugar industry. Sugarcane and sugar crops are highly efficient in converting solar energy into chemical energy and have unique ability to synthesize a large number of useful compounds and store them. These chemicals include sucrose, glucose, fructose, complex polysaccharides, wax, vitamins, polyphenols, etc., which could be extracted commercially and may be used in food and wellness industry.

Recent researches in green chemistry has led to transform sugarcane and sugar crops biomass and carbohydrates into the basic chemical ingredients that go into many everyday products. All biomass from sugar crops are potential feedstocks for bio-based industries. The cogeneration of bioelectricity from bagasse and trash is now a reality in many countries and, due to the high carbon content of bagasse and leaves, can also be converted into value-added products such as biochar. Sugar crops are superior feedstocks for the production of chemicals for the manufacture of a range of value-added products which have large-scale application in agriculture and industry. Among sugarcane-based products such as raw sugar, white sugar, refined sugar and sugar with molasses, these sugars are renewable feedstock for the production of platform chemicals for the manufacture of a range of end-products, e.g., bioplastics, industrial solvents, and chemicals. Cellulosic by-products like bagasse is used for the production of bleached pulp, glazed paper, typographic paper, printing paper, corrugated base-stock, copper printing paper, wrapping paper, fiber boards, furfural, binding agent, etc. Molasses-based products are ethyl alcohol, liquid carbon dioxide, dry ice, edible yeast, ribonucleic acid, nucleotides, adenosine triphosphate, cytidine triphosphate, polyinosinate polycytidylate, fuel oil, etc. Other economically important products that can be produced from sugars are succinic acid, sorbitol, xylitol, glutamic acid, itaconic acid, levulinic acid and hydroxymethylfurfural. Commercial production of platform chemicals has received considerable attention in recent years in view of industry sustainability and green chemistry. The diversification in the sugar agro-industry value chain will be an important strategy for the competitiveness, profitability and sustainability.

Published August 2022

> **Link**

Valorization of Sugar Industry's By-products: A Perspective



The worldwide expansion in energy and resource use has resulted in a number of unsustainable innovations, necessitating the development of resource sustainability and a reduction in energy usage. Valorization of industrial waste is centred on reducing the amount of pollutants in the environment as well as increasing the revenue generated by industries. Sugarcane processing generates large amount of by-products, namely cane trash, bagasse, molasses and press mud which can be valorized into various value-added products. In this paper, the authors reviewed the variety of applications of sugar industry by-products that has been physically and chemically transformed. It also observed that the technology for producing power from the by-products has advanced, while the manufacture of value-added chemicals has not. The key technological challenges in this area are downstream separation and purification. The difficulties in putting these waste valorization methods in place are also discussed. The amount of investigation and implementation of various solutions varies a lot. In order to translate research findings into commercial products, both business participation and government encouragement are essential. Economic and technological constraints must be recognized for effective commercialization. Some interesting areas were also highlighted which can become the basis for further investigations and could act as guidance for further research in this domain.

Journal published: August 2022, article available now

> **Link**

Evaluation of Saccharomyces cerevisiae modified via CRISPR/Cas9 as a cellulosic platform microorganism in simultaneously saccharification and fermentation processes

The nonrenewable character and deleterious effects of fossil fuels foster the need for cleaner and more inexhaustible energy sources, such as bioethanol. Especially from lignocellulosic biomasses. However, the economic viability of this product in the market depends on process optimization and cost reduction. This research applied a sequential experimental project to investigate the process of enzymatic saccharification and simultaneous fermentation to produce ethanol with sugarcane bagasse. The differential of the work was the application of the strain of Saccharomyces cerevisiae AGY001 which was improved by evolutionary engineering to become thermotolerant and by a heterologous expression based on genomic integration by CRISPR/Cas9 to produce endoglucanase and β-glucosidase (AsENDO-AsBGL). The maximum ethanol yield found was 89% of the maximum theoretical yield (released sugars), obtained at temperature concentrations, sugarcane bagasse and inoculum at 40 °C, 16.5%, and 4.0 g/L, respectively (12.5 FPU/g bagasse). The mathematical model obtained can predict approximately 83% of the data set with 95% confidence. Therefore, these findings demonstrated the potential of sugarcane bagasse and S. cerevisiae AGY001 strain (CRISPR/Cas9 modified) in bioethanol production without the need for impractical selection media on an industrial scale, in addition to providing useful insights for the development of SSF processes.

Published August 6, 2022

> **Link**

Pyrolysis of Sugarcane (Saccharum officinarum L.) Leaves and Characterization of Products

The finite nature, regional availability, and environmental problems associated with the use of fossil fuels have forced all countries of the world to look for renewable eco-friendly alternatives. Agricultural waste biomasses, generated through the cultivation of cereal and noncereal crops, are being considered renewable and viable alternatives to fossil fuels. In view of this, there has been a global spurt in research efforts for using abundantly available agricultural wastes as feedstocks for obtaining energy and value-added products through biochemical and thermal conversion routes. In the present work, the thermochemical characteristics and thermal degradation behavior of sugarcane leaves (SCL) and tops were studied. The batch pyrolysis was carried out in a fixed-bed tubular reactor to obtain biochar, bio-oil, and pyrolytic gas. Effects of bed height (4–16 cm), particle size (0.180–0.710 mm), heating rate (15–30 °C/min), and temperature (350–650 °C) were investigated. The maximum yields of bio-oil (44.7%), biogas (36.67%), and biochar (36.82%) were obtained at 550, 650, and 350 °C, respectively, for a 16 cm deep bed of particles of size 0.18–0.30 mm at the heating rate of 25 °C/min. The composition of bio-oil was analyzed using Fourier transform infrared spectroscopy (FTIR), proton nuclear magnetic resonance (1H NMR), and gas chromatography–mass spectrometry (GC–MS) techniques. Several aliphatic, aromatic, phenolic, ketonic, and other acidic compounds were found in the bio-oil. The biochar had a highly porous structure and several micronutrients, making it useful as a soil conditioner. In the middle temperature ranges, biogas had more methane and CO and less hydrogen, but at higher temperatures, hydrogen was predominant.

Published August 5, 2022

> **Link**

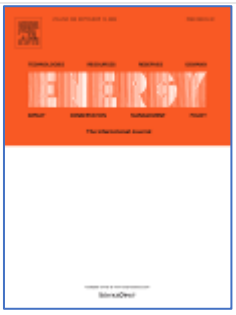
Prediction Of Morpho-Physiological Traits In Sugarcane Using Aerial Imagery And Machine Learning

Changes in morpho-physiological traits are important for biotic or abiotic stresses in sugarcane (Saccharum spp. interspecific hybrids). Ground measurements of such traits are labor-intensive and time-consuming. Therefore, predicting them using aerial imagery can be important for detecting stress and timely management. In this study, ground data and aerial imagery were collected from plant cane and first ratoon (two site-years) field trials of the last stage (Stage IV) of the Canal Point sugarcane cultivar development program in Florida. There were multiple genotypes (12 plant cane: 9 first ratoon) with six replications in each trial. Data were collected on soil plant analysis development (SPAD), leaf area index (LAI), plant height, normalized difference vegetation index (NDVI), and number of millable stalks per hectare. Aerial imageries were collected using a hyperspectral sensor, and ground data using handheld sensors and manual readings on multiple dates (April, July, and September) to determine the best timing in morpho-physiological trait prediction. The gradient boosting regression tree was selected as the best prediction model. The mean absolute percentage error (MAPE) was utilized to determine the model's prediction accuracy. Results showed that SPAD was predicted with higher accuracy (89%) compared to other traits. July was observed as the best time for predicting most of the morpho-physiological traits in plant cane and first ratoon. Furthermore, the NDVI values collected by GreenSeeker and UAV imaging were compared using the Bland-Altman degree of agreement, and it was found that the mean difference of NDVI values between the two sensing systems was low (0.09).

Journal published August 6. 2022

> **Link**

Brazilian sugar cane industry – A survey on future improvements in the process energy management



The Brazilian Energy Matrix is characterised by the presence of Renewables, whose participation reached 46.1% in 2019, equivalent to 133.8 Mtoe, of which 18.0% represented the sugarcane biomass share, 12.4% the hydraulic, 8.7% the wood and charcoal, and 7.0% corresponded to other renewables. The sugarcane industry produces sugar, ethanol, and electricity as main products and, considering the total primary energy produced, 52.861 Mtoe comes from sugarcane products (BEN, 2020). Another aspect of this industry is that it is energy self-sufficient, that being so, the energy used in the production process is also produced (from bagasse) in the same process. The aforementioned data show the significance of the sugarcane industry for the country and being this an energy industry, there is no doubt that the energy management holds importance to its industrial process. The present work will address different alternatives to improve the industrial process of sugarcane, aiming at optimising the energy management. Among the proposals to be presented, the following can be mentioned: increasing of electric energy in cogeneration, thermal integration of process streams using the Pinch Point method, second-generation ethanol production, water use in the process, integration with biodiesel production, vinasse disposition aiming at increasing energy production and reducing pollution. The main objective is to identify each proposal's influence on and contribution to the improvement of the performance and efficiency in the production process from sugarcane.

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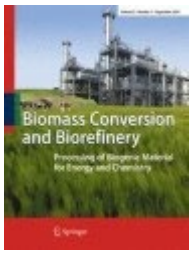
> **Link**

Commercialization of 2G bioethanol as a transportation fuel for the sustainable energy, environment, and economic growth of India: theoretical and empirical assessment of bioethanol potential from agriculture crop residues



Determination of structural carbohydrates content of a lignocellulosic biomass is a preliminary step for the predictive analysis of its bioethanol potential. In this study, the annual agriculture crop residues like rice straw, wheat straw, corn stover, and sugarcane bagasse have been selected as lignocellulosic biomass, which contains about 59.6–61.4% structural carbohydrates. Based on the stoichiometry of glucose/xylose/arabinose, theoretical bioethanol yield is accounted to be 387 L/dry tons of lignocellulosic biomass. Moreover, empirical mode of bioethanol potential of selected agriculture crop residues has been evaluated by considering the biochemical conversion process developed by National Renewable Energy Laboratory (NREL). The process includes deacetylation, acid impregnation, pretreatment, enzymatic hydrolysis and fermentation. NREL performed pilot scale demonstrations runs and evaluated bioethanol yield per dry ton of lignocellulosic biomass. Moreover, NREL estimated the minimum ethanol selling price (MESP) by a process simulation software, Aspen plus, by considering the end-to-end process which includes capital investment, feedstock handling, biochemical conversion process, coproduct credit and wastewater treatment. Therefore, a pilot scale study of NREL has been opted for the empirical estimation of bioethanol potential of selected lignocellulosic biomass. As a result, about 295 L of bioethanol can be produced per dry ton of lignocellulosic biomass with a MESP of 0.56 US$/L.

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> **Link**

Effects of Large Scale Mechanized Sugarcane Harvesting Mode on Soil Physical Properties of Sugarcane Fields and Ratoon Sugarcane Yield

The present study aims to clarify the effects of the mechanical harvesting on the soil physical properties of sugarcane fields and ratoon sugarcane yield and to eliminate sugarcane farmers' concerns about whether the large-scale mechanized harvesting system wouldl cause serious compaction of the sugarcane plough layer. Regarding the red soil slope farmland in Guangxi, two treatments of mechanical harvesting and manual harvesting were set up to determine the effects of mechanical harvesting on the physical properties of plough layer and ratoon sugarcane yield. The results showed that there was no significant difference between mechanical harvesting and manual harvesting in soil bulk density, penetration resistance, shear strength, field moisture capacity and total porosity in the ridge of 0-40 cm layer. In the furrow of 0-20 cm layer, soil compaction, penetration resistance and shear strength significantly increased after mechanical harvesting, while the total porosity and aeration porosity decreased. Compared with manual harvesting, in the process of mechanical harvesting, the walking of the machine compacted the furrow soil, but had no significant impact on the plough layer of the ridge where the sugarcane grows. The soil compaction of the ridge surface had two obviously alternating layers along the vertical gradient, 0-20 cm layer was more compacted by manual harvesting, and 20-40 cm layer was more compacted by mechanical harvesting. The ratoon sugarcane yield after manual harvesting was higher than that after mechanical harvesting in the first year ratoon and the second year ratoon, but the difference was not significant. It also showed that under the permanent raised bed technology, the sugarcane mechanical harvesting has no significant effect on the soil physical properties of the ridge soil and the yield of ratoon sugarcane. The research would provide a scientific basis for standardizing sugarcane harvesting operations and reducing soil compaction of sugarcane field by large-scale machinery.

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> Link

Techno-economic evaluation of second-generation ethanol from sugarcane bagasse: Commercial versus on-site produced enzymes and use of the xylose liquor

Sugarcane streak mosaic virus (SCSMV) is a major pathogen of sugarcane mosaic disease. P1 protein encoded by SCSMV is an RNA silencing suppressor, which plays a key role in suppressing the host's RNA silencing defense. However, its mechanism is not yet clear. Interaction with host proteins is one of the main pathways for RNA silencing suppressors to exert the suppression functions. Therefore, identifying host proteins that interact with viral RNA silencing suppressors is an important method to study the mechanism of suppressors. In order to explore the mechanism of SCSMV P1 suppressing the host RNA silencing, in this study, SCSMV P1 was ligated to the plasmid pGBKT7 to construct the bait plasmid pGBKT7-P1, then pGBKT7-P1 was tested for toxicity and self-activation, and finally pGBKT7- P1 was used as a bait to screen the host proteins that interact with P1 from the sugarcane cDNA library by yeast two-hybrid technology. The results showed that the bait plasmid pGBKT7-P1 was successfully constructed. After the pGBKT7-P1 bait plasmid was transferred into the Y2H Gold yeast strain, the yeast strain grew well in the SD/-Trp plate and liquid medium, indicating that the pGBKT7-P1 bait plasmid was non-toxic to the Y2H Gold yeast strain. The yeast strain containing the pGBKT7-P1 bait plasmid grew white rather than blue colonies on the SD/-Trp/X-α-Gal plate, and did not grow on the SD/-Trp/X-α-Gal/AbA and SD/-Trp/-Leu/X-α-Gal/AbA plates, indicating that the pGBKT7-P1 bait plasmid had no self-activation activity. The

sugarcane cDNA library was screened with pGBKT7-P1 bait plasmid. After screening on SD/-Trp/-Leu/X-α-Gal/AbA plate once and SD/-Trp/-Leu/-His/-Ade/X-α-Gal/AbA plate three times, 42 positive yeast clones were obtained. The positive yeast plasmids were extracted and introduced into Escherichia coli for amplification. After sequencing and blastx comparison analysis, a total of 13 host sugarcane proteins that may interact with SCSMV P1 were obtained, namely auxin-responsive proteins IAA1, IAA15, transcription factors NAC, GATA4, OFP4, eukaryotic translation initiation factor eIF5A, chaperone DnaJ, co-chaperone SBA1, heavy metal-associated isoprenylated plant protein HIPP35, suppressor of mec-8 and unc-52 protein homolog SMU2, outer envelope pore protein OEP24, and two uncharacterized proteins. Based on the functions of the proteins, it was speculated that P1 may interact with host proteins to regulate the expression of host defense response-related genes, and/or interact with host proteins to affect the synthesis, processing, or transport of host RNA silencing-related proteins, thereby exerting the RNA silencing suppressor function of P1. The research results would lay an important foundation for the subsequent in-depth analysis of the RNA silencing suppression mechanism of P1.

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> **Link**

Pathway to a land-neutral expansion of Brazilian renewable fuel production

nature communications

Biofuels are currently the only available bulk renewable fuel. They have, however, limited expansion potential due to high land requirements and associated risks for biodiversity, food security, and land conflicts. We therefore propose to increase output from ethanol refineries in a land-neutral methanol pathway: surplus CO2-streams from fermentation are combined with H2 from renewably powered electrolysis to synthesize methanol. We illustrate this pathway with the Brazilian sugarcane ethanol industry using a spatio-temporal model. The fuel output of existing ethanol generation facilities can be increased by 43%–49% or ~100 TWh without using additional land. This amount is sufficient to cover projected growth in Brazilian biofuel demand in 2030. We identify a trade-off between renewable energy generation technologies: wind power requires the least amount of land whereas a mix of wind and solar costs the least. In the cheapest scenario, green methanol is competitive to fossil methanol at an average carbon price of 95€ tCO2-1.

Preprint published: June 7, 2022

> **Link**

Events

SASTA	**94th SASTA Congress 2022** *SASTA – South African Sugar Technologists' Association* **16-18 August 2022** **ICC, Durban, 45 Bram Fischer Rd, Durban, 4001 South Africa** > **Link**
FENASUCRO & AGROCANA ENERGIA QUE MOVE O FUTURO	**28ª Feira Internacional da Bioenergia** *Fenasucro & Agrocana* **16-19 August 2022**

	Centro de Eventos Zanini, Sertãozinho, Brazil > **Link**
3rd Edition Sugarex THAILAND 2022 In Conjunction with the 8th edition World Sugar Expo	**SugarEx Thailand 2022** *Tecnicaña* **8 - 9 September 2022** **KICE, Khonkaen, Thailand** > **Link**
XII CONGRESO Tecnicaña EVOLUCIÓN DE LA AGROINDUSTRIA DIGITAL DIVERSIFICADA SOSTENIBLE	**XII Congreso Tecnicaña (XII Tecnicaña Congress)** *Tecnicaña* **12-16 September 2022** *At Tecnicaña we are preparing to share a unique international scenario with the Sugarcane Agroindustrial Sector, for this reason, we invite you to participate in this great meeting that will allow us to have the opportunity to meet again around sugarcane to discuss and reflect on the future and projections of the agribusiness.* **Cali, Valle del Cauca, Colombia** > **Link**
Sugar & Ethanol Asia	**Sugar & Ethanol Asia** *Informa Connect* **20-22 September 2022** *Join the 15th anniversary of Sugar & World Asia in person this September! Meet sugar millers and ethanol producers from across the Asia-Pacific including Thailand, India, Pakistan, Philippines and Indonesia.* **Sheraton Grande Sukhumvit Hotel, Bangkok, Thailand** > **Link**
SUGARCON-2022 Lucknow - India 7th IAPSIT International Sugar Conference IAPSIT	**7th IAPSIT International Sugar Conference & Sugarcon-2022** ***"Sustainability of the Sugar and Integrated Industries: Issues & Initiatives"*** *Indian Institute of Sugarcane Research* ~~**16-19 February 2022**~~ **Postponed to 16-19 October 2022** **Lucknow, India & virtual platform (for international delegates)** > **Link**

BONSUCRO GLOBAL WEEK Brazil 17-20 October 2022	**Bonsucro Global Week** *Bonsucro* **17-20 October 2022** **Ribeirão Preto, Brazil** > **Link**
25TH ANNIVERSARY World Ethanol & Biofuels	**25th World Ethanol & Biofuels** *Informa Connect* **8-10 November 2022** **Steigenberger Wiltcher's Hotel, Brussels & digital** > **Link**
ISO	**31st ISO International Seminar 2022** *International Sugar Organization* **22-23 November 2022** **East Wintergarden, Canary Wharf, London, UK** > **Link**
International Society of Sugar Cane Technologists Founded 1924	**ISSCT XXXI Congress** *International Society of Sugar Cane Technologists / The Sugar Technologists' Association of India (STAI)* **February 2023** • ***Congress: 20-23 February*** • ***Pre-congress tour: 17-18 February*** • ***Post-congress tour 24-28 February*** **Hyderabad International Convention Centre (HICC), India** > **Link**