



1. The planting of drought tolerant varieties like CoC 671, VSI 434 and VSI 08005 should be undertaken in the drought prone area of Maharashtra.
2. The early planting (Pre-season planting) should be preferred (October-November) in the drought prone area.
3. Distance between two rows can be reduced upto 90 cm in the drought prone area.
4. Incorporation of sugarcane trash in soil instead of burning OR in situ decomposition with trash mulching to increase the fertility of soil, it has a major role in soil conservation, checks the weed growth, helps to minimize the impact of water stress as well as salt stress on crop.
5. The application of *Acetobacter diazotrophicus* bioinoculant @ 3 lit/ha in 500 lit of water as foliar application after 60 days of planting in morning hours.
6. To control sugarcane mealy bug or scale insects infestation in stress condition by removal of lower 2-3 dry leaves and spraying of Imidachloprid 17.8 % SL @ 300 ml/ha (0.3 ml/lit) is recommended.
7. For the management of Early shoot borer and Internode borer in stress affected sugarcane crop, the release egg parasitoid *Trichogramma chilonis* @ 3-5 lac parasitized eggs /ha in suitable instalments in the field and soil application of granular insecticide Fipronil 0.3 GR @ 25 kg/ha or Chlorantraniliprole 0.4 GR @ 22.5 kg/ha or Spraying of Chlorantraniliprole 18.5% SC @ 375 ml per ha (0.4 ml/ lit of water) is recommended.
8. Under abiotic stress condition the incidence of sugarcane diseases viz, pokkah boeng, rust, red rot, wilt, pineapple and whip smut is increasing as well as abnormalities viz., leaf scorching, drying of leaves, rotting of leaves, decaying of leaves, defoliation and banded chlorosis are also observed. To control these diseases and abnormalities the recommended prophylactic measures should be adopted for the management of sugarcane diseases and abnormalities under stress condition.

Valorizing Waste from Sugar & Allied Industries

One-day workshop entitled 'Valorizing waste from sugar & allied industries' was jointly organized by the Department of Alcohol Technology and Biofuels, VSI and UK partners at Vasantdada Sugar Institute (VSI), Manjari (BK), Pune, India on March 31, 2022 with the active participation of sugar mills and distilleries from different States across the Country.

For this workshop following eminent Delegates & Speakers viz, Mr. Jayprakash Dandegaonkar, Chairman, NFCSFL & MRSSK Sangh Ltd., In Mr. Prakash Naikaware, MD, NFCSFL, India; Mr. Sanjay Khatal, MD, MRSSK Sangh Ltd., India; Prof. V. V. Ranade, Professor Emeritus, Queen's University Belfast, UK; Prof. SV Patil, Professor Emeritus, Alcohol Tech &





Biofuels, VSI, India; Prof. Yogendra Shastri, Department of Chemical Engineering, IIT Bombay, India; Mr. Joseph Vimal, MD, J & FBioGas, Chennai, India; Mr. Gajendra Singh, Dhampur Sugar Mills Ltd., UP, India (Online); Dr. Vinod Kumar, Cranfield University, Cranfield, UK (Online); Dr. Ines Baptista, Green Fuels Research Ltd., Berkeley, UK (Online); Mr. Shivajirao Deshmukh, Director General, VSI, India; Mr. Sambhaji Kadupatil OSD, VSI, India and apart from this, total 133 participant (Sugar Mills: 79 and VSI; 54) were present and

The workshop was inaugurated and welcome address was given by Mr. Shivajirao Deshmukh. He welcomed all the guests, sugar mill representatives and VSI staff. He told that Sugar and Allied Industries has huge opportunities for utilization of sugarcane bagasse (SCB) and press mud cake (PMC) for value added products such as bio-CNG, lactic acid, bio-butanol, succinic acid, xylitol, etc. He informed that VSI has collaborated with NiraBhima SSKL for installation of two pilot scale anaerobic digesters to study various aspects and retrofit Compressed biogas (CBG) facility in existing sugar mill complex.

Introductory remarks were given by Mr. Jayprakash Dandegaonkar. He informed that India is importing 77% crude oil requirements and 50% of natural gas requirement and Government of India has set a target of reducing this import by at least 10% by 2022. He also told that India has set a target of 10% blending of fuel ethanol with petrol by 2022 and 20% blending by 2025 for ethanol blending programme. He also informed that GOI has invited expression of Interest by Oil Marketing Companies (OMCs) for production & supply of CBG under Sustainable Alternative towards Affordable Transportation (SATAT) programme. He further informed that Indian Sugar Mills generates 8-10 million tons of PMC and 100 million tons of SCB every year. He told that both PMC & SCB can be utilized for CBG production through anaerobic digestion (AD). SCB can be used to produce value added products such as bio-ethanol, bio-butanol, lactic acid, succinic acid and xylitol, etc. He emphasized that if 50 % of Sugar mills out of total 540 Sugar mills will adopt CBG technology, they will produce 3.75 lakh ton of CBG per annum with revenue of Rs. 1750 crore per annum to India and this will

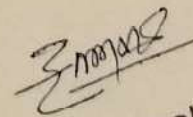
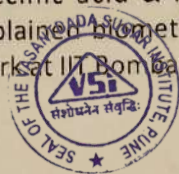
create employment opportunities. He also explained the market potential of lactic acid and succinic acid.

Technical Session-I

During the 1st technical section, Prof. VV Ranade gave a presentation on 'Valorising waste biomass via hydrodynamic cavitation and anaerobic digestion'. He briefly discussed the visions of vWa project. He told that the PMC & SCB produced from sugar & allied industries could be converted in to bio-CNG & other value added products. He specially focused on hydrodynamic cavitation pretreatment method using vortex based devices for cavitation. He also also discussed biogas improvement for spent wash digester on commercial scale using cavitation pretreatment.

The 2nd technical presentation was delivered by Prof. SV Patil on the topic entitled 'Value added products from waste biomass'. Prof. SV Patil started his presentation with the explanation of vWa project concept and the role of VSI in the project. In his talk, Prof. Patil emphasized mainly on bio-CBG and lactic acid production. He also explained about the achievement of biogas production of 480 M³ per ton of dry PMC or 120 M³ per ton of wet PMC. He also explained about the 45% enhancement of biogas production rate in case of PMC feed when the retention time was changed from 30 days to 20 days. On aspect of CBG production, Prof. Patil described 5 different types of CBG production models on Sugar Industry perspective.

The third technical presentation was delivered by Prof. Yogendra Shastri on the topic entitled 'Technologies for Sugar Industry Waste Valorization: Development and Scale-up Potential'. He explained life cycle analysis for different products (lactic acid, succinic acid, xylitol & CBG) in vWa. He mentioned regarding the techno-economic & life cycle assessment of different value added products (Rs. 215/kg lactic acid, Rs. 37/kg of CBG, Rs. 121/kg for succinic acid & Rs. 230/kg for xylitol). He also explained about methane and lactic acid purification works at IIT Bombay.



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Technical Session II

During the 2nd technical session, Mr. Gajendra Singh, Dhampur Sugar Mills Ltd., UP, India gave a presentation on '**Biomethane production: An opportunity**'. He explained the single stage anaerobic digestion with cavitation and two stage anaerobic digestion. He explained anaerobic digestion data for 1M³ and 7M³ digester. He also shown flame test for 7M³ digester. He also explained production of volatile fatty acids (acetic, propionic and butyric acids) during biogas production for two stage anaerobic digestion.

The 2nd technical presentation was delivered by Dr. Vinod Kumar on the topic entitled '**Sugarcane bagasse-based Production of Biochemicals**'. He focused on production of xylitol and succinic acid from SCB. He informed that 102.5 g/L of xylitol was produced through fed-batch fermentation from pure xylose in comparison to 86.6 g/L of xylitol from SCB xylose hydrolysate. He further informed that 36.7 g/L of succinic acid was produced from pure xylose in comparison to 28.7 g/L of succinic acid from SCB xylose hydrolysate.

The 3rd technical presentation was delivered by Dr. Ines Baptista on '**Towards biobutanol production: ABE fermentation of sugarcane bagasse hydrolysate**'.

She emphasized on biobutanol production from synthetic media and SCB hydrolysate containing both glucose and xylose.

The 4th technical presentation was delivered by Mr. Joseph Vimalon on '**CSTR Semi dry fermentation technology**'. He described in detail about pros and cons of semi-dry fermentation technology in the field of bio-digestion for various different substrates (paddy straw, press mud, cane trash, Napier grass).

The technical session I & II was coordinated by Dr. Kakasaheb Konde, Head, Professor and Technical Adviser, AT & B, VSI, India.

In the panel discussions, Mr. Shivajirao Deshmukh, Mr. Sambhaji Kadupatil, Mr. Prakash Naiknavare, Prof. Yogendra Shashtri, Mr. SD Bokhare, Prof. Vivek Ranade, Prof. SV Patil and Dr. KS Konde were present on the dias. There was lot of deliberation made on use of vWa technologies for production of value added products (bio-CNG, bio-butanol, lactic acid, succinic acid, xylitol) and their adoption in sugar and allied industries. The participants of the workshop raised many questions and doubts about the use of feed stocks released from sugar & allied industries and necessary explanation were provided by the delegates.

The programme was concluded with vote of thanks given by Mr. Sambhaji Kadupatil.



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