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Production of Corbondioxide on Different Substrete Glucose Xylose Amino Acids Casein Hydrolysate Glycerol

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Abstract

At regular intervals samples withdrawn were analysed for carbondioxide production, volatile acids, pH, OA, COD and remaining substrates (glucose, xylose, glycerol and aminonitrogen in case of amino-acids and casein hydrolysate). This experiment was done to check up individually the possible fate of these above substrates which are suspected to be present in spent wash and to find a correlation between growth, volatile acids, carbondioxide production, substrate consumption and change in pH.

Keywords: pH, OA, COD.

Introduction

Sugar industry is the second largest industry in India and there are about 325 sugar factories at present.(1) India produced a record 8.4 million tones of sugar in 2012-13. Sugar production in 2013-14 was 8.2 tones. With the increased production of sugar and corresponding increase in molasses availability, many distilleries have come up. There are about 200 distilleries in India with an annual installed capacity of 1200 million litres of alcohol. The spentwash discharge from Indian distilleries is estimated to be of the order of 2000 million litres per year.

The spentwash contains innumerable organic substances from the sugarcane juice and those formed during the processing of cane juice, molasses fermentation and distillation of the fermented broth. Quin and Marchant(7) have carried out detailed analysis of Irish malt whisky distillery effluent and found that major components were carbohydrates (6.7 to 21.2 g/l), proteins (15.1 to 31.0 g/l), free aminoacids (2.1 to 4.3 g/l), glycerol (4.5 to 7.5 g/l) and total titrable acids (4.9 to 18.9 g/l).

Material and Method

Carbondioxide production in spentwash medium followed the usuful bacterial growth pattern i.e. initial lag is followed by an exponential or log phase which was later followed by a stationary phase. Only strain III (HA 600) gave a straight line relationship for the production of CO_2 . In case of medium containing glucose, CO_2 production as percent of substrate utilized was in the range of 25.3 to 37.1 percent with a final value in the range of 1950 to 2500 mg/l and was nearly equal in all the strains. Strains I (LA 20) and VI (PLC 600) showed an initial lag while strain IV (PLCMB) and V (HB 100) showed a biphasic pattern . Here again yield of CO_2 is about half of the theoretical value expected for glucose on the basis of glycolysis followed by oxidation of pyruvate to acetate. This would suggest that about half of glucose is degraded and other half partly utilized in the synthesis of biomass and partly metabolized with the production of CO_2 or volatile acids.

CO_2 production from xylose was 28.3 to 36.1 percent (Table 01) comparable to that from glucose except in the case of Strain II (PLCMA) where it was much higher. Strain I (LA 20) IV (PLCMB), V (HB 100) and VI (PLC600) showed typical microbiological growth pattern for CO2 production, Strain II (PLCMA) produced a biphasic pattern and Strain III gave a straight line relationship.

CO_2 production from aminoacids and casein hydrolysate was rather low in the range of 1.96 to 6.81 percent except for strain II (PLCMA) which gave 12.7 and 9.6 percent respectively (Table 01). This is in agreement with the pattern of volatile acids production, further confirming that these substrates are utilized mainly for biomass Production.

With aminoacids Strain I (LA 20) produced a straight line relationship while with other Strain after an initial lag, CO2 production continued to increase further. Nearly similar data were obtained with casein hydrolysate. Strain I (LA20) gave very little CO_2 while strain II (PLCMA), III (HA 600) and V (HB 100) produced CO_2 after an initial lag. Strain IV (PLCMB) did not show any lag and strain VI (PLC 600) showed a biphasic pattern (. CO_2 production from glycerol was in the range of 7.7 to 34.5 percent of glycerol and was in the range of 7.7 to 34.5 percent of glycerol utilized with final values in the range of 800 to 3000 mg/l (Table 01). Strain I (LA 20), and VI (PLC 600) gave a biphasic pattern while lag, it increased continuously. Strain III (HA 600) and IV (PLCMB) did not show any lag and CO2 continued to increased from the beginning itself. (D.W. Tempest).

Table 01.Production of corbondioxide on different substrates (end of the paper)

Result and Discussion

It is evident from the study that compounds chosen for study viz glucose, xylose, aminoacids, casein hydrolysate and glycerol can very officiently be utilized by the bacterial strain. However, in case of glucose and xylose, volatile acids and CO_2 account for major reduction in Cod values. In the case of other compounds these two though account for a reduction in Cod values but major products are other than CO_2 and volatile acids. (Figure-1 & Table-1) The similer result found by michela marchi. et al (2018), froncielle Carvalho. et al (2018), x.ren, j .ren.et al (2012), B.

shimekit and H. mukhtar. et al (2012), M. t. Ravanchi. et al (2011). G.Xu et al (2012), A.R.Kulkarni et al (2012), A.R santal et al (2016), M.P.Woghet al (2017) Agora Energiewende and Sandbagm, (2018) Bamji Z., (2019), Crippa M, Oreggioni G, Guizzardi D. (2019)14.David W. Keith, Holmes (2018) J.G.J. Olivier and J.A.H.W. Peters (2020) also recorded

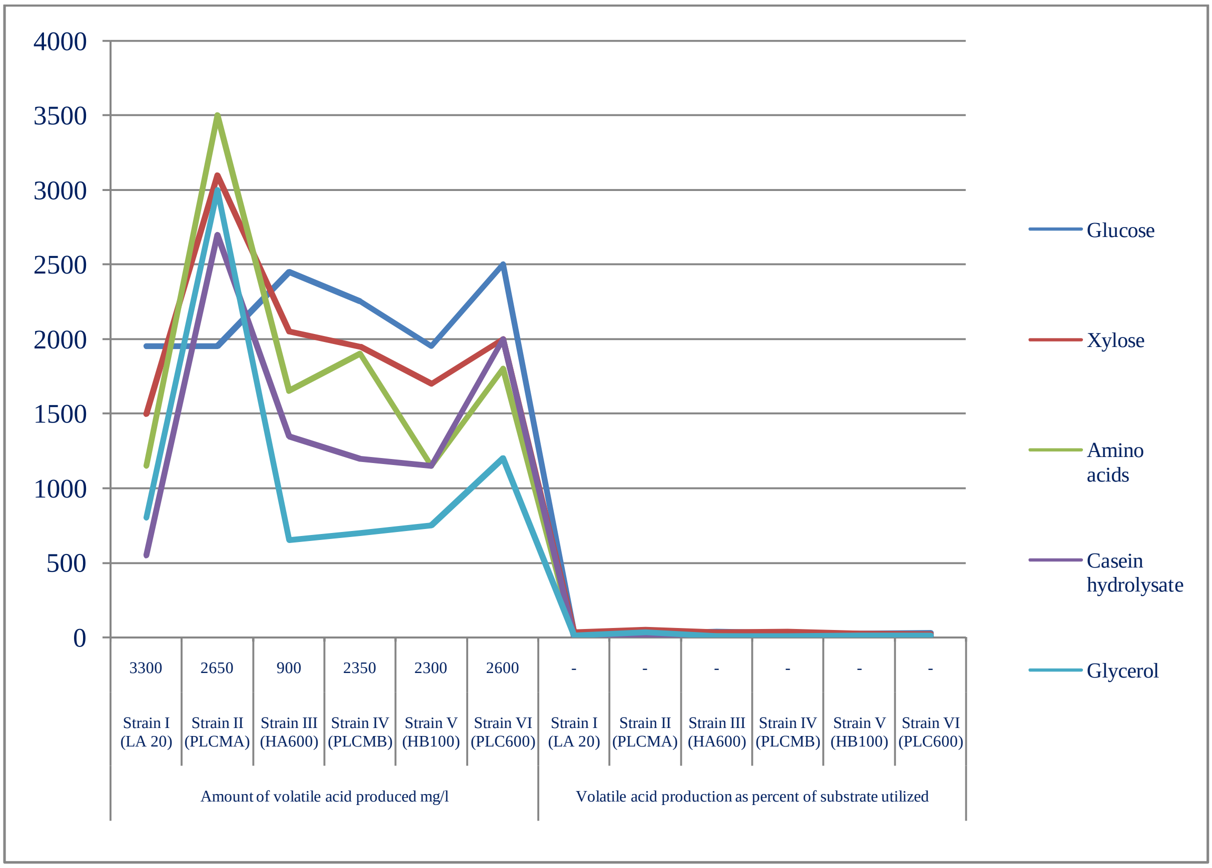

Figure 1.Production of corbondioxide on different substrates

Figure: Parentheses are Transfer Value

References

Michela Marchi, Simone Bastianoni, Elena neri(2018) CO2 recovery from wine production, Journal of co2 utilization 28:137-144, DOI:10.1016/j.jcou.2018.09.021.

Franclelle Carvalho, Fabio Teixeria F da Silva, Isabela Tagomori, (2018) CO2 capture in ethanol distilleries in Brazil March2018·International Journal of Greenhouse Gas DOI: 10.1016/ jjjggc.2018.02.018.

X. Ren, J. Ren , H.Li, S. Feng, and MDeng, 2012 “poly(amide- 6-b- ethylene oxide) multilayer composite membrane for corbon dioxide separation, “International Journal of Greenhouse gas Control, vol. 8 pp 111-120,

G.Xu, L.Li, Y.Yang, L.Tian, T.Liu, and K. Zhang, 2012 "A novel C02, cryogenic Iiquefaction, anseparation system," *Energy*, vol.42, pp.522-529.

B. Shimekitand H. Mukhtar 2012, "Natural gas purification technologies-major advance of or C02 separation and future directions, in *Advances in Natural Gas Technology*, A.M. Hanlid, Ed., pp.235-270, In Tech, China.

M.T. Ravanchi, S. Sahebdelfar, and F.T. Zangeneh, (2011) "Carbondioxidese questrationinpetro chemical industries with the aim of reduction in greenhouse gas emissions," *Frontiers of Chemical Engineering inChina*,vol.5,no. 2,pp.173-178,

A.R. Kulkarniand D.S. Sholl, (2012) "Analysis of Equilibrium-Based TSA Processes for Direct Capture of C02 from Air, "*Industrial & Engineering Cbe1nistJy Research*, vol.51, pp. 8631-8645,

A.R santal, n. p singh, B.S Sharma, (2016) A novel application of paracoccus pantotrophus for the decolourrization of melanoidins from distillery effluent under static condition . J.environ manage . 169 78-83.

M.P Wagh , P .D Nimande (2017)an influence of experimental parameters in the treatment of anaerobically treated distillery spent wash by using ozone assited electroco a gelation , desal wat. Treat 83 07- 15.

Agora Energiewende and Sandbag (2019). The European Power Sector in 2018. Up-to-date analysis on the electricity transition. January 2019

Bamji Z. (2019). Global gas flaring inches higher for the first time in five years. 14 June 2019. Global Gas Flaring Reduction Partnership (GGFR)

Crippa M, Oreggioni G, Guizzardi D,Muntean M, Schaaf E, Lo Vullo E, Solazzo E, MonfortiFerrario F, Olivier JGJ and Vignati E. (2019). Fossil CO2 emissions of all world countries, 2019 Report - Study, EUR 29849 EN, Publications Office of the European Union, Luxembourg, 2019, ISBN 978-92-76-11100-9,

D.W. Tempest (1970) Method in Microbiology, 2, 259.

David W. Keith, Holmes et al (2018) Joule Vol. 2, A Process for Capturing CO_2 from the Atmosphere, P. 1573, 1594

J.G.J. Olivier and J.A.H.W. Peters (2020), PBL Netherlands Environmental Assessment Agency, Trendra in Global CO_2 and Total Greenhouse Gas Emissions P.1-77.

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Table 01.Production of corbondioxide on different substrates

Substrate	Amount of volatile acid produced mg/l						Volatile acid production as percent of substrate utilized					
	Strain I (LA 20)	Strain II (PLCMA)	Strain III (HA600)	Strain IV (PLCMB)	Strain V (HB100)	Strain VI (PLC600)	Strain I (LA 20)	Strain II (PLCMA)	Strain III (HA600)	Strain IV (PLCMB)	Strain V (HB100)	Strain VI (PLC600)
Control	3300	2650	900	2350	2300	2600	-	-	-	-	-	-
Glucose	1950	1950	2450	2250	1950	2500	33.6	25.3	37.1	29.1	26.7	31.5
Xylose	1500	3100	2050	1950	1700	2000	31.3	51.7	34.7	36.1	26.3	20.3
Amino acids	1150	3500	1650	1900	1150	1800	4.0	12.7	6.29	5.63	3.68	5.25
Casein hydrolysate	550	2700	1350	1200	1150	2000	1.96	9.0	5.14	3.84	4.28	6.81
Glycerol	800	3000	650	700	750	1200	10.1	34.5	7.7	8.1	11.2	13.3

Table: Parentheses are Transfer Value