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Enforcement of Isolated Stain on Spentwash Medium Containing Yeast Sludge in Place of Urea and Phosphate

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Abstract

It was evident in the earlier experiments that urea and phosphate are needed as nutrients in spentwash medium for good growth and COD reduction. On a plant scale, due to huge volumes of the effluent, it will not be economical to add these nutrients in the required quantities.

Yeast sludge was obtained from a distillery, autoclaved and kept in the cold. The analysis of yeast sludge showed that it had the following gross composition i.e. wet weight 9.6 percent, dry weight 4.18 percent, ash content 0.125 percent, nitrogen 0.125 percent, phosphate as PO4 0.037 percent and COD of 60,000 mg/l. 0.1 percent yeast sludge (V/V) was added into the spentwash medium in place of urea and phosphate.

Keywords: Spentwash, Medium, Yeast, Sludge, Molasses.

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.

After the complete recovery of alcohol the wastes consisting of spentwash and the washings of the fermenters are thrown out from the distillery as a liquid waste. This is called by different names such as slops, dunder, effluent, stillage and vinasse (2). It varies widely in composition (3, 6) depending mainly on the type of molasses used and partially on the type of yeast employed for fermentation. Large amounts of sludge that are washed out from the bottom of the fermenter is often added to this effluent. 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.

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Material and Method

The colorimetric procedure is very sensitive and can measure conveniently the COD values down to 100 mg/l by taking samples directly without dilution. However, most of the samples used in the study had high COD values, hence were suitably diluted upto about 50 times. A number of samples of glucose, untreated sidtillery effluent and

Table 1.Relationship between COs and BOD at different time intervals on spentwash medium

Time hrs	**Strain II (PLCMA)**		**Strain III (HA 600)**		**Strain V (HB 100)**		**Strain VI (PLC 600)**	
	COD mg/l	BOD mg/l	COD mg/l	BOD mg/l	COD mg/l	BOD mg/l	COD mg/l	BOD mg/l
Initial	15700	12000	24500	19500	24000	20000	15300	11500
24	5750 (63.1)	2775 (76.8)	18300 (25.3)	9300 (52.1)	17800 (25.8)	8700 (56.1)	5300 (65.4)	2570 (77.5)
72	3800 (75.3)	1475 (87.7)	11800 (51.8)	5850 (70.0)	12000 (50.0)	5900 (70.2)	3750 (75.4)	1380 (88.0)
96	1970 (87.1)	740 (93.8)	8300 (66.1)	4300 (77.5)	7500 (68.7)	3800 (81.0)	1860 (87.8)	725 (93.3)

Values in brackets denote percent reduction in the concerned parameter.

distillery effluent treated to various extents by the isolated bacterial strains were submitted to the analysis by the colorimetric as well as standard method and it was found that difference in the values given by the two methods. Was less than ± 10 percent. It is believed that the colorimetric method will be of great use when a large number of samples of a similar nature were to be analyzed on a routine basis. The method has been standardized specifically for the studies on the treatment distillery effluent and it is quite likely that the method will similarly be of great use for routine handling of a large number of samples of other types of effluents. However, it is advisable to standardize the method separately for each type of effluent by Kumar S *et al* (1985) Anonymus 1992.

Result and Discussion

It was evident in the earlier experiments that urea and phosphate are needed as nutrients in spentwash medium for good growth and COD reduction. On a plant scale, due to huge volumes of the effluent, it will not be economical to add these nutrients in the required quantities. Therefore, there was a need for some cheap substitute which can be added to spentwash medium since yeast sludge produced in the distillery as a residue after molasses fermentation, is practically of no use and contains sufficient amounts of nitrogen and phosphate, attempts were made to replace the urea and phosphate with that of yeast sludge.

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Yeast sludge was obtained from a distillery, autoclaved and kept in the cold. The analysis of yeast sludge showed that it had the following gross composition i.e. wet weight 9.6 percent, dry weight 4.18 percent, ash content 0.125 percent, nitrogen 0.125 percent, phosphate as PO4 0.037 percent and COD of 60,000 mg/l. 0.1 percent yeast sludge (V/V) was added into the spentwash medium in place of urea and phosphate. The data required Table No. 2 and Figure No. 1 sample 1 LA20 to VI (PLC600). 0 hrs to 144 hrs obtained data 0 hrs ranged 14900 to 25600, 48 hrs varied from 57.05, 96 hrs range from 69.12 to 88.50 and 144 hrs having 74.40 to 90.40 also noticed. This contributed an additional COD load of 60 mg/l only. The cultures were transferred a few times before being analysed for reduction in COD. The Similar result found by Debjani M. *et al* (2012), Hoarau J. *et al* (2018), Chappa *et al* (2018), Raghu Kumar C. and Ravindranan G. (2001), Kumar V. wati *et al* (1998), Meehan C. *et al* (2002), Sastry C. and vichineswary S. (1995), Miranda M P *et al* (1996), Ram chandra (1993), Ryu B.C. *et al* (2013), Kalavathi *et al* (2001), and singh sanjay and dikshit A.K. (2012) also recorded.

Table 2.Performance of isolated bacterial strains I to VI on spentwash medium containing yeast sludge in place of urea and phosphate.

S. No.	Strain	COD mg/l			
		Initial 0 hrs	48 hrs	96 hrs	144 hrs
1	I (LA20)	14900	6400 (57.05)	4600 (69.12)	4100 (72.40)
2	II (PLCMA)	15700	4400 (71.90)	2200 (85.90)	1700 (89.17)
3	III (HA 600)	27000	13000 (51.85)	9300 (65.50)	8200 (69.60)
4	IV (PLCMB)	17000	3800 (77.60)	2600 (84.70)	1800 (89.40)
5	V (HB 100)	25600	14500 (43.30)	7960 (68.90)	7500 (70.70)
6	VI (PLC 600)	14900	3200 (78.50)	1770 (88.50)	1430 (90.40)

Values in brackets denote percent reduction in COD

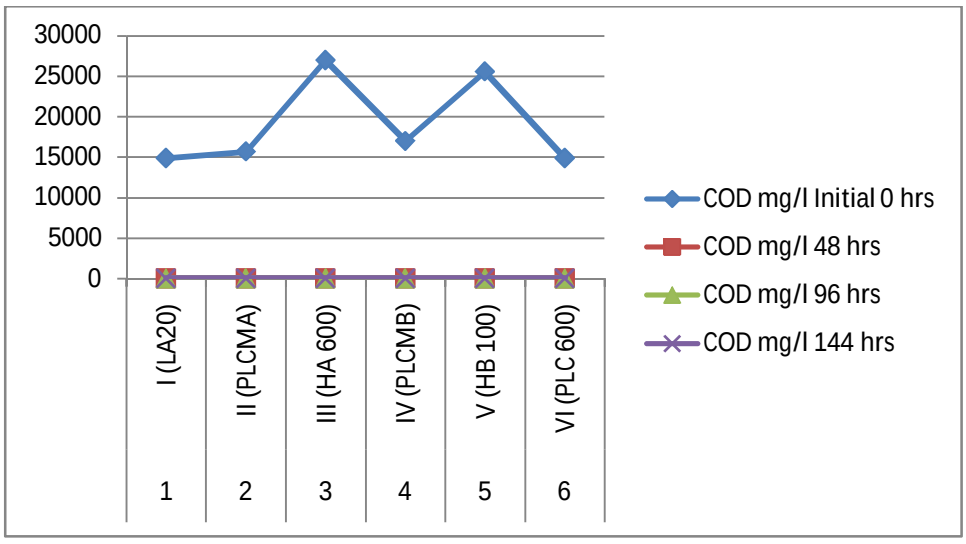

Figure 1

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