

REDUCTION OF METALLIC CONSTITUENTS FROM DISTILLERY EFFLUENT BY FUNGIPrajakta A. Maygaonkar¹ and Usha Permeswaran¹Department of Botany, Bhavan's college, Andheri (W) Mumbai -58.
sweet_praj2003@yahoo.co.in**ABSTRACT**

In the present work biodegradation ability of *Aspergillus nidulans* have been evaluated for 24 hours of time interval. The effluent was collected from Sanjivani distillery industry located at Kopergaon, Dist Ahemadnagar (M.S) India. *Aspergillus nidulans* was isolated from soil sample collected from Bhavan's College campus and purified by serial soil dilution method. *Aspergillus nidulans* was found to reduce the metallic constituents of effluent such as sodium (Na) and magnesium (Mg) dynamically. Reduction was noticed at 4hrs, 8hrs, 12hrs, and 24 hours of time interval. Much well reduction was noticed when sucrose (1% w/v) and dextrose (1% w/v) were supplemented in effluent. Addition of sucrose showed significant reduction ($P \leq 0.05$) for magnesium (Mg) when compare with dextrose. For sodium (Na), less significant result ($P \leq 0.1$) was noticed in 24 hours in both experimental flasks containing sucrose and dextrose.

Key words: reduction of sodium (Na) and magnesium (Mg), *Aspergillus nidulans*, sucrose and dextrose.

INTRODUCTION

M/s Sanjivani sugar industry is renowned in the state of Maharashtra for sugar production. The molasses obtained from the industry is promoted for manufacturing of liquor. During this process the highly polluted liquor effluent is generated. The content of the effluent does show traces of sodium and magnesium (Shah *et al.*, 2004).

It has been seen that distillery effluent with sodium contamination when released on land as it is, causes adverse effect on the characteristic of soil (Christoph Moor *et al.*, 2001) Thus causing soil pollution and as well as when released in water due to the presence of organic load it leads to water pollution. Pandey (2008) had reported the phytotoxic effect of distillery effluent on the germination of seed, due to the presence of heavy metals. Sangeeta srivastava and Radha jain (2010) have reported the effect of distillery spent wash on cytomorphologica behavior of sugarcane settling. Thus it is clear that use of crude spent wash for irrigation is harmful. The presence of toxic heavy metals causes harmful effect on soil as well as water.

Many workers have revealed the role of microbes for degradation of pollutants, among microbes the fungi are very well known for their decomposition property. Fungi have tremendous capacity for treating industrial hazardous waste in support of an environment. Several experiments were carried out with different varieties of fungi,

and it was observed that fungi are highly effective against industrial waste (Aassadi *et al.*, 2001). Some fungi are reported for removal of heavy metals from effluent (Akthar and Mohan, 1995). Biosorbtion of heavy metals by dead fungal cell was reported by Hemambika *et al.*, (2011) In addition to this; effect of nutrient medium on the degradation capacity of fungi was too noticed. Rajamohan and Kartikeyan (2006) have reported the effect of substrate specifically carbon source and nitrogen source on the degradation ability of *Paecilomyces variotii*, when it was added into the dye house effluent. Deepak pant *et al.*, (2008) have reported the effect of carbon and nitrogen source amendment on synthetic dyes decolorizing efficiency of white rot fungus, *Phanerochaeta chrysosporium*.

Thus considering above fact, it was decided to dynamically analyze on hourly basis the effect of sucrose and dextrose on the degradation capacity of *Aspergillus nidulans* for the reduction of sodium (Na) and magnesium (Mg) when added into the distillery effluent.

MATERIALS AND METHODS

Distillery effluent was collected from M/s Sanjivani sugar industry, located at Kopergaon, Dist. Ahemadnagar, Analysis of metallic constituents were done by, Inductively coupled plasma-atomic emission spectrometry (ICP-AES).

Sample collection: The plastic container initially rinsed with sample three times before being filled up finally. The container was submerged up to sufficient height with the help of rope and filled with the effluent completely.

The stopper was laid down, the container was held in such a way that the effluent did not get in contact with hands. Further the container was stored at 4°C and a portion was removed periodically for respective analysis.

Isolation and identification of fungi: The fungal culture of *Aspergillus nidulans* obtained and purified from the soil sample of Bhavan's College campus. The culture was re-cultivated periodically on PDA at 28°C. Identification of characters was done by comparing with the description provided by Udaya Prakash (2004).

Inoculation of fungi with nutrient:

The fungal species of *Aspergillus nidulans* grown on the potato dextrose agar (PDA) were used as inoculums with two different carbon sources, viz sucrose and dextrose in liquor effluent. For inoculation, fungal discs of 8 mm diameter were used. About 100 mL of liquor effluent was taken into the three sterilized conical flasks (Borosil) of 250 mL capacity. In the set of three flasks *Aspergillus nidulans* was inoculated in aseptic condition.

One flask was introduced with sucrose (1%w/v) and other with dextrose (1%w/v) the last

flask was kept as control, without any nutrient medium. Samples from respective flasks were withdrawn at regular time interval of 4 hours, 8 hours, 12 hours and 24 hours in sterilized condition and the results were tabulated as follows:

Inductively coupled plasma-atomic emission spectrometry (ICP-AES):

In an Inductively coupled plasma-atomic emission spectrometer the aqueous sample was pumped and atomized with argon gas into the hot plasma. The sample was excited, emitting light wavelengths characteristic of its elements. A mirror reflects the light through the entrance slit of the spectrometer onto a grating that separates the element wavelengths onto photomultiplier detectors. The more intense this light is, the more concentrated the element. A computer converts the electronic signal from the photomultiplier tubes into concentrations. The determination portion of the process takes approximately 2 minutes to complete.

RESULTS AND DISCUSSION

From Table 1 it was noticed that at 4 hours of time interval, reduction in sodium quantity was more in the experimental flask containing, sucrose. (16.140mg/L) than dextrose (19.886mg/L).and control flask (19.679 mg/l).

Table 1: Effect of *Aspergillus nidulans* on Metallic constituents of liquor effluent when inoculated with nutrient medium

Time in hours	Liquor effluent + <i>Aspergillus nidulans</i> +sucrose (1%w/v)		Liquor effluent + <i>Aspergillus nidulans</i> +dextrose(1%w/v)		Liquor effluent + <i>Aspergillus nidulans</i> + without nutrient medium.	
	Na (ppm)	Mg (ppm)	Na (ppm)	Mg(ppm)	Na(ppm)	Mg(ppm)
4	16.140	81.347	19.886	89.728	19.679	93.505
8	15.883	79.666	20.570	99.622	17.133	84.908
12	16.037	63.982	19.210	94.682	18.791	78.809
24	11.993	37.316	16.975	81.107	17.380	70.302
	0.880*	2.110**	1.117*	1.923*		

Level of significance are, *=P≤ 0.1and **=P≤ 0.05

Ppm: - (parts per million or Mg/L)

As time increased further, similar phenomena was noticed for magnesium (Mg), the experimental flask with sucrose (81.347 mg/L - 37.316 mg/L) showed more reduction than dextrose (99.622 mg/L - 81.107 mg/L) and control flask (93.505 mg/L - 70.302 mg/L). However statistical studies reveals that, the sodium (Na) reduction in the effluent sample is 0.880($P \leq 0.1$) for sucrose and 1.117($P \leq 0.1$) is for dextrose. It might be due to the difference in protoplast of new region and old region of hyphae (Susan Isaac *et al.*, 1986)

CONCLUSION

In this study it was noticed that in case of *Aspergillus nidulans*, when sucrose was added significant reduction were noticed in magnesium (Mg) as compare to dextrose. ($P \leq 0.05$). Therefore from present study it was observed that in 24 hours

of time interval *Aspergillus nidulans* showed reduction of metallic constituents present in effluent. On the other hand when nutrient was provided to *Aspergillus nidulans* showed better reduction than without nutrient supply. Hence from this study it could be concluded that *Aspergillus nidulans* do exhibit the biodegradation ability.

It is expected that, Present hourly based study (dynamic) could lead to much better achievement towards expected development in treatment technology to ascertain minimum time interval required for maximum quantitative reduction of heavy metals by providing favorable conditions relating to nutrient supply or altering other physico chemical parameters. Then it might be possible to have a significant reduction and due to which pollutants from effluent can be reduced effectively in minimum time interval.

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