EFFECT OF CARBON SOURCES AS A SUPPLEMENT IN THE DECOLOURIZATION OF AZO DYES BY FUNGAL ISOLATES

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Abstract - The supplement of different carbon sources like Glucose, Sucrose and Starch in the synthetic media used in the decolourization of Azo dyes using fungal isolates showed increase in decolourization by 80-90%, 72-82%and 60-76% respectively. Addition of Glucose showed highest decolourization whereas starch shows less.

Keyword - Carbon sources, Supplements, decolourization, fungal isolates, Azo dyes.

INTRODUCTION

Biodegradation of Azo dyes is often limited and slow due to limited availability of carbon and nitrogen from the complex structure of dyes[1]. The addition of nutrients like carbon and nitrogen may increase the degradation of target organic compound [2]. On the other hand it can also exert no or inhibitory effect on degradation. Textile wastewater has generally a complex chemistry having a number of organic as well as inorganic compounds; dyes being a major compound. The degradation in such environment having several metabolizable organic substances acting as substrates more commonly in circumstances when supply of one or more nutrient is a limiting factor is very interesting. A carbon source is necessary for fungal growth [3] and to provide the supply for oxidants, the fungus requires for decolourization [4]. A precondition for the reduction of Azo dyes is the presence and availability of a co-substrate because it acts as an electron donor for the Azo dye reduction. Many different co-substrates were found to suite as electron donor, like glucose; hydrolyzed starch, tapioca yeast extract. Glucose has been used in the majority of research studies It also has been observed that the extend of decolorization of an Azo dye like Remazol Black B varies depending on the co-substrates used, e.g. 82% with glucose, 71% for glycerol and lactose, 51% of starch. In the present investigation efforts are made to know the effect of carbon source in the decolourization of Azo dyes from fungal isolates.

MATERIAL AND METHODS

Effect of added carbon sources in decolorization of malachite green

Glucose, starch, sucrose was supplemented to the semi synthetic media along with six tightly capped culture tubes and six Erlenmeyer flask after autoclaving the media was cooled and 0.050 g/L concentrated of malachite green was added and mixed well in sterile condition .Then the semi synthetic media along with malachite green was distributed into the six culture tubes and six Erlenmeyer flask, 20ml in each and marked the six culture tubes as static condition and six Erlenmeyer flask as shaking condition then a loop full of fungal species such as Pleurotus ostreatus, Aspergillus oryzae, Penicillium chrysogenum, Cladosporium rubrum, Aspergillus flavus, and Aspergillus niger were inoculated separately in the culture tubes and Erlenmeyer flask and incubated at temperature of 280c [4]. Decolourisation was monitored and measured every 24 hours till 96 hours using a UV spectrophotometer at 570 nm. The experimental procedure adopted was as per [5] for the decolorization of malachite green.

RESULTS

Effect of Glucose on Decolorization of Malachite Green.

Results reveal that after 72 hours the decolorization of malachite green becomes stable. It can be observed that minimum and maximum decolorization was in the range of 80-86% and 92%-95% for 24 hours and 72 hours respectively. (Figure 1)
Figure 1. Variation of percentage decolorization of malachite green with Time when supplemented with glucose under static condition

It can be observed that percentage decolorization increases significantly with increase in time for glucose as an additional source of energy. This might be due to the fact that the fungal isolates are efficient using glucose as the main source of nutrient for their growth and energy production thereby decolorizing malachite green.

Effect of Sucrose on decolorization of Malachite Green.

It can be observed that minimum and maximum decolorization was observed in the range of 70-78% and 80%-85% for 24 hours and 72 hours respectively. Figure 2 shows the variation in percentage decolorization of malachite green with time. It can be observed that percentage decolorization increases rapidly till 48 hours with an increase in time for sucrose as an additional source of energy. After 48 hours the decolorization of malachite green increases gradually. This might be due to the fact that all the fungal isolates are efficiently using sucrose as a source of nutrient for their growth and energy production thereby decolorizing malachite green

Effect of Starch on decolorization of Malachite Green.

It can be observed that minimum and maximum decolorization was observed in the range of 60-62% and 70%-76% for 24 hours and 72 hours respectively. Figure 3 shows the variation in the percentage decolorization of Malachite green with time (hours) for different isolates respectively. It can be observed that percentage decolorization increases slowly with the increase in time for starch as an additional source of energy. The decolorization of malachite green increases gradually later. This might be due to the fact that all the fungal isolates are using starch as a source of nutrient for their growth and energy production thereby decolorizing malachite green. The percentage decolorization of malachite green using glucose, sucrose and starch were found to be 80%-95%, 72%-85%, 60-76% respectively.

Plate 1(a), (b) and (c) Decolorization of malachite green after 48, 72 and 96 hours respectively.

Plate 1 (a, b, c) shows the decolorization of malachite green when supplemented with glucose after 48, 72 and 96 hours respectively. (Fig 4)
Figure 4. Comparison of Variance of percentage decolorization of malachite green for different carbon sources

It can be observed that highest decolorization of malachite green was found in case of Glucose, whereas moderate decolorization in case of Sucrose and lowest decolorization occurred in case of Starch.

CONCLUSION

High percentage decolorization of malachite green in the presence of glucose might be due to the fact that presence of glucose as the carbon source in the media initiates cell growth and the cell mass increases. Since glucose being a monomer breaks down into simple compounds such as carbon dioxide and water more easily than sucrose and starch, which are available for the fungi. This indicates that a catabolisable carbon source like glucose accelerates the rate of discoloration. Alternately glucose may enhance decolorization by allowing faster growth of fungi resulting in rapid decolorization and causes higher decolourisation of Malachite Green.

Earlier reports revealed that [6] reported that minimum level of glucose as a supplementary carbon source is required to maintain maximum removal efficiency. When sucrose and starch were supplemented, decolorization of malachite green reached 65%. Iadhav and govindwar, 2006 found that 95% of decolorization of malachite green was achieved using glucose [7]. showed, glucose favored and increased rate of decolorization from 68% to 72%.

REFERENCES