I. INTRODUCTION

Large amount of wastewater is produced and discharged to the receiving environment during textile process. Strong colour of the effluent is the most serious problem pose the threat to the environment. Azo dyes constitute the largest and versatile class of synthetic dyes used in the textile, industries and represent major components in wastewater. The Ministry of Environment and Forests (MoEF) has prohibited around 42 benzidine based dyes and 70 azo dyes which are capable of releasing any of the harmful amines. (MoEF, Jan 1990) Decolourisation of the effluent is a challenging process to the textile industry, and the potential of microbial decolorizing can be adopted as an effective tool. (Anastasi A1, Parato B, Spina F, Tigni V, Prigione V, Varese G C., 2011) The conventional method for treating the effluent has found to be generating waste product that pose additional serious disposal problem. Microorganisms can breakdown most compounds for their growth and energy need (McMullan. G, Meehan. C., Conneely. A., Kriby N., 2001). This paper examines various fungi, living or dead cells, which are capable of decolorizing the effluents. (Moreira M.T., Mielgo I., Feijoo G., Lerna J.M, 2000) Azo dyes are characterized by presence of nitrogen-nitrogen bond (N=N) in its chemical structure. The aza groups are generally connected to benzene and naphthalene rings, but can also be attached to aromatic heterocyclic groups. In order to exploit the potential various process parameters like nutritional sources, pH, and temperature were optimized to develop an economic decolorization process (Meera Gupta, Kumari Manisha, 2012). Degradation analysis was studied using UV–Visible Spectrophotometer, GC-MS and FTIR.

II. MATERIALS & METHODS

A. Wastewater and Chemicals

The effluent was taken from the common effluent treatment plant, kanchipuram, Tamilnadu; this sample was used for isolating indigenous organisms for treatment process. The textile dye Congo red was used throughout the study. All the chemicals were of highest purity and of analytical grade.

B. Microorganisms and Growth conditions

The minimal agar medium is used for isolating the organisms. The medium consists of distilled water, PDA, Yeast extract, Glucose. The medium was then sterilized and autoclaved. It was then incubated for 48 hours.

III. RESULTS & DISCUSSIONS

Decolourisation of dye by the fungal isolates was optimized with respect to temperature, pH, and for nutritional sources such as carbon, nitrogen sources.

A. Effect of Temperature

100 ml of culture amended with 200 mg/l of dye under different temperature were determined. The rate of colour removal increases with temperature, within a range of 35-37°C. The decline in colour removal activity at higher temperatures is attributed to the loss of cell viability or to the denaturation of the enzyme. (Fig. 2)
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Figure 2 Temperature optimization of decolourisation

B. Effect of pH
100 ml of nutrient broth inoculated with Aspergillus species was amended with 200 mg/l of dye with varying pH from 2–9 were experimented. [6], [7] pH was adjusted using either Hydrochloric acid or Sodium hydroxide. Results clearly indicate that the optimum pH for colour removal is at slightly acidic and the rate of colour removal tends to decrease rapidly at strongly acid or strongly alkaline pH values. (Fig. 3)

Figure 3 pH optimization

C. Effect of Carbon & Nitrogen Source
The effect of three nitrogen sources Yeast extract, Peptone and beef extract was evaluated. Among the three nitrogen sources, peptone appeared to support the decolorization process by the fungal strains. The effect of carbon sources on decolorization of dye by Aspergillus species was determined that dextrose has as the ideal carbon source for the strains. Fructose recorded least percentage decolorization by all the strains.

D. Chromatography- Mass Spectrum Analysis
GC-MS technique was performed using GC SHIMADZU QP2010 system and gas chromatograph interfaced to a Mass Spectrometer (GC-MS) equipped with Elite-1 fused silica capillary column. An electron ionization energy system with ionization energy of 70eV was used. Helium gas was used as the carrier gas. Mass spectra were taken at 70eV; a scan interval of 0.5 seconds with scan range of 40 – 1000 m/z. Total GC running time was 35 min. The relative percentage of each component was calculated by comparing its average peak area to the total areas. The Metabolites are found to be Ergoline 8 Carboxylic acid, methyl ester, Dasyxipidin-1-methanol, Ascorbic acid, 2,6-dihexadecanoate.

Figure 4 FT-IR before and after Degradation

IV. CONCLUSIONS
These isolate have the effective potential in decolourisation of Congo red, among the fungal isolates the As. Terreus shows the highest percentage of decolourisation of 85% in 72hrs. The strain was capable of decolorizing the azo dye over a pH range of 4–6. The optimum temperature was found to be 35–37 °C. Various other process parameters like additional carbon and nitrogen source were also optimized. UV–Visible analysis has been used to confirm the decolorization of dye and GC-MS and FT-IR confirmed that the degradation has takes place.