1. INTRODUCTION

Colour has been investigated and used by man for several years. Many civilizations have used, valued, experimented and traded colour for body decoration, art, textiles, food and cure. Natural dyes may have a wide range of shades and can be obtained from various parts of plants including leaves, seeds, roots, flowers, barks, fruits etc (Saravanan et al., 2014). Dyeing was known as early as in Indus Valley period (2500 BC) and this knowledge has been substantiated by findings of coloured garments of cloth and traces of madder dye in the ruins of Indus Valley Civilization at Mohenjo-Daro and Harappa (3500 BC). Human beings have traditionally preferred natural sources to add colours to food, clothing, cosmetics and medicines as reported by Canizares et al. (1998). The accidental synthesis of Mauveine (coal tar dyes) by Sir William Henry Perkin in 1856 and its commercialization led to the rapid decline in the use of natural dyes which were later completely replaced by the synthetic dyes.

The dyestuff sector is one of the important segments of the chemicals industry in India, having forward and backward linkages with a variety of sectors like textiles, leather, paper, plastics, printing inks and foodstuffs. The textile industry accounts for the largest consumption of dyestuffs. The global colorant industry is valued at US$ 27 billion and has been growing at 2 to 3% per annum. India accounts for 12% of the global colorant industry, out of which nearly two- third is exported (Texman, 2012). However, it has to be emphasized that the overwhelming majority of synthetic dyes currently used in the industry are azo derivatives.
The rapid industrialization of dye sector is a major global concern owing to its adverse environmental effects. Synthetic dyes have some limitations, primarily, (i) their production process requires hazardous chemicals, creating worker safety concerns, (ii) they generate hazardous wastes, and (iii) these dyes are not environment friendly. The wastewater from fabric and yarn dyeing and printing produces a serious environmental problem (Babu et al., 2007). As reported by Rai et al. (2005) 10 to 35% of the dye is lost in the effluent during the dyeing process while 50% of the initial load of reactive dyes is present in the dye bath effluent. The upsurge of natural dyes has thus emerged as an essential alternative in response to the global concern of human safety and environmental conservation in many countries.

The global interest in natural sources of colours has kindled fresh enthusiasm in commercial dyers and small textile export houses for looking at the possibilities of using natural dyes for regular basis dyeing and printing of textiles. Broadly classified into three categories i.e. vegetable origin, animal origin and mineral origin, natural dyes produce very uncommon, soothing and soft shades as compared to synthetic dyes (Rungruangkitkrai and Mongkholrattanasit, 2012). Samanta and Agarwal (2009) reported that in spite of the better performance of synthetic dyes, recently the use of natural dyes on textile materials has been attracting more and more scientists for study due to the wide viability of natural dyes, their huge potential and non-toxicity. However, the limitation of natural colourants is their labour intensive extraction procedure, poor fastness, limited shades and low brilliancy. It is clear that if natural dyes are to be considered as an alternative to the synthetic dyes used today, they have to manifest the same characteristics of synthetic dyes such as enhanced production, high performance fastness and reasonable price. Hence, intensive investigations on
the application of other biological sources such as bacteria, fungi and algae should be encouraged.

Microbes have advantages of versatility and productivity over higher forms of life in the industrial-scale production of natural pigments and dyes. Velmurugan et al. (2010) reported the potential of other biological sources such as fungi (both moulds and yeasts), bacteria and algae with appropriate selection, mutation or genetic engineering techniques to improve the pigment production compared to the wild-type organisms. Santis et al. (2005) and Nagia and El-Mohamedy (2007) studied the application of fungal pigments in dyeing of cotton, silk and wool which is reported in several studies. Fungi are more rarely used in natural dyeing, even though some species are known to possess stable colorants.

Fungi are structurally and functionally simpler organisms than higher plants and so the isolation of secondary metabolites such as pigments from them seems to be quite easy. However, there is very little information about the use of fungi for dyeing textiles. *Pisolithus tinctorius* was among the first fungi to be used in dyeing and the word ‘tinctorius’ refers to its colouring nature. Moreover, in America furs were coloured using extracts of fungi to give them a luxurious golden hue. In 1974, Miriam C. Rice published the first book concerning dyeing with fungi and since then, the custom has spread all over the world (Bessete and Bessete, 2001; Cedano et al., 2001; Räisänen, 2002). Proper findings in such innovative research areas could provide ample solutions to the increasing global concerns of a better and safe environment.

Being poorly investigated, fungi are obviously a rich and reliable source of bioactive and chemically novel compounds with huge medicinal, agricultural potential and industrial applications. The aim of this investigation can be classified into four
chapters. The first chapter deals with collection, isolation and identification of *Alternaria* sp. from tropical and temperate regions in Tamilnadu. The second chapter describes the growth and production of pigment by *A. alternata* in natural and synthetic medium. The third chapter includes extraction, estimation, purification and characterization of the reddish brown pigment from *A. alternata*. In order to isolate the secondary metabolites, the fungus was grown in static liquid Maize grain medium at room temperature under optimized conditions. The mycelial mat was harvested and extracted with different solvents. The obtained crude extracts, on the basis of recovery were considered for separation and purification using chromatographic techniques. The visually strong coloured fractions, on the basis of coloration and respective UV-Visible spectra were further analysed by LC/MS. The structure of the metabolite constituents was elucidated and confirmed by FTIR and NMR spectroscopy. Mass production and extraction of the reddish brown pigment from *A. alternata* was done to evaluate its dyeing and painting potential on selected textiles in the fourth chapter. The selected textiles were tested for antimicrobial properties in the final and fifth chapter.