Abstract

1. Project Code	IFGTB/RP-175/2018-2022
2. Project Title	Characterization and Extraction of Eco-friendly natural dyes from Eucalyptus, Casuarinas and Melias-leaves and bark; their application in textile industry
3. Date of Start	April 2018
4. Date of Completion	March 2022
5. Approved Budget (Rs.)	Rs. 18.36 lakhs
6. Name & Designation of PI	Dr. D. Thangamani, Scientist D
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8. Project Objectives: (Indicate midterm revision, if any)	**1.** Screening and isolation of potential dye components of *Eucalyptus* spp., *Casuarina* spp. and *Melia dubia*. **2.** Bioassay directed characterization of active dye components. **3.** To develop bio dye by studying the dye fastness on different fabrics. **4.** Evaluate the potentially of bio dye against different textile filaments/fabrics and commercialization.

Summary

In order to be in a sustainable way of dyeing by the textile industry, natural dyes are in the need for environmentally friendly which also satisfy local regulatory requirements pertaining to production activities having minimal environmental impact. The proposed process involves transforming waste residue discarded by the pulp and paper industry into a useful coloring matter for the textile industry. It does not use any hazardous materials such as heavy-metal-containing dyeing auxiliaries, but instead generates a biodegradable effluent. In this way, it should be considered as a more sustainable alternative to other dyes, both environmentally, as for its production process, as well as its use by the textile industry.

Eucalyptus, Casuarina and Melia dubia was majorly used for pulpwood and it played a vital promising source for pulp and paper industries due to its fast growth and adaptability to varied agro-climatic conditions of the country. These species are money spinning tree of short rotation.

The commercial cultivation of these species was being preferred under different agroforestry systems at a large scale. The use of these locally available raw materials (plantation wastes i.e. leaves and bark) for natural dyes that are renewable for our textile, food and cosmetics industries would enhance their value and increase national resource development and gross domestic products. A ton of waste may be available at every 5 tons of harvestable wood material. The left over leaves and bark wastes was utilized as Natural dyes for textile industries.

The natural dyes were successfully extracted from Eucalyptus camaldulensis, Casuarina equisetifolia and Melia dubia leaves and bark samples. The extracted dyes was characterized for its biochemicals through premilinary phytochemical analysis, quantitative analysis of phenols, flavonoids, tannins, Fourier Transform Infrared Spectroscopy analysis, Gas Chromatography Mass Spectrometry (GC-MS) analysis. The extracted natural dyes were successfully dyed on different fabrics ((cotton, silk, wool and linen) with combination of natural mordants.

In this context, Institute of Forest Genetics and Tree Breeding (IFGTB) has developed and released double layered cotton, natural dyed, aromatic face mask named “DYECOP” using IFGTB Eucalyptus clones. The face mask has excellent fastness properties (washing, rubbing, light and perspiration) and also possesses anti-bacterial activity. This face mask was tested for Bacterial Filtration Efficiency (BFE) as per the Bureau of Indian Standard and showed 85.2% of 113 filtration efficiency. This facemask is washable and reusable. The dyed fabric can also be used as garments. Hence, this “DYECOP” face mask is recommended for infection prevention and as source control for COVID 19. The natural dye extracted from these species can be very useful in developing sanitized fabrics for medical applications and protective clothing to protect users against common infections.

Incense stick and Bio-compost was developed from the waste leaves and bark of Eucalyptus. The most importantly IFGTB has designed “Pilot Natural Dye Extractor” where 20 litres of natural dye can be extracted at desired temperature at a time. This equipment is recommended for small scale dyeing industries and self help groups. The patent for this equipment is under progress. Consequently, natural dye extraction from the plantation wastes provides additional income to farmers who cultivate these species and also generates employment opportunities in small scale dyeing industries