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REVIEW

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Fungi as versatile biocatalytic tool for treatment of textile wastewater effluents

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Abstract

Textile wastewater poses a significant environmental challenge, primarily due to the presence of diverse contaminants, especially textile dyes. Untreated release of these effluents directly into aquatic systems can lead to esthetic degradation, eutrophication, reduced photosynthetic activity, and accumulation of hazardous substances. Although conventional treatment methods are employed for reducing the contaminant load in effluents, they often are less efficient, thus prompting the exploration of innovative alternatives. Current review highlights myco-remediation as an inexpensive, promising and environmentally sustainable solution. Fungi, with their diverse decontamination mechanisms such as biosorption, biotransformation, and immobilization, prove effective in reducing heavy metals, persistent organic pollutants, and emerging contaminant levels present in these effluents. However, more research effort is needed to apply the biodegradation strategy to decompose completely the "forever chemicals" per- and poly-fluorinated alkyl substances. Fungi play a key role in degrading and decolorizing textile dyes due to their biocatalytic activity mediated by the production of oxidative enzymes, such as laccases, lignin peroxidases, and manganese peroxidases, as well as their dye adsorption capabilities. This comprehensive review concentrates on fungi-based remediation of textile wastewater effluents, including the mechanisms they employ. While most studies concentrate on effluent treatment, this review also explores the concurrent utilization of biomass and growth kinetics for efficient reduction in pollutant concentrations. Further, the current work showed data on optimization of growth conditions such as pH, temperature and nutrient requirements that lead to efficient effluent decontamination.

Keywords Textile wastewater, Azo dye, Fungus, Bioreactor, Immobilized

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Research Paper / Article / Review

A Review of Biological and Nutritional Significance of Lutein derived from Indian Cultivars of *Tagetes patula* L

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Abstract: Carotenoids and oils derived from Indian cultivars have gained attention for their biological significance and potential health benefits. Several Indians suffer from nutritional deficiencies, which lead to chronic illnesses with the progression of time. Carotenoids, as antioxidants, play a crucial role in maintaining cellular health and protecting against chronic diseases. Extensive research underscores its potent antioxidant and anti-inflammatory properties, potentially offering protection against a multitude of chronic diseases. Marigolds, a readily available and sustainable source of lutein, offer a practical solution for food fortification. Dairy products, particularly yogurt, represent a suitable food matrix due to their widespread consumption, taste and color versatility, and ease of ingestion. However, investigation is important to ensure lutein stability throughout food processing and storage, while minimizing any potential alterations to sensory attributes. The prospect of lutein-fortified foods not only holds promise for enhanced public awareness of its health benefits but also paves the way for increased consumption of naturally lutein-rich fruits and vegetables. This literature review explores the biological significance of carotenoids and oils derived from Indian cultivars through a comprehensive analysis of available literature.

Key Words: Marigold, Lutein, Lutein-fortified food, chronic diseases.

1. INTRODUCTION :

Fruits and vegetables boast a vibrant array of colors due to the presence of carotenoids, a class of pigments [1]. These pigments possess a central chromophore, that dictates their light absorption properties. Selective absorption of blue and green wavelengths by the chromophore results in the reflection of yellow, orange, and red light, which we perceive as the colors of these plant products [2]. Carotenoids serve a multifaceted role in plants. They act as light-harvesting antennae during photosynthesis, similar to solar panels, and provide photoprotection against excessive sunlight, analogous to sunscreen [3]. Animals, including humans, lack the ability to synthesize carotenoids and rely on dietary sources, primarily colorful fruits and vegetables, to acquire them. Over 1200 distinct carotenoids exist in nature [4]. Beta-carotene, a type of carotenoid, is the main essential precursor of vitamin A in our bodies, which is essential for vision, growth, and immune function. Vitamin A deficiency can even lead to blindness [5]. Another prominent carotenoid, lutein, safeguards eye health by mitigating age-related macular degeneration (AMD) [6]. Unlike vitamin A, lutein deficiency doesn't cause illness; hence, it's classified as a bioactive compound rather than a vitamin. Bioactives offer health benefits but aren't indispensable for survival.

Marigolds, vibrant orange or yellow flowers native to the Americas but now cultivated globally, belong to the Asteraceae family, which also includes daisies and sunflowers. In India, *Tagetes patula* L., commonly known as the French marigold, is a widely used variety with yellow, orange, or red flowers, employed for decorative, religious, and even medicinal purposes [7]. Data from the National Horticulture Board suggests that India is a leading producer of marigolds, generating millions of tons of flowers annually. Notably, marigold flowers are a rich source of carotenoids, particularly lutein. Traditionally, lutein extraction from *Tagetes patula* L. petals involves a multi-step process that utilizes drying and solvent extraction, which can be expensive and environmentally detrimental due to the use of heat and harsh chemicals. Researchers are actively seeking more sustainable and cost-effective methods for lutein isolation.

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Experimental and Surface Morphological Studies of Imidazolium-based Ionic Liquid as Corrosion Inhibitor for Mild Steel in Sulphuric Acid Medium

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The corrosion inhibitor 1-butyl-3-methylimidazolium chloride ($[\text{BMIM}]^{\text{Cl}^-}$), an ionic liquid, was used to determine the potency of inhibitor in 0.5 M of H_2SO_4 on the surface of mild steel. The studies performed weight loss measurements over time and electrochemical impedance spectroscopy (EIS). Weight loss studies evaluate the degree of degradation in a mild steel (MS) specimen subjected to sulphuric acid by assessing the reduction in weight of the exposed sample over the duration of exposure. EIS measures the electrochemical properties of the mild steel sample in a sulphuric acid solution interface. Through experimental analysis involving the use of mild steel and ionic liquid, it was established that the material possesses a high potential to reduce the corrosion rate of mild steel in acidic solution. Also, the surface characterization of the steel sample treated with or without the $[\text{BMIM}]^{\text{Cl}^-}$ inhibitor in sulphuric acid was characterized using both SEM and APM techniques. A cross-sectional analysis by SEM and APM give a physical confirmation of the findings that the ionic liquid, $[\text{BMIM}]^{\text{Cl}^-}$, when mixed with sulphuric acid, deposits a barrier on the steel surface. The results support the application of $[\text{BMIM}]^{\text{Cl}^-}$ in preventing corrosion of steel samples in an acidic environment, owing to the formation of a passivating layer through the reaction of the ionic liquid with the metal surface.

Keywords: Corrosion Inhibitor, Sulphuric acid, Ionic Liquid, Mild steel, Weight loss, Electrochemical studies.

INTRODUCTION

Mild steel, mainly consist of carbon and manganese along with iron, is the most commonly utilized carbon steel in industrial setting's where it interacts with acids, bases and salt solutions. The processes of plastic deformation and heat treatment play a vital role in the processing of mild steel and can influence its susceptibility to corrosion. Good machinability and workability and at the same time competitive price make the mild steel preferable for use in buildings, automobiles, structures and ships, where a high strength price ratio is desirable. Nevertheless, in industrial applications such as acid pickling and descaling, the utilization of sulphuric acid results in severe corrosion and therefore, many monetary losses [1-4]. Corrosion is the process by which metals disintegrate due to their chemical reaction with the surrounding environment, not only altering the aesthetics of the material but also decreasing its durability and, in turn,

impacting people's lives and technological advancements. This problem is most acute with generally used metals including iron, aluminium, copper, nickel, zinc, etc.

Inhibitors are also among the most effective and cheap means of preventing corrosion. These substances are widely used as they are cheap, easily available, non-hazardous to health, biodegradable and easy to apply [5]. The economic impacts, the effectiveness of the chosen inhibitor and its environmental compatibility are the primary factors influencing the specific suitability of the inhibitor. Some of these molecules attach themselves more easily to the metal surface because of the nature of the molecules or compounds they are made from. More particularly, compounds with heteroatoms with high electronegativity like oxygen, sulphur and nitrogen exhibit areas of high electron density. Also, the multiple bonds like double or triple bonds are also responsible for the localized electron density areas. When these high electron density regions come in contact

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Harnessing the Power of Indian Medicinal Plants: Traditional Knowledge and Modern Applications in Herbal Medicine

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ABSTRACT:

In light of ongoing global health challenges, the focus has shifted beyond the initial COVID-19 context to explore sustainable and effective solutions. Respiratory infections transmitted through respiratory droplets remain a persistent concern, even with widespread vaccination efforts. Masks continue to be vital in reducing pathogen transmission, but the surge in demand has led to shortages and increased prices, prompting many to turn to homemade cloth masks. Researchers worldwide have been investigating innovative ways to enhance the efficacy of these homemade masks, with one promising approach involving the infusion of medicinal herbs into cloth mask materials, imparting them with anti-bacterial and anti-viral properties. This concept not only addresses the need for effective protection but also aligns with environmentally conscious practices, offering a sustainable alternative to non-biodegradable masks. By synthesizing herbal-infused cloth masks, we can bridge the gap between traditional wisdom and modern science, promoting both public health and ecological responsibility. This paper explores the synthesis, properties and applications of these herbal-infused cloth masks, shedding light on their potential to provide multifaceted solutions for personal protection and environmental preservation.

KEYWORDS

anti-bacterial,
anti-viral,
medicinal herbs,
cloth masks,
sustainable,
ecological
responsibility.

Introduction

In recent years, the world has witnessed the emergence of a novel coronavirus, SARS-CoV-2, which originated in Wuhan, China, in December 2019 and subsequently led to a global pandemic declaration by the WHO in March 2020. This infectious disease has posed significant challenges to public health, with its ability to spread efficiently between humans and from humans to animals, making it a pervasive threat. The global impact of the COVID-19 pandemic has been profoundly affecting daily life across the world. The pandemic has presented itself in waves, each with the potential to disrupt regularity and exact a toll in lives lost [1]. The importance of responsible human behavior in curbing the

virus's spread has become evident, with infection rates remaining a concern, particularly in the absence of comprehensive precautions. Beyond the realm of infectious disease control, the use of masks hold significance in various other fields. They play a crucial role in occupational safety, particularly in industries where exposure to hazardous particles or chemicals is a concern. Additionally, masks find applications in dust control, air quality improvement, and protection against environmental allergens. Furthermore, masks have been instrumental in preserving cultural traditions and customs, such as in artistic performances, and they serve as a form of self-expression and identity. Consequently, the importance of adhering to fundamental preventive



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ORIGINAL RESEARCH PAPER

English Literature

AFRO-AMERICAN UNDERTONES IN THE WORKS OF BAMA: A CROSS-CULTURAL READING OF DALIT RESISTANCE

KEY WORDS: Oppression, Dalit, Afro-American, Dalit Christians.

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ABSTRACT

Dalit literature portrays the slavery and oppression endured by Dalits in their lifetime. Bama, a celebrated Tamil Dalit writer, crafts narratives of Dalits and gendered oppression that resonate far beyond the geographical and cultural borders of India. While her works like Karukku, Sangati, and Vanmam are deeply rooted in the lived realities of Dalit Christians in Tamil Nadu, they share striking thematic and structural affinities with African American literary traditions. This paper explores the Afro-American undertones in Bama's literary consciousness, portraying how both traditions use autobiographical narrative, oral traditions, linguistic assertion, and intersectional feminism as strategies of resistance. Drawing parallels with the works of Toni Morrison, James Baldwin, Maya Angelou, and Alice Walker, the paper argues for a transnational Dalit-Black aesthetic that foregrounds shared histories of trauma, survival, and hope. Through this cross-cultural reading, Bama's literary voice is contextualized as part of a global conversation on subaltern resistance, memory, and identity politics.

INTRODUCTION

Within the tapestry of Indian Dalit literature, Bama's Faustina Soosairaj, who is also known as Bama, appears to be a loud voice who advocates the intersectional experiences of Dalits in general and Dalit Women in particular. The works written by her challenge the dominant social orders around caste, gender and religion by voicing the experiences of the people who are marginalized. Despite being an author of Indian origin Bama's works have the universal undertones of resistance and oppression with explicit influences from Afro-American literary traditions, as referred to by Lakshmi Holmstrom who says, "... Bama's work is among those that are exploring a changing Dalit identity..." (Holmstrom xix). This comparative reading of Bama highlights a shared spirit of protest against deeply ingrained hierarchies within Afro American and Indian Dalit frameworks.

Bama's incorporation of oral traditions, songs, and proverbs in Sangati and Vanmam reflects a cultural memory rooted in collective experience.

Intersectional Feminism: Shared Struggles of Women

Intersectional feminism, as depicted in the works of Bama and African American writers like bell hooks, Audre Lorde, Alice Walker, and Toni Morrison, foregrounds the layered and interconnected nature of oppression faced by marginalized women. In Sangati, Bama provides a vivid portrayal of Dalit women's lived experiences, highlighting how they are doubly marginalized—first by caste and then by gender. These women perform strenuous physical labor, face domestic violence, and suffer social exclusion not only from dominant castes but also from within their own communities. This mirrors the themes explored in African American literature, where authors like Walker in The Color Purple and Morrison in Sula critique the dual burdens of racism and patriarchy borne by Black women. Both literary traditions reject single-axis frameworks of oppression, insisting that gender cannot be examined in isolation from caste or race. "You a lowdown dog is what's wrong. It's time to leave you and enter into the creation..But Nettie and my children coming home soon, I say. And when she do, all us together gon whup your ass". (Walker 207)

Instead, they advocate for a holistic, community-based liberation that recognizes the unique struggles of women at the intersection of multiple systems of power. The writings of bell hooks and Audre Lorde further reinforce this stance, emphasizing that true feminist liberation must include the voices of those historically silenced—Dalit women, Black women, and all those living at the margins. Through their narratives, Bama and Afro-American writers construct a powerful, transnational dialogue that underscores solidarity through shared struggles and affirms intersectionality as essential to social justice.

Religion and Resistance

Ambedkar writes : "The caste system does not demarcate racial division. The caste system is a social division of people of the same race" (238). A lot of parallels can be seen in comparing African-American and Dalit standpoints. While Dalits in India face oppression from within their own communities due to being born into a specific caste—a system legitimized by religious beliefs—African Americans endure discrimination based on their race, skin color, and associated traits. Unlike the African American experience of slavery, the Indian caste system includes the uniquely dehumanizing practice of untouchability, which stands out as its most severe aspect. Bama faces marginalization not just as

Shared Histories: Caste and Race as Structures of Oppression

Both Dalit and Afro-American communities have historically endured social exclusion, segregation, and systemic disenfranchisement. In Karukku, Bama writes of how her identity as a Dalit Christian placed her at the fringes of both caste Hindu and religious communities. This mirrors the "double exclusion" faced by African Americans—discriminated against by the state and alienated within predominantly white Christian institutions. W.E.B. Du Bois's concept of "double consciousness" is echoed in Bama's depiction of growing up as a Dalit Christian—torn between religious teachings of equality and the lived reality of caste discrimination.

Autobiography as a Tool of Protest

Bama's Karukku can be read alongside Maya Angelou's I Know Why the Caged Bird Sings or The Autobiography of Malcolm X. All three texts employ life-writing as a form of resistance, narrating personal trauma while critiquing institutionalized injustice. In Karukku, Bama's discovery of caste consciousness is a political awakening that mirrors Angelou's growing awareness of racial inequality. Both writers employ confessional modes to destabilize hegemonic narratives and reclaim agency.

Language and Orality: Reclaiming Identity

A key Afro-American strategy of resistance is the use of African American Vernacular English (AAVE), evident in the works of Zora Neale Hurston and Alice Walker. Bama similarly refuses to use sanitized Tamil, opting instead for the dialect of Dalit communities. This linguistic defiance reclaims both identity and authenticity, challenging dominant linguistic hierarchies. Like the African American spirituals and blues,