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Antifungal Activity of Plant Latex collected from *Plumeria alba* L. , *Tabernaemontana divaricata* Linn. and *Wrightia tinctoria* R. Br.

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ABSTRACT:

The creation of new chemotherapeutic drugs can benefit greatly from the structures found in medicinal plants. The goal of the current investigation was to assess the antifungal activity of latex extract from Plumeria *alba* L. , *Tabernaemontana divaricata* Linn. and *Wrightia tinctoria* R. Br. that has been partially purified against a few pathogenic fungi isolated from various fruits. In vitro tests were done on the latex's ethanolic extract against various fungus strains. The disc diffusion method was used to evaluate the inhibitory impact. The serial dilution approach was also used to calculate the minimum inhibitory concentration (MIC) and the minimum fungicidal concentration (MFC). A qualitative phytochemical screening was performed on the ethanolic extract to check for the presence of any bioactive components. Numerous physiologically active compounds, including Flavonoids, alkaloids, terpenoids, steroids, saponins, phenols, and glycosides are present in the ethanolic extract. The latex extract exhibits a considerable, dose-dependent zone of inhibition. The Latex extract's MIC and MFC values range from 1 mg to 8 mg, and the outcomes are comparable to those of amphotericin B. We conclude from this research that latex extract has a high antioxidant capacity, fungicidal activity, which may be because of the ethanolic extract of Plumeria *alba* L. , *Tabernaemontana divaricata* Linn. and *Wrightia tinctoria* R. Br. latex contain biologically active components with antimicrobial activity.

Plant latex bioactive chemicals have the potential to be a source of antifungals for infections that emerge after harvest. Different plant species' latexes were examined to determine their phytochemical and antifungal compositions. Alkaloids, flavonoids, glycosides, phenols, saponins, steroids, tannins, and terpenoids were found in latex extracts after analysis with phytochemical tests. Petroleum ether extracts may have an inhibitory effect against the postharvest fungus isolates, according to an antifungal experiment. Different levels of sensitivity were seen regardless of the plant species. In conclusion, using plant latex to manage post-harvest fungal infections is interesting and fits well with the idea of environmental and human health safety.

KEYWORDS: Bioactive compouds, Latex, Anti-fungal activity.

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INTRODUCTION:

Latex is the milky sap found in many plants that coagulates when exposed to air. Proteins, alkaloids, carbohydrates, sugars, oils, tannins, resins, and gums can all be found in this complex emulsion. The majority of plants produce white latex, although some also produce yellow, orange, or scarlet latex. In a synthetic process, surfactant-emulsified monomers can be used to polymerize latex. In specialized cells or vessels known as laticifers, latex is a colloidal suspension. Cortex, pith, wood, embryos, leaves, fruits, and seedlings all contain laticifers, which are internal secretary structures that can be articulated or unarticulated. There are around 20 families, 900 genera, and 12000 species of latex in plants. The biochemical characteristics of the latex from the various families, such as triterpenes, polyisoprenes, waxes, carboxylic acids, alkanes, and other enzymes, have been studied by a number of researchers. In general, the latex of Indian taxa has 15–60 mg of protein per milliliter.

The laticiferous system, which arises in two quite distinct ways, is made up of the cells or vessels where latex is present. In the meristem of the stem or root, rows of cells are laid down to create the laticiferous system in many plants. As a result of the dissolution of the cell walls separating these types of cells, latex vessels—constant tubes—are created. The poppy family, the rubber plant, and the Cichorieae, a subfamily of the Asteraceae family characterised by the presence of latex in its members, all exhibit this mode of production. Cichorieae includes dandelion, lettuce, hawkweed, and salsify.

On the other hand, the laticiferous system is produced very differently in the Milkweed and Spurge families. Early in the seedling's growth, latex cells begin to differentiate, and as the plant develops, these latex cells branch out to cover the entire plant. The complete laticiferous system of an adult plant descends from a single cell or set of cells that were present in the embryo. The mature plant's root, stem, leaves, and occasionally the fruits all have the laticiferous system. The cortical tissues make it very clear.

It has been suggested that latex serves a variety of purposes. Some think of it as a way to store food, while others see it as a way for plants to excrete their waste. Others still think that its main purpose is to safeguard the plant in the event of injuries. It creates a barrier that stops the entry of germs and fungi. Additionally, because some plants' latex is extremely bitter or even poisonous, it might serve as defense against animals that browse. It's possible that latex performs each of these roles to varied degrees in various plant species.

Although latex has several applications, rubber is its primary use. Another latex item is chicle, which is frequently used as the foundation for chewing gum. Latex is used as a binder in some paints, sometimes known as "latex paints." Typically, emulsion polymerization is utilized to create the synthetic latex that is used in these paints. Finally, opium and its numerous derivatives are derived from poppy latex.

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In approximately 40 families, including the Euphorbiaceae, Apocynaceae, Caricaceae, Moraceae, and Asclepidaceae, over 10% of flowering plants produce latex (Agrawal and Konno 2009). According to Hagal et al. (2008), latex is a milky fluid that is released by ducts of laticiferous tissue and flows inside laticifers, such as the leaves, stems, fruits, and roots of several blooming plants (Pickare, 2008). According to Santos et al. (2011), latex is a complex mixture of secondary metabolites that includes a number of physiologically active substances and antibacterial properties. Siritaperawee et al., 2012; Kanokwiroon et al., 2008)Secondary plant metabolites (phytochemicals) have received a lot of attention recently as a potential source of therapeutic medicines (Balandrin et al., 1985). Proteins, alkaloids, tannins, terpenes, starches, sugars, oils, resins, gums, and enzymes are known latex ingredients. In 2001, Pandey Due to its widespread use in tribal groups, plant latex has broader ethnopharmacological applications. E. hirta latex has traditionally been used to treat ear drops, boils, sores, and wounds.Igoli et al. (2005) Jatropha latex is used medicinally for things like blood coagulation and wound healing (Ome et al., 2008).

The use of medicinal plants is crucial for maintaining both individual and collective health. Its medical effectiveness is derived from certain chemical compounds that work physiologically on the human body. All across the world, many medicinal plants have been utilized for years as part of daily life to treat sickness. Alkaloids, flavonoids, glycosides, and tannins are the most significant bioactive components of plants (Hill, 1952). Finding out the true worth of folk treatments might benefit from understanding these chemical components of plants. Pharmaceutical companies have begun producing more and more novel phytomedicines.

MATERIALS AND METHODS:

Collection of latex

Early in the morning, latex samples were taken from each plant by pinching the stem or making an incision in the trunk and branches, and then letting the milk drain into a clean glass tube separately. After two weeks of shade drying, the collected latex was ground into a fine powder.

Extraction of Latex:

About 10gm latex powder extracted separately with petroleum ether, benzene, chloroform, ethanol and water by cold extraction method for 72 hours. These extracts had been filtered and concentrated and kept in brown bottles for the preliminary phytochemical screening (Harborne, 1998) and (Yadav et al 2011).

Isolation of fungal pathogens:

Isolation of fungal strains are done from fruits (Tomato, Lemon, Papaya and Custard Apple) collected from local market and the fungus is inoculated in PDA (Potato dextrose agar) medium

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and incubated at 28°C for 48-72 hours. The colonies are identified (*Pencillium, A.niger, A.flavous, Rhizopus, Mucor, L.diplodia)* and pure cultures were stored in slants.

Results:

Antifungal activity for-*Plumeria alba* L.

Water Extract						
	Organism					
Dilutions	*Pencillium*	*A. niger*	*A. flavous*	*Rhizopus*	*Mucor*	*L.diplodia*
10 µg/ml	-	15mm	-	-	-	-
25 µg/ml	-	16mm	-	-	-	-
50 µg/ml	-	20mm	-	-	-	-
75 µg/ml	-	24mm	-	-	-	-
100 µg/ml	-	25mm	-	-	-	-

Ethanol Extract						
	Organism					
Dilutions	*Pencillium*	*A. niger*	*A. flavous*	*Rhizopus*	*Mucor*	*L.diplodia*
10µg/ml	13mm	15		-	12	11
25 µg/ml	15mm	16	5	-	14	16
50 µg/ml	18mm	20	7	15	11	20
75 µg/ml	19mm	22	12	18	20	21
100 µg/ml	22mm	35	12	19	23	25

Methanol Extract						
	Organism					
Dilutions	*Pencillium*	*A. niger*	*A. flavous*	*Rhizopus*	*Mucor*	*L.diplodia*
10 µg/ml	15mm	18mm	28mm	16mm	15mm	18mm
25 µg/ml	21mm	20mm	29mm	22mm	20mm	21mm
50 µg/ml	17mm	24mm	29mm	23mm	21mm	25mm
75 µg/ml	15mm	26mm	31mm	20mm	22mm	24mm
100 µg/ml	20mm	27mm	26mm	30mm	25mm	26mm

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Petroleum Ether Extract						
	Organism					
Dilutions	*Pencillium*	*A. niger*	*A. flavous*	Rhizopus	Mucor	L.diplodia
10 µg/ml	-	-	-	-	-	-
25 µg/ml	-	-	-	-	-	-
50 µg/ml	-	-	-	-	-	-
75 µg/ml	-	-	-	-	-	-
100 µg/ml	-	-	-	-	-	-

Chloroform Extract						
	Organism					
Dilutions	*Pencillium*	*A. niger*	*A. flavous*	*Rhizopus*	*Mucor*	*L.diplodia*
10 µg/ml	-	-	10mm	-	-	15mm
25 µg/ml	-	-	12mm	-	-	16mm
50 µg/ml	6mm	-	14mm	-	-	17mm
75 µg/ml	9mm	-	15mm	-	-	19mm
100 µg/ml	12mm	-	15mm	-	-	20mm

Antifungal activity for- *Tabernaemontana divaricate* Linn.

Water Extract						
	Organism					
Dilutions	*Pencillium*	*A. niger*	*A. flavous*	*Rhizopus*	*Mucor*	*L.diplodia*
10 µg/ml	-	-	-	-	-	-
25 µg/ml	-	-	-	-	-	-
50 µg/ml	-	-	-	-	-	-
75 µg/ml	-	-	-	-	-	-
100 µg/ml	-	-	-	-	-	-

Ethanol Extract						
	Organism					
Dilutions	*Pencillium*	*A. niger*	*A. flavous*	*Rhizopus*	*Mucor*	*L.diplodia*
10 µg/ml	11mm	11mm	-	-	8mm	-
25 µg/ml	13mm	16mm	5mm	-	9mm	-
50 µg/ml	16mm	20mm	7mm	10mm	10mm	-

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75 µg/ml	18mm	26mm	12mm	12mm	10mm	-
100 µg/ml	20mm	28mm	12mm	12mm	11mm	-

Methanol Extract						
	Organism					
Dilutions	*Pencillium*	*A. niger*	*A. flavous*	*Rhizopus*	*Mucor*	*L.diplodia*
10 µg/ml	10mm	16mm	28mm	11mm	14mm	20mm
25 µg/ml	19mm	26mm	29mm	12mm	21mm	21mm
50 µg/ml	25mm	30mm	24mm	18mm	22mm	22mm
75 µg/ml	26mm	26mm	26mm	20mm	23mm	27mm
100 µg/ml	30mm	30mm	31mm	21mm	23mm	28mm

Petroleum Ether Extract						
	Organism					
Dilutions	*Pencillium*	*A. niger*	*A. flavous*	*Rhizopus*	*Mucor*	*L.diplodia*
10 µg/ml	-	-	-	-	-	-
25 µg/ml	-	-	-	-	-	-
50 µg/ml	-	-	-	-	-	-
75 µg/ml	-	-	-	-	-	-
100 µg/ml	-	-	-	-	-	-

Chloroform Extract						
	Organism					
Dilutions	*Pencillium*	*A. niger*	*A. flavous*	*Rhizopus*	*Mucor*	*L.diplodia*
10 µg/ml	-	-	-	-	-	16mm
25 µg/ml	-	-	11mm	-	-	17mm
50 µg/ml	8mm	-	12mm	-	-	18mm
75 µg/ml	-	-	15mm	-	-	18mm
100 µg/ml	11mm	-	15mm	-	-	19mm

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Antifungal activity for- *Wrightia tinctoria* R. Br.

Water Extract						
	Organism					
Dilutions	*Pencillium*	*A. niger*	*A. flavous*	*Rhizopus*	*Mucor*	*L.diplodia*
10 µg/ml	-	-	-	-	-	-
25 µg/ml	-	-	-	-	-	-
50 µg/ml	-	-	-	-	-	-
75 µg/ml	-	-	-	-	-	-
100 µg/ml	-	-	-	-	-	-

Ethanol Extract						
	Organism					
Dilutions	*Pencillium*	*A. niger*	*A. flavous*	*Rhizopus*	*Mucor*	*L.diplodia*
10 µg/ml	10mm	10mm	21mm	11mm	11mm	9mm
25 µg/ml	13mm	12mm	17mm	12mm	17mm	11mm
50 µg/ml	15mm	20mm	18mm	15mm	18mm	12mm
75 µg/ml	17mm	21mm	25mm	16mm	17mm	13mm
100 µg/ml	19mm	38mm	27mm	18mm	21mm	20mm

Methanol Extract						
	Organism					
Dilutions	*Pencillium*	*A. niger*	*A. flavous*	*Rhizopus*	*Mucor*	*L.diplodia*
10 µg/ml	12mm	15mm	17mm	19mm	14mm	16mm
25 µg/ml	16mm	20mm	21mm	20mm	15mm	21mm
50 µg/ml	25mm	25mm	28mm	21mm	16mm	23mm
75 µg/ml	30mm	26mm	27mm	22mm	20mm	25mm
100 µg/ml	31mm	30mm	29mm	26mm	21mm	27mm

Petroleum Ether Extract						
	Organism					
Dilutions	*Pencillium*	*A. niger*	*A. flavous*	*Rhizopus*	*Mucor*	*L.diplodia*
10 µg/ml	-	-	-	14mm	13mm	-

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25 µg/ml	-	-	-	15mm	-	-
50 µg/ml	-	-	-	16mm	14mm	-
75 µg/ml	-	-	-	20mm	-	-
100 µg/ml	-	-	-	21mm	21mm	-

Chloroform Extract						
	Organism					
Dilutions	*Pencillium*	*A. niger*	*A. flavous*	*Rhizopus*	*Mucor*	*L.diplodia*
10 µg/ml	11mm		0.5mm	-	-	
25 µg/ml	7mm		11mm	-	-	15mm
50 µg/ml	9mm		16mm	-	-	16mm
75 µg/ml	13mm		18mm	-	-	17mm
100 µg/ml	15mm		19mm	-	-	20mm

Zone of inhibition

Penicillum oxallicum (ethanol extract)

Dilutions(ul)	Inhibition zones(mm)		
	Plumaria	*T.divaricata*	*W.tinctoria*
10 µg/ml	13mm	11mm	10mm
25 µg/ml	15mm	13mm	13mm
50 µg/ml	18mm	16mm	15mm
75 µg/ml	19mm	18mm	17mm
100 µg/ml	22mm	20mm	19mm

Aspergillus niger (ethanol extract)

Dilutions(ul)	Inhibition zones(mm)		
	Plumaria	*T.divaricata*	*W.tinctoria*
10 µg/ml	11mm	10mm	-
25 µg/ml	15mm	12mm	-
50 µg/ml	16mm	13mm	18mm
75 µg/ml	17mm	15mm	15mm
100 µg/ml	13mm	18mm	19mm

Rhizopus (ethanol extract)

Dilutions(ul)	Inhibition zones(mm)		
	Plumaria	*T.divaricata*	*W.tinctoria*

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10 µg/ml	-	-	11mm
25 µg/ml	-	-	12mm
50 µg/ml	18mm	10mm	15mm
75 µg/ml	15mm	8mm	16mm
100 µg/ml	19mm	11mm	18mm

Discussion:

According to the commodity and country, postharvest decay losses to fruits and vegetables can range from 10 to 50% (El-Ghaouth et al., 2004), and postharvest disease development causes significant losses to horticultural produce. Synthetic fungicides provide benefits, but their overuse has a negative impact on the environment and human health. Plant pathologists are interested in natural substances originating from plants, and there is a global movement to look into safe alternatives to prevent post-harvest infections (Johnson and Sangchote, 1994). For the prevention of postharvest degradation, a number of interesting prospective alternatives, such as naturally occurring antifungal agents, microbial antagonists, and induced resistance, have been created.

Plant latexes' antimicrobial properties have a long history of research (Guerrero and Guzman, 2004). Chitin-binding lectins from *Artocarpus* have been described by Trindade et al. (2006), who also discovered that they have antifungal action against *Fusarium moniliforme*. *A. heterophyllus* latex may have antimycotic efficacy against postharvest fungal infections, according to this experiment. Previous research looked into the latex and papaya seeds' potential antifungal properties (Quintal et al., 2011; Giordani et al., 1996). According to our research, *P. alba*, *T. variegata, and W. tinctoria* latex have a considerable inhibitory effect.

Conclusion

Numerous secondary metabolites, including steroids, alkaloids, phenolic groups, saponin, tannin, sugar, catechin, amino acids, and reducing sugar, were discovered during the initial phytochemical examination. The majority of secondary plant metabolites have medicinal, antimicrobial, and antimycotic effects. Because of its outstanding fungicidal properties, latex extract may be a valuable source for the creation of new antifungal agents that are effective against pathogenic fungi. Standardization and quality control of plants are very important for maintaining raw material purity prior to processing. Future pharmaceutical industries will be able to create medications by isolating phytoconstituents because of recent investigations.

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