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Plant-Based Antivirals against COVID-19 - A Review

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Abstract: ***COVID-19, caused by the SARS-CoV-2 virus, has posed a serious threat to global health. Though vaccines and synthetic antivirals are available, the role of natural, plant-based antivirals has gained attention for their immune-boosting and antiviral effects. This review focuses on selected medicinal plants such as Tulsi, Neem, Turmeric, Karpoora Valli, Vetrilai, Aloe Vera, and Vetiver, and highlights their phytochemicals, mechanisms of action, and potential as complementary therapeutic agents in viral infections.***
Keywords: COVID-19, medicinal plants, antiviral agents, Tulsi, Karpoora Valli, natural immunity

I. INTRODUCTION

The outbreak of COVID-19 has triggered a global crisis, pushing researchers to explore alternate antiviral options. Traditional medicine systems like Ayurveda, Siddha, and Unani have long used medicinal plants with proven efficacy. These plants contain active compounds that demonstrate antiviral, antioxidant, and immunomodulatory properties. Exploring these botanicals offers a holistic approach in preventing or managing viral infections including COVID-19.

II. MECHANISM OF ACTION OF PLANT-BASED ANTIVIRALS

Medicinal plants help fight viruses through several biological mechanisms:

1) Inhibiting Virus Entry: Blocking viral spike proteins from binding to host receptors.
2) Inhibiting Replication: Interrupting RNA replication or protease function.
3) Immunomodulation: Strengthening host immunity to eliminate the virus.
4) Anti-inflammatory Effects: Preventing cytokine storms and lung inflammation.

III. SELECTED MEDICINAL PLANTS AND THEIR ANTIVIRAL ROLES

1) Tulsi (Ocimum sanctum)
- Compounds: Eugenol, Ursolic acid
- Action: Inhibits viral replication, enhances immune response
- Benefit: Used traditionally in respiratory infections and viral fevers

2) Neem (Azadirachta indica)
- Compounds: Nimbin, Azadirachtin
- Action: Prevents virus entry and multiplication
- Benefit: Strong antibacterial and antiviral properties

3) Turmeric (Curcuma longa)
- Compound: Curcumin
- Action: Suppresses inflammation, inhibits viral enzymes
- Benefit:Protects against lung inflammation, boosts immunity

4) Karpoora Valli (Indian Borage)
- Compounds: Thymol, Carvacrol
- Action: Relieves cold and cough; antimicrobial
- Benefit: Used in traditional medicine for throat and respiratory issues

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5) Vetrilai (Betel Leaves)
- Compounds: Eugenol, Chavicol
- Action: Broad-spectrum antimicrobial
- Benefit: Helps in respiratory tract cleansing, potential antiviral effect

6) Aloe Vera
- Compounds: Acemannan, Aloin
- Action: Stimulates immunity, repairs tissues
- Benefit: Enhances mucosal immunity, anti-inflammatory properties

7) Vetiver (Vetti Ver)
- Compound: Vetiverol
- Action: Cooling and detoxifying effects
- Benefit: Supports fever reduction and immune modulation

IV. RECENT STUDIES AND FINDINGS

1) Studies have shown that curcumin and neem extracts demonstrate strong binding with SARS-CoV-2 main protease.
2) AYUSH ministry has promoted the use of herbal decoctions with Tulsi, Giloy, and turmeric for immunity.
3) Molecular docking and simulation studies prove the potential of phytochemicals in antiviral applications.
4) In Silico Studies: Molecular docking analyses suggest strong binding affinity of plant compounds to SARS-CoV-2 spike and protease proteins.
5) In Vitro Studies: Neem and Curcumin extracts demonstrate viral inhibition in laboratory studies.
6) Clinical Trials: Preliminary human studies indicate immune modulation benefits, but large-scale trials are needed for validation.
7) Comparative Studies: Plant-derived antivirals show potential for combination therapy with synthetic antiviral drugs.

V. FUTURE PROSPECTS AND CHALLENGES

1) Standardization of plant-derived compounds for clinical applications.
2) Comprehensive safety and efficacy trials in human populations.
3) Development of nano-formulations to enhance bioavailability of plant-based antivirals.
4) Regulatory approvals and integration into mainstream medicine.

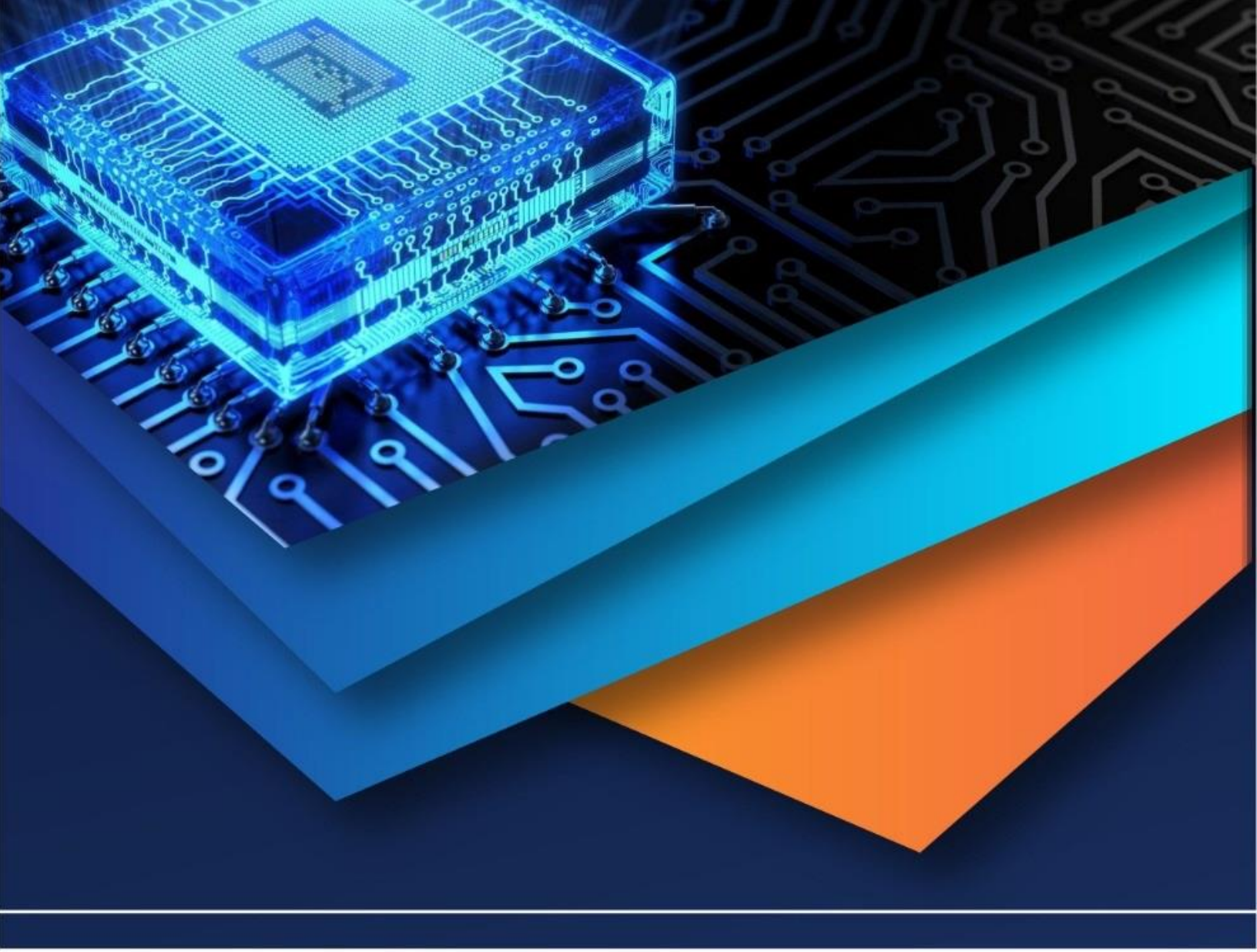
VI. CONCLUSION

Plant-based antivirals offer a natural and safer approach to support conventional therapies against viral infections like COVID-19. The presence of diverse phytochemicals provides a multi-targeted effect, making these plants valuable in integrative medicine. More clinical validation is needed to translate traditional knowledge into modern therapeutic applications.

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