IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

A Review On Pharmacological Activity On "Eucalyptus"

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ABSTRACT :

Eucalyptus (Eucalyptus spp.), an evergreen tall tree native to Australia and Tasmania, has been used since ancient times by the aboriginal population for several purposes. In particular, the species E. globulus is widely used in the pulp industry, as well as for the production of eucalyptus oil extracted on a commercial scale in many countries as raw materials in perfumery, cosmetics, food, beverages, aromatherapy and phytotherapy. The 1,8-cineole (eucalyptol), the principal and the most important constituents extracted from eucalyptus leaves, demonstrated an antimicrobial and anti- inflammatory activities. Despite the fact that the healthy effects of eucalyptus have been well established by research, further studies are necessary to investigate other prime effects of the plant and its possible implication in the treatment of a greater number of pathological conditions.

The interest in the use of Eucalyptus genus members, in parallel with preclinical studies has been steadily growing over the last few decades in the field of pharmaceuticals, agriculture, cosmetics, food, etc. Eucalyptol (1,8-cineole or cineole), the main terpenoid constituent in Eucalyptus species, has been studied in both preclinical and clinical settings for its various pharmacologic activities. Investigations into the pharmacological activities of the genus Eucalyptus revealed that it manifests astounding potential in the treatment and management of respiratory disorders, COVID-19, pain, oral health, infectious diseases, cancer, etc.

Geographical Source:

It is mainly found in Australia, Tasmania, United States, Spain, Portugal, Brazil, North and South Africa, India, France, and Southern Europe .

History:

Eucalyptus globulus has been used since a long time for intermittent fever. The leaves and their preparations have been successfully used as a tonic, stimulant, stomachic, in dyspepsia, in catarrh stomach, in typhoid fever, in asthma, in whooping cough, etc. More recently it has been

recommended as a diuretic in the treatment of dropsy.

Eucalyptus was first introduced to India around 1790 by Tipu Sultan, the ruler of Mysore, who planted it in his palace garden at Nandi Hills. Initial large-scale plantations of Eucalyptus globulus were established in the Nilgiri hills of Tamil Nadu in 1856 to meet demand for firewood, and widespread cultivation expanded significantly from the late 19th century onward for industrial uses

like pulp and paper. Today, India has vast eucalyptus plantations, but the tree's high water consumption and ecological impacts have led to ongoing environmental debates and a re-evaluation of its widespread use.

Early Introduction & Expansion

1790: Tipu Sultan, ruler of Mysore, introduces eucalyptus to India in his garden at Nandi Hills, near Bangalore, possibly receiving seeds from Australia.

1843: Eucalyptus is planted in the Nilgiri hills of Tamil Nadu.

1856: The first regular eucalyptus plantations are established in the Nilgiris to supply firewood, a practice that rapidly expands across the country.

Late 1900s: Eucalyptus cultivation expands significantly due to its fast growth, use in the pulp and paper industry, and suitability for fuel and shelter needs.

Characteristics:

Eucalyptus is a tall, evergreen tree, the trunk, which grows to 300 feet high or more, is covered with peeling papery bark.

The leaves on the young plant, up to five years old, are opposite, sessile, soft, oblong, pointed, and a hoary blue colour.

The mature leaves are alternate, petioled, leathery, and shaped like a scimitar. The flowers are solitary and white, without any petals. Eucalyptus oil is a colourless or straw-coloured fluid, with a characteristic odour and taste, soluble in its own weight of alcohol.

According to the British Pharmacopoeia Eucalyptus oil should contain not less than 55%, by of Eucalyptol, have a specific gravity 0.910 to 0.930, and optical rotation –10 degrees to 10 degrees.

1. INTRODUCTION:-

Eucalyptus trees, native to Australia, are iconic symbols of the continent. These evergreen trees are known for their distinctive appearance and the essential oils they produce. The genus Eucalyptus encompasses over 700 species, displaying a remarkable diversity in size, shape, and habitat preference. From towering giants that dominate the landscape to smaller, shrub-like varieties, eucalyptus trees have adapted to thrive in various environments, including arid deserts, coastal regions, and mountainous areas.

One of the most recognizable features of eucalyptus trees is their bark. It can vary greatly depending on the species, ranging from smooth and colourful to rough and fibrous. Some eucalyptus species shed their bark in long strips, revealing a patchwork of colours beneath, while others retain their bark throughout the year. The leaves of eucalyptus trees are another defining characteristic. They are typically lance-shaped and have a leathery texture. The leaves contain oil glands that produce a fragrant, aromatic oil. This oil, known as eucalyptus oil, is responsible for the characteristic scent associated with these trees.

Eucalyptus trees play a significant role in the ecosystems they inhabit. They provide habitat and food for various animals, including koalas, which rely almost entirely on eucalyptus leaves for sustenance. Additionally, eucalyptus forests help to regulate water cycles, prevent soil erosion, and contribute to carbon sequestration.

Beyond their ecological importance, eucalyptus trees have also been utilized by humans for centuries. Indigenous Australians have long used eucalyptus leaves and oil for medicinal purposes, treating ailments such as coughs, colds, and skin infections. Today, eucalyptus oil is a common ingredient in various products, including pharmaceuticals, aromatherapy products, and cleaning agents. Eucalyptus wood is also valued for its strength and durability, making it suitable for construction, furniture, and paper production.

In recent decades, the demand for plant derived products for therapeutic uses has been increased. In many countries worldwide aromatic herbs are used in primary health care, especially in rural areas , and 80% of the populations in developing countries use these

traditional resources . For this reason, the use of essential oils extracted from plants for clinical purposes have become an important topic in scientific research and industrial application thanks to the different biological activities of oils, which exercise antimicrobial. antioxidant and anti-inflammatory activities. Eucalyptus (Eucalyptus spp.), is a large genus of the Myrtaceae family, which includes 900 species and subspecies. This evergreen tall tree is native from Australia and Tasmania and is the second largest genera after acacia . Since the1850s, it has been successfully introduced into 90 countries worldwide where it is now one of the most important and widely planted genera . In ancient times the eucalyptus plant was used for several purposes by aboriginal people, both as medicine and as food. Nowadays, the plant is used in forestry (timber, fuel, paper pulp), environmental planting (water and wind erosion control), as a source of essential oil (medicinal, perfumery oils), for arts and craft . Among all the species of Australian Eucalyptus, the E. globulus was widely introduced overseas . becoming largely cultivated in the subtropical and Mediterranean regions. as well as in Nigeria. E. globulus which has different vernacular names (eucalyptus in Bengali and in Hindi; blue-gum eucalyptus in English and Karpuramaram in Tamil is considerably used in the pulp industry, as well as for the production of eucalyptus oil (henceforth EO), extracted on commercial scale in many countries and adopted in perfumery, cosmetics, food, beverages, aromatherapy and phytotherapy.

Eucalyptus plants draw the attention of researchers and environmentalists worldwide because it represents a fast-growing source of wood as well as a source of oil used for several purposes. The oil is extracted from leaves, fruits, buds and bark showing antibacterial, antiseptic, antioxidant, anti-inflammatory, anticancer activities and for this reason used in the treatment of respiratory diseases, common cold, influenza, and sinus congestion . The aim of this paper is to provide and collect scientific information about eucalyptus plants in order to present the beneficial and healthy properties and its potential use.

Physical description:-

The flower petals cohere to form a cap when the flower expands. The capsule fruit is surrounded by a woody cup-shaped receptacle and contains numerous minute seeds. Possibly the largest fruits—from 5 to 6 cm (2 to 2.5 inches) in diameter—are borne by mottle Cah, or silverleaf eucalyptus (*E. macrocarpa*).

2.AIM AND OBJECTIVE:-

AIM:-

A review on pharmacological activity on “Eucalyptus”.

OBJECTIVES :-

- It is used to treat cold and Respiratory issues.
- It is used to relieve muscles and joint pain.
- It is used as Antiseptic agent.
- It is used in Cosmetics, Perfumes etc.
- It is used in industrial solvents.
- It is used in some mouthwashes and toothpaste.

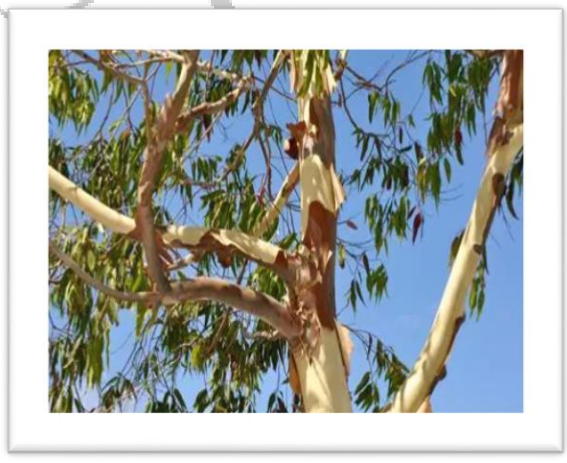

Fig. 01(Eucalyptus Tree)

3.LITERATURE REVIEW:-

(Dabhoya Sainbanu, Dalal Kinja...April 2023)

The study eucalyptus indicates that the evaluated paper soap contain may be antimicrobial properties and this can contribute the curative and preventive actions for skin infections caused by bacteria if well balanced.

(Panikar *et al.*. 2021).

Due to its therapeutic potential, Eucalyptus essential oil has found its application in the treatment of various ailments such as bronchitis chronic obstructive pulmonary disease.

(Galan *et al.*.2020)

The use of extracts from Eucalyptus species leaves for the treatment of various ailments especially respiratory problems have a rich folkloric history, especially by the Australian Aborigines.

(Shaffique *et al.*, 2018).

Traditionally, eucalyptus has been utilized in folk medicine for various ailments, including respiratory issues and digestive problems…

(Vecchio *et al.*, 2016)

Eucalyptus species, particularly E. globulus, are extensively used in the pulp and paper industry, providing a significant source of raw material for paper production...

(Vecchio *et al.*, 2016)

Medicinal Properties Eucalyptus leaves are rich in essential oils, particularly 1,8-cineole (eucalyptol), which exhibit antimicrobial and anti-inflammatory properties…

(Hiwale, 2015)

The biomass yield of eucalyptus can reach up to 195 quintals per hectare in ten-year-old plantations, making it a valuable crop for construction and other industries…

(Bachhe, 2015)

Oil in the Leaf of E. globules has Maximum antibacterial activity against S. aureus, while the minimum activity for P. aeruginosa.

(Asian Pac J Trop Biomed. 2012 Sep)

The encouraging results indicate the essential oil of E. globulus leaves might be exploited as natural antibiotic for the treatment of several infectious diseases caused by these two germs, and could be
useful in understanding the relations between traditional cures and current medicines.

(Anon, 1984)

Economic and Planning Council, 1984. Proceedings of the Economic and Planning Council, Meeting of Karnataka, India.

(Bhatia, C.L. 1984)

Eucalyptus In India - Its Status and Research needs, Indian Forester, 110 (2) pp.91-96.

(Bhattee, S.S. 1972)

Status of man-made forests in the Union Territory of Goa, Daman and Diu, Symposium on Man-made forests in India, pp. 48-54.

(Calder, I.R. 1991)

use of Eucalyptus. In: Proc. International Seminar on Growth and Water Use of Forest Plantations, Bangalore.

(Calder, I.R. 1991)

The Soil Moisture regimes beneath Forest and Agricultural Crop in Southern India - Observation and Modelling. In: Proc. of International seminar on Growth and Water use of Forest Plantations, Bangalore.

(Dilip Kumar, P.J. 1991)

Eucalyptus in Industrial and Social Plantations in Karnataka, In: Proc. of International Seminar on Growth and Water Use of Forest Plantations, Bangalore.

(FAO. 1979)
Eucalyptus for planting. Food and Agriculture Organisation of the United Nations, Rome.

(George, M. 1978)
Interception, stem flow, throughfall in a E. hybrid plantation, Indian Forester, 104 (11) pp. 719-724.

(George, M. 1979)
Nutrient Return by Stem flow, Throughfall and rain water in a Eucalyptus hybrid plantation. Indian Forester 105 (7) pp. 494-496.

(George, M. 1982)
Litter production and Nutrient Return in Eucalyptus hybrid plantations, Indian Forester, 108 (4) pp. 253-258.

(George, M. 1984)
Nutrient removal from Eucalyptus plantations by harvesting wood, Indian Forester 110 (10) pp. 61-66.

(George, M. 1986)
Nutrient uptake and cycling in young E. hybrid plantations. Myforest 22 (1) pp. 22-26.

(Indian Statistical Institute. 1984)
Proceeding of the Workshop on Eucalyptus plantations, Indian Statistical Institute, Bangalore, India.

(Krishnaswamy Kadambi. 1944)
A Working Plan for the Devarayadurga Group of Forests, Tumkur District, 1942- 51, Printed by the Superintendent, Government Press, Bangalore.

(Kushalappa, K A. 1985)
Productivity and Nutrient Recycling in Mysore gum Plantations near Bangalore. Ph.D. Thesis, Mysore University. pp 178.

(Nanjundappa, D. 1957)
A note on Eucalyptus plantations in old Mysore State, Indian Forester, 83 (4) pp. 280-284.

(National Commission on Agriculture. 1976)
National Commission on Agriculture - Report on Forestry. Vol 8 & 9, Government of India. New Delhi.

(Mathur, R.S., Sagar, S.R., Ansari, M.K. 1984)
Economics of Eucalyptus (hybrid) with special reference to Uttar Pradesh, India.

(Poore, M.E.D. and Fries, C. 1985)
The Ecological effects of Eucalyptus, FAO Forestry Paper-59.

(Rajan, B.K.C. 1987)
The Versatile Eucalyptus. Diana Publication, Bangalore.

(Rao, A.L. 1984)
Eucalyptus in Andhra Pradesh, Indian Forester, 110 (1) pp. 1-8.

(Sandhu, S.S. 1988)
Eucalyptus and Farm Forestry. Heartwood and Co. Ludhana. pp. 160.

(Sharma, G.K., Naiar, C.T.S., Kedarnath, S., Kundan, S. 1986)
Eucalyptus in India. Past, Present and Future. Proceedings of National Seminar on Eucalyptus. KFRI. Pecchi, Kerala - India.

(Shyam Sundar, S. 1979)
Eucalyptus in Karnataka. Myforest. 134-143.

(Shyam Sundar, S. 1984)
Forest Development and Eucalyptus controversy in Karnataka, Workshop on Eucalyptus plantation, Indian Statistical Institute, Bangalore.

(Shyam Sundar, S. 1984)
Some aspects of Eucalyptus hybrid, Workshop on Eucalyptus plantation, Indian Statistical Institute, Bangalore.

4.PLANT PROFILE :-

SCIENTIFIC CLASSIFICATION OF PLANT :

Synonym: ***Gum tree***
Biological Source: The dried leaves of various Eucalyptus species**.**
Family: *Myrtaceae*
Chemical Constituents: Eucalyptus oil contains cineole (eucalyptol), which is the primary active component, along with other terpenes like alpha-pinene and limonene. The leaves also contain tannins, flavonoids, and phenolic acids.

Fig no.2:- Eucalyptus flowers

Decoration: Flowers add beauty to events like weddings, birthdays, and festivals, and are used in bouquets, flower arrangements, and potpourri.

Fragrance: Flower extracts are key ingredients in perfumes, colognes, and essential oils, used for relaxation and mood enhancement.

Food: Some flowers are edible and can be cooked into dishes or used to make herbal teas, like chamomile. Flowers also produce nectar for honey.

Medicine: Various flowers are used in herbal remedies for their medicinal properties, with applications in aromatherapy and for physical and psychological ailments.

Gifts: Flowers are a popular way to express emotions and are given as gifts for various occasions.
Art and Culture: Flowers are incorporated into religious practices, festivals, and art forms, such as Japanese.

Fig no.03:- Eucalyptus trees

Eucalyptus is a medicinal plant known for its therapeutic properties, particularly for respiratory issues like colds, coughs, and congestion, as well as for muscle and joint pain.

Its leaves yield eucalyptus oil, rich in compounds like eucalyptol, which has antiseptic, anti-inflammatory, and expectorant actions. Benefits include relieving sore throats, healing cuts and burns, reducing inflammation, and acting as a breath freshener. However, oral consumption of eucalyptus oil is toxic, and it should be kept away from children.

Common Medicinal Uses:-

Respiratory Relief: Inhaling steam from boiled eucalyptus leaves or applying diluted eucalyptus oil to the chest can help clear nasal passages and relieve symptoms of colds, coughs, bronchitis, and asthma.

Pain Management: The analgesic and anti-inflammatory properties of eucalyptus can reduce muscle and joint pain, offering relief for conditions like arthritis.

Antiseptic and Wound Healing: The oil's antiseptic qualities help prevent infection and promote healing in minor cuts, burns, and insect bites.

Breath Freshening: The antibacterial action of eucalyptus helps fight mouth odors, acting as a natural breath freshener.

Fig no.4 :- Eucalyptus leafs

Uses and Benefits

Respiratory Relief: Inhaling steam from eucalyptus leaves or using eucalyptus oil can help clear nasal congestion, relieve cough, and ease symptoms of colds and bronchitis by helping to expel phlegm and mucus.

Wound and Skin Care: The antimicrobial and antiseptic properties of eucalyptus oil can help in healing minor wounds, cuts, and burns. It's also used to inhibit acne-causing bacteria when diluted and applied topically with a carrier oil.

Pain Management: Applied topically, diluted eucalyptus oil can act as a natural pain reliever for muscle and joint pain due to its analgesic and anti-inflammatory effects.

Oral Health: Eucalyptus is found in some mouthwashes and has been shown to help reduce plaque and gingivitis, improving overall oral hygiene.

Insect Repellent: The oil is a natural and effective alternative to chemical bug sprays.

Aromatherapy: The distinct aroma of eucalyptus oil is invigorating and can help reduce mental fatigue, stress, and provide an overall sense of relaxation and mental clarity.

Fig no.4 :- Eucalyptus fruits

Eucalyptus "fruit" (technically, the eucalyptus seed pod) is primarily used for decorative purposes, such as in floral arrangements and wreaths, and in aquariums where it provides benefits for fish and invertebrates. While the pods are non-edible, the leaves and oil are used for their medicinal properties, which include treating respiratory issues like coughs and colds, and as an antiseptic.

Uses of the eucalyptus seed pod Aquarium decorations:

Eucalyptus pods are used in aquariums to help with water quality and shrimp and fish health.

They release tannins that can have bactericidal and fungicidal effects, promote breeding, reduce stress, and improve coloration

Coughs and Colds:
Inhalation of eucalyptus vapors from steam or vapor rubs can help alleviate congestion, colds, and flu symptoms.

Bronchitis and Asthma:
Eucalyptus may help dissolve mucus and reduce inflammation in the airways, offering relief for bronchitis and severe asthma.
Sinusitis: It acts as a decongestant, helping to clear sinuses.

5.Uses:

-Medicinal*:* Used as an expectorant, decongestant, and antiseptic

- It's used to treat respiratory conditions like coughs, colds, and bronchitis.

-Aromatherapy*:* Eucalyptus oil is used in aromatherapy for its refreshing and stimulating properties.

-Industrial*:* Used in the production of essential oils, pharmaceuticals, and cleaning products.

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Fig.05(Eucalyptus Flower)

Other*:* Eucalyptus wood is used in construction and paper production.

6.PHARMACOLOGICAL ACTIVITY:-

ANTI-CANCER:

Eucalyptus has shown potential in anticancer research due to the presence of bioactive compounds like flavonoids and terpenoids. These compounds exhibit cytotoxic effects, meaning they can kill cancer cells, and can also inhibit tumor growth and metastasis.Studies suggest that eucalyptus extracts can induce apoptosis (programmed cell death) in cancer cells, while also possessing antioxidant and anti-inflammatory properties that may indirectly contribute to cancer prevention and treatment.

ANTI-SEPTIC:

Eucalyptus exhibits antiseptic activity due to its high content of cineole, a monoterpenoid. Cineole disrupts the cell membranes of bacteria, fungi, and viruses, leading to their inactivation.
It also has anti-inflammatory properties that can reduce the swelling and redness associated with infections.

ANTI-DIABETIC:

Eucalyptus extracts have demonstrated anti-diabetic properties in several studies. These extracts contain compounds like flavonoids and tannins that can help regulate blood sugar levels. They work by improving insulin sensitivity, enhancing glucose uptake by cells, and inhibiting the enzymes involved in carbohydrate digestion. This can lead to a reduction in post-meal blood glucose spikes and overall better glycemic control.

ANTI-SEPTIC :

Eucalyptus oil is well-known for its antiseptic properties, primarily due to its high content of cineole, also known as eucalyptol. Cineole is an effective antimicrobial agent, capable of killing bacteria, viruses, and fungi. This makes eucalyptus oil useful in treating minor cuts,

wounds, and infections. It can also be used to disinfect surfaces and air, contributing to a cleaner and healthier environment.

ANTI-VIRAL:

Eucalyptus oil has shown antiviral activity, mainly attributed to its main component, cineole (eucalyptol), and other terpenes. These compounds can interfere with the virus's ability to infect cells and replicate. Research suggests that eucalyptus oil can be effective against various viruses, including influenza, herpes simplex, and some respiratory viruses. It works by disrupting the viral envelope, preventing the virus from attaching to and entering host cells, and inhibiting viral replication.

ANTI-INFLAMMATORY:

Eucalyptus oil is recognized for its anti-inflammatory properties, which are largely due to its main component, cineole. Cineole helps to reduce inflammation by inhibiting the production of inflammatory cytokines and other inflammatory mediators. This action can help alleviate symptoms of various inflammatory conditions, such as arthritis, sinusitis, and bronchitis. Additionally, eucalyptus oil's antioxidant properties contribute to its anti-inflammatory effects by neutralizing free radicals that can exacerbate inflammation.

BRONCHODILATOR:

Eucalyptus oil acts as a bronchodilator, meaning it helps to relax the muscles in the airways, thus widening the bronchi and bronchioles. This action is primarily due to its active compound, cineole. By relaxing these muscles, eucalyptus oil can ease breathing difficulties, reduce coughing, and help clear congestion in the respiratory system. This makes it beneficial for conditions like asthma, bronchitis, and the common cold.

ANTI-OXIDANT:

Eucalyptus extracts exhibit antioxidant activity due to the presence of various phenolic compounds, including flavonoids and tannins. These compounds help neutralize free radicals, which are unstable molecules that can cause cellular damage and contribute to various diseases. By scavenging these free radicals, eucalyptus extracts can protect cells from oxidative stress, potentially reducing the risk of chronic diseases and promoting overall health.

7.ADVANTAGESOf EUCALYPTUS:

- **Fast Growth:** They grow quickly, making them a sustainable resource for timber and other products.
- **Versatile Wood:** The wood is strong and can be used in construction, furniture, and paper production.
- **Oil Production:** Eucalyptus leaves contain oil used in medicine, aromatherapy, and cleaning products.
- **Adaptability:** They can thrive in various climates and soil conditions.
- **Erosion Control:** Eucalyptus can help prevent soil erosion due to their extensive root systems.
- **Carbon Sequestration:** They absorb carbon dioxide from the atmosphere, contributing to climate change mitigation.
- **Medicinal Properties**: Eucalyptus oil is used to treat respiratory issues like coughs, colds, and congestion.
- **Aromatherapy:** The oil is used in aromatherapy for its refreshing and invigorating scent.
- **Antiseptic:** Eucalyptus oil has antiseptic properties and can be used to clean wounds.

- **Insect Repellent**: It acts as a natural insect repellent**.**
- **Cleaning Agent:** Eucalyptus oil is an ingredient in some cleaning products.
- **Industrial Uses**: Eucalyptus wood is used in construction, furniture, and paper production**.**
- **Koala Food:** Eucalyptus leaves are the primary food source for koalas.
- **Ornamental Purposes:** Eucalyptus trees are planted for ornamental purposes due to their attractive appearance**.**

8.KEYWORDS:- EUCALYPTUS LEAVES

9.REFERENCE:-

1. AKHTAR, M.S. AND JABEEN, M., 1981. Responses of Coptotermes heimi (Wasmann) (Isoptera) to woods, wood extracts and essential oils of timbers. Materials and Organism, 16:200-206.
2. Barkat Ali Khan, Naveed Akhtar, Haji Muhammad Shoaib Khan, Khalid Waseem, Tariq Mahmood, Akhtar Rasul, Muhammad Iqbal and Haroon Khan, Basics of pharmaceutical emulsions: A review, African Journal of Pharmacy and Pharmacology Vol. 5(25), pp. 2715- 2725, 30 December, 2011.
3. BATISH, D.R., SINGH, H.P., KOHLI, R.K. AND KAUR, S., 2000. Eucalyptus essential oil as a natural pesticide. Forest Ecol. Manage., 256: 2166-2174.
4. Branislava Teofilovic, Nevena Grujic-Letic, Milica Karadzic, Strahinja Kovačević, Sanja Podunavac-Kuzmanović, Emilia Gligorić, Slobodan Gadzuric, Analysis of functional ingredients and composition of
5. Ocimumbasilicum, South African Journal of Botany,Volume 141, Pages 227-234, (2021).
6. BUSVINE, J.R., 1971. A critical review of the techniques for testing insecticides. CIE, London. pp. 345.
7. Chandrashekhar K. Sangle, Prof. Poonam P. Khade, Dr. Megha T. Salve, formulationand evaluation of multifunctional herbal soap paper strips from tulsi, turmeric, and neemVol-10 Issue-3 2024 IJARIIE-ISSN(O)-2395-4396
8. Dr. Pravin V. Gomase ,Dr. R. R. Patil , Dr. Sunil P. Pawar Formulation and Evaluation of Antibacterial Polyherbal Paper Soap ,IJRPAS, July-August 2022; 1(1): 1-5
9. Dr. Saraswathi, Dr. Kavitha PN, Mahalakshmi Sampagavi, Saurav Kumar Upadhyay, Bhawna Poudyal and Priyanka Mandal, Formulation an evaluation of herbal paper soapinternational Journal of Pharmaceutical Sciences and Drug Analysis 2021; 1(2)
10. Jeevan Gawade, Rajesh Khude, Karan Bhosale, Akshay Bhenki, Dr. R. R. Bendgude, A Review on Basics of Pharmaceutical Emulsion, Quest Journals Journal of Research in Pharmaceutical Science Volume 10 ~ Issue 5 (2024) pp: 24-32.
11. Karwate Pratik, Muley V.R ,Dr. Prachi U formulation and evalution of poly

herbal paper soap IJCRT | Volume 11, Issue 5 May 2023 | ISSN: 2320-2882

12. Osborn M. and Rodham K., Insights into pain: a review of qualitative research, Reviews in Pain. (2010) 4, no. 1, 2–7.

13. Sweeta Akbari, Abdurahman Hamid Nour, Emulsion Types, Stability Mechanisms and Rheology: A review, International Journal of Innovative Research and Scientific Studies. Volume 1 Issue 1(2018),11-17. 31-36

14. Sharma A, Manisha Dikshit, Amita Jhunjhunwala, Ashwani K. Som. Extraction process of Haridra & amp; Tulsi essential oil with their medicinal uses. J Ayurveda Integr Med Sci 2022Jul.10 ;7(5):41 -47.

15. Rafal M Pielaket, Howard I Maibach Skin Surface pH and Its Implication in Skin Health, Research Gate.(2022)

16. Usman Mureed ,Kiran Asad, Zohaib Saddique, Akhtar Hussain ,Ahmad Zulfiqar ,Extraction of essential oil from Holy basil (O. sanctum) by steam distillation and it's chemical and biological profiling. Acta Chemical Malaysia 7(2) 89-101. (2023)

17. Bachir, R. G., & Benali, M. (2012). Antibacterial activity of the essential oils from the leaves Of Eucalyptus globulus against Escherichia coli and Staphylococcus aureus. Asian Pacific journal of tropical biomedicine, 2(9), 739-742.

18. Batish, D.R., Setia, N., Singh, H.P.,

19. Kohli, R.K. (2004).Phytotoxicity of lemon-scented eucalypt oil and its potential use as a bioherbicide. Crop Prot.,23, 1209–1214.

20. Batish, D.R., Singh, H.P., Setia, N., Kaur, S., Kohli,R.K. (2006). Chemical composition and phytotoxicity of volatile essential oils from intact and fallen leaves of Eucalyptus citriodora. Z. Natur for sch. c61, 465–471.

21. Batish, D.R., Singh, H.P., Setia, N., Kohli, R.K., Kaur, S., Yadav, S.S. (2007). Alternative control of Little seed canary grass using eucalypt oil. Agron.Sust. Dev,27, 171–177.

22. Bailey, J. K., Schweitzer, J. A., Rehill, B. J., Lindroth,R. L., Martinsen, G. D., & Whitham, T. G.

23. (2004). Beavers as molecular geneticists: a genetic basis to the foraging of an ecosystem engineer. Ecology, 85(3), 603-608.

24. Buchbauer, G. (2000). The detailed analysis of essential oils leads to the understanding of their properties. Perfumer & flavorist, 25(2), 64-67.

25. Brooker, M.I.H. and Kleinig, D.A. (2006). Field Guide to Eucalyptus. vol.1. South-eastern Australia,Third edition. Bloomings, Melbourne. Council of Europe (1992). Flavouring substances and natural sources of flavourings. Volume I, 4th Edition: Chemically-Defined Flavouring Substances.Ceferino, T. A., Julio, Z., Mougabure, C. G., Fernando,

26. B., Eduardo, Z. and Maria, I. P. (2006).Fumigant and Repellent Properties of Essential Oils and Component Compounds against Permethrin-resistant Pediculus humanus capitis(Anoplura: Pediculidae) from Argentina. J. Med.Entomol., 43: 889– 895.

27. Batish, D.R., Singh, H.P., Kohli, R. K., & Kaur, S.(2008). Eucalyptus essential

oil as a natural pesticide. Forest ecology and management, 256(12), 2166-2174.

28. Dixit A, Rohilla A, Singh V. (2012). Eucalyptus globulus: A new perspective in therapeutics. Int. J. Pharm. Chem. Sci., 1(4): 1678-83.

29. Dhakad, A. K., Pandey, V. V., Beg, S., Rawat, J. M., & Singh, A. (2018). Biological, medicinal and toxicological significance of Eucalyptus leaf essential oil: a review. Journal of the Science of Food and Agriculture, 98(3), 833-848.

30. Egawa, H., Tsutsui, O., Tatsuyama, K., & Hatta, T.(1977). Antifungal substances found in leaves of Eucalyptus species. Experientia, 33(7), 889-890.