INTERNATIONAL JOURNAL OF PHARMACEUTICAL SCIENCES
[ISSN: 0975-4725; CODEN(USA): IJPS00]
Journal Homepage: https://www.ijpsjournal.com

OPEN ACCESS

Review Article

A Review on Pharmacological Activity and Biologically Active Constituents Present of Bay Leaf

Abhijit Sahana*, Ruma Das Sahana, Anoop Kumar, Kashiram Kushwaha

One Beat College of Medical Sciences, Bhira Kheri, 262901.

ARTICLE INFO

Published: 07 Mar. 2025
Keywords:
Culinary herb, pharmacological properties, biological, oil extracts, chemical constituents.
DOI:
10.5281/zenodo.14995374

ABSTRACT

The Lauraceae family includes the culinary herb known as bay laurel or bay leaf (Laurus nobilis L.), which is grown in the Mediterranean region as well as in the warm climes of the southern United States, Central America, Europe, the Middle East, and Asia. It is used as a herb to enhance the flavours of many Indian, French, Italian, and Turkish foods. It works incredibly well to treat stomach issues. Extracted from various plant parts, the oil from bay leaves has strong biological and pharmacological qualities and is utilized as an antioxidant, antifungal, antibacterial, and many more applications. Certain chemical compounds found in bay leaves, including cineole, sabinene, α-pinene, and p-cymene, have significant medicinal significance. The biological potential and health advantages of bay leaf in all of its forms—oil, powder, or extract—will be the main emphasis of this review. The chemical makeup and biological activity of the leaf will be highlighted, which will be very helpful for future research.

INTRODUCTION

The evergreen perennial shrub known as bay leaf (Laurus nobilis) belongs to the Lauraceae family of laurels. It is a staple in many traditional cuisines and has been used for a millennium (20). There are between 24,000 and 25,000 species in the genus Laurus, and many of these species can be found in the Southern Mediterranean, the subtropics and tropics of Eastern Asia, South and North America, the Balkans, and Asia Minor. Uncertainty regarding the precise number of species is a major contributing factor to the significant variety among them. The form, flower colour, growth habitat, leaves, stems, and chemical makeup all exhibit variability. Laurus azorica and L. nobilis are examples of traditional laurel species. The bay rum tree (Pimenta racemosa) is one of numerous plants that go by the common name "bay laurel" but are not members of the genus Laurus. L. nobilis has been referred to by several names. In Urdu, it's called teejh pat. In English, it is frequently referred to as sweet bay or bay leaf. In Arabic, it is called

***Corresponding Author:** Abhijit Sahana
Address: One Beat College of Medical Sciences, Bhira Kheri, 262901.
Email ✉: sahanaabhijit07@gmail.com

Relevant conflicts of interest/financial disclosures: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

waraq ghaar. In German, it's called lorbeer. In Greek, it is called Dafni. In India, specifically in Hindi, it's called teejpatta. In Meghalaya, the annual yield of bay leaf units varies from 30 to 70 kilogram per tree, whereas in Nepal, the average is 13 kg of dry leaves (21). About 900 tonnes of bay leaf are grown in the Udaipur district, and Nepal exports 2100 tonnes to India (22). The majority of bay leaf collection areas for export are found in the Eastern Mediterranean and Aegean regions (23). 4869 tonnes of bay leaf were shipped from Turkey to the US in 2002 (24). There are 32 genera for bay leaves. Laurus is also known as Sweet Bay, Bay Laurel, Grecian Laurel, True Bay, and Bay Tree. It grows between 900 and 2500 meters above sea level in the tropical and subtropical Himalayas. In addition, it is found in South Asia, Australia, the Pacific, and tropical and subtropical Asia. In addition to the Western Himalayas, it can be found in Sikkim, Assam, Mizoram, Meghalaya, and Uttarakhand and Himachal Pradesh in India (2). It is a hardy tree with many branches and smooth bark that can reach a height of 10 meters. Its alternating leaves are thin, oblong-lanceolate. The male has 8–12 stamens, while the female has 2-4 staminodes. The flowers are tiny and have four lobes. The fruit is ovoid, black, and 10 to 15 in diameter when it is ripe. These southern European plants are fragrant and aromatic, and they yield both volatile and fixed oil in addition to camphor. Laurus nobilis is a significant industrial plant that is utilized in medications, meals, and cosmetics. The culinary sector makes extensive use of the dried leaves and essential oils to season fish, meats, and soups. Another reason the bay is utilized as a food ingredient in the food sector is because of its antibacterial and insecticidal qualities. Both volatile and fixed oils, which are mostly utilized in the making of soap, are present in the fruits. In addition to gastrointestinal problems like flatulence, eructation, poor digestion, and epigastric bloating, it has historically been used to treat dermatitis and rheumatism (25). In Turkish traditional medicine, bay leaf aqueous extract is used as a diuretic, antirheumatic, anti-hemorrhoidal, and anti-snakebite remedy. It is also used to cure stomachaches. Recently, it has been used to treat diabetes and prevent migraines (3). Bay leaves (Syzygium polyanthum) are among the plants that can be utilized to reduce cholesterol levels (26). Bay leaves contain terpenoid, flavonoid, polyphenol, alkaloid, saponin, and essential oil as secondary metabolites. Numerous in vivo investigations have demonstrated that bay leaf extract lowers cholesterol levels in animal blood. Flavonoids, a type of phenolic substance found in bay leaves, are believed to have a role in reducing blood cholesterol levels. Additionally, Lee et al. showed that flavonoids can reduce cholesterol by blocking HMG-CoA Reductase activity (27). Numerous investigations have demonstrated the antioxidant qualities of flavonoids and phenolic acids, two families of polyphenolic chemicals, including their ability to scavenge free radicals, inhibit oxidative enzymes, and reduce inflammation (4). In addition to eugenol, acetyl and methyl eugenol, alpha and beta-pinene, phellandrene, linalool, geraniol, and terpineol, the essential oil (0.8 to 3%) extracted from the leaves mostly comprises 1,8-cineol (up to 50%) (47). Dried laurel fruits contain between 0.6 and 10% essential oil. Terpenes (cineol, terpineol, - and - pinene, citral) are the main source of this essential oil's scent, but it also contains cinnamic acid and its methyl ester. Laurel essential oil's possible antibacterial properties have also been studied. Pinene and methyl eugenol are responsible for the anticonvulsant properties of laurel essential oil. However, eugenol, cineol, and methyl eugenol also decrease motor function and induce drowsiness. Laurel leaf essential oil is also recognized to have anti-inflammatory and analgesic effects. Methanolic extracts of L. nobilis

have antioxidative properties and contain polar substances such phenols, flavones, and flavanols (5). The roots and leaves of Bay trees contain sesquiterpene lactones, of which two different chemical kinds have been identified, with costunolide and laurenobiolide being the main constituents (28, 30). Bay leaf contains sesquiterpene lactones, which have been shown to have a number of pharmacological characteristics, including increased liver glutathione S-transferase (GST) activity, inhibitory effects on alcohol absorption, and anti-inflammatory effects on NO generation (30, 31). Rheumatism, earaches, and skin rashes have all historically been treated with bay leaves and fruits. Additionally, it has diaphoretic, stimulant, emetic, emmenagogue, abortifacient, stomachic, astringent, carminative, and insect repellent properties. Essential oils are used in soaps, lotions, and fragrances by the cosmetics industry (6).

1. Taxonomical Classification

- Kingdom: Plantae
- Division: Magnoliids
- Order: Laurels
- Family: Lauraceae
- Genus: Laurus
- Species: Laurus nobili

2. Chemical Constituents of Bay Leaf

2.1 Linalool: -- Two enantiomers of a naturally occurring terpene alcohol that can be found in a wide range of flowers and spice plants are referred to as linalool. Dihydro and tetrahydro linalool, which are more resistant to oxidants and can be found in household cleaning products, are created when linalool is hydrogenated. It is an antibacterial agent, metabolite, volatile oil component, and plant scent element. Linalool is utilized in the manufacturing of soaps, fragrances, food and household flavourings, and insecticides (32, 33).

2.2 Geraniol: -- Geraniol is an alcoholic and monoterpenoid chemical. It is frequently used in perfumes because of its rose-like scent. Additionally, it is frequently used as an insect repellent, especially to ward off mosquitoes (35).

2.3 Terpineol: -- Alpha-terpineol, another name for terpineol, is a naturally occurring terpene alcohol that can be found in a variety of essential oils, such as eucalyptus, pine, and cajuput. Numerous therapeutic properties, such as anti-inflammatory, analgesic, antioxidant, antibacterial, sedative, and anticancer properties, have been discovered in it (45).

2.4 Lauric Acid: -- As a saturated fatty acid with a 12-carbon chain, lauric acid, also known as systematically dodecanoic acid, possesses several characteristics of medium-chain fatty acids. The lauric acid in bay laurel leaves has antibacterial and insect-repellent qualities (35).

4.5 Phellandrene: -- Phellandrene is an organic chemical that occurs naturally and is present in a variety of essential oils, including cumin, ginger, and eucalyptus. Alpha-phellandrene and beta-phellandrene are its two isomers, which are bicyclic monoterpenes. The therapeutic qualities of both isomers, such as their anti-inflammatory, analgesic, antibacterial, anticancer, anti-obesity, and antidiabetic effects, have been investigated (46)

4.6 α and β-pinenes:-- The family of unsaturated bicyclic monoterpenes includes pinene. α-pinene and β-pinene are the two geometric isomers of pinene found in nature. These substances' anti-inflammatory, antibacterial, antioxidant, neuroprotective, insecticidal, antiallergic, anticancer, and anticonvulsant qualities have all been investigated (44).

4.7 **Methyl Eugenol:--** A naturally occurring organic molecule, methyl eugenol is a member of the phenylpropene chemical class. Its scientific name is 1,3,4,5tetramethoxy-2-(3,4,5-trimethoxyphenyl) pent-1-one, and its chemical formula is $C_{11}H_{14}O_2$. Essential oils from a variety of plants, including nutmeg, bay leaves, cinnamon, and basil, frequently contain methyl eugenol. It is also utilized as a fruit fly attractant and flavoring element in food items, making it a crucial part of many agricultural insect traps. Given that methyl eugenol has some antifungal properties, the chemical might have developed in reaction to infections. Many insects are also repelled by it. Nevertheless, the International Agency for Research on Cancer (IARC) has designated methyl eugenol as a Group 2B carcinogen, which means it may cause cancer in humans, after it was found to be a possible carcinogen in animal studies. Consequently, many governmental organizations worldwide restrict the use of methyl eugenol as a food additive (43).

4.8 Sesquiterpenes:-- Numerous plants contain the chemical compounds known as sesquiterpenes, which have been shown to have a range of medicinal uses. The roots and leaves of Bay trees were found to contain sesquiterpene lactones, and two distinct chemical types were identified, with costunolide and laurenobiolide serving as important ingredients (28, 30). According to reports, the sesquiterpene lactones found in bay leaves have a variety of pharmacological properties, such as enhancing liver glutathione S-transferase (GST) activity, inhibiting alcohol absorption, and having anti-inflammatory effects on NO production (30, 31). Therapeutic benefits of sesquiterpenes include analgesia, anti-inflammatory, antibacterial, antioxidant, anticancer, and neuroprotective effects (41, 42).

4.9 **Terpenes:--** Terpenes, also known as terpenoids, are the most diverse group of compounds found in plants. They can be classified as mono, di, tri, tetra, and sesquiterpenes according to the number of isoprene units. Typically found in plants, terpenes are the primary constituent of essential oils derived from plants; common plant terpene sources include tea, cannabis, thyme, citrus fruits, and Spanish sage. Terpenes have a variety of functions in plants, including signalling, pigments, solvents, taste, and medicinal applications. Terpenes have anti-inflammatory, anticancer, antibacterial, antiviral, antifungal, analgesic, antihyperglycemic, antiparasitic, and anti-inflammatory properties. Inflammatory diseases are also avoided and skin penetration is increased with their help. Terpene is a component of many pharmaceutical products. Effective against pollinators, mycorrhiza, herbivores, and diseases as well. Terpenes, according to some investigators, offer a wide array of therapeutic effects as ant plasmodial and antimalarial medications. In the current world, monoterpenes are intensively investigated for their antiviral, antidiabetic, and anticancer activities. (40, 39).

4.10Eucalyptol: -- Eucalyptol, also referred as 1,8-cineole, is a naturally organic compound that is present in the essential oils of numerous plants, particularly in eucalyptus, hence its name. Eucalyptol has been studied for its different therapeutic qualities, some of which include Anti-inflammatory, A pain reliever Antimicrobial, Expectorant and Neuroprotective. Insect repellent as well as insecticidal qualities are also displayed by eucalyptol. [37, 38].

3. Pharmacological Activities:

3.1 Antioxidant Activity: -- Both extracts showed significant total antioxidant activity in a linoleic acid emulsion; concentrations of 20, 40, and 60g/ml inhibited lipid peroxidation of linoleic acid emulsion by 84.9, 95.7, 96.8, and 94.2, 97.7, and 98.6% for water and ethanol extracts, respectively. The antioxidant properties of lyophilized aqueous and ethanol extracts of Laurus nobilis were examined. The antioxidant activity, reducing power, free radical scavenging, superoxide anion radical scavenging, hydrogen peroxide scavenging, hydrogen peroxide scavenging, hydrogen peroxide scavenging, hydrogen peroxide scavenging, and metal chelating activities were assessed as well as the antioxidant capacity of both extracts. Nevertheless, lipid peroxidation in linoleic acid emulsion was prevented by 60 g/ml of the common antioxidant butylated hydroxy anisole (BHA), butylated hydroxytoluene (BHT), and alpha tocopherol by 96.6, 99.1, and 76.9%, respectively (9,48).

3.2 Wound Healing Activity:-- The aqueous extract of L. nobilis was shown to have better wound-healing activities than the aqueous extract of Allamanda. Many wound healing models, including excision and incision, were employed to estimate wound healing activity. To evaluate wound healing activity, researchers looked at tensile strength, granulation tissue weights, pace of wound closure, epithelialization period, granulation tissue histology, and hydroxyproline concentration. The weight of granulation tissue, hydroxyproline concentration, and wound contraction were all comparatively high in animals given bay leaf. In animals treated with bay leaves, there were more inflammatory cells and less collagen than in mice treated with Allamanda cathartica (8, 49).

3.3 Analgesic and Anti-inflammatory: -- The analgesic and anti-inflammatory qualities of Laurus nobilis Linn. essential oil was examined in mice and rats. The essential oil demonstrated a dose-dependent anti-inflammatory impact in formalin-induced edema, a mild sedative effect at anti-inflammatory dosages, and a considerable analgesic effect in the tail-flick and formalin tests. The analgesic and anti-inflammatory effects of the essential oil were on par with those of nonsteroid anti-inflammatory medications such piroxicam and morphine as well as reference analgesics. In a carrageenan-induced hind paw edema model in mice without causing any gastric damage, ethanol and aqueous extracts from Laurus nobilis leaves and seeds were also evaluated for anti-inflammatory activity; the ethanol extract demonstrated notable anti-inflammatory activity (3,11).

3.4 Anticonvulsant Activity: -- It was examined whether L. nobilis leaf essential oil had anticonvulsant properties against experimental seizures.

Mice were shielded by the essential oil against tonic seizures brought on the maximal electroshock, specifically pentylenetetrazol. In anticonvulsant dosages of the essential oil, sedation and motor impairment were noted. The presence of methyl eugenol, eugenol, and pinene in bay essential oil may be the cause of this action (10,50).

3.5 Immunostimulant Activity: --By giving rainbow trout food components, the immunostimulant effects of bay leaf powder was shown. Three groups of rainbow trout were given experimental diets. After 21 days, examination of nonspecific immunological markers showed immunostimulant activity, including phagocytosis in blood leukocytes,

extracellular or intracellular respiratory burst activity, lysozymes, and protein levels (1).

3.6 Antimutagenic Activity:-- The antimutagen was discovered instrumentally as 3kaempferol p coumarate after its separation chromatographically from an ethyl acetate extract of bay leaves. 20 mg was obtained from 100g of bay, and 1.9g was the IC50 value—the level needed to 50% suppress the mutagenicity of 20 mg of TrpP2—was obtained. Strong antimutagens like flavones and flavanols have values similar to this one. A demutagenic activity that stopped Trp-P-2 from being metabolically converted to its final carcinogenic form was the cause of the antimutagenicity. The action had been helped by the kaempferol moiety (1,12).

3.7 Antiviral Activity: -- The essential oils of Laurus nobilis were assessed for their inhibitory effectiveness against SARS-CoV and HSV1 replication in vitro by visually evaluating the virus-induced cytopathogenic impact after infection. Laurus nobilis oil shown efficacy against SARSCoV with an IC (50) value of 120 g/ml and a selectivity index (SI) of 4.16. This oil was found to have beta-ocimene, 1, 8-cineole, alpha-pinene, and beta-pinene as its primary constituents (3).

3.8 Insect Repellent Activity:-- Adult females of Culex pippins, the most prevalent pest mosquito in Antalya's urban and suburban environments, were tested for repellent effectiveness using essential oils that were derived from the seeds of fresh foliage of the laurel Laurus nobilis Linn. Repelling qualities were revealed by the essential oils (3,14).

3.9 Anticholinergic Activity:--

Acetylcholinesterase (AChE) enzyme activity was assessed in Laurus nobilis ethanolic extract, decoction, and essential oil. It was shown that the essential oil fraction had an inhibitory capability for AChE of more than 50%. Additionally, it reduced AChE in the ethanolic fraction at apotent 64% (1 mg ml1) (7,13).

3.10Antimicrobial Activity: -- The methanol extracted form of seed oil, seed oil, and L. nobilis essential oil all demonstrated in vitro antibacterial activity. However, in terms of antibacterial activity, the methanolic extract of seed oil performs better than both essential oil and seed oil. Similarly, another study found that L. nobilis essential oil had antibacterial efficacy against Staphylococcus aureus, Bacillus subtilis, and Staphylococcus intermediate. With minimal inhibitory doses of 0.35 and 0.56 mg/mL, respectively, the essential oil of L. nobilis showed strong antibacterial activity. The main chemical component of bay leaf, 1,8 cineol, may be responsible for its antibacterial properties. Seven plant pathogenic fungal strains were subjected to in vitro tests of L. nobilis's antifungal activity at varying doses, including 50, 125, and 250 mg/mL. A dosage of 250 mg/ml exhibited the strongest antifungal action against the fungus Botrytis cinerea (1,15,16).

3.11Antiulcerogenic Activity: -- Rats with ethanol-induced stomach ulcers were used to investigate Laurus nobilis seeds' antiulcerogenic properties. According to the findings, 20 and 40% of the oily fraction and aqueous extracts of these seeds exhibited antiulcerogenic efficacy (7,18).

3.12Acaricidal Activity: -- The acaricidal effect of Laurus nobilis leaf oils against Psoroptes cuniculi was examined. At a concentration of 10%, L. nobilis oil exhibited 73% acaricidal activity; at 5%, the average activity was considerably lower at 51%, and dilutions of 2.5%, 1.25%, and 0.625% showed no impact (3,17).

3.13Neuroprotective Activity:-- In human neuroblastoma SH-SY5Y cells, the effects of an n-hexane fraction isolated from Laurus nobilis leaves on dopamine-induced intracellular reactive oxygen species, or ROS for short, generation and death were investigated. The hexane fraction's

IC50 value for induced apoptosis was 3.0 g/ml, whereas the IC50 values of costunolide itself and dehydrocostus lactone were 7.3 M and 3.6 M, respectively, when compared to apomorphine (APO, IC50=18.1 M) as a positive control. These key substances and the hexane fraction dramatically reduced ROS production in DA-induced SH-SY5Y cells. A mouse 6hydroxydopamine (6-OHDA) model of Parkinson's disease was used to examine the possible neuroprotective effects of hexane fraction in vivo. 6- Young adult rats' substantia nigra was injected with OHDA, and immunohistochemistry was used to quantify the number of tyrosine hydroxylase (TH)positive neurons (3,19).

4. Side Effects and Toxicity: --

In dietary quantities, bay leaves and bay leaf oil are probably safe for the majority of people. Unlike entire bay leaves, ground bay leaves do not have the potential to choke. Since the entire leaf cannot be broken down, it stays whole as it moves through the digestive tract. Reliable information regarding the safety of taking bay leaf while pregnant or nursing is lacking. Bay leaf may not be safe to take while diabetic and may interfere with blood sugar regulation. It's possible that bay leaf slows down the central nervous system. When used with anaesthesia and other drugs used before and after surgery, there is a chance that it will cause the central nervous system to slow down excessively. It is advised to cease using bay leaf medication at least two weeks before to the planned surgery.

5. CONCLUSION: --

Due to its historical and nutritional significance, the perennial aquatic herb Bay leaves is becoming more and more well-liked. According to the ancient medical system, it was used to treat cancer, inflammation and analgesics of the tissues, immunostimulant activity, wound healing, epileptic disorders, antiviral activity, antibacterial activity, and neuroprotective problems. These days, identifying a potential mechanism of action for these impacts requires doing and documenting evidence-based research. If it can be made into a useful food, it will also have economic value.

Source of Support: -

For the research, writing, and/or publication of this article, the author(s) did not receive any funding.

Conflict of Interest: - Regarding the research, writing, and/or publication of this paper, the author or authors have disclosed no potential conflicts of interest.

REFRENCES

1. Batool S., Khera R. A., Hanif M. A., & Ayub M. A., “Bay Leaf. In Medicinal Plants of South Asia”: Novel Sources for Drug Discovery; (2020) page- 63–74.
2. Chahal K. K., Kaur M., Bhardwaj U., Singla N., and Kaur A., “A review on chemistry and biological activities of Laurus nobilis L. essential oil.” Journal of pharmacognosy and phytochemistry, Vol. 6; (2017) page-1153-1161.
3. Patrakar R., Mansuriya M. and Patil P., “Phytochemical and Pharmacological Review on Laurus Nobilis.” International Journal of Pharmaceutical And Chemical Sciences, Vol. 1; (2012) page-595-602.
4. Hartanti L., Yonas M. K., S., Mustamu J. J., Wijaya S., Setiawan H. K., & Soegianto L., “Influence of extraction methods of bay leaves (Syzygium polyanthus) on antioxidant andHMGCoA Reductase inhibitory activity.” Heliyon, (2019) page- 1-15.
5. Zekovic Z. P., Lepojevic Z. D., Mujic I. O., “Laurel Extracts Obtained by Steam Distillation, Supercritical Fluid, and Solvent Extraction.” Journal of Natural Products, Vol. 2; (2009) page104-109.
6. Kaurinovic B., Popovic M., and Vlaisavljevic S., “In Vitro and in Vivo Effects of Laurusnobilis L. Leaf Extracts” Molecules: Vol. 15 (2010) page-3378-3390.

7. Patil A., Patil R., Et. al., "PHARMACOLOGICAL ACTIVITY OF BAY LEAVE" TIJER - INTERNATIONAL RESEARCH JOURNAL: Vol. 10 (2023) page-84-90.
8. Nayak S, Nalabothu P, Sandiford S, Bhogadi V, Adogwa A. Evaluation of wound healing activity of Allamanda cathartica. L. and Laurus nobilis. L. extracts on rats. Complementaryand Alternative Medicine. 2006; 6: 12.
9. Elmastas M, Gulcin I, Isildak O, Kufrevioglu OI, Ibaoglu K, Aboul-Enein HY. Radical Scavenging Activity and Antioxidant Capacity of Bay Leaf Extracts. Journal of the Iranian Chemical Society. 2006;3(3): 258-266.
10. Sayyah M, Valizadeh J, Kamalinejad M. Anticonvulsant activity of the leaf essential oil ofLaurus nobilis against pentylenetetrazole- and maximal electroshock-induced seizures. Phytomedicine. 2002; 9: 212–216.
11. Esra K, Ilkay O, Erdem Y. Evaluation of Some Plants Used in Turkish Folk Medicine for Their Anti-inflammatory and Antinociceptive Activities. Pharmaceutical biology.2007; 45(7): 547-555.
12. Samejima K, Kanazawa K, Ashida H, Danno G. Bay Laurel Contains Antimutagenic Kaempferyl Coumarate Acting against the Dietary Carcinogen 3-Amino-1methyl5Hpyrido [4, 3- b] indole. J. Agric. Food Chem. 1998; 46 (12): 4864–4868.
13. .Ferreira A, Proenca C, Serralheiro MLM, Araujo MEM. The in vitro screening for acetylcholinesterase inhibition and antioxidant activity of medicinal plants from Portugal. Journal of Ethnopharmacology. 2006; 108(1): 31-37.
14. Erler F, Ulug I, Yalcinkaya B, Repellent activity of five essential oils INTERNATIONAL JOURNAL OF PHARMACEUTICAL AND CHEMICAL SCIENCES ISSN: 2277−5005 Vol. 1 (2) Apr–Jun 2012 www.ijpcsonline.com 602 against Culex pippins. Fitoterapia. 2006; 77 (7-8): 491-494.
15. Ozcan, B., Esen, M., Sangun, M.K., Coleri, A., Caliskan, M., 2010. Effective Antibacterial and Antioxidant Properties of Methanolic Extract of Laurus Nobilis Seed Oil.31(5)637641.
16. Derwich, E., Benziane, Z., Boukir, A., 2009. Chemical composition and antibacterial activity of leaves essential oil of Laurus nobilis from Morocco. Australian Journal of Basic and Applied Sciences 3, 3818-3824.
17. Macchioni F, Perrucci S, Cioni P, Morelli I, Castilho P, Cecchi F. Composition and acaricidal activity of Laurus novocanariensis and Laurus nobilis essential oils against Psoroptes cuniculi. Journal of Essential Oil Research. 2006; 18: 111-114.
18. Afifi FU, Khalil E, Tamimi SO, Disi A. Evaluation of the gastroprotective effect of Laurusnobilis seeds on ethanol-induced gastric ulcer in rats. Journal of Ethnopharmacology. 1997;58: 9-14.
19. Ham A, Shin J, Oh K, Lee S, Nam K, Koo U, Kim KH, Mar W. Neuroprotective Effect ofthe nHexane Extracts of Laurus nobilis L. in Models of Parkinson's Disease. Biomol Ther.2011; 19(1): 118-125.
20. Parthasarathy, V.A., Chempakam, B., Zachariah, T.J., 2008. Chemistry of Spices. Cabi. 426- 434.
21. Akgu¨l, A., Kivanc, M., Bayrak, A., 1989. Chemical composition and antimicrobial effect of Turkish laurel leaf oil. Journal of Essential Oil Research 1, 277-280.
22. Choudhary, D., Kala, S., Todaria, N., Dasgupta, S., Kollmair, M., 2014. Effects ofharvesting on productivity of bay leaf tree (Cinnamomum tamala Nees & Eberm): Case from Udayapur district of Nepal. Journal of Forestry Research 25, 163-170.

23. Nurbas¸, M., Bal, Y., 2005, Recovery of fixed and volatile oils from Laurus nobilis L. fruit and leaves by solvent extraction method. Journal of Engineering and Architectural Faculty of Eskis¸ehir Osmangazi University.
24. Deniz, H., 2012. Sustainable Collection of Laurel (Laurus Nobilis L.) Leaves in Antalya Province. 104-109.
25. Kilic A, Hafizoglu H, Kollmannsberger H, Nitz S. Volatile constituents and key odorants in leaves, buds, flowers, and fruits of Laurus nobilis L. J. Agric. Food Chem. 2004; 52: 1601-1606.
26. A. Aljamal, Effects of bay leaves on blood glucose and lipid profiles on the patients with type 1 diabetes, World Acad. Sci., Eng. Technol. Int. J. Med. Health Sci. 4 (9) (2010) 409412.
27. S.H. Bok, S.H. Lee, Y.B. Park, K.H. Bae, K.H. Son, T.S. Jeong, M.S. Choi, Plasma hepatic cholesterol and hepatic activities of 3-hydroxy-3-methyl-glutaryl-CoA reductase and Acyl CoA: cholesterol transferase are lower in rats fed citrus peel extract or a mixture of citrus bioflavonoids, J. Nutr. 129 (6) (1999) 1182-1185.
28. Tada, M.; Takeda, K. Sesquiterpenes of Lauraceae plants. IV. Germacranolides from Laurus nobilis L. Chem. Pharm. Bull. 1976, 24, 667-671.
29. El-Feraly, S.; Benigni, D. Sesquiterpene lactones of Laurus nobilis leaves. J. Nat. Prod. 1980, 43, 527-531.
30. Yoshikawa, M.; Shimoda, H.; Uemura, T.; Morikawa, T.; Kawahara, Y.; Matsuda, H. Alcohol absorption inhibitors from Bay leaf (Laurus Nobilis): Structure-requirements of sesquiterpenes for the activity. Bioorg. Med. Chem. 2000, 8, 2071–2077.
31. Fang, F.; Sang, S.; Chen, K.; Gosslau, A.; Ho, C.; Robert, T. Rosen isolation andidentification of cytotoxic compounds from Bay leaf (Laurus nobilis). Food Chem. 2005, 93, 497–501.
32. Peana, A. T., D'Aquila, P. S., Panin, F., Serra, G., Pippia, P., & Moretti, M. D. L. (2002). Antiinflammatory activity of linalool and linalyl acetate constituents of essential oils. Phytomedicine, 9(8), 721-726.
33. “Linalool". PubChem, US National Library of Medicine. 16 October 2021. Retrieved 17 October 2021.
34. Müller, G. C., Junnila, A., Kravchenko, V. D., Revay, E. E., Butler, J., Orlova, O. B., ... & Schlein, Y. (2008). Ability of essential oil candles to repel biting insects in high and low biting pressure environments. Journal of the American Mosquito Control Association, 24(1), 154-160.
35. Nitbani, F. O., Siswanta, D., & Solikhah, E. N. (2016). Isolation and antibacterial activity test of lauric acid from crude coconut oil (Cocos nucifera L.). Procedia Chemistry, 18, 132140.
36. Ralston, A. W., & Barrett, J. P. (1941). Insect repellent activity of fatty acid derivative. Oil & Soap, 18(4), 89-91.
37. Juergens, U. R., Dethlefsen, U., Steinkamp, G., Gillissen, A., Repges, R., & Vetter, H. (2003). Anti-inflammatory activity of 1.8-cineol (eucalyptol) in bronchial asthma: a double-blind placebo-controlled trial. Respiratory medicine, 97(3), 250-256.
38. Sfara, V., Zerba, E. N., & Alzogaray, R. A. (2014). Fumigant insecticidal activity and repellent effect of five essential oils and seven monoterpenes on first-instar nymphs of Rhodnius prolixus. Journal of medical entomology, 46(3), 511-515.
39. Franklin, L. U., Cunnington, G. D., & Young, D. E. (2000). U.S. Patent No. 6,130,253. Washington, DC: U.S. Patent and Trademark Office.
40. .Roaa, M. H. (2020). A review article: The importance of the major groups of plants

secondary metabolism phenols, alkaloids, and terpenes. International Journal for Research in Applied Sciences and Biotechnology (IJRASB), 7(5), 354-358.

41. Chaturvedi, D. (2011). Sesquiterpene lactones: structural diversity and their biological activities, In-Opportunity, Challenges and Scope of Natural Products in Medicinal Chemistry. ISBN: 978-81-308-0448-4, Research Signpost, Trivandrum, 313-334.
42. Robles, M., Aregullin, M., West, J., & Rodriguez, E. (1995). Recent studies on the zoo pharmacognosy, pharmacology, and neurotoxicology of sesquiterpene lactones. Planta medica, 61(03), 199-203.
43. Tan, K. H., & Nishida, R. (2012). Methyl eugenol: its occurrence, distribution, and role in nature, especially in relation to insect behavior and pollination. Journal of insect science, 12(1).
44. Salehi, B., Upadhyay, S., Erdogan Orhan, I., Kumar Jugran, A., LD Jayaweera, S., A. Dias,D., Sharifi-Rad, J. (2019). Therapeutic potential of α-and β-pinene: A miracle gift of nature. Biomolecules, 9(11), 738.
45. .Khaleel, C., Tabanca, N., & Buchbauer, G. (2018). α-Terpineol, a natural monoterpene: A review of its biological properties. Open Chemistry, 16(1), 349-361.
46. Thangaleela, S., Sivamaruthi, B. S., Kesika, P., Tiyajamorn, T., Bharathi, M., & Chaiyasut, C. (2022). A Narrative Review on the Bioactivity and Health Benefits of Alpha-Phellandrene. Scientia Pharmaceutica, 90(4), 57.
47. Biondi, D., Cianci, P., Geraci, C., Ruberto, G., & Piattelli, M. (1993). Antimicrobial activity and chemical composition of essential oils from Sicilian aromatic plants. Flavour and fragrance journal, 8(6), 331-337.
48. Deepa, G., Ayesha, S., Nishtha, K., & Thankamani, M. (2013). Comparative evaluationof various total antioxidant capacity assays applied to phytochemical compounds of Indian culinary spices. International Food Research Journal, 20(4), 1711.
49. Fujita, K., Kuge, K., Ozawa, N., et al. (2015). 'Cinnamtannin B-1 promotes migration of mesenchymal stem cells and accelerates wound healing in mice.' PLoS One, 10, e0144166. doi: 10.1371/journal.pone.0144166.
50. Dallmeier, K., Carlini, E.A.: Anesthetic, hypothermic, myorelaxant and anticonvulsant effects of synthetic eugenol derivatives and natural analogues.Pharmacology 22: 113–127, 1981.

HOW TO CITE: Abhijit Sahana*, Ruma Das Sahana, Anoop Kumar, Kashiram Kushwaha, A Review On Pharmacological Activity And Biologically Active Constituents Present Of Bay Leaf, Int. J. of Pharm. Sci., 2025, Vol 3, Issue 3, 636-645. https://doi.org/10.5281/zenodo.14995374