

## Phytochemical and Pharmacological Review on *Laurus Nobilis*

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### ABSTRACT

*Laurus nobilis* is traded as sweet bay leaf, and true, Roman, or Turkish laurel. It is small evergreen tree of lauraceae family. Chemically it has found to contain sesquiterpene lactones such as 10-epigazaniolide, Gazaniolide, spirafolide, costunolide, Reynosin, santamarine, flavonoid glycosides, essential oil. It has been reported to possess wound healing, neuroprotective, antioxidant, antiulcerogenic, anticonvulsant, antimutagenic, antiviral, anticholinergic, antibacterial, antifungal activities. This review highlighted some Phytochemical and Pharmacological aspect of *Laurus nobilis* which will be useful to the researcher for further study.

**Keywords:** Cultivation and collection, *Laurus nobilis*, Phytochemistry, Pharmacology, Taxonomy.

### INTRODUCTION

*Laurus nobilis* is traded as sweet bay leaf, and true, Roman, or Turkish laurel. It is small evergreen tree of lauraceae family. It is hardy multibranched tree with smooth bark that grows to about 10 m high<sup>1,2</sup>. It has alternate, narrowly oblong-lanceolate leaves. The flowers are small and four lobed; the male has 8—12 stamens and female 2—4 staminodes. The fruit is 10—15 mm, ovoid, and black when ripe<sup>3</sup>. These are aromatic and fragrant plants yielding fixed and volatile oil as well as camphor, it is native of south Europe<sup>4</sup>. *Laurus nobilis* is a plant of industrial importance, used in foods, drugs, and cosmetics. The dried leaves and essential oils are used extensively in the food industry for seasoning of meat products, soups and fishes. Its antimicrobial and insecticidal activities are other factor for which bay is used in the food industry as a food preservative. The fruits contain both fixed and volatile oils, which are mainly used in soap making<sup>5</sup>. Traditionally it is used in rheumatism and dermatitis<sup>6</sup>, gastrointestinal problems, such as epigastric bloating, impaired digestion, eructation, and flatulence, The aqueous extract is used in Turkish folk medicine as an anti-hemorrhoidal, anti-rheumatic, diuretic, as an antidote in snakebites and for the treatment of stomachache<sup>7,8</sup>

diuretic<sup>9</sup>. Recently it is used in treating diabetes and preventing migraine<sup>10</sup>.

### Taxonomical classification

Kingdom: *Plantae*

Division: *Magnolids*

Order: *Lurales*

Family: *Lauraceae*

Genus: *Laurus*

Species: *Laurus nobilis*

### Cultivation and collection

Sweet bay is propagated by seeds or preferably by cuttings. From a well ripened wood, cuttings of about 7.5 to 10 cm length are put in sharp sand either under bell-glasses or in glass cases. The rooted cuttings are placed in small pots containing fairly rich sandy loam with good drainage, and then can be put in a hot bed, with gentle bottom heat where they will make a good strong growth. *L. nobilis* stem cuttings produce roots better in July/August, under Mediterranean conditions, than in other seasons, although the optimal rooting period can be extended by bottom heating from May until September. After that, they may be planted in nursery beds with rich sandy soil and good drainage. In one growing season, the plants may attain a height of 1 to 1.5 m. At the end of the growing season and long before the cold season the young plants together with their stakes are kept in well

lit and ventilated sheds and temperature is kept just above freezing. These plants are kept in close rows and watered once or twice a week. The plants are taken out during the spring season and either potted or plunged in nursery. The rich peaty soil with plenty of water and congenial moist atmosphere near the sea coast are favorable conditions for fast and luxuriant growth<sup>1</sup>. The leaves of *L. nobilis* are plucked and dried under shade for use as a flavouring material in a variety of culinary preparations, especially in French cuisine. The leaves contain an essential oil of aromatic, spicy odour and flavour which can be isolated by steam distillation. The oil is a valuable adjunct in the flavouring of all kinds of food products, particularly meats, sausages, canned soups, baked goods, confectionery, etc. The oil replaces the dried leaves to great advantage because it can be dosed more exactly and therefore gives more uniform results than the dried leaves<sup>12</sup>.

## PHYTOCHEMISTRY

### Terpenoids

Various sesquiterpene lactones were found to present in *Laurus nobilis* such as 10-epigazaniolide, Gazaniolide, spirafolide, costunolide, Reynosin and santamarine[13], 5 $\alpha$ ,9-dimethyl-3-methylene-3,3a,4,5,5a,6,7,8-octahydro-1-oxacyclopenta[c]azulen-2-one and 3 $\beta$ -chlorodehydrocostuslactone along with other sesquiterpene lactones such as dehydrocostuslactone, artremorinand[14], Lauroxepine, 11,13-dehydrosantonin[15], 5 $\alpha$ ,9-dimethyl-3-methylene-3,3a,4,5,5a,6,7,8-octahydro-1-oxacyclopenta[c]azulen-2-one and 3 $\beta$ -chlorodehydrocostuslactone[14], deacetyl laurenobiolide[16], 5 $\alpha$ H,7 $\alpha$ H-eudesman-4 $\alpha$ ,6 $\alpha$ ,11,12-tetraol and 1 $\beta$ ,15-dihydroxy-5 $\alpha$ H,7 $\alpha$ H-eudesma-3,11(13)-dien-12,6 $\alpha$ -olide[17], Trypanocidal terpenoid zaluzanin D[18]. Two stereoisomeric monoterpene alcohol such as Cis and trans-thuj-2-en-4-ol were obtained in the essential oil of *Laurus nobilis*[19].

### Glycosides

*Laurus nobilis* leaves yielded four non-polar flavonoids kaempferol-3-O- $\alpha$ -L-(3",4"-di-E-p-coumaroyl)-rhamnoside, kaempferol-3-O- $\alpha$ -L-(2",4"-di-E-p-coumaroyl)-rhamnoside, kaempferol-3-O- $\alpha$ -L-(2"-4"-p-coumaroyl)-rhamnoside and a new product kaempferol-3-O- $\alpha$ -L-(2",4"-di-Z-p-coumaroyl)-rhamnoside [20]. Five new megastigmane glucosides named laurosides A-E and a new phenolic glucoside were isolated from the methanolic extract of *L. nobilis* L. leaves<sup>21</sup>. Kaempferol-3-rhamnopyranoside, and kaempferol-3,7-di-rhamnopyranoside were isolated from *Laurus nobilis* aqueous ethanolic extract<sup>22</sup>.

### Anthocyanin

The major anthocyanins were characterized as cyanidin 3-O-glucoside and cyanidin 3-O-rutinoside. Furthermore, two minor anthocyanins were detected and identified as 3-O-glucoside and 3-O-rutinoside<sup>23</sup>.

### Essential oil

The main components of the oil were identified. 1,8-Cineole along with  $\alpha$ -terpinyl acetate, terpinene-4-ol,  $\alpha$ -pinene,  $\beta$ -pinene, *p*-cymene, linalool acetate<sup>24</sup>. It also found to contain (*E*)- $\beta$ -cymene,  $\beta$ -longipinene, cadinene,  $\alpha$ -terpinyl acetate,  $\alpha$ -bulnesene<sup>25</sup>, terpinene-4-ol (4.25%), sabinene. The acyclic monoterpenes linalool and myrcenol were present in smaller amounts, while cuminaldehyde, dimethylstyrene, eugenol, methyl eugenol, and carvacrol were found<sup>26</sup>.

## PHARMACOLOGY

### Wound healing activity

The aqueous extracts of *Laurus nobilis* were evaluated for its wound healing activity in rats and compared with aqueous extract of *Allamanda*. Excision and incision wound models were used to evaluate the wound healing activity. Wound healing were assessed by the rate of wound closure, period of epithelialisation, tensile strength, weights of the granulation tissue, hydroxyproline content and histopathology of the

granulation tissue. In *Laurus nobilis* treated animals, the rate of wound contraction, weight of the granulation tissue and hydroxyproline content were moderately high ( $P < .05$ ). The histological study of the granulation tissue of the *Laurus nobilis* treated animals showed larger number of inflammatory cells, and lesser collagen when compared with the *Allamanda cathartica* treated group of animals<sup>27</sup>.

#### Neuroprotective activity

The effects of *n*-hexane fraction from *Laurus nobilis* leaves on dopamine induced intracellular reactive oxygen species (ROS) production and apoptosis in human neuroblastoma SH-SY5Y cells was investigated. Compared with apomorphine (APO,  $IC_{50}=18.1 \mu M$ ) as a positive control,  $IC_{50}$  value of hexane fraction for DA-induced apoptosis was  $3.0 \mu g/ml$ , and two major compounds from, costunolide and dehydrocostus lactone, were  $7.3 \mu M$  and  $3.6 \mu M$ , respectively. Hexane fraction and these major compounds significantly inhibited ROS generation in DA-induced SH-SY5Y cells. A rodent 6-hydroxydopamine (6-OHDA) model of PD was employed to investigate the potential neuroprotective effects of hexane fraction *in vivo*. 6-OHDA was injected into the substantia nigra of young adult rats and an immune histochemical analysis was conducted to quantitate the tyrosine hydroxylase (TH)-positive neurons. Hexane fraction significantly inhibited 6-OHDA-induced TH-positive cell loss in the substantia nigra and also reduced DA induced  $\alpha$ -synuclein (SYN) formation in SH-SY5Y cells and shown to be neuroprotective<sup>28</sup>.

#### Antioxidant Activity

Lyophilized aqueous and ethanol extract of *Laurus nobilis* were studied for their antioxidant properties. The antioxidant activity, reducing power, free radical scavenging, superoxide anion radical scavenging, hydrogen peroxide scavenging and metal chelating activities were evaluated to determine the total antioxidant capacity of both extracts. Both

extracts shown strong total antioxidant activity in linoleic acid emulsion. Concentrations of 20, 40, and  $60 \mu g/ml$  showed 84.9, 95.7, 96.8, and 94.2, 97.7, and 98.6% inhibition of lipid peroxidation of linoleic acid emulsion, for water and ethanol extracts, respectively. On the other hand,  $60 \mu g/ml$  of the standard antioxidants butylated hydroxyanisole (BHA), butylated hydroxytoluene (BHT), and  $\alpha$ -tocopherol exhibited 96.6, 99.1, and 76.9% inhibition of lipid peroxidation in linoleic acid emulsion, respectively. In addition, the both extracts were having effective reducing power, DPPH· free radical scavenging, superoxide anion radical scavenging, hydrogen peroxide scavenging and metal chelating activities at 20, 40, and  $60 \mu g/ml$ . The total amount of phenolic compounds in each extract was determined as gallic acid equivalents<sup>29</sup>.

#### Antiulcerogenic activity

Antiulcerogenic activity of *Laurus nobilis* seeds was tested on experimentally ethanol induced gastric ulcer in rats. The results indicated antiulcerogenic activity for 20 and 40% aqueous extracts as well as for the oily fraction of these seeds<sup>30</sup>.

#### Anticonvulsant activity

The leaf essential oil of *Laurus nobilis* was evaluated for anticonvulsant activity against experimental seizures. The essential oil protected mice against tonic convulsions induced by maximal electroshock and especially by pentylenetetrazole. Components responsible for this effect may be methyleugenol, eugenol and pinene present in the essential oil. At anticonvulsant doses, the essential oil produced sedation and motor impairment. This effect seems because of cineol, eugenol and methyleugenol<sup>31</sup>.

#### Analgesic and anti-inflammatory

The leaf essential oil of *Laurus nobilis* Linn. evaluated for analgesic and anti-inflammatory activities in mice and rats. The essential oil exhibited a significant analgesic effect in tail-flick and formalin

tests, a dose-dependent anti-inflammatory effect in the formalin-induced edema and a moderate sedative effect at the anti-inflammatory doses. The analgesic and anti-inflammatory effect of the essential oil was comparable to reference analgesics and non-steroid anti-inflammatory drugs such as morphine and piroxicam<sup>32</sup>. Ethanol, aqueous extracts obtained from leaves and seeds of *Laurus nobilis* were also studied using carrageenan-induced hind paw edema model in mice without inducing any gastric damage for anti-inflammatory activity and ethanol extract shown prominent anti-inflammatory activity<sup>33</sup>.

#### **Antimutagenic activity**

The antimutagen was purified chromatographically from ethyl acetate extract of bay leaf and identified instrumentally to be 3-kaempferyl *p*-coumarate. The yield was 20 mg from 100 g of bay, and its IC<sub>50</sub> value, the amount required for 50% inhibition of the mutagenicity of 20 mg of Trp-P-2, was 1.9 µg. This value is close to those for strong antimutagens such as flavones and flavonols. The antimutagenicity was due to a desmutagenic action that inhibited the metabolic activation of Trp-P-2 to its ultimate carcinogenic form. The kaempferyl moiety contributed to the activity<sup>34</sup>.

#### **Immunostimulant activity**

Immunostimulant effects of laurel powder investigated by dietary intake on rainbow trout. After 14 days of adaptation on a control diet 3 groups of rainbow trout were fed the experimental diets containing 0.5 and 1% laurel leaf powder for 21 days. The fish were then switched back to the control diet. Non-specific immunity was investigated at the end of the 21 day experimental feeding period and then again 42nd, 63rd days later. The non-specific immune parameters, extracellular and intracellular respiratory burst activities, phagocytosis in blood leukocytes, lysozyme and total plasma protein level were evaluated. *Laurus nobilis* is not having immunostimulant

activity as this study showed no effect on respiratory burst, lysozyme activity and total plasma protein levels<sup>35</sup>.

#### **Antiviral activity**

Essential oils of *Laurus nobilis* were evaluated for their inhibitory activity against SARS-CoV and HSV-1 replication in vitro by visually scoring of the virus-induced cytopathogenic effect post-infection. *Laurus nobilis* oil shown activity against SARS-CoV with an IC (50) value of 120 µg /ml and a selectivity index (SI) of 4.16. This oil was characterized by the presence of beta-ocimene, 1, 8-cineole, alpha-pinene, and beta-pinene as the main constituents<sup>36</sup>.

#### **Anticholinergic activity**

Essential oil, ethanolic extract and decoction of *Laurus nobilis* were analyzed for their activity towards acetyl cholinesterase (AChE) enzyme. It showed AChE inhibitory capacity higher than 50% in the essential oil fraction. It also showed a high inhibition value of AChE in the ethanolic fraction, 64% (1 mg ml<sup>-1</sup>)<sup>37</sup>.

#### **Insect repellent activity**

Essential oils extracted from the seeds of fresh foliage of laurel *Laurus nobilis* Linn. were tested for their repellent activity against the adult females of *Culex pipiens*, usually the most common pest mosquito in urban and suburban settings in the Antalya province. The essential oils showed repellent activity<sup>38</sup>.

#### **Antibacterial activity**

In vitro antibacterial activities of the essential oil, seed oil, and methanolic extract of seed oil obtained from *Laurus nobilis* was carried. The methanolic extract of seed oil exhibited more effective antibacterial activity comparing to essential oil and seed oil<sup>39</sup>.

#### **Antifungal activity**

Antifungal activity of *Laurus nobilis* were carried out in vitro on seven strains of plant pathogenic fungi cultivated in Petri plates and each extract (or essential oil)

was tested at three different concentrations (50, 125 and 250  $\mu\text{g/ml}$ ). The results has been demonstrated that the greatest antifungal activity was observed for the extract obtained from *L. nobilis* against the fungus *Botrytis cinerea* Pers. when it was applied at an concentration of 250  $\mu\text{g/ml}$ <sup>40</sup>.

#### Acaricidal activity

Acaricidal activity of *Laurus nobilis* leaf oils against *Psoroptes cuniculi* evaluated. Acaricidal activity of *L. nobilis* oil, at a concentration of 10%, led to a mortality rate of 73%; at 5% the average activity

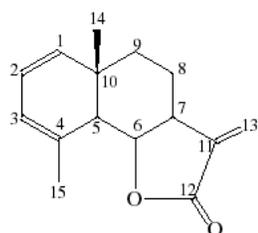
was significantly reduced to 51%, while dilutions of 2.5%, 1.25% and 0.625% were ineffective<sup>41</sup>.

#### CONCLUSION

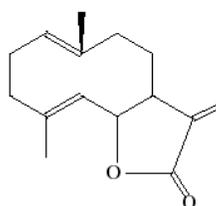
This study attempts to focus the Therapeutic potential of *Laurus nobilis* and their constituents. From this study we can conclude that the results reviewed in the review artical will be helpful of researchers seeking new drugs from *Laurus nobilis*. The isolated compounds will be considered in future for more clinical evaluations.



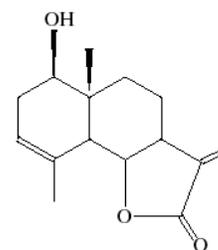
Fig. 1: *Laurus nobilis* plant



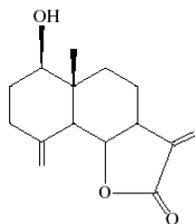
Gazaniolide



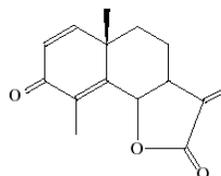
Costunolide



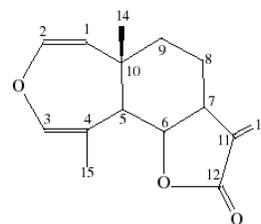
Santamarine



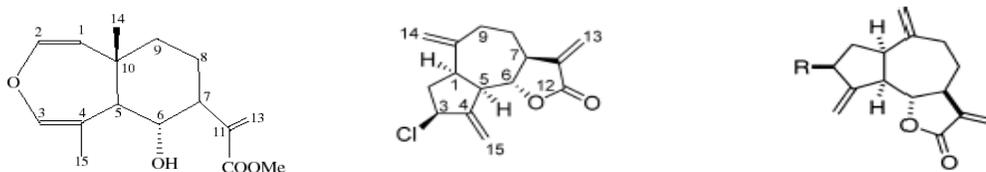
Reynosin



11,13-dehydrosantonin



Spirafolide



Lauroxepine

3β-chlorodehydrocostuslactone

Zaluzanin D(R=OAc)

**Fig. 2: Structures of some phytochemicals isolated from *Laurus nobilis*****REFERENCES**

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