REVIEW ARTICLE

RECORDS OF PHARMACEUTICAL AND BIOMEDICAL SCIENCES

# Review article on chemical constituents and biological activity of *Olea europaea*.

***Mohamed A. Diab[a*], Ghada M. Hadad [b], Amany K. Ibrahim [c]***

[a*] *Department of Pharmacognosy, Faculty of Pharmacy, Sinai University, North Sinai, Al-Arish, Egypt.*
[b] *Department of Pharmaceutical Analytical Chemistry, Faculty of Pharmacy, Suez Canal University, Egypt.*
[c] *Department of Pharmacognosy, Faculty of Pharmacy, Suez Canal University, Ismailia, Egypt.*

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Correspondence Author:

Tel: +201553031291

E-mail address:

mohameddiab1991@yahoo.com

**Abstract**

The olive tree is a member of the *Oleaceae* family (*Olea europaea*). *Olea europaea* is commonly known as Zaitoon. The ancient Egyptians, Greeks, Romans and other Mediterranean nations cultivated olives for its edible fruits and to obtain oil from them. Leaves of the tree became important when olive leaf extract was reported to be potent in reducing incidence of degenerative diseases, particularly coronary heart disease (CHD) and cancers of the breast, skin, and colon. Olive leaves have the highest antioxidant power among the different parts of the olive tree. While in olive fruit, phenols (e.g. TYR) and terpenoid hydrocarbon (squalene) are the major components found in the oil. Much research has been carried out on the medical applications of olive. The choice of the plant was based on the good previous biological study of *Olea europaea*. Interest to choose this plant, may have been due to the widespread use of olive species medicinally, food industry and cosmetics.

**Keywords**: *Olea europaea* , Chemical constituents, Biological activity, oleuropein, tyrosol.

## 1.Introduction:

The olive tree is a member of the *Oleaceae* family (*Olea europaea*) (Crisosto, Ferguson et al. 2011). The ancient Egyptians, Greeks, Romans and other Mediterranean nations cultivated olives for its edible fruits and to obtain oil from them (ALTINYAY and ALTUN 2006, Crisosto, Ferguson et al. 2011). In the Mediterranean area, there are nearly eight million hectares of olive trees (Guinda, Pérez-Camino et al. 2004, ALTINYAY and ALTUN 2006). Olive leaf was first used medicinally in ancient Egypt, and was the symbol of heavenly power (Tayoub, Sulaiman et al. 2012, Şahin and Bilgin 2018). Leaves of the tree became important when olive leaf extract was reported to be potent in reducing incidence of degenerative diseases, particularly coronary heart disease (CHD) and cancers of the breast, skin, and colon because

olive tree leaves are rich in olive biophenols as oleuropein (OLP), tyrosol (TYR) and hydroxytyrosol which have antioxidant activity (Keys, Mienotti et al. 1986, Owen, Haubner et al. 2004, Pereira, Ferreira et al. 2007, Waterman and Lockwood 2007, Altıok, Bayçın et al. 2008, Japón-Luján and Luque de Castro 2008, El and Karakaya 2009, Mavrakis 2009, Souilem, Fki et al. 2017). Therefore, the demand of olive leaf extract has increased for use in food (Lafka, Lazou et al. 2013, Blasi, Urbani et al. 2016). Olive leaves have the highest antioxidant power among the different parts of the olive tree (Blasi, Urbani et al. 2016). A high content of biophenols was detected in all varieties and OLP was the major compound (Al-Rimawi, Odeh et al. 2014, Termentzi, Halabalaki et al. 2015, Blasi, Urbani et al. 2016). While in olive fruit, phenols (e.g. TYR) and terpenoid hydrocarbon (squalene) are the major components found in the oil (Owen, Giacosa et al. 2000, Waterman and Lockwood 2007, Termentzi, Halabalaki et al. 2015). Nevertheless, OLP is not found in the oil except in sub-ppm quantities (Termentzi, Halabalaki et al. 2015). The concentration of phenols in oil rely on oil production method, environmental growth conditions and storage conditions (Visioli, Poli et al. 2002, Waterman and Lockwood 2007).

Squalene (SQL) is considered today an interesting natural molecule, with broad applications in food industry and cosmetics. SQL is a naturally occurring terpenoid hydrocarbon found in olive tree. After intake, SQL is usually stored in the skin tissue and plays a number of important roles (Passi, De Pità et al. 2002, Huang, Lin et al. 2009, Rosales-García, Jimenez-Martinez et al. 2017).

It is normally used in its natural form as emollient agent in cosmetic preparations and pharmaceuticals (Rosales-García, Jimenez-Martinez et al. 2017). More importantly, it has antioxidant and anticancer activity (Murakoshi, Nishino et al. 1992, Rao, Newmark et al. 1998, Smith, Yang et al. 1998, Reddy and Couvreur 2009, Rosales-García, Jimenez-Martinez et al. 2017). The active constituents of olive leaves and fruits vary relying on several conditions such as origin, climatic conditions, storage conditions, the time of year, location and cultivar (Sabry 2014, Blasi, Urbani et al. 2016).

## 2. Chemical constituents reported from *Olea europaea*:

### *2.1 seco-iridoid glycosides:*

(Tsukamoto, Hisada et al. 1984, Tsukamoto, Hisada et al. 1984, Tsukamoto, Hisada et al. 1985, Soler-Rivas, Espín et al. 2000, Bianco, Melchioni et al. 2004, Nenadis and Tsimidou 2009, Procopio, Alcaro et al. 2009, Haloui, Marzouk et al. 2011) isolated oleuropein from olive leaves and bark (table1).

### *2.2 phenolic compounds:*

(Esti, Cinquanta et al. 1998, Bianco and Uccella 2000, Owen, Haubner et al. 2003) isolated tyrosol and Hydroxytyrosol from fruit, oil and leaves (table1).

### *2.3 Flavonoids glycosides:*

(Bouaziz, Grayer et al. 2005, Meirinhos, Silva et al. 2005, Savarese, De Marco et al. 2007) isolated rutin from leaves (table1).

### *2.4 Coumarins:*

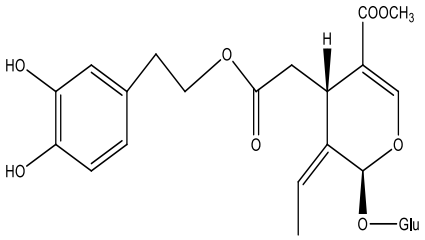
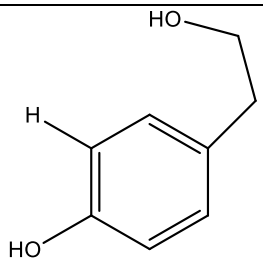
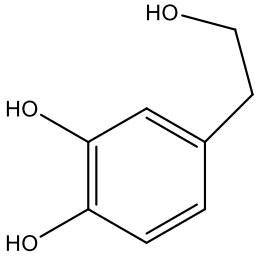
(Tsukamoto, Hisada et al. 1984, Tsukamoto, Hisada et al. 1985)

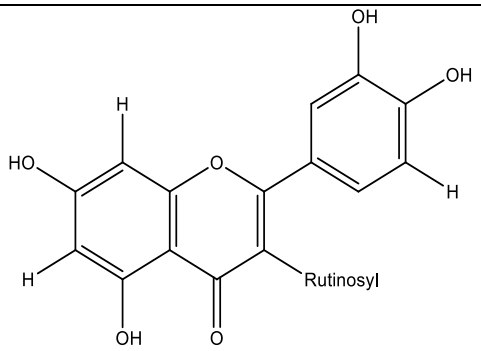
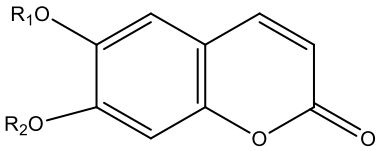
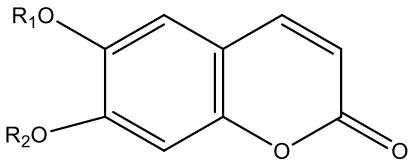
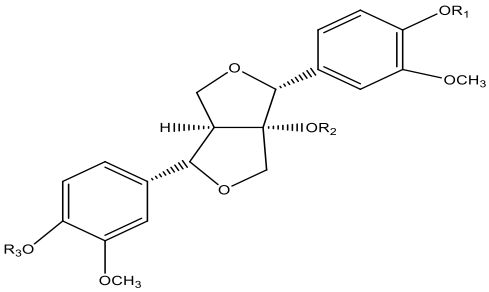
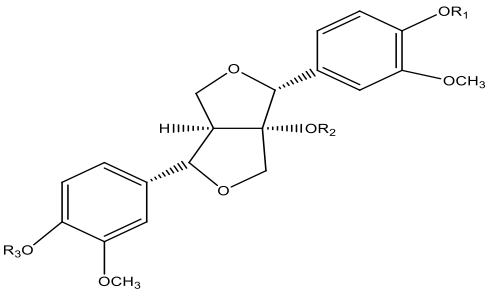
isolated Esculetin and Scopoletin from *Olea europaea* (table1).

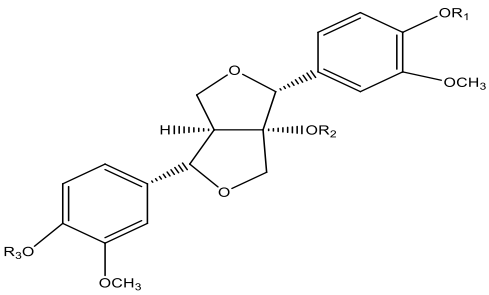
**2.5 Lignan and Lignan Glycosides:**

(TSUKAMOTO, HISADA et al. 1984, Christophoridou, Dais et al. 2005) isolated (+)-1-Acetoxypinoresinol and (+)-1-Hydroxypinoresinol from *O.europaea*. (Tsukamoto, Hisada et al. 1984, Tsukamoto, Hisada et al. 1984, Tsukamoto, Hisada et al. 1985) isolated (+)-1-Hydroxypinoresinol-4´-*β*-D-glucopyranoside isolated from *O.europaea* (table1).

**Table (1): Examples of some compounds isolated from *O. europaea*:**

| Structure | name | plant | reference |
|---|---|---|---|
|   | oleuropein | *Olea europaea* | (Tsukamoto, Hisada et al. 1984, Tsukamoto, Hisada et al. 1984, Tsukamoto, Hisada et al. 1985, Soler-Rivas, Espín et al. 2000, Bianco, Melchioni et al. 2004, Nenadis and Tsimidou 2009, Procopio, Alcaro et al. 2009, Haloui, Marzouk et al. 2011) |
|   | Tyrosol | *Olea europaea* | (Esti, Cinquanta et al. 1998, Bianco and Uccella 2000, Owen, Haubner et al. 2003) |
|   | Hydroxy tyrosol | *Olea europaea* | (Esti, Cinquanta et al. 1998, Bianco and Uccella 2000, Owen, Haubner et al. 2003) |

| | | | |
|---|---|---|---|
|  | Rutin | *Olea europaea* | (Bouaziz, Grayer et al. 2005, Meirinhos, Silva et al. 2005, Savarese, De Marco et al. 2007) |
|  | Esculetin<br>$R_1$ = H<br>$R_2$ = H | *Olea europaea* | (Tsukamoto, Hisada et al. 1984, Tsukamoto, Hisada et al. 1985) |
|  | Scopoletin<br>$R_1 = CH_3$<br>$R_2$ = H | *Olea europaea* | (Tsukamoto, Hisada et al. 1984, Tsukamoto, Hisada et al. 1985) |
|  | (+)-1-Acetoxypinoresinol<br>$R_1$ = H<br>R2 = AC<br>R3 = H | *Olea europaea* | (TSUKAMOTO, HISADA et al. 1984, Christophoridou, Dais et al. 2005) |
|  | (+)-1-Hydroxypinoresinol<br>R1 = H<br>R2 = OH<br>R3 = H | *Olea europaea* | (TSUKAMOTO, HISADA et al. 1984) |

| | | | |
|---|---|---|---|
|  | (+)-1-Hydroxypinoresinol -4´-$\beta$-D-glucopyranoside.<br>R1 = GLC<br>R2 = OH<br>R3 = H | *Olea europaea* | (Tsukamoto, Hisada et al. 1984, Tsukamoto, Hisada et al. 1984, Tsukamoto, Hisada et al. 1985) |

## 3. Biological activities reported from *O.europaea*:

### *3.1 Antidiabetic Activities:*

The treatment of antidiabetic patients with good antioxidants was proposed by (Al-Azzawie and Alhamdani 2006), as the blood glucose levels is reduced by the relief in oxidative stress.

### *3.2 Anticancer Activities:*

(Juan, Wenzel et al. 2008) studied the apoptotic and antiproliferative effects of erythrodiol in human colorectal carcinoma HT-29 cells, inhibiting the cell growth without any in colon adenocarcinoma cells.

### *3.3 Antimicrobial Activities:*

(Kubo, Lunde et al. 1995) identified a series of long-chain α, β- unsaturated aldehydes found in *O. europaea* fruit and its oil flavor for their antimicrobial activities and discovered they were active against a broad spectrum of microbes.

### *3.4 Antioxidant Activities:*

(Le Tutour and Guedon 1992) studied the antioxidant effects of oleuropein, hydroxytyrosol, and tyrosol from the leaves of O. europaea and compared it with vitamin E and BHT. Oleuropein and hydroxytyrosol demonstrated raised antioxidant effectiveness while tyrosol did not demonstrate any antioxidant or prooxidant effects whatsoever.

### *3.5 Enzyme Inhibition Activities:*

(Homer, Manji et al. 1992) reported that Water extracted from the terminal branches of *O. europaea ssp. africana* inhibited peptidase and glycosidase enzyme activities produced by periodontopathic bacteria *Porphyromonas gingivalis, Bacteroides intermedius, and Treponema denticola*.

### *3.6 Antihypertensive and Cardioprotective Activities:*

(Somova, Shode et al. 2004) reported that Oleanolic acid as well as uvaol demonstrated a significant, dose-response vasodepressor effect; thus, olive oil was prescribed as a cheap, natural cure for controlling hypertension.

### *3.7 Anti-Inflammatory and Antinociceptive Activities:*

(Esmaeili-Mahani, Rezaeezadeh-Roukerd et al. 2010) revealed that OLP doses of 50–200mg/Kg produce an analgesic effect that is dose dependent and intraperitoneal administration of 200mg/Kg OLP caused significant reduction in pain response in formalin test.

### *3.8 Gastroprotective Activities:*

(Arsić, Žugić et al. 2010) described the

gastroprotective properties of olive oil extract in respect to its quercetin content, the latter was confirmed with the help of HPLC.

***3.9 Neuroprotective Activities:***

(Teng, Yi-Song et al. 2010) studied the effect of maslinic acid , a triterpenoid that is isolated from olive leaves, on neuroprotection in rats suffering from type 2 diabetes.

## 4. Conclusion:

*O. europaea* are growing all over the world as it used for medicinal purposes. Here we just report a brief review for the chemical constituent and biological activity from the plant.

## 5. Conflict of interest:

The authors report no declaration of conflict of interest.

## 6. References:

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