

PHYTOCHEMISTRY, NUTRITIONAL AND MEDICINAL VALUE OF OLIVE

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Summary: Olive (*Olea europaea*) exists majorly in Mediterranean areas, various parts of Africa and tropical & central Asia. It can be used as a food, for clinical purpose, and it also plays an important role in cosmetic field. The importance of this plant has also been described by the last Prophet Hazrat Muhammad (PBUH). Olive plant has complex botanical parts which include tree, fruit, leaf, branches and bark. The olive majorly comprised of three kinds of chemical compounds i.e., oleic acid, phenolics and squalene. Phenolics of olive contain four important compounds namely ligstroside, tyrosol, hydroxytyrosol and oleuropein. Olive finds an immense significance due to its nutritional as well as medicinal value. Nutritional value is owed to the presence of significant quantities of lipids, carbohydrate, sterols, pigments, minerals and vitamins in olive oil which finds important uses in cooking and preparation of food items. The olive fruit and leaves paly a good role in treatment of cardiovascular disorders, anti-oxidant, anti-inflammation, anti-cancer and anti-HIV. However, olive fruit is not used directly for eating purposes due to its bitter taste.

Keywords: olive, phytochemicals, nutritional contents, antioxidants, disease treatment

INTRODUCTION

Plants are widely investigated throughout the world due to their important phytochemical constituents [1-3], nutritional [4-6] and medicinal value [7-9]. The olive (*Olea europaea*) of the Mediterranean zone, is viewed as one of the most seasoned and significant agricultural crops as it finds an important value especial-

ly in the form of olive oil [10-12]. In the Copper Age (sixth thousand years BC) there is proof of the utilization of its fruits and fluid extractions for weight control. In the seventh thousand years BC, olive oil started to be utilized for fundamental clinical purposes and it was also utilized in cosmetics. In the ninth and eighth century BC, oil was utilized for food and likewise to deal with dermatitis, sun protection, burnt skin, stomach and digestive system issues [13]. Olives are moreover filled monetarily in Australia, South Africa and California. Around 3500 BC, eatable olive was developed on the Crete Island. The spreading of olive in the Mediterranean area of Africa and southern Europe was caused by the Phoenicians. Since in 2000 years BC olives have been found in Egyptian burial chambers. In early Greeks the olive culture was firstly spread. Approximately 1,400 years ago, the Messenger of Islam-Hazrat Muhammad (PBUH) utilized olive oil on his head; He (PBUH) also advised to His companions to utilized olive oil on their bodies. The utilization of this oil has been reported in numerous societies and religions [14]. In religions, olive tree and olive fruit have significant importance. Both in the new and old confirmations of Bible, olives are mentioned a few times. Olive has likewise been commended as a favored fruit and tree in the Quran Pak (Quran, Section 24 Al-Noor, and Stanza 35). The most famous specie of *Olea* class is *Olea europaea* [15]. In the Mediterranean area [16], it is the major type of this specie which is utilized as food [17]. Olives are not utilized as a characteristic fruit on account of their amazingly severe taste yet are somewhat burned-through either as table olives or olive oil [18]. It has been utilized during special functions and furthermore has importance in the field of medical health care. Therefore, it is called the symbol of victory, peace and wisdom. The champions in the early Olympic were crowned with wreaths which is made up of olive branches. At the commercial value most plant oils are accumulated in seeds [19]. In Mediterranean diet, olive tree products are considered as essential diet. Now the key ingredient of Mediterranean diet i.e. olive oil, so mostly researchers has great interest in it, and major role of its fatty acid profile have been played in the field of disease prevention, in addition there is some bioactive compounds like phenolic compounds, tocopherols and phospholipids [20-24]. Olive leave are viewed as low-cost raw material which may be utilized as a helpful source of upgraded items [phenolic compounds]. Indeed, several studies justify the presence of a large number of phenolic compounds in olive leaves for example, rutin, luteolin-7-glucoside, hydroxytyrosol, verbascoside, oleuropein, ligstroside, oleuropein aglycone [25], and some other different compound like quinic acid [26]. Generally, in olive cultivars the oleuropein is consider the most abundant phenolic compound [26], however it can be easily removed as part of the phenolic portion of leaves, seeds and olive fruits, but about virgin olive oil it has been not reported till now [25, 27]. The olive tree is thick and small in height while tress or bushes has tallness which

is about to 10m, trunk has bent and twisted shape with large diameter, it also has opposite branchlets with reedy branches (**Fig. 1a**) [28]. The olive leaves (**Fig. 1b**) are lanceolate, narrow, shortly stalked, sometimes oblong, ovate, wrinkled, glabrous, attenuate with rough appearance, margin entire, silvery-whitish beneath in shading and light green above with few scales and, petiole has 1-3 cm width and 4-10 cm length with 6-12 primary veins on each side of leaf [28]. Generally, wood of earlier year, the olive flowers (**Fig. 1c**) are numerous, small, sessile, creamy white, bisexual or functionally unisexual. Olive has short corolla with four projections and is 1-2 mm long with short calyx which has four little teeth [29]. The size of olive fruit (**Fig. 1d**) is small which has skin or an external plump part that encompasses a shell of seed. Olive fruit change its color in to blackish-violet after ripening it is normally in length it is 1-2.5 cm long, it has ovoid shape and in some wild plants olive fruit is small than in orchard cultivates [29]. The color of olive bark (**Fig. 1e**) is light gray [17].

Keeping in view the great importance of Olive fruit, current studies were concentrated on its phytochemistry, nutritional and medicinal importance.

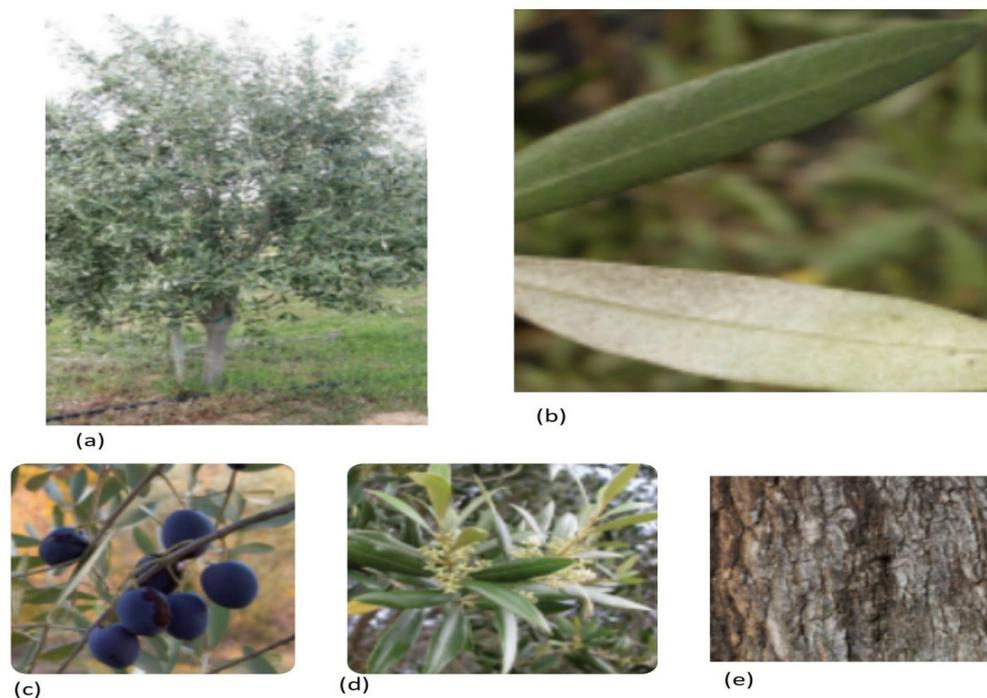


FIGURE 1. (a) tree (b) leaves [28] (c) inflorescence (d) ripe fruits [29] (e) stem bark [17]

PHYTOCHEMISTRY

Olive oil has complex composition; the biggest and smaller groups of olive oil has beneficial medical advantages which includes small amount of palmitate and it also contained oleic acid as tocosterols, about 0.2% phytosterol in sterols, Vitamin E [α -tocopherol] and caffeic acid [30], squalene, phenolics [31] and monoenoic acid oleate [32].

1. Oleic acid: Three fatty acids of olive oil have been joined to a backbone of glycerol. It is basically a triacylglyceride, which is a type of chemical i.e., glycerolipid. For plants and animals the major energy reserve are Triacylglycerols (Triglycerides or Fats), it contains a monounsaturated fatty acid which has approximately 72% oleic acid [33]. EVOO (extra virgin olive oil) speaks to the fundamental wellspring of fat in the Mediterranean eating routine [34]. It is rich in MUFA (generally oleic acid), a variable quantity of PUFA (going from 1.5% to 21%), and minor amounts of cancer prevention agent, micronutrients, for example secoiridoids, phenyl-ethyl alcohols, lignans, squalene, polyphenols [35]. Oleic acid (18:1 n-9) speaks to 49-83% of absolute FA in olive oil [31, 36].

2. Phenolics: Olive oil phenols classified into basic phenols, lignans and secoiridoids, all these phenols may help in the inhibition of auto-oxidation. Olive has significant phenols which are ligstroside [31] tyrosol, hydroxytyrosol and oleuropein [37].

3. Squalene: The scientist Kiritsakis [38] submitted his report, that among a scope of seasoning oils, olive oil contained the major amount of squalene. In the Mediterranean diet, it found in large quantity, it also has major role for chemo-protective effects [33] and in epidemiological investigations of population has been seen that people who consume this diet they have low chance of skin cancer. Olive oil contains limited quantity roughly 0.7% of squalene [33]. Between the level of squalene in refined virgin olive oils and extra virgin olive oil there is a slight difference [39].

NUTRITIONAL VALUE

Plants are well recognized for their nutritional importance [4, 40, 41]. By the USDA following information about the nutrition of one tablespoon (15g) of olive oil is given which is;

- **Protein:** 0g
- **Fiber:** 0g
- **Carbohydrates:** 0g
- **Sugars:** 0g
- **Sodium:** 0.3mg

- **Fat:** 14g
- **Calories:** 119g

One tablespoon of olive oil contains about 119 calories and 14 grams of fat making it high calorie food item. Fortunately, the fat is healthy, generally it is 4.6g polyunsaturated and 6.7g monounsaturated. From saturated fat the small quantity of calories come. It is also used for dressing and preparing of food. Olive oil has large quantity of a fat soluble vitamin i.e. vitamin E, which plays its role in immunity and it also help in normal nerve conduction [42, 43]. **Figure 2** displays some important nutritional facts of Kiwi.

O. europaea has various customary and contemporary utilizes in medication. A portion of its commendable uses are given underneath while the remaining are summed up in Table 1. Olive is broadly utilized in customary medication for a wide reach of infirmities in different nations. Its fruit, bark, wood, leaves, oil and seeds are utilized in various field, it also used with different spices. Seeds oil is used external use as an inflammation balm and furthermore use for oral use as a [44].

Nutrition Facts	
Extra Virgin Olive Oil	
Serving Size: <input type="text" value="1"/> tablespoon (14g)	
Amount Per Serving	
Calories 119	Calories from Fat 122
% Daily Value*	
Total Fat 14g	22%
Saturated Fat 1.9g	10%
Polyunsaturated Fat 1.4g	
Monounsaturated Fat 9.8g	
Cholesterol 0mg	0%
Sodium 0.3mg	0%
Potassium 0.1mg	0%
Total Carbohydrates 0g	0%
Dietary Fiber 0g	0%
Sugars 0g	
Protein 0g	
Vitamin A	0%
Vitamin C	0%
Calcium	0%
Iron	0.4%
* Percent Daily Values are based on a 2000 calorie diet.	

FIGURE 2. One table of olive oil nutritional facts
[<https://cullyskitchen.com/nutrition-facts-for-one-tbsp-of-extra-virgin-olive-oil/>]

TABLE 1. Traditional and contemporary uses of *Olea europaea*

Sr. No.	Plant part/preparation	Use/ailment	Reference
1	Infusion of leave and fruits	Use for diabetes prevention	[45]
2	Lemon juice + olive oil	For treatment of cholelithiasis	[46]
3	Olive oil/applied on scalp	To prevent hair loss	[47]
4	Seeds oil	Laxative	[44]
5	Boiled extract of fresh leaves/ oral use	To treat asthma	[48]
6	Infusion of fruit and dried leaves	Urinary tract and, respiratory infections, diarrhea	[46]
7	Infusion of leaves/oral use	Antipyretic	[49]
8	Olive oil	Use as a balm for fractured limbs	[50]
9	Decoction of leaves	Anti-inflammatory, tonic	[51]
10	Boiled extract of dried leaves/ oral use	For Antihypertensive use	[52], [51]
11	Olive fruit	Skin cleanser	[53]
12	Olive leaves	Antibacterial	[54]
13	Infusions of leaves	Eye infections treatment	[55]
14	Decoction of leaves	Antidiabetic, antihypertensive	[56]

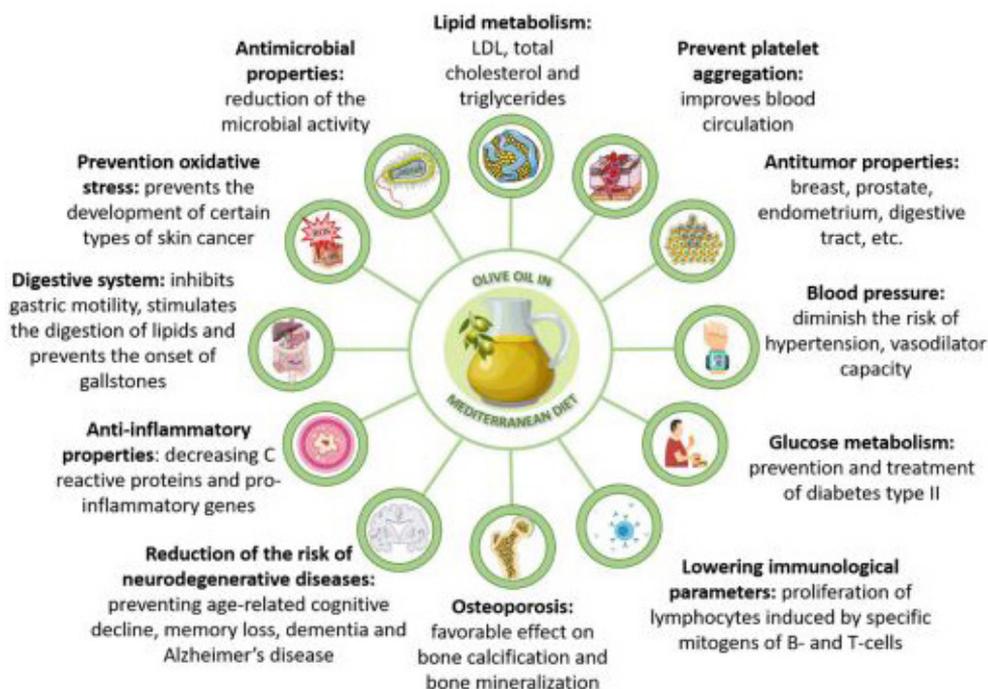


FIGURE 3. Olive oil scheme for the valuable and healthy impacts present in the Mediterranean diet [60]. Data adjusted from [61, 62]

A portion of some helpful properties are gotten together in **figure 3**. Olive oil structure is predominantly shaped by fatty substances and an assortment of a few mixes in little amounts. Out of the glyceride portion, olive oil also contain elevated portion of monounsaturated fats and high content of unsaturated fats [57, 58]. Through olive oil important pigment i.e. carotenoids are extracted [59].

It has been reported that there is major decrease about 15% in women breast cancer, who utilized extra virgin olive oil [63]. In the following (**Fig. 4**) effects of olive oil and its minor components along with basic science investigations on human, will elucidate their molecular activities [64].

For the treatment of hypertension and tumult, and as a diuretic and vermicide in the US olive oil is taken orally [66]. Infusion of dried or new leaves is used in treatment of asthma which is taken orally [48] and also use to treat diuresis and hypertension [52, 67]. The carotenoids contained in oil amass in numerous tissues, plasma lipoproteins are the mean of transport to the various organs for which they are basic, they are forerunners of nutrient An and answerable for the yellowing in olive oils, in which they are available in their three isomers α , β , and γ , related by their cancer prevention agent job in the insurance of nucleic acids, along these lines they have antiatherogenic and hostile to malignancy impacts (productive against particular kinds of disease), they keep up ordinariness in the visual framework, skin and mucous, reinforce the safe framework and secure our body against cardiovascular diseases [68]. For the treatment of eye disease decoction of leaves are utilized as ointment or it is also use for the treatment of sore throat as

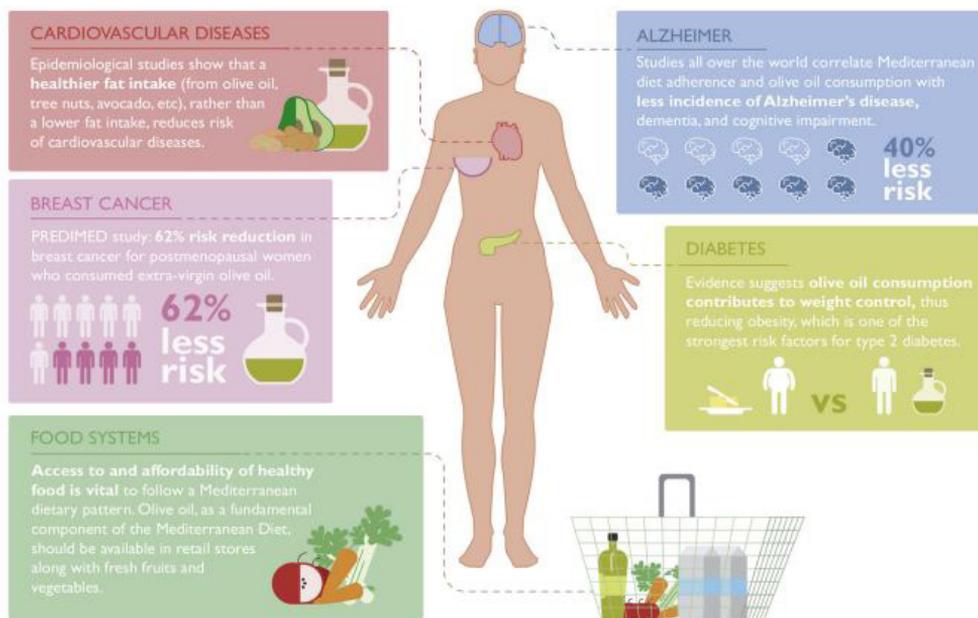


FIGURE 4. The manifold health properties of olive oil [65]

mouthwash [55]. In Morocco, it is utilized for the treatment of diabetes and hypertension [56]. For the treatment of gallstones mixture of lemon juice and olive oil is used [69]. So, due to health characteristics of olive oil i.e. its bioactive compounds and lipid content it is considered as a super food [70].

MEDICINAL VALUE

Medicinal value of plants is well recognized and widely investigated throughout the world [5, 71, 72]. Mediterranean diet is enrich in extra virgin olive oil which have been accounted that it may help in the prevention against diseases in the medical field [73], for example , oxidative damage [74, 75] or protection against CVD [76], type 2 diabetes mellitus [77] and anticipation of breast malignancy [78].

Antihypertensive & Cardio- protective activities: From the extraction of olive leaves three major triterpenoids which are ursolic acid [79], uvaol [80] and oleanolic acid [81] has been analyzed, these triterpenoid has cardiotoxic impacts. Uvaol and oleanolic acid appeared a huge, portion reaction in vasodepressor impact; hence, olive oil was recommended as a characteristic and modest wellspring of controlling hypertension [82]. In US, the main source of death is coronary heart disease (CHD) [83]. In the olive tree natural antioxidant i.e. Oleuropein is present, which help in prevention of cardiovascular illnesses , by maintaining the LDL oxidation quantity through a diminished arrangement of atherosclerotic plaques [84]. In a lab study it was reported that an extract of olive leaf have vasodilating impacts [85]. For treatment of cardiovascular infection olive oil and olive leaf play its vital role [86, 87]. Another report was submitted about olive oil that it can also help in decrease the danger of heart attacks, stroke, other heart problems and stomach malignant growth [17]. Olive oil has some antihypertensive activities been summed up in **table 2**.

TABLE 2. *Olea europaea* – antihypertensive activities

Sr. No.	Type of compound	Assay	Activity	Reference
1	Leaf extract	Antihypertensive	Very good	[88]
2	Extract of leaf ([EFLA 943])	For monozygotic twins use as antihypertensive	Good	[89]
3	Oleanolic acid, uvaol and ursolic acid	Cardiotonic	Good for oleanolic acid and uvaol	[82]

Antioxidant Activity: Under the activity of endogenous compounds, for example, catalase, superoxide dismutase and glutathione peroxidase, so the reactive nitrogen and oxygen of these compound are basic for chemical signaling,

energy supply, safe capacity and detoxification and their amount is cautiously controlled and are ceaselessly delivered in the human body. Due to large production of these responsive compounds, it may damage the defense systems, it also harmful for important biomolecules like, lipids, proteins and DNA [90]. This harm has been related with an expanded danger of cardiovascular illness, malignant growth, and other persistent infections. Henceforth, antioxidant agents are required to keep from oxidative harm and persistent illnesses [91]. Extra virgin olive oil has great antioxidant impacts which have been examined the relationship between atherosclerosis or CVD and oxidative stress. [92], in their investigations it has been exhibited that after high-phenolic VOO and EVOO intake, in a dose-dependent way the oxidative damage, reduction of lipid, reduction in oxidized LDL concentration and the LDL ability to endure oxidation [93, 94]. Different studies evaluate that olive possesses antioxidant activities, as a reference 2,2-diphenyl-1-picrylhydrazyl (DPPH) radicals and hydroxyl is used. These include, ethanolic extract of olive leaves [95, 96], olive leaves infusion [97] olive leaves and fruit [98, 99], olives from Dhokar olive cultivators [100, 101] and aqueous olive leaf extract [102]. These all-olive extracts have very good antioxidant activities. Olive has Antioxidant activities which have been discussed in **table 3** [44].

TABLE 3. Antioxidant activities of *Olea europaea*

Sr. No	Type of compound	Assay	Reference drug	Activity	Reference
1	Infusion of leaves	Antioxidant	(DPPH) radicals and hydroxyl	Good	[97]
2	Extract of leaf	Antioxidant	Trolox	Good	[101]
3	Hydrothermal released phenolics which used for prevention of pruning olive tree	Antioxidant	Trolox	Good	[103]
4	Olive fruit	Antioxidant	(DPPH) radicals	Good	[102]

Anti-Inflammation Activity: Extra virgin olive oil have great anti-inflammatory activity due to phenolic compound i.e. oleocanthal [45], another synthetic anti-inflammatory drug i.e. ibuprofen which has a strikingly similar profile to oleocanthal which is present in EVOO [104]. A primary etiologic factor of a few non-transferable pathologies is chronic inflammation, whose incidence is increase day by day. Subsequently, the anti-inflammatory impacts of extra virgin olive oil have picked up consideration thus have been broadly evaluated [105]. In olive leaves a triterpenoid i.e. ursolic acid is present, which has been inspected for its pro- and anti-inflammatory activities [106]. Extra virgin olive oil utilization were evaluated in chronic inflammatory and other immune system diseases for example, systematic lupus erythematosus [107] rheumatoid joint pain [108], or various

sclerosis [109, 110]. Extra virgin olive oil play its vital role as a possible therapeutic product, lessening inflammation in inflammatory bowel infections, which include Crohn's infection and ulcerative colitis , chronic inflammation of intestinal mucosa are related to these two diseases [111, 112]. Olive has anti-inflammatory activities which have been summed up in **table 4**.

TABLE 4. Anti-inflammatory activities of *Olea europaea*

Sr. No	Part of compound	Assay	Reference drug	Reference
1	Olive oil	Anti-inflammatory	Acetyl salicylate of lysine	[54]
2	Olive fruits n-Hexane extract	Anti-inflammatory	Indomethacin, acetylsalicylic acid	[98]
3	Olive oil	Anti-inflammatory	Dexamethasone	[113]

Anti-tumoral Activity: Excellent antitumoral activities of olive has demonstrated on different sorts of diseases [114]. Utilization of cancer prevention agents is accepted to lessen the danger of mutagenesis and carcinogenesis, oxidation of lipids, proteins and DNA has also been appeared to add to cancer improvement [115]. It has been reported by epidemiological evidence that people who use the Mediterranean diet have a less chance of certain cancers which include breast, skin and colon [116, 117].

Breast Cancer Treatment: The strongest advantageous impacts of extra virgin olive oil concerning malignancy have been depicted in breast cancer anticipation. A meta-investigation announced a factually huge reverse relationship between estrogen receptor-negative postmenopausal breast cancer and attachment to Mediterranean diet [118]. Those women who used Mediterranean diet which enrich with extra virgin olive oil indicated a 62% moderately lower danger of breast cancer, compare to women who used a low-fat eating diet [73, 78].

Skin Cancer Treatment: Olive oil contains linoleic corrosive, which is characterized as a fundamental fatty acid for the person and the absence of which today is related with skin issues(flaky skin, dermatitis and anomalous fair skin) [119].

Colon Cancer Treatment: As far as the connection between colorectal cancer risk & extra virgin olive oil utilization is concerned no new enormous case-control. Furthermore, a meta-examination has been confirmed that Mediterranean diet utilization is identified with a 13% lower danger of colorectal malignancy [120]. Recently, it has been proposed that the antitumoral movement of extra virgin olive oil , bringing down colorectal tumor occurrence in rats, could be mediated by epigenetic components, for example, deoxyribonucleic acid (DNA) and mRNA methylation [121].

Anti-HIV activity: For some treatment, AIDS patient has started to utilize extract of olive leaf for different symptoms, which may also use to build up strong immune system, to relieve chronic weakness and to boost the effects of anti-HIV medications, olive also use for the prevention HSV infection and HIV-related Kaposi's sarcoma [122].

CONCLUSIONS

It is concluded that olive is considered as most effective plant for various diseases like heart problems, diabetes, cancer and also effective for AIDS patient. Olive has important phenolics which act as great anti-oxidant agent. Extra virgin olive oil is utilized for the prevention of chronic inflammation of intestinal mucosa. Olive has also important traditional uses in many fields. Olive leaf infusion is used as eye ointment and olive leaf act as an anti-bacterial agent. Olive fruit can be used as skin cleanser.

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