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OVERVIEW OF THE CHARACTER ANALYSIS OF LIBYAN OLIVE OIL AND THEIR ADVANTAGES IN BIOMEDICAL APPLICATIONS

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ABSTRACT

Olive oil is depicted as "green gold" in Libya. It plays an inevitable role in Libyan food culture and countries' economies. This review highlighted the most recent advances and challenges about the botanical classification of olives', factors affecting olive oil quality and virgin olive oil processing techniques. Furthermore, this review explores the most significant attributes of olive oil in health and pharmaceutical applications. For instance, reduced pure olive oil considerably lowers the risk of cholesterol-related and other vascular diseases. Also exhibits excellent pharmaceutical properties for curing oxidative damage linked to cancer and neurodegenerative diseases. In addition, this review highlights the nutritional and food benefit of olive oil. Olive oil is an excellent antioxidant whereby olive oil can be applied to protect highly refined food such as meat from any pathogenic food spoilage. We hope that this review will give comprehensive knowledge about the health benefits of olive oil, which help to utilise oil in pharmaceuticals.

Contribution/ Originality: This study contributes to the current literature on the evaluation and how to increase production and benefit from the medicinal benefits of olive oil applications.

1. INTRODUCTION

The health benefits from virgin olive oil (VOO) are now a fact backed via laboratory experiments rather than a scientific hypothesis, epidemiological and clinical evidence. It has been shown that VOO consumption may decrease the risk of fat and the major health-promoting component with impacts that include diseases associated with oxidative damage, for example, neurodegenerative diseases Alzheimer's Disease, cancer, Parkinson's, metabolic syndrome and cardio-cerebrovascular [1-3]. Revert name for the fruits of the Olive oil tree comes from fruits of the

evergreen tree Olea europaea. It is one of the vital essential and ancient oils. The olive tree grows best in the subtropical climes of the Mediterranean Sea and North Africa's neighbouring countries. The oil content of the olive fruit can range from 35 to 70 % (dry basis), with up to 75% in the pulp [4, 5].

Libya is one of North Africa's top olive oil producers, and olive oil is ingrained in the culture. The country's average oil production was 15,000 tonnes per year, accounting for 0.5 %of global olive oil production. Libyans use olive oil as part of their culture, and many small-scale oil producers use the cold-pressing method [4, 5].

An epidemiological study was conducted in the past few years in Tripoli Medical Center (TMC) mycology laboratory. There are no recent epidemiological data in the literature to confirm the true incidence of fungal infection and its causative agents. We noticed that superficial fungal infections are among the most common skin diseases in patients visiting a dermatologist's clinic. Ours was more evident in children with tinea corporis, tinea capitis, and tinea pedis, which were more common among adult patients in this study, on the occurrence and spread of fungal-related skin diseases in Tripoli [6, 7].

Virgin Olive Oil is derived for extracting olive fruit considered one of the preferable sources of unsaturated fatty acids (primarily oleic acid); tocopherols, phenols, and flavour components are significant because nutritional qualities are highly valued for their beneficial effects on human health [8]. As the principal source of fats in this diet, extra virgin olive oil plays an important role [9]. Fresh olive juice collected solely through mechanical and physical techniques is virgin olive oil. Mono- and polyunsaturated fatty acids (particularly triacylglycerides) are more than 98%of the total weight; a small fraction (about 2% of the total weight) comprises a complicated set of little chemicals that contains over 230 different chemical components, hydrocarbons, volatile compounds and antioxidants aliphatic and triterpene alcohols, sterols[9].There is information in the literature about the physical and chemical features of various varieties of olive oils. However, in the past, due to a lack of knowledge about olive oil qualities, establishing appropriate boundaries for these traits has been difficult. To address this issue, Standard procedures for olive oil analysis, comprising a range of characteristic values for various olive oils, have been proposed by the FAO/WIIO Food Programme Alimentarius Commission. Olive oil is distinguished by its high oleic acid content (up to 93%) in the neutral lipid fraction [4].

2. OVERVIEW OF OLIVE OIL PRODUCTION AND COMPOSITION

2.1. Botanical Classification of the Olive

Olea europaea L. var., the modern cultivated olive, is of uncertain genetic origin. Some experts believe the "European" olive, which has the only edible Olea, represents a cross between two or more species. Others argue that the genus Olea and the genus Europaea are one set of plants having a wide range of "ecotypes" or "subspecies" found in different geographic regions. In practically every location where farmed olives thrive, wild olive trees and bushes known as oleaster or cebiche can be found. These plants could be seedlings of developed olive varieties disseminated by birds, and other wildlife who eat the fruit, or they could represent more native subspecies or ecotypes before the cultivated olive was introduced. The Olea genera all have the same chromosome number (2n = 46), and there have been multiple successful crossbreeding attempts. Olea europaea L. Sativa is now widely used by scientists [8, 9] to distinguish it from the wild olive subspecies oleaster.

2.2. World Production and Consumption of Olive Oil

The Mediterranean region contributes the highest percentage of the global olives oil, with more than 95% of the world olive oil produced. The total olive production from European countries is estimated at 81%; the olive tree's highly adverse climate conditions, as well as the fact that almost all olive trees are planted in a Mediterranean environment, explain the large concentration of olive oil production in these areas nations [7, 10, 11]. Olive trees are grown on more than 11 million hectares over five continents in 47 nations that generate olive oil. Over 12,000

olive oil mills worldwide, with olive oil being consumed in over 160 countries [12]. The world's olive oil production in 2016/2017 was estimated to be 2.713.500 t, down 14% from the previous crop year (- 446.000 t). Spain was first with 1.311.000 t, followed by Italy with 243.000 t, Greece with 260.000 t, and Tunisia with 100.000 t (-29 %); Libya was eleventh with 27.000.

2.3. Virgin Olive Oil Processing

Harvesting, cleaning, crushing, malaxation, and oil separation from solid and liquid phases of olive paste are all steps in the VOO procedure. Because enzymatic and chemical reactions begin during processing, roughly 90% of the bioactive chemicals, mainly phenolic compounds, are lost along with the lipid and aqueous phases separation. 17 and 18 Each of the processing phases' approaches may significantly impact the final oil composition [13, 14].

2.4. Genotype and Agronomical Factors

Many of the substances in VOO are metabolites of biosynthesis and biotransformation that occur during the development of olive fruits, such as TAGs, DAGs, MAGs, phenolic compounds, stereos, and pigments. Because different enzymes are responsible for creating various chemicals through biosynthetic pathways, differences in enzymatic activities can result in significant oil compositions. The enzymatic activity of olive fruits results from complicated interactions between genotype and agronomical circumstances such as water availability, ambient temperature, altitude, fruit health, and alternate bearing in olive trees. The fatty acid composition and tocopherol contents of VOOs from the same varieties grown in two locations at different altitudes were significantly different; the higher altitude oil sample had a higher oleic acid content, whereas the lower altitude oil sample had higher contents of tocopherol and linoleic acid. Variations in the composition of the volatile fraction of VOO may be caused by nine factors that affect the activity of each enzyme engaged in the pathway. Differences in olive fruit cultivation, including variety, origin location, maturity, and climatic circumstances, have significantly impacted the initial enzyme activity and substrate composition. As a result, volatile chemicals are frequently employed to describe differences in VOO cultivation [14-16].

2.5. Functional Components of Olive Oil

Olive oil contains active compounds such as oleic acid, phenolics, squalene, etc. Secoiridoids derivatives, flavonoids, and phenolic alcohols are the most abundant constituents in olive oil. Chemical stability, sensory attributes, and oxidative stability are all quality parameters for olive oil, and they are all based on the amount and quality of active compounds in the oil [17].

2.6. Functional Properties of Olive Oil

Olive oil is widely used for a variety of purposes. Several grades of olive oil and their phenolic components, functional applications, and biological properties are demonstrated. It is a suitable fat replacement and antioxidant and promotes health benefits due to phenolic compounds. Simple phenols, secoiridoids, and lignans are three distinct phenolic components with differing antioxidant, antibacterial, and other health-promoting characteristics [18].

3. PHARMACEUTICAL AND HEALTH BENEFITS OLIVE OIL

3.1. Antioxidant Properties of Olive Oil

Oxidative stress is a condition in which antioxidants and pro-oxidants are out of equilibrium. Hypertension, cardiovascular disease, cancer, neurodegenerative disorders, metabolic syndromes, and other chronic ailments have been linked to oxidative stress. A diet high in natural antioxidants can help to avoid these problems. On DNA and

lipid oxidation, hydroxytyrosol and oleuropein demonstrated more potent antioxidant effects than natural and synthetic antioxidant oxidation is more likely when there are more PUFA and fewer phenolic substances. Although sunflower oil and virgin olive oil have distinct fatty acid profiles, they exhibited comparable results in the ESR assay. In contrast, olive oil had similar fatty acid profiles but different results in the ESR experiment [19]. When it comes to measuring antioxidant capacity, the ESR approach comes in handy. FTIR, ATR, and spectroscopic techniques combined with partial least squares (PLS) are used [20].

3.2. Olive Oil May Promote Heart Health

Two spoons of olive oil daily make you more resistant to strokes and heart attacks because it makes your arteries more elastic. It aids in the reduction of blood cholesterol levels. Olive oil includes polyphenols, which help keep your LDL cholesterol levels in check, reduce the risk of stroke in older individuals via a different mechanism, and lower the risk of coronary heart disease in women [18]. The olive and its oil have long been cherished in Mediterranean cultures, and for a good reason [21, 22]. Researchers in Italy discovered that a diet rich in omega-3 fatty acids lowers the risk of coronary heart disease in the women who took part in the study. As a reason, a polyphenol present in olive oil is the most effective in protecting red blood cells from oxidation, causing the expected ageing effects. According to studies, olive oil contains nitric acid, which reduces blood pressure. However, still, this hypothesis is fully proven [14, 23, 24]. Furthermore, the danger is linked to the substitution of SFA for MUFA, which helps lower LDL cholesterol without reducing HDL cholesterol. The European Society of Hypertension advised a higher consumption of fruits, vegetables, and seafood while lowering SFA and cholesterol intake [11, 21, 22]. According to epidemiological and clinical evidence, a plant-based diet reduces the incidence of cardiovascular disease and cancer. Oils high in MUFA and low in SFA are expected to lower blood cholesterol levels. EVOO polyphenols block alpha-glycosidase, alpha-amylase, and angiotensin-converting enzymes (ACE), enzymes linked to diabetes, obesity, and hypertension, according to in vitro studies [25].

3.3. Olive Oil and Dermal Benefits

Polyphenols, a type of natural antioxidant found in olive oil, may support to prevention of cancer in humans. Sunlight destroys DNA and creates free radicals in skin tissues, which cause oxidative damage [3, 26, 27].

3.4. Olive Oil for Hair Care

One of the most surprising benefits is its ability to prevent and cure hair loss caused by a hormone that causes hair follicle shaft shrinkage. Nonetheless, when olive oil is applied to the scalp, the generation of that hormone, known as DHT (Dihydrotestosterone), is slowed. Antibacterial and antifungal qualities (rich monounsaturated fatty acids, vitamin E, and antioxidants) aid in the treatment of scalp and hair issues [26, 28].

3.5. Effect on Blood Sugar Control

According to a study titled Insulinotropic potency of lauric acid: a metabolic rationale for medium-chain fatty acids (MCFA) in TPN formulation by Garfinkel M et al., the effect of MCFA on insulin secretion depends on its chain length. The MCFAs were shown to have the most substantial impacts on insulin secretion27, with capric acid (C10) and lauric acid having the most potent effects. Compared to other oils, coconut oil consumption increased insulin activity and binding affinity [29].

3.6. Anticancer Activity of Olive Oil

Three meta-analysis researchers on the intake of olive oil and cancer were found. The first study's goal was to see if olive oil consumption was linked to specific forms of cancer. Thirty-seven thousand one hundred forty people

were included in this meta-analysis from 19 case-control studies. The highest class of olive oil information was linked to a lower risk of any cancer compared to the lowest type of olive oil consumption (log odds ratio: -0.41, 95 % CI -0.53 to -0.29). However, whether the beneficial health effects of olive oil consumption are related to its antioxidant content or other biochemical variables is unknown (such as monounsaturated fatty acid concentration) [30, 31]. A total of 150,000 females from five cohorts and 11 retrospective case-control studies were included in this meta-analysis. The influence of olive oil consumption on the risk of breast cancer was studied in the second meta-analysis. This meta-analysis included 25 studies and found that olive oil (a lipid that is free of saturated fatty acids) may reduce the risk of breast cancer and other malignancies (breast cancer risk ratio: 0.62, 95 % confidence interval: 0.44 to 0.88 for the highest vs lowest rank of olive oil intake). Compared to the declining classes, more excellent olive oil intake categories revealed a protective impact against breast cancer (OR: 0.74, 95 % CI 0.60-0.92). Simultaneously, A dose-response study found that each 10 g increase in oil did not significantly increase the risk of breast cancer [32].

3.7. Olive Oil Consumption for Type 2 Diabetes

This study included was in a Meta-analysis on diabetes mellitus This meta-analysis took part in four studies total of 187,068 people When the highest olive oil consumption group was compared to the lowest intake group, it was discovered that the highest intake group had a 16 % lower risk of diabetes (RR: 0.91, 95 % CI 0.87 to 0.95). As a result, this meta-analysis adds to the body of information on the risk of type 2 diabetes from olive oil benefits [33, 34].

3.8. Anti-Microbial Activity of Olive Oil

In vitro tests have revealed that phenolic compounds contained in olive oil, such as hydroxytyrosol, tyrosol, and oleuropein, have antibacterial properties against a variety of microbes. The anti-inflammatory activity of VOO minor components on 12-O-tetra decanolyphorbol (TPA)-induced oedema in mice was investigated. It was discovered that both polar and unsaponifiable details contribute to this anti-inflammatory action [35]. Polyphenols from olive oil and rosemary were investigated for antioxidant activities and antibacterial and antimicrobial activity of hydroxytyrosol and oleuropein against many bacterial strains that cause respiratory and intestinal diseases in humans, Polyphenolic compounds have antibacterial action against Listeria monocytogenes, and it has been discovered that they protect food from Listeria monocytogenes disease. Olive oil contains a wide variety of antimicrobial properties. As a reaction to the immune system, oleuropein promotes phagocytosis against pathogenic bacteria [6, 16, 17, 27, 34].

4. OLIVE OIL FOR FOOD AND NUTRITION APPLICATIONS

4.1. Nutritional Benefits of Olive Oil

People in southern Greece have found that consuming much olive oil and grilled veggies will help prevent rheumatoid arthritis. Olive oil contains essential fatty acids identical to those present in human milk, making it especially beneficial to the elderly in terms of mineral and vitamin absorption and stimulating bone mineralisation and avoiding calcium loss [26, 36]. Olive oil is a high-fat diet that can help prevent or delay diabetes by reducing insulin resistance and improving blood sugar management. Olive oil's phenolic components may contribute to the Mediterranean diet's cardiovascular health advantages by lowering polyunsaturated and monounsaturated fats in the bloodstream, lowering cholesterol levels. It also contains antioxidant vitamins that can help to avoid atherosclerosis. Plant sterols, derived from plant oils, reduce LDL cholesterol and can be supplemented or added to spreads to improve cholesterol levels. It's also high in antioxidant vitamins, which can help you avoid heart disease. Plant sterols, a type of plant oil, decrease LDL cholesterol and can be used to supplement or add to

spreads to improve cholesterol levels [37]. Monounsaturated fats enhance HDL, a good mix of omega-3 and omega-6 fatty acids. They have anti-clotting properties and appear to lessen the risk of cardiac arrhythmias and second heart attacks. Olive oil has a positive effect on gastritis and lowers the symptoms. Gallstones are more likely to form when ulcers induce the secretion of bile [26, 38].

4.2. Cholesterol Profile of Olive Oil

Oil has always performed a significant function in the Mediterranean diet, providing reliable monounsaturated and polyunsaturated fats. Olive oil's mono and polyunsaturated lipids help to maintain a better balance among HDL and LDL cholesterol ("good") cholesterol and LDL ("bad") cholesterol, which results in positive effects on cholesterol levels and a healthy diet. According to studies, extra-virgin unprocessed olive oil includes non-fat components like specific 26 phenolic compounds with a wide range of health advantages, including favourable effects on LDL oxidation cholesterol levels [26].

4.3. Olive Oil in Meat Products

Olive oil has long been used as a fat alternative and antioxidant in recipes to improve health. As an animal fat alternative, olive oil aids in significant lipid profile changes, enhancing -6/-3 fatty acid ratios, and deterioration of quality criteria such as colour, flavour, and nutritional value impacts in the oxidation of free radicals in dietary ingredients via scavenging free radicals with the help of antioxidants, free radical chain reactions in meat can be prevented [15]. Several types of research have shown that substituting olive oil for pig fat in meat-based items such as liver pate [17] and dry-cured sausages can reduce the amount of pig fat used, and fermented sausages improve health and increase MUFA content without modifying the -6/-3 ratio [1, 39]. The saturated fatty acid concentration was reduced when pig fat was partially or wholly replaced with olive oil in a water emulsion form. I looked into the influence of 5% VOO on the formation of salami effects and discovered that all physico-chemical and sensory features yield beneficial results [17, 40].

5. CONCLUSION

Olive oil plays a crucial role in the food production of the middle east region and the world. Besides, modern scientific studies have proved that olive oil has excellent medicinal and functional nutrient properties. This review summarises the recent finding of olive oil in various fields in biomedical applications. Significantly, olive oil helps stabilise the LDL level in the blood where body cholesterol level and heart health are maintained consistently healthy. Similarly, olive oil exhibits excellent anticancer and antimicrobial properties, which confer great opportunity to olive oil to be used in cancer drugs and communal diseases preventing applications. Besides, this review highlights the nutritional and food benefit of olive oil. Olive oil is an excellent antioxidant whereby olive oil can be applied to protect highly refined food such as meat from any pathogenic food spoilage. We hope that this review will give comprehensive knowledge about the health benefits of olive oil, which help to utilise oil in pharmaceuticals.

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