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Review Article

Table Olives: A Nutritional Approach to Health

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Abstract:

Olea europaea L. is the botanical name for olive tree; it is usually produced in the Mediterranean countries. The by-products are table olives and olive oil; they undergo many processes in order to become edible for consumers. Table olives are affected by various agronomical factors; this affects the structure of nutritional and non-nutritional components. Some of the most significant nutrients include monounsaturated fatty acids (MUFAs), vitamin E and a substantial amount of phytochemicals. The primary aim of this review is to study the various bioactive compounds found in the table olives, it also comprehensively explained the numerous health benefits associated with the regular intake of olive oil.

Key words: table olives; olea europaea L; oleuropein; health benefits; phytochemicals

1. Introduction

The botanical name of the evergreen olive tree is Olea europaea L., it is usually consumed by the Mediterranean countries, the fruit is known as the olive and the derivatives are table olives and olive oil (Foscolou et al., 2018). According to the International Olive Council, almost 6000 years ago there are some records that show the first cultivated trees i.e., olive tree can be found in Asia Minor regions (Román et al., 2019). Nearly in all regions of the continents there is widespread olive trees plantation, however, the countries which hold its majority of the production are Mediterranean countries including Spain, Italy, and Greece (Rossi, 2017). There are other important producing countries also including Egypt, Turkey, Syria, and Morocco (IOC, 2019). Nonetheless, the worldwide olive production is from the European Union, thus the production value is around 7000 million euros annually and consequently becoming a major constituent for both industrial and agricultural sectors (Rossi, 2017).

There are three basic parts of the olive fruit namely epicarp, mesocarp, and the endocarp (Ghanbari et al., 2012; Bianchi et al., 2003). Collectively, the epicarp and the mesocarp form the edible part of the olive fruit (Bianchi, 2003; Lanza, 2005). Nevertheless, in order to find out the nutritional and non-nutritional composition of the table olives various qualitative and quantitative methods are employed (Ghanbari et al., 2012; Pereira et al., 2012). There is a potential increase in the concentration of oleuropein which is a glycosylated secoiridoid as the olive fruit approaches its growth phase (Ghanbari et al., 2012; Uylaser and Yildiz, 2014). Meanwhile, there is an increase in the production of many biophenols such as hydroxytyrosol (HT) (Boskou et al., 2015).

It is not possible to consume fresh olives because of the natural bitterness caused by oleu-ropein, a bitter glucoside. Hence, it should be removed by treating with alkaline or by brining, fermentation, and acidification, thereafter allowing it to be edible for consumers (Boskou, 2017). Table olives are packed with innumerable vitamins, fats, proteins and many other carbohydrates (Lanza, 2012).

The purpose of the review is to determine the composition and health benefits related to the table olives, moreover, to give an overview on the functional and nutritional bioactives present in the olive fruit.

2.Types of Table Olives

There are some processing phases of the olives (Jaén Index-P.I.) as shown in **Figure 1**. Table olives can be divided into many types, however, globally only three practices are used for its preparation; Spanish green olives, Californian black olives and Greek black olives (Pereira et al., 2006; Uylaser and Yildiz, 2014).

2.1 Spanish green olives

Olives are treated with sodium hydroxide solution (NaOH) once they have attained the standard size, this process is also known as lye treatment (Charoenprasert and Mitchell, 2012). The oleuropein is hydrolyzed into

hydroxytyrosol through this lye treatment and therefore, the remaining amount of lye is washed with water, furthermore, the olives are administered to sodium chloride solution so as to enable lactic fermentation (Charoenprasert and Mitchell, 2012; Mateus, 2016). The resultant olives are then packed in brine and to prolong its shelf-life they can be submitted to sorbic acid or its salts, additionally, these olives can also be heat-treated through pasteurization for 15 minutes at 62.4 °C (Charoenprasert and Mitchell, 2012).

2.2 Californian black olives

In this method the first and foremost step is storage of olives in brine for a period of about 2 to 6 months, furthermore, by inclusion of lactic acid and acetic acid it is kept at medium acidification with pH 4 (Pereira et al., 2006; Charoenprasert and Mitchell, 2012). Olive fruits are treated with two to five sodium hydroxide solutions and eventually this enters into the flesh (Charoenprasert and Mitchell, 2012; Marsilio, 2001). Meanwhile, the process of lye is carried out and the olives in water or a weak brine solution transform into dark coloured fruit, this change is primarily caused by oxidation and polymerization of phenolic compounds (Boskou et al., 2015; Charoenprasert and Mitchell, 2012). Lastly, these olives are preserved in a can containing saline solution, thereupon; they are given to a sterilization treatment (Charoenprasert and Mitchell, 2012).

2.3 Greek black olives

In this method olives are harvested in the last stage of maturation. When the procedure of harvesting is completed olives undergo washing and are submerged in a brine solution (Boskou et al., 2015; Charoenprasert and Mitchell, 2012). Immediately fermentation starts, this occurs mainly by yeasts, lactic acid and gram-negative bacteria. The bitterness of olives is eliminated because of the dissemination of oleuropein from the fruit to the brine and along with the acid hydrolysis of the OL (Mendes, 2012; Boskou et al., 2015; Charoenprasert and Mitchell, 2012; Mateus, 2016).

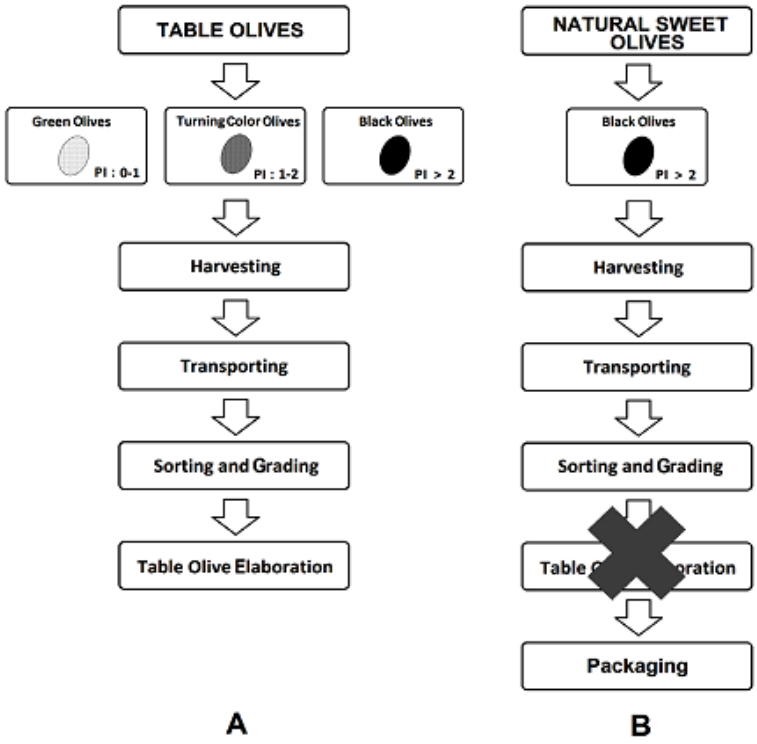


Figure 1. A: Classification of table olives according to Pigmentation Index (Jaén Index-P.I.) and major pre-processing operation; B: Natural sweet olives.

3.Nutritional Aspects of Table Olives

It is assumed that 100 grams of table olives can provide with 180-250 kilocalories, however, there are some expectations. Lipids are main component ranging from 6-30 g/100 g. The protein content is generally low and does not vary with olive types. The protein content ranges from 1.0 to 2.2 g/100g (Boskou, 2017).

Proteins have a very little contrition in overall nutrition of olives but these proteins include all of the essential amino acids, aspartic and glutamic acids. The carbohydrates are absent in table olives. Furthermore, olives are essentially rich in fibre, this comprise mainly of cellulose, hemicellulose, pectin and lignin (Rocha et al., 2020).

4.Health Benefits of Olives

Olives are rich in fat, carbohydrates, minerals and vitamins. Fat is the major nutrient in the form of monounsaturated fatty acids (MUFAs). According to investigations, olives are known to provide with least possible health risks. The consumption of olive oil has been linked to these health benefits in terms of diet. In **Figure 2**. (Rodrigo et al., 2015) clearly demonstrates some healthy effects of olive oil. Moreover, epidemiological data shows that the different antioxidants and phenolic components present in the olive oil are responsible for some of these benefits. Surprisingly, these minor factors significantly impact on lowering the prevalence of atherosclerosis, cardiovascular disease, neurological disorders, and some cancers (Guo et al., 2018). Besides, these compound also show potential as antioxidant, anti-carcinogenic, antimicrobial, and anti-inflammatory agents (Jimenez-Lopez et al., 2020).

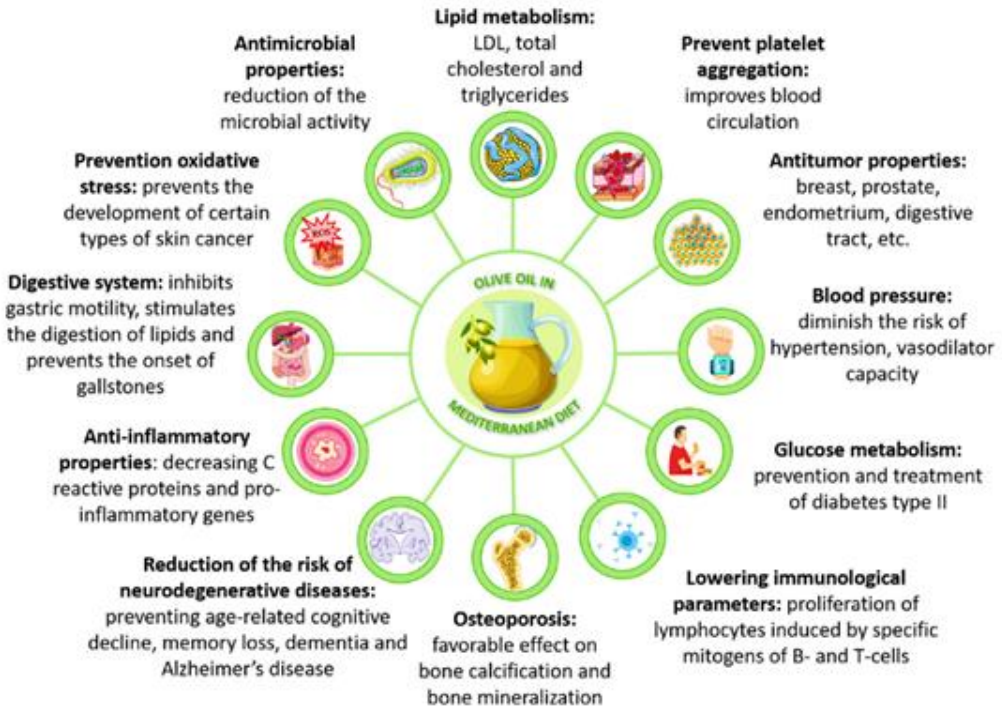


Figure 2. Some healthy effects of olive oil

4.1 Anti-inflammatory activity

Nowadays many non-communicable diseases are primarily caused by acute or chronic inflammation, thus, one of the types of the olive oil i.e. Extra Virgin Olive Oil or EVOO plays an important role for its beneficial anti-inflammatory properties. The patients with dysmetabolic syndrome followed virgin olive oil breakfast routine, this subsequently led to reduced levels of postprandial inflammatory response (Camargo et al., 2014).

Additionally, some inflammatory bowel diseases that cause chronic inflammation of the gastrointestinal tract including ulcerative colitis and Crohn's disease can be cured with the utilization of EVOO (Millman et al., 2021). The consumption of EVOO was also found useful against rheumatoid arthritis (Marcelino et al., 2019) and systemic lupus erythematosus or multiple sclerosis (Žugčić et al., 2019). Moreover, among all the aforementioned anti-inflammatory effects of EVOO a study shows that it has neuroprotective benefits also that may delay cognitive decline and, consequently, the onset of dementia in the elderly or Alzheimer's disease (Gavahian et al., 2019).

4.2 Antioxidant activity

(ROS) produce some highly reactive chemicals in aerobic organisms such as peroxides, superoxide and hydroxyl radical, hence, elevated levels may cause damage to DNA, lipid or proteins (Bozzetto et al., 2019). There are certain molecules known as antioxidants that prevent the action of oxidative stress primarily through a dynamic system of antioxidants, Glutathione (GSH) which are found in plants, animals, fungi and some bacteria. Reportedly only a few vitamins act as antioxidants but they present some adverse effects (Peroulis et al., 2019). Many researchers are striving hard to gather evidence apropos of the antioxidant properties of natural compounds so as to avoid any side effects. Here much importance is given to the lipophilic and hydrophilic phenols in EVOO. One of the intervention group determined that a diet enriched with EVOO was effective against HDL atheroprotective functions and oxidative status (Luisi et al., 2019).

4.3 Anti-tumoral activity

In comparison with the United States or other European countries, Mediterranean countries have historically had lower rates of some cancers, including breast, colorectal, endometrium, and prostate cancer, which have been associated with dietary factors (Klimova et al., 2019). Several studies have been conducted on EVOO's anti-tumoral and anti-cancer properties. The significant anti-cancer benefits of EVOO have been linked to breast cancer prevention. Approximately 4200 women with breast cancer were admitted in the PREDIMED trial and the women who consumed MED containing EVOO diet demonstrated minimum risk of breast cancer in contrast to women who consumed a low-fat diet (Fernandes et al., 2020). Recently, it has been proposed that epigenetic processes including miRNA and DNA methylation may be responsible for the anti-tumoral effect of EVOO, which reduces the incidence of colorectal tumours (Nanda et al., 2019).

5.Beneficial Effects of Olive Phenolic Compounds

Olive fruits and oil are a blend of variety of phenolic compounds including oleuropein, andoleocanthal, (Almatroodi et al., 2020). There are numerous hydrophilic phenolic molecules, but two in particular need to be identified: the hydroxytyrosol and the secoiridoid oleuropein. In **Figure 3**. (Romani et al., 2019) shows the structure of the phenolic compounds found in Olea europaea L. Generally, polyphenols are known for their biological properties. Olive polyphenols if added in a balanced diet can perform as natural anticancer agents. Research shows that polyphenols reduce the morbidity and prevent the development of many diseases like neurodegenerative and cancer diseases. In addition, these polyphenols also have other health-promoting benefits such as anti-allergic, anti-atherogenic, anti-thrombotic, and anti-mutagenic activities (Sherif et al.,

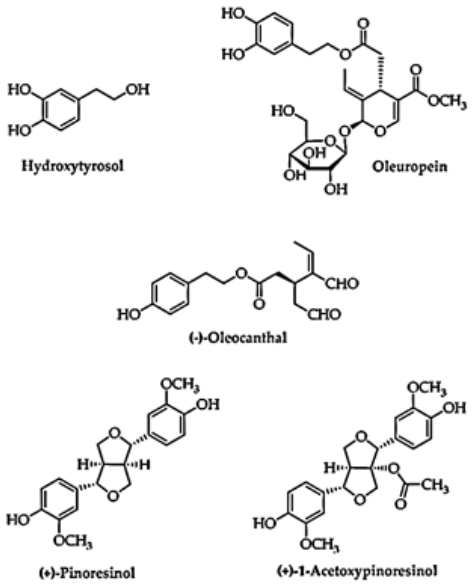


Figure 3. Structure of the phenolic compounds found in Olea europaea L.

According to collected data intake of high polyphenol foods on a daily basis prevent many diseases such as obesity, diabetes mellitus, and cardiovascular diseases. The anti-inflammatory properties of polyphenols, which are manifested by numerous pathways including antioxidant activity, are largely responsible for this beneficial effect (Bucciantini et al., 2021). EUROLIVE study shows that polyphenols enhance the functionality of human HDL, and also favors the HDL-mediated cholesterol efflux from macrophages. In **Figure 4**. (Romani et al., 2019) present the benefits of EVOO. Increasing evidence suggests that EVOO polyphenols have positive effects on intestinal immunity and gut health. Furthermore, EVOO polyphenols also have antibacterial and bacteriostatic actions against pathogenic intestinal microflora (Marcelino et al., 2019).

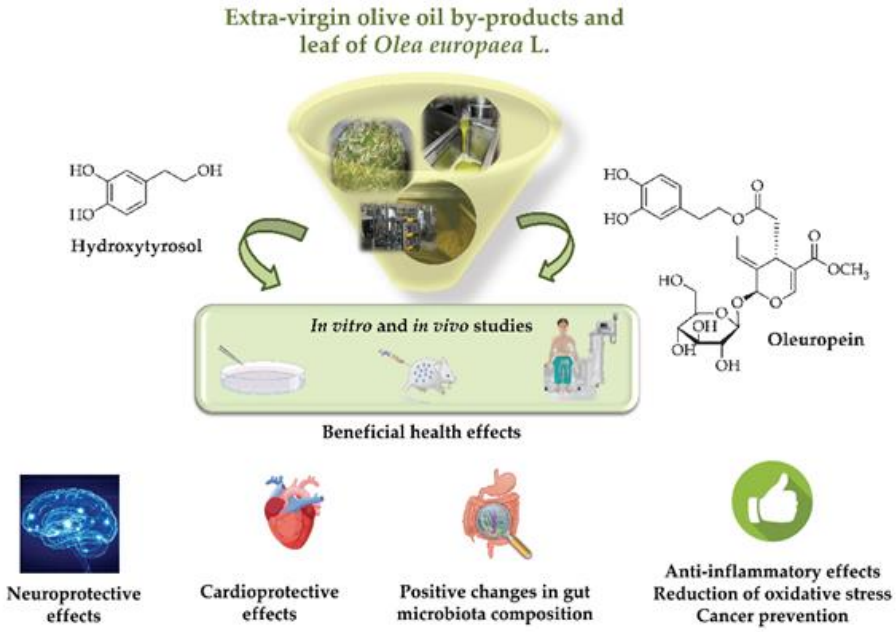


Figure 4: Benefits of Extra-virgin olive oil

Olive polyphenols exhibit some pharmacological properties for example, hypoglycemic, anti-inflammatory, antitumoral, antiviral, and immunomodulatory activities (Fernández-Prior et al., 2021). In addition to the prevention against age-related neurodegenerative diseases, the concentration of polyphenols is affected by certain factors these comprise of olive cultivar, environmental factors, cultivation practices, and the stage of fruit ripening. The storage conditions are also very important as

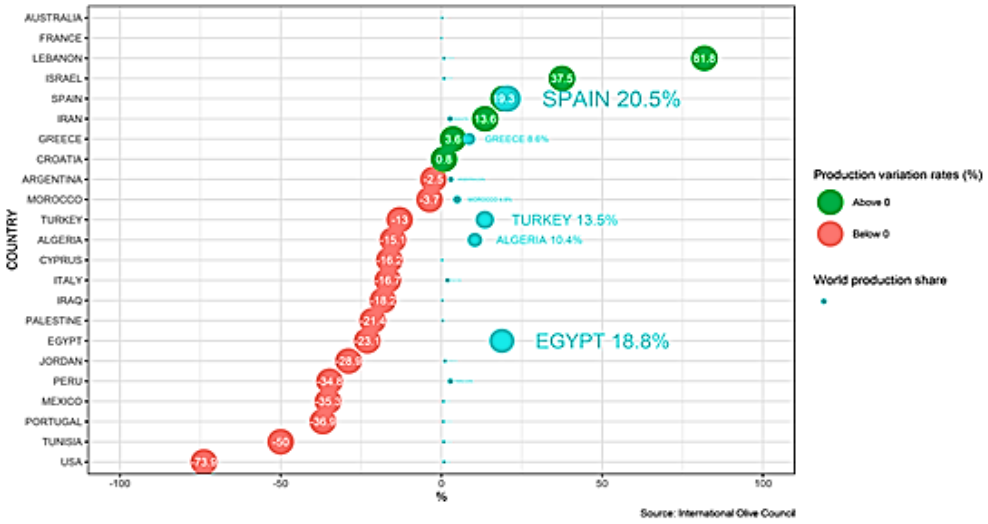
these conditions can alter the rate of oxidation or photo-oxidation reactions (Hornedo-Ortega et al., 2018).

6.Worldwide Distribution of Table Olives

The data of International Olive Oil Council for the year 2020/21 shows the average consumption of table olives:

- Turkey – 13%.
- Egypt – 12%.
- USA – 9%.
- Spain – 7%.
- Algeria – 7%.
- Italy – 5%.
- Rest of the world – 47%

In Graph I. The International Olive Oil Council report indicates Spain as the leading country in the world for table olives production. The remaining countries such as Egypt, Turkey, Algeria, Greece, and Portugal lag behind in their performance.



Graph I: Table olives production

7.Conclusion

Olive fruits are essentially valuable source of MUFA, vitamin E, and phenolic compounds. Several studies show that with the consumption of table olives the risk of chronic diseases is reduced, moreover, there is an increase in life expectancy. The most active compounds are HT and OLE. The polyphenolic compounds OL and HT present in olive oil are potent antioxidants thus, protecting against innumerable diseases including cancer, chronic inflammation and neurodegeneration. However, more extensive research is required to find out the control measures necessary for the table olives production and as a result will help to determine health benefits.

References

1. Petkoska, A. T., & Trajkovska-Broach, A. (2021). Health Benefits of Extra Virgin Olive Oil. In Olive Oil-New Perspectives and Applications. IntechOpen.
2. Bianchi, G. (2003). Lipids and phenols in table olives. European Journal of Lipid Science and Technology, 105(5), 229-242.
3. Boskou, D., Camposeo, S., & Clodoveo, M. L. (2015). Table olives as sources of bioactive compounds. In Olive and olive oil bioactive constituents (pp. 217-259). AOCS press.
4. Boskou, D. (2017). Table olives: a vehicle for the delivery of bioactive compounds. J Exp Food Chem, 3(123), 2472-0542.
5. Bozzetto, L., Alderisio, A., Clemente, G., Giorgini, M., Barone, F., Griffo, E., ... & Annuzzi, G. (2019). Gastrointestinal effects of extra-virgin olive oil associated with lower postprandial glycemia in type 1 diabetes. Clinical Nutrition, 38(6), 2645-2651.
6. Camargo, A., Rangel-Zuñiga, O. A., Haro, C., Meza-Miranda, E. R., Peña-Orihuela, P., Meneses, M. E., ... & Perez-Jimenez, F. (2014). Olive oil phenolic compounds decrease the postprandial inflammatory response by reducing postprandial plasma lipopolysaccharide levels. Food Chemistry, 162, 161-171.
7. Charoenprasert, S., & Mitchell, A. (2012). Factors influencing phenolic compounds in table olives (Olea europaea). Journal of Agricultural and Food Chemistry, 60(29), 7081-7095.
8. Fernandes, J., Fialho, M., Santos, R., Peixoto-Placido, C., Madeira, T., Sousa-Santos, N., ... & Carneiro, A. V. (2020). Is olive oil good for you? A systematic review and meta-analysis on anti-inflammatory benefits from regular dietary intake. Nutrition, 69, 110559.
9. Fernández-Prior, Á., Bermúdez-Oria, A., Millán-Linares, M. D. C., Fernández-Bolaños, J., Espejo-Calvo, J. A., & Rodríguez-Gutiérrez, G. (2021). Anti-inflammatory and antioxidant activity of hydroxytyrosol and 3, 4-dihydroxyphenyglycol purified from table olive effluents. Foods, 10(2), 227.
10. Foscolou, A., Critselis, E., & Panagiotakos, D. (2018). Olive oil consumption and human health: A narrative review. Maturitas, 118, 60-66.
11. Gavahian, M., Khaneghah, A. M., Lorenzo, J. M., Munekata, P. E., Garcia-Mantrana, I., Collado, M. C., ... & Barba, F. J. (2019). Health benefits of olive oil and its components: Impacts on gut microbiota antioxidant activities, and prevention of noncommunicable diseases. Trends in food science & technology, 88, 220-227.
12. Ghanbari, R., Anwar, F., Alkharfy, K. M., Gilani, A. H., & Saari, N. (2012). Valuable nutrients and functional bioactives

in different parts of olive (Olea europaea L.)—a review. International journal of molecular sciences, 13(3), 3291-3340.
13. Guo, Z., Jia, X., Zheng, Z., Lu, X., Zheng, Y., Zheng, B., & Xiao, J. (2018). Chemical composition and nutritional function of olive (Olea europaea L.): A review. Phytochemistry Reviews, 17(5), 1091-1110.
14. Hornedo-Ortega, R., Cerezo, A. B., De Pablos, R. M., Krisa, S., Richard, T., García-Parrilla, M. C., & Troncoso, A. M. (2018). Phenolic compounds characteristic of the mediterranean diet in mitigating microglia-mediated neuroinflammation. Frontiers in Cellular Neuroscience, 12, 373.
15. International Olive Council. World Table Olive Figures International Olive Council. March 2019. World Table Olive Figures: Production.
16. Jimenez-Lopez, C., Carpena, M., Lourenço-Lopes, C., Gallardo-Gomez, M., Lorenzo, J. M., Barba, F. J., ... & Simal-Gandara, J. (2020). Bioactive compounds and quality of extra virgin olive oil. Foods, 9(8), 1014.
17. Klimova, B., Novotný, M., Kuca, K., & Valis, M. (2019). Effect of an extra-virgin olive oil intake on the delay of cognitive decline: role of secoiridoid oleuropein?. Neuropsychiatric disease and treatment, 15, 3033.
18. Lanza, B. (2012). Nutritional and sensory quality of table olives. Olive Germplasm–The Olive Cultivation, Table Olive and Olive Oil Industry in Italy, 2840.
19. Luisi, M. L. E., Lucarini, L., Biffi, B., Rafanelli, E., Pietramellara, G., Durante, M., ... & Ceccherini, M. T. (2019). Effect of Mediterranean diet enriched in high quality extra virgin olive oil on oxidative stress, inflammation and gut microbiota in obese and normal weight adult subjects. Frontiers in pharmacology, 10, 1366.
20. Marcelino, G., Hiane, P. A., Freitas, K. D. C., Santana, L. F., Pott, A., Donadon, J. R., & Guimarães, R. D. C. A. (2019). Effects of olive oil and its minor components on cardiovascular diseases, inflammation, and gut microbiota. Nutrients, 11(8), 1826.
21. Marsilio, V., Campestre, C., & Lanza, B. (2001). Phenolic compounds change during California-style ripe olive processing. Food Chemistry, 74(1), 55-60.
22. Mateus, T. I. D. P. (2016). Contribuição para o estudo de produção de azeitona de mesa da cultivar Cobrançosa: caraterização microbiológica (Doctoral dissertation).
23. Mendes, P. A. F., & da Silva Malheiro, R. M. (2012). Caracterização da fração fenólica e atividade biológica de azeitonas de mesa ao natural produzidas na região de Trás-os-Montes (Doctoral dissertation, Instituto Politecnico de Braganca (Portugal)).
24. Millman, J. F., Okamoto, S., Teruya, T., Uema, T., Ikematsu, S., Shimabukuro, M., & Masuzaki, H. (2021). Extra-virgin olive oil and the gut-brain axis: influence on gut microbiota, mucosal immunity, and cardiometabolic and cognitive health. Nutrition Reviews, 79(12), 1362-1374.
25. Nanda, N., Mahmood, S., Bhatia, A., Mahmood, A., & Dhawan, D. K. (2019). Chemopreventive role of olive oil in colon carcinogenesis by targeting noncoding RNAs and methylation machinery. International journal of cancer, 144(5), 1180-1194.
26. Pérez-Rodrigo, C., & Aranceta, J. (2016). Olive oil: Its role in the diet.
27. Peroulis, N., Androutsopoulos, V. P., Notas, G., Koinaki, S., Giakoumaki, E., Spyros, A., ... & Kampa, M. (2019). Significant metabolic improvement by a water extract of olives: Animal and human evidence. European journal of nutrition, 58(6), 2545-2560.
28. Rocha, J., Borges, N., & Pinho, O. (2020). Table olives and health: A review. Journal of nutritional science, 9.
29. Romani, A., Ieri, F., Urciuoli, S., Noce, A., Marrone, G., Nediani, C., & Bernini, R. (2019). Health effects of phenolic compounds found in extra-virgin olive oil, by-products, and leaf of Olea europaea L. Nutrients, 11(8), 1776.
30. Roman, G. C., Jackson, R. E., Reis, J., Román, A. N., Toledo, J. B., & Toledo, E. (2019). Extra-virgin olive oil for potential prevention of Alzheimer disease. Revue neurologique, 175(10), 705-723.
31. Rossi, R. (2017). The Eu Olive and Olive Oil Sector Main Features, Challenges and Prospects. European Parliamentary Research Service; European Parliament: Brussels, Belgium, 12.
32. Sherif, I. O., Nakshabandi, Z. M., Mohamed, M. A., & Sarhan, O. M. (2016). Uroprotective effect of oleuropein in a rat model of hemorrhagic cystitis. The International Journal of Biochemistry & Cell Biology, 74, 12-17.
33. Uylaşer, V., & Yıldız, G. (2014). The historical development and nutritional importance of olive and olive oil constituted an important part of the mediterranean diet.
34. Yubero-Serrano, E. M., Lopez-Moreno, J., Gomez-Delgado, F., & Lopez-Miranda, J. (2019). Extra virgin olive oil: More than a healthy fat. European journal of clinical nutrition, 72(1), 8-17.
35. Žugčić, T., Abdelkebir, R., Alcantara, C., Collado, M. C., García-Pérez, J. V., Meléndez-Martínez, A. J., ... & Barba, F. J. (2019). From extraction of valuable compounds to health promoting benefits of olive leaves through bioaccessibility, bioavailability and impact on gut microbiota. Trends in Food Science & Technology, 83, 63-77.

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