CHARLES UNIVERSITY IN PRAGUE

FACULTY OF PHARMACY IN HRADEC KRALOVE

DEPARTMENT OF BIOLOGICAL AND MEDICAL SCIENCES

Diploma thesis (DT)

Olive oil and health properties

Angeliki Kavvalou

Supervisor: Assoc.Prof. PharmDr. Miloslav Hronek, Ph.D.

HRADEC KRALOVE, 2022

Acknowledgements

I would like to thank my supervisor, Associated Professor Miloslav Hronek, whose mastery was critical in developing the framework of my thesis. I am very grateful for your constant support, patience and comprehension. Your important guidance motivated me to highlight my thinking and guided my effort to a soaring degree.

I would also like to express my gratitude to my colleagues, friends and family for their magnificent collaboration and for always having my back throughout the studies. Your support really means a lot to me.

"I declare that this thesis is my original copyright work. All the literature and other resources, from which I drew during processing, they are listed in the list of used literature, and in the work are properly cited. Work was not used to obtain another or of the same title. "

HRADEC KRALOVE, 2022

SIGNATURE OF THE STUDENT

CONTENT

ABSTRACT 7

1. Introduction 9

2. Aim Of The Diploma Thesis 10

2. Chapter 11

2.1 “Olive oil in ancient Greece” 11

2.1.1 Mythology 11

2.1.2 History of Olives 13

2.1.3 Olive tree and Ancient Greece 13

3. Chapter 14

3.1.1 Olives 14

3.1.1.1 Olive tree 14

3.1.1.2 Cultivation of olive 15

3.1.1.3 Exploitation system 15

3.1.1.4 Preparation of field 16

3.1.1.5 Planting of new trees 16

3.1.1.6 Oiling of new olive grove 16

3.1.1.7 Pruning 17

3.1.1.8 Cooling and Flowering 18

3.1.1.9 Water requirements and irrigation management 19

3.1.1.10 Lubrication 20

3.1.1.11 Confrontation of insects 21

3.1.1.12 Enemies and illnesses 21

3.1.1.13 The process of olive fruit 21

3.1.1.14 Variety of olive 22

3.1.1.15 Qualitative characteristics of olives 23

3.1.1.16 Nutritional value of olive 24

4. Chapter 24

4.1 Olive oil 24
4.1.1 Definition 24
4.1.2 Categories of olive oil 25
4.1.3 Refined Olive Oil 25
4.1.4 Different types of olive oil 25
4.1.5 Oil concentration and composition 27
4.1.6 Standardization- Packaging- Marking 28
4.1.7 The quality of olive oil 29

5. Chapter 30
5.1 Chemical composition of olive oil 30
5.1.1 Phospholipids 32
5.1.2 Hydrocarbons 32
5.1.3 Carotenoids 33
5.1.4 Chlorophylls 33
5.1.5 Vitamins 33
5.1.6 Tocopherols 33
5.1.7 Sterols 33
5.1.8 Triterpenic acids 34
5.1.9 Phenols 34
5.1.10 Antioxidants 35
5.1.11 Synthetic antioxidants 35
5.1.12 Natural antioxidants 35
5.1.13 Flavonoids 35
5.1.14 Carotenoids 36

6. Chapter 36
6.1 Effect of olive oil on health 36
6.1.1 Cardiovascular Diseases 37
6.1.2 Metabolic Syndrome 38
6.1.3 Obesity 38
6.1.4 Maintenance of weight 39
6.1.5 Hyperglycemia 39
6.1.6 Stress 39
6.1.7 Diabetes Mellitus 40

6.1.8 Rheumatoid Arthritis 41
6.1.9 Olive oil and peptic system 41
6.1.10 Olive oil and intestine 42
6.1.11 Cancer 42
6.1.12 Breast cancer 42
6.1.13 Small intestine 43
6.1.14 Prostate 43
6.1.15 Esophagus 43

7. Chapter 44
7.1 Cosmetology 44
7.1.1 Combination of olive oil with substances 44
7.1.2 CREAMS 45
7.1.3 EMULSIONS 48
7.1.4 FACE AND BODY SCRUBS 49
7.1.5 SUNSCREENS 50
7.1.6 SOAPS 51

8. CHAPTER QUESTIONNAIRE PART 52
8.1 Questionnaire for the consumption of olive oil 52

9. Conclusion 61

10.References 62

11. LIST OF FIGURES 67

12. LIST OF ABBREVIATIONS 68

ABSTRACT

The diploma thesis explores and shows some effects of olive oil on people's wellbeing, as they have been studied in recent times. It is examined to be a very beneficial food for the organism, and because of its composition, it can give a boost and power to the immune system, especially to people with a very weak immune system. It can also be divided into some specific categories according to the composition, acidity and cultivation of the fruit. Some general characteristics of olives and olive oil will be mentioned. About olives, we will analyze the early procedures such as the cultivation, cooling and flowering, some qualitative characteristics and the variety of olives. The basic categories will be analyzed including Extra Virgin olive oil, Refined olive oil and-so-on, the concentration of each type and what they include, the quality and lastly the way olive oil should be present in the market meaning the standardization, the packaging and the marking. In addition, the chemical composition of olive oil will be mentioned such as phospholipids, hydrocarbons, carotenoids, chlorophylls, vitamins, tocopherols, sterols triterpenoid alkaloids and phenols. Also, it contains some antioxidants like flavonoids, carotenoids, natural and synthetic antioxidants. The role of antioxidants will also get attention, due to their significant importance. It is established that olive oil has beneficial outcomes in our organism and prevents it from countless disorders. Diseases including diabetes, rheumatoid arthritis, cancer, cardiovascular system illness and metabolic syndrome will be analyzed in more detail. In the experimental part comes of a questionnaire, 50 people were called to participate and to describe how as the consumers deal with the presence of olive oil in their lives and their believes about its importance, the cost, the type of olive oil they choose, and many more details.

ABSTRAKT

Tato diplomová práce zkoumá a ukazuje některé účinky olivového oleje na zdraví lidí, tak jak byly v poslední době studovány. Olivový olej se ukazuje jako potravina velmi prospěšná pro organismus, svým složením dokáže zvýšit činnost imunitního systému, zejména u lidí s velmi slabým imunitním systémem. Může být také rozdělen do některých specifických kategorií, a to podle složení, kyselosti a pěstování ovoce. Jsou zmíněny některé obecné charakteristiky oliv a olivového oleje. U oliv budeme analyzovat postupy, jako je pěstování, chlazení a kvetení, některé kvalitativní vlastnosti a jejich rozmanitost. Budou analyzovány základní druhy včetně extra panenského olivového oleje, rafinovaného olivového oleje atd., koncentrace každého druhu a co obsahují, kvalita a konečně způsob, jakým by měl být olivový olej na trhu zastoupen, což znamená standardizaci, balení a označení. Kromě toho bude uvedeno chemické složení olivového oleje, látky jako jsou fosfolipidy, uhlovodíky, karotenoidy, chlorofyly, vitamíny, tokoferoly, steroly, triterpenoidní alkaloidy a fenoly. Dále obsah některých antioxidantů, jako jsou flavonoidy, karotenoidy, přírodní a syntetické antioxidanty. Pro svůj význam bude zvýšená pozornost věnována také roli antioxidantů. Je prokázáno, že olivový olej má blahodárné účinky na náš organismus a je prevencí nesčetných nemocí. Podrobněji budou rozebrána onemocnění včetně diabetu, revmatoidní artritidy, rakoviny, onemocnění kardiovaskulárního systému a metabolického syndromu. V experimentální části bylo formou dotazníku vyzváno 50 lidí, aby popsali, jak jako spotřebitelé využívají olivový olej ve svém životě, jaké je jejich přesvědčení o jeho důležitosti, o ceně a typu olivového oleje, který si vybírají, a mnoho dalších podrobností.

1. INTRODUCTION

At the beginning of 1950, big research was started, known as the research of the 7 countries, where the nutritional habits of people from different countries were contemplated. These countries included Greece, Japan, the USA, Italy, Holland, Finland and Yugoslavia. This study lasted for thirty years and the results were impressive because Cretan people seemed to have less percentage of mortality from disorders such as cardiac disorders and cancer. They also had the highest average value of life in comparison to other countries.

The Mediterranean diet is considered to be from the worldwide union the healthiest model of diet in the past decades. The consumption of a diet that is based on the template of the Mediterranean diet has been confirmed that be linked with less danger for the appearance of some diseases which are dangerous for life.

The basic ingredient of the Mediterranean diet is olive oil, whose nutritional value is truly dominant. Olive oil donated for many centuries the health and long-life to the people who lived in the Mediterranean and they used it as their basic component for many years. Its nutritional and biological value for the organism is very important, and that is the reason why it is included in the list of the 10 most beneficial foods in the world.

Many scientific studies have confirmed that olive oil is utilized for the prevention of many infections equally to cardiovascular diseases, as they protect the cardiac system as much as possible; it reduces the danger for the presence of cancer and helps in the metabolism of glucose in diabetic people.

Its beneficial action is owed to the components which include antioxidants as they work in combination and they reduce the dangerous action of free radicals, boosting the immune system and helping the heart and the vessels.

2. AIM OF THE DIPLOMA THESIS

Just because olive oil is considered to be a “nutritional drug”, it would be a good idea to know its specific properties and to conclude it in our diet. The main aim of this project is the presentation of the data and knowledge regarding olive oil and its therapeutic indications from valid sources, research and scientific articles and books.

On a questionnaire, 50 people were called to participate to realize and to observe how the consumers deal with the presence of olive oil in their lives and their beliefs about its importance, the cost, the type of olive oil they choose and many more details.

2. CHAPTER

2.1 "Olive oil in ancient Greece"

2.1.1 Mythology

'Athena's Moria Elia'

In accordance with the past, Poseidon -God of the ocean- and Athena -Goddess of piece and intelligence- impugned the title that was supposed to be given to the town that has been constricted to the ground of Attica. Zeus decided that the town would take the name from one of these two Gods, according to which one of them gives the dearest gifts to the citizens.

The first one who tried was Poseidon, who stroked his trident on the ground and a huge wave of salt water jumped out from the ground. Athena took place after stroked her lance on the ground and converted it into an olive tree which was nutrient, therapeutic for wounds and cold and never died. It was decided that the olive oil was way more important to the citizens, so the town took the name Athens, in the owner of Athena. Athenas' olive tree, which was the first tractable tree in Athens and the world, was called "Moria Elia".

Figure 1: Athena under the olive tree (1') https://line.17qq.com/articles/hogcddpov_p5.htm

- The first Olympic games wild tree wealth

Hercules was the first person to transfer a wild olive tree from Crete and plant it in Olympus. One day he invited his brothers on a race in Olympus and he awarded the winner with a wreath made from olive branches that there was plant there. This race was established as the first race in the world and in the Olympic Games, the winners were awarded branches of the olive trees.

Figure 2: Greek olive wreath indicating the winner of the race. (2')
https://m.naftemporiki.gr/story/1517540

- Aristaios, the protector of olive growing

Hermes took Aristaios to Gaia and trusted his nurture to "Ores". He was taught many simple things from the Muses that were unknown to the people back in those days. Divination and Medicine were taught, and he also became an expert in the removal of epidemics. Muses were able to teach him the cultivation of vineyard, the art of olive oil production. Aristaios transmitted all his knowledge to Greece and the rest of the world. In Sicily, people named him as the God of agriculture and protector of olive growers.

- Other examples

A very critical point in Mythology was the death of Ektoras from Achilles in the war of Troy. When Ektoras died, Aphrodite coated his dead body with the olive oil scented with pomegranate.

When Zeus found out that his son Sarpidonas was dead, he ordered Apollonius to take care of the dead body of his son with oil. Comparing it to nowadays, everyday life is related to myth, olive oil is connected to life and death and the ideology of olives captures the hearts of the population. (1)

2.1.2 History of Olives

The history of olives begins from the depths of the century, even way before humans discovered the benefits of social life and organized societies. A native plant of the Mediterranean is one of the most ancient cultivation that bloomed in the world, even before the scripture was discovered. Archeological researchers have discovered fossil olive oil in the Greek land with the impressive number of 50.000-60.000 years old.

There are two sides of the History reflecting the origin. The first one indicates that the origin came from Asia, Syria, and Palestine. On the other hand, the second one indicates that the origin comes from Africa or Egypt. The first written testimonies for the cultivation of the olive tree, are coming from Elvas from North Syria, where some plates were discovered from 3.000 BC and they are talking about the great production of olive oil in the area. Proportionate information is known for the existence of olive trees in Palestine from 2.000 BC.

Many antiquarians have talked about it. A De Candolle was one of them and he has mentioned on this research that the olive tree was known from 4.000 BC. The tree came from Syria and Asia and his research was based on the presence of native vegetation of feral olive trees and in the literature of the ancient authors. Some of the authors believed that the origin of olive tree and the base of the diffusion is Africa, with Egypt to conquer the leading role. From there, it was transferred to Crete due close relationships that were held between the inhabitants. Then it was cultivated in Crete and after it passed though Cyprus, Morocco and Algeria.

Some research findings advocated that the homeland of olive tree is Crete. This assumption was supported by the fact that the name of the olive is Greek, and it mounted through the other languages. More recent research in Cyclades revealed some fossilized leaves of an olive tree that comes from 60.000 years ago. According to many authors and researchers, Cretans were the first people to cultivate a tamed variety of olive trees. In Crete belongs the price that wild olive tree was converted to a tamed one. Greek citizens spread the cultivation of olive trees to the rest of the Mediterranean countries and from there Spanish and Portuguese ships arrived in America. The cultivation started in the 16th century in Mexico, Peru and Argentina. Meanwhile, at the end of the 18th century, it was also spread to California. In more recent years it started to grow in different locations of the world and with evidence appeared in Japan, Korea and India. (2)

2.1.3 Olive tree and Ancient Greece

Civilization, ancient Greece, olive tree and olive oil go together, as olive tree is naturally related to the history of Greece. Excavation in Pylos, Mycenae and Knossos showed that the monuments of Linear B are showing us much information about the use of olive oil during this time. Also, we receive information about the pot in which the olive oil was transferred. The front runner of cultivation was held by Minoan Crete. Excavations on Crete brought up Pithos, a big container for the storage of olive oil, certificating in this way that the power of Minoan kings was also coming from the export of olive oil. Many Greek philosophers studied the quality of olive oil. Later on, some laws regarding the protection of Olive treeσ were enacted, forbidden at the same time the clear outing big amounts of trees in Athens.

In everyday life, religion, commercial transaction, textiles and perfumery in all of these branches' olive has a huge impact. On Medicine, it was known for its therapeutic and salutary properties and very well-known doctors such as Galinos was using it for the therapy of these patients. (3)

3. CHAPTER

3.1.1 Olives

3.1.1.1 Olive tree

Olive, the most famous appetizer of the traditional cuisine of the Mediterranean constitutes the fruit of the olive tree (Olea). Olea in the Latin language means oil; therefore the name of olive reflects the fact that it is rich in fat, of which 75% is oleic acid, a monosaturated fatty acid that can minimize the number of sterols in the organism. Olive is thriving in a temperate climate without abnormal moisture and that is the reason why the olive tree was first appeared in the Mediterranean Basin, in states such as Greece, Italy and Spain. It is a tree whose leaves are dark green on the upper side and dark green on the lower side. When olives blossom, they have white colour and they appear towards the ending of May, meanwhile the olive crop is matured and selected from the ending of autumn until the beginning of winter. Olives cannot be consumed right after their collection from the tree. Firstly, a specific and necessary procedure needs to be made to reduce their bitter taste, due to a substance called oleuropein which exists on the peel of olive. These methods vary according to the type of olive, the cultivation area, and the final organoleptic characteristics. A few olives are collected when they are green and unripe and on the other hand, some others are only collected when they are matured with an intense black dye. The colour of the olive can be affected with different elaborated techniques such as fermentation,

water, and salt. These methods do not only affect the colour but they also affect the texture. (4)

Figure 3: Olive tree (3') https://en.wikipedia.org/wiki/Olive_tree_of_Vouves

3.1.1.2 Cultivation of olive

Instillation of olive grove and selection of area

The planting of olives shall not be happening in places where the degrees fall under -5oC. The damage of trees is very severe and is due to winter and spring frost. A safe criteria for a suitable area, is the existence of the olive trees where at a minimum of two decades have not been damaged by frost. The varieties which have better resistance to warm temperatures should be preferred for olive groves which exist at high altitudes. Olives also get damaged when they are exposed to dry air, during the period of blossom and fruiting. Additionally, in closed and non- ventilated areas with high atmospheric moisture, some illnesses such as cyclones are favoured. Another evidence for the correct choice of an area is the effortless discovery of workers for the collection, together with the management of factories for the processing of olives. The height of the rainfall should also make allowances for the preference of the location. So, in the areas with low rainfall, the output of olives is sufficient only in the ground with good restraint of water. In the areas with the big amount of rainfalls, the output is sufficient in almost all types of grounds, with the condition that the good drainage of the ground is ensured, because olives are too sensitive to the ground with an excess of moisture. (5)

3.1.1.3 Exploitation system

According to the exploitation system that is used, the density of planting is applied. For intensive exploitation into deep fertile territory, there is dense planting. According to the variety, the density of planting is usually between 20-30 plants/acre. In poor and

shallow terrains with low rainfall, the density of planting is reduced. Generally, there are two ways of planting:

1) Traditional way: The distance between planting is 7x7, 6x8, 8x8 and there are less than 200 plants/acre
2) Dynamic way: The distance between planting is denser like 5x6 or 6x6 and there are 270-300 plants/acre

3.1.1.4 Preparation of field

Before planting many cultivation processes are taking place such as extortion, removal of stones and razing. If the field is originated by extortion before planting, it would be a good choice if the field will be cultivated with annual plants so that the removal of the routes will be possible. If there are insects especially in the summer period, then the field should be medicated in a correct way before planting. After all of these processes, one of the main that is coming next is plowing and it needs to happen so the development of the routing system will be in higher depth. After the last plowing, the integration of phosphoric and potassium fertilizers are happening and it is a really crucial step because these type of fertilizers will help the growth of the tree for the first years of its cultivation. (6)

3.1.1.5 Planting of new trees

The planting of new trees is coming to life during November- December in mild areas and colder areas in February-March. One very important note is that for the planting we need to be sure that there is no frost and that very careful extortion has happened. The planting happens in pits and the depth of them has to be the same as the depth of the nursery it existed before. In dry areas, the depth of the pit has to be 5-10cm long. After planting, the soil is compressed and watered so there will be a good connection between the route and the ground and the pit is covered with a sufficient amount of soil that is needed. It would also be very beneficial if the surface of the pit will be covered with glumes, in order to protect the water from evaporation. The newly planted trees should be watered very often in the first 2-3 years of the cultivation and should be lubricated with Nitrogen fertilizer.

3.1.1.6 Oiling of new olive grove

Before the installation of the new olive grove, the terrain needs to be analyzed and sampled. According to the results of the analysis, there should be phosphorous and potassium lubrication in all the areas of the cultivation. Also, the results will show if the terrain also needs calcium lubrication as extra. (7)

3.1.1.7 Pruning

The pruning of the olive trees is a really important process that is intended for the adjustment of the development of blooming of the trees in the soil-climatic conditions of the area and in the cultivation pursuits, especially in the cultivation of the harvest which is the most common problem of the cultivation these days.

The target of pruning is:

1) The balance between the fruiting and vegetation
2) Minimization of nonproductive period
3) Period prolongation of the stable output of the plant
4) Avoidance of premature decline of the tree
5) Achievement of economic benefit
6) Saving of moisture

The time and intensity of pruning have to do with many conditions and evidence such as:

1) The volume of rainfall during winter and autumn
2) The volume of yield in an annual year
3) The density of planting and the type of pruning

The correct season for pruning can be right after the harvest of the fruit. So, in the varieties of olives can start in November-December if the colour of them was green when they were collected or in February- March if the olive were collected in black colour. Generally, pruning can happen during all periods from autumn until the initial months of spring but it ought to be restricted to the zones where there are many frosts during the winter period. (8)

Figure 4: Pruning of olive tree (4') https://all-about-change.com/projects

3.1.1.8 Cooling and Flowering

Blooming states one of the most crucial attributes in olive, even if there is a sufficient number of flower manufactures, the ones which contain fruits are only at 2%. Blooming takes place, when sprouts persuade the earlier season, obtain adequate chilling, throughout the winter pause to the end of this dormancy. The collection of chilling demands for flourishing across winter dormancy is referred as vernalization and raised climate in winter is not beneficial for chilling. The consequence of this is that there is not enough blooming and after that of course fruiting is lacking, because of inadequate temperature. (9)

In the next Figure, we can observe the differentiation of olive cultivation between the Mediterranean countries and Argentina. In this place, it has been noticed that warm conditions during the winter and spring period guide to primitive flourishing and olive agglomeration of olive oil compared to Mediterranean countries. Furthermore, it has been noticed that cultivation bared to poor chilling and great temperature can bloom, but the result is not beneficial because of the bad quality of the crop. (10)

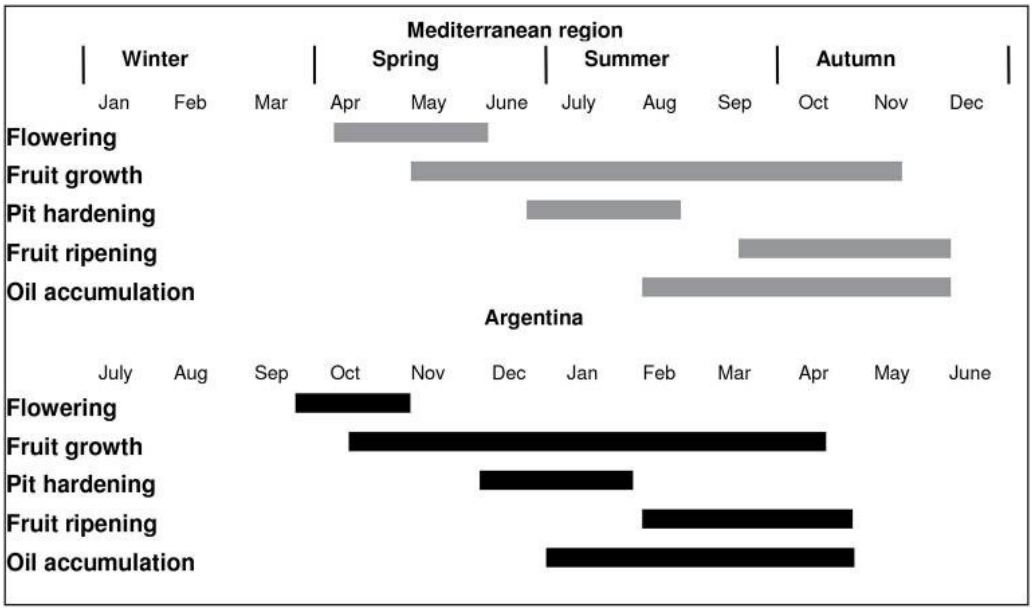

Figure 5: The consecutive cohesion of the leading levels of cultivation in European countries and Argentina (5') https://www.oliveoiltimes.com/production/experts-in-italy-offer-advice-for-olive-growers-combating-the-fruit-fly/87072

3.1.1.9 Water requirements and irrigation management

The olive tree contains a very good resistance mechanism especially in dry conditions and it is probably one of the strongest cultivations in fruiting trees. Unfortunately, this resistance is holding against the development and the output of the trees. So, when there is an improvement in moisture conditions, there is significant progress in the production, because this tree utilizes the amount of water on the ground in a very smart way. The problem appears when there is too much moisture on the ground because then the trees do not have durability and they suffer way more than other types of trees. Irrigation should happen in the case of the small number of rainfalls, in rainfalls which are concentrated in winter period resulting to no sufficient water in summer and spring periods and when the ground is sandy, and it cannot accept amounts of water.

Shrinking fruits gain plasmolysis right after watering or from rainfall. That's why in many varieties irrigation is suggested during the last period for the raise of weight in improvement in the quality of fruit. But this has to be done with caution if the fruit is used matured (black olives), because there might be a delay in the growth. Late irrigations can also be very helpful to the plants which are very sensitive due to the winter frost. Many olive groves in the Mediterranean are not irrigated because they don't need to. (11)

The frequency of irrigation is determined accordingly by the availability of water in order that there should exist adequacy of moisture on the ground in the most crucial periods of the cultivation. The quantity of water during irrigation varies according to the type of ground and the size of the trees. As it was mentioned before the olive trees are very sensitive to excess amounts of water and moisture. This type of ground does not allow the correct ventilation and the result is that the routes suffocate and lead to death. The trees that are cultivated in saturated with moisture terrains are more likely to be sensitive to different climate changes and in illnesses.

Olive has been raised under natural rain conditions in the Mediterranean, without any additional irrigation. A great amount of oil production could be reached without flooding in the places where natural rain is exceeding 600mm. Various studies have shown that the watering requirements of the olive trees raised in the Mediterranean juncture are established on the susceptibility of the major olive scientific phases to water shortage. The researches have mostly concentrated on appreciative irrigation requirements under very warm and dry summer status when rain does not exist and prevue awareness, indispensable for the appliance of the irrigation tactics under many mercantile extending circumstances. (12)

In states such as Spain, Greece and Italy watering is interrupted during the winter period because natural rain is more than enough for crops to grow and for evapotranspiration (Etc) under chilling and steaming status. The wetness of the ground

saved during winter might exclude the irrigation during the spring period as this happens in many European countries. On the other hand, a country such as Australia is exactly the opposite, because rain exists in the summer period and in the winter period it is almost absent. As a result, we figured out, those countries with higher temperature climates in winter, have greater Etc.

Pierantozzis study deals with the shortage of irrigation and it is most likely described during the dearth period. When the impact of water accessibility was divided into numerous phases, water shortage in the course of winter did not influence blooming specifications, but the shortening of water throughout the growing period decreased an important number of flowering characteristics and evolution. In this way, it seems that short duration and bland water shortage during an inactive period of winter will not offend generative reaction, but increased deficit form late autumn until midst spring comprehend winter inactivity flower growing, evolution and production results to harmful results. (13)

3.1.1.10 Lubrication

1) Nitrogenous fertilizers

Ammonium sulfate: It is presented in two types, Crystalline and granular and consists of 23-24% sulfur. It is suitable for calcium- alkaline grounds, in which the reduction of PH in the atmosphere increases the solubility of phosphorus. It is not recommended for an acidic environment.

Ammonium nitrate: It is presented in granular form and contains 33-34.5% nitrogen. It is very soluble and with a small amount of water provides to the plant's nitrogen in the ammonium form. It is not restrained to the ground and the part that is not absorbed by the routes disappears in the waste.

Calcium ammonium nitrate: It is presented in granular form and contains 26-28% nitrogen. It is used an acidic environment and areas with moisture climates.

Urea: It is soluble in water and contains nitrogen in organic form 45-46%. It has an oxygenated effect on the ground and in calcium environments it is appeared that there are intense losses due to the volatilization of ammonia.

2) Potassium fertilizers

Potassium sulfate: It is presented in dust and granular form for application to the ground. It contains mostly 48-50% potassium and 17% sulfur. It has a low index of salinity and it is used to environments which confront salinity problems.

Potassium nitrate: It is presented in granular and crystalline form; it is very soluble and is offered to the application with hydro-lubrication. It contains 46% potassium and 13% Nitrogen. (14)

3.1.1.11 Confrontation of insects

Olives can survive in low fertile grounds with minimum moisture. Unfortunately, many types of insects are customized in the identical circumstances and they extend much quicker than the olive trees, subtracting from the ground water and all the nutritional substances. For that reason, the confrontation of insects should happen four to six weeks prior the spring vegetation of the olive trees. Insects usually are controlled chemically or mechanically. The area between the series of olive trees can also be confronted chemically or mechanically with the process of the plow. Alternatively, natural coverage can be used with vegetative residues or irrigation under the surface.

3.1.1.12 Enemies and illnesses

The most significant enemy of olives is olive fly and it can affect in a great amount the output of olive, which also results in financial loss. Regarding the illnesses, the most common ones are verticillium wilt, cyclone and tuberculosis. (15)

Figure 6: Enemies and insects “attacking” olives (6’)

Sanz-Cortés F., Martínez-Calvo J., Badenes M. L., Bleiholder H., Hack H., Llacer G., et al. (2002). Phenological growth stages of olive trees (*Olea europaea*). *An. Appl. Biol*. 140, 151–157.

3.1.1.13 The process of olive fruit

The process of olive fruit comes down briefly in a few steps:

1st step: Receipt of the fruit. After harvest, olives are transferred to processing units for their elaboration as soon as possible.

2nd step: Washing. In the beginning, olives are placed in the hopper of olive receipt and later on, they are transferred with a conveyer belt to the decolourizer where leaves and other foreign substances have to be removed.

3rd step: Breakage and grinding. In traditional olive mills, the grinding of the olive crop happens with cylindrical millstones. In modern units, metallic mills are used.

4th step: Mollification. It constitutes the basic step of the processing and it contributes to the union of small oil droplets with big oil droplets.

5th step: The receipt of olive oil. The traditional way of receipt of pressure produces olive oil.

6th step: Cleaning of olive oil. The part of olive oil that it will be used has to go through very careful cleaning, so only the clean part of the olive oil will be out to the market.

7th step: The final separation from vegetal liquids happens with the usage of centrifugal oil separators.

The exportation of olive oil differs from country to country. For example, in Spain the usage of biphasic exportation of olive oil goes up to 95%. On the other hand, in Italy and Greece the triphasic method of export is more commonly used. (16)

3.1.1.14 Variety of olive

Some of the most known varieties of olives across Mediterranean countries will be mentioned below.

Green olives from Crete: This specific variety of olives contains green olives which have been broken with a stone and are kept in a glass container with water until their bitter taste disappears and after they are maintained in brine.

Manzanilla: This type is a Spanish type of olives that are green without a core and are matured and placed in brine, salt and lactic acid.

Picholine: French matured green olives, which are preserved in brine salt.

Liguria: Italian black olives, which are matured in brine and have intense flavour. (17)

3.1.1.15 Qualitative characteristics of olives

Size of olive fruit and nucleus

The size of the olive fruit differs according to the diversity of the load of the olive tree, the lubrication and many other cultivation processes. The relation between the weights of flesh towards the weight of the nucleus which has to be as big as possible indicates the availability of fruit for the production of olive.

According to the size of the nucleus, olives are distinguished to micronuclei, mid-nuclei and macronuclei. Micronuclei are the ideal case for the industry because the nuclei need to be removed easily in order the olive to be filled with almond and pepper.

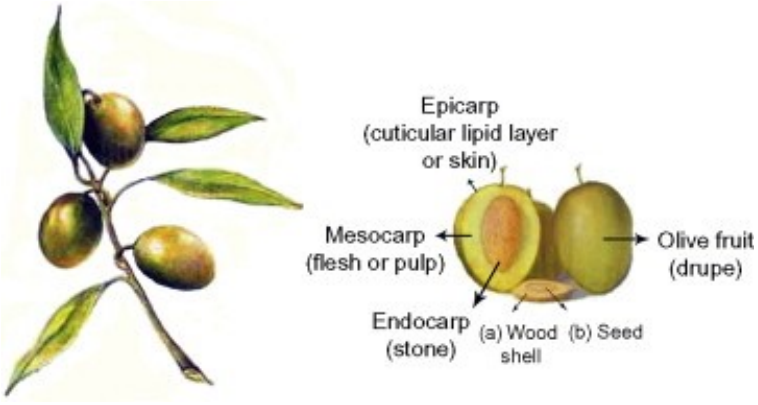

Figure 7: Anatomy of olive (7') https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/olea-europaea

The epidermis of olive fruit

The cuticle of the fruit has to be elastic and thin in order to have resistance to different levels of the process, maintenance and difficult environmental conditions.

Content of olive fruit in sugars and oil

The comprehensiveness of flesh of fruit in fermentable substances is beneficial and ensures successful fermentation. These substances are converted to lactic acid and with the presence of brine salt and the absence of air, they contribute to protection.

The content of olive fruit in oil has to be as low as possible usually fewer than 20%, otherwise many important features of oil are influenced, and the olive fruits are very sensitive to tanning.

Aroma-taste-texture

Excluding the technical black olives, all the other types have a characteristic odour. Regarding the flavour, is due to the salt in flesh, some organic acid and phenol

substances. The bigger the cohesion of the flesh is, the better the quality of the final product. Cohesion is maximized at the first steps of the fruit and then it is reduced. (18)

3.1.1.16 Nutritional value of olive

Olives are classified in the category of fat, just because they have a high content of fat in them. According to their size, 8-10 olives give almost 45 calories, as much as on a spoon of olive oil. Many theories support that olives have the same nutritional value as olive oil; however, they differ in the fact that olive oil contains only fat as its substance and olive contain proteins, water and carbohydrates additionally. In addition, olives contain Vitamin E, potassium, phosphorus, calcium and many antioxidants. The only drawback they have is that they should be kept in brine which is rich in sodium. On average the weight of the olive fruit is 2-12gr, but many other fruits reach 20gr. (19)

Nutritional substances transferred in olive oil

These substances are both polar and non-polar. Their concentration in olive oil gets forced by the variety of olive, the climate change, the level of mature, the manner or receipt of oil and other factors. Lipid soluble substances which exist in olives or are composed during the process of production are, monoacylglycerols, diacylglycerols, triacylglycerols, free fatty acids, squalene, sterols, stearyl esters and a-tocopherol.

Meanwhile, it is very interesting the presentation of the polar substances such as phenols, proteins and phospholipids. These substances are very active, and they can influence the organic worth of olive oil, either they have other properties such as antioxidant action, as a result, to grant to oxidative stability of olive oil, or they can influence the flavour. During the elaboration of olive fruit in olive mill, there is the dissolution of proteins and polysaccharides, which are water-soluble and coexist with phenolics and that contributes to the dissolution of phenolic substances. The consequence of this dissolution is that a large number of phenolic substances which exist on the flesh of the fruit are removed with the waste. (20)

4. CHAPTER

4.1 Olive oil

4.1.1 Definition

Olive oil is characterized as the olive which is received from the fruit of Olea Europea and the elaboration happens with different techniques such as mechanical and physical, resulting always in not harming the final product.

4.1.2 Categories of olive oil

Virgin olive oil

Oils that are received from olive fruit by automatic or natural methods under a heated environment, which do not apply with the alteration of oil and have not to suffer from other processes minus washing, centrifugation and sedimentation.

These types of oils are categorized into the next consecutive classes:

a) Extra Virgin Olive Oil

Virgin olive oil of which the value of organoleptic evaluation is identical to or bigger than 6.5 and the free acidity, uttered as oleic acid, is a maximum of 0.8g/100g

b) Virgin Olive oil

Virgin olive oil of which the value of organoleptic evaluation is identical to or bigger than 5.5 and the free acidity, vocalized as oleic acid, is a maximum of 2g/100g (22)

4.1.3 Refined Olive Oil

Oil which is received from refined olive oil and the free acidity, voiced as oleic acid, is a maximum of 0.3g/100g

Pure Olive oil

Oil originated by the mixture of ROO and EVOO and the free acidity, expressed as oleic acid, is a maximum of 0.1g/100g (21)

4.1.4 Different types of olive oil

Greece is rumored to have one of the best olive oil production areas worldwide. Each of them produces olive oil with specific characteristics such as odour, flavour, smell, which depend on the ground, the diversity of olive and the climatic conditions in the

area. Organoleptic features of olive oil are also influenced by the elevation of olive grove and the sunshine of the area.

Biological olive oil

Originated by cultivations of which the producer comes across the entire possible problem he might face without chemical substances, lubrication and pesticides. Some organizations control regularly the cultivations and the final product.

Biological cultivation of olive

The biological cultivation of olive is based on revitalization methods on the ground of olive grove, on recycling of by-products and other available organic substances and on reproduction and protection of the environment. It is a method of olive oil production, which has set a goal of a production of the product in significant quality.

The biological cultivation of olives and the process of olive fruit are accomplished by the following conditions:

- No usage of agrochemicals
- No usage of chemicals during transmutation
- Elition of olive oil is accomplished with cold water as a means to save the character of nutritional outcomes and vitamins
- Usage of manure and lubrication
- Mild methods for plant protection
- The collection of olive happens manually

Before the creation of a new olive grove of biological production, it is important for the climate and ground conditions to be studied. It is also really crucial the location for the installation not to be influenced by conventional olive groves. Also, if it is possible the plantation should be isolated in a high physical windbreaker so that it will not be affected by spraying. The main goal of biological cultivation is the manufacture of extra virgin olive oil, with elevated quality of chemical as well as organoleptic substances. Before harvest, the grove should not be in contact with the ground and it must be transferred to the olive mill as soon as possible. Elision needs to be done without any delay and in the case, the olive mill is not used just for the manufacture of biological olive oil, and then it needs to be cleaned very carefully before the beginning of the process and elaboration. It is a way better solution that the elision of olive fruit to happen on specialized biological olive mills. (22)

Unheated olive oil

It is produced by the elision of olive with the usage of low-temperature mollification.

Green olive oil

It is originated from unripe green olives, which are collected at the beginning of October and produced with the method of cold elision. It has very low acidity and is used for many foods in everyday life.

Scented olive oil

Oils that are mainly used for pharmaceutical reasons are produced by several very simple techniques, and they can be used by anyone and they also have ant oxidative properties. (23)

4.1.5 Oil concentration and composition

The force of oil deposition is examined to have σ-type of the calibration curve, independent of quality, even though the proportion and continuation of the olive oil composition area may be different for the quality of state in consonance with the topical environmental situation. The σ-type curve contains a mild growth in oil concentration in fruit development, continuous with a prolonged linear area of concentration raise and ends with a reduction of this centralization towards the end of the season. (24)

The quantity of olive oil collected seems to be influenced by increased heat. According to some studies using elements from different verities, settings and places with warm land such as Argentina, it was discovered by specialists that the terminal oil concentration, is reduced over the distance of 23°-27°C. In comparison to some other countries such as Italy or Greece, the utility of the concentration of olive oil has been higher. A significant approximation to immediately appreciate oil concentrations replies to great temperature has been performed by warming or cooling some branches of the fruit in the diaphanous room under field situation. Continuing a four-month therapy, the research came to a result that there is a weak linear connection between oil concentration and the midst rate temperature in oil synthesis area, coming to a result that there is a reduction of 1.1% per °C beyond the examined temperatures (16–32°C) (25)

Concerning the composition of olive oil, important verification demonstrates that European olive varieties cultivated in various places including America or Africa, construct oils with non-identical fatty acid compositions, in comparison with the ones gained from identical cultivars in the raised areas. Genetic constitution is assumed to be the main origin of changeability for Virgin olive oil fatty acid configuration, but we should take into consideration that there might be some interconnection between the environment and genetics. Plenty varieties of Spain and Italy demonstrate the low volume of oleic acid and greater amounts of linoleic and palmitic acid when cultivated

and differentiated in a country such as Argentina rather than in the Mediterranean Basin.(26)

In addition, there also had to be some researches about the relationship of the composition of oil fatty acid and the temperature. The same procedure as before was followed; some branches were surrounded in a transparent room for four months and in the conditions of the field. It was shown that fruits are grown less than 5 or 10°C warmer than the original temperature 20.6 °C generated oils with lower oleic acid substance. According to some measurements of this experiment, the amount of oleic concentration was decreased 0.7% per °C, compared to palmitic, linoleic and linolenic acid amounts increased with greater temperature. (27)

4.1.6 Standardization- Packaging- Marking

1) Standardization

The main factor for the security of the consumers for the authenticity and the quality of the product is definitely the standardization of olive oil. Extra Virgin Olive oil (EVOO) is a very unaffected product that is received from the olive mill without any changes and differentiations. Also, each type of olive oil should fill out some standards before it goes out to the market. These decisions are taken by Joint Ministerial Decisions (JMD) and the orders of this commission are applied to the direct sales of all the types of olive oils from the producers to the final consumers. The noted and standardized types of olive oils are strictly controlled by a qualified carrier. These controls constitute the safety and guarantee the clarity of the final product.

Expiration data and all the data of the standardizer should be listed during the standardization process. The packages which have to be used play a crucial role and they have to be very well protected for the better and safer environment of the product. The expiration date of the olive oil usually ranges between twelve and eighteen months and during this time all the ingredients and the composition of the olive oil stay unaltered. In addition, the way of storage has a significant impact, so the olive oil can keep its basic characteristics such as odour, colour and flavour. (28)

2) Packaging

Packaging constitutes an important role in the maintenance, trending and disposal of the products. With the primary packaging olive oil protects its qualitative characteristics such as colour, structure, flavour and other properties. The secondary packaging, a paper box or a plastic tender of one use is way more important because it has to protect the primary packaging, the storage of the product with a controlled temperature and the transport of the product to the shelf of the market, where finally the consumers will have the chance to see them and select them. All the types of olive

oils are presented to the final consumers pre-packaged and the final ones will be up to 5 litres. The collections are very well provided with a special space arrangement, which is demolished following the earliest apply. Packages up to 5 litres can be used in restaurants or bakeries, but in the case of industry-level, it can be more than 5 litres. (29)

Figure 8: Primary and Secondary Packaging of olive oil (8') https://pakfactory.com/olive-oil-packaging-boxes.html

3)Marking

The marking of olive oil on the level of retail trade should be indelible and articulate and it should contain a series of obligatory and optional indications. For example, on the packaging it should be written:

Obligatory indications: The type of olive oil, clear amount of olive oil in ml (volume), The name or the brand name of the product and the address of the manufacturer, expiration date and the specific conditions for the storage of the product.

Optional indications: Conditions of the production of the olive oil, some characteristics such as flavour, odour etc, acidity, brand name and the origin of the product. (30)

4.1.7 The quality of olive oil

The quality of olive oil is importantly influenced by many exogenous factors and it should be protected in any way possible. Some of the basic factors which affect olive oil are:

Acidity: It is the most crucial factor of quality evaluation of olive oil and it is the one that defines its commercial importance. The rate of acidity indicates the content of the product in oleic acid. The way of harvest and storage can affect in an important amount the final acidity of the olive oil. The acidity of the olive oil is owed to the existence of free fatty acids and when they are increased the give olive oil an unpleasant taste and odour.

Odour and Flavour: These characteristics of olive oil can verify much evidence about its quality. The pleasant taste and odour suggest specific features which may be owed to the area olives were cultivated or the way of the cultivation. The bitter taste is a result that the crop was collected before it gets matured. (31)

Clarity and colour: Olive oil which is originated from a mature crop has increased clarity, unlike the olive oil which is originated from a premature crop. Regarding colour, usually, it verifies from dark green to light green.

Oxidation: Oxidation is a natural alteration, which happens when the physical products come in contact with the oxygen. Oxidation destroys the flavour and odour of the product and the combination of light and oxygen are the main reasons for this consequence. Other factors which help to this result are the storage and the way of the harvest of the product and with all of these changes, it is natural that the grade of the olive oil will be decreased.

Other factors for the resolution of the classification of olive oil include:

From binding, up to the collection of the crop, to the condition of trees the climate changes and the attack of some illnesses. During the collection and the process of the crop, the quality gets influenced by the way of transport and collection. (32)

5. CHAPTER

5.1 Chemical composition of olive oil

Olive oil is mainly a mixture of triglycerides, namely triesters of glycerol with fatty acids. Some of the fatty acids are saturated and some others are unsaturated. Apart from triglycerides, olive oil holds a small number of other ingredients, which are coming from olive fruit including:

- Free fatty acids
- Phospholipids
- Sterols
- Aliphatic alcohols
- Phenols
- Tocopherols
- Pigments
- Volatile organic components

The synthetic arrangement of olive oil has resulted as an object of numerous scientific researches. It constitutes from saponifiable (99-99. 5%), as well as from other unsaponifiable substances, which are known as minor components (0.5-1%), which contribute to its stability and its sappiness. Saponifiable contain substances such as triglycerides, free fatty acids and phosphatides and unsaponifiable contain substances such as hydrocarbons and fatty alcohols. The composition of olive oil can be used for the appreciation of its authenticity. (33)

Chemical composition in fatty acids

The chemical composition of olive oil in fatty acids is not stable. Elements in particular:

- The diversity of olive
- The climate changes of the location
- The grade of full growth of olive fruit and other factors, influence the constitution.

The most important fatty acids of olive oil are unsaturated. Between them, the one with the highest amount is monounsaturated elaic (C 18:1). The second most important unsaturated fatty acid is linoleic (C 18:2). Other unsaturated fatty acids which exist in smaller amounts are linolenic (C 18:3), and arachidonic (C 20:4). From the saturated acids, the ones that exist in the highest amount are palmitic (C 16:0) and stearic (C 18:0).

The main glycerides of olive oil are the ones that exist in oleic acid, as they represent 70-80% of the total weight of olive oil. These triglycerides stay in a liquid state in the temperature room, so the final olive oil also stays in a liquid state.

According to the structure of olive oil in fatty acids, scientists resulted in two types of olive oils. The first one includes olive oils with low content in linoleic and palmitic and high in elaic acid and the second one includes a high content of linoleic and palmitic and low content in elaic acid.

The environment has a major role in the final composition of olive oil in fatty acids. Factors such as harvest, variety, and origin influence the synthesis of the main fatty

acids of olive oil in different ways. Temperature seems to be a catalytic factor for the unsaturated character of fatty acids of olive oil, which increases with the reduction of the temperature and the rise of elevation. (34)

5.1.1 Phospholipids

They constitute a small ratio of the components of olive oil and the information that exists regarding the chemical composition and the concentration in virgin olive oil is not enough. The differences in the results of some researches mostly have to deal with the analytical method which has been used. The main phospholipids which have been observed from TLC chromatography are phosphatidylcholine, phosphatidylethylamine, phospatidylinositol and phosphatidylserine. With the use of liquid chromatography, phosphatidylglycerol was the main phospholipid that was found.

Generally, it can be noticed that there is not much evidence for the nature and the character of phospholipids in olive oil and their concentration as well. When they exist in a sufficient concentration, they can contribute to the rise of stability of the olive oil. More specifically, phospholipids act as secondary antioxidants because they disrupt hydroxyl peroxides and they form complexes with preoxidant metals. It has been found that they have a synergistic effect with tocopherols and they work as blocking agents in the surface of olive oil.

Years later, it was found that the concentration of phospholipids in olive oil is between 35-40mg/kg. The biggest quantity of these phospholipids is coming from the nucleus of the olive fruit. The phospholipids which exist in olive oil are lecithin and cephalin. (35)

Basic classes of unsaponifiable components of olive oil

5.1.2 Hydrocarbons

In olive oil, one part of the hydrocarbons which exist is saturated and the other part is unsaturated. These are byproducts of the biosynthesis of fatty acids.

The two basic hydrocarbons which are necessary to exist in olive oil are squalene and β-carotene. Squalene is the basic unsaponified component of extra virgin olive oil and is at the level of 450mg/100g. With a high consumption of EVOO, the reception can reach 200-400g/day, a phenomenon very well known in the Mediterranean countries. It is known as a component with high biological value due to its prophylactic action. Another component such as β-carotene exists in a very small amount such as 0.36mg/100g.

5.1.3 Carotenoids

Carotenoids that exist in olive oil are the main reason for its yellow output. Lutein, which exists in xanthophylls, is the basic carotenoid in olive oil. Some other important carotenoids are carotenoids (α, β, γ), and the one with the highest concentration in olive oil is β-carotenoid with 85%, and α-carotenoid follows with 15%. The main concentration of lutein and carotenoids in the olive oil is 0.085-0.496 mg/100gr. (36)

5.1.4 Chlorophylls

Olive oil contains pigments such as chlorophylls a and b. Chlorophyll a has a cyan-green colour and chlorophyll b has a yellow-green colour, and these are the substances that give the characteristic green colour in the olive oil. On the other hand, chlorophylls are also the main reason for the degradation of its quality especially when there is contact with light.

The total amount of chlorophylls in olive oil can be from 1 to 10mg/kg. With the progress of maturity of the olive fruit and with the timing of storage of the olive oil, there is a reduction of the content of chlorophylls.

5.1.5 Vitamins

Vitamins are very important components, in small amounts, for the development and the growth of the organism. The inadequate amount of vitamins in the organism can lead to many diseases. Vitamin E and Vitamin A are the ones that are present in a small portion of olive oil and they help for the more beneficial effect of olive oil.

5.1.6 Tocopherols

Tocopherols, which are very well known as Vitamin E, are components with high antioxidant action and their concentration in olive oil is ranged between 60-370 mg/kg. The content of tocopherols in Greek olive oil is ranged between 90-370 mg/kg. Mainly in the olive oil, α-tocopherol contains 90% of all the components, β-tocopherol is 10 mg/kg, γ-tocopherol is 20mg/kg and δ-tocopherol is 10mg/kg. (37)

5.1.7 Sterols

Sterols are cyclic alcohols with high molecular weight. They exist in all-natural fat forms; they are soluble in lipids and oils and insoluble in water. Sterols are important fatty acids that have to deal with the quality of olive oil. The types of sterols which exist in the olive oil are four:

1) Common sterols
2) 4^{α}-methylsterols
3) Triterpenoid alcohols
4) Triterpenoid dialcohols

The concentration of sterols in olive oil is between 1000-2000 mg/kg. A specific type of sterol, β- sitosterol contains 75-90% of the total ratio. Specific sterol such as 5-avenasterol is one of the main reasons, olive oil keeps its antioxidative actions and can resist to high temperatures. Percentage of 10-40% of sterols exists in olive oil in the form of esters with fatty acids.

5.1.8 Triterpenic acids

These acids are related to the oxidative stability of olive oil. They exist in high amounts in leaves rather than olive fruit. Hydroxypentacyclic tritepenic acids are important components of olive and they are biologically active. The acids, oleanolic and maslinic are the major triterpenic acids that exist in the olive oil, as they are components of the cortex of the olive, which are transferred to the final product. (38)

5.1.9 Phenols

In the last decades, it has been imputed from the researchers the meaning of the presence of natural antioxidants in natural products. This is due to the correlation of some chronic diseases, the action of reactive oxygen and nitrogen species, oxidative stress and the attenuation of free radicals. The meaning reactive oxygen species is used generally for the next chemical compounds, radicals and ions such as superoxide radical (O2-), oxygen peroxide (H2O2), hydroxylic radical (-OH), alkoxy radicals (RO-) and the radical (NO-). These drastic forms offend biomolecules and affect mechanisms that are involved in many diseases or mechanisms which are important for gene expression. The involution of these mechanisms in the pathology of many diseases and in the protection against infections became the reason that antioxidants and nutritional products have a beneficial effect on humans' health. The density in polar phenols has been recommended to be used as criteria for the quality of the olive oil. The most common method of determination of total polar phenols is the chromatographic method.

According to the variety of the olive, the climate conditions and many other factors, the concentration of polar phenols is ranged between 50-1000 mg/kg of olive oil, but the majority of olive oils contain 100-300 mg/kg. When the concentration is more than 300 mg/kg, olive oil presents a bitter taste. Nonetheless, high content in polar phenols seems to act as a benefit for the duration of life of olive oil, due to the relationship that exists between the content and the stability in total polar phenols. (39)

Phenolic compounds of Virgin olive oil are classified into the next categories:

1) tyrosol, hydroxytyrosol and their derivatives,
2) 4 hydrocybenzoic acids, 4 hydroxyphenolic acid, 4 hydroxycinnamic acid and their derivatives.
3) Ligands and Flavonoids

From the different phenolic compounds which have been examined for their usage on the stability of olive oil, hydroxytyrosol and caffeine are the ones which seem to be the most potent. (40)

5.1.10 Antioxidants

Many of the substances which have been discovered, either are coming as natural substances, either are added during the production of food, and act as antioxidants, preventing oxidation. Vitamins C and E and β-carotene are playing a crucial role in the protection of the humans' body. There are two categories of antioxidants: The first one is natural and the other one is synthetic.

5.1.11 Synthetic antioxidants

Synthetic antioxidants are phenyl compounds that are used as additives of fats, in order to prevent or slow down their oxidation. The highest concentration of antioxidants in food is 0.02%. Synthetic antioxidants are more active than natural and in this category, several types exist such as:

- Butylated hydroxyanisole (BHA)
- Butylated hydroxytoluene (BHT)
- Butylated hydroxyquinone (BHQ)

There can be a combination of these types for a better and faster result. For example, one combination can be BHA and BHT.

5.1.12 Natural antioxidants

The natural ones are compounds of nutritional origin with antioxidant activity. The result of natural antioxidants depends on the origin of the plants which are coming from and from the way of the delivery. (41)

5.1.13 Flavonoids

Flavonoids are a group of natural benzo-gamma-pyrrone factors, which are responsible for the colour of olive fruit and flower, they are very important for the plants and they constitute an important part of the diet and they are also known as aglycones.

Flavonoids are characterized as high-level antioxidants due to their ability to deactivate free radicals, and they also cause attenuation of oxygen in a simple situation.

5.1.14 Carotenoids

Natural carotenoids are colouring substances that exist in various plants, such as fruits, vegetables and olive oil. They are very important for our health and they are related to the protection from cancer.

Some other antioxidants which were also mentioned before are phenols and tocopherols. (42)

Role of antioxidants

The role of antioxidants is also really important and it should be mentioned because they:

- Protect the cell membranes, by destroying free radicals of oxygen
- Protect the cardiovascular system: They increase the resistance of vessels, they decline the inflammatory factors, they prevent the oxidation of LDL cholesterol, and they play a crucial role in the control of the level of blood pressure.
- Contain anticancer substances: They block the adhesion of dangerous enzymes in tissues and they inactivate substances that are causing damage to healthy tissues.
- Keep the skin elastic and prevent it from early aging, restricting the disruption of collagen.
- Act as ant allergens
- Strengthen the vision (43)

6. CHAPTER

6.1 Effect of olive oil on health

6.1.1 Cardiovascular Diseases

Oxidative stress takes place when the levels of oxidant arrangement and antioxidants are not equal. The result of this process is the disability of the operation of the endothelium, and there is a rise in the volume of LDL cholesterol, which concludes in a high risk of atherosclerosis. One of the biggest sources of passing in Nation is definitely the presence of diseases in the cardiac system. Some examples of these diseases are arterial hypertension, dyslipidemia or a type of inflammation in the body. (44)

The epithelial tissue damage creates modifications in vessels and it does not allow the smooth muscle to grow properly. The consequence of this phenomenon is atherosclerosis, which is also a risk factor for other very serious disorders such as coronary infarction and stroke. It has been reported that many people have added EVOO in their everyday diet because it is a sign of obstruction of cardiovascular problems. Studies have shown their concentration on the decline of inflammatory cytokines such as IL-6 and LDL-cholesterol, and the rise of HDL-cholesterol. The abnormal function of the endothelium is a consequence of the agglomeration of bonding particles, which leads to vascular disabilities. In addition, the utilization of EVOO can be really helpful for the secondary superstition in patients, since it wields power on LDL cholesterol, and expands the concentration of HDL cholesterol, which moderates the development of the disease, and decreases any risk for the appearance of some cardiac diseases. (45)

One of the first steps for the evolution of atherosclerosis is the decomposition of LDL cholesterol, and when oxidation appears it is not identified by the unique receptor that belongs to, directing to vascular abnormalities. Some phenolic substances which are included in EVOO, behave as defensive means in opposition to the corruption of LDL-cholesterol, and the oleic fatty acids have the proportion to decline this process by keeping the cholesterol discharge and so reducing LDL-c. (46)

Oleic acid is also a very important compound that needs to be used for the protection of humans' health. The outcome of oleic acid on the cardiac tissue was remarked in species accepting a high-cholesterol diet and a lipid fountain, exhibiting that the oleic acid meliorated a topical inflammation. This obviously happens because oleic acid declines the concentration of Triglycerides and LDL-c and gives a rise to HDL-c and protects it from oxidation. (47)

The utilization of EVOO also has an action on blood pressure, as both DBP and SBP were reduced. A decline in blood pressure was also very visible in obese people using 25 ml/day of EVOO for almost a year. (48)

For this particular disease, there was an experiment that happened to patients who have been suffered from a heart attack. Almost 600 people were split into the

following categories: The first class goes after a meal rich in linoleic and oleic acid and the second group followed a normal diet. After four years, even if there was not such a huge difference in plasma lipids and lipoproteins, it was noticed that in the group who followed the Mediterranean diet, there was a reduction in mortality of more than 70%. These really important findings show that a resulting strategy for the reduction of cardiac deaths needs to be supported by a very careful and protective diet. (49)

Recently the relationship between the food chain was evaluated. Researchers came across a powerful, positive correlation between coronary heart disease and the consumption of butter, milk, meat and sweets, alongside the utilization of vegetables and olive oil has a negative result on the occasion of Coronary heart disease. (50)

6.1.2 Metabolic Syndrome

Previous researches have appeared that the depletion of elevated phenol of virgin olive oil causes reduction of pre-inflammatory, pre-antioxidant and hyper anticoagulant indicators in comparison with low-density phenols of virgin olive oil, but it remains unclear if the biological results of the fraction of phenol are the ones which influence the transfer level in vivo. (51)

Analysis of gene expression “microarray” happened in mononuclear cells of peripheral blood during the postprandial period. Two types of virgin olive oil with an excessive and small content of phenolic compositions were granted in a number of patients who suffered from metabolic syndrome after a double, randomized, cross-over study. For the elimination of potential effects which are coming from their everyday diet, all the people followed similar low-density fats, rich in carbohydrates diet during the studies. There were determined 98 different expressed genes in comparison to the recruitment of olive oil rich in low-density phenols. Many of these genes are connected to obesity, dyslipidemia and diabetes mellitus 2. Between them, it seems that many genes are involved also in inflammatory actions. (52)

This study has shown that the consumption of Virgin olive oil, which is rich in phenolic compounds, is in the right place to reduce in vivo expression of various pre-inflammatory genes. Also, it was noticed that this result has affection on the reduction of many cardiovascular diseases in many countries of the Mediterranean, where virgin olive oil consists of the major sources of nutritional fat. (53)

6.1.3 Obesity

The Mediterranean diet is linked with a reduced risk of obesity, although many foods rich in olive oil are included. Many investigations have observed that a sufficient

amount of olive oil is not related to an increase in weight in patients suffering from metabolic syndrome, but acts oppositely way, it reduces the body mass. (54)

6.1.4 Maintenance of weight

It has been supported that a diet rich in fats, leads to obesity. This argument is advocated by evidence that refers to the balance of fat in the organism, unlike proteins and carbohydrates, it is not finished by strict metabolic control.

The goal of the study is the comparison of acidity indicators of fats postprandial, after a rich in fats breakfast meal which is rich either in monosaturated fatty acid from extra virgin olive oil or saturated fats by the crème.

In five hours after breakfast with olive oil, there was a significantly bigger percentage of acidic fats from content in carbohydrates postprandial, after breakfast with saturated fats. The thermal effect of a meal was much higher for people with a high body mass index (BMI). (55)

6.1.5 Hyperglycemia

A diet that contains olive polyphenols seems to have a beneficial effect on hyperglycemia. Many trials have been experimented on animals at first and after on humans. For instance, it was observed that a complementary diet with olive oil for four months was related to a 20% amelioration in insulin vulnerability in patients over 40. Last but not least, the small substances of olive oil, also have a crucial part in the reduction of hyperglycemia and many trials have been used to prove it. Substances such as luteonin and apigenin have been used on the diet of patients for an amount of 500mg/day, and the results have been really good for those people, as they decline the sugar blood levels. (56)

6.1.6 Stress

Many types of research defend that a big amount of employees suffer from stress. It is known by many scientists that a physiological plane of stress is natural and beneficial for the organism, but if this condition is taking for years it can act as a disadvantage for the organism of the person. Some consequences of stress include insomnia, loss of appetite or the opposite and fatigue and on important occasions, it can guide to depression. The outcome of stress leads to some alterations in the figure of the person

and this has to do with the degree of cortisol, a very important hormone, in our body. A raise in the excretion of cortisol can lead to tachycardia and high blood pressure. (57)

One way to calculate the level of stress in the body is the functional near-infrared spectroscopy (fNIRS). Also, some studies indicate that fat recess may reduce the production of cortisol. After many thoughts and researches, scientists came to a result that olive oils may be an advantage in this problem, because they belong to lipid groups. For a better result, an examination took place on some students. Scientists wanted to decompose the outcome of oils on stress, so they analyze the elements from the experiments by calculating the blood flow in the brain and hemoglobin and oxyhemoglobin were the basic elements they measured. The absorption of these two is on the rise because of neuronal operation. The outcome of this is that olive oil utilization reduces the quantity of stress in the organism. (58)

6.1.7 Diabetes Mellitus

Diabetes mellitus is a disorder that is characterized by the lifted level of glycemia. The main goal for the cure for diabetic patients is the control of the metabolism, in essence, the achievement of the suitable body weight and this is feasible with the adjustment of a suitable diet. The causality of β-cell operating volume is a needful process for the evaluation of DM2. That means that there should be a reinstatement of β-cells to cure this disease. (59)

This particular nutritional composition of the Mediterranean diet has as a result on the one hand low density of saturated fats and cholesterol, and on the other hand, increased solidity in complex carbohydrates and fibers. The everyday use of olive oil in various quantities implies a high density of the diet in mono-saturated fatty acids, which is between 15-20% of the calories, as a result, the total amount of lipids to be between 25-35% of the whole calories. (60)

The composition of this plan satisfies all the conditions of an adequate diet for diabetic people. The proportion of mono-saturated fatty acids and carbohydrates can be different, according to the metabolic profile and the personal preference, with the differentiation in the quantity of olive oil which is consumed in everyday life. If weight loss and the limitation of calories are necessary, the amount of olive oil can be reduced. (61)

Additionally, some researchers have shown that a diet full of rich olive oil can reduce the risk of atherosclerosis in diabetic patients. In their work scientists investigated the effect of nutritional polyunsaturated fatty acids at postprandial lipoprotein, as at other

factors which influence glucose and the metabolism of lipids, in comparison with the outcome of the monounsaturated lipids.

The scientists concluded that a diet full of elaic acid is much better than a diet full of linoleic acid for the patients suffering from diabetes mellitus 2 and that may decline the risk of atherosclerosis, due to reduction of insulin and glucose level in the blood during fasting as the level of low-density lipoproteins and most importantly postprandial lipoproteins. (62)

6.1.8 Rheumatoid Arthritis

People who agonize from rheumatoid arthritis when they follow the traditional diet, whose one of the basic characteristics is olive oil, present remarkable development regarding the signs of the disease. Swedish doctors concerned for many years with the relationship between diet and rheumatoid arthritis. The doctors submitted 25 patients with rheumatoid arthritis on the Mediterranean diet and the other 25 patients to the ordinary diet. The final examinations have shown that the people who followed the diet rich in fish, olive oil, vegetables and fruits presented an important reduction of the symptoms of the disease and improvement of functionality and vitality. (63)

6.1.9 Olive oil and peptic system

Olive oil and stomach

Charbon-Niers research, concerning the gastric behaviour of olive oil, discovered the existence of some nutritive hierarchy between viable fats and oils, which has a connection with their configuration in fatty acids. Olive oil becomes acceptable from the organism, whose most significant fatty acid is the monosaturated elaic acid.

Some researchers have signalized the beneficial influence of olive oil in perchloride gastritis and gastro-duodenal ulcer. It was noticed that the addition of olive oil in the trial meal of porridge was causing a reduction of secretion of gastric acid, in comparison with the secretion of the pure porridge. Plenty of researchers have imputed this affection on the liberation of enterogastrin, but finally, it was declined as theory. (64)

One of the basic features of olive oil is its protective activity. A scientist reported a rise of alkaline secretions of cells of gastric mucosa in a pyloric cave and in the stomach after the granting of olive oil. It was figured out that during the therapy of 102 patients who suffered from an ulcer, which the replacement of viable fats with olive oil challenged the reduction of alterations in 33% of the cases and the healing of the ulcer in 55% of the cases.

Definitely, the composition for the reception of the olive oil in the cases of perchloride gastritis or gastroduodenal ulcer does not replace its therapeutic confrontation. Additionally, in recent research on normal people who had as a unique source of fat in their diet olive oil, it was not mentioned the basic reduction of basic secretion of gastric acid or the acid which is caused by the pentagastrin. (65)

6.1.10 Olive oil and intestine

One or two spoons of soup of olive oil every morning before breakfast seem to have a significant influence on acute and chronic constipation. It is believed that the mechanism which is related to the production of cholecystokinin has double properties; on one hand, it causes contraction of the gallbladder and on the other hand, it activates the peristaltic movement of the small intestine. (66)

6.1.11 Cancer

People who receive a big amount of olive oil in their diet are in a very good position about preventing their body cells from damage and this damage can lead to cancer. There is evidence that olive oil can diminish oxidative destruction in the inherited information of cells which can lead to the evolution of cancer. (67)

6.1.12 Breast cancer

Technologists have uncovered that oleic acid, the major ingredient of olive oil, reduces the activity of oncogene HER-2/eu which exists in 30% of patients with cancer. In compliance with a recent study in some laboratory tests which happened in cancer cells of breast, it was reported that oleic acid was decreasing gradually the level of a gene which was believed that it was promoted this particular type of cancer. There was a limitation in the action of HER-2/eu, but also improved the effectiveness of anticancer active substance trastuzumab, which contribute to the improvement of the situation of many women suffering from the disease. (68)

This discovery may imply that oleic acid can delay or prevent the resistance in transtuzumab which many patients develop due to high levels of HER-2/eu. Simultaneously, oleic acid upgrades the activity of the drug Herceptin which reduces the action of the oncogene. The mechanism of action between the oncogene and the drug works in a completely different way, but there is good cooperation between them. (69)

6.1.13 Small intestine

The cancer of the small intestine is a very frequent type of cancer and olive oil seems to play a significant role in its improvement. Many views believe that olive oil influences the secretion of bile salt in rats, it has been formulated the case that it can influence the frequency of manifestation of the disease.

A study was conducted on a population from 28 countries all over the world. Nutritional factors were analyzed at a national level and there was a comparison with the differences of cancer for each country. With a simple analysis, a correlation was related between the high incidences of cancer and the low level of vegetables and cereals consumption. Previous works of scientists have shown that the consequence of cancer is less intense in Mediterranean countries due to the low consumption of meat. Practically it can influence the secretion of cholic acid in the small intestine, and in turn, it may affect the metabolism of polyamines in the cells of the small intestine, so that the reduction from the physiological mucosa to cancer will appear. (70)

6.1.14 Prostate

A research team carried out work about the effect of diet on prostate cancer. Age, total recruitment of calories, fats and diets were the key to the solution and the prevention for this type of cancer. It was observed that diet take part in a dominant role in the possibilities of manifestation of prostate cancer. The danger of prostate cancer was reduced as the consumption of carotenoids and leucopein was increased. In conclusion, vegetables, fruits and olive oil which include carotenoids are related to the prevention of prostate cancer in men. (71)

6.1.15 Esophagus

Various studies have taken into account the age, smoking regularity and alcohol consumption of many people and it was observed that there is a high risk of cancer in esophagus to people who were receiving big amounts of soups, meanwhile, the opposite was for the ones who included rice, raw vegetables and fruits. Olive oil was also contributed to the reduction of this danger; meanwhile, the butter was enhancing the risk. Last but not least there is much evidence that raw vegetables and olive oil contribute to a very healthy life as they limit the possibilities of esophagus cancer to the population. (72)

7. CHAPTER

7.1 Cosmetology

In ancient times, olive oil was subsisted as a source of health and beauty. It has nutritious and detergent properties and offers hydration, deep peeling, smoothing and shining. Ω3 and Ω6 fatty acids which are incorporated in olive oil form a thin protective layer that holds the internal moisture of the epidermis stable. Olive oil is also rich in antioxidant sources such as Vitamin E and polyphenols, which act against premature ageing, helping the formation of collagen and elastin.

Olive oil whenever it is alone or in combination with other substances gives epidermis all the important sources to be healthy. In cosmetology, olive oil is combined with other substances such as avocado, jojoba, eggs, honey, yogurt, salt and sugar for the formation of cosmetics and soaps which are helpful for the skin. It can also be used in aromatherapy as a base.

Cosmetics, which include olive oil protect the cells, from oxidation and give strength to the skin. Also, antioxidants, stimulate the cell membrane to have regeneration of the skin.

Cosmetics are all the substances that can be used in human skin, teeth and mouth mucosa to improve hygiene. Cosmetology can also be used in hair and the human face to improve it but also to protect it from hostile factors. (73)

7.1.1 Combination of olive oil with substances

- *Honey:* It is a natural sweet substance that is produced by bees. It is a very popular substance in many beauty products and that is because it is a source full of vitamins and metals. It causes deep hydration in the epidermis and affords excellent healing properties. It acts as an antioxidant and as a shield against bacteria.
- *Beeswax:* It is produced by young working bees and is considered the second most profitable product. It has healing, antiseptic, anti-inflammatory, soothing

and hydrating possessions. It is suitable for all types of skin and can be used in many hair and lip products. It protects the skin from irritation, lets it breathe and helps in the regeneration of cells in the membrane.

- *Eggs:* They are wealthy in proteins and fatty acids and constitute the best base of face and hair masks. They are opulent in vitamins A, C and E, they rebirth the skin and make the hair slicker. They contribute to hair loss.
- *Milk:* The protein milk offers to the skin many hydrating and therapeutic properties. Their hydrating ability is a result of an excellent absorption from the epidermis as of their ability to bind water.
- *Avocado oil:* It is a physical way for the hydration of skin without chemicals. It is used in many beauty products such as creams, conditioners, masks and lotions. Avocado is rich in products that sooth and hydrate skin plus it also contains Vitamin E which helps for the restoration of dry hair.
- *Bananas:* They contain Vitamin B such as B6 and B12 which help the hair to be smooth and they protect the elasticity of hair and set a barrier to scissors.
- *Almond Oil:* It contains many vitamins such as E and K. It is very fluid and does not give the sense of oil when applied to the skin or hair and it is the best lubricant and softener.
- *NaOH:* It is a crystalloid, white compound and very hygroscopic. This element allows the transformation of oils in soap.
- *KOH:* It is used in the production of soft soaps as the first material. It should be used with caution because it can irritate the eyes and skin. (74)

7.1.2 CREAMS

Figure 9: An example of cream after its preparation (9')
https://www.webmd.com/beauty/skin-lightening-products

1) **COLD CREAMS**

From the second century, there are references for the production of creams and more specifically cold creams. They are called this way due to the sense of cold they leave on the epidermis since their spread, due to the evaporation of water they include. The first cream that was produced was by bee wax, olive oil and rose water.

Below will be analyzed a very characteristic moisturizing cream with olive oil and bee wax, which can be used in all types of skin and is very nutritious and hydrating. It is suggested to be spread after the morning facial cleanse. Some of the identities of the ingredients are:

- Olive oil due to its antioxidants compounds and vitamins can make the skin more elastic, smooth and silky.
- Rose-water makes the skin more soft and fresh.
- Bee wax helps in the maintenance of the cream (even three months after its opening in a cool place) and improves its action.

Production

A few days before the production of the cream, you posit 3-4 spoons of olive oil in an implement and heat it with 2-3 spoons of rose water. Leave it like this for a few days. After, melt the beeswax on a pan and when it is ready add the previous mixture. After some time you take it off the heat and add a small amount of water to get the right texture. After it gets cold you place it on containers and keep it in a cool place.

2) NUTRITION CREAMS

These creams with the help of their compounds can react to the physiological reparation mechanisms and improve the causes that challenged the dryness of the skin. In addition, olive oil plays a crucial role in that procedure, as it is suitable for the care of dry skin. It causes deep hydration and is making it more smooth and shiny.

Below a very easy recipe will be analyzed by using aloe vera and olive oil and it can be produced at home. It has a very nice and soft aroma and is very nutritious for the skin. It is suggested to be used in the morning in night before bed.

Production

Mix the olive oil with the aloe gel for a few minutes until the mixture will be homogenized and then add it to your skin. (75)

3) EMOLLIENT CREAMS

These types of creams make the skin softer. When olive oil is added, not only it makes the skin softer but also gives the suitable nutrients it deserves.

Also, these types of creams can have very good results in dry and dull hair and it helps them find their strength and smoothness. A very easy recipe which can be made by the home is the next one:

Production

You place in a bowl two spoons of olive oil, one-yolk and one spoon of vinegar and mix it until it becomes a homogenous mixture. Additionally, you can place it on your hair and leave it there for thirty minutes. After that, you can wash it away.

4) MOISTURIZING CREAMS

Moisturizing of the epidermis is very crucial, so the creams that are produced are the most important. Water is the ingredient that makes the skin smooth and shiny, so its absence can make the skin rough and very thin.

There are three ways in which we can make our skin work.

- Humidification, meaning that a suitable amount of water should be controlled to complete its content on the skin.
- With the restoration of compounds that are missing, making an effort to find if there are any mistakes by which the skin gets dry.
- With inclination, this is the most important because in that case olive oil is used. More importantly, with this method, the loss of water that is eliminated from the skin is declined. For this method, olive oil is the best solution because it is an ingredient that cannot be penetrated by the water.

5) MASSAGE CREAMS

The first massage creams are traditionally the cold creams and most importantly the ones that are water in oil (w/o). These creams have a high content in the oily phase and for that reason, they cannot be absorbed as fast as the others. These creams are the best for massage and in combination with good movements the blood flows throughout the body very easily and the dead cells of the skin come on the surface.

Cosmetic industries have huge success in terms of marketing with these creams and they can be used for various reasons such as topical fat. (76)

6) HAND CREMES

Hand creams are very important because they tend to make a thin layer on the tip of our hands to make microbes and other pollutants stick and not pass through the skin. They also have smoothing and emollient properties as they make the skin more elastic

and soft and they prevent them from making the hands dry due to their constant exhibition in the sun or cold. The addition of olive oil helps.

7) MASKS

Except for the creams olive oil can be used as an ingredient in masks whether they are for hair, skin or face. They tend to give the skin revitalization as they also make it clean, due to the fact that they can bring out the dead cells and clean the skin. Also, some of them can fight against age and decline the freckles for a small period.

The use of olive oil gives them the ability to be nutritious for the skin and generally for the areas that need to be used. The antioxidant compounds that are used are incorporated to the enhancement of their abilities to make them more suitable.

Procedure

Melt 35gr of glycerin and then slowly add 25gr of honey and mix it immediately in order not to get stuck. Then add 10gr of olive oil and 35gr of rose water, mix the mixture until the mixture gets cold. (77)

Figure 10: Homemade face mask for dry skin (10') https://www.dreamstime.com/mask-face-natural-ingredients-care-dry-skin-vector-facial-mask-recipe-homemade-mask-dry-skin-vector-image123453516

7.1.3 EMULSIONS

The emulsion is characterized as a system that consists of two liquid mixed phases. There are two types of emulsions, oil in water (o/w) and water in oil (w/o). Oil in water emulsion has water as an external phase and water in oil emulsion has oil as an

external phase. They contain oils because they help with the improvement of the epidermis.

Using olive oil in emulsions we can see a significant improvement on the skin as it is smoother and softer. Because olive oil cannot be dissolved in water, it is really important to shake the emulsion before each use, to be homogenized. When the emulsion is homogenized, the olive oil acts as a smoothing and external lubricant and its goal is to make the skin hydrated and soft. Moreover, olive oil is a compound that can be used as a sun protector due to its components.

Olive oil can be combined with many fluids such as juices from fruits, water, aloe, milk and many more. Many women choose to make their emulsions at home, by mixing olive oil and milk and then they apply it on their face or neck. (78)

7.1.4 FACE AND BODY SCRUBS

Olive oil is also used in peeling products of the face and body. Olive oil is the ingredient that exists in these products, as it is full of vitamins, acts against wrinkles and keeps the temperature of the skin stable. Usually face and body scrubs are used in dry skin to peel and hydrate them Olive oil succeeds in deep hydration of the skin and in combination with other compounds it removes the dead cells out of the organism.

Production

The first step is to mix olive oil with salt in a bowl. When these two ingredients are united, then add a full lemon and mix it all very well. (79)

 Figure 11: Preparation of scrubs (11') https://simple-veganista.com/diy-edible-sugar-scrub/

7.1.5 SUNSCREENS

Sunscreen products play a crucial role in the everyday routine of many people. It is well known that the sun has many benefits but also harmful properties on the skin, so the skin needs to be protected by the sun radiation. Sunscreens exist in various forms such as emulsions, creams, lotions etc.

Olive oil can absorb sun rays, so that is the reason that it is used in the production of most the sunscreens. Specifically, it is ideal for the production of a tan lotion, which helps the skin to tan but also gives suitable protection due to its antioxidant properties. Sunscreens with olive oil contain natural filters of protection from sun rays, which do not absorb but reflect the radiation in contrast with the synthetic filter which absorbs the sun rays in the skin.

Production

You heat 50ml of coconut oil and after you mix it with 50 ml of olive oil and 100ml of sesame oil. After that, you pour two sachets of black tea and then mix it. The final step is to put it in a jar and then use it at least 20 minutes before the exhibition to the sun. (80)

Figure 12: Sunscreen containing coconut (12') https://www.goddessgarden.com/can-i-use-oil-as-natural-sunscreen/

7.1.6 SOAPS

Soap has a significant meaning in everyday life and is one of the first aid products. It is produced by a chemical reaction between alkali compounds and fatty acids in fat or oil.

Chemical soaps which are used in everyday life, sometimes cause allergies on the skin compared to the physical ones which are produced by good quality olive oil. Good quality soap does not contain a big amount of alkali compounds.

Production

- The simplest composition of soap is called clear soap and consists of olive oil and soda. It is considered one of the best cleansers of the skin and it does not irritate.
- Green soap is composed of KOH, olive oil and glycerin. It can be used as a pharmaceutical liquid soap which is used in oily skin and causes hydration and it exists in sterile composition for the hair. (81)

Figure 13: Final product of soap (13') https://practicalselfreliance.com/how-to-make-soap/

8. CHAPTER QUESTIONNAIRE PART

Consumers

Meaning of consumers

The satisfaction of consumers is not a new business definition, but many companies fail to approach the expectations of their clients. The most important chapter of a company is its clients and if they are not pleased, they obvert to another product. The good quality of the product and service is not enough for the existence of the company, but it should maintain a good relationship with its clients to understand them and to keep improving its work.

For the study of condiments of olive oil consumers, a questionnaire was created and it contains 12 questions. Twenty questionnaires were sent and filled to 50 consumers. Next are the results from the research.

8.1 Questionnaire for the consumption of olive oil

Theme: The satisfaction of olive oil consumers

Please fill in the next questionnaire, and the data of this research will be used to obtain a complete image for the satisfaction of olive oil consumers in Greece. To be mentioned the next questionnaire is **anonymous**.

Thank you for your cooperation.

1)Sex

- Male
- Female

2)Age

- >25
- 26-40
- 41-55
- <56

3) Profession

- Assistant
- Businessman/ Businesswoman
- Student
- Housewife
- Unemployed
- Retired

4) How much oil do you use/year?

- 25-30lt
- 50-54lt
- 75-80lt

5) Which type of olive oil do you prefer to use?

- Extra Virgin Olive Oil
- Virgin Olive Oil
- Refined Olive Oil
- Green Olive Oil
- Biological Olive Oil

6) When you buy standardized Olive oil are you looking at the label?

- Yes
- No

7) If yes, which information are you looking for?

- Range
- Acidity
- Expiration date
- Place of production
- Other

8) How helpful is Olive oil on humans' health?

- Good enough
- Good
- Not enough
- It does not help
- I do not know

9) In which area can we use olive oil?

- Cosmetology
- Medicine
- Pharmacy
- Other

10) What are the criteria that you buy olive oil? (More than 1)

- Colour
- Density
- Odour-flavour
- Clarity
- Acidity
- Package
- Brand
- Cost
- Biological
- Other

11) Are you satisfied with the type of Olive oil that you buy?

- Very satisfied
- Satisfied
- Not so much satisfied
- Not satisfied

12) Are you satisfied with the cost of the Olive oil that you buy?

- Very satisfied
- Satisfied
- Not so much satisfied
- Not satisfied

Results of the Questionnaire

Question 1 and 2

Sex: From 50 people, 32 were women and 18 were men

Age: The age was classified into four categories. Most of the consumers were between the ages of 41-55.

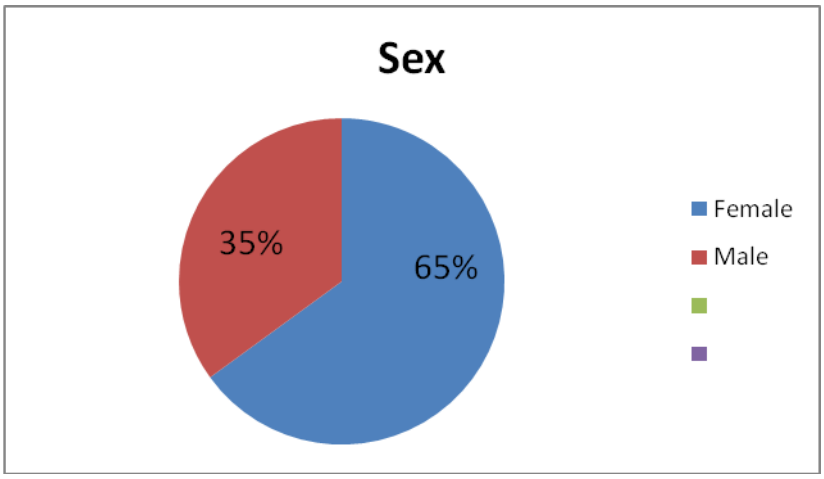

Figure 10: Gender question

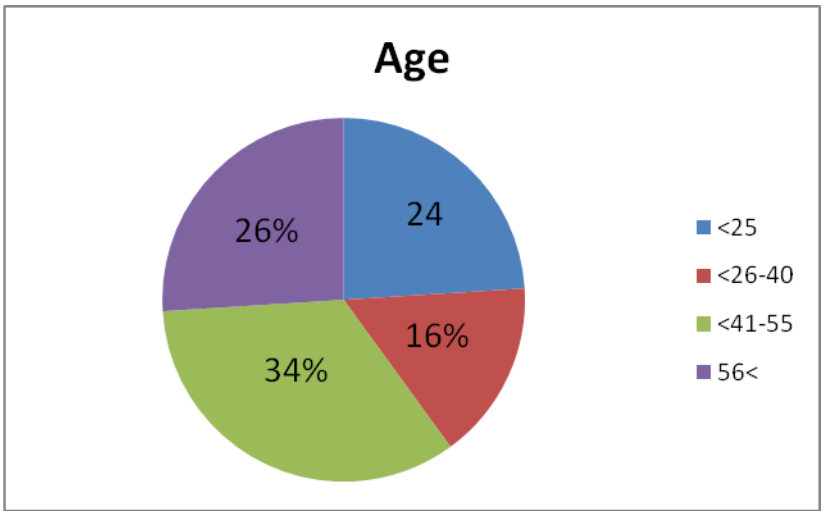

Figure 11: Age question

Question 3

Regarding profession, 32% are assistants (public or private), 16% are businessmen/women, 10% are students and retired, 25% housewives, 7% are unemployed.

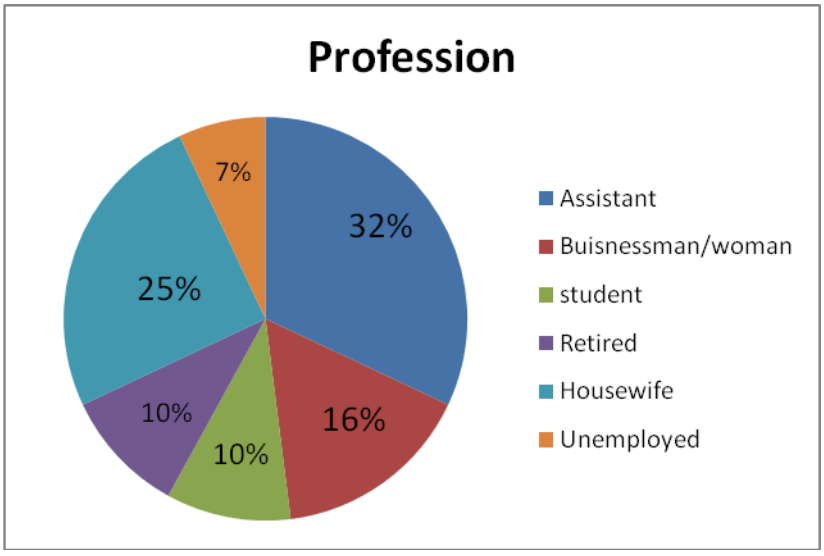

Figure 12: Profession question

Question 4

In the question of how much olive oil is consumed by the clients, the answers were very high as you can see on the next diagram.

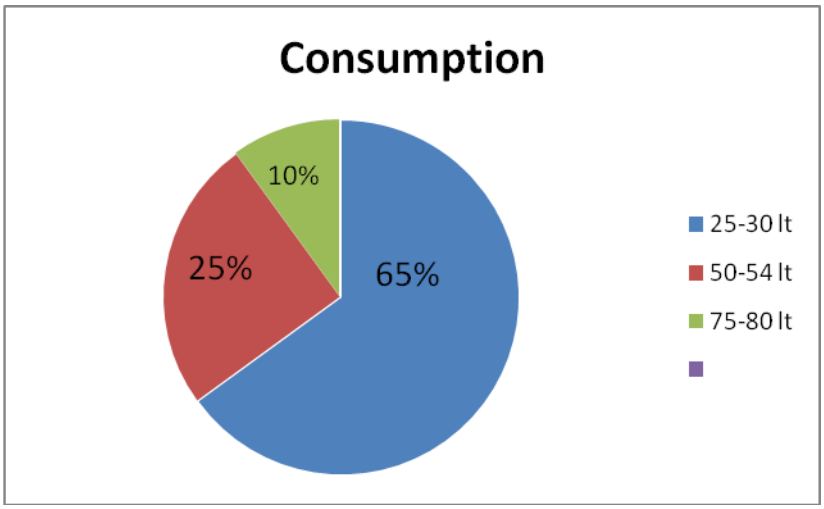

Figure 13: Consumption question

Question 5

The olive oil type that is mostly used by the audience is EVOO with 58%, VOO with 30%, Biological with 8%, ROO with 4% and GOO is not preferred by the clients.

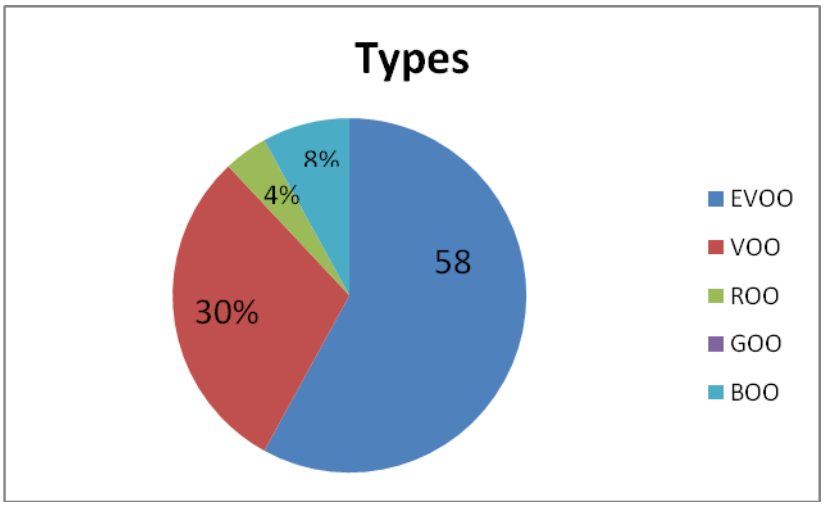

Figure 13: Types of olive oil question

Questions 6-7

Most of the consumers, who buy olive oil from the market, always check the label of the bottles they choose. The percentage is 95% and the information they are looking for are 37% Acidity, 26% Place of production, 17% Expiration date.

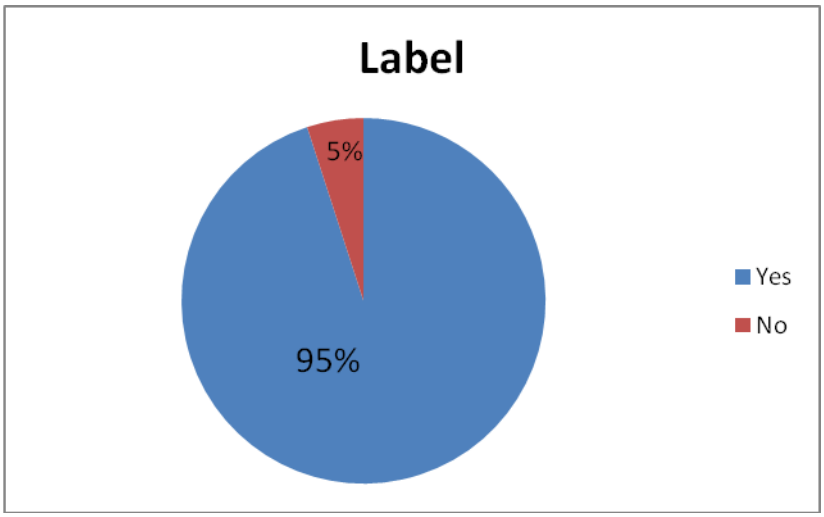

Figure 14: Label question

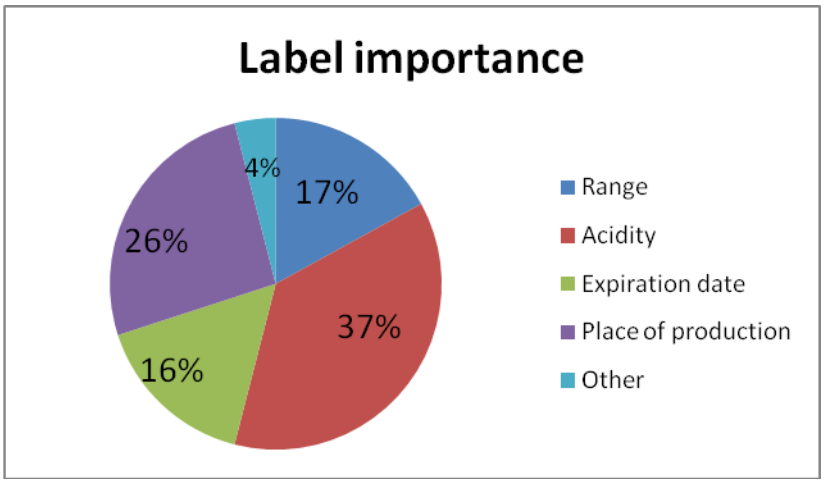

Figure 15: Label importance question

Questions 8-9

Most of the consumers know the importance of olive oil in everyday life and the health of people (64%). Also, many of them believe that olive oil is used in pharmacy and cosmetology.

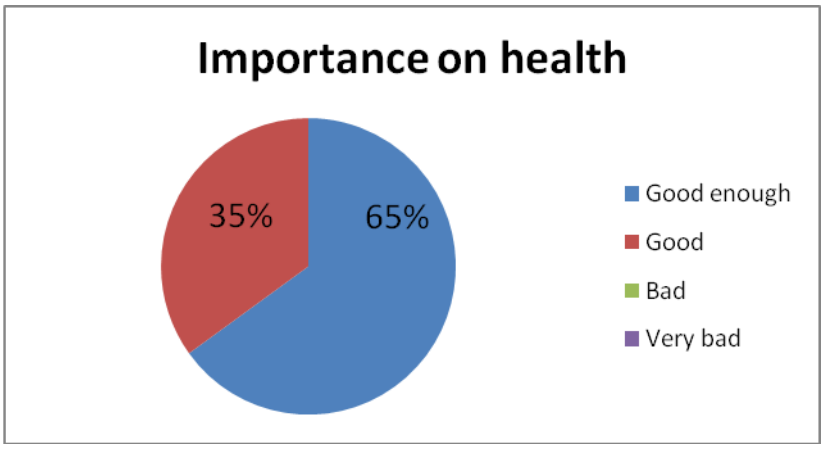

Figure 16: Importance of health question

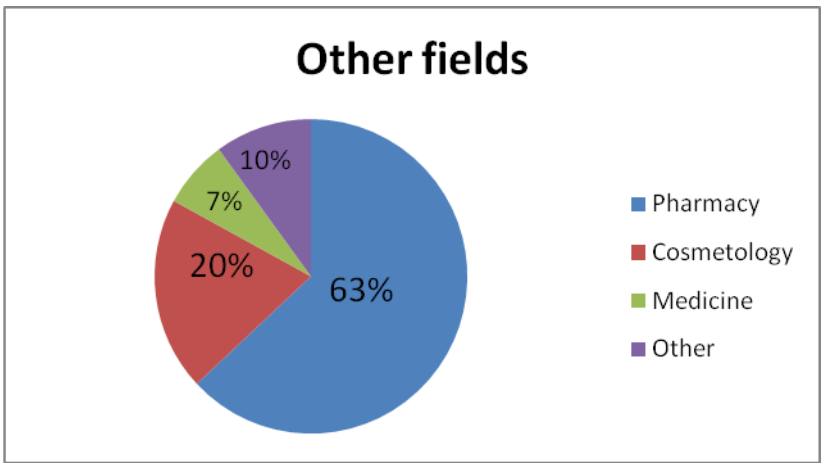

Figure 17: Fields for usage question

Question 10

Acidity (25%) and Odour- Favour (16%) are the main criteria that many people are checking before they buy the product.

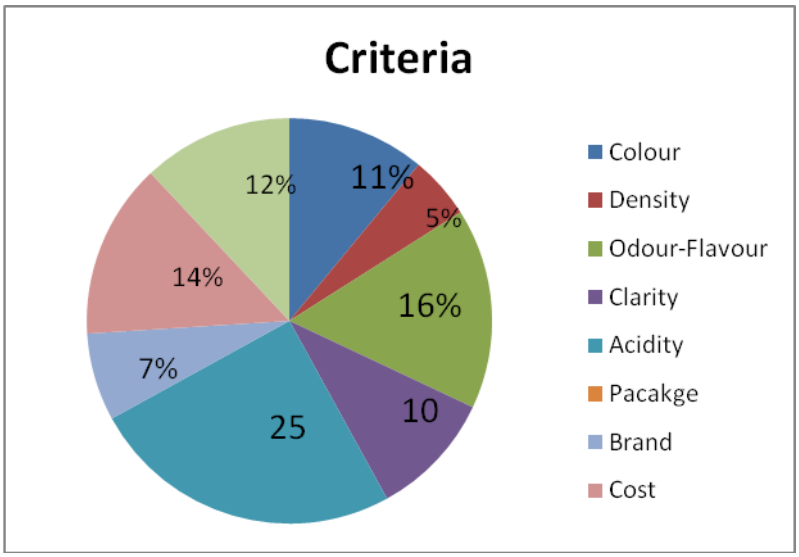

Figure 18: Criteria of choosing olive oil question

Question 11-12

These questions have to do with the satisfaction of the consumers about the cost and the type of olive oil they use. Most of them are satisfied in high percentage.

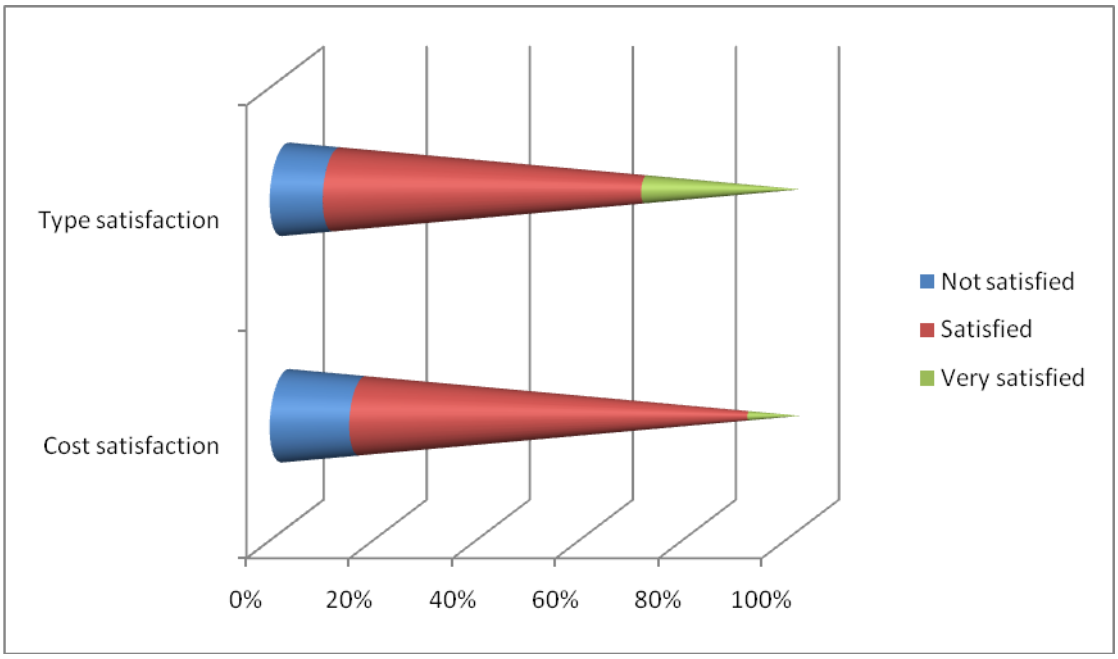

Figure 19: Cost and type of olive oil question

9. CONCLUSION

Olive oil is a functional food and due to its bioactive components, it includes, it contributes to the maintenance of the health of the human and also improves the health of the people who suffer from a disease. It contributes actively to the prevention and improvement of cardiac diseases such as atherosclerosis, improves postprandial triglyceridemia, glucose, insulin secretion and glucagon. Olive oil consumption can also dissuade the inception of carcinogenesis and helps in the prevention of many autoimmune diseases. Finally, it helps in the maintenance of weight in people and also in the deterrence of weight gain.

From the point of view of the consumers, the results were impressive. Most of the people who took part in the questionnaire were women, middle age. For the profession most of them were assistants, but it was also a high percentage of housewives. The amount of olive oil they consume in a week is 25-30lt and the type is Extra Virgin olive oil and Virgin olive oil.

Regarding the labelling, 95% of the consumers pay attention to it and the characteristics they are looking for are the acidity and the place of production in the majority. Most of the participants are very well educated and they know a lot of information about the importance of olive oil in our health and most of them believe that olive oil can also be used in pharmacy and cosmetology preparations.

About the criteria of the preference, the majority is looking for the acidity, the expiration date, the odour and the flavour of the olive oil. Lastly, regarding the cost and the type of olive oil they consume, many of them are very satisfied with a percentage between 30-75%.

It is really important to understand the value of olive oil in our health and life in general. Many generations are growing up with the knowledge that olive oil is a treasure to the organism and we should not underestimate its importance. Greece and other Mediterranean countries which can produce and dispense it, have also many economical benefits from it because its importance is very popular worldwide and many people prefer it.

10.REFERENCES

Chapter in Book

2)Boukas G. Olive and olive oil in ancient Greece. Boukas G. Everything about olive and olive oil. 1st ed. Athens: Kalliergitis, 2013:5-8.

3)Boukas G. Olive and olive oil in ancient Greece. Boukas G. Everything about olive and olive oil. 1st ed. Athens: Kalliergitis, 2013:13-16.

4) Fooks R. General. In: Fooks R. The book of olive oil. 1st ed. London: Psyxalos, 2002:15-18.

5)Fotopoulos C. Instillation of olive grove. In: Fotopoulos C, Kantaros I, Konstantopoulos G, Veikontis G, Papadopoulos P. Biological cultivation of Olive. 1st ed. Athens: Stamoulis, 2010:22.

6) Fotopoulos C. Soil analysis. In: Fotopoulos C, Kantaros I, Konstantopoulos G, Veikontis G, Papadopoulos P. Biological cultivation of Olive. 1st ed. Athens: Stamoulis, 2010:27.

7) Fooks R. Planting. In: Fooks R. The book of olive oil. 1st ed. London: Psyxalos, 2002:53-55.

8) Boukas G. The technique of pruning. Boukas G. Everything about olive and olive oil. 1st ed. Athens: Kalliergitis, 2013:43-45.

14) Veikontis G. Lubrication. In: Fotopoulos C, Kantaros I, Konstantopoulos G, Veikontis G, Papadopoulos P. Biological cultivation of Olive. 1st ed. Athens: Stamoulis, 2010:58-59.

15) Fotopoulos C. Enemies. In: Fotopoulos C, Kantaros I, Konstantopoulos G, Veikontis G, Papadopoulos P. Biological cultivation of Olive. 1st ed. Athens: Stamoulis, 2010:91-95.

16) Fooks R. The collection of the fruit. In: Fooks R. The book of olive oil. 1st ed. London: Psyxalos, 2002:167-175

17) Alexakis A. Varieties. In: Alexakis A. Olive oil and its production. 1st ed. Athens: Sideris, 1998:25-29.

18) Kuritsakis A. Qualitative criteria of olive oil. In: Kuritsakis A. Olive oil. 2nd ed. Thessaloniki: Kuritsakis, 2017:377-279.

19)Boukas G. Olive oil of good origin. Boukas G. Everything for olive and olive oil. 1st ed. Athens: Kalliergitis, 2013:81-85.

20) Papadopoulos P. Nutritional substances. In: Fotopoulos C, Kantaros I, Konstantopoulos G, Veikontis G, Papadopoulos P. Biological cultivation of Olive. 1sted. Athens: Stamoulis, 2010:33-35.

21) Fooks R. Olive oil. In: Fooks R. The book of olive oil. 1st ed. London: Psyxalos, 2002:189-191.

22) Alexakis A. Olive oil, a delicate material-Categories of olive oil. In: Alexakis A. Olive oil and its production. 1st ed. Athens: Sideris, 1998:88-91.

23) Alexakis A. Olive oil, a delicate material-Categories of olive oil. In: Alexakis A. Olive oil and its production. 1st ed. Athens: Sideris, 1998:96.

28) Boukas G. Market organization of olive oil. Boukas G. Everything about olive and olive oil. 1st ed. Athens: Kalliergitis, 2013:129-132.

29) Kantaros I. Factors that influence the quality of olive oil. In: Fotopoulos C, Kantaros I, Konstantopoulos G, Veikontis G, Papadopoulos P. Biological cultivation of Olive. 1st ed. Athens: Stamoulis, 2010:122.

30) Kuritsakis A. Quality and marketing of olive oil. In: Kuritsakis A. Olive oil. 2nd ed. Thessaloniki: Kuritsakis, 2017:601-610.

31) Kuritsakis A. Criteria of quality of olive oil. In: Kuritsakis A. Olive oil. 2nd ed. Thessaloniki: Kuritsakis, 2017:378-381.

32) Alexakis A. Analysis of olive oil. In: Alexakis A. Olive oil and its production. 1st ed. Athens: Sideris, 1998:155-158.

33) Therios I. The assortment and morphology of olive oil. In: Therios I. Olive growing. 1st ed. Thessaloniki: Gartagani, 2007:89-93.

34) Alexakis A. Chemical composition of olive oil. In: Alexakis A. Olive oil and its production. 1st ed. Athens: Sideris, 1998:103-105.

35) Alexakis A. Chemical composition of olive oil. In: Alexakis A. Olive oil and its production. 1st ed. Athens: Sideris, 1998:110-113.

36) Kuritsakis A. Chemical composition of olive oil. In: Kuritsakis A. Olive oil. 2nd ed. Thessaloniki: Kuritsakis, 2017:63-70.

37) Kuritsakis A. Chemical composition of olive oil. In: Kuritsakis A. Olive oil. 2nd ed. Thessaloniki: Kuritsakis, 2017:75-76.

38) Alexakis A. Chemical composition of olive oil. In: Alexakis A. Olive oil and its production. 1st ed. Athens: Sideris, 1998:120.

39) Alexakis A. Chemical composition of olive oil. In: Alexakis A. Olive oil and its production. 1st ed. Athens: Sideris, 1998:123-125.

40) Kuritsakis A. Chemical composition of olive oil. In: Kuritsakis A. Olive oil. 2nd ed. Thessaloniki: Kuritsakis, 2017:80-82.

41) Fooks R. Olive oil. In: Fooks R. The book of olive oil. 1st. London. Psyxalos, 2002:199.

42) Therios I. The assortment and morphology of olive oil. In: Therios I. Olive growing. 1st ed. Thessaloniki: Gartagani, 2007:100-105.
43) Kuritsakis A. The role of antioxidants. In: Kuritsakis A. Olive oil. 2nd ed. Thessaloniki: Kuritsakis A, 2017:451-457.

73) Vegkos A. General information. In: Vegkos A. Cosmetology. 1st ed. Athens: Interbooks, 2004:17.

74) Vegkos A. General information. In: Vegkos A. Cosmetology. 1st ed. Athens: Interbooks, 2004:20-25.

75) Tsirivas E, Varvaresou A, Papageorgiou S. Cold creams. In: Tsirivas E. Cosmetology-Dermatology. 1st ed. Athens: Vasiliadis, 2017:2.

76) Tsirivas E, Varvaresou A, Papageorgiou S. Emollient and Moisturizing components. In: Tsirivas E. Cosmetology-Dermatology. 1st ed. Athens: Vasiliadis, 2017:15-27.

77) Papaioannou G. Creams for the care and the protection of skin. In: Papaioannou G. Cosmetology. 1st ed. Athens, Gelbesis, 2010:153-157.

78) Vegkos A. Emulsions. In: Vegkos A. Cosmetology. 1st ed. Athens: Interbooks, 2004:30-37.

79) Tsirivas E, Varvaresou A, Papageorgiou S. Moisturizing products. In: Tsirivas E. Cosmetology-Dermatology. 1st ed. Athens: Vasiliadis, 2017:26-28.

80) Papaioannou G. Sunscreen products. In: Papaioannou G. Cosmetology. 1st ed. Athens:Gelbesis, 2010:200-207.

81) Vegkos A. Soaps. In: Vegkos A. Cosmetology. 1st ed. Athens: Interbooks, 2004:40-41.

Article in Journal

1) Nomikos NN, Nomikos GN, Kores DS. The use of deep friction massage with olive oil as a means of prevention and treatment of sports injuries in ancient times. Arch Med Sci. 2010;6(5):642-645.

9) Connor D. J. Adaptation of olive (Olea europaea L.) to water-limited environments. Aust. J. Agric.Res. 2005;56:1181–1189.

10)Gómez del Campo M, Morales-Sillero A, Vita Serman F, Rousseaux M, Searles P. Olive growing in the arid valleys of Northwest Argentina (provinces of Catamarca, La Rioja and San Juan). Plant Sci. 2017;114:23–45.

11)Rallo L, Martin G. C. The role of chilling in releasing olive floral buds from dormancy. J. Am. Soc. Hortic. Sci. 1991;116(6):1058–1062.

12)Lavee S, Hanoch E, Wodner M, Abramovich H. The effect of predetermined deficit irrigation on the performance of cv. Muhasan olives *(Olea europaea* L.) in the eastern coastal plain of Israel. Sci. Hortic. 2007;112:156–163.

13)Fernández J. E. Understanding olive adaptation to abiotic stresses as a tool to increase crop performance. Environ. Exp. Bot. 2014;103:158–179.

24) Allalout A, Krichene D, Methenni K, Taamalli A, Daoud D, Zarrouk M. Behaviour of super-intensive Spanish and Greek olive cultivars grown in Northern Tunisia. J. Food Biochem. 2011;35:27–43.

25) García-Inza G. P, Castro D. N, Hall A. J, Rousseaux M. C. Responses to temperature of fruit dry weight, oil concentration, and fatty acid composition in olive (*Olea europaea* L. var. 'Arauco'). Eur. J. Agron. 2014;54:107–115.

26) Ceci L. N, Carelli A. A. Characterization of monovarietal Argentinean olive oils from new productive zones. J. Am. Oil Chem. Soc. 2007;84:1125–1136.

27) García-Inza G. P, Castro D. N, Hall A. J, Rousseaux M. C. Opposite oleic acid responses to temperature in oils from the seed and mesocarp of the olive fruit. Eur. J. Agron. 2016;76:138–147.

44) Zamora-Zamora F, Martínez-Galiano JM, Gaforio JJ, Delgado-Rodríguez M. Effects of olive oil on blood pressure: A systematic review and meta-analysis. fat-oils. 2018;69(4):272.

45) Shen J, Wilmot KA, Ghasemzadeh N, Molloy DL, Burkman G, Mekonnen G, Gongora MC, Quyyumi AA, Sperling LS. Mediterranean Dietary Patterns and Cardiovascular Health. Annu Rev Nutr. 2015;35:425-49.

46) Hernáez Á, Castañer O, Goday A, Ros E, Pintó X, Estruch R, Salas-Salvadó J, Corella D, Arós F, Serra-Majem L, Martínez-González MÁ, Fiol M, Lapetra J, de la Torre R, López-Sabater MC, Fitó M. The Mediterranean Diet decreases LDL atherogenicity in high cardiovascular risk individuals: a randomized controlled trial. Mol Nutr Food Res. 2017;61(9):160-1.015.

47)Katsarou A.I, Kaliora A.C, Papalois A, Chiou A, Kalogeropoulos N, Agrogiannis G, Andrikopoulos N.K. Serum lipid profile and inflammatory markers in the aorta of cholesterol-fed rats supplemented with extra virgin olive oil, sunflower oils and oil-products. Int. J. Food Sci. Nutr. 2015;66:766–773.

48) Piroddi M, Albini A, Fabiani R, Giovannelli L, Luceri C, Natella F, Rosignoli P, Rossi T, Taticchi A, Servili M, Galli F. Nutrigenomics of extra-virgin olive oil: A review. Biofactors. 2017;43(1):17-41.

49) American Heart Association Nutrition Committee, Lichtenstein AH, Appel LJ, Brands M, Carnethon M, Daniels S, Franch HA, Franklin B, Kris-Etherton P, Harris WS, Howard B, Karanja N, Lefevre M, Rudel L, Sacks F, Van Horn L, Winston M, Wylie-Rosett J. Diet and lifestyle recommendations revision 2006: a scientific statement from the American Heart Association Nutrition Committee. Circulation. 2006;114(1):82-96.

50) Shah M, Adams-Huet B, Garg A. Effect of high-carbohydrate or high-cis-monounsaturated fat diets on blood pressure: a meta-analysis of intervention trials. Am J Clin Nutr. 2007;85(5):1251-1256.

51) Babio N, Bulló M, Salas-Salvadó J. Mediterranean diet and metabolic syndrome: the evidence. Public Health Nutr. 2009;12(9A):1607-17.

52) Raederstorff D. Antioxidant activity of olive polyphenols in humans: a review. Int J Vitam Nutr Res. 2009;79(3):152-65.

53) Salas-Salvadó J, Fernández-Ballart J, Ros E, Martínez-González MA, Fitó M, Estruch R, Corella D, Fiol M, Gómez-Gracia E, Arós F, Flores G, Lapetra J, Lamuela-Raventós R, Ruiz-Gutiérrez V, Bulló M, Basora J, Covas MI; PREDIMED Study Investigators. Effect of a Mediterranean diet supplemented with nuts on

metabolic syndrome status: one-year results of the PREDIMED randomized trial. Arch Intern Med. 2008;168(22):2449-2458.
54) de Bock M, Derraik JG, Brennan CM, Biggs JB, Morgan PE, Hodgkinson SC, Hofman PL, Cutfield WS. Olive (Olea europaea L.) leaf polyphenols improve insulin sensitivity in middle-aged overweight men: a randomized, placebo-controlled, crossover trial. PLoS One. 2013;8(3):57622.

55) Vahideh Behrouz, Zahra Yari. A review on differential effects of dietary fatty acids on weight, appetite and energy expenditure. Critical Reviews in Food Science and Nutrition. 2020;(1):101080-1040839.
56) Wainstein J, Ganz T, Boaz M, Bar Dayan Y, Dolev E, Kerem Z, Madar Z. Olive leaf extract as a hypoglycemic agent in both human diabetic subjects and in rats. J Med Food. 2012;15(7):605-610.

57) G. Giannakakis, M. R. Koujan, A. Roussos and K. Marias, "Automatic stress detection evaluating models of facial action units," 2020 15th IEEE International Conference on Automatic Face and Gesture Recognition. 2020;728-733.

58) Kyriakou K, Resch B, Sagl G, Petutschnig A, Werner C, Niederseer D, Liedlgruber M, Wilhelm F, Osborne T, Pykett J. Detecting Moments of Stress from Measurements of Wearable Physiological Sensors. Sensors (Basel). 2019;19(17):3805.

59) Marrano N, Biondi G, Cignarelli A, Perrini S, Laviola L, Giorgino F, Natalicchio A. Functional loss of pancreatic islets in type 2 diabetes: How can we halt it? Metabolism. 2020;110:154-304.

60) Salas-Salvadó J, Bulló M, Estruch R, Ros E, Covas MI, Ibarrola-Jurado N, Corella D, Arós F, Gómez-Gracia E, Ruiz-Gutiérrez V, Romaguera D, Lapetra J, Lamuela-Raventós RM, Serra-Majem L, Pintó X, Basora J, Muñoz MA, Sorlí JV, Martínez-González MA. Prevention of diabetes with Mediterranean diets: a subgroup analysis of a randomized trial. Ann Intern Med. 2014;160(1):1-10.

61) Vissers M, Zock P, Katan M. Bioavailability and antioxidant effects of olive oil phenols in humans: a review. Eur J Clin Nutr. 2004;58,955–965.

62) Salas-Salvadó J, Bulló M, Estruch R, Ros E, Covas MI, Ibarrola-Jurado N, Corella D, Arós F, Gómez-Gracia E, Ruiz-Gutiérrez V, Romaguera D, Lapetra J, Lamuela-Raventós RM, Serra-Majem L, Pintó X, Basora J, Muñoz MA, Sorlí JV, Martínez-González MA. Prevention of diabetes with Mediterranean diets: a subgroup analysis of a randomized trial. Ann Intern Med. 2014;160(1):1-10.

63) El SN, Karakaya S. Olive tree (Olea europaea) leaves: potential beneficial effects on human health. Nutr Rev. 2009;67(11):632-8.

64) Joseph Kanner, Adi Shpaizer, Liron Nelgas, Oren Tirosh. S-Nitroso-N-acetylcysteine (NAC-SNO) as an Antioxidant in Cured Meat and Stomach Medium. Journal of Agricultural and Food Chemistry 2019;67(39) :10930-10936.

65) Cariello M, Contursi A, Gadaleta RM, Piccinin E, De Santis S, Piglionica M, Spaziante AF, Sabbà C, Villani G, Moschetta A. Extra-Virgin Olive Oil from Apulian Cultivars and Intestinal Inflammation. Nutrients. 2020;12(4):1084.

66) Anderson WF, Rosenberg PS, Prat A, Perou CM, Sherman ME. How many etiological subtypes of breast cancer: two, three, four, or more? J Natl Cancer Inst. 2014;106(8):165.

67) Zare N, Haem E, Lankarani KB, Heydari ST, Barooti E. Breast cancer risk factors in a defined population: weighted logistic regression approach for rare events. J Breast Cancer. 2013;16(2):214-. 219.

68) Menendez JA, Vazquez-Martin A, Colomer R, Brunet J, Carrasco-Pancorbo A, Garcia-Villalba R, Fernandez-Gutierrez A, Segura-Carretero A. Olive oil's bitter principle reverses acquired autoresistance to trastuzumab (Herceptin) in HER2-overexpressing breast cancer cells. BMC Cancer. 2007;7:80.

69) Lucia Fini, Erin Hotchkiss, Vincenzo Fogliano, Giulia Graziani, Marco Romano, Edward B. De Vol, Huanying Qin, Michael Selgrad, C.Richard Boland, Luigi Ricciardiello, Chemopreventive properties of pinoresinol-rich olive oil involve a selective activation of the ATM–p53 cascade in colon cancer cell lines. Carcinogenesis. 2008;29(1):139–146.

70) Rossi T, Gallo C, Bassani B, Canali S, Albini A, Bruno A. Drink your prevention: beverages with cancer preventive phytochemicals. Pol Arch Med Wewn. 2014;124(12):713-22.

71) Bosetti C, La Vecchia C, Talamini R, Simonato L, Zambon P, Negri E, Trichopoulos D, Lagiou P, Bardini R, Franceschi S. Food groups and risk of squamous cell esophageal cancer in northern Italy. Int J Cancer. 2000;87(2):289-94.

11. LIST OF FIGURES

Figure 1: Athena under the olive tree……..12

Figure 2: Greek olive wreath indicating the winner of the race……..13

Figure 3: Olive tree……..16

Figure 4: Pruning of olive tree……..18

Figure 5: The consecutive cohesion of the leading levels of cultivation in European countries and Argentina……..19

Figure 6: Enemies and insects attacking olive oil……22

Figure 7: Anatomy of olive……24

Figure 8: Primary and secondary packaging of olive oil……30

Figure 9: An example of cream after its preparation……46

Figure 10: Homemade facial mask for dry skin……49

Figure 11: Preparation of scrubs……50

Figure 12: Sunscreen containing coconut……51

Figure 13: Final product of soap……52

12. LIST OF ABBREVIATIONS

Abbreviation	
BOO	*Biological Olive Oil*
BHA	*Butylated Hydroxyanisol*
BHQ	*Butylated Hydroxyquinone*
BHT	*Butylated Hydroxytoluene*
BMI	*Body Mass Index*
DBP	*Diastolic Blood Pressure*
ETC	*Evapotransportation*
EVOO	*Extra Virgin Olive Oil*
FNRIS	*Functional Near-Infrared Spectroscopy*
GOO	*Green Olive Oil*
HDL	*High Density Lipoprotein*
HER-2	*Human Epidermal Growth Factor Receptor 2*
IL-6	*Interleukin 6*
JMD	*Joint Ministerial Decisions*
LDL	*Low Density Lipoprotein*
ROO	*Refined Olive Oil*
SBP	*Systolic Blood Pressure*
VOO	*Virgin Olive Oil*