

Evaluation of the Output Waters of Olive Oil Plants

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Abstract

Olive and olive oil production is of great importance for the economy of our country. Olive and olive oil are also very important for human health. However, while olive is an important nutrient source, wastewater (blackwater) that occurs during its production poses a threat to water resources. In this study, it is aimed to evaluate and recycle olive wastes. Today, the importance given to recycling with the developing technology has increased. Olive oil has caused pollution of the environment due to the high organic pollution it contains; this element is eliminated as a result of recycling. Thus, the land was prevented from being given to the land, and the environmental problem was minimized. While preventing environmental pollution, the country's economy is also contributing.

Keywords: Olive Oil, Wastewater Treatment

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INTRODUCTION

The olive tree is a tree with a large shrub or evergreen leaves, which can be sized up to 10 meters. It has a large, curved, obtuse body. The spear, very short-handled, hard leaves like leather are arranged in pairs in mutual pairs. The leaves are simple, full-edged, and the edges are slightly curved towards the bottom. The leaf has a length of 20–86 mm and a width of 5 to 17 mm. There is a pointed protrusion at the end of the leaves. The upper face of the leaf is dark gray-green and glabrous, and the lower face is bluish silvery and covered with white silky silk.

Towards the end of spring, the leaves have small, whitish-yellow, fragrant flowers that open in sparse bunches. The flowers, which are fertilized with the flower dusts carried by the winds, produce fleshy and oily fruits. The fruit is green before it gets ripe and then it gets a bright black color. There is a hard core in the fleshy fruit. It is a very valuable tree in terms of "fat" obtained from the flesh and fruit of the fruit. At the same time the tree has a very imposing and aesthetic appearance.

Olive oil is a greenish-yellowish liquid oil obtained from the fruit of the olive tree. In olive oil, as in many other vegetable oils, it is composed of fatty acids, which are largely bound around glycerin. Olive oil contains 55-83% of fatty acids, 7-20% of palmitic acid, 0-5% of linoleic acid, 0-4% of steric acid and 0.1-0.7% of palmitoleic acid.

The color of olive oil can vary from greenish to yellowish. Variable color is the result of the substances in the structure. For example, the green color of olive oil gives the green color in the structure up to 10ppm chlorophyll. It is a carotene substance which gives this color in yellow oil. Although there is a link between the quality and color of olive oil among the people, the color has no effect on the quality of the oil. In addition, unfiltered olive oil may have a blurred appearance. Olive oil is seen in red color due to the chlorophyll fluorescent property under the light of ultraviolet light (Anonymous, 2015). Mediterranean countries, namely Greece, Italy, Lebanon, Portugal, Spain, Syria, Tunisia and Turkey, the annual average of 1.7 million tons from 11 million tons of olive oil is obtained (Evcil, 2005).

Methods Used in Olive Oil Production

In this study, methods used in olive oil production; traditional pressing processes and continuous production processes. In both methods, two by-products are formed as pirina and blackwater (Oktav et al., 2001).

In the pressing process, the olives are washed, crushed and kneaded after the addition of process water. The resulting dough is then pressed into oil and water. Finally, oil and water are separated by vertical centrifugation or decanters (Demichelli and Bontoux, 1996). In the continuous production process, the press is replaced by a centrifuge. Continuous production processes depending on the type of decanter used:

- a) 3-phase process requiring process water and forming three phases (oil, blackwater and pirina) as a result of production,
- b) two classes, which do not require process water and which constitute only two phases (oil and pirina) as a result of production, are discussed in two classes.

In the 3-phase production process, which is the most widely used in olive oil production, significant amounts of process water are added and therefore large amounts of fat content and low black water are formed (Oktav et al., 2003).

Olive Oil Wastewater (Blackwater)

Karasu is a by-product of olive juice produced in the production of olive oil, which consists of the total amount of water added during the extraction process (Anonymous, 2015).

Olive oil waste water (blackwater) contains high organic matter, suspended solids, phenol and oil – grease (Evcil, 2005).

Olive black sea usually contains 83-96% water, 3.5-15% organic matter and 0.5-2.0% mineral salts. The composition of blackwater varies considerably. The reason for this depends on many factors such as the degree of maturity of olive, oil separation technology and operating conditions.

Environmental Damage of Olive Oil Wastewater (Blackwater)

Although Karasu is an organic source of water, it causes environmental pollution in the world and in our country (İkizoğlu, 2007). Due to the high organic matter content; Blackwater consumes dissolved oxygen very quickly in receiving water sources such as blackwater, sea and rivers. Therefore, not all living macro and microorganisms can survive. The dark color of the land disrupts the bright appearance of the water and prevents the transmission of sunlight to the water and prevents the reproduction of water plants and algae, making photosynthesis. The oil contained in the Black Water also prevents the transfer of oxygen from the air to the water by forming a film layer on the water surface. Over time, anaerobic microorganisms develop in the water and the smell begins. It also causes soil pollution due to its acidic nature and high salt and phenolic substances (Anonymous, 2010). The main problem in the discharge of the Black Sea after olive oil production is the lack of environmentally friendly, economic discharge method. The biochemical treatment of black water is limited due to high organic load and high COD / BOD ratio. Therefore, these systems can be considered as systems with high investment and operating costs. Due to the fact that they contain toxic organic substances formed by the breakage of olive cores during olive oil production, these wastes are toxic and it is not possible to directly treat them in biological treatment systems.

Small businesses do not have sufficient economies for treatment because their financial power is limited. Purification of land in central treatment systems also has a negative effect on the operation of the system. There are many studies on the economic use of olive oil. These include: biogas production, biogas production, composting, soil improvement, production of valuable products such as antioxidants or enzymes.

Methods Used in Olive Oil Wastewater Treatment

Treatment or re-use as irrigation water is required for treatment. There are three general methods used for treatment. Physical, chemical and biological methods, but the sub-headings are as follows;

Centrifugation, Precipitation, Filtration, Membrane Filtration, Adsorption (activated carbon, natural adsorbents), Evaporation, Distillation, Composting physical treatment methods, Chemical deposition (FeCl_3 , $\text{Ca}(\text{OH})_2$ etc.), Chemical Oxidation (electrolysis, photo-oxidation) chemical treatment methods, Anaerobic Biological Treatment, Aerobic Biological Treatment is treated by using biological treatment methods.

Expensive treatment methods cause an economic crisis in olive production. However, it has been quoted by many Mediterranean countries to olive producers for the purification and disinfection of land. Study about it in Turkey are being closely monitored by the Ministry of Environment and Forests. Currently in Mediterranean countries and Turkey are the most widely used method aerated lagoons. In recent years, because of being practical and economical, physico-chemical oxidation methods are among the most commonly used methods after ventilated lagoons. However, the chemical treatment sludge produced after physico-chemical treatment is a new problem (Deveci et al., 2011).

Pirina

Pirina, olive oil factories olives are left behind after what is the olives meal. According to the technologies used by olive oil factories, there are different amounts of oil and water in the pyrrole. After the oil has been separated, the remaining part turns into getirmek ball coal Yağ and sold as solid fuel. Pirina, solid waste, C, H and N rich, contains 2-12% fat.

Pirina Oil

Pirina oil, 100 kg of pirina average 6-7.5 kg, 60-70 kg dry pirina is obtained. The free acidity increases rapidly over time due to enzymes in Pirina. In order to avoid this increase in fatty acids, the pyrina should be sent to the pirina plants as soon as possible, if possible, to get rid of it. The drying process stops the enzyme activities and facilitates the removal of the oil from the paste with the solvent.

Usage Areas of Pirina

- Solid fuel,
- Pirina can also be used as an animal feed additive. The nutrient value corresponds to 1 kg of pomegranate.
- Pirina has also found use in composting. In the studies, it is stated that composted pirina, which is non-phytotoxic and has high organic matter content, can be used in the cultivation of horticultural crops and land in which the soil needs to be truncated.
- Chemical materials such as lipase can be produced from fermentation by fermentation. After hydrolysis, it was tried to obtain activated carbon, methanol, acetic acid, carbon by distillation. Activation of activated carbon from pirina has become widespread in recent years.

Pirina as Fuel

- Ash and S content low,
- Volatile substances(VOC, PAH),
- More CO formation,
- Fluidized bed burning technology preference,
- Less SO₂ formation than coal,
- NO_x formation is similar to coal,
- Excessive combustion of pyrex + coal mixture (less NO_x and SO₂) is observed (Deveci et al., 2011).

RESULTS

The study, which is considered as the treatment of wastewater from olive and olive oil factories, has been researched for many years and is one of the areas where work continues. Today, it is not only the treatment of waste, but also the environment. It should be ensured that this land is recycled to the environment by using the most appropriate methods to remove it from environmental problems and to treat it. The cost should not be ignored and economic methods should be preferred. Establishing integrated facilities including olive oil plant, drying plant and black stocking unit, plant, treatment plant and table olive processing facilities; and a serious financial resource is required for this solution. Due to the structure of existing enterprises, the social dimension should be taken into consideration and can be suggested in the long term.

Another solution is the treatment of the land which is extracted from the olive oil factories which are producing with three phase system by means of purification systems. In this approach in which the cost of construction and operation of the treatment plant and the collection and transport costs of the land will be taken into consideration, the individual treatment from each facility will be costly(Tunalıoğlu, 2010).

In order for this solution to be acceptable and feasible, it is important to establish the facilities as su Central Treatment, Collection, Evaporation Pools Buhar or Organized Industrial Zones (OIZ) or municipalities near city wastewater treatment plants (Gördük, 2009).

In case the olive oil enterprises continue to operate in three phases, it is necessary to build lagoons that require significant investment cost in accordance with the measurements required by the Ministry of Environment and Forestry. The most important obstacle in this solution is the odor, fly, transport risks and the difficulties of removing the solid residue obtained after evaporation (Eliçora, 2010).

Another option is the conversion of three-phase olive oil enterprises to a two-phase system within the framework of a particular program. In this option, due to the high cost of conversion of the machines in the three phase olive oil plants and the emergence of the black sea together with the pirina from the system, it is necessary to make new arrangements in the infrastructure of the pirina factories. For this reason, at least five years transition program should be provided to olive oil factories with state support and investment support should be given to enterprises in this process (Anonymous, 2008).

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