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## Synergistic impact of olive waste on some soil properties: A comprehensive review

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### Abstract

Olive waste, also known as olive pomace, is the residue left over from the extraction of olive oil. It is composed of olive skins, pulp, seeds, and leftover oil. This byproduct has traditionally been considered a waste material and often discarded or burned. However, recent research has shown that olive waste can be a valuable resource with great potential for soil improvement. When olive waste is incorporated into the soil, it can help improve soil structure by increasing its organic matter content and promoting better soil aggregation. This, in turn, can improve water infiltration and retention, as well as reduce soil erosion. In addition, olive waste contains nutrients such as nitrogen, phosphorus, and potassium, which can help improve soil fertility and provide essential nutrients for plant growth. Furthermore, olive waste can also have a positive impact on soil microbial activity. The organic matter in olive waste provides a food source for soil microorganisms, which play a crucial role in nutrient cycling and soil health. These microorganisms help break down organic matter, release nutrients, and suppress plant pathogens, ultimately contributing to a healthier and more productive soil ecosystem. In conclusion, olive waste is a valuable byproduct that can have a significant impact on soil properties. By incorporating olive waste into the soil, farmers can improve soil structure, fertility, and microbial activity, leading to healthier plants and increased crop yields. Additionally, using olive waste in soil management practices can also help reduce waste and promote sustainability in the agricultural industry.

**Keywords:** olive waste, soil structure, soil fertility, soil microbial.

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## 1. Introduction

Incorporating olive waste into soil management practices not only benefits the structure and fertility of the soil (Arpouzas *et al.*, 2010; KAbu-Zreig and Al-Widyan, 2002; Nasini *et al.*, 2013), but also has a significant impact on overall soil health (Mechri Ben *et al.*, 2014; Vella *et al.*, 2016). The organic matter found in olive waste serves as a valuable food source for beneficial soil microorganisms, which are essential for creating a balanced and thriving soil ecosystem (Khalil *et al.*, 2024; Mechri *et al.*, 2007; 2014). These microorganisms play a crucial role in breaking down organic matter, releasing important nutrients that are essential for plant growth and development (Mechri *et al.*, 2010; Sofo *et al.*, 2014). By promoting healthy soil biology through the use of olive waste, farmers can improve the overall health and resilience of their soil, leading to improved crop yields and reduced dependence on synthetic fertilizers (Mekki *et al.*, 2013; Nasini *et al.*, 2013). Additionally, the incorporation of olive waste can help to reduce soil erosion and improve soil moisture retention (Mahmoud *et al.*, 2010). The high carbon content in olive waste helps to bind soil particles together, thereby reducing the risk of erosion caused by wind or water (Salem and Ali, 2017). Moreover, the improved soil structure resulting from the use of olive waste can help to retain moisture more effectively, reducing the need for frequent irrigation and promoting water conservation (Aburumman, 2016; Ameziane *et al.*, 2019). This is particularly important in regions prone to drought or water scarcity, where efficient water management practices are

essential for sustainable agriculture. Overall, the use of olive waste in soil presents a sustainable and eco-friendly solution for enhancing soil health and fertility (Khalil *et al.*, 2024; Vella *et al.*, 2016). By harnessing the natural benefits of olive waste, farmers can reduce their environmental impact, improve soil productivity, and support long-term agricultural sustainability (Chaari *et al.*, 2015; Ochoa *et al.*, 2020). With proper management practices and a holistic approach to soil health, the incorporation of olive waste can play a valuable role in promoting healthy soils and sustainable agricultural practices for generations to come (Killi and Kavd, 2013).

## 2. Impact of olive waste on soil structure

One of the key benefits of using olive waste in soil is its ability to improve soil structure (Mohawesh *et al.*, 2019). When added to soil, olive waste helps promote aggregation, which refers to the clumping together of soil particles (Aburumman, 2016; Mechri *et al.*, 2014). This, in turn, creates pore spaces in the soil, allowing for better water infiltration and air circulation (Al-widyan *et al.*, 2005). Improved soil structure can also help prevent erosion and compaction, leading to healthier and more productive soils (Ameziane *et al.*, 2019). Additionally, as olive waste decomposes, it releases nutrients such as nitrogen, phosphorus, and potassium, which are essential for plant growth (El-bassi *et al.*, 2020; Mekki *et al.*, 2013). These nutrients can help enhance soil fertility, providing plants with the necessary elements they need to

thrive (Tekaya *et al.*, 2021). Furthermore, the organic matter in olive waste acts as a slow-release fertilizer, providing a steady supply of nutrients to plants over time (López-Piñero *et al.*, 2007). Incorporating olive waste into soil can be a sustainable way to recycle a byproduct of olive oil production while also improving soil quality and promoting plant growth. Additionally, using olive waste in soil can help reduce the need for synthetic fertilizers, ultimately benefiting both the environment and agricultural practices (Abu-Zreig and Al-Widyan, 2002; Alghamdi *et al.*, 2021a).

### **3. Impact of olive waste on soil fertility**

This practice of using olive waste as a soil amendment is not only beneficial for the soil and the environment, but it also has a positive impact on farmers and their crops (Nasini *et al.*, 2013). By incorporating olive waste into the soil, farmers can reduce the need for chemical fertilizers, which can be harmful to the environment and expensive to purchase (Malkawi, 2016). The organic nutrients in olive waste can provide a natural and sustainable alternative that promotes healthy soil and plant growth (El-bassi *et al.*, 2020; Mohawesh *et al.*, 2019). Furthermore, using olive waste as a soil amendment can also contribute to the circular economy by repurposing a waste product into a valuable resource. Instead of letting olive waste go to waste in landfills, farmers can utilize it to improve the fertility and productivity of their land

(Alghamdi *et al.*, 2021b). This not only reduces waste and greenhouse gas emissions but also helps to conserve natural resources and promote a more sustainable agricultural system (Chaari *et al.*, 2015). Overall, incorporating olive waste as a soil amendment is a win-win situation for farmers, the environment, and the economy (Mahmoud *et al.*, 2021). By taking advantage of the organic nutrients and improving soil structure, farmers can enhance the health and productivity of their land while reducing their environmental impact (Malkawi, 2016). This practice of sustainable agriculture not only benefits the current generation but also the generations to come by preserving the health of the soil for future agricultural activities (López-Piñero *et al.*, 2007).

### **4. Impact of olive waste on soil microbial**

By adding olive waste to the soil, it can serve as a food source for microorganisms such as bacteria and fungi (Mechri, *et al.*, 2014; Rolda, 2008; Tekaya *et al.*, 2021). These microorganisms play a crucial role in breaking down organic matter, releasing vital nutrients that are essential for plant growth (Chaari *et al.*, 2015; Chartzoulakis *et al.*, 2010). By stimulating microbial activity in the soil, olive waste can increase the availability of nutrients for plants, leading to improved crop yields. Additionally, the decomposition of olive waste adds organic matter to the soil, which helps improve soil structure and water holding capacity. This can lead to

better soil aeration and drainage, reducing the likelihood of soil erosion and flooding (Al-widyan *et al.*, 2005). In turn, this can help farmers reduce the need for chemical fertilizers and pesticides, promoting environmentally friendly and sustainable agriculture practices (Tekaya *et al.*, 2021). Overall, the use of olive waste in agriculture can have a positive impact on soil health, promoting enhanced nutrient cycling and organic matter decomposition (El-bassi *et al.*, 2020; Mechri *et al.*, 2014). By incorporating olive waste into farming practices, farmers can help improve the long-term fertility and productivity of their soils, leading to more sustainable and resilient agricultural systems (Sofa *et al.*, 2014).

## 5. Conclusion

Overall, it is evident that olive waste can positively impact soil properties by improving structure, fertility, and microbial activity. Utilizing olive waste in agriculture can help reduce waste disposal and promote sustainable soil management practices.

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