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*Mini Review*

# The Impact of Cantaloupe Cultivation on the Variety of Soil Microorganisms

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**Abstract**

Cantaloupes grown in sandy soil are rich in trace elements, especially selenium, so they are also known as selenium-rich sandy cantaloupe. Declining, adversely affecting ecosystems and ultimately resulting in lower quality cantaloupe. Introducing different cultures into the culture pattern can alleviate the problems caused by continuous pruning. Field trials were conducted to investigate the effects of different cropping patterns on soil microbial communities and soil properties using standard techniques. The results showed that his 14,905 operational taxonomic units of bacteria and 2,150 fungi were conserved and assigned to his eight bacterial strains and five fungal strains, respectively. The soil bacterial community mainly contained Proteobacteria, Planktomyces, Actinobacteria and Acidobacteria, while the soil fungal community was dominated by Ascomycota's, Chytridiomycota and Basidiomycota. Different cultivation patterns had significant effects on the Chao and ACE indices of fungal communities in soil. The 6-year watermelon and 1-year wheat rotations had the highest abundance indices of any rotation. Different cultivation patterns had a significant impact on soil properties such as: B. Organic matter (OM), total nitrogen (TN), total potassium (TK), available phosphorus (AP), available K, nitrogen (NN), and pH. Soil OM, TN, NN and pH values were significantly higher in 6-year watermelon cultivation and 1-year wheat cultivation than in the other three cultivation patterns. In addition, soil TK and AP values were significantly higher in watermelon continuous cropping than in the other three cropping patterns. Redundancy analyzes revealed many complex relationships between soil properties and soil bacterial or fungal communities. The use of different cropping patterns plays an important role in effectively modulating soil microbial diversity and characteristics.

**Keywords:** Agricultural, Crop management, Diversity, Microbial community

## INTRODUCTION

Watermelon (Citrullus lanatus, 2n = 2x = 22), native to Africa, belongs to the genus Citrullus of the Cucurbitaceae family and is one of the most widely cultivated fruit trees worldwide **(Luo Y et al.., 2017).** The latest classification of the genus Citrullus includes seven extant species. C.amarus, C.colocynthis, C.ecirrhosus, C. lanatus, C. mucosospermus, In China, planted area and production in 2020 were 1,405,871 hm2 and 60,246,888 tons respectively, the highest in the world. Watermelon is especially popular in the summer because it is rich in water and nutrients such as vitamins A, B, C and lycopene.

Farmers who grow crops in monoculture systems suffer from continuous cultivation that leads to reduced yields and poor quality. Yields of the world's most important food crops, such as wheat (Triticum aestivum), rice (Oryza sativa), maize (Zea mays) and soybeans (Glycine max), decline with continued cultivation. Yield loss in perpetual cultivation can be attributed to plant-microbe interactions in the soil **(Wang H, 2017).** For example, dynamic changes in bacterial and fungal populations can be an important factor in reducing peanut growth and yield over many years of continuous cultivation. Continuous cultivation of peas (Pisum sativum L.) adversely affects crop yield, soil organic matter (OM) content, and soil microbial community structure and function **(Deaton A**

**et al., 2008).** However, continuous cultivation interruption can be achieved by various strategies such as: B. Rhizobium, which promotes interplanting, rotation, and plant growth, alleviates its deficiency. For example, monocultivation of watermelon grown on aerobic rice reduced Fusarium wilt in watermelon by limiting the production of Fusarium spores in the rhizosphere soil and altering the microbial community **(Headey D et al., 2012)**. Potato and legume rotation systems can improve soil bioenvironment, remove obstacles to continuous cultivation, and increase potato tuber yields in semi-arid regions. Furthermore, plant growth-promoting rhizobia attenuate aluminum toxicity and bacterial wilting in ginger (Zingiber officinale Roscoe) in acidic perennial soils. Gravel-sand mulch fields, also known as "sand fields" in Chinese, are a traditional cultivation pattern on the semi-arid Loess Plateau in northwestern China, established by farmers in Gansu province about 300 years ago, used to absorb sporadic and limited rainfall and enable reliable crop production **(Datt G, 1998)**. Sandy soils in China are mostly found in areas with an annual rainfall of 200-400. Growing melons and vegetables on sandy soils can improve agricultural production in dry areas and reduce wind and water erosion. In particular, the watermelon that grows in the sandy soil of Zhongwei, China, is rich in trace elements, especially selenium, and is also called selenium-rich sand watermelon. However, the continuous cultivation of selenium-rich sandy watermelon is widespread in China, causing serious soil-borne diseases, reducing soil fertility and watermelon quality, and damaging sandy ecosystems **(Ravallion M et al., 2002)**.

In this study, in field trials he established four cultivation patterns. 7 years of continuous watermelon cultivation, 3 years of fallow after the first 4 years of watermelon planting, continuous watermelon-sunflower rotation, continuous watermelon-wheat rotation. Soil properties and microbial diversity were measured to investigate the effects of different cropping patterns on soil fertility and microbial diversity **(Christiaensen L et al., 2011).**

# MATERIAL AND METHODS

### Site description and experimental design

This study was conducted in a field in Xiangshan Township, Zhongwei City, Ningxia, China (105°15'E, 36°56'N, 1698m above sea level). It is suitable for watermelon cultivation because it is sunny, has a high retention temperature effect, and has a large temperature difference between day and night **(Bamji MS et al., 2011)** annual average evaporation is 2000 mm. Average annual solar hours are 2800-3000 hours. The average annual temperature is 6.8 °C. Effective cumulative temperature above 10 °C is 2500 to 3200 °C. According to different watermelon soil successions, this study included four treatments and soil microbial communities were assessed in four groups.); Treatment 2 (T2) (planting cantaloupe for 7 years from 2013 to 2019); Treatment 3 (T3) (planting cantaloupe for 6 years from 2013 to 2018 and wheat in 2019); Treatment 4 (T4) (7-year harvest pattern of annual cantaloupe and annual sunflowers). In 2013, a total of 36 plots of 5m x 5m were laid out **(Headey D, 2013)**.

### Physicochemical soil analysis

Soil OM was measured using 0.25 mm sieved soil according to the method of Nelson and Sommers (1982). Available potassium (AK) and total potassium (TC) were extracted and analyzed using the ammonium acetate method and flame photometry, respectively. The molybdenum blue method was used to calculate plant-available phosphorus (AP). A continuous flow analyzer (FIAstar 5000Analyzer) was used to measure total nitrogen (TN), nitrogen nitrogen (NN) and total phosphorus (TP) in soil **(Abdul-Rahaman A et al., 2018)**.

# DISCUSSION

In this study, we investigated the effects of different cultivation patterns on soil chemistry and microbial communities. Correlation analyzes were performed between soil microbes and traits, revealing many complex and tight correlations between them.

### Effects of different crop planting patterns on soil chemical properties

Soil chemistry plays an important role in determining soil health. Various typical and favorable planting patterns have a positive effect on soil properties such as: B. Increased OM content Gikonyo et al. (2022) reported that the winter wheat-summer maize planting sequence resulted in higher soil OM than other crop planting patterns. In addition, melon and cowpea intercropping systems have been reported by TN, AP, and OM Lyu et al. showed a significant increase in the levels of (2020) found that OM, TK, and AP of cabbage and bean rotation treatments were significantly higher than that of control tomato continuous cultivation, and that celery rotation had significantly higher pH and TN than that of continuous tomato cultivation. I found the results of this study showed that OM, TN, TK, AP, AK, NN and pH concentrations were significantly affected by cultivation patterns. A 6-year watermelon and a 1-year wheat rotation (T3) showed the highest OM, TN, NN and pH concentrations than the other three his treatments. This result supported the initial hypothesis that different planting patterns influence soil physical and chemical properties.

### Effects of different crop planting patterns on soil microbial community

Agricultural management practices such as B. Cropping patterns have a strong impact on soil microbial ecosystems. Understanding the impact of crop management treatments on agricultural soils and their microbial communities will have significant implications for improving the sustainability of agricultural production. There is evidence of the impact of cropping patterns on microbial diversity. Four rice rotation regimes (canola, wheat, vegetable and fallow) in agroecosystems showed bacterial families that were mainly grouped into his six phyla.

Proteobacteria, Actinobacteria, Chloroflexi, Armatimonadetes, Nitrospira, Firmicutes. Corn-wheat rotation revealed that it was the most abundant phylum for Proteobacteria. The bacterial community was dominated by Proteobacteria, Firmicutes and Bacteroides strains in melon crops grown in a closed hydroponic system. Proteobacteria and Bacteroidetes dominated the soil bacterial communities in melon and cowpea mixed crop systems. Similarly, the results of the present study indicate that the soil bacterial communities of the four crop management treatments are predominantly dominated at the stem level by Proteobacteria, Planctomycetota, Actinobacteria and Acidobacteria, with different treatments affecting the Phylum Planctomycetophyta. Showed that excluding these had a significant impact on the soil bacterial community.

# CONCLUSION

In this study, we found that different treatments of watermelon crop specimens had significant effects on soil chemistry. Moreover, different cultivation patterns had a strong impact on the composition and diversity of bacterial and fungal communities in soil. The treatment of planting watermelon for 6 years and then planting wheat revealed higher fungal and bacterial community abundances compared to 7 years of watermelon planting. A crop rotation pattern for melons and wheat can be selected to promote long-term protection and health of the land. Additionally, further research is needed to explore techniques for managing watermelon plants to improve the quality and yield of this plant.

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