ISSN: 2688-8645

Research Progress on the Effectiveness of Increasing Organic Fertilizer Application in Regulating Soil Quality and Crop Quality in Orchards

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Abstract

This article reviews the research progress on the application of organic fertilizers instead of chemical fertilizers in fruit trees, summarizes the current situation and problems of crop fertilization, and focuses on the impact of combined application of organic fertilizers on soil quality, crop growth, and fruit quality. In response to the current problems in the application of organic fertilizers in China, future research directions were discussed.

Keywords

Organic Fertilizer; Soil Quality; Quality.

1. Research Background

Fertilizer, as the foundation of fruit tree production, has a significant effect on increasing fruit tree yield.[1] It not only provides nutrients for fruit trees, but also directly affects soil physical and chemical properties and biological characteristics. Reasonable use of fertilizers can increase fruit tree yield and improve fruit quality. However, due to the lack of guidance on fertilization techniques among farmers, they often apply chemical fertilizers year after year in production, especially in terms of nitrogen fertilizer input. Unreasonable fertilization not only causes soil nutrient imbalance, but also brings a series of environmental risks, such as soil compaction, eutrophication of water bodies, and atmospheric nitrogen deposition.[2] However, the rapid development of intensive agriculture has led to low levels of organic fertilizer input in farmland, while the amount of chemical fertilizer input continues to increase. However, the sustainability of chemical fertilizer efficiency is poor, and the effect of improving soil quality is not significant, and even side effects may occur. In addition, factors such as farming systems, field management, and extreme climate have exacerbated soil degradation, acidification, reduced organic matter content, and excessive heavy metals. The problem of declining farmland quality is becoming increasingly prominent. [3]Therefore, how to improve scientific fertilization technology to ensure the yield and quality of agricultural products while enhancing soil fertility and ensuring soil health has become an urgent key issue that needs to be addressed in current agricultural production.

ISSN: 2688-8645

2. Research Progress on the Application of Organic Fertilizers on Fruit Trees

2.1. Impact of Organic Fertilizer on Soil Quality

Compared with chemical fertilizers, bio organic fertilizers not only contain a large number of beneficial microorganisms to the soil and nutrients required by crops, but also maximize the benefits of beneficial microorganisms and reduce the damage of harmful organisms to crops. They can also improve soil fertility and soil enzyme activity, enrich soil microorganisms, and change the structure of soil microbial communities.[4] Soil microorganisms are an important component of soil ecosystems, and research has shown that soil microorganisms are involved in about 90% of soil reaction processes [5]. Soil enzymes, as catalysts for most soil transformation processes, are considered important indicators of soil quality and ecosystem health [6]. Liu Zengbing and others found that long-term high proportion substitution of chemical fertilizers with organic fertilizers can effectively improve the organic matter and nutrient content of soil. Zhu et al. [7] found that long-term continuous application of organic fertilizers can effectively improve the ecological environment of soil root micro domains, increase the richness of soil community structure, reduce the number of harmful fungi, and improve soil health.

2.2. Effects of Organic Fertilizer on Fruit Tree Growth

Compared with the application of chemical fertilizers alone, the use of bio organic fertilizers or organic fertilizers can enhance the tree vigor of Yangmei trees, increase mango and apple yields, and improve fruit quality. To meet the requirements of comprehensive crop nutrient management, replacing chemical fertilizers with organic fertilizers can not only ensure high and stable crop yields, but also effectively improve soil quality. Ye Shengjia et al. [8] found that reducing conventional nitrogen application rates by 60% and 40% for wheat and corn, respectively, and applying 3000 kg/hm2 of organic fertilizer each can maintain high productivity in the wheat corn rotation system.

2.3. The Effect of Organic Fertilizer on Fruit Quality

Fruit quality is an important indicator for evaluating the growth of fruit trees, and all quality indicators will affect people's consumption trends and market prices. [9]The quality of fruit is mainly determined by its inherent heritability, but external factors can also have a significant improvement effect on fruit quality. The reasons for this are mainly twofold: firstly, Yadav et al. [10] pointed out that organic fertilizers contain trace elements required for plant growth, which can be directly absorbed and utilized by fruit trees, thereby improving indicators such as single fruit weight and sugar acid ratio. The research results of Chang Xiaoxiao et al. on apple peaches showed that the single fruit weight of apple peaches treated with organic fertilizer was 232.35 g, which increased by 39.8% compared to the application of ordinary compound fertilizer. The research results of Chang Xiaoxiao et al. on apple peaches showed that the single fruit weight of apple peaches treated with organic fertilizer was 232.35 g, which increased by 39.8% compared to the application of ordinary compound fertilizer.

3. Existing Problems and Prospects

China has abundant and continuously increasing organic fertilizer resources, but the utilization rate is low. It is necessary to fully tap the potential of organic fertilizer resources for phosphorus supply, further promote the rational application of organic fertilizers, and strengthen the research and promotion of harmless technology in organic fertilizer production. The research and promotion of soil fertility improvement technology is of great significance for improving soil quality and establishing a scientific, green, and healthy soil crop production system.

ISSN: 2688-8645

However, unlike synthetic amendments and techniques such as optimizing planting systems that indirectly improve soil quality, organic fertilizers have significant advantages in weight loss and efficiency enhancement, optimizing plant growth, and improving soil fertility, which are more intuitive, comprehensive, and economical. Based on the current situation of excessive use of chemical fertilizers and significant shortage of organic fertilizers in China's grain crop production, it is of great significance to summarize and clarify the specific application techniques of organic fertilizers under different fertility conditions and the scientific compatibility effects with chemical fertilizers, in order to balance crop yield and quality as well as soil health cultivation.

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