Effects of microbial agents on soil properties in greenhouse complex

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Abstract. In this experiment, four different amounts of microbial fertilizers of 10, 20, 30, 40 g were used as treatments, and the amount of no added microbial fertilizers was used as a control to study the effects of microbial fertilizers on the physical and chemical properties of soil. The measured soil physical and chemical properties include soil bulk density, soil pH, and organic matter content to obtain the optimal application amount of microbial fertilizer to improve the soil.

Keywords: microbial fertilizer, soil bulk density, soil pH, soil organic matter

1. Introduction

Microbial fertilizer is a compound fertilizer rich in a variety of active substances. Most of them use agricultural product processing waste, such as corn syrup, mushroom residue and other fruit and vegetable residues as substrates for production. The fertilizer not only contains organic matter and beneficial biological bacteria, but also has various antioxidant substances, amino acids, etc. [1-2].

In order to increase the output of agricultural products to meet the high demand for high-quality agricultural products under the background of the era, agricultural producers have invested a large amount of pesticides and fertilizers, and long-term and unreasonable development of land has not only caused excessive pesticide residues in agricultural products, but also led to the problem of greenhouse soil. Problems such as salinization and continuous cropping obstacles violate the ecological principles of sustainable development. The application of microbial fertilizer can effectively improve the above problems. This article studies the impact of microbial fertilizer on the soil to provide guiding suggestions for agricultural production personnel [3-4].

2. Materials and methods

2.1. Materials

Compound microbial fertilizer, the soil in the glass greenhouse of Shenyang Institute of Technology

2.2. Experiment design and method

Four treatments were set up, 10 g, 20 g, 30 g, and 40 g of microbial bacterial fertilizer, and no bacterial fertilizer was added to the control group. Soil bulk density was measured 17 days and 21 days after treatment, and pH value and soil organic matter content were measured 21 days.
3. Results and Analysis

3.1. The influence of microbial fertilizer on soil bulk density
The results of the test are shown in Figure 1. In the soil where the microbial fertilizer has been applied, the soil volume is smaller than that of the control group without adding the bacterial fertilizer. The specific performance is that the soil bulk density varies with the bacterial fertilizer in the range of 10-30 g/L. The application rate increased and gradually decreased. Under the 30 g/L bacterial fertilizer dosage, the two measurement results were 0.76 and 0.72 g/cm³, respectively, which showed that the soil bulk density decreased slightly under the same treatment. The addition of bacterial fertilizer variable 14 After days, the specific performance is: the soil bulk density of the cultivated soil measured in the blank control group is higher than other test groups, including 30 g/L treatment and blank control group, 40 g/L treatment and blank control group, and 20 g/L treatment. It is significantly different from the blank control group. In the comparison between the treatments, the soil bulk density under the 30 g/L treatment was the smallest among the treatments, and the soil bulk density under the 10 g/L treatment was the largest, but the difference between the treatments was not significant.

21 days after adding the bacterial fertilizer variable, the performance between different treatments is: the soil bulk density of the cultivated soil measured in the blank control group is higher than that of the other test groups, among which the 30 g/L treatment and the blank control group, 40 g/L treatment. There are significant differences with the blank control group. In the comparison between the treatments, the soil bulk density under the 30 g/L treatment was the smallest among the treatments, the soil bulk density under the 40 g/L treatment was slightly higher than the 30 g/L treatment, and the soil bulk density under the 10 g/L treatment was the largest but each The differences between the treatments were not significant.

The two measurement results under the treatment of 30 g/L bacterial fertilizer amount were 0.76 and 0.72 g/cm³, which were significantly lower than the control group by 0.08~0.09 g/cm³. It shows that the bacterial fertilizer can reduce the soil bulk density, and the application rate of 30 g/L bacterial fertilizer can reduce the soil bulk density.

![Figure 1. The influence of microbial fertilizer on soil bulk density](image)

3.2. The influence of microbial fertilizer on soil pH
Compared with the control group without adding bacterial fertilizer, the pH value of the soil that has been applied with microbial fertilizer is higher than that in the blank control group, that is, when the amount of bacterial fertilizer is in the range of 10-40 g/L, the pH value in the soil is The value increases with the increase of the amount of bacterial fertilizer. The specific performance is: 30 g/L treatment and blank control group are significantly different, 40 g/L treatment and blank control group, 20 g/L treatment and blank control group, 10 g There are significant differences between the /L treatment and the blank control group; in the comparison between the treatments, 40 g/L treatment and
10 g/L treatment, 30 g/L treatment and 10 g/L treatment have significant differences, 40 g/L The pH value of the soil under the application rate of bacterial fertilizer was slightly higher than the 30 g/L treatment, and the effect was the best in each treatment group. The results show that the application of microbial fertilizer is beneficial to increase the soil pH, and the soil pH is the highest at the application rate of 40 g/L bacterial fertilizer.

Figure 2. The effect of microbial fertilizer on soil pH

3.3. The impact of microbial fertilizer on soil organic matter
Compared with the blank control group, the content of soil organic matter in each test group after treatment with the amount of bacterial fertilizer is higher than that of the control group. When the amount of bacterial fertilizer is in the range of 10-30 g/L, the content of organic matter in the soil varies with the amount of bacterial fertilizer. The increase of fertilizer dosage showed an increasing trend. Among them, the soil organic matter content under the treatment of 30 g/L bacterial fertilizer dosage was the highest, and the specific performance was 30 g/L treatment and blank control group, 40 g/L treatment and blank control group There are significant differences between the 20 g/L treatment and the blank control group, and the 10 g/L treatment and the blank control group; in the comparison between the treatments, the 30 g/L treatment and the 10 g/L treatment and the 30 g/L treatment There is a significant difference from 20 g/L, and the soil organic matter content is the highest under the 30 g/L bacterial fertilizer treatment, and the soil organic matter content is the lowest under the 10 g/L bacterial fertilizer treatment. The results show that the application of microbial fertilizer is beneficial to the increase of soil organic matter, and the application rate of 30 g/L bacterial fertilizer is most beneficial to the increase of the content of organic matter in the soil.

Figure 3. The effect of microbial fertilizer on soil organic matter
4. Conclusion
The test results showed that the soil bulk density was the smallest under the 30 g/L bacterial fertilizer dosage, and the soil organic matter content was the highest, and the soil pH reached the highest under the 40 g/L bacterial fertilizer dosage.

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