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# *Study on the Effect of EM Fungi on Horticultural Crops*

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***Keywords:*** EM Bacterial Agent; Horticultural Crops; Growth Rate; Resistance to Adversity

***Abstract:*** This article investigates the effects of EM fungicides on horticultural crops, and explores the mechanism of action and application effects of EM fungicides. Research has shown that EM fungicides can significantly increase the growth rate and yield of horticultural crops, improve soil quality, enhance crop resistance and quality, and also contribute to environmental protection and sustainable development. Therefore, the application of EM fungicides in the production of horticultural crops has high application value and promotion prospects.

## 1. Introduction

With the development of modern agriculture, farmers are also faced with many problems while improving crop yield, such as the decline of soil quality, the increasing difficulty of pest control, and the increasing use of chemical fertilizers and pesticides. Therefore, how to improve the yield and quality of crops and protect the environment has become a hot issue in the field of agriculture today. This article will explore the impact of EM fungicides on horticultural crops, analyze the mechanism of action and application effects of EM fungicides, in order to provide theoretical and practical guidance for the production of horticultural crops.

## 2. Basic characteristics and mechanism of action of EM bacterial agents

### 2.1. Composition of EM bacterial agent

EM microbiota, also known as Effective Microorganisms, is a biological preparation made by mixing and cultivating various beneficial microorganisms. The main components of EM microbiota typically include:

Photosynthetic bacteria: These bacteria can absorb sunlight and produce organic matter through photosynthesis. They can improve the soil environment and promote plant absorption of nutrients.

Lactic acid bacteria: Lactic acid bacteria can decompose organic matter, produce lactic acid, inhibit the growth of harmful microorganisms, and improve the disease resistance of crops.

Yeasts: Yeasts can produce growth hormones and antibiotics, stimulate plant growth, and inhibit the activity of harmful microorganisms.

Actinomycetes: Actinomycetes have a strong inhibitory effect on harmful microorganisms, while they can decompose organic matter and improve soil fertility.

Microbial nitrogen fixing bacteria: These bacteria can fix nitrogen in the atmosphere and convert it into a form that plants can absorb to improve soil fertility.

### 2.2. Mechanism of action of EM fungi

EM microbial agent is a biological fertilizer cultivated using beneficial microbial strains, where "EM" represents "Effective Microorganisms", or "Effective Microorganisms". The main components of EM microbial agents include lactic acid bacteria, photosynthetic bacteria, yeast, and actinomycetes. These microbial strains can interact with plants in the soil through symbiosis, antagonism, and growth promotion, so as to enhance crop disease resistance, and improve yield and quality. They can also help decompose harmful substances, accelerate organic matter decomposition, and promote plant growth and development.[1]

### 2.3. Scope of action of EM bacterial agent

EM fungicides are mainly used in fields such as agriculture, landscaping, and environmental governance. In the agricultural field, EM fungicides can be applied to the production of vegetables, fruits, tea, grains and other crops, and help to increase crop yield and quality, in order to improve soil quality, reduce the use of fertilizers and pesticides, and enhance crop resistance and quality. In the field of landscaping, EM fungicides can be applied to the maintenance of vegetation such as lawns, flowers, and green belts, so as to enhance plant resistance and growth ability, improve soil quality, and increase vegetation coverage, and beautifying effects. In the field of environmental governance, EM bacterial agents can be applied to the treatment of rivers, lakes, wastewater and other water bodies, degrading organic pollutants, reducing decay odors, to improve water quality and ecological environment.[2]

### 2.4. Usage of EM bacterial agents

It can be applied to soil. After mixing EM bacterial agents with water, they can be evenly spread on the soil surface or mixed into the soil, which can improve soil quality and promote crop growth. It can also be sprayed on crop leaves. After mixing EM bacteria with water, it can be evenly sprayed on crop leaves with spray, which can improve the nutrient absorption capacity and stress resistance of crops. It is also possible to irrigate the roots by mixing EM bacterial agents with water and using irrigation equipment to irrigate around the plant roots, which can promote root growth and increase plant nutrient absorption. It should be noted that the application amount of EM fungicides should be adjusted according to the needs of crops and soil conditions, as excessive or insufficient amounts can affect the effectiveness of the action. During use, attention should also be paid to controlling the amount of pesticides and fertilizers used to avoid affecting the survival and functioning of microorganisms. At the same time, the application of EM bacterial agents should be carried out during the appropriate growth period to avoid affecting crop growth and yield.

## 3. The application effect of EM fungi on horticultural crops

### 3.1. Decomposing organic matter to improve soil quality

Organic matter is one of the most important nutrient elements in soil, which is crucial for crop growth and soil health. Research shows that EM bacteria can promote the degradation and transformation of organic matter in soil. EM bacteria can use organic matter, such as plant residues, livestock manure, etc., to decompose and transform it into useful soil nutrients, such as ammonia nitrogen, nitrate, etc., so as to increase the number and diversity of microorganisms in soil, promote soil microbial activity, and increase the content of soil organic matter, not only enhance soil fertility, but also improve soil structure. At the same time, microorganisms such as lactic acid bacteria in EM

microbial agents can produce a large amount of organic acids, reduce soil acidity and alkalinity, and improve soil environment. Applying EM microbial agents in sandy soil can significantly increase soil organic matter content and improve soil quality. Specifically, microorganisms in EM inoculum can decompose organic matter, transform it into useful soil nutrients, and improve soil fertility. Microorganisms in EM inoculum can decompose organic matter, form stable humus, improve soil structure, soil aeration and water retention.

### 3.2. Improving the nutrient absorption capacity of plants

The microbial strains in EM agents can decompose organic matter in the soil and release nutrients required by plants such as nitrogen, phosphorus, and potassium. We can simultaneously promote root growth and nutrient absorption, increase the ability of crops to absorb and utilize nutrients in the soil. Research has shown that microorganisms in EM inoculants can produce a large amount of organic acids in the soil, which can lower the pH value of the soil and convert some insoluble nutrients (such as phosphorus, calcium, etc.) into easily soluble nutrients, making them more easily absorbed by plant roots. At the same time, organic acids can also stimulate the development of plant roots and enhance the plant's ability to absorb nutrients. EM bacteria can significantly increase the content of available phosphorus and available potassium in the soil, improve the content and activity of microorganisms in the soil, and increase the diversity of crop rhizosphere microorganisms. Microbial bacteria can also fix nitrogen in the air in the soil through nitrogen fixation to provide nitrogen nutrition for plants.

Some microorganisms in EM agents, such as photosynthetic bacteria, can produce plant hormones such as indoleacetic acid (IAA), which can stimulate plant cell division and elongation, promoting plant growth. At the same time, plant hormones can also regulate the growth rhythm of plants, making them more robust and improving their resistance to environmental pressure. The application of EM bacterial agents can promote the growth and nutrient absorption of their roots.

### 3.3. Enhancing the antioxidant capacity and stressing resistance of crops

EM agents contain some microbial strains that can promote the activation of the plant immune system, such as lactic acid bacteria and Bacillus. These microbial strains can stimulate crops to produce a series of immune related proteins, such as PR protein, antioxidant enzymes, etc., thereby enhancing the immune system of crops. EM inoculum contains rich antioxidant substances, such as superoxide dismutase, catalase, etc. These substances can eliminate free radicals in the body, reduce the damage of free radicals to cells, improve the antioxidant capacity of crops, and thus enhance their resistance to diseases and pests.

EM bacterial agents contain some microbial strains with antibacterial and antiviral effects, such as lactic acid bacteria and Bacillus. These microbial strains can inhibit the growth and reproduction of pathogenic microorganisms, to reduce their damage to crops and reducing the incidence of crop diseases. In addition, the microorganisms in EM fungicides can form a protective film inside and around plants, to increase their resistance to stress and reduce the damage caused by stress.

### 3.4. Improving crop growth speed and quality

EM microbial inoculants are a type of biological fertilizer with broad application prospects. The beneficial microorganisms in EM microbial inoculants can also interact with crop root microorganisms to form an ecosystem and increase the crop's ability to absorb and utilize nutrients in the soil. In this way, the roots of crops can better absorb nutrients from the soil, enhance their growth and development ability, and improve yield and quality. Research has shown that the application of EM fungicides can significantly improve the growth rate and yield of horticultural crops. For example,

Japanese researchers conducted experiments on crops such as tomatoes and chili peppers and found that the application of EM fungicides can increase yield by about 20%. In addition, EM fungicides can also promote the quality improvement of crops, increase the sugar content and vitamin content of fruits, and enhance the economic value of crops.

## 4. Precautions for the use of EM fungicides in horticultural crops

### 4.1. Determining the appropriate application time and temperature

The application time of EM bacterial agents should be at an appropriate growth period and temperature to avoid affecting crop growth and yield. The suitable application time for different crops may vary, and should be carried out during the critical period of horticultural crop growth and development. It is usually recommended to apply EM fungicides during the stage of plant growth and development. Generally, spring and autumn are the best time to apply EM fungicides. EM bacterial agents have a narrow temperature adaptation range and are usually suitable for use in environments with temperatures above 15 ℃ and humidity around 70%. When using, the appropriate time and temperature should be selected based on the above considerations. Generally speaking, the application should be carried out during clear weather and low wind speeds, and avoid use in high temperatures or extremely dry environments.

### 4.2. Avoiding excessive mixing with pesticides and fertilizers

When applying EM bacterial agents, attention should also be paid to controlling the amount of pesticides and fertilizers used to avoid affecting the survival and effectiveness of microorganisms. EM fungicides can be used together with fertilizers and pesticides, but they should be controlled in moderation. It is recommended not to use pesticides and fertilizers within 1-2 days before and after the application of EM bacterial agents. Avoid using pesticides and fertilizers at the same time and in the same area to avoid excessive mixing. If necessary, detect the soil nutrient content in advance, understand the nutrient demand of plants and soil fertility, and adjust the fertilizer dosage and time according to actual needs to ensure the survival and function of microorganisms.

### 4.3. Controlling the application amount and frequency

The application amount of EM bacterial agents should be adjusted according to the needs of crops and soil conditions. Excessive or insufficient amount can affect the effectiveness of the action. Different types and growth periods of crops have different nutrient requirements. Therefore, the appropriate application amount and frequency should be determined based on the crop type and growth period. During the use process, the growth status of crops should be continuously observed, and the application amount and frequency should be adjusted in a timely manner according to the actual situation and needs. At the same time, before using EM inoculants, it is necessary to understand the soil nutrient content and pH value and other indicators, and determine the appropriate amount of application according to the test results. Generally, it is recommended that the amount of application should be 20-30 liters per mu to avoid excessive application, leading to changes in soil pH value and the occurrence of plant disease. In addition, the frequency of application should also be controlled within an appropriate range, as excessive or insufficient frequency can affect the effectiveness. The actual application frequency is usually once a quarter or once a month, and the specific application frequency should be determined based on the needs and actual situation of the crop. For example, fruit trees require more nutrients during the flowering and fruit ripening stages, so EM fungicides can be used at these stages. Generally, they should be used once a month. If the soil condition is poor, the

frequency of use can be increased; Flowers also have a relatively low demand for soil nutrients, so the frequency of using EM inoculants can be appropriately reduced. Generally, it is sufficient to use EM inoculants once every two months; Fruit and vegetable crops, such as strawberries and tomatoes, due to their short growth cycle, can be used once a month during important stages such as transplanting, before flowering, and before fruit ripening.

### 4.4. Mixing evenly and taking personal protective measures before use

During the application of EM bacterial agents, attention should be paid to uniform mixing. Before use, the EM bacterial agent should be mixed evenly with an appropriate amount of water before application to avoid sedimentation or stratification, which may affect the effectiveness of use. The specific mixing ratio and method should be operated according to the product manual. Generally speaking, an appropriate amount of EM bacterial agent can be poured into a bucket of water, and then stirred evenly to ensure that the bacterial agent can be evenly distributed in the water. It is recommended to use a stirrer or stirring rod to thoroughly stir and mix. During the use of EM bacteria, personal protection should be taken into account. EM bacteria belong to microbial products and should not come into direct contact with skin and eyes. If they come into contact, they should be immediately rinsed with water and seek medical attention in a timely manner. It is recommended to wear masks, gloves, protective clothing and other personal protective equipment during application. When operating bacterial agents, ensure that the operating area is well ventilated and avoid operating in a closed space. After operation, wash hands, thoroughly clean clothes, seal unused bacterial agents and store them in a dry, cool and ventilated place.

## 5. Conclusion

EM microbial agent is a widely used biological fertilizer, and its mechanism of action and application effect have been widely studied and verified. In the production of horticultural crops, EM fungicides can significantly increase the growth rate and yield of crops, improve soil quality, enhance crop resistance and quality, and also contribute to environmental protection and sustainable development. Therefore, EM fungicides have high application value and promotion prospects in horticultural crop production. However, when using EM bacterial agents, it is also necessary to pay attention to mastering the correct usage methods and precautions to fully exert their effects.

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