Study the efficiency of antibiotics produced by microorganisms in the soil around a cassava factory

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Abstract

The research project on studying the efficiency of antibiotics substances produced by soil bacteria around the cassava factory aims to investigate the potential of generating bioactive substances from soil around the cassava factory. This involves culturing separately isolated bacteria from the bioactive substances in the same culture dish as Trichophyton rubrum, a fungus found in toenails. The method includes streaking the isolated bacteria from the soil into two parallel straight lines, 2 cm apart from the center of the culture dish, then inoculating Trichophyton rubrum at the center of the culture dish, followed by an incubation period of approximately 24-48 hours. The experimental results revealed that the bacteria isolated from the soil around the cassava factory were effective in inhibiting Trichophyton rubrum growth. Another round of experiments was conducted to obtain antibiotics that are effective in inhibiting Trichophyton rubrum from the soil around the cassava factory.

1. Introduction

Nail fungus typically doesn't present any symptoms, although some patients may experience redness and swelling around the nails, particularly in fingers exposed to frequent moisture, caused by yeast infections. However, most patients facing treatment challenges often have secondary nail fungus infections resulting from true fungal pathogens or opportunistic fungi, which may be asymptomatic. Some individuals may leave these infections untreated for many years until significant nail changes prompt them to seek medical attention, or for other reasons, they end up consulting a dermatologist due to the discovery of abnormal nails. The disease typically affects toenails more frequently than fingernails and is more common in adults than children, especially in older adults who may have other concurrent conditions. Some patients may also have concurrent skin fungal infections, such as foot fungus or other fungal infections that spread widely. Additionally, some may experience complications following fungal infections, such as thickened or inflamed nails, or secondary bacterial infections. The observed characteristics of nail fungus vary significantly, but notably, the number of affected nails tends to be limited, with approximately 1 to 3 nails typically affected. Infected nails may exhibit thickening, accumulation of debris beneath the nail, changes in nail color, or separation of the nail from the nail bed, often resulting in pits or voids beneath the nail. Fungi are small, living organisms capable of surviving without sunlight and often thrive in warm, humid environments. Due to their small size, they are difficult to see with the naked eye and can enter the body through small wounds or gaps between the nails and the nail bed. While some types of fungi are beneficial, others are harmful to the body. The primary groups of fungi responsible for nail infections are Dermatophytes, which can affect nails in individuals of all ages and genders. Certain factors or behaviors increase the risk of nail fungus infection. Therefore, the researchers conducted experiments to identify bacteria effective in inhibiting foot fungus from the soil around cassava factories. Cassava is a major economic crop, ranking third in terms of cultivation area in Kalasin Province, where there are several cassava factories. Additionally, soil from cassava factories was chosen because these facilities may use chemical substances, which could potentially make soil bacteria resilient to certain chemicals, thereby enhancing their strength and ability to produce antibiotics substances.

1.2 Goal of the Project

To separate microorganisms from the soil around the cassava factory. and to study the ability to create antibiotics from the soil around the cassava factory

2. Body of paper

2.1 Method and Experimental

1.) Soil dilution around the cassava factory: Take 10 grams of soil from the desired area around the cassava factory and place it into a flask containing 100 mL of sterilized water to kill any pathogens (resulting in a soil solution diluted at a ratio of 1:10). Shake the soil solution, then allow the flask to settle until the suspended soil particles begin to settle, and use a pipette to extract 10 mL of the soil solution. Dilute it with 100 mL of sterilized boiled water to kill pathogens (resulting in a soil solution diluted at a ratio of 1:100). Mix well and continue diluting in the same manner until achieving a soil solution diluted at a ratio of 1:1000. Use a pipette to extract 1 mL of the soil solution diluted at ratios of 1:100 and 1:1000, and place them onto the surface of the culture medium. Incubate the plates in an incubator at room temperature for 2 days before proceeding to the next step.

2.) Testing the efficacy of bioactive substance production by bacteria isolated from soil around the cassava factory: Inoculate bacteria suspected of having antibacterial properties onto culture plates using streaking, with two parallel lines spaced 2 cm apart from the center of the culture plate. Incubate the plates at 37 degrees Celsius for 24 hours, or until the bacteria grow sufficiently to produce bioactive substances. Then, inoculate Trichophyton rubrum onto the same culture plates alongside the bacteria producing bioactive substances. Incubate the plates for approximately 24-48 hours at 30 degrees Celsius. Afterward, examine the growth of the tested bacteria and observe if any of them are unable to grow near the colonies of bacteria producing bioactive substances. This indicates the efficacy of the bioactive substances produced by the tested bacteria in inhibiting the growth of the tested pathogens

3. Discussion

From the experiment of inhibiting Trichophyton rubrum using bacteria from soil around the cassava factory in Kalasin Province, 10 types of bacteria were found, namely f1-10. In the experiment testing the efficacy of bacteria found in the soil around the cassava factory, all 10 types were evaluated, and it was found that two types of bacteria, namely f1 and f8, were effective in inhibiting nail fungus. These two types of bacteria were tested three times each and were able to inhibit the fungus in all three trials. However, bacteria f2, f3, f4, f5, f6, f7, f9, and f10 were found to be ineffective in inhibiting the fungus in all three trials. The bacteria that were effective in inhibiting the fungus were found in soil with the following properties:

Nutrient levels:

Nitrogen (N): 50 ppm

Phosphorus (P): 5 ppm

Potassium (K): 50 ppm

Soil pH: 7.4

Moisture content: 10%

5. Conclusion

From the experiment, it was found that the Antibiotic produced by bacteria in the soil around the cassava factory, when cultured on the same culture plate as Trichophyton rubrum fungus, by streaking two parallel lines 2 cm apart from the center of the culture plate, and incubated at 37 degrees Celsius for 24 hours or until the fungus grew, enabled the fungus to produce bioactive substances. Subsequently, the Trichophyton rubrum fungus was cultured on the same plate as the bacteria that produce bioactive substances, by inoculating the fungus at the center of the culture plate and then incubating the plate for approximately 24-48 hours at 30 degrees Celsius. From the experiment, it was found that there were two types of bioactive substances produced by bacteria in the soil around the cassava factory that could inhibit the growth of Trichophyton rubrum fungus. The experiment was repeated two more times for data validation and accuracy

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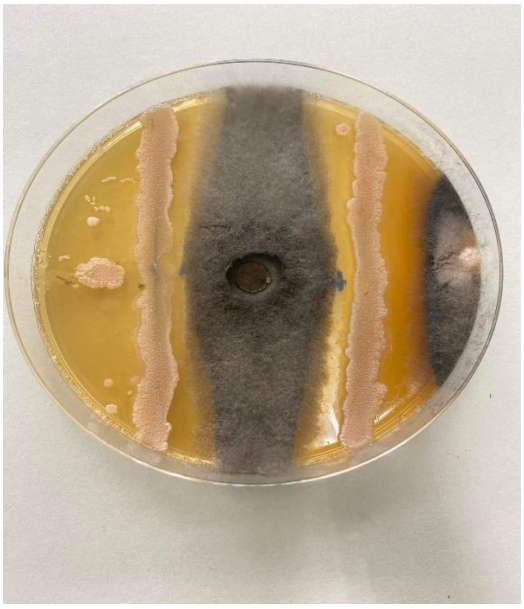
References

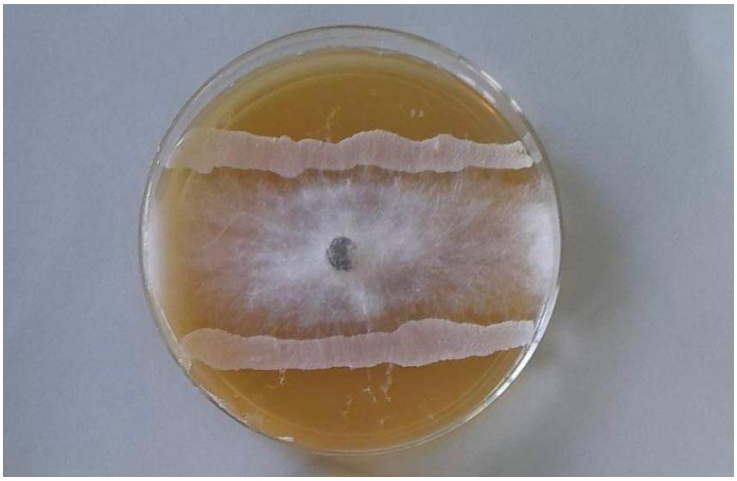
https://www.si.mahidol.ac.th/th/healthdetail.asp?aid=1302

https://www.bumrungrad.com/th/health-blog/december-2023/onychomycosis

Appendix



The test sample No. 1 （F1）



The test sample No. 8 （F8）