

Soil Properties and the Amount per Group of Filamentous Fungus

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Hypothesis • Purpose

[Hypothesis] The filamentous fungus' amount and genus are varied in different properties of the soil

[Purpose] Examine the relationship between ① and ②

① Filamentous fungus' population per genus in different soils ② The properties of soil (ex. Color, Water retention capacity, pH)

Procedure

Experiment 1 : Cultivate filamentous fungi and determine the number of each genus

Preliminary experiment

- Soil sampling： Soil samples were taken from two locations at 5 cm depth from the ground
- Dilution： Soil and sterile water were mixed, and 5 different dilutions were prepared from 10² times to 10⁶ times
- Preparation of culture media (YPD)： YPD medium was prepared in 10 petri dishes of 60 mm in diameter
- Cultivation of filamentous fungus： Spread 60 μL of dilution solution and cultivated in an incubator at 27 °C → 10² was found to be the most appropriate

Experiment

- Same method as in the preliminary experiment (Changes)

Soil samples were collected at five locations / Dilution ratio was 10² times / Prepared 20 Petri dishes, 4 for each location / Spread 100 μL of diluted solution in a petri dish of 90 mm diameter / Cultivated for 3 days

- Results were measured and made into graphs： Counted the amount of colonies using a binocular-stereomicroscope. Observed a proportion of the colonies under an optical microscope, as well as through articles and books, to identify the types(genus) → the number of colonies per genus were also taken into consideration

Experiment 2: Determining the characteristics of each soil

a) Color discrimination

identified the color of the soil using an app called color helper

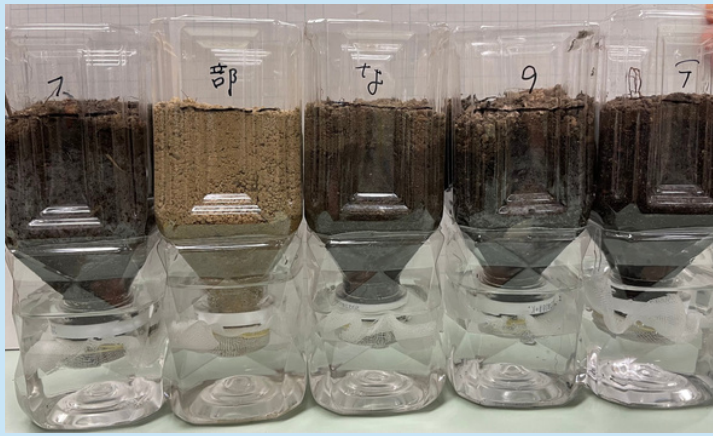
b) Water retention measurement

- Device creation： Used plastic bottles to create 10 devices(five 150 mL bottles and five 250 mL bottles), also with gauze and rubber bands
- Soil drying： Heated soil in a microwave at 500 W for 10 min
- Water absorption measurement： Soaked the bottom of the device in water overnight for full absorption of the soil. The weight of the entire device is compared before and after to measure the absorption of water.
- Calculation and graphing water holding capacity： Calculated the water holding capacity (=water retention) as the amount of water absorbed per 100 mL of the soil and determined the average results of the two experiments

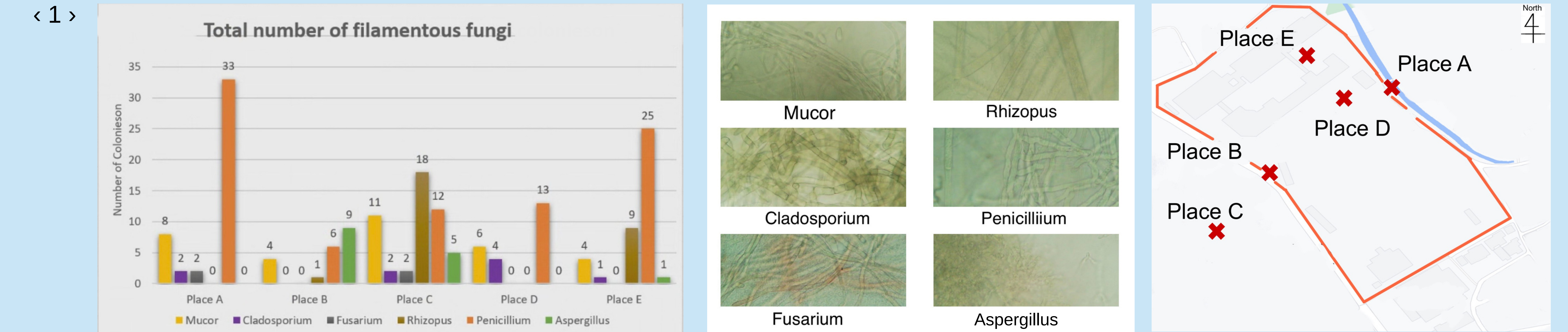
c) pH measurement

- Preparation of the dilution solution： Mixed the dry soil in step b) with distilled water at a ratio of 2:5 (soil : water) and prepared the supernatant solution
- pH result measurement and graphed

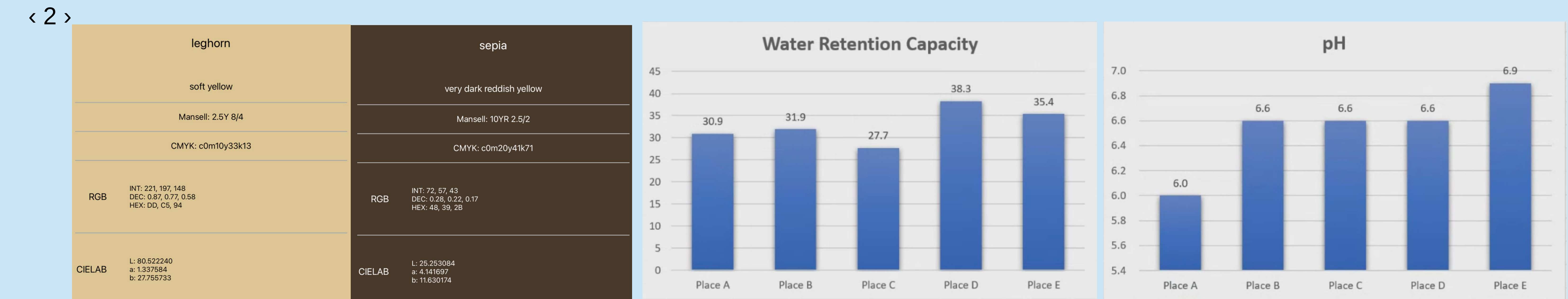
Self-made water retention measurement device ！



Result



Total number of genus of filamentous fungi in different measurement sites Microscope pictures by filamentous fungi type The map of 5 places in the experiment



Left → Back of club room / Right → Four other locations Water retention capacity of soil by measured value pH value of soil dilution solution by measurement site

Referenced the application "Color Helper"

Discussion

From the table at right we conclude the following statements:

- Mucor and Rhizopus inhabit soils with relatively lower water retention capacity.
- Cladosporium inhabits soils with relatively higher water retention capacity.
- Cladosporium inhabits soils with high water retention capacity.
- Fusarium inhabits leghorn-colored soils.
- Fusarium inhabits slightly acidic soils with relatively lower water retention capacity.
- (The terminologies of fungus above are all genus)

References

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The properties of soil

Place	Color	pH	Water Retention	Represented genus name
Place A	Sepia	Mild acidity	Slightly low	Penicillium (Fusarium)
Place B	Leghorn	Slightly acidic	Middle	Aspergillus
Place C	Sepia	Slightly acidic	Low	Mucor Rhizopus (Fusarium)
Place D	Sepia	Slightly Acidic	High	Cladosporium
Place E	Sepia	Neutrality	Slightly high	