

Comparison of the microbes contained in the water and soil sample of BaiLu Park

Introduction

There are many water bodies inside BaiLu Park. I collected 3 different water samples from 3 sources: stream in the BaiLu Park, DuShu Lake and Lotus Pond. And soil sample from the Lotus Pond and DuShu Lake I hope to determine the differences in the microbes contained in these 3 water samples.

Abstract

I compared microbes in BaiLu Park from 3 sources via 16s sequencing.

Methods & Materials

- Collect water samples and soil samples from different sources
- Use vacuum filtration set up to capture microbes onto membrane filters
- Then cut the filter paper and using the QIAGEN DNeasy Powersoil Pro Kit to extract genomic DNA. Reagents CD1, CD2, CD3,C5, C6, EA , PowerBead tubes and spin columns are used in this experiment.
- After that , I did Metabarcoding with 16s Barcoding kit with replicates
 - Use barcoded primers from extracted DNA to amplify 16s gene
 - Check PCR product by gel electrophoresis
 - Measure and adjust the DNA concentration
 - Preparations for Flowing Cell Priming and Loading

Results

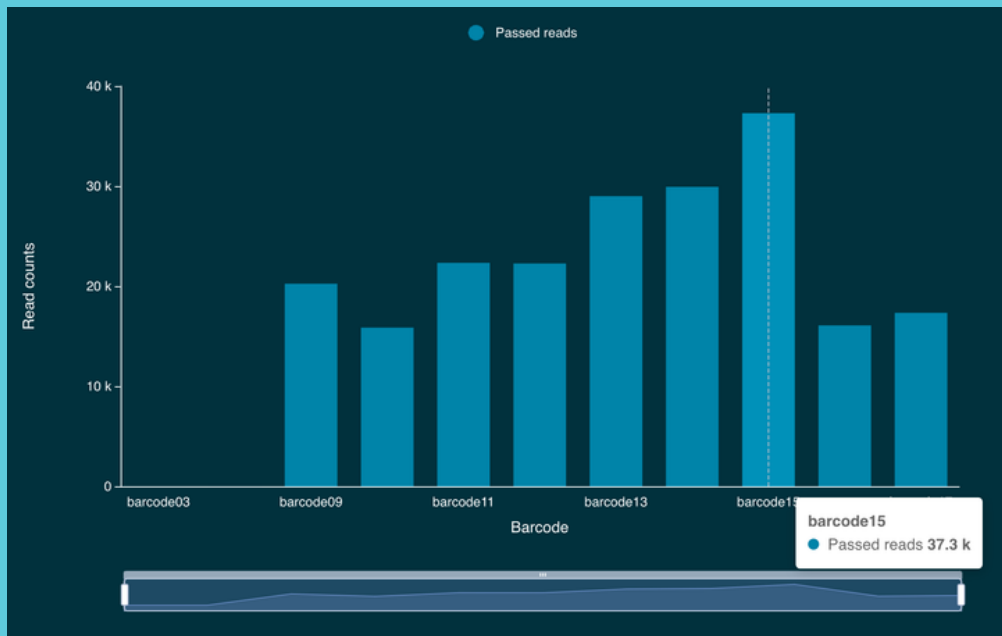


Fig 1 is the passed read for barcodes from the flow cell.

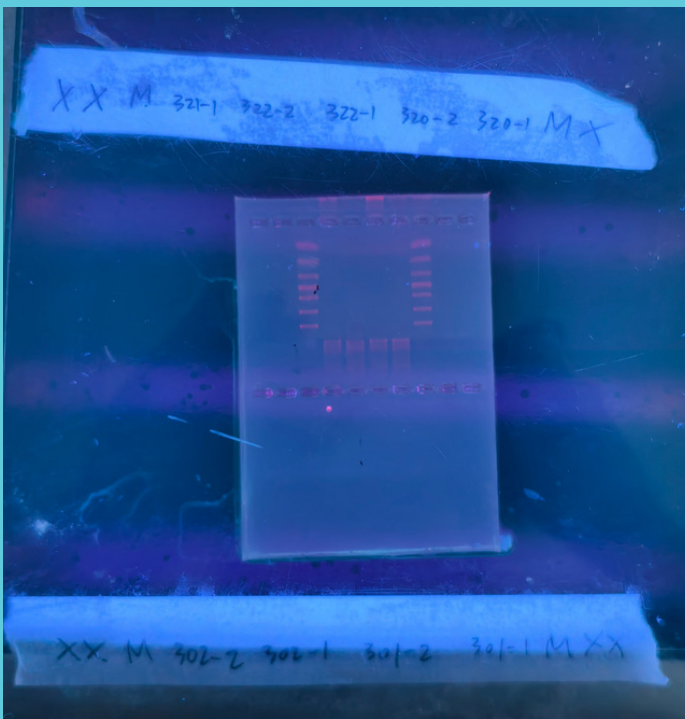


Fig 2 is a example of gel electrophoresis

Result analysis

Then we use EPI2ME to visualize the results

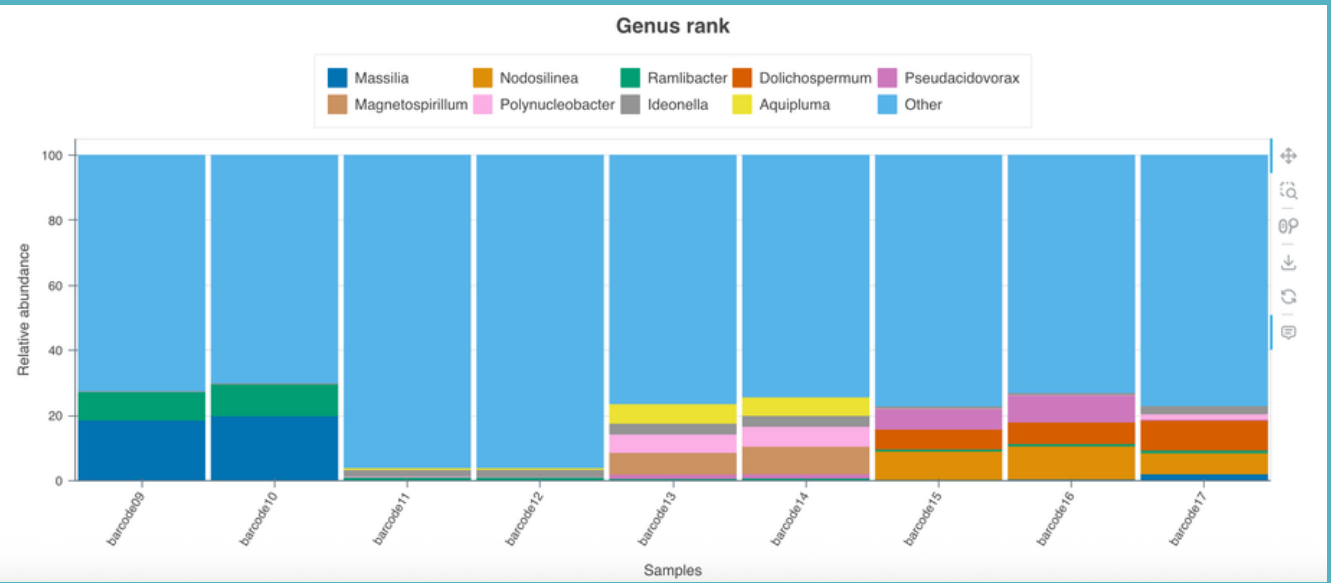


Fig 3 shows the microbes classified in genus

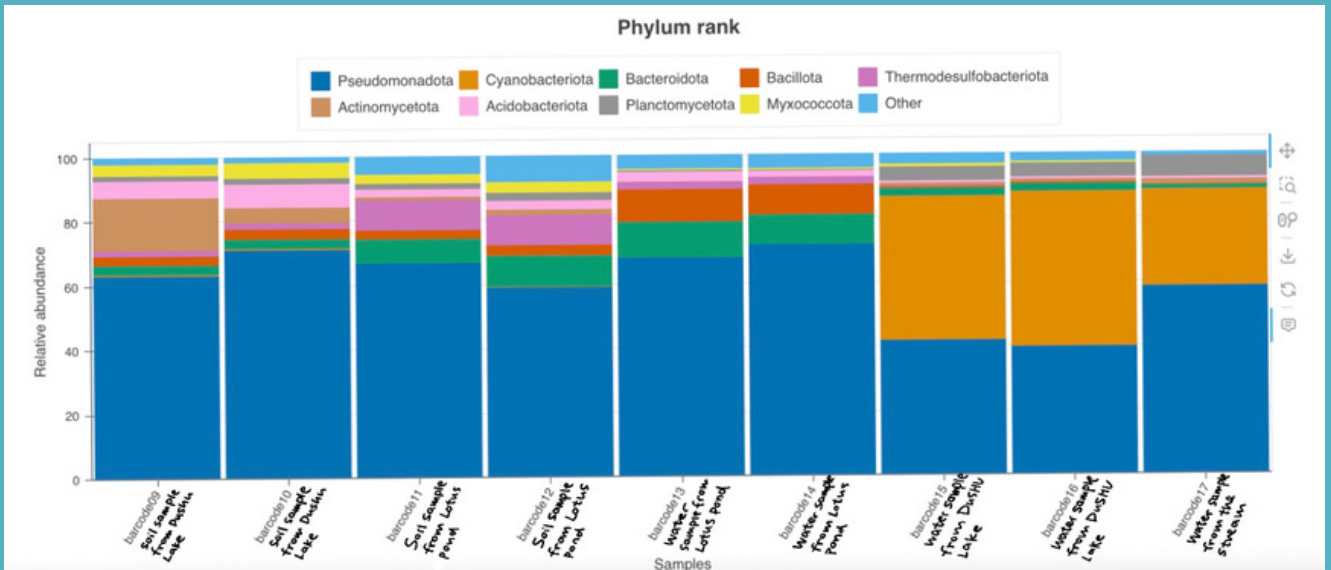


Fig 4 shows the microbes classified by phylum

PRESENCE OF MICROBES	Pseudomonadota	Cyanobacteriota	Bacteroidota	Bacillota	Thermodesulfobacteriota	Actinomycetota	Acidobacteriota	Planctomycetota	Myxococcota
BARCODE 9&10 DuShu Lake soil sample	✓		✓	✓	✓	✓	✓	✓	✓
BARCODE 11&12 Lotus pond soil sample	✓		✓	✓	✓	✓	✓	✓	✓
BARCODE 13&14 Lotus pond water sample	✓		✓	✓	✓		✓		✓
BARCODE 15&16 DuShu Lake water sample	✓	✓	✓	✓		✓	✓	✓	✓
BARCODE 17 Stream water sample	✓	✓	✓	✓		✓	✓	✓	

Fig 5 is a chart I made for comparison of phylum in samples

I found out that all 9 samples contain:

- Pseudomonadota (a large, diverse bacterial group that commonly dominate in soil and water samples, responsible for carbon and nitrogen cycles.)
- Bacteroidota (major phylum for Gram-negative bacteria. They breaks down complex carbohydrates.)

If both Bacteroidota and Pseudomonadota were found in the same place, this indicates that the is a complete decompose system.

References

Title: Functional diversity of soil microbial communities increases with ecosystem development

Source: Natural Communications

Author:

[Tord Ranheim Sveen](#), [Maria Viketoft](#), [Jan Bengtsson](#), [Joachim Strengbom](#), [Justine Lejoly](#), [Franz Buegger](#), [Karin Pritsch](#), [Joachim Fritscher](#), [Falk Hildebrand](#), [Ernest Osburn](#), [S. Emilia Hannula](#) & [Mo Bahram](#)

Citation:

“ Soil microbes constitute the largest pool of terrestrial diversity and undergo gradual changes in response to changing resource quality and soil properties during succession.”

Discussion:

i have learnt a lot of things , such as how to do nanopore sequencing and how to use website like DNA Subway. Although my gel electrophoresis technique needs improvement , bur I think there will be progress in the future.

Acknowledgement:

- Xinyue Wang
- David Micklos

But there are many difference between the microbes each barcode contain:

For barcode15,16and 17, they contain Cyanobacteriota that doe not present in rest of the barcodes. Cyanobacteriota are photosynthetic bacteria that can produce organic carbon via photosynthesis and supply nutrients to other bacteria.

Only barcode 9 and 10 contain relatively greater percentage of Actinomycetota.

They are soil bacteria mainly present in dry and poor nutrient soil.Actinomycetota can decompose compound like lignin and produce antibiotics.

Thermodesulfobacteriota (bacterias that only work in oxygen-depleted zone, this indicates that soil sample are collected from anaerobic microenvironment (water accumulation, compacted soil layer) in certain areas.)present in barcode 9,10,11,12,13,14. Barcode 12 and 13 have highest percentage of Thermodesulfobacteriota about 9.35%.

Barcode 13 and 14 contain highest percentage of Bacillota about10.15%, but with absence of planctomycetota compared to rest of barcodes. Bacillota are common soil bacteria that have high tolerance to extreme temperatures and dryness by forming endospore

Planctomycetota decompose complex polysaccharides and engage carbon cycle. The presence of Planctomycetota shows that the soil sample have various carbon decomposition pathways.