

A citizen science project to investigate environmental yeasts in urban soils (FungiSol)

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INTRODUCTION

Although recent studies showed that several yeasts usually considered to be human commensals can also evolve in the environment [1], its role as a reservoir of pathogenic yeasts is largely unexplored [2]. To move forward, we aimed to set up a citizen science project related to yeast biodiversity in urban soils.



MATERIALS & METHODS

- ✓ Citizen science project (January-June 2023)
- ✓ Four schools (Nantes, France) - 128 kids involved (10 to 16 years)
- ✓ Three meetings at each school to explain and set up the protocol and identify sampling sites
- ✓ Two soil samples per kid (256 samples)
- ✓ Processing of the samples, using a unique protocol, adapted from [3]
- ✓ Mycological identification of each distinct phenotype

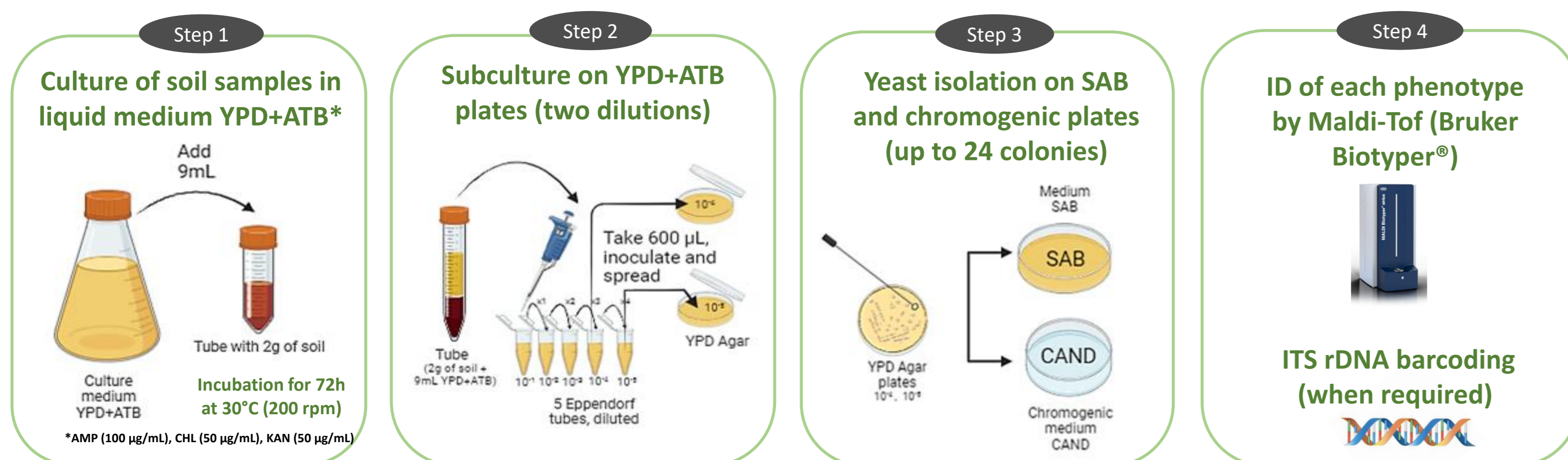
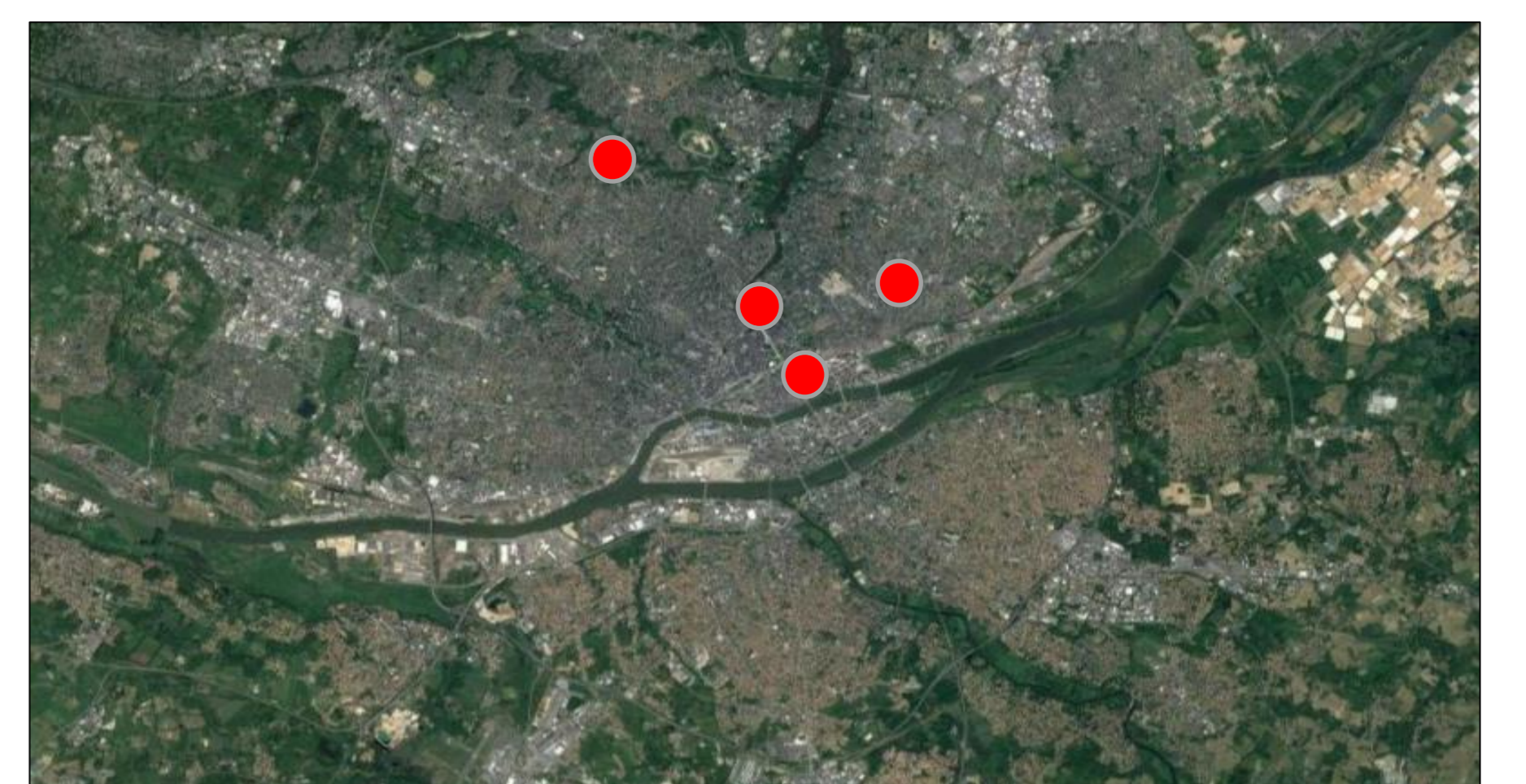


Figure 1 Overview of the workflow for isolating yeasts from soil samples



Figure 2 Kids teamworking to collect the samples in school yards

Figure 3 Location of each school enrolled in the project



RESULTS

- ✓ Yeasts isolates in half of the samples (n = 159, 62%). 2042 colonies grown in cultures (216 phenotypes)
- ✓ 46 distinct species (27 genera). Most prevalent species: *Torulaspota delbrueckii* and *Hanseniaspora uvarum*
- ✓ Several human opportunistic yeasts: *C. tropicalis*, *P. kudriavzevii*, *K. marxianus*, *N. glabratus* and *C. lusitanae*...
- ✓ Species distribution differed between schools
- ✓ 2 isolates belonging to new yeast species

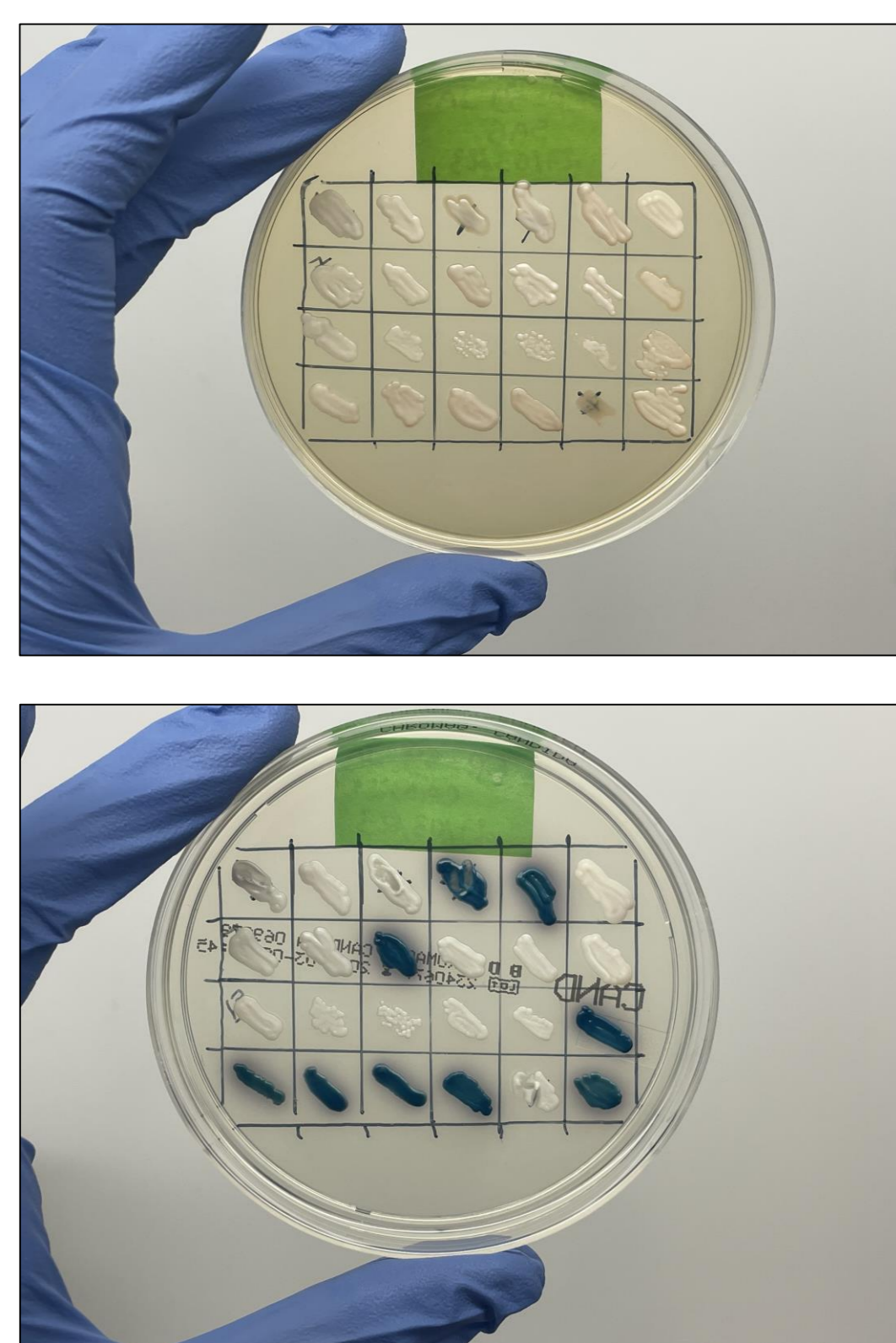


Figure 4 Subculturing yeasts on different media facilitates the discrimination of phenotypes (top panel, YPD; bottom, chromogenic media)

Table 1 Overview of the diversity of yeast species identified from soil samples

Debriefing of the project

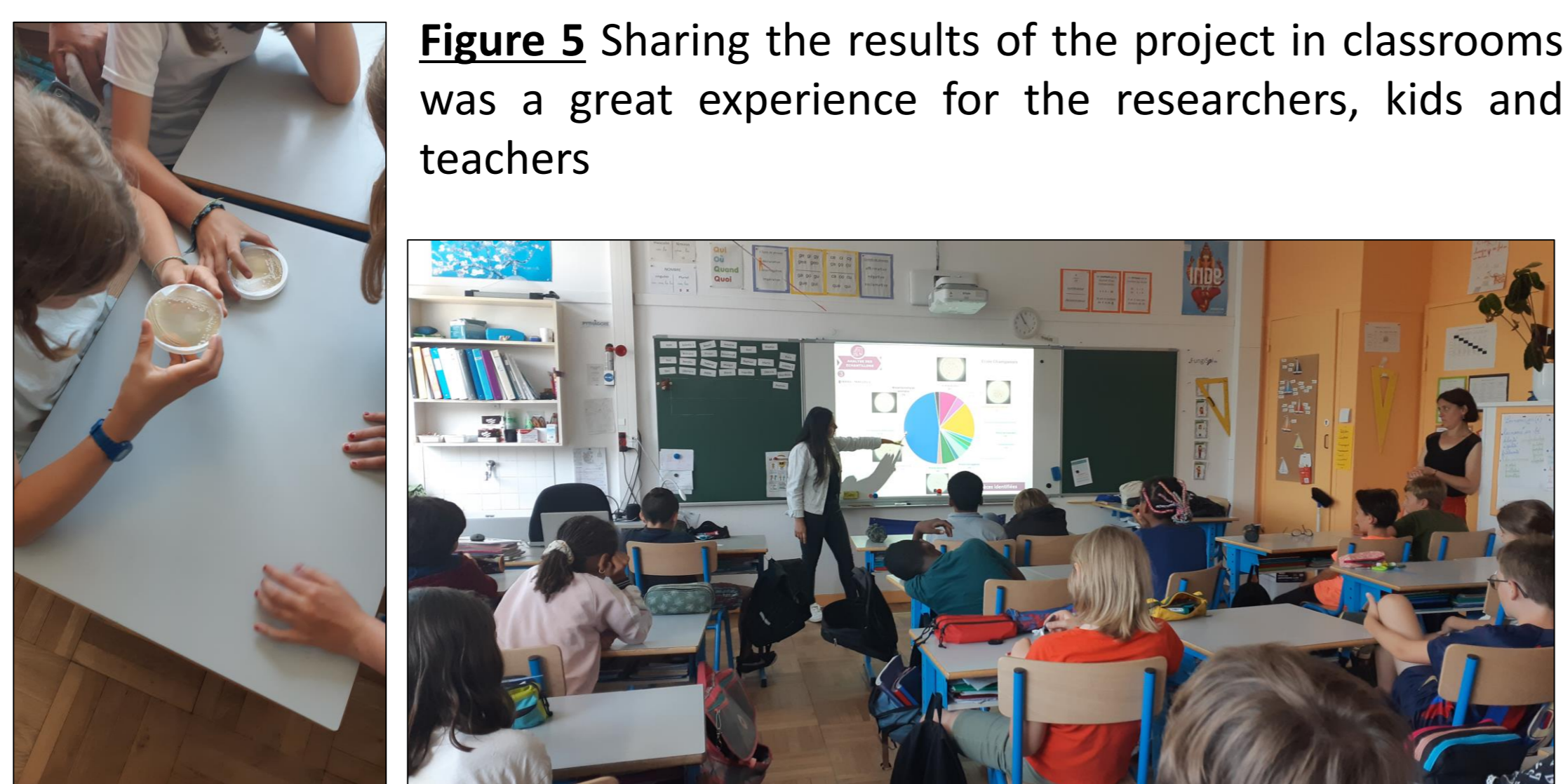


Figure 5 Sharing the results of the project in classrooms was a great experience for the researchers, kids and teachers

CONCLUSIONS

Bringing citizens and researchers on this topic was both an opportunity to raise public awareness on fungi and medical mycology and a mean of speeding up research in this field. Our preliminary findings underline the role of urban soils as a reservoir of opportunistic yeasts along with the isolation of new yeast species. Further experiments will explore their antifungal susceptibility.

Bibliography

- [1] Opulente *et al.*, FEMS Yeast Res. 2019 May 1;19(3):foz032;
[2] Morio F., FEMS Yeast Res. 2020 Feb 1;20(1):foz080;
[3] Sylvester *et al.*, FEMS Yeast Res. 2015 May;15(3):fov002.

Fundings

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Genus	Species	Total (n=)	Nb of isolates per school				
			School 1 (n=76)	School 2 (n=51)	School 3 (n=61)	School 4 (n=68)	
<i>Barnettozyma</i>	<i>californica</i>	21	16	2	-	3	
<i>Blastobotrys</i>	<i>vanleenenianus</i>	1	1	-	-	-	
<i>Candida</i>	<i>boidinii</i>	10	5	4	1	-	
	<i>pseudolambica</i>	4	3	-	-	1	
	<i>railensis</i>	2	-	1	1	-	
	<i>subhashii</i>	11	7	2	1	1	
	<i>tropicalis</i>	13	8	2	-	3	
<i>Clavispora</i>	<i>lusitanae</i>	2	-	-	-	2	
<i>Cutaneotrichosporon</i>	<i>dermatis</i>	1	-	-	-	1	
	<i>moniliforme</i>	4	1	2	1	-	
<i>Cyberlindnera</i>	<i>fabianii</i>	1	-	-	-	1	
	<i>saturnus s.l</i>	6	5	-	-	1	
<i>Debaryomyces</i>	<i>hansenii s.l.</i>	16	8	5	3	-	
	sp.	1	-	-	1	-	
<i>Diutina</i>	<i>catenulata</i>	1	-	-	-	1	
<i>Hanseniaspora</i>	<i>uvarum</i>	25	14	8	1	2	
<i>Hypopichia</i>	<i>homilentoma</i>	1	-	1	-	-	
<i>Kazachstania</i>	<i>servazii</i>	4	2	-	-	2	
	<i>telluris</i>	1	-	-	-	1	
<i>Kluyveromyces</i>	<i>dobzhanskii</i>	6	-	-	6	-	
	<i>lactis</i>	2	-	-	1	1	
	<i>marxianus</i>	11	-	-	1	10	
	<i>thermotolerans</i>	6	-	-	6	-	
<i>Lachancea</i>	<i>pulcherrima</i>	10	4	1	2	3	
<i>Nakaseomyces</i>	<i>glabrata</i>	1	1	-	-	-	
<i>Ogataea</i>	<i>methanolica</i>	1	-	-	1	-	
<i>Papiliotrema</i>	<i>laurentii</i>	2	1	-	1	-	
<i>Pichia</i>	<i>fermentans</i>	6	2	1	-	3	
	<i>kluveri</i>	2	-	2	-	-	
	<i>kudriavzevii</i>	4	-	-	-	4	
	<i>manshurica</i>	1	1	-	-	-	
	<i>menbranifaciens</i>	6	3	2	1	-	
	<i>norvegensis</i>	1	-	1	-	-	
	sp.	1	1	-	-	-	
	<i>terricola</i>	7	3	3	1	-	
	<i>Rhodotorula</i>	<i>kratochvilovae</i>	1	1	-	-	-
	<i>Saccharomyces</i>	<i>paradoxus</i>	10	6	-	3	1
<i>Saccharomycopsis</i>	<i>schoenii</i>	1	1	-	-	-	
<i>Saturnispora</i>	sp.	4	-	1	-	3	
<i>Schwanniomyces</i>	<i>occidentalis</i>	3	-	-	3	-	
	sp.	4	-	4	1	1	
	<i>vanrijiae s.l.</i>	1	1	-	-	-	
<i>Torulaspota</i>	<i>delbrueckii</i>	82	31	22	6	23	
<i>Vanrija</i>	<i>humicola</i>	1	-	-	1	-	
<i>Wickerhamomyces</i>	<i>anomalous</i>	5	3	1	1	-	
<i>Yamadazyma</i>	<i>mexicana</i>	1	-	-	-	1	
Total		305	104	59	43	64	
	Putative new species	2	2	-	-	-	