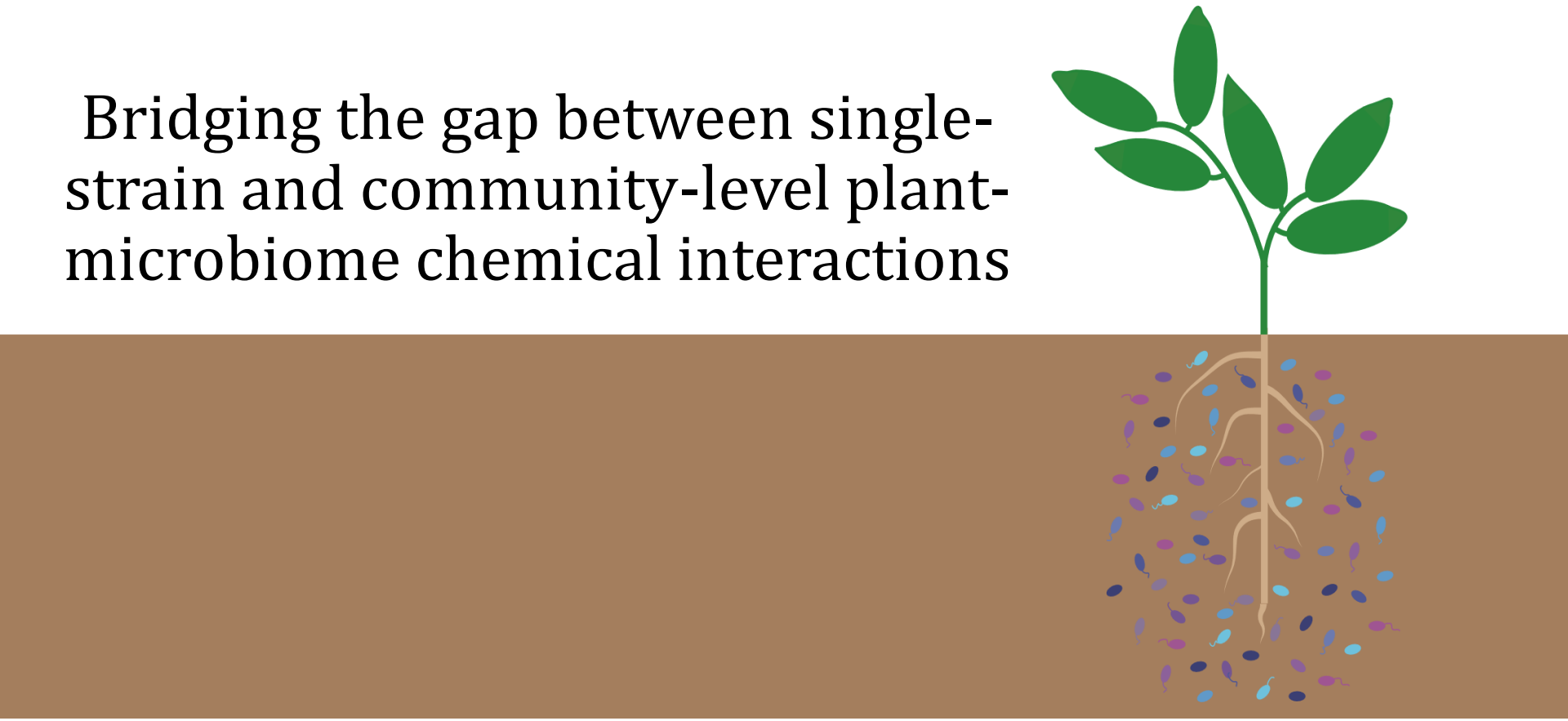
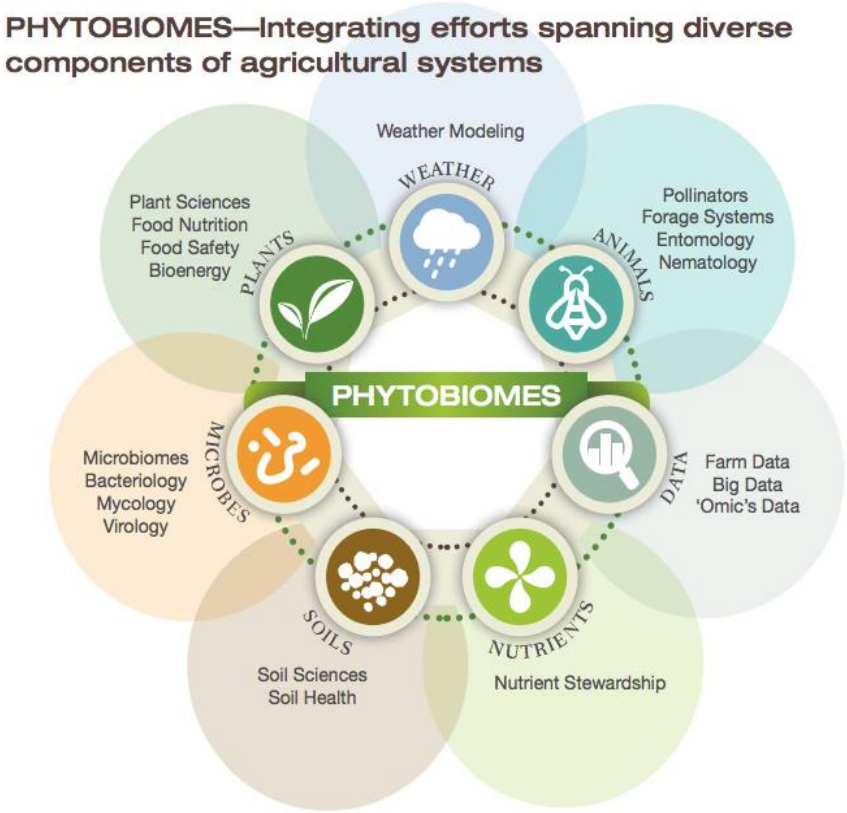
Bridging the gap between single-strain and community-level plant-microbiome chemical interactions





www.phytobiomes.org

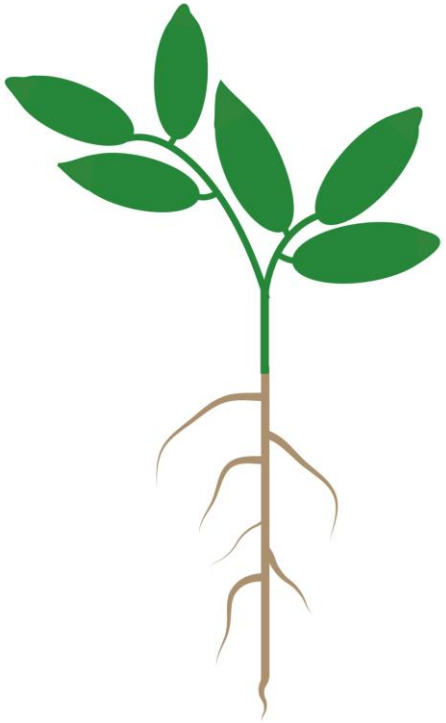
How do plants shape their microbiomes?

What activities do microbes need to colonize plants?

How do microbiomes influence plant health over developmental time?

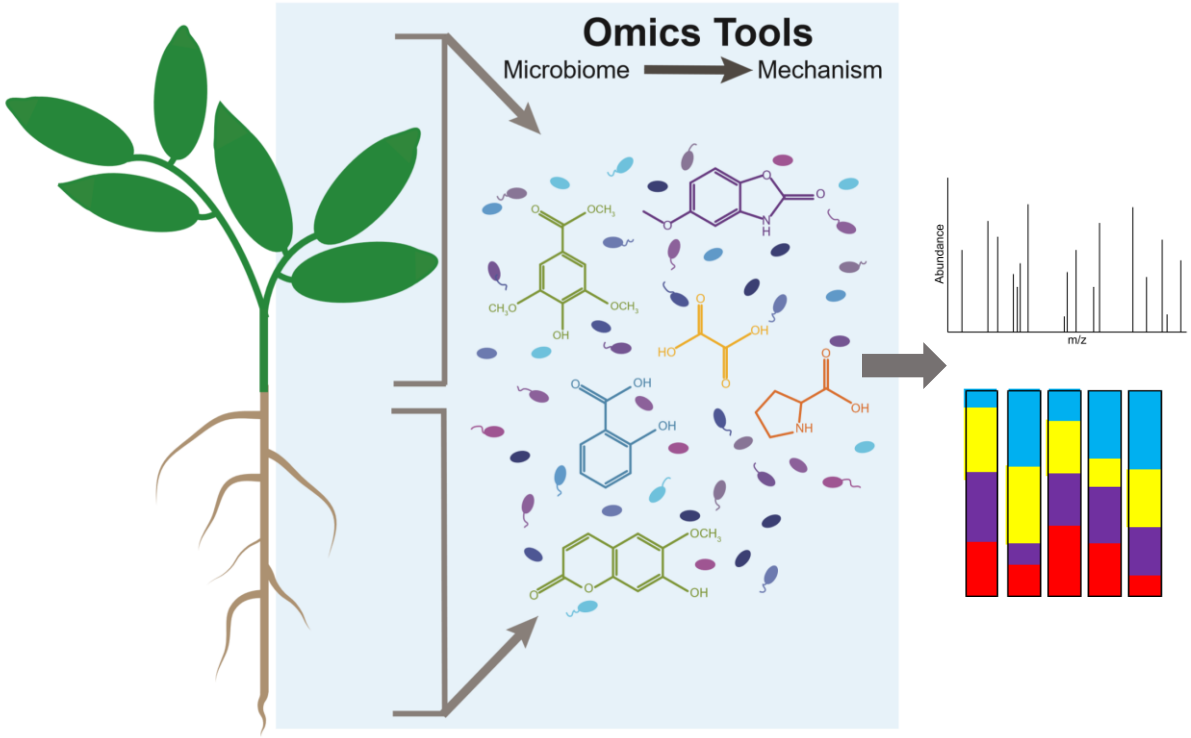
How can we harness this knowledge?

Spatial scales in plant microbiome studies



Modified from O'Banion, et al. 2019

Spatial scales in plant microbiome studies



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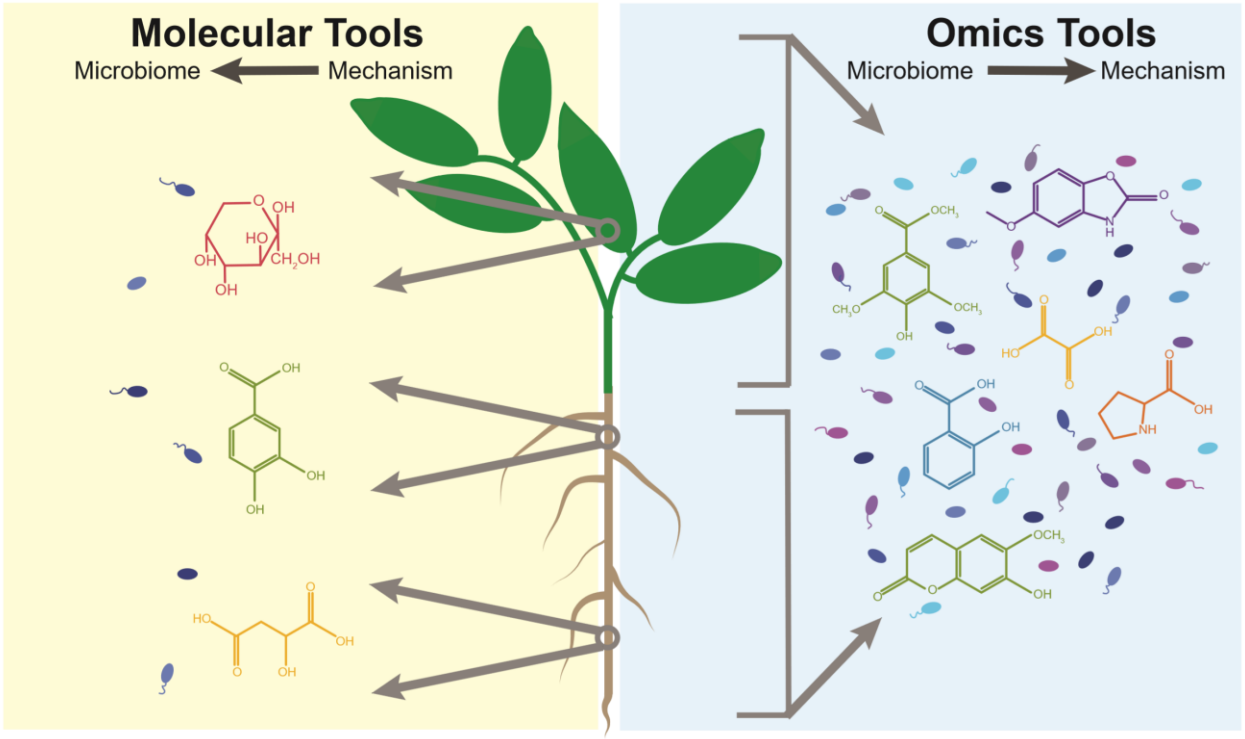
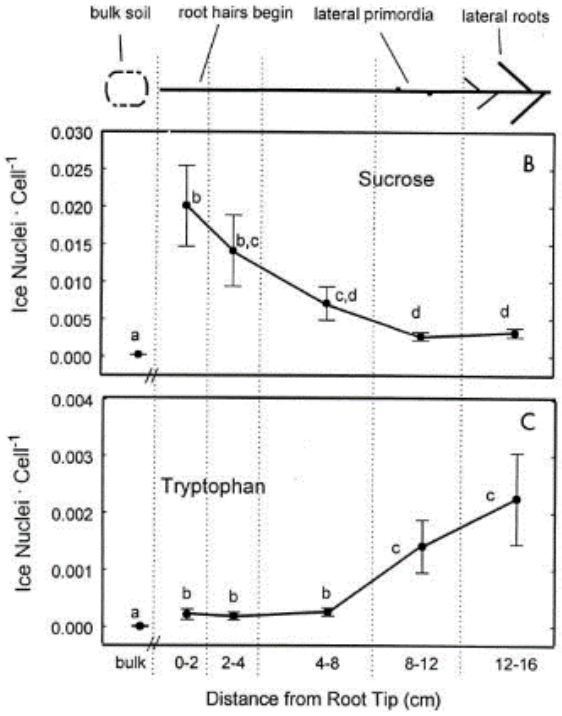
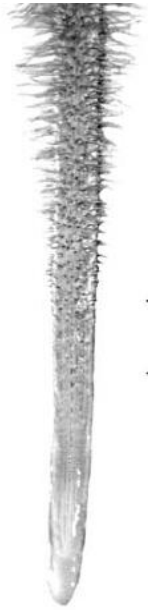
Spatial scales in plant microbiome studies



Modified from O'Banion, et al. 2019

Roots niches are chemically distinct, and microorganisms are sensitive to differences

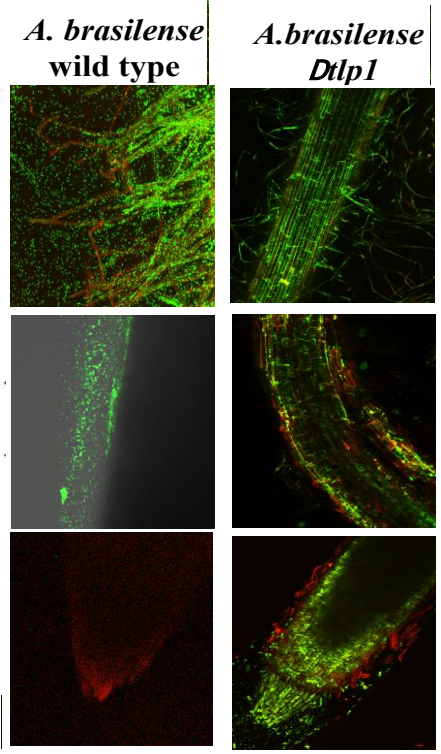




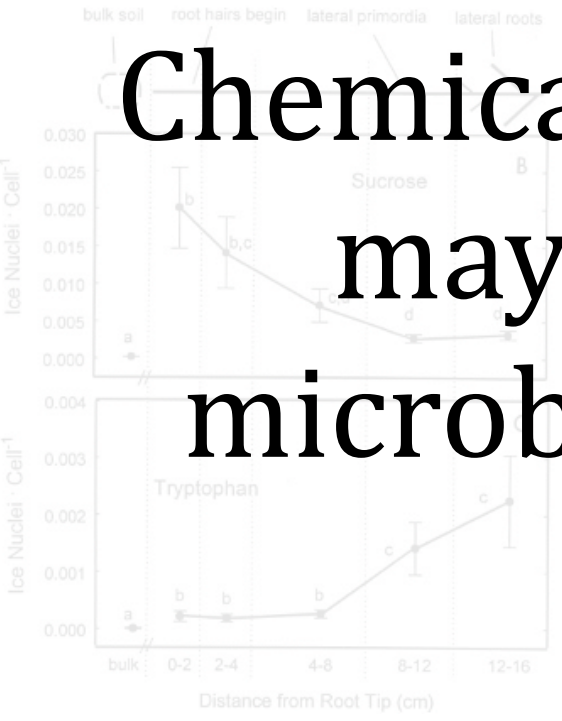
Root Hair

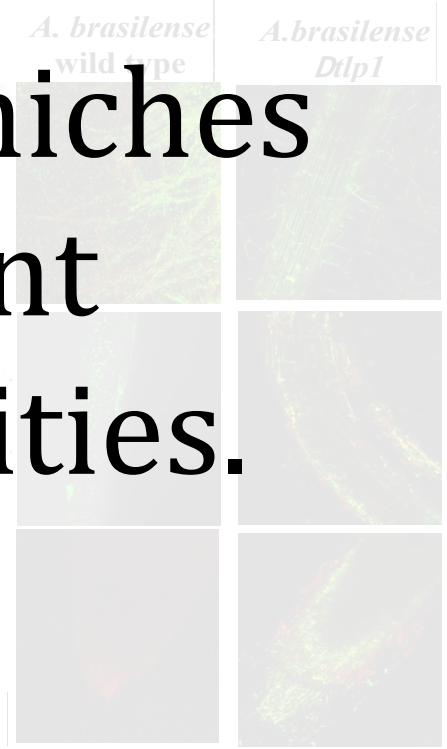
Elongation Zone

Root Tip



Chemically distinct niches may host different microbial communities.

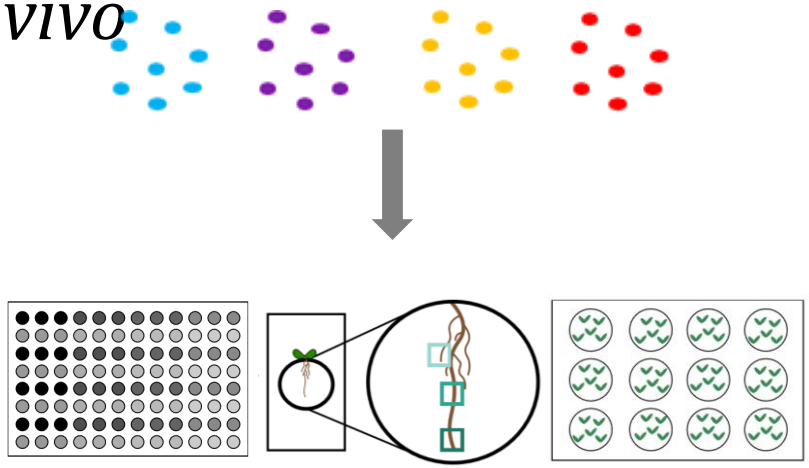




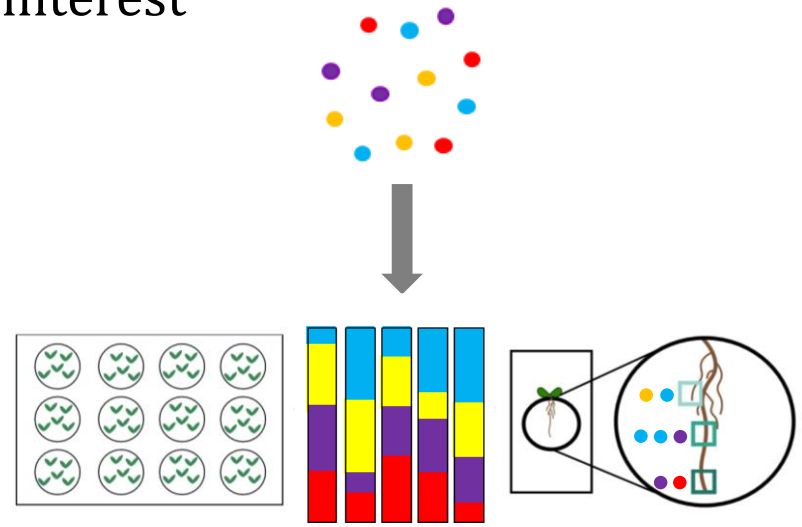
Does chemotaxis to specific root niches influence bulk microbiome assembly?

Our approach

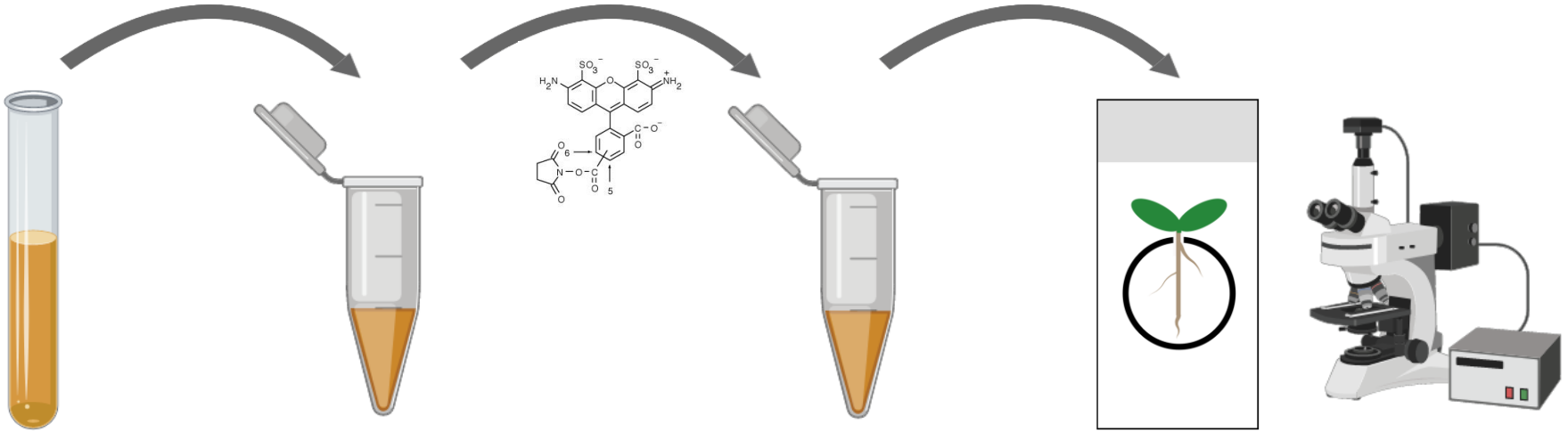
Characterize the fundamental niche of isolates *in vivo*

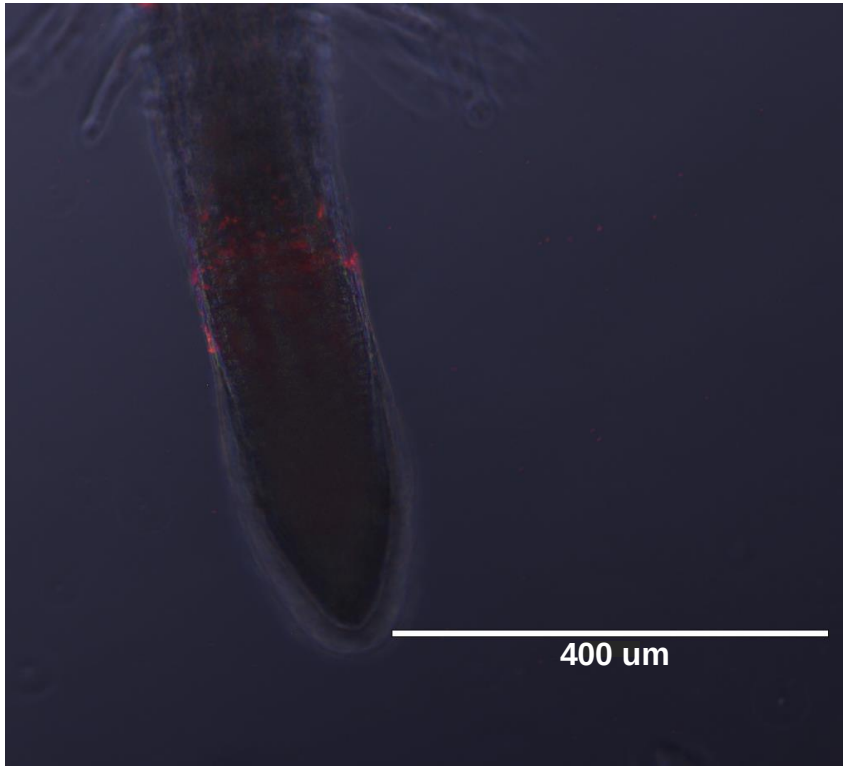


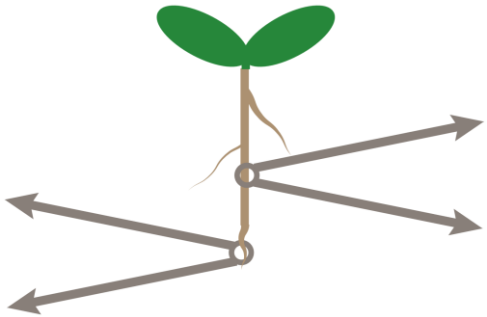
Use functional information to build synthetic communities and investigate phenotypes of interest

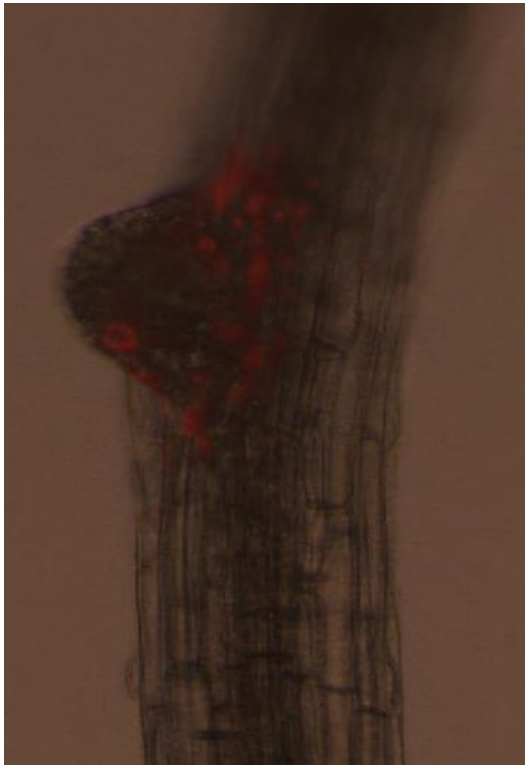


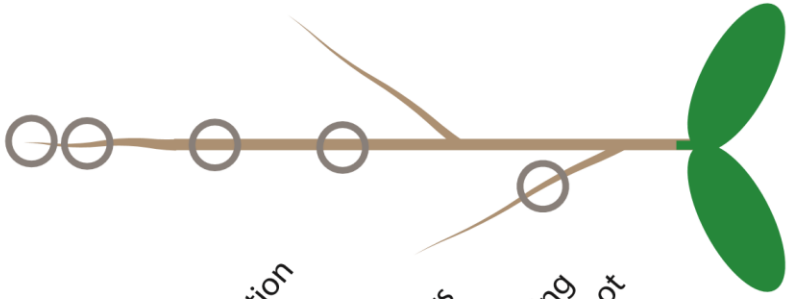
Fluorescent dyes for live staining cells




400 um

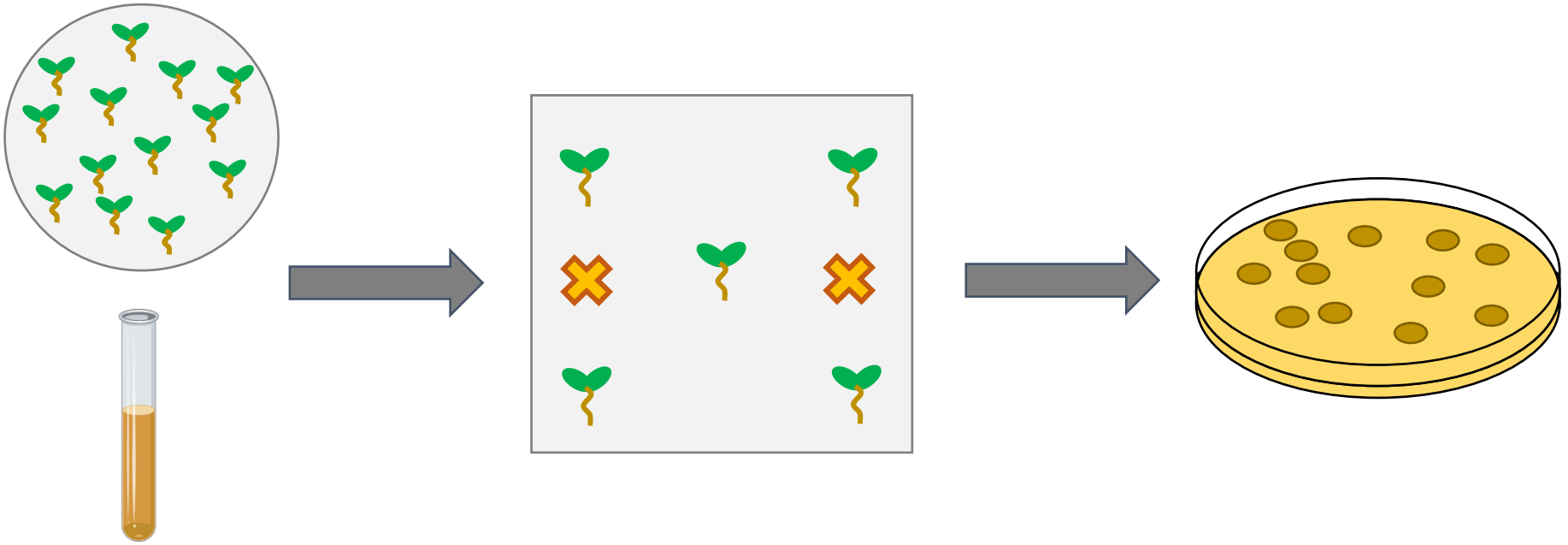




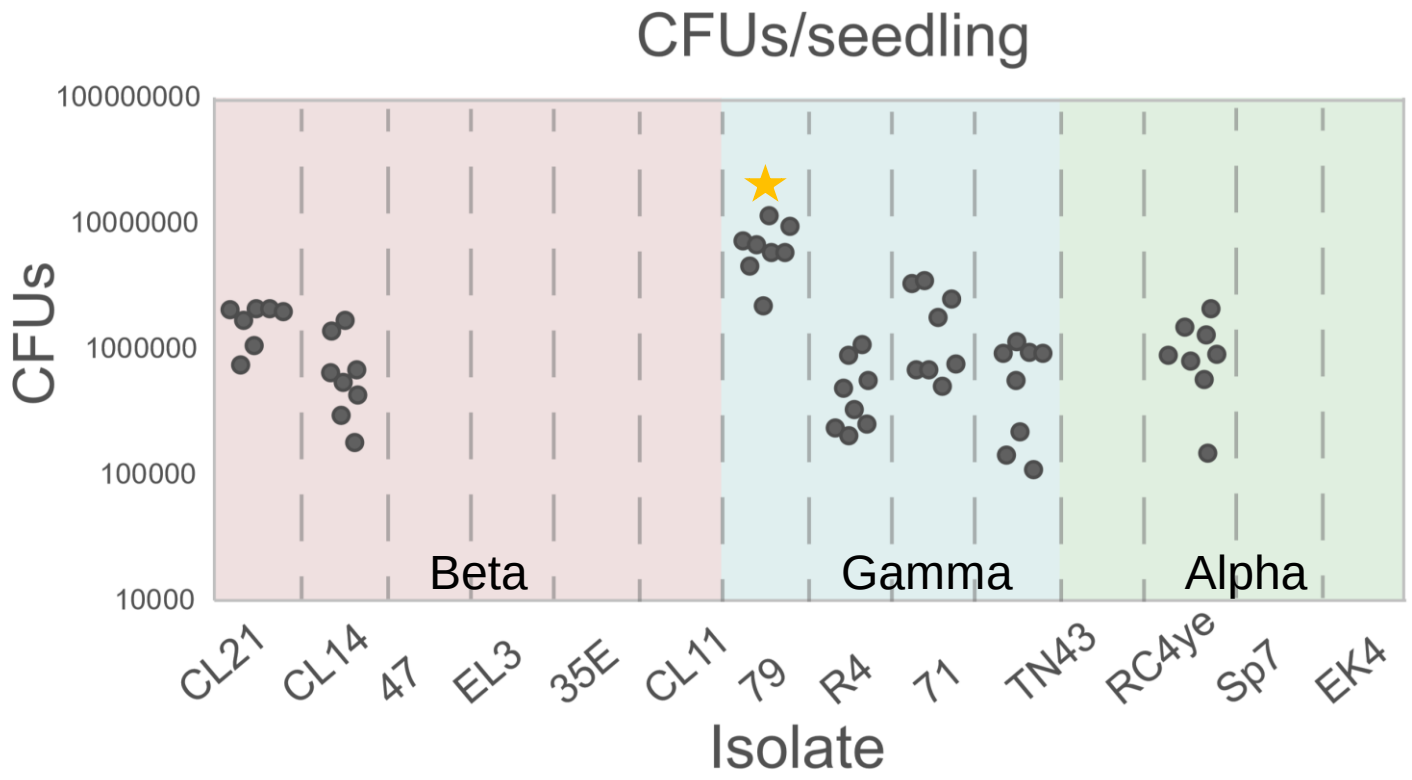


Isolate ID	Root Tip	Elongation Zone	Root Hairs	Emerging Lateral Root	Lateral Root
CL21					
CL14					
47					
EL3					
35E					
CL11					
79					
R4					
71					
TN43					
RC4ye					
Sp7					
EK4					

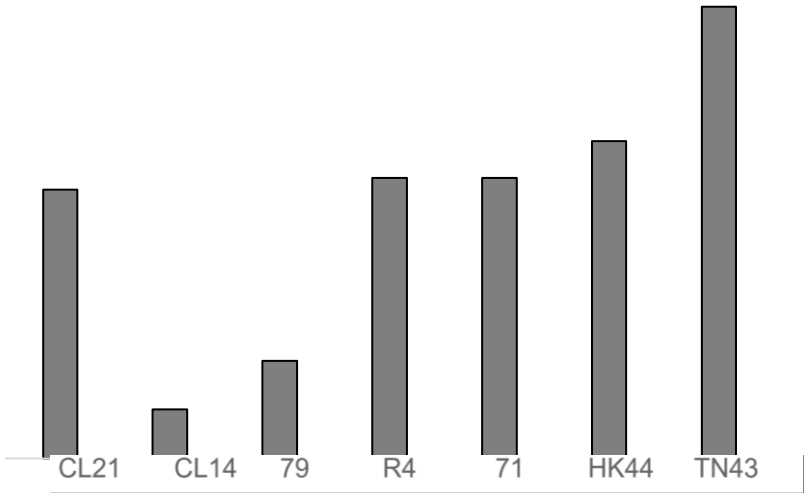
Bulk seedling colonization

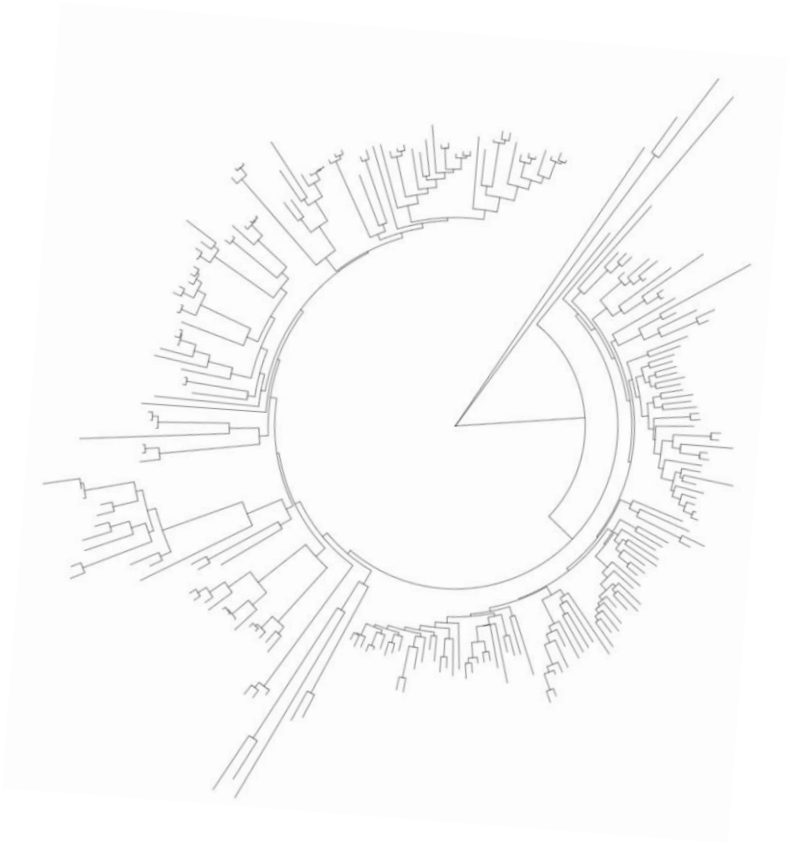


Bulk seedling colonization



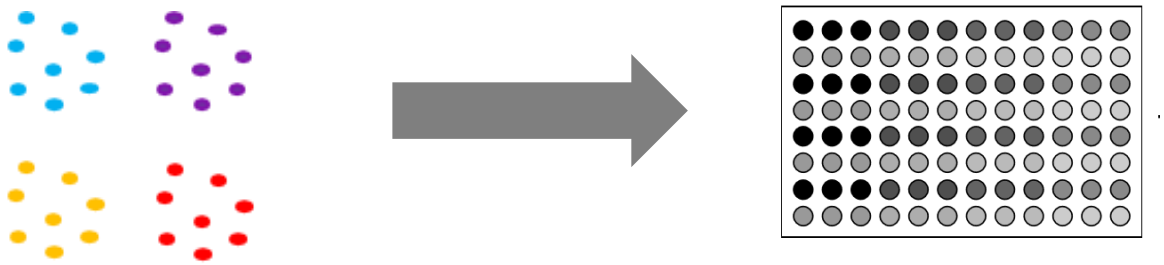
Future work:



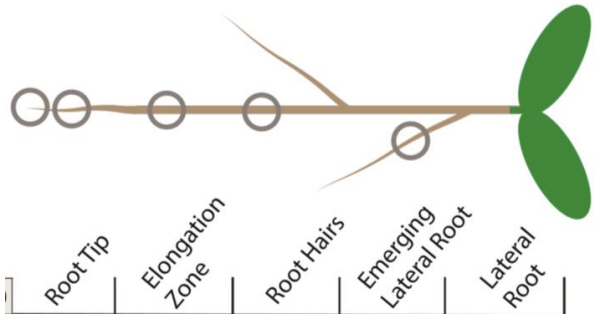


Biolog Plates

- Grow cells in LB
- Wash 3x in 1x PBS
- Resuspend to an OD 0.01 in ¼ MS (no carbon source)
- Measure color change over time

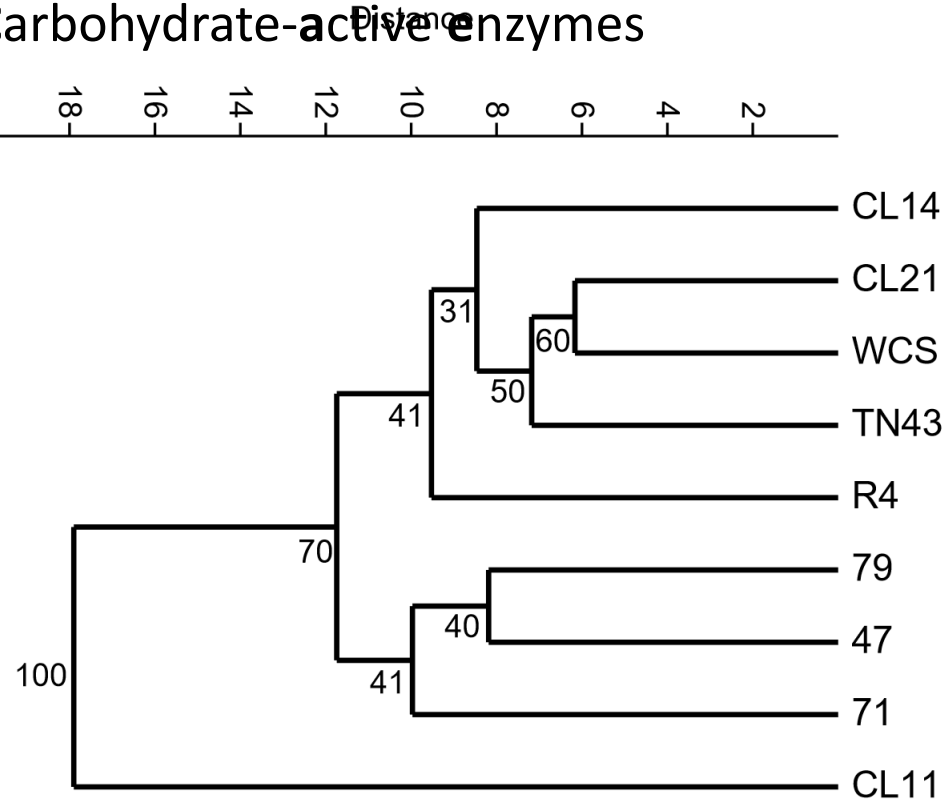


Predicted carbon utilization



		CL21	CL14	47	EL3	79	R4	71	TN43	RC4ye	SP7
Carbs	D-Xylose	2.833667	0.143667	2.148667	0	0	0.521	2.478	1.684667	0.072333	0.447667
	i-erythritol	0.022333	0.035	0	0.010667	0.004333	0.062667	2.861	2.22	1.650333	0
	n-acetyl-d-glucosamine	2.936333	0.007	0	0	0.322	0.4	2.217333	1.605	0.386333	0
	glucose-1-phosphate	0.012333	0.049333	0	0.033	0.078	0.248333	1.355333	1.824	0	0
	a-D-Lactose	0.001	0.021333	0	0.015	0.343	0.970333	0.005	0.020333	0	0.003
Acids	D-Galacturonic Acid	2.095333	0.023	0	0.257333	0.055667	0.136	1.375333	2.06	1.449333	1.06
	2-hydroxy benzoic acid	0	0	0	0.001667	0	0.039	0	0	0	0
	4-hydroxy benzoic acid	2.523667	0.097333	1.699667	0.124333	0	0.065333	1.152333	0.869667	0.453333	0.372333
	y-amino butyric acid	2.898	0.187667	2.283333	0.03	0.000333	0.425333	3.126667	3.1	0.291	0.389
	D-Malic acid	0.060333	0	0.475667	0	0.025667	0.127	1.064667	0.309	0.128333	0.25
AA	L-Asparagine	2.706333	2.449333	1.506333	0.963667	0.062667	0.318	3.017	2.931667	0.287667	2.017
	L-Phenylalanine	2.978	0.630667	0	0.003333	0	0	0.107333	0.150333	0	0
	L-Serine	2.382667	0.001	0	0.123667	0	0.154	0.261	1.050333	0	0.761667
	L-threonine	3.013	0.004	0.04	0.042	0	0.046333	0.061667	0.079667	0	0.378333
Amine/ Amide	Putrescine	0.01	0.075667	1.265667	0.007333	0	0.074	1.902	1.544667	0	0.098

- **D**ata**b**ase of **C**arbohydrate-**a**ctive **e**nzymes



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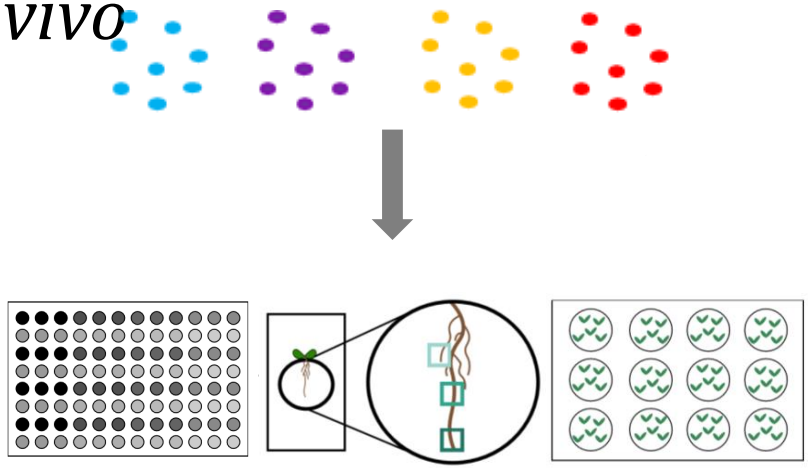

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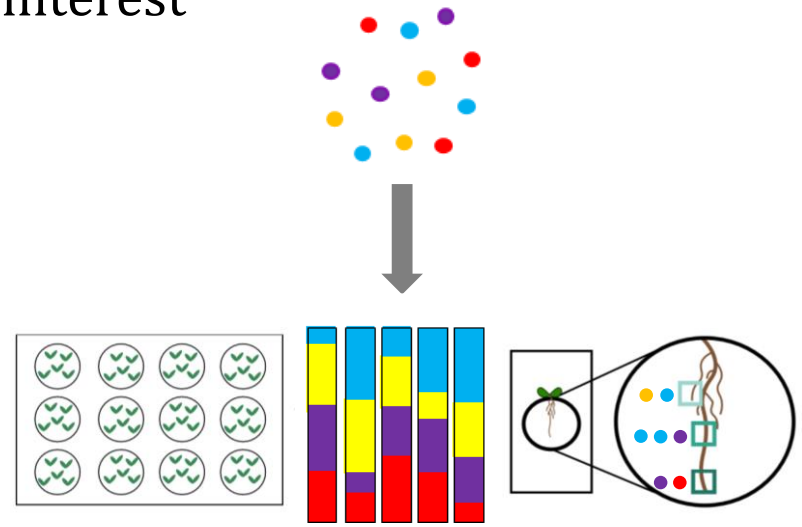

Acknowledgements

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