Plant- Based Culture Media: A novel approach to improve culturability of rhizobacteria

البيئات المزرعية النباتية: اتجاه حديث لتحسين طرق تنمية و أكثار الميكروبات المصاحبة لجذور النباتات

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OBJECTIVES

- Increase culturability of rhizobacteria
- Recover the hidden members of rhizobacteria, to support plant nutrition and health
- Using different Plants as culture media to mimic the plant root environment.
- Comparing the plant microbiome present in the Rhizosphere and Phyllosphere

The interaction between plant and microbes

Intensive agriculture

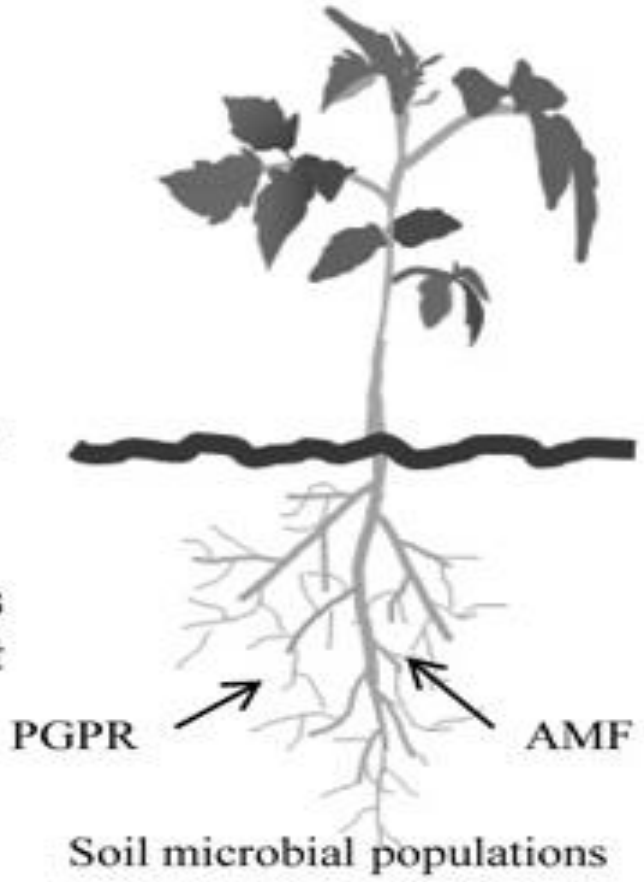
↓

Global change

↓

Stress factors

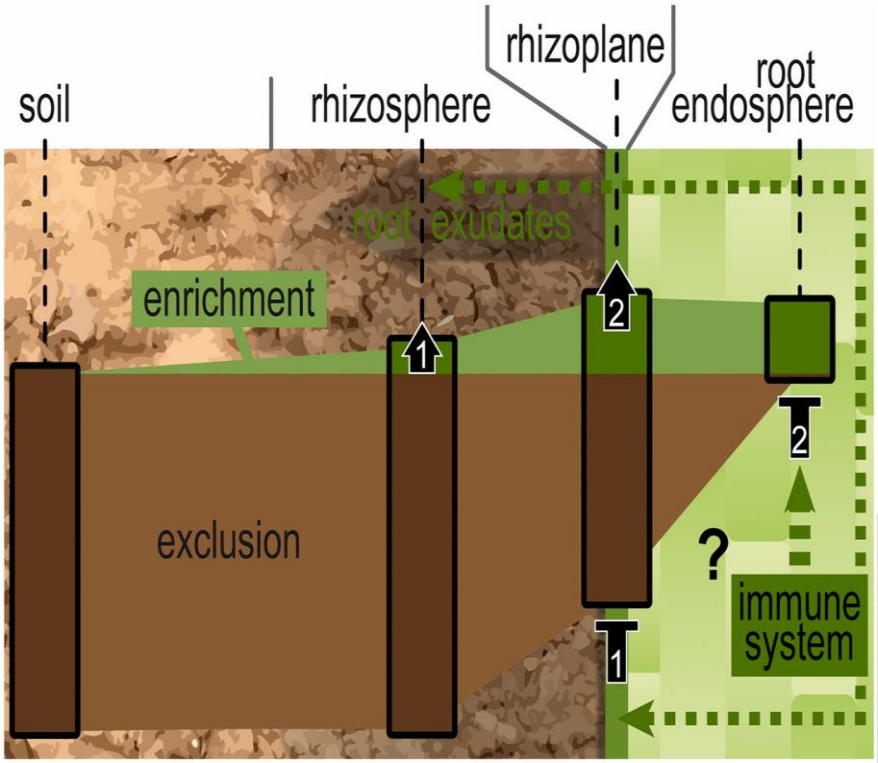
- **Salinity**
- **Drought**
- **Contamination**
- **Diseases**
- **Pest**
- **Parasitic weeds**
- **Nutrient deficit**



Environmental stress cues triggers the activation of signalling plant hormones cross talk that may be used by plants to recruit microbes with stress-alleviating activities

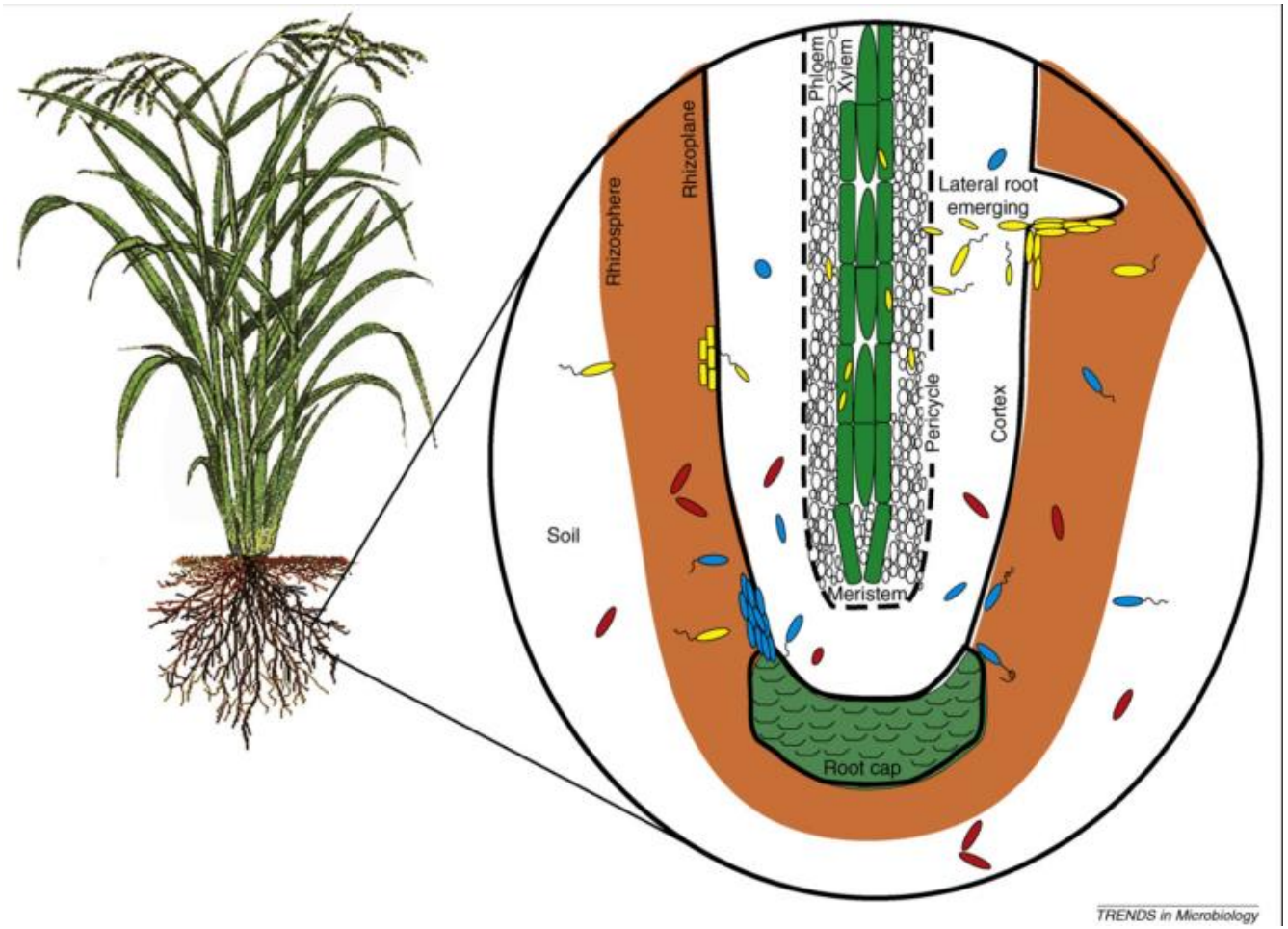
A better understanding of crop-microbe interactions can help to optimize plant adaptation mechanisms to environmental challenges and to improve the ability of soil microbes for stress alleviation.

Evaluation of Microbes associated to Plant Roots

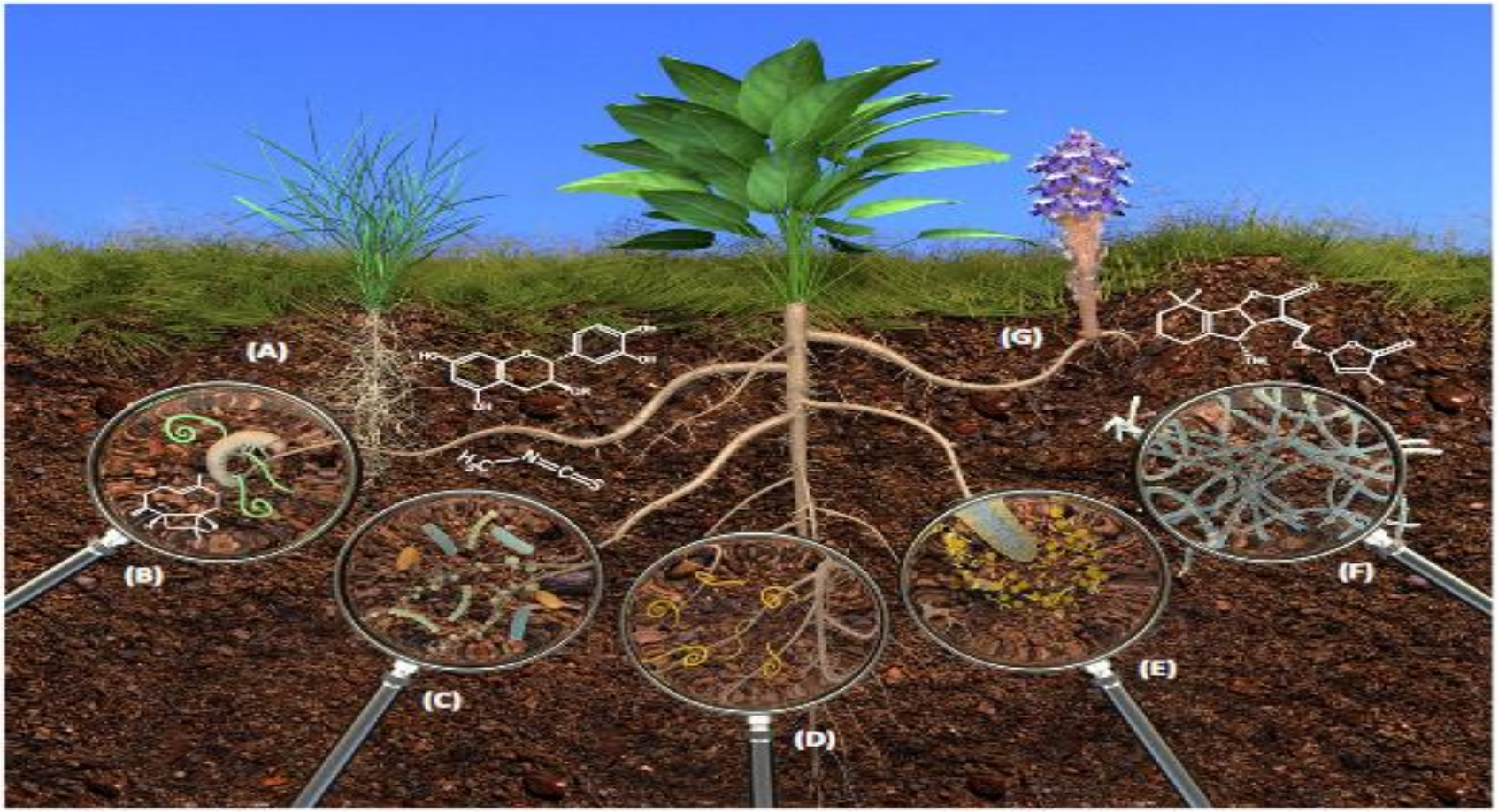


Evaluation of Microbes along Plant Roots

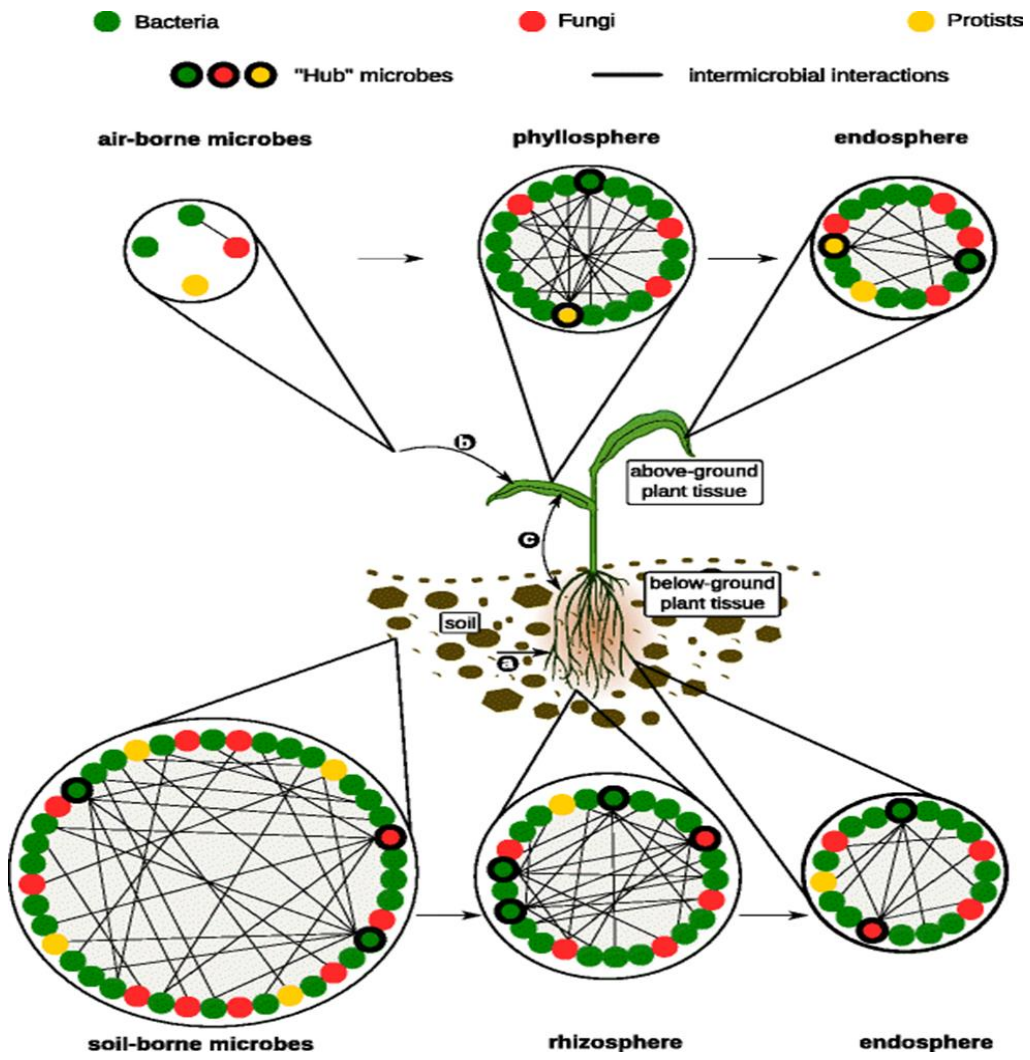
Root Zones	Root exudates	Nutrient availability	Nutrient uptake	Bacterial abundance	Bacterial growth
Mature zone	Low	High	Low	Low	Low
Root hairs	Medium	Low	High	High	Medium
Elongation zone	High	Low	Medium	High	Medium
Cell division zone	High	High	Medium	Medium	High

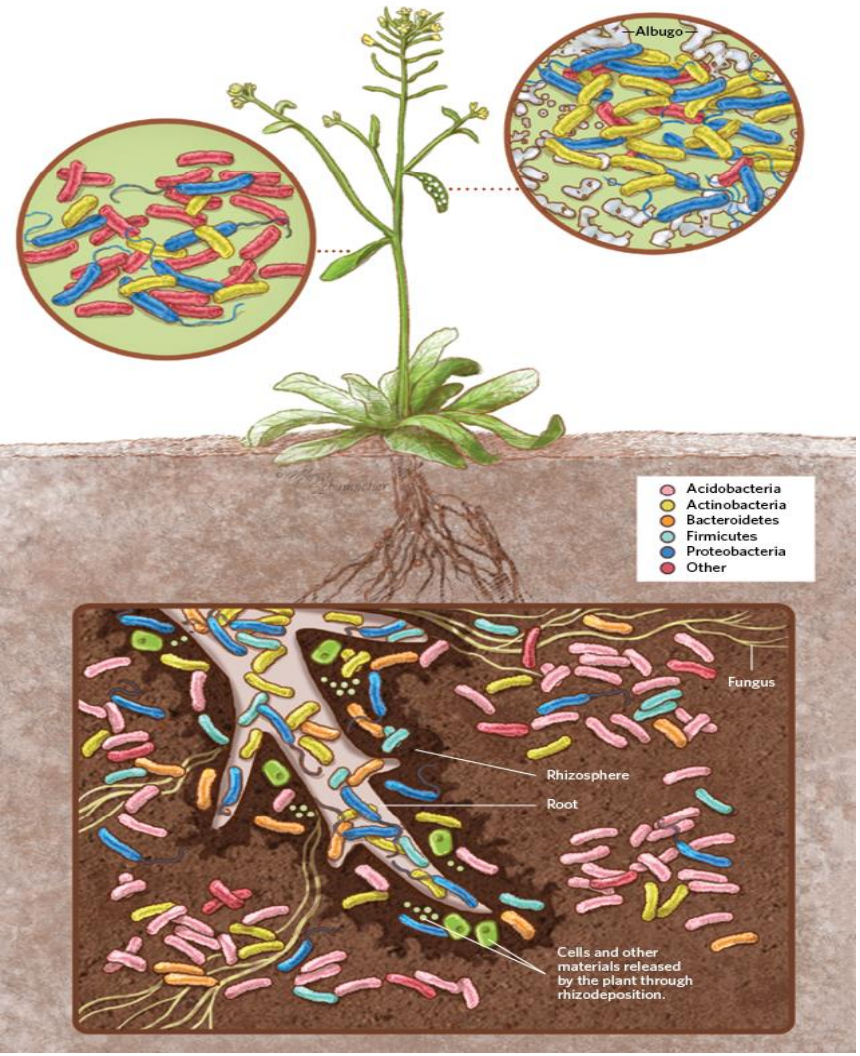

Phloem
Xylem
Rhizoplane
Rhizosphere
Lateral root
emerging
Pericycle
Cortex
Soil
Meristem
Root cap
TRENDS in Microbiology

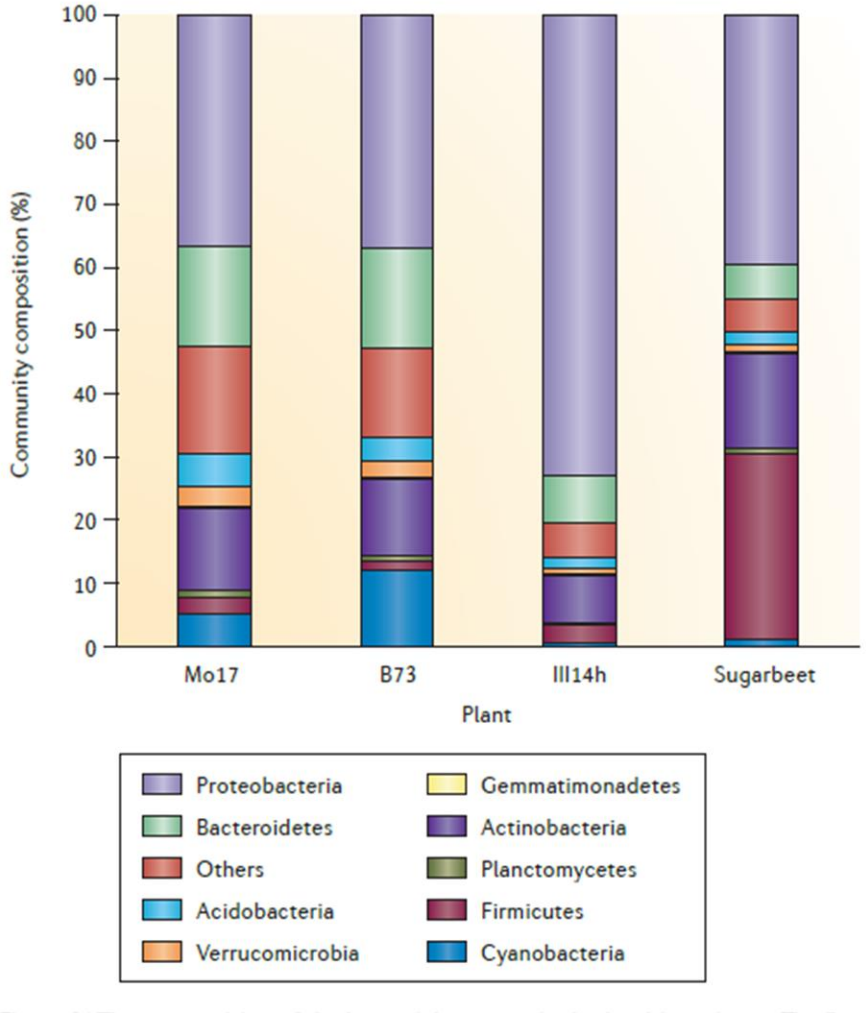
Chemical Communication of Plants with other Organisms.

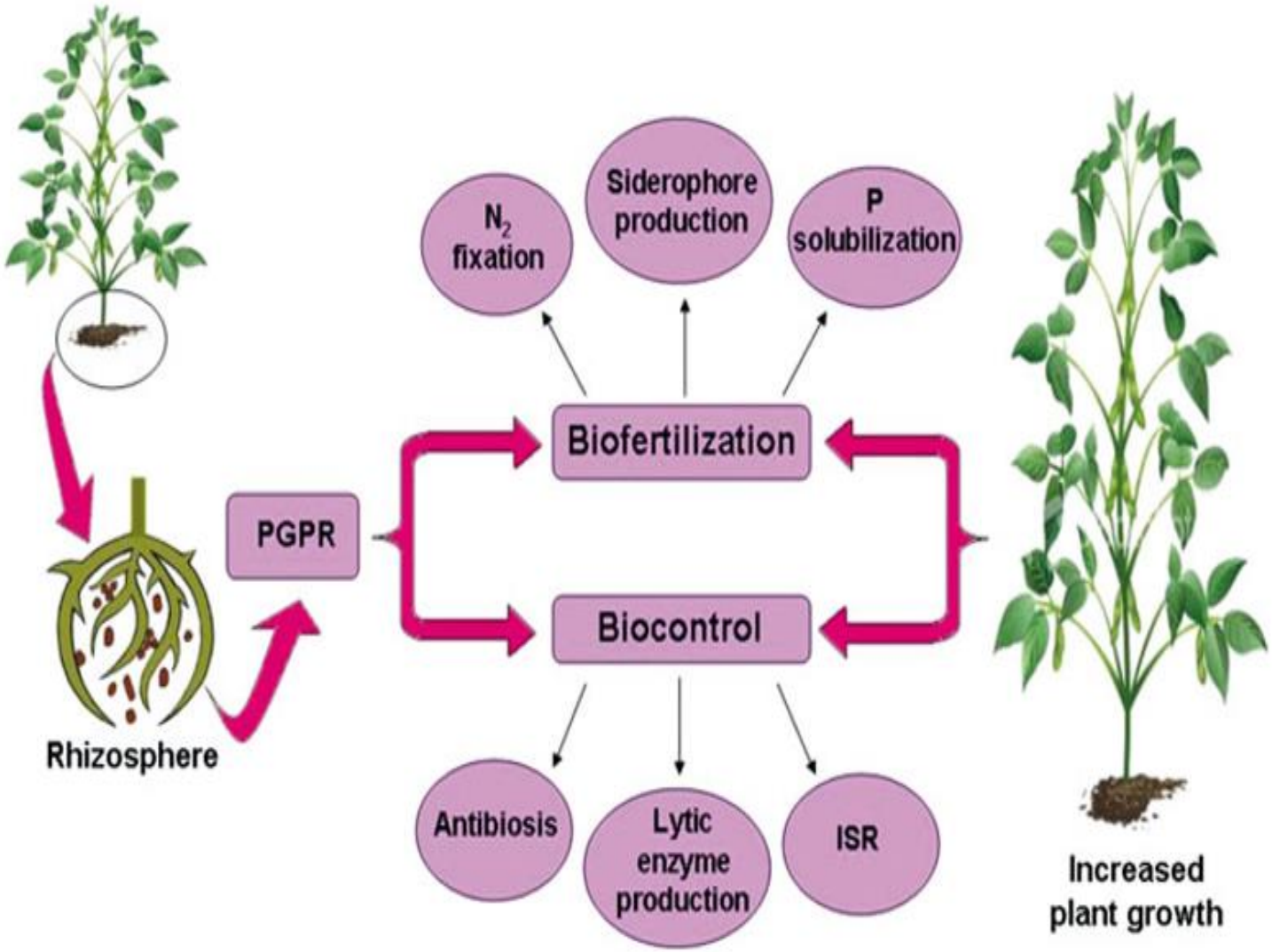


Since the colonization of land by ancestral plant lineages 450 million years ago, plants and their associated microbes have been interacting with each other, forming an assemblage of species that is often referred to as a “**holobiont**.”




Albugo
Acidobacteria
Actinobacteria
Bacteroidetes
Firmicutes
Proteobacteria
Other
Fungus
Rhizosphere
Root
Cells and other materials released by the plant through rhizodeposition.


Community composition (%)
100
90
80
70
60
50
40
30
20
10
0
Mo17
B73
Ill14h
Sugarbeet
Plant
Proteobacteria
Bacteroidetes
Others
Acidobacteria
Verrucomicrobia
Gemmatimonadetes
Actinobacteria
Planctomycetes
Firmicutes
Cyanobacteria


N_2 fixation
Siderophore production
P solubilization
Biofertilization
PGPR
Biocontrol
Antibiosis
Lytic enzyme production
ISR
Rhizosphere
Increased plant growth

Suggested Tested host Plants

Winter Crops

1- *Trifolium alexandrinum*
(Clover) برسيم مصرى

2- *Triticum turanicum*
(Wheat) قمح

3- *Hordeum vulgare*
(Barley) شعير

Summer Crops

1- *Zea mays*
(maize) الذرة

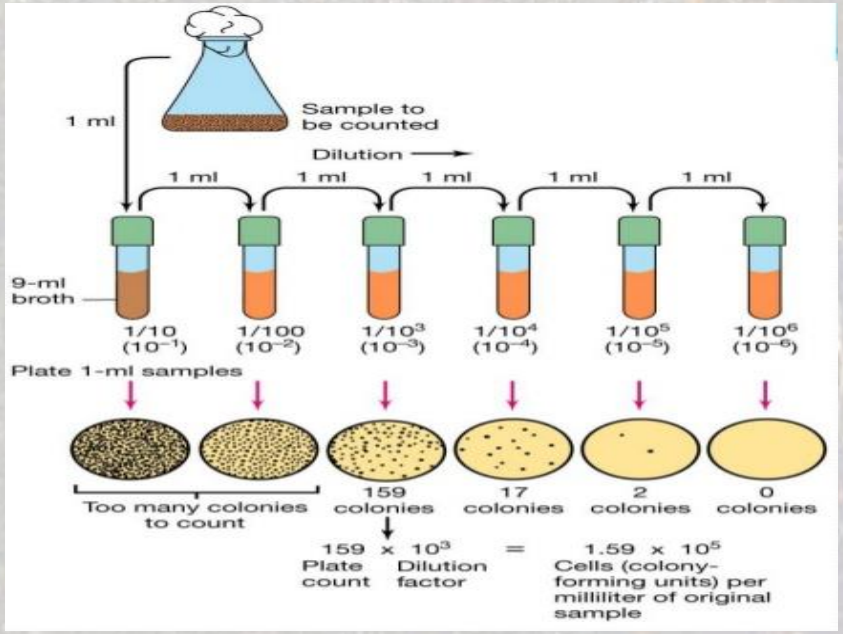
2- *Sorghum bicolor*

3- *Glycine max*
(Soy bean) فول الصويا

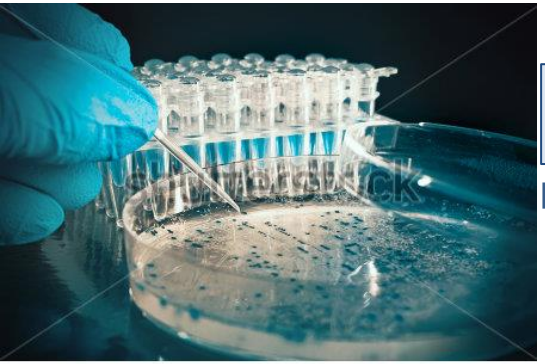
Methodology

Techniques used:

- Plate count method (cfu).
- Single colony isolation.
- Selection of isolates, probably unculturbles
- Box PCR for identification (Molecular technique).
- Data analysis.
- Sequencing.

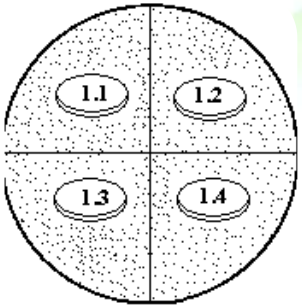


Identification

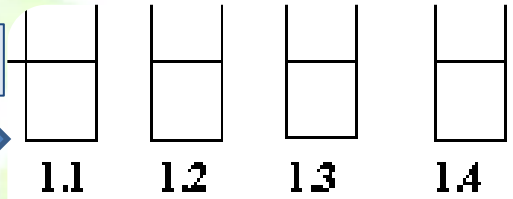


Picking colony from master plate

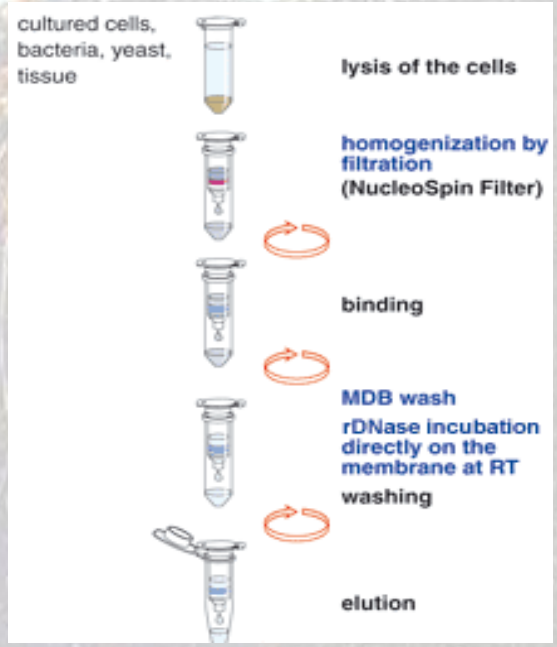
Streaking



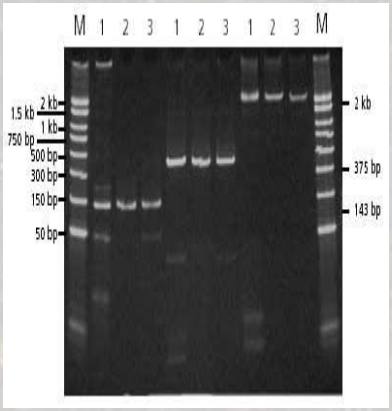
Sub culturing



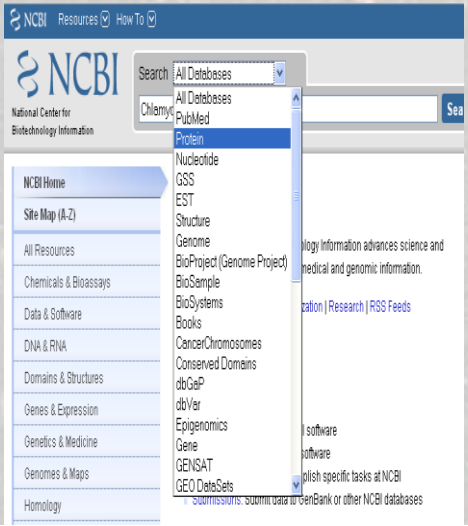
DNA Extraction



Box PCR



Database for comparing



The plan Research

1- Selection of the tested plant and cultivation areas to study the Rhizosphere associated to plant.	2 months
2- Performing the chemical analysis for the used plants in the study.	3 months
3- Selection for the most suitable method for preparation of plant preparation (Liquid – Dry) for media preparation.	3 months
4- In situ recovery of plant microbiome, associated to Phyllosphere and Rhizosphere by using different culture media and growth conditions.	10 months
5- Result analysis and thesis writing.	6 months


Thank you