Age	18+	**Number of people**	60 people approximately	**Topic**	Biotechnology and agricultural
Date					
Purpose	The student is introduced to scientific concepts of synthetic biology to comprehend the modern synbio solution for many problems. We also introduced them to our proyect and the kind of technology we are using in an attempt to save the crops, using terminology they use.		**Time**	60-90 minutes	
Name of the activity			**Expected learning**		
Synbio lectures			Considers broad topics as possible future solutions		
sequence				**Resources**	
Presentation (45-60 minutes)					
A) Problematic				Presentation	
We explained thouroughly why this problematic is significant, and the position of those who suffer it.					
B) Nowadays solutions					
Before explaining synbio we explained the solutions that farmers use as of now and some of the negative effects they may present in various aspects. This section changed a bit depending on the University since some om them focus more on environmental topic and others on agro, etc.				Presentation	
C) Synbio					
We made clear what synbio was with a simple description and a couple of examples where synbio has been used for problem solving in different areas (environmental, health, etc.)				Presentation	
D) Synbio solutions					
We focused on pur proyects and deepened on the development on mechanism of it.				Presentation	
E) Closure and invitation to follow us on social platforms					
Q & A (15-30 minutes)					

SYNTHETIC BIOLOGY

A SUSTAINABLE TOOL TO FIGHT CHILLI WILT

Tecnológico de Monterrey

iGEM Tec-Chihuahua

GEM 2022
Team: TEC – CHIHUAHUA

www.menti.com

code 6063 2142


¿CAN YOU IMAGINE WATCHING YOUR LIFE'S WORK DIE IN FRONT OF YOUR EYES?

Chilli producers report looses up to a

100 %

in their crops due to wilt, a disease caused by the oomycete *Phytophtora capsici*

(Nabor-Romero *et al.*, 2020)

IMPORTANCE

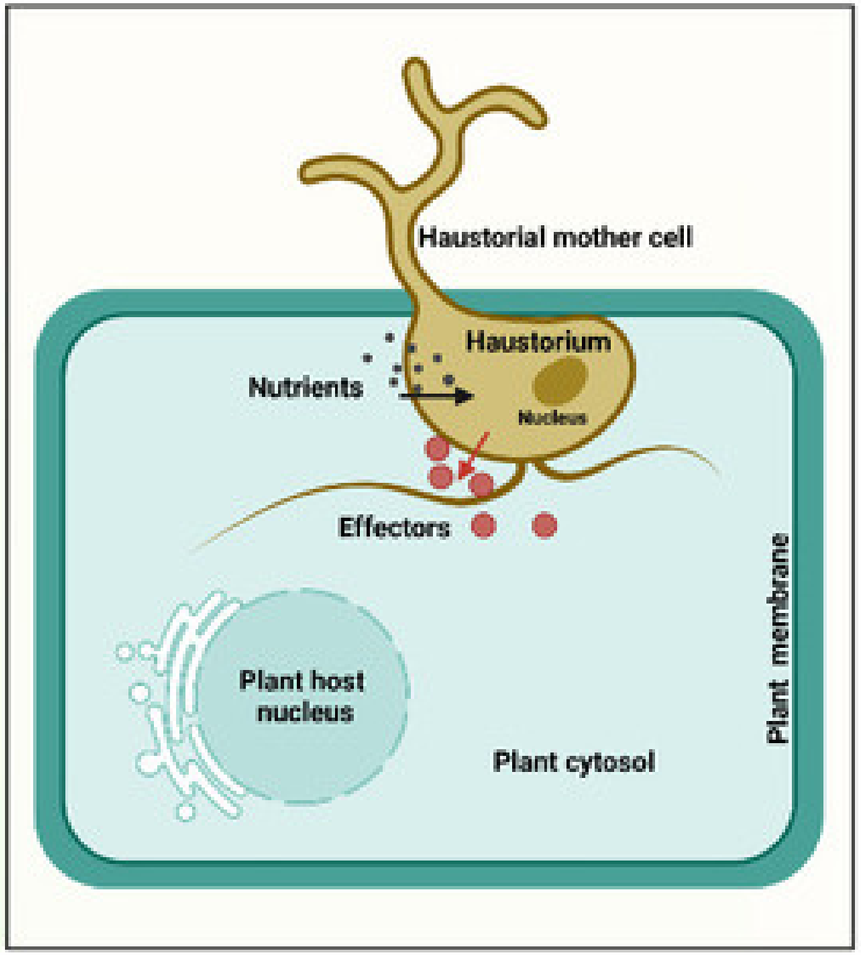
In 2020 there was a production of 723 thousand tons = 5,011 million pesos

12,000 producers and more than 30 million laborers

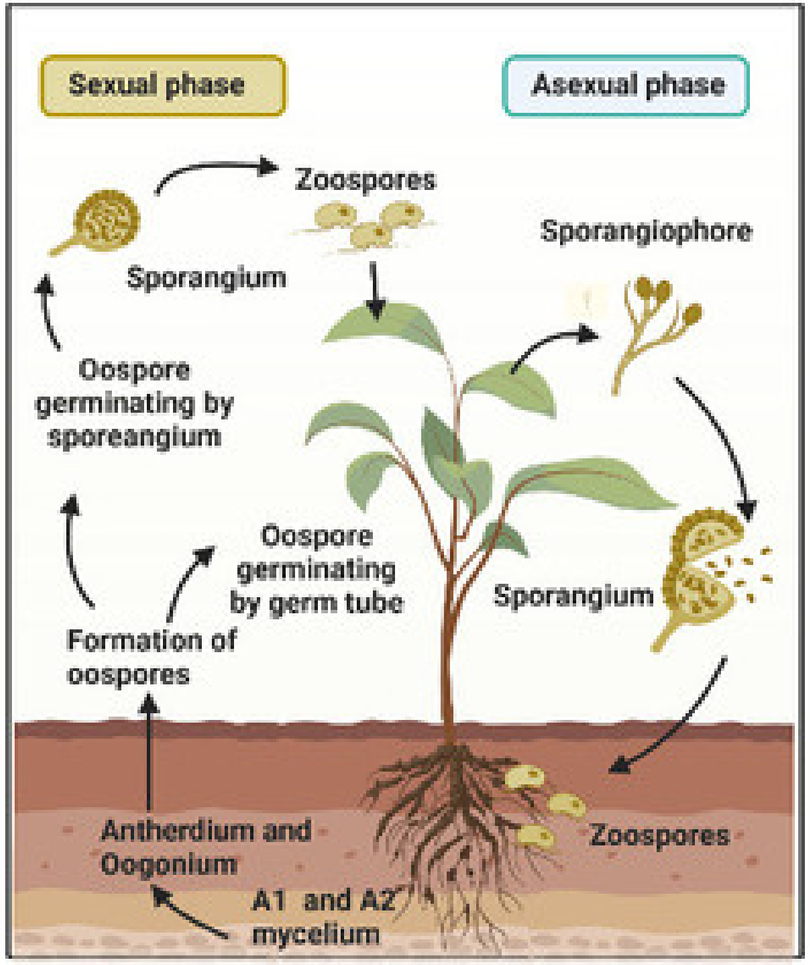
#1 on the scale of world wide exportation on chilli and peppers

(La Jornada, 2021; Vite, 2019)

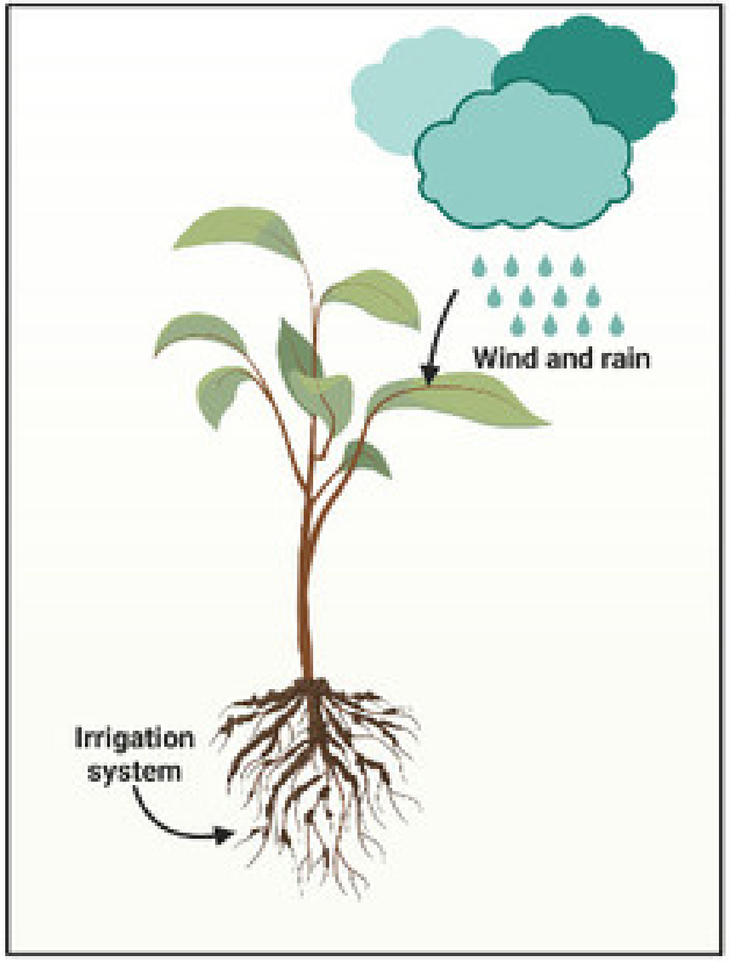
Mechanism of action of the omycete



Phytophtora capsici life cycle

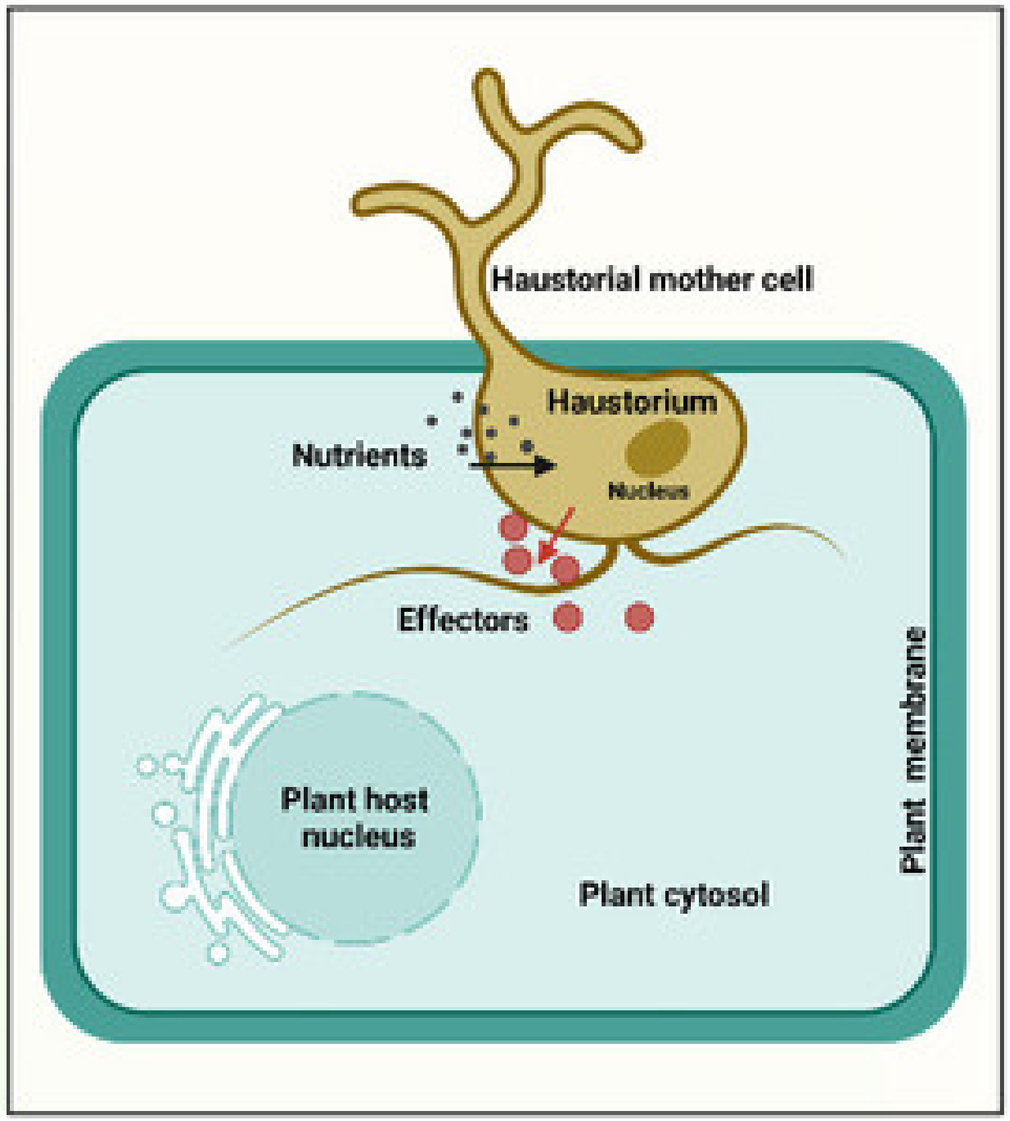


Transmission of the omycete

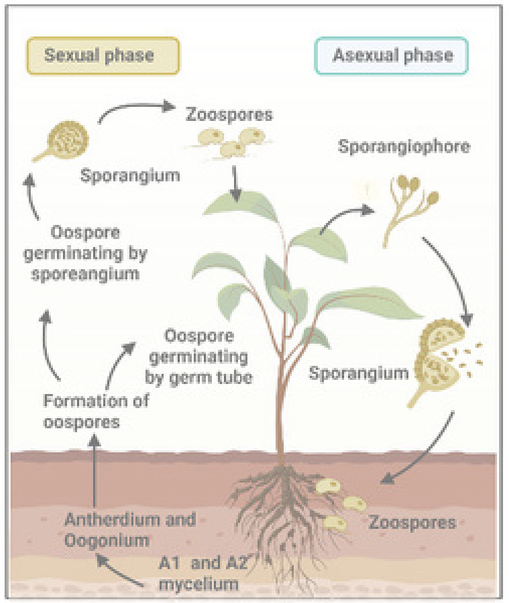


(Xu *et al.*, 2007; Jackson *et al.*, 2010)

Mechanism of action of the omycete



Phytophtora capsici life cycle



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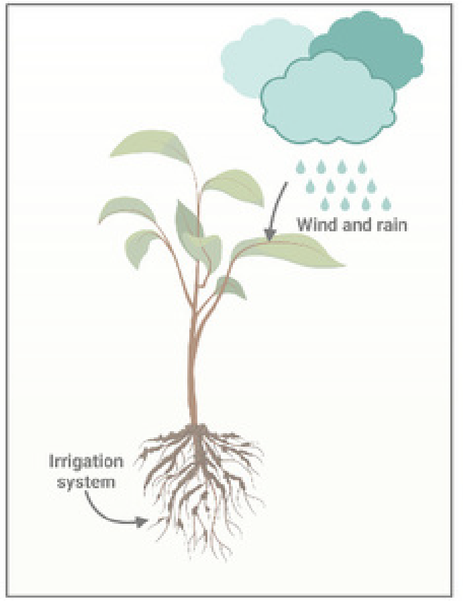

(Xu *et al.*, 2007; Jackson *et al.*, 2010)

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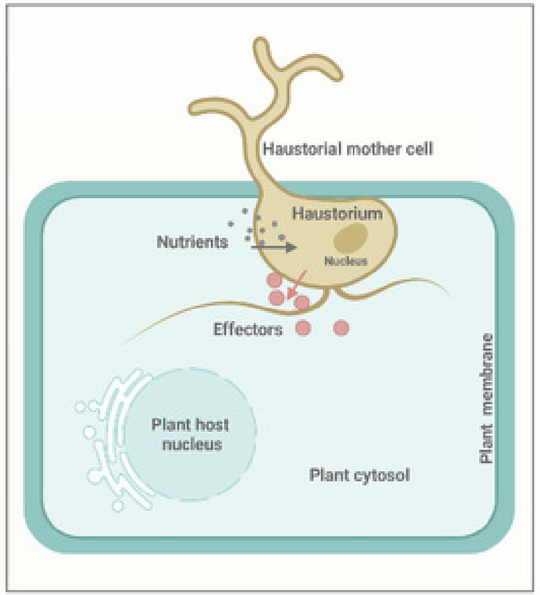

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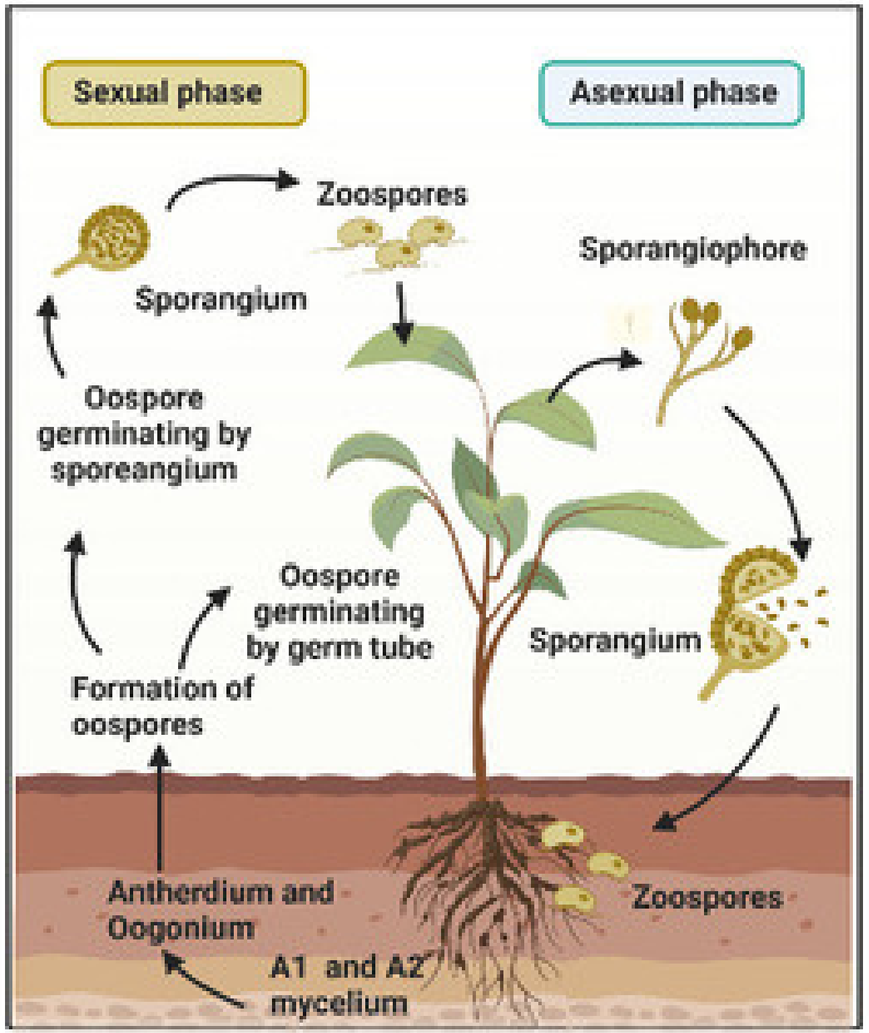

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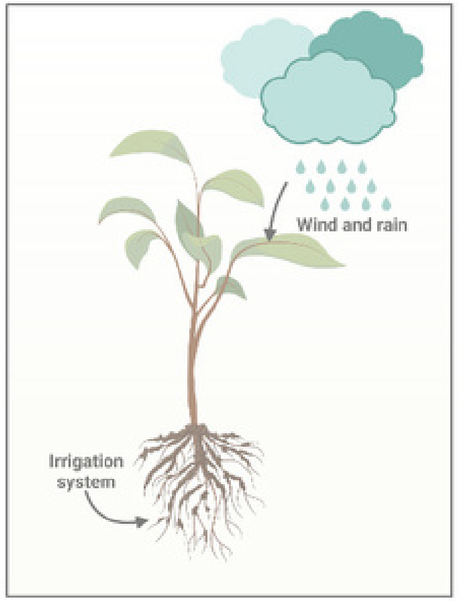

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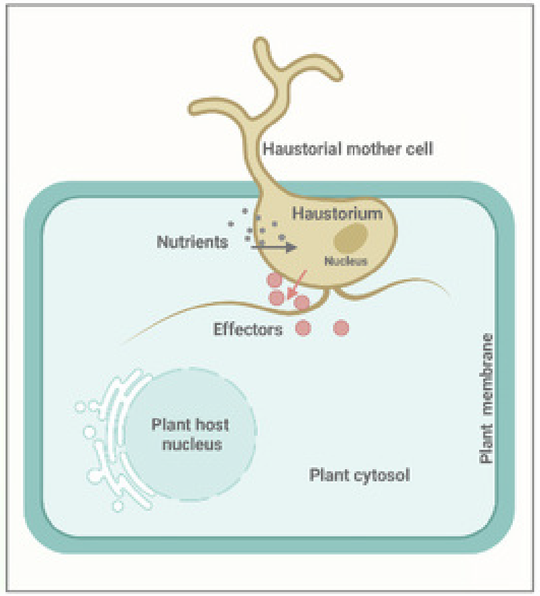
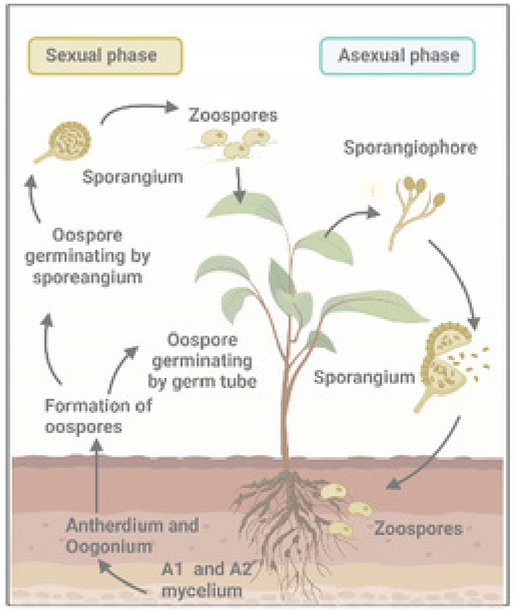


Phytophtora capsici life cycle



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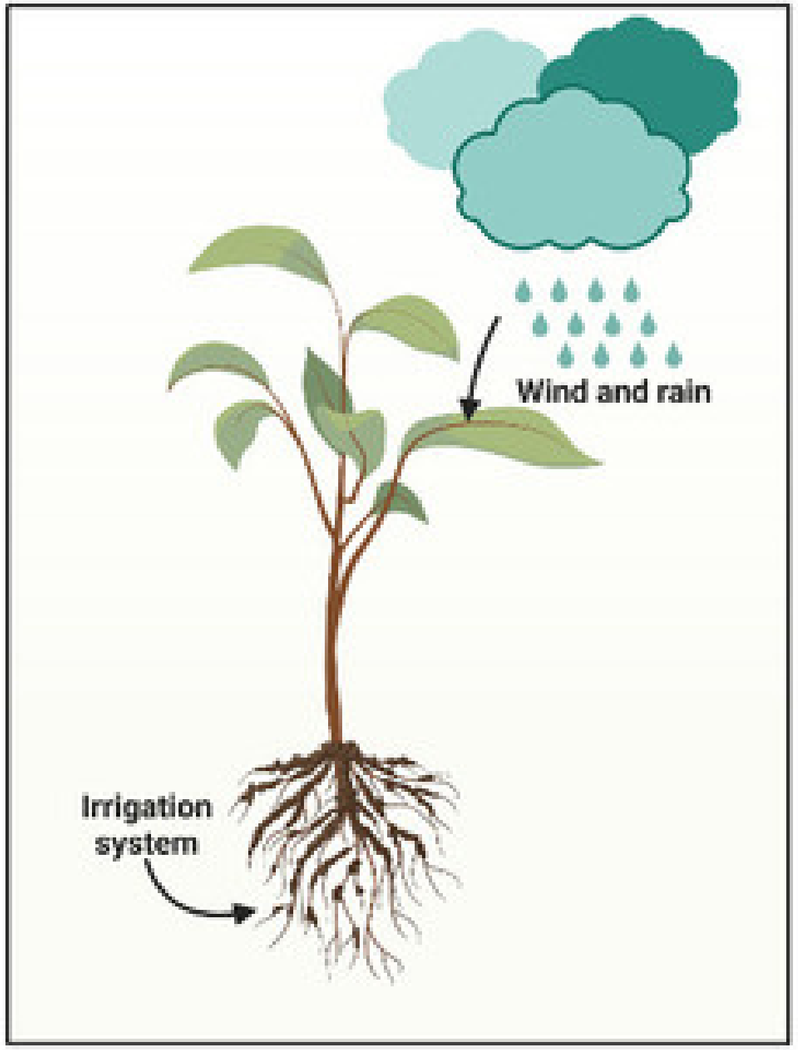


(Xu *et al.*, 2007; Jackson *et al.*, 2010)

SYMPTOMS

The symptoms of the disease are divided into 2 main categories: Symptoms that appear before the seed germinates and symptoms that appear after the germination. During the first stage, seeds can't germinate and they go rot. On the second, they can germinate and get rot before cotyledons appear

(Reyes-Tena *et al.*, 2019)

AGRO CHEMICALS

Currently, farmers use chemicals that result harmful to the environment, human health and create pathogenic resistance

(Sánchez-Gurrola *et al.*, 2019; Tomah *et al.*, 2020)

ENVIRONMENTAL EFFECTS

	SHORT TERM	LONG TERM
CLOSE ENVIRONMENT	Immediate contamination of the abiotic environment such as land, water bodies and air	Death of the vulnerable organisms that affect physiological equilibrium of the exposed living beings and resistance development in organisms
FAR ENVIRONMENT		New contaminants that take years to degrade, indirect exposition, persistence in food and harming of the trophic nets

Effects on the trophic net

(Gobierno de México, s.f.)

BIOLOGIC CONTROL

DISADVANTAGES

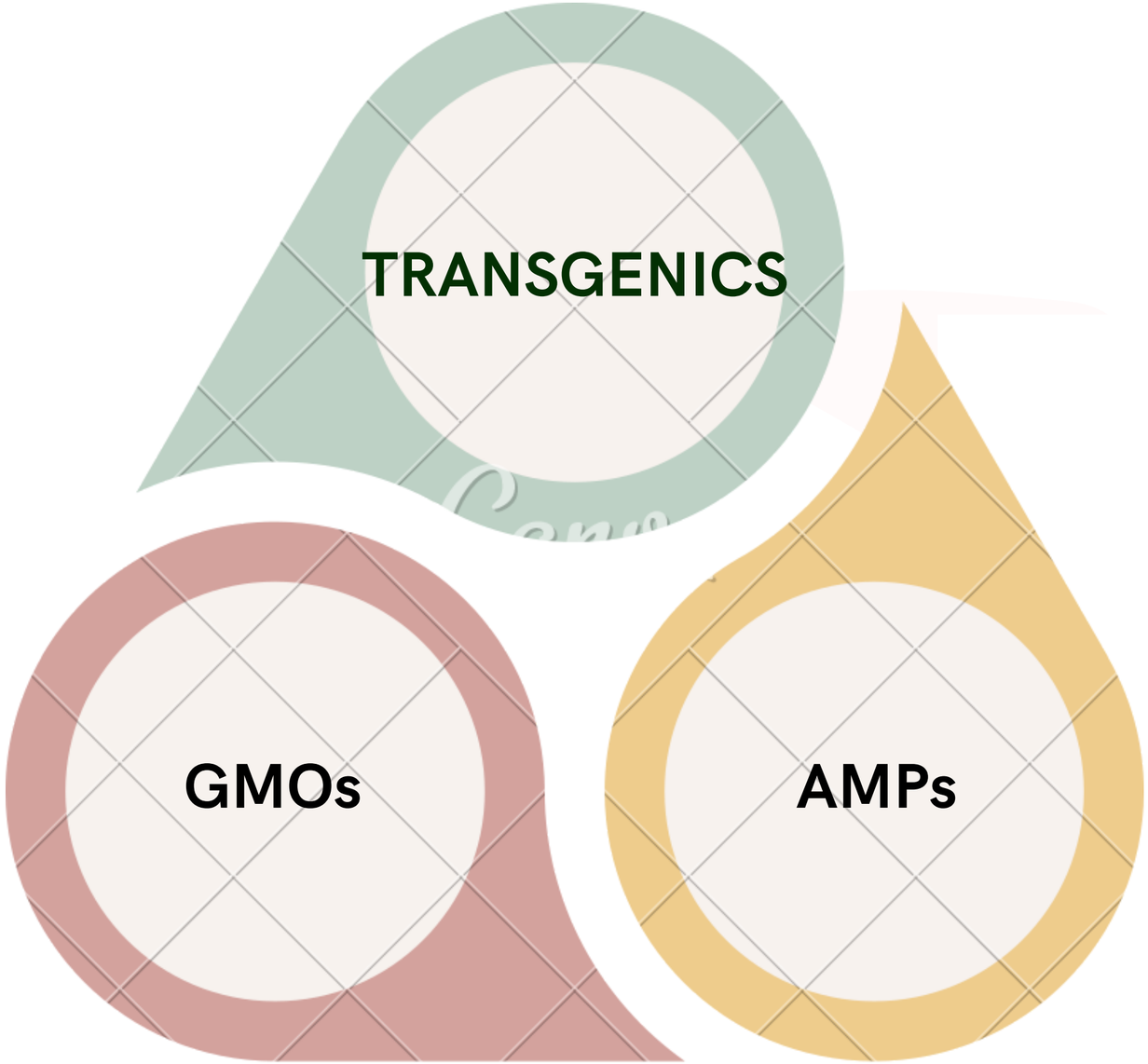
It requires time, it's a slow response

Must have the proper knowledges to apply this type of control

To find the right one, biological knowledge is necessary

(Eco-Sitio, s.f.)

NEW ALTERNATIVES THAT CAME UP THANKS TO SYNTHETIC BIOLOGY



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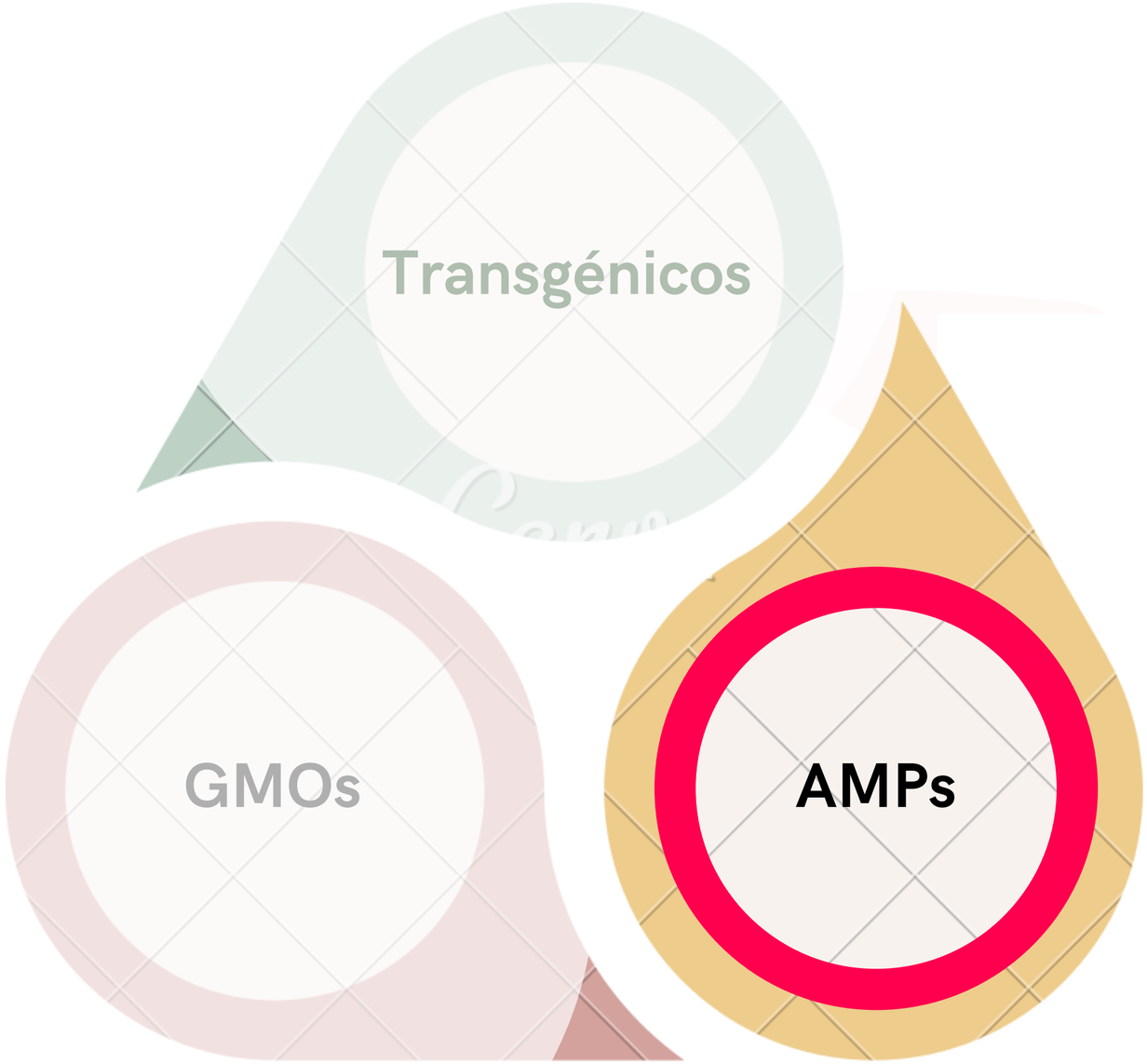
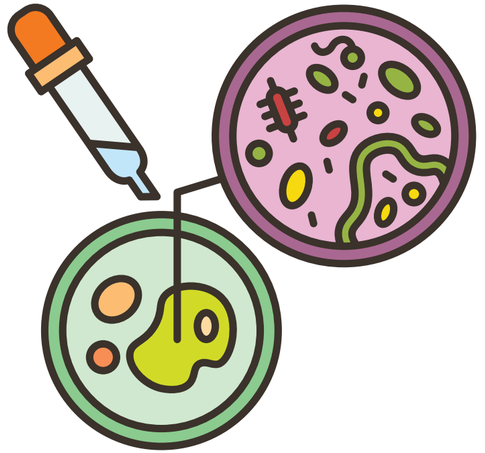


"SynBio" is a recent and upcoming discipline that allows the designing or re-designing os biological systems to give them new or enhanced qualities.

Examples

- Drugs
- Gene therapy
- Biorremediation
- Bio sensors
- Bio factorys



(Muñoz-Miranda *et al.*, 2019)

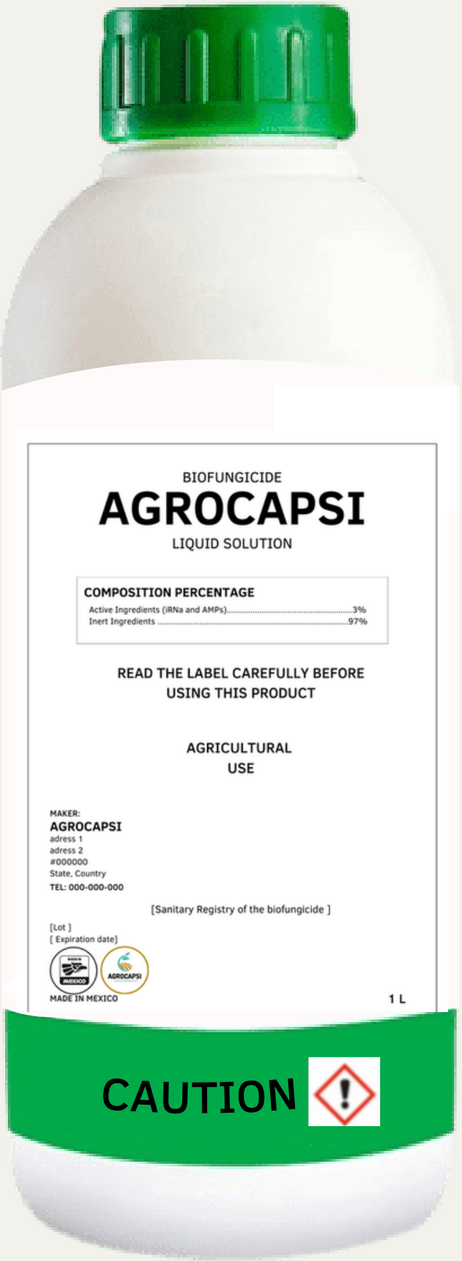
WHAT IS SYNTHETIC BIOLOGY?

THAT'S HOW OUR PROJECT WAS BORN

AGROCAPSI

A biofungicide that controls and eliminates *P. capsici* through SynBio

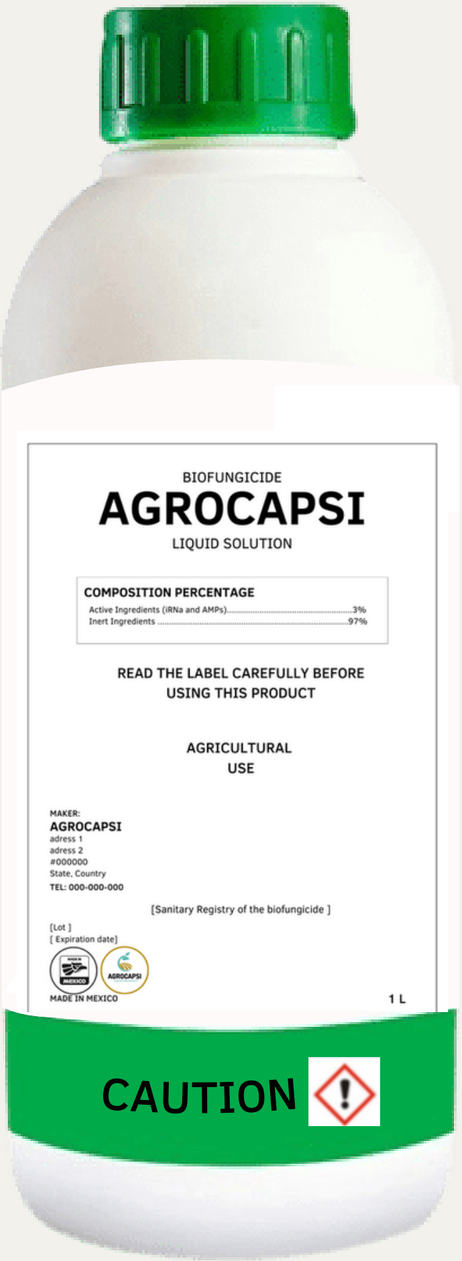
- ☑ Effective against *P. capsici*
- ☑ Environmentally responsable
- ☑ Not a risk to human health



ACTIVE INGREDIENTS

Antimicrobial peptides and interference RNA

- Osmotin
- Dermaseptin
- iRNA



ACTIVE INGREDIENTS

Dermaseptin DrsB1

It is a peptide naturally produced by *Phyllomedusa bicolor* (bicolor frog). It is not toxic in any way

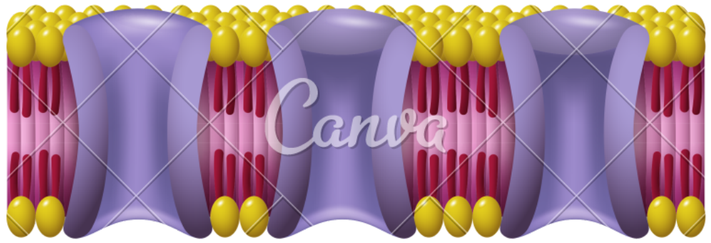
Destabilizes the membrane

(Khademi, et al., 2020)

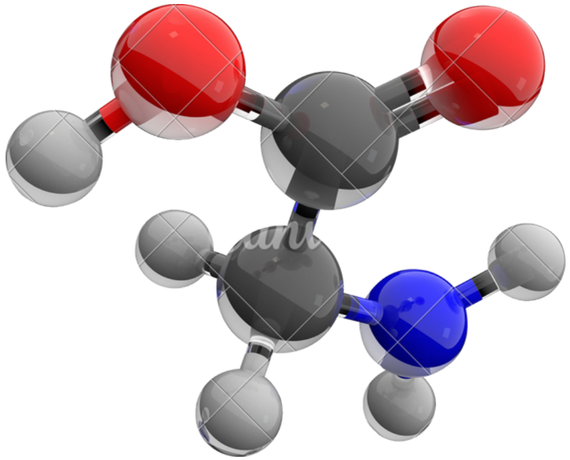
ACTIVE INGREDIENTS

Osmotin PcOSM

It is a peptide naturally found in *Piper colubrinum.* This is one of the few chilli species that are naturally resistant to this oomycete.



Destabilizes the membrane



Induces ROS

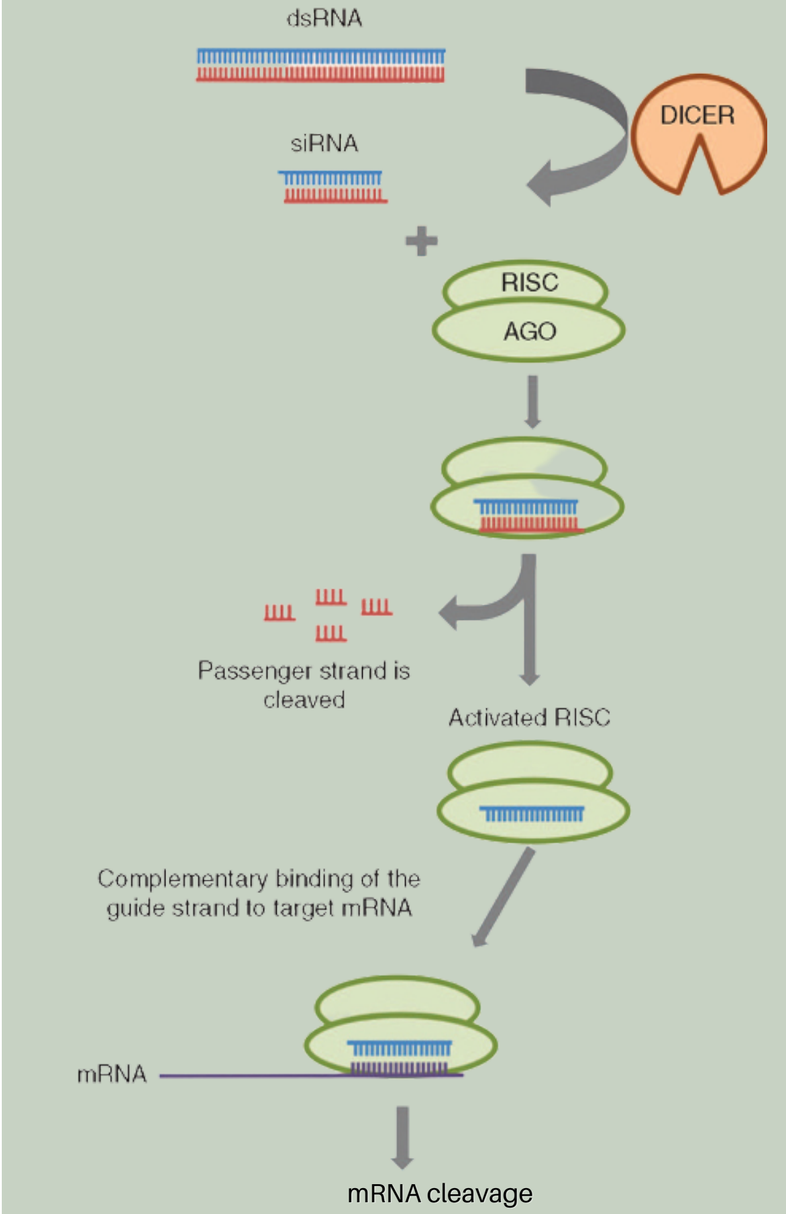
(Geetha, *et al., 2021;* Mani & Manjula, 2010)

ACTIVE INGREDIENTS

iRNA RXLR1

Assays on transitory over expression and promotion of the infection indicates that the gene RXLR1 could promote pathogenic infection.

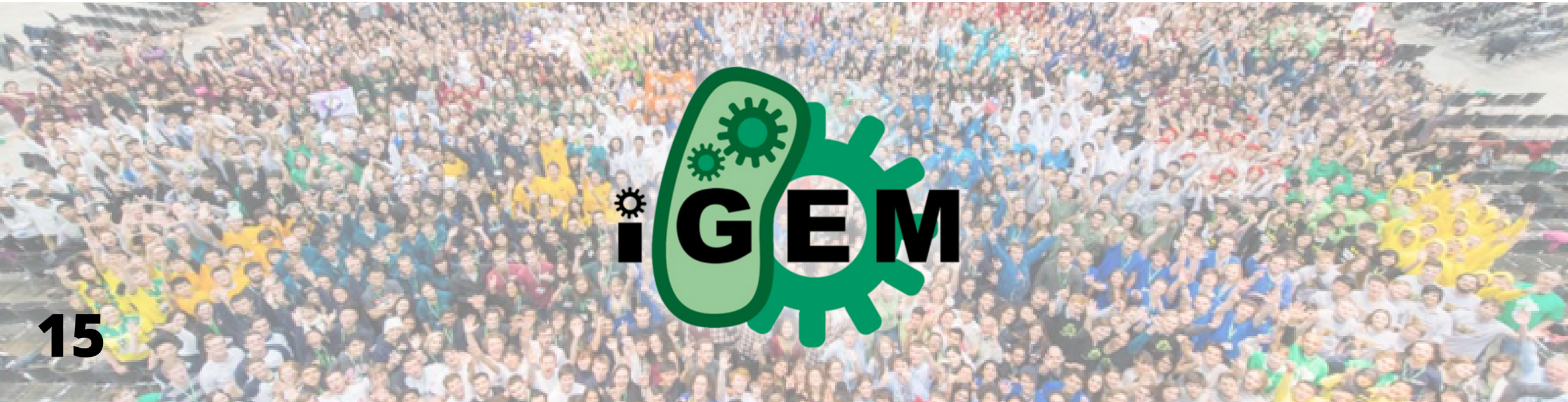
Genetic silencing



(Cheng *et al., 2022;* Edwards *et al., 2020;* Demirer *et al.,* 2020)

¿What is iGEM?

The known limits of SynBio are exceeded to solve different problems faced world wide. The point is to solve complex situations through bioremediation, therapeutics and sustainable materials. The idea of SynBio goes beyond the laboratory; there exists a compromise with the stake holders, local communities and iGEM teams through different collaborations.

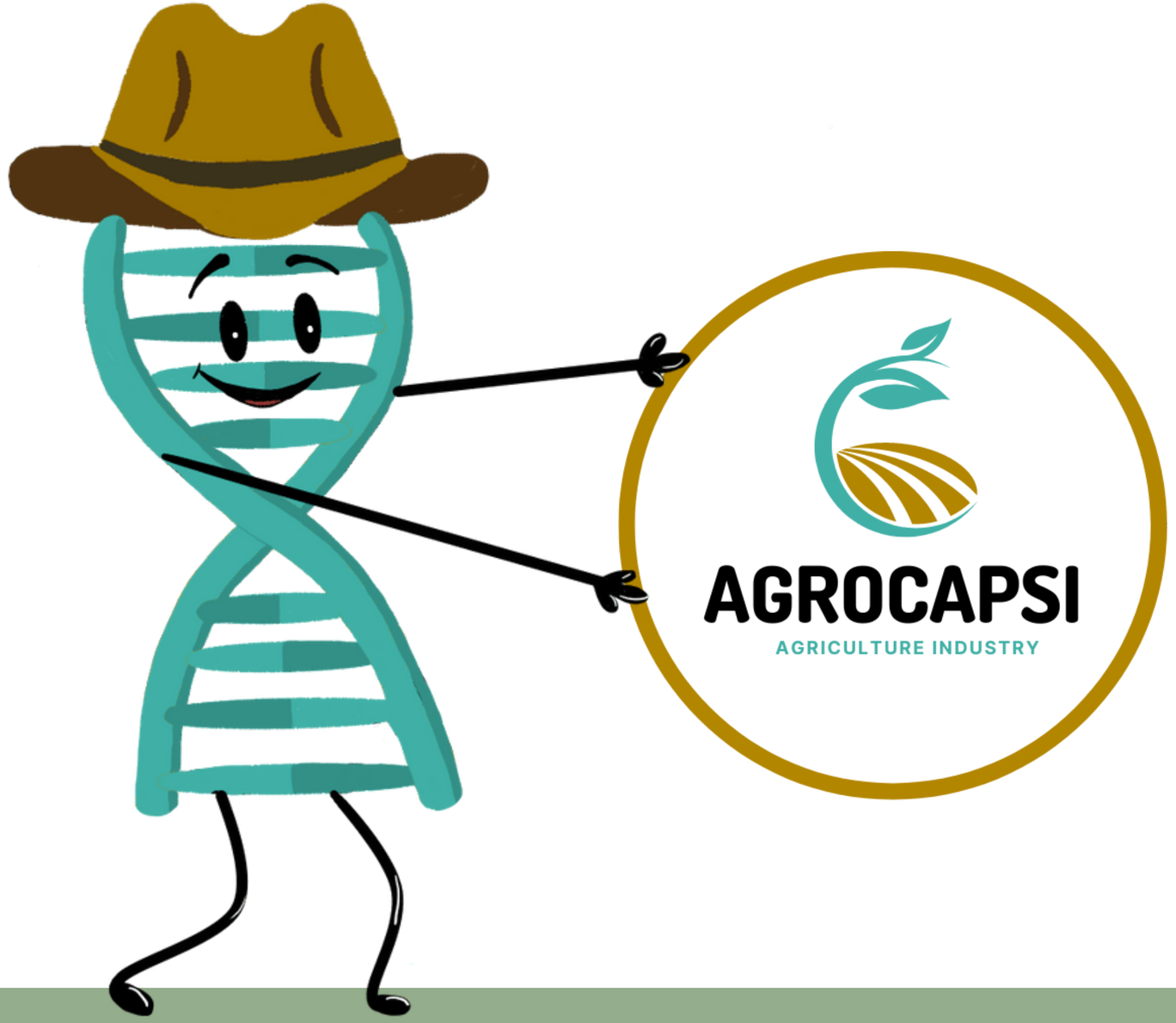


Synthetic Biology can enhance the sustainability in crop production while rescuing an icon of our Mexican identity.

Manuals:

- **Main problems in chilli production**

¿Questions?



Thanks!

igemtecchih

igemtecchih

iGEM Tec-Chihuahua

iGEM Tec-Chihuahua

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