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Growth performances of *Pterocarpus officinalis* seedlings regarding *ex situ* soil and light conditions



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FORESTED WETLANDS IN GUADELOUPE, FWI



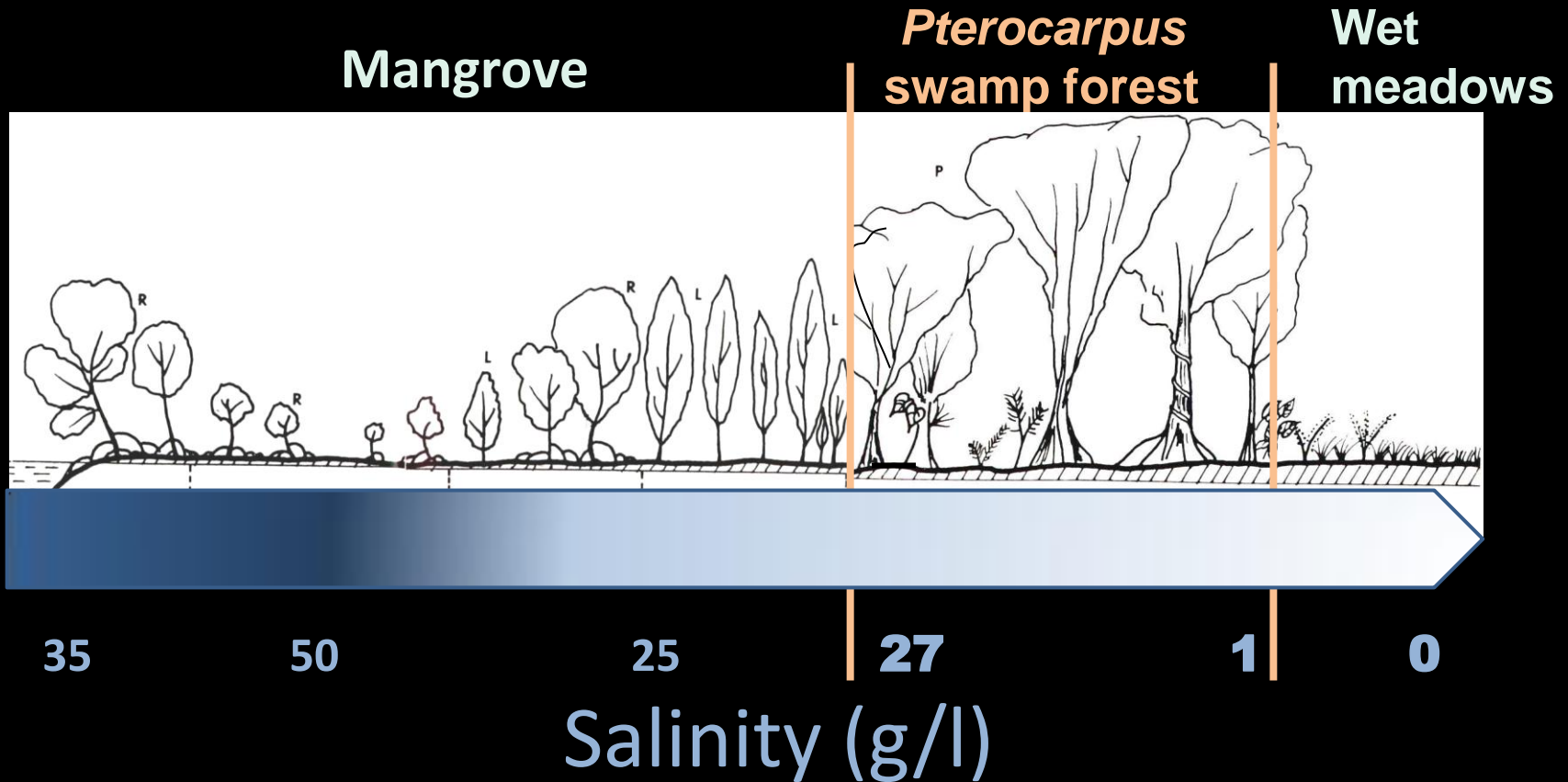
Mangroves:

3 100 ha

Pterocarpus swamp forest:

2 600 ha

PTEROCARPUS SWAMP FOREST ECOLOGY



Permanently or seasonally flooded by fresh or brackish water
(0-27 gNaCl / l)

PTEROCARPUS OFFICINALIS Jacq

Leguminous tree
Fabaceae

N₂ fixing by
Bradyrhizobium sp.
in nodules on
buttressed and
lateral roots

Large, boyant
pods



Land reclamation and
climate change
(sea level rise)



Threat to the swamp
forest

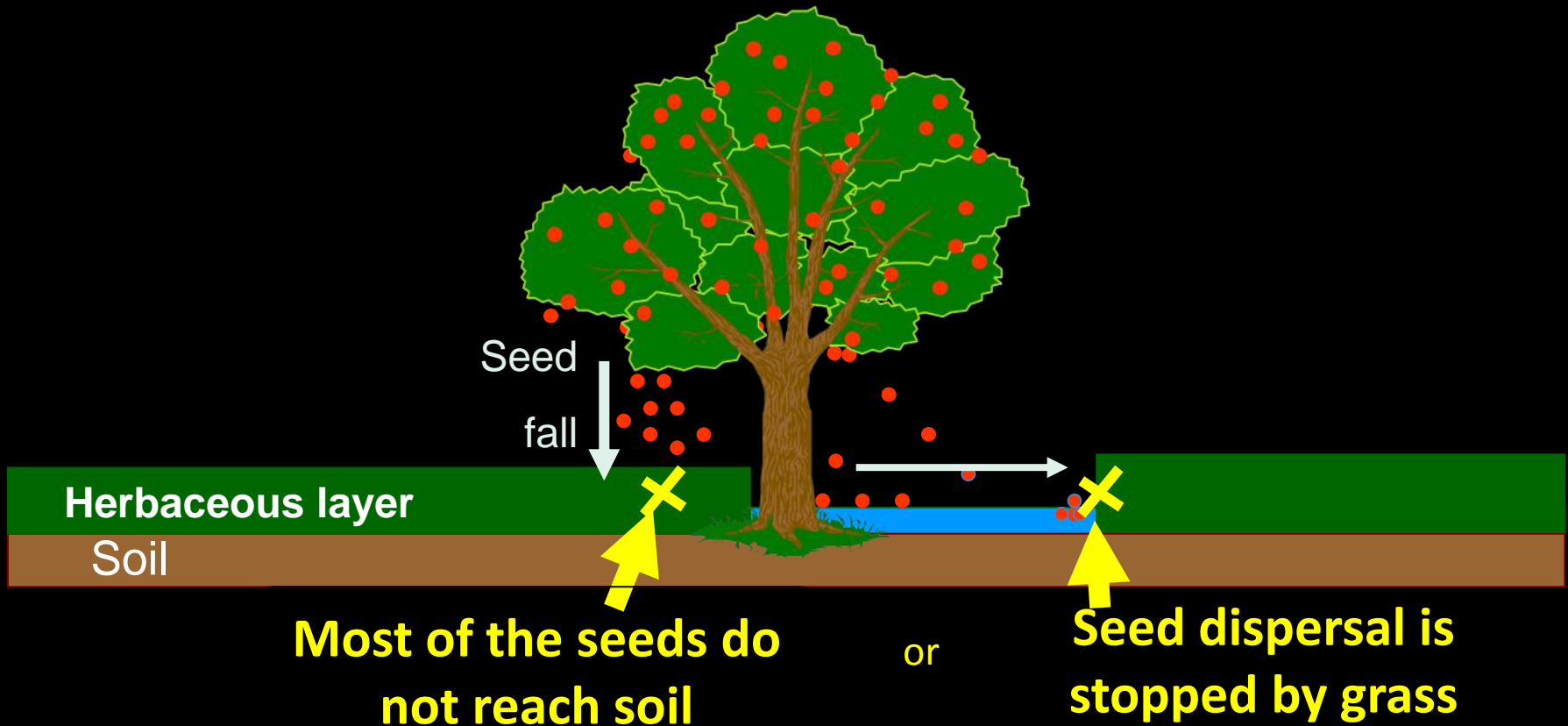


Reforestation program



LIMITED FOREST RECOVERY IN HERBACEOUS WETLANDS

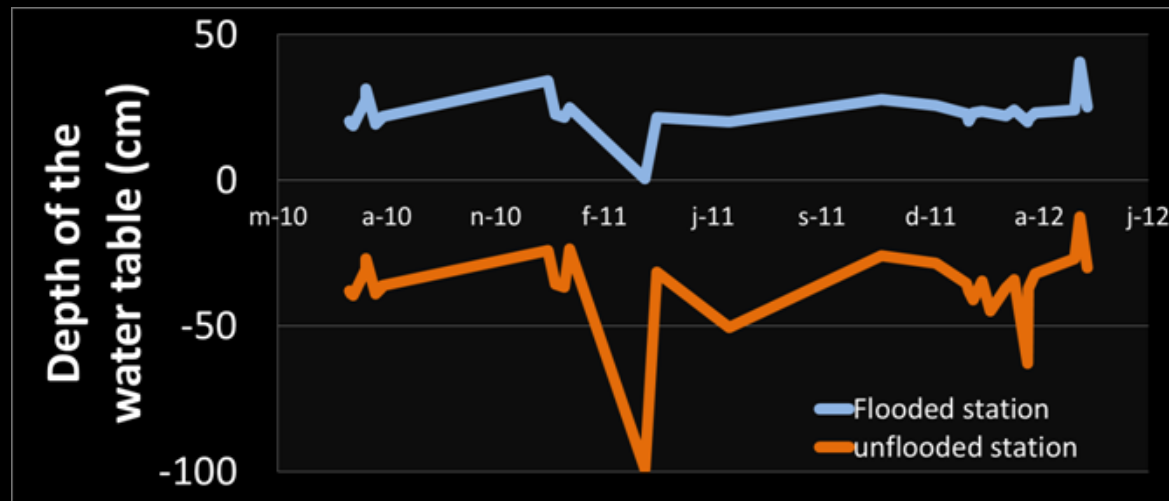
Isolated, mature tree



Seeds fail to disperse, germinate and/or establish

ENVIRONMENTAL DIVERSITY IN HERBACEOUS WETLANDS

- Different **shade levels** in various, paucispecific communities (different light attenuation profiles)



- different **soil types** (clayey or peaty)
- different **flooding conditions**

OBJECTIVES

**Experimentation
in greenhouse
during 12 or 20 months**



What are the optimum growth conditions for *Pterocarpus seedlings*, taking into account the environmental diversity in herbaceous wetlands ?

We have evaluated, the effect of:

- Inoculation
- Soil type (clayey, peaty)
- Shade
- Soil salinity
- Flooding

INOCULATION

In forest trees,
nodules and
fine roots

liquid nutritive
solution (YEM)

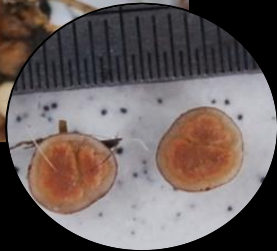
Inoculation of seedlings in
greenhouse

~~Non-inoculated
Control, n=10~~

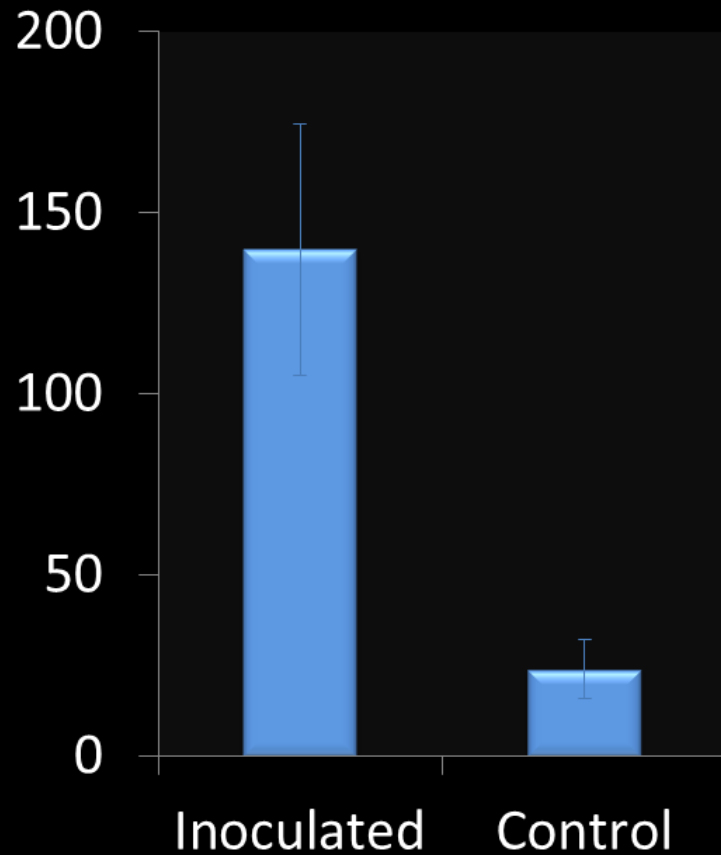
Inoculated
treatment



INOCULATION INCREASES NODULATION OF *PTEROCARPUS* SEEDLINGS



number of nodules



INOCULATION INCREASES GROWTH AND PHYSIOLOGY OF PTEROCARPUS SEEDLINGS



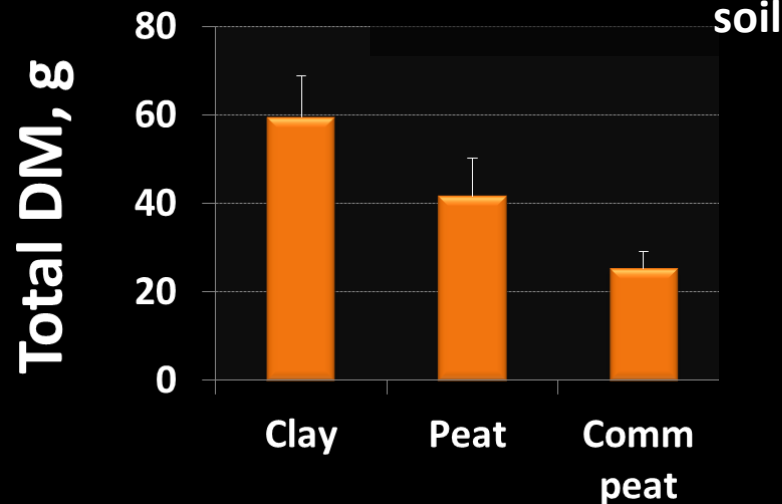
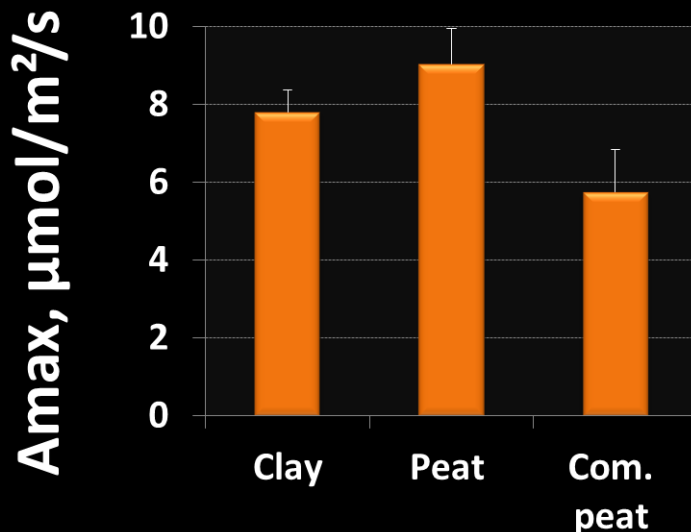
Effect of inoculation, n=10.

	Inoculated		Control
Plant height, (cm)	84,6	>	54,9
No of leaves	21,2	>	13,6
Leaf chlorophyll content (mg/l)	26	>	15
CO ₂ assimilation, ($\mu\text{mol}/\text{m}^2/\text{s}$)	10,4	>	7,3
Shoot/ root ratio	2,1	>	1,2
Total biomass, (g/plant)	16,8	>	9,8

CLAYEY AND PEATY SOIL OF WETLAND, MORE FERTILE THAN THE COMMERCIAL ONE

Soil types => clayey soil of wetland
=> peaty soil of wetland
=> commercial soil

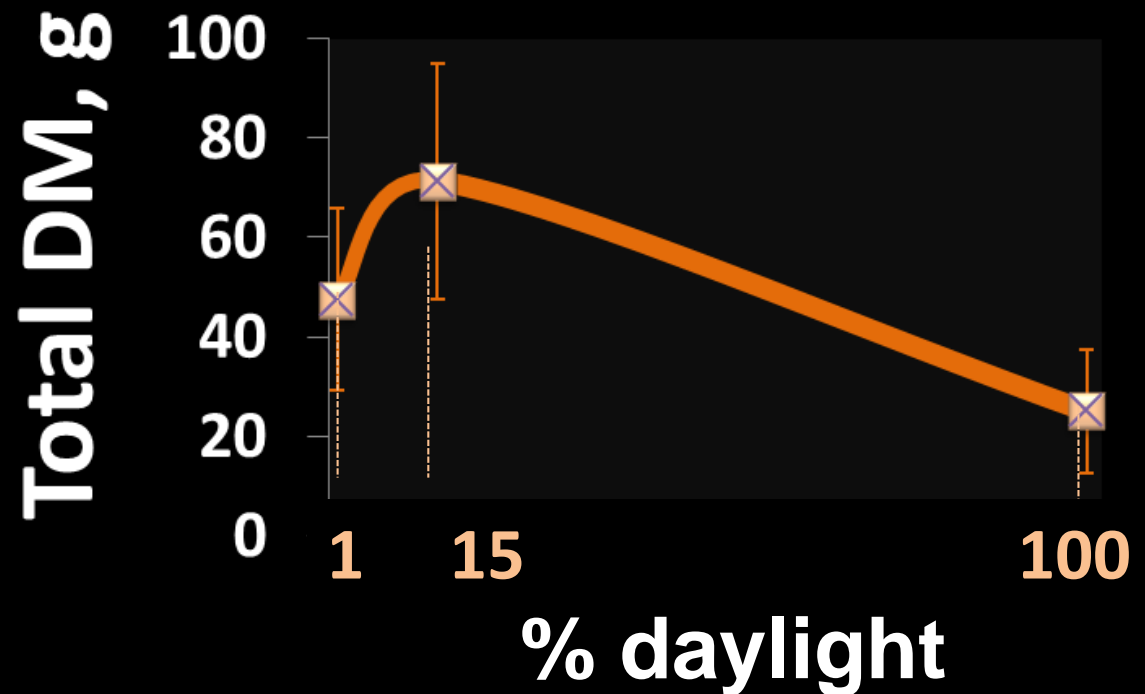
Best growth on herbaceous wetland soils:
↗ plant assimilation
↗ total biomass



SHADE

Compared to 15% of daylight

- **1%** of daylight: - 15% DM
- **100 %** of daylight: - 50% DM



SHADE: 15 % OF DAYLIGHT INCREASE SEEDLING GROWTH

1% of daylight:

↘ photosynthesis => ↘ DM

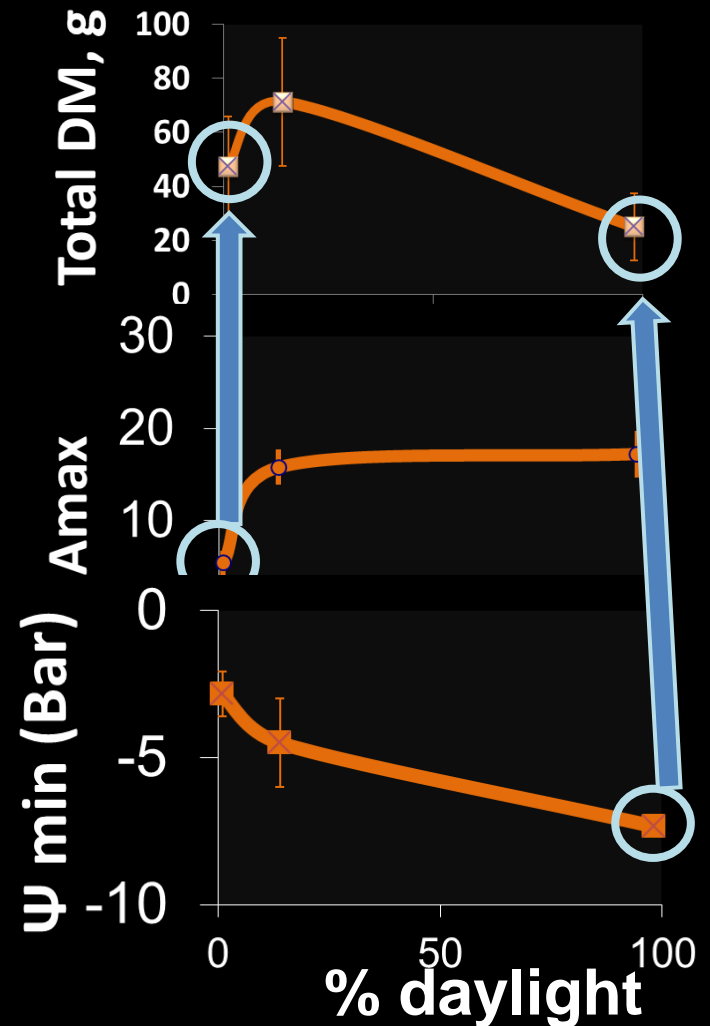
100% of daylight:

↗ climatic demand

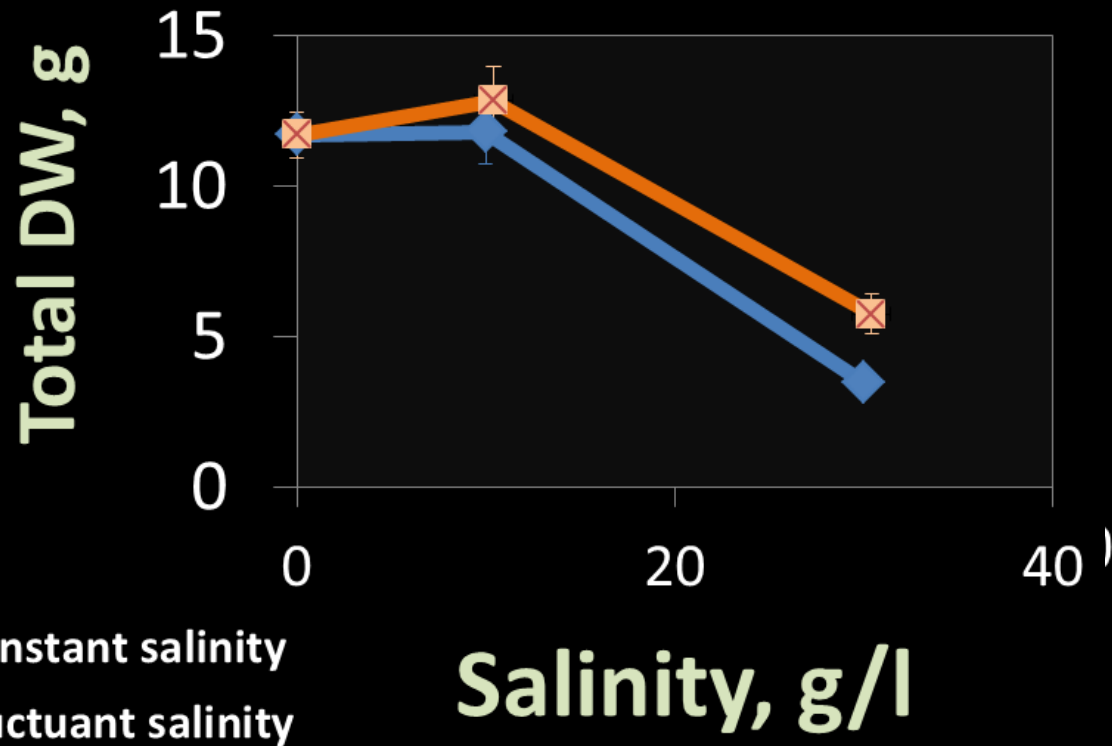
=> ↘ plant water status

“the midday water depression”

=> ↘ DM



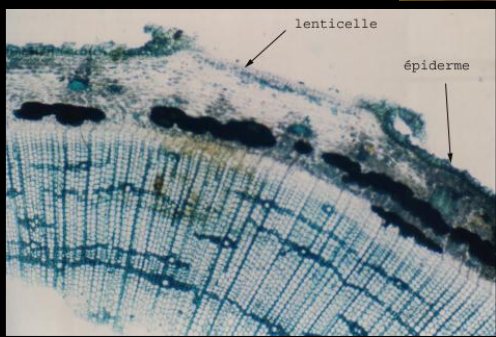
SALT



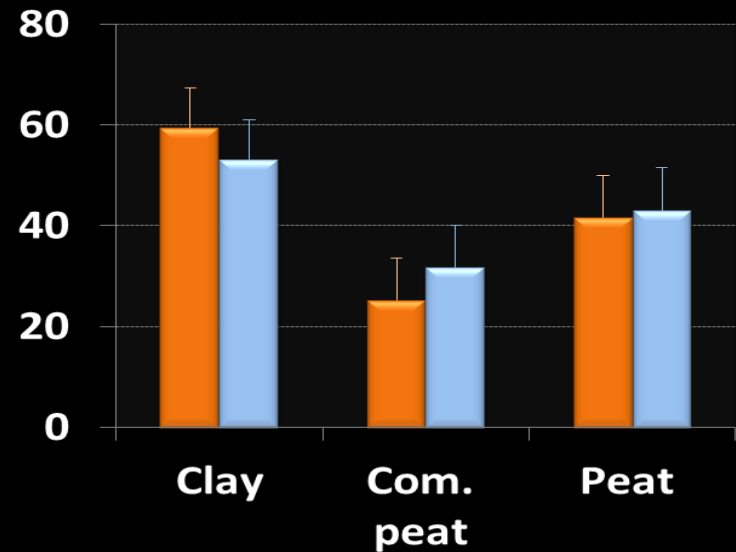
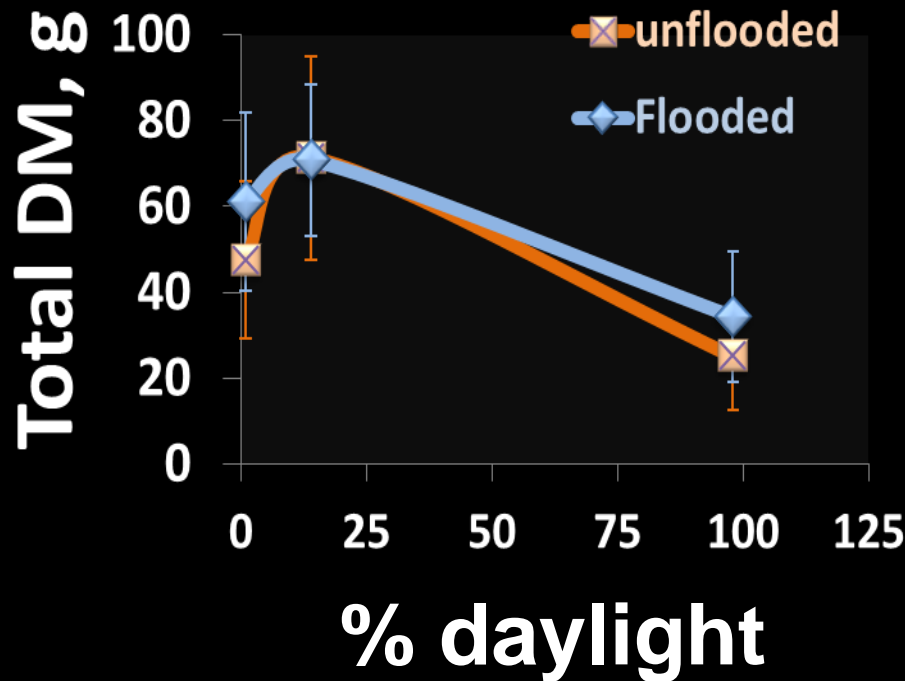
Pterocarpus seedlings tolerate up to 10 g/l of salt
Ponctual fall of salinity improves growth at 30g/l

FLOODED CONDITIONS

15 cm above soil level



FLOODED CONDITIONS



Pterocarpus seedlings tolerate flooding, whatever light availability and soil type

SUMMARY

The growth of *Pterocarpus* seedlings is improved by:

- root inoculation
- herbaceous wetlands soils,
flooded or unflooded
- light attenuation (85% of shade)
- low soil salinity (<10g/l)

THANK YOU ALL FOR YOUR ATTENTION



**Lab staff in the canopy of the swamp forest
and in herbaceous wetland**

SHADE

Different communities

=> several maximal heights, and

=> several level of transmitted daylight

Height: 30 cm

Light: 100 %



Unflood grassland with
Lippia and *Paspalum*

100 cm

90 %



Eleocharis mutata

3 m

2 %



Acrostichum danaeifolium

SHADE

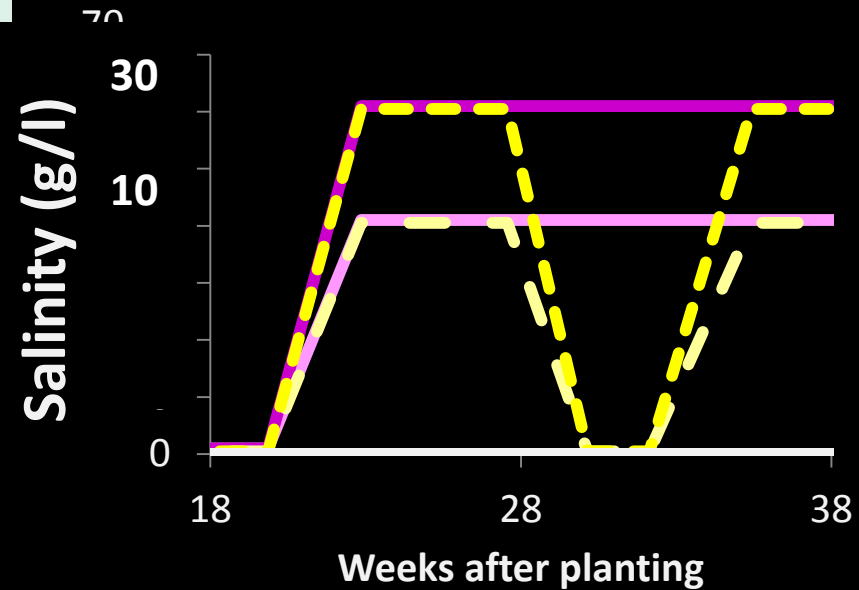
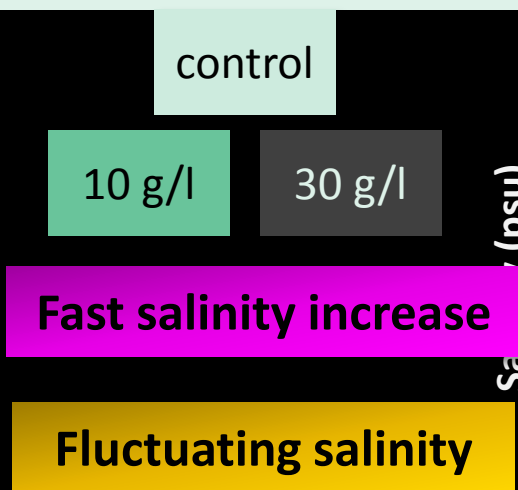
The range of transmitted daylight
(2 to 100%) in herbaceous wetland
could modified seedlings growth



Shade effect in greenhouse
1, 15 and 100% of daylight

EXPERIMENTAL DESIGN OF SALT TREATMENT

Treatments



Data

Survival rate (n=15)
Total biomass (n = 10)
Carbon assimilation (n = 5)



- Endomycorhize à arbuscule

- Alimentation en P

