Paper ID:
CO 1222

Bio-available Silicon, effects on Winter bread wheat drought tolerance

Rachdad Fatima Ezzahra[1,2*], *El Baouchi Adil[3], Sanchez Garcia Miguel[3], Michel Edmond Ghanem[4], El Bouhmadi Keltoum[1], Claudio Zucca[2].*

[1]Environment and Ecology Laboratory, University Hassan II-Faculty of sciences Ben M'sik ,Casablanca-Morocco,
[2]Crop Physiology Laboratory ,International Center for Agricultural Research in the Dry Areas (ICARDA)-Rabat-Morocco,
[3]Quality laboratory, International Center for Agricultural Research in the Dry Areas (ICARDA)-Rabat-Morocco,
[4]itK-Clapiers-France.

1st International Congress of Green Biotechnology
«Biotechnology for Sustainable Agriculture»
Polydisciplinary Faculty of Taroudant
IBN ZOHR University

1. Introduction

Wheat

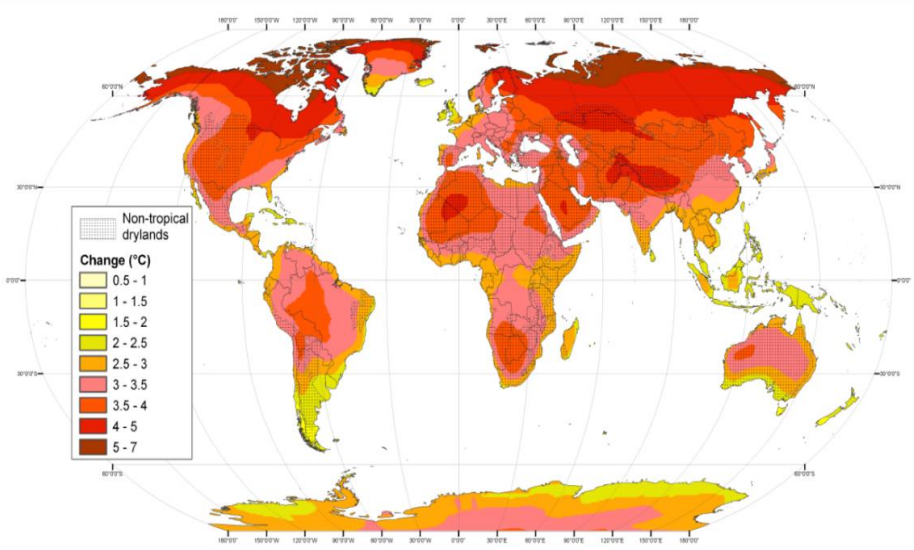
- **Principal component** of human diet for thousands of years,
- Primary **source of nourishment** from beginning domestication process,
- **50% of world daily caloric intake** is derived directly from cereal grain consumption.

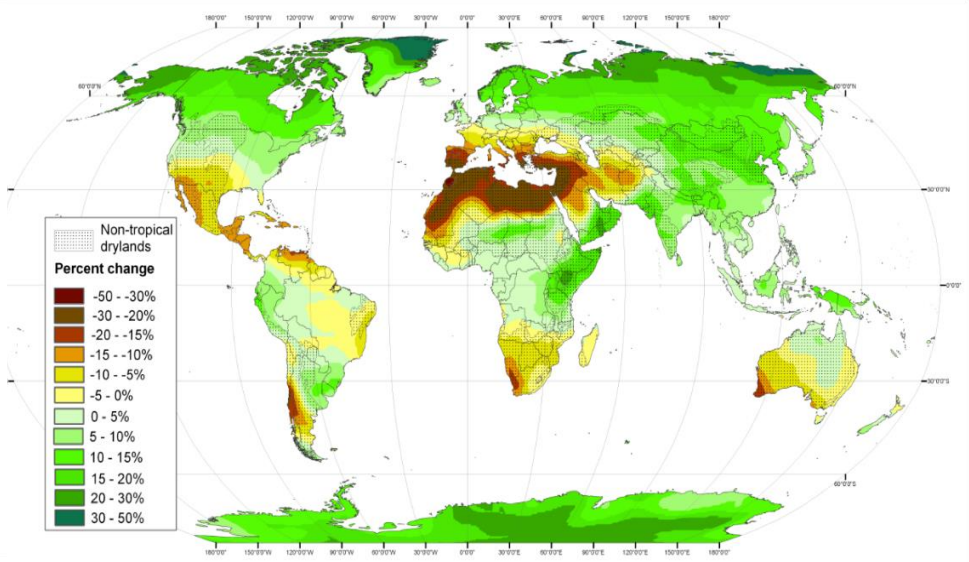
Food and Agriculture Organization of the United Nations. 2012. Chaves, M.S. 2013;

Paper ID:
CO 1222

Problematic

Global warming ⇨↗ Temperature ; Rain fall irregularity





Compiled by GIS Unit ICARDA, based on partial maps in Christensen et al., 2007.

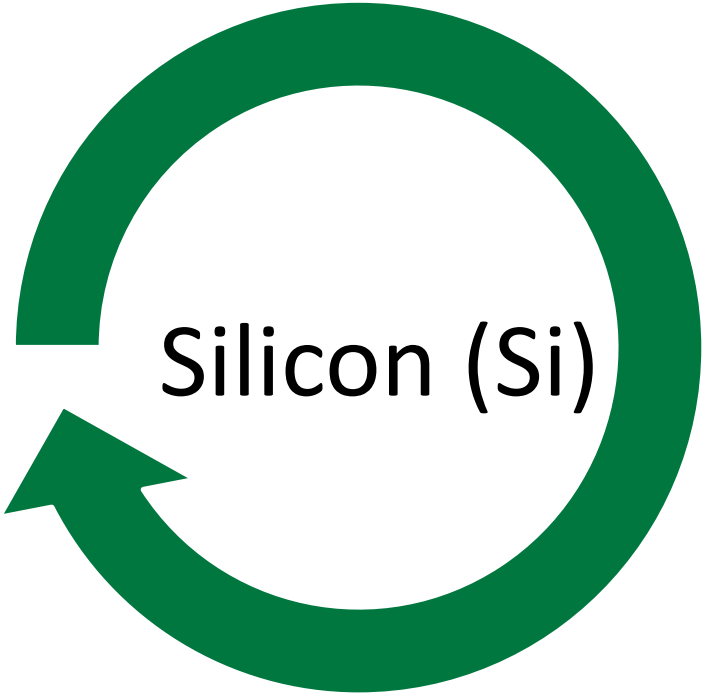
Arid zones are the most negatively impacted

1. Introduction

Silicon is the second most abundant element in the earth's crust

About 87% of the earth's surface is made up of silica (SiO_2)

A **small portion** of Silicon is released in soluble form and **available** to plants



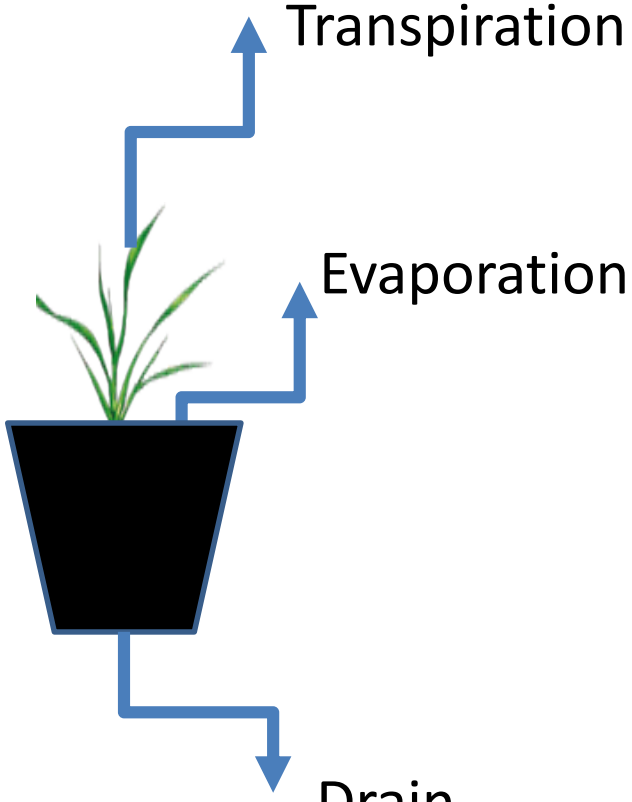
- Significant concentrations in plants
  - (sugar cane and rice)
- Benefits in agriculture
- mitigate environmental stresses
- Alternative for sustainable agriculture

Gunter et al 2012, Janislampi, K.W. 2012, Meena et al 2014, Olga et al 2018,

Paper ID:
CO 1222

Objective

What is the impact of bio available silicon on water conservation traits in wheat (winter bread wheat) ?!



$$Transpiration_{24hrs} = Weight_{\,(Day\ x+1)} - Weight_{\,(Day\ x)}$$

2. Material and methods

Faculty of Geosciences and Geography, Georg-August University of Göttingen (Germany)

With silica
(K2SiO3 2.5 mM)

Winter bread wheat genotypes

15 DBS*

Without silica
(K2SO4 2,5 mM)

1 DBS

5 WS

5 WW

5 WS

5 WW

- ✓ **LA ; DW ; FW**
- ✓ **Si in plant**
- ✓ **NTR** (**N**ormalized **T**ranspiration **R**ate)
- ✓ **FTSW** (**F**raction of **T**ranspirable **S**oil **W**ater)

- ✓ Leaf area (LA)
- ✓ Fresh biomass (FW)
- ✓ Dry biomass (DW)

- ✓ LA
- ✓ FW
- ✓ DW
- ✓ Si in plant

*DBS : Days Before Stress

2. Material and methods

- **2 to 3 seeds per pots**
- **2,5 Kg Soil from Koudia** (mobile Si 7,1µg/g ; Amorphous Si 4,89 mg/g)
- **controlled conditions**
  - ✓ **Temperature** : T min = 20°C ; T max = 25°C;
  - ✓ **Photoperiod** = 14h;
  - ✓ **Humidity**: HR% Day = 40% ; HR% night= 60%.

3 to 4 leaves

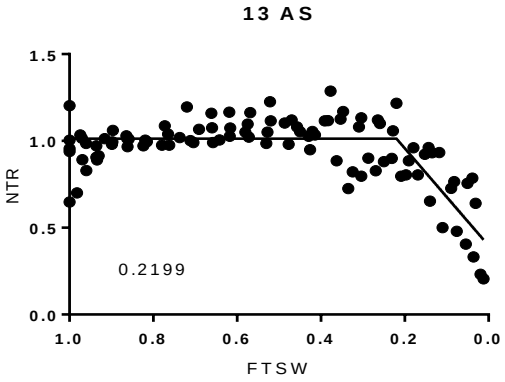
Progressive drought

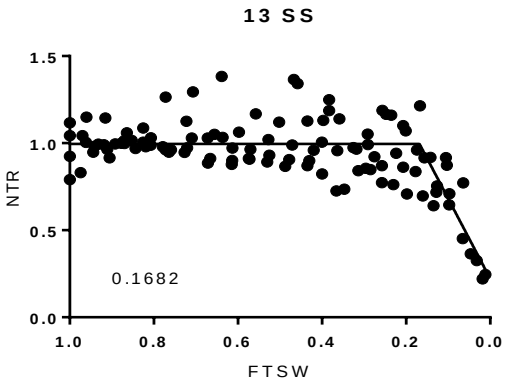
20 to 26 days

3. Results and discussion

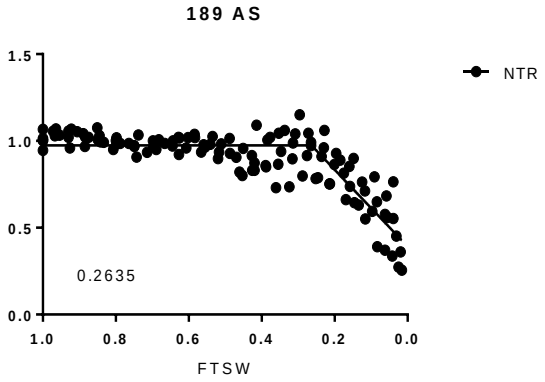
3 types of response

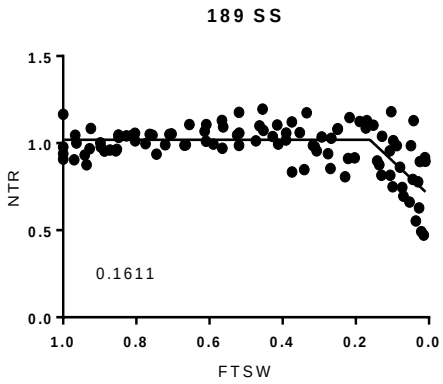
Positive change



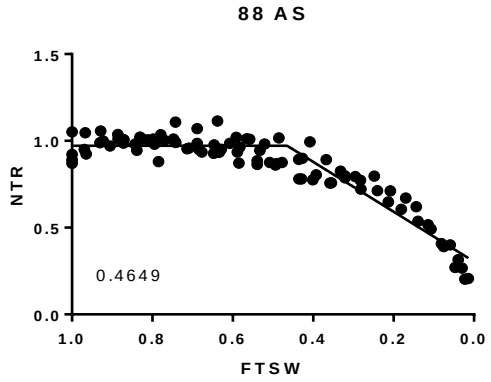


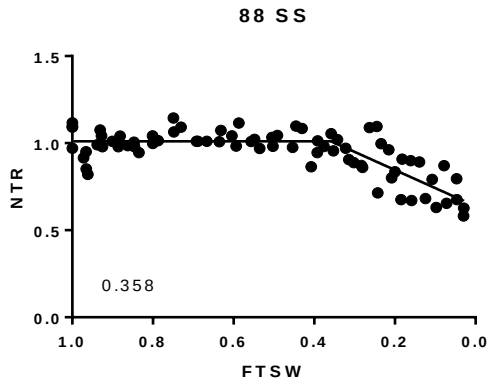
No change





Negative change

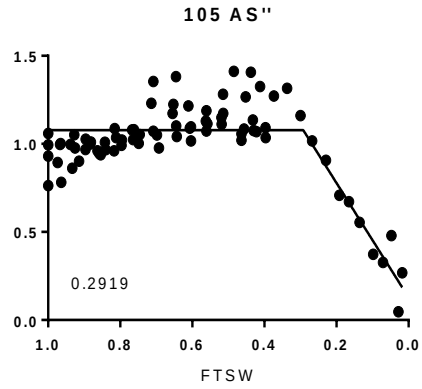


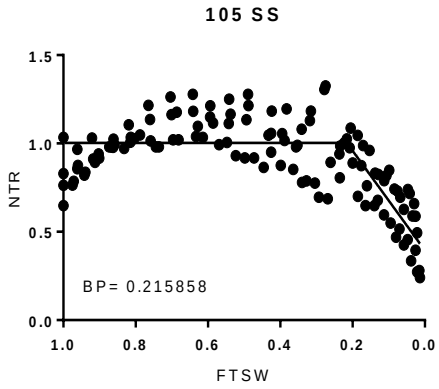


3. Results and discussion

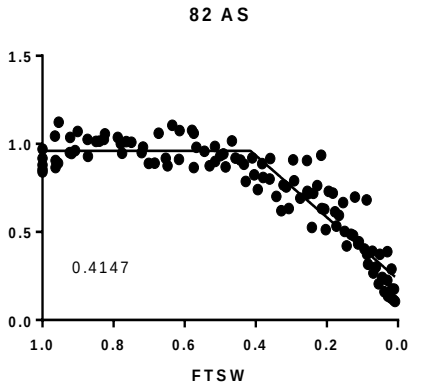
3 types of response

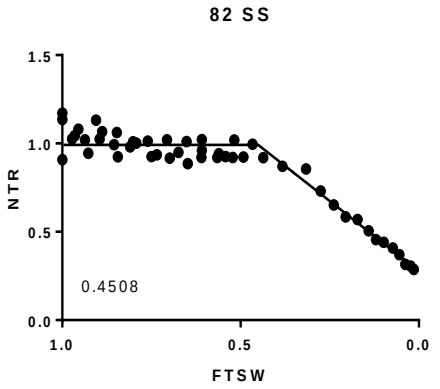
Positive change



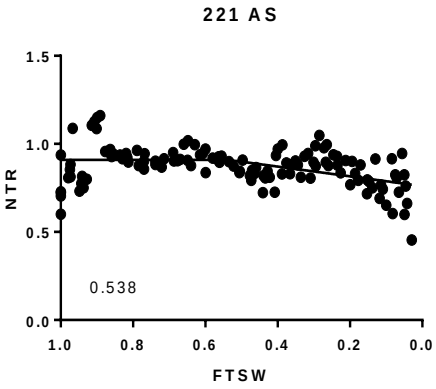


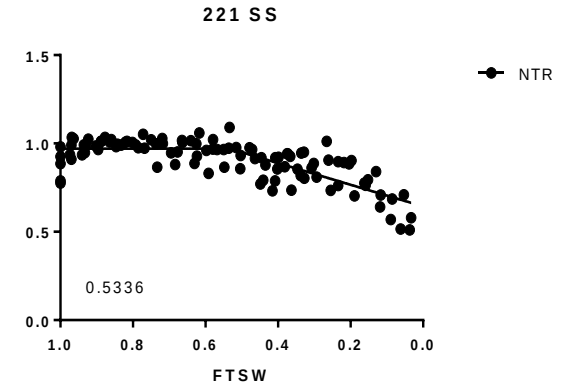
No change





Negative change





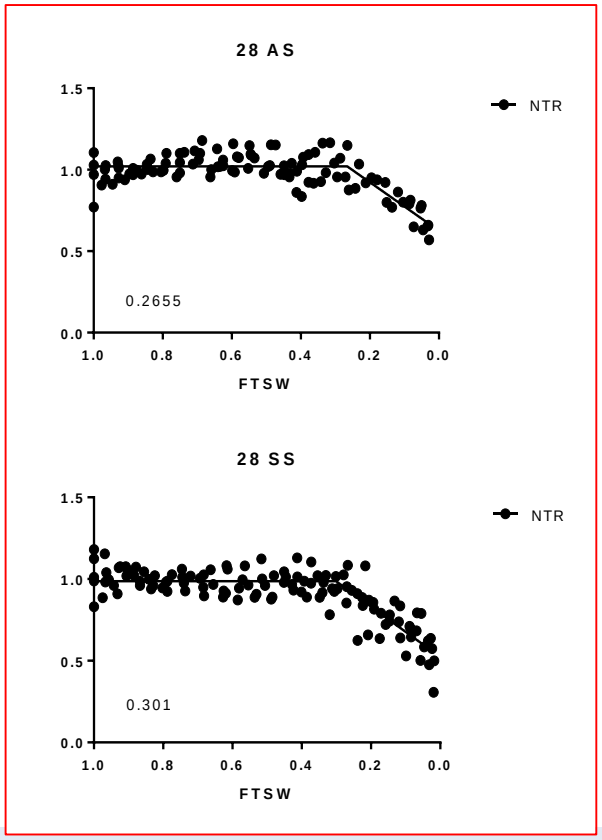
3. Results and discussion

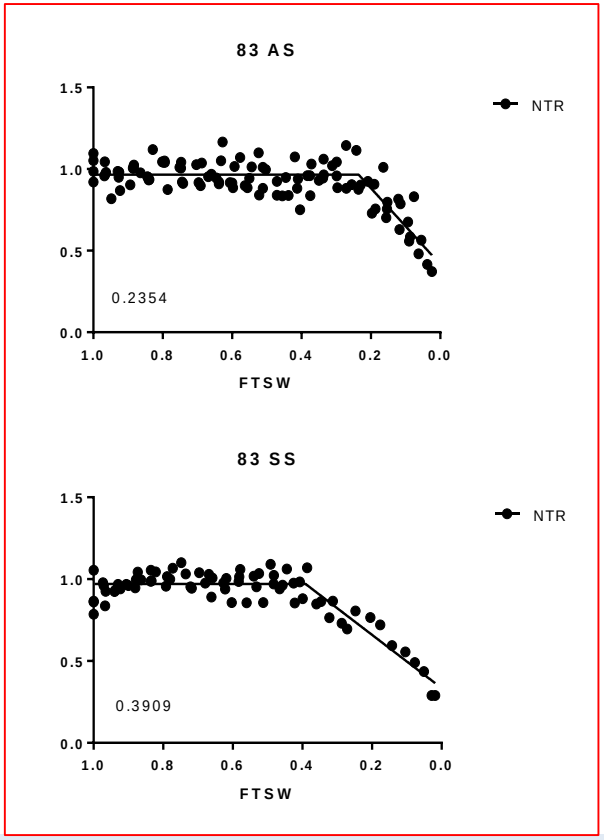
3 types of response

Positive change

No change

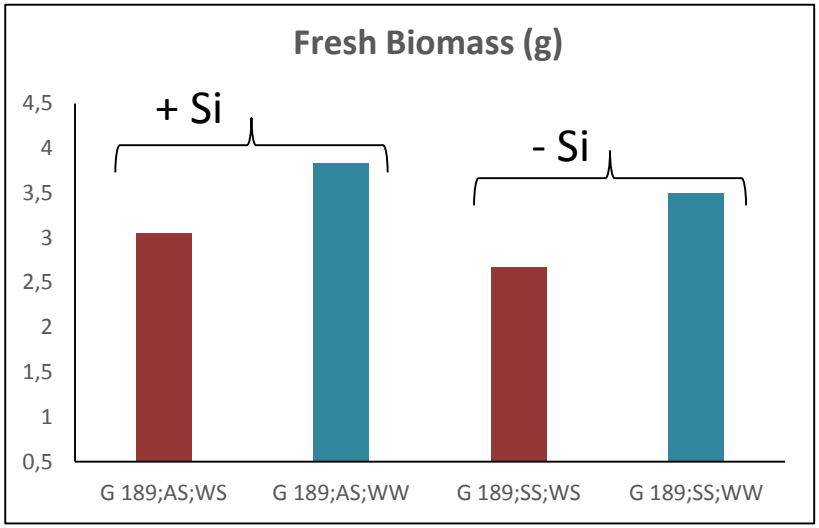
Negative change

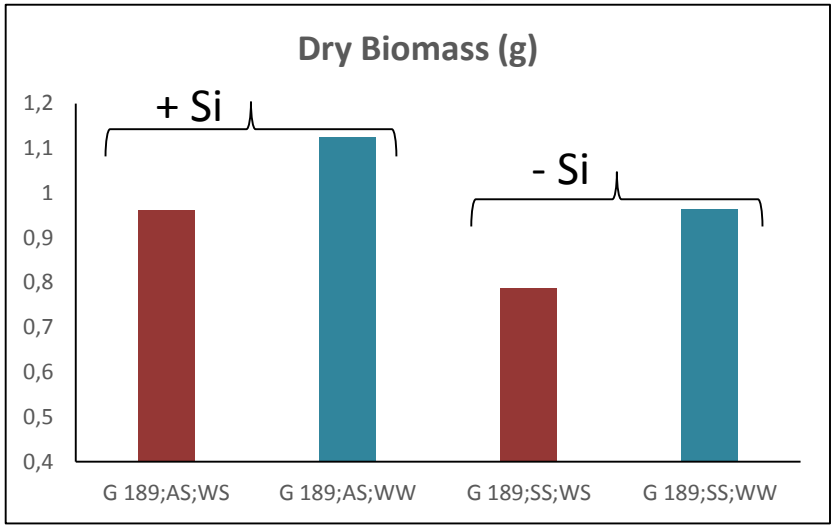


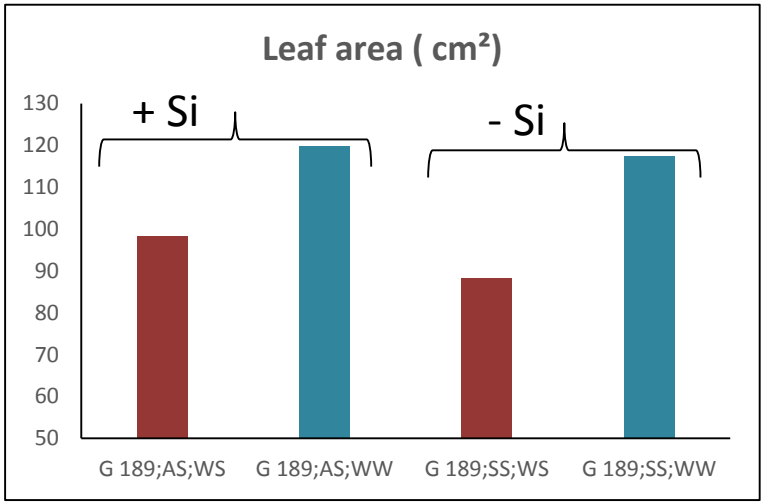


3. Results and discussion

Other parameters : Fresh weight ; Leaf area ; Dry weight







Fresh biomass, Dry biomass and Leaf area of **genotype 189** with 2 treatment **with Si (+Si)** and **without Si (-Si)** under **normal (WW)** and **stressed (WS)** conditions.

4. Conclusion and perspectives

Our first findings reveal that there is a silicon effects:

- ✓ Diversity of **water behavior** with silicon addition in both of conditions normal and stressed.
- ✓ Significant changes on **biomass criteria**

Perspectives

- ➢ Measure the quantity of **Silicon and mineral concentration** in leaves samples (Germany)
- ➢ Evaluate the Silicon's effects on aquaporin (Roots)
- ➢ Run experiment in the field and measure other parameters: stomatal conductance , photosynthetic activity, plant height , grain yield …etc.

Bio-available Silicon, effects on Winter bread wheat drought tolerance

Thank you for your attention

Rachdad Fatima Ezzahra

الكلية متعددة التخصصات تارودانت
FACULTE POLYDISCIPLINAIRE TAROUDANT

1st International Congress of Green Biotechnology
«Biotechnology for Sustainable Agriculture»
Polydisciplinary Faculty of Taroudant
IBN ZOHR University