ENI CBCMED
Cooperating across borders in the Mediterranean

Project funded by the EUROPEAN UNION

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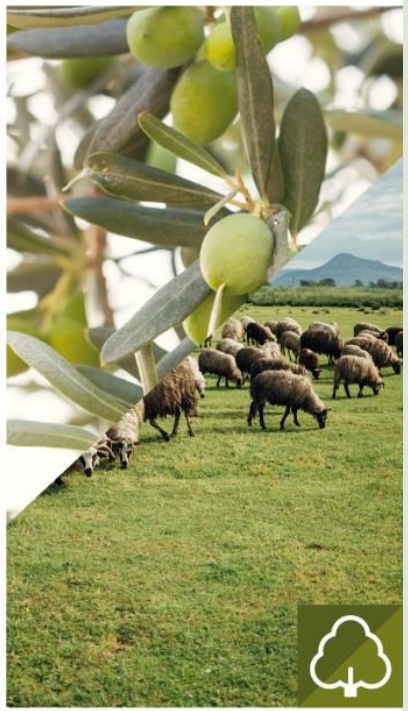
LIVINGAGRO



The LIVINGAGRO project:
Cross-Border Living Laboratories for Agroforestry

Department of Horticultural Genetics and Biotechnology
Mediterranean Agronomic Institute of Chania
Crete, Greece

Technology Dissemination Workshop, Online, September 28, 2023

Forestas
Agenzia forestale regionale pro s'isviluppu de su territòriu e de s'ambiente de sa Sardigna
Agenzia forestale regionale per lo sviluppo del territorio e dell'ambiente della Sardegna
SardegnaForeste

Consiglio Nazionale delle Ricerche

NARC
المركز الوطني للبحوث الزراعية
National Agricultural Research Center

LARI

CIHEAM
MAI CHANIA

ATM CONSULTING sas

The LIVINGAGRO Project

- TITLE: Cross-Border **Living** Laboratories for **Agro**forestry
- Duration: 48 months, September 2019 to September 2023
- Programme : ENI CBC MED 2014-2020
- Program Priority : A.2.1 – Support technology transfer and commercialization of research results
- Budget: € 3.333.163,72 (ENI contribution amount: € 2.999.847,35)

(Please note that we may take screenshots of this workshop.)

Cross-Border Dimension

4 European Partners:

- Italy: **FoReSTAS** – Leading Partner
- Italy: **CNR**
- Italy: **ATM Sas**
- Greece: **MAICH**

2 Mediterranean Partners:

- Lebanon: **LARI**
- Jordan: **NARC**

5 Associated Partners:

- Assessorato Difesa Ambiente (IT)
- Assessorato dell' Agricoltura (IT)
- COLDIRETTI (IT)
- ARA – Associazione Regionale Allevatori Sardegna (IT)
- THE LEBANESE UNIVERSITY (Lebanon)

What is a Living Laboratory?

- Definition – An Open-Innovation ecosystem that operates in a well-defined territorial context (local, regional, national or international) to integrate Research and Innovation processes within an Association including Public, Private and Community subjects

- The following elements tend to be key features of a Living Laboratory*:*
  - Experimental approach in **a real life context** - **Real Life Setting**
  - **Stakeholder participation and involvement** - **User-centered**
  - **Collaboration and co-production** of knowledge and innovation - **Co-creation**

- LIVINGAGRO's Living Labs are **active collaborations** among farmers, agri-food company staff, local authorities, researchers, innovators, and other stakeholders in order **to identify common problems in the real world and then find and share innovative solutions that can help stakeholders**.

Agroforestry

- **Agroforestry: many definitions** since 1977
  - "a collective name for land-use systems and technologies where **woody perennials** (trees, shrubs, palms, bamboos, etc.) **are deliberately used on the same land-management units as agricultural crops and/or animals**, in some form of spatial arrangement or temporal sequence" (FAO)
  - "a dynamic, ecologically based, natural resource management system that, through the integration of trees on farms and in the agricultural landscape, **diversifies and sustains production for increased social, economic and environmental benefits** for land users at all levels"
- **Innovation:** The European Commission (EC) defines innovation in agriculture and forestry as "'a new idea that proves successful in practice.' In other words, the introduction of something new (or renewed, a novel change) which turns into an economic, social or environmental benefit for rural practice."

General objective of LIVINGAGRO

Create 2 **cross-border Living Laboratories** to support training, research and development, and technology transfer in the **agroforestry** sector, strengthening cooperation among researchers, public administrators, SMEs, farmers and breeders, as well as other stakeholders

Field visits, collaboration, R&D, field trials, technology transfer

LIVINGAGRO's Two Living Labs

Living Lab 1:
MULTIFUNCTIONAL OLIVE SYSTEMS

Living Lab 2:
GRAZED WOODLANDS

Field visits with stakeholders: co-creation

20 Field Visits to learn about innovation needs directly from end users & share innovation offers

Italy (R. Lai)

Greece (L. Radinovsky)

Lebanon LL1 (P. Moubarak)

Jordan (S. Ayoub)

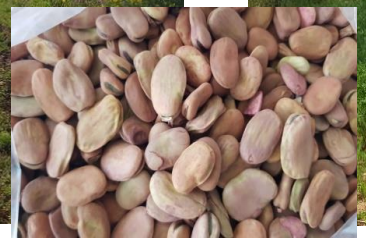
Field trials with farmers and breeders: Real-life settings

Innovative seed mixtures (P. Arca)

Green manure in multifunctional olive systems (P. Moubarak)

Field trials with farmers in Jordan

Cover crop field trials (broadbeans, peas, chickpeas and vetch) and greenhouse for forest ecosystem restoration



Brokerage (B2B) events: discussing innovations with stakeholders

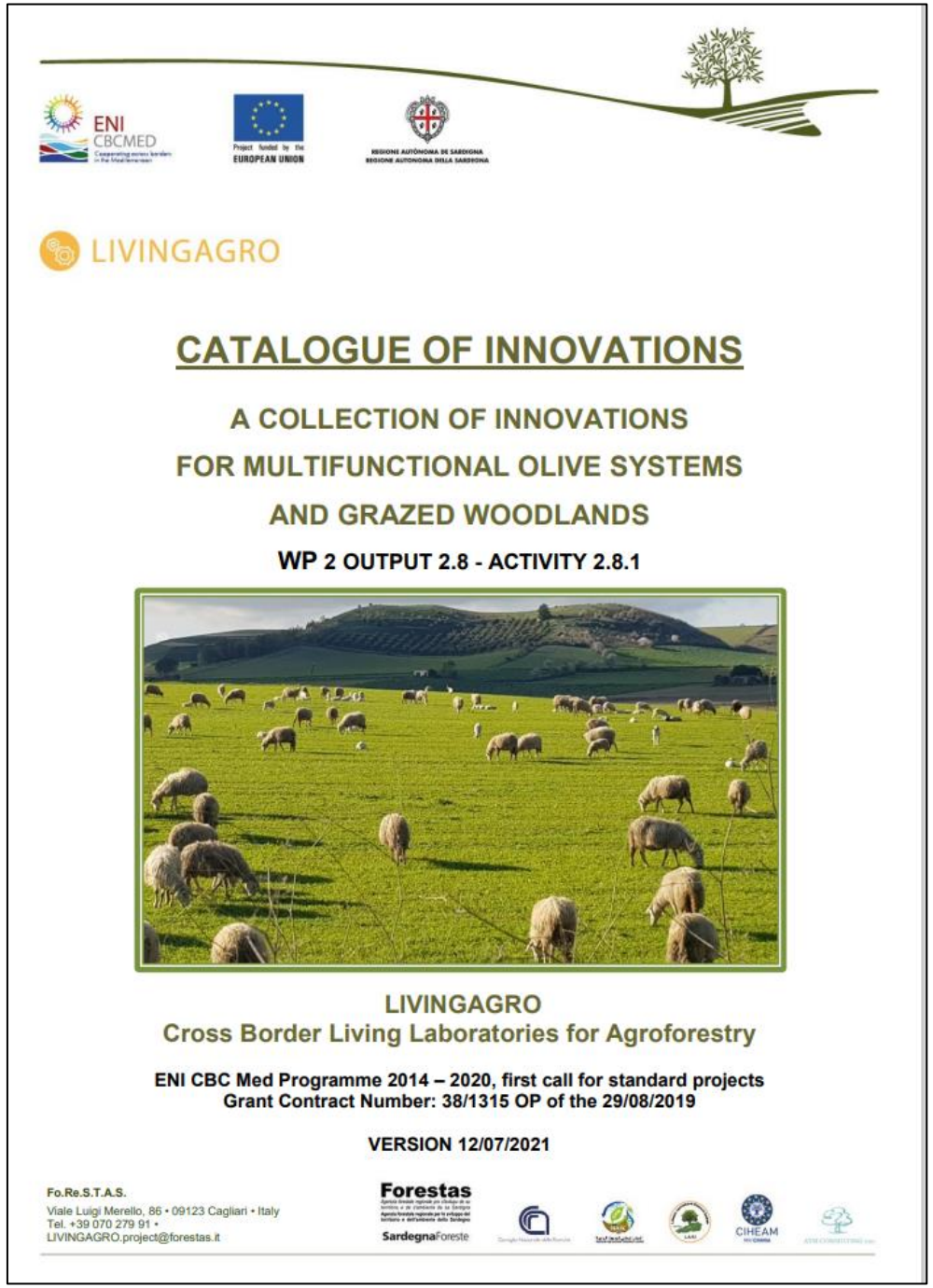
- 2 in Greece
- 4 in Lebanon
- 4 in Jordan

- **Format: seminars and discussion**
  - presentations followed by questions and discussions
  - one-on-one meetings between innovators and stakeholders
- **Participants**

  farmers, agronomists, marketers, managers, exporters, researchers, and others involved with agri-food products, multifunctional olive systems, grazed woodlands, and/or agroforestry

Catalogues of innovations

- ✓ 10 catalogues: one for each B2B event
- ✓ Provide overviews of innovations presented to stakeholders at brokerage events
- ✓ Use non-technical language
- ✓ Include confact info for innovators
- ✓ Available on the project's ICT platform (https://livingagrolab.eu/) in English, with some also in Arabic and Greek

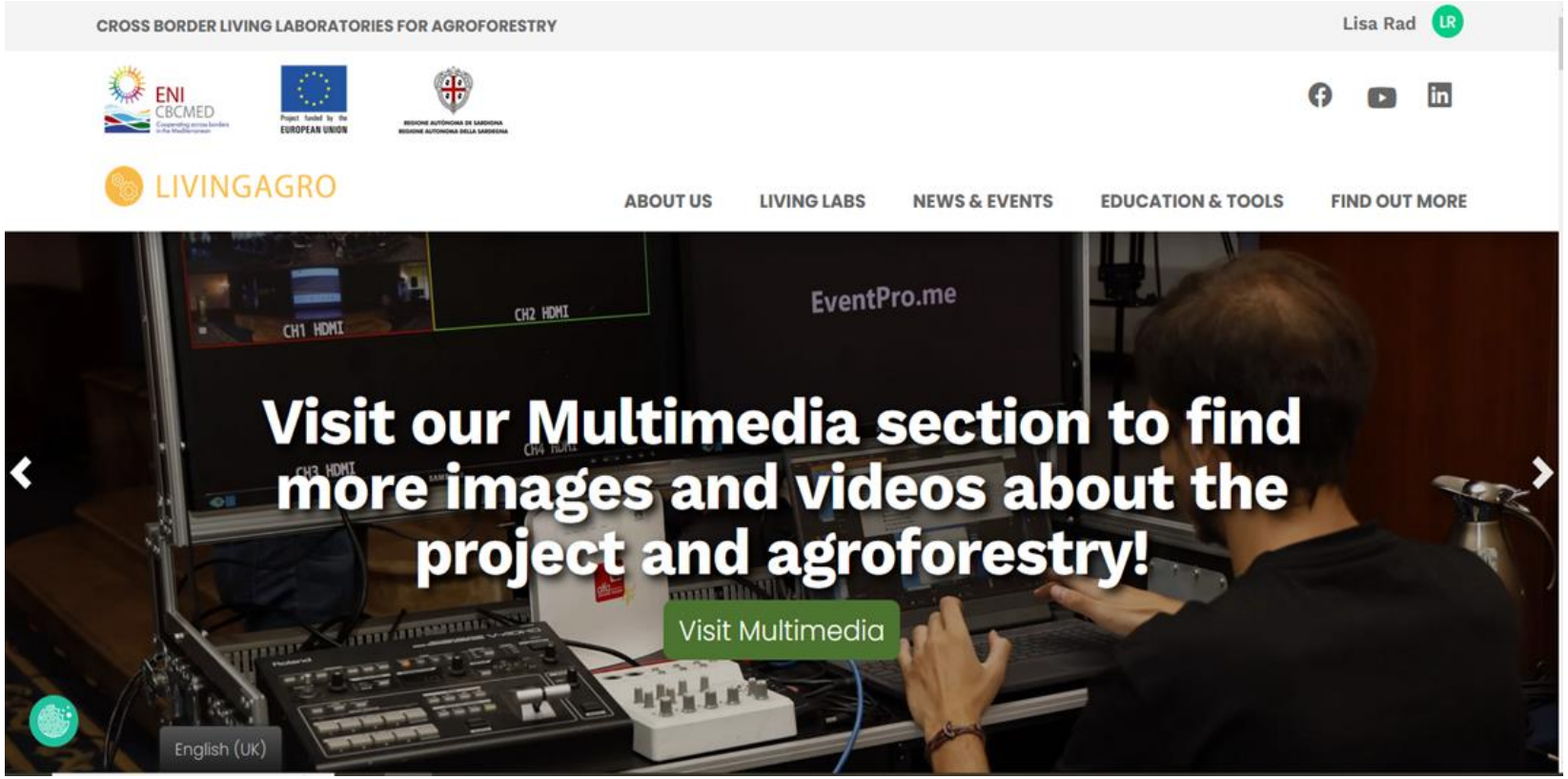


LIVINGAGRO COMMUNICATION CHANNELS AND TOOLS

Register on the project's **ICT platform** to join our Living Labs!

https://livingagrolab.eu/

- e-learning classes
- Precompetitive analysis tool
- catalogues of innovations
- articles & scientific resources
- recorded workshops
- networking opportunities
- And more, in 4 languages!



Also follow our

Official **social media** channels:

www.facebook.com/Livingagro

www.linkedin.com/company/livingagro-eni-cbc-med-project

LIVINGAGRO

We would appreciate it if you would write your names and email addresses in the chat section so we have a record of the workshop's participants. Feel free to type in your questions as well. Thank you for joining us!

The LIVINGAGRO TEAM

https://livingagrolab.eu/

Preliminary work on growth of forage species from high and low altitudes & their response to hypoxia

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LIVINGAGRO

CIHEAM
MAI CHANIA

OXFORD OPTRONIX

Oxford Optronix **HypoxyLab** Hypoxia Workstation

A fully-featured, ergonomically engineered **hypoxia workstation** that precisely control;

1- oxygen

2- Carbon dioxide

3- Temperature and humidity

Uses

1- Biotechnology

2- Cancer research

3- Stem cell investigations

Key Benefits

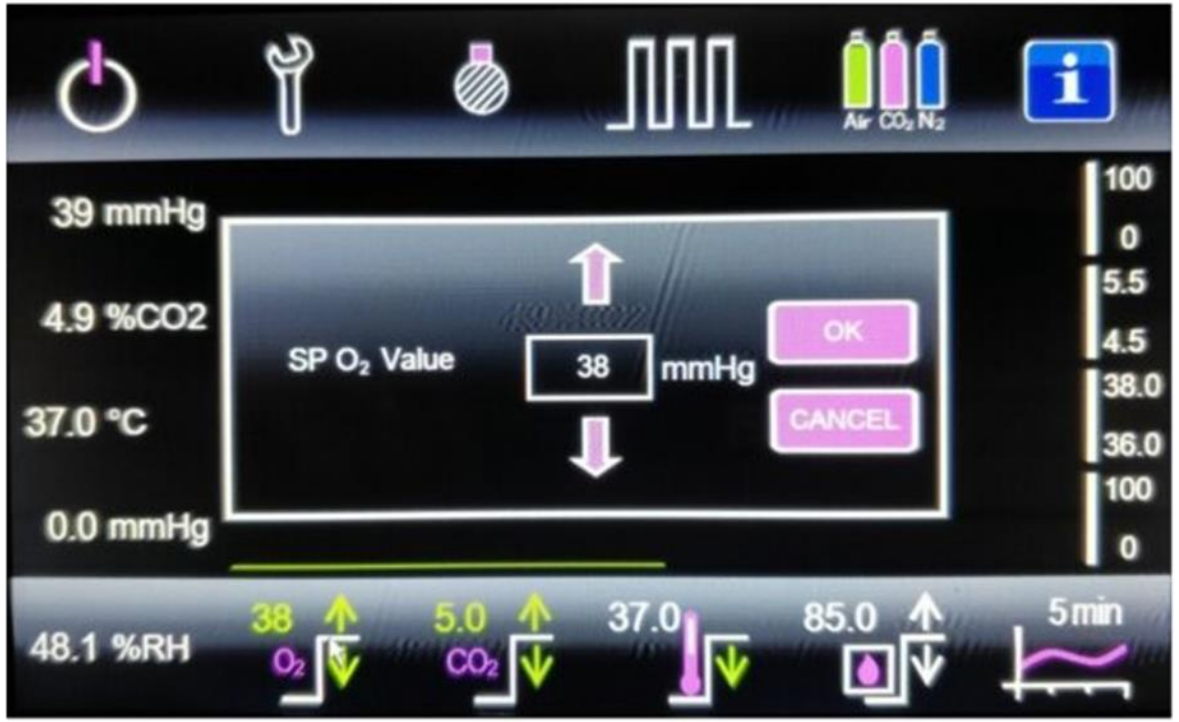
1. Precise Oxygen Control (1-140 mmHg)

2. Gradient oxygen concentration

3. Effortless Entry

4. Contamination Control

5. Intuitive Touchscreen Control



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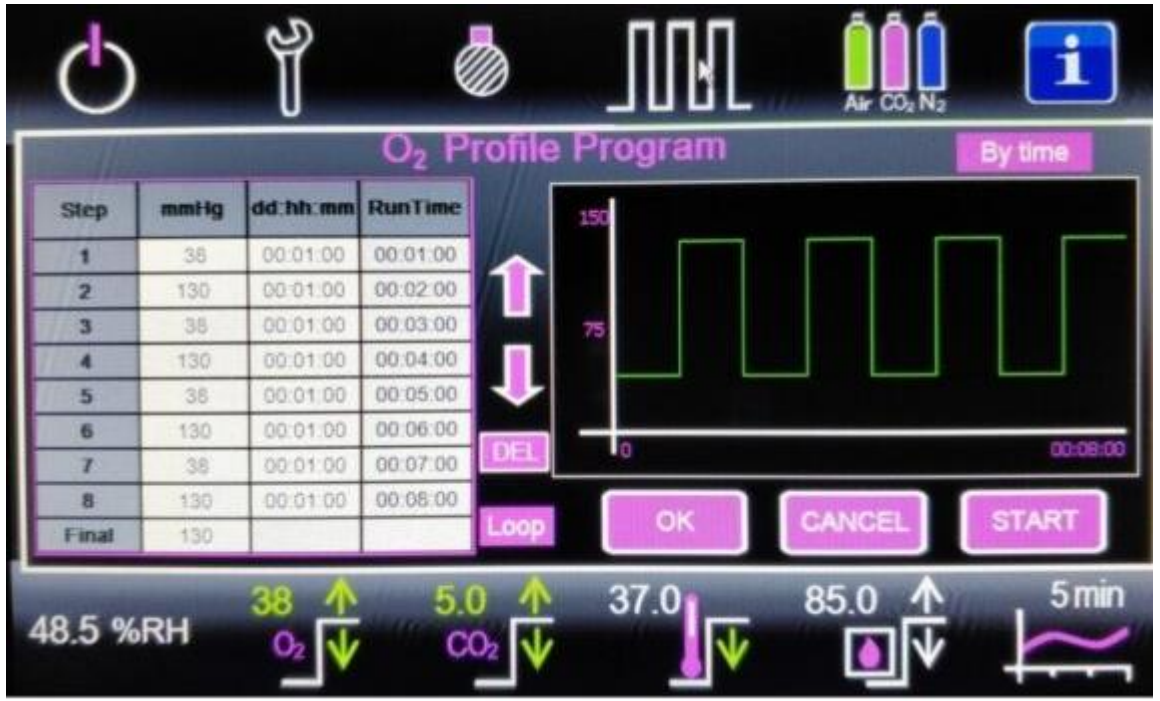

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1. Precise Oxygen Control (1-140 mmHg)

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<u>5. Intuitive Touchscreen Control</u>

Key Benefits

Long term exposure to low oxygen conditions at low cost, compared to other hypoxia open systems

Scientific background

An oxygen-sensing mechanism for angiosperm adaptation to altitude

Mohamad Abbas, Gunjan Sharma, Charlene Dambire, Julietta Marquez, Carlos Alonso-Blanco, Karina Proaño & Michael J. Holdsworth

Nature **606**, 565–569 (2022)

- Atmospheric oxygen concentration influences the levels of protochlorophyllide, a precursor to chlorophyll, in angiosperm seedlings
- High-altitude populations exhibit enhanced oxygen sensitivity and altered gene expression of related genes (PLANT CYSTEINE OXIDASE-PCO and transcription factors ETHYLENE RESPONSE FACTOR-ERFVII) allowing them to adapt to lower oxygen levels.

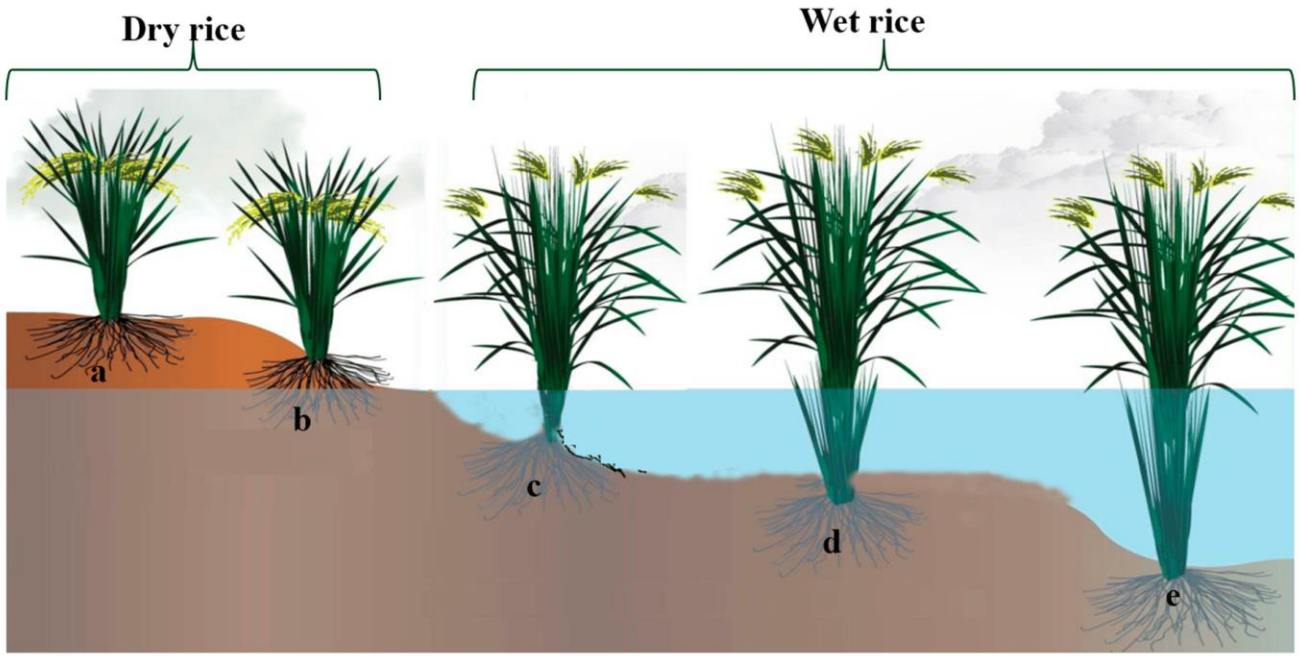
Objective

Identify species which **produce more forage** for grazing animals in Lebanon and Jordan through a combination of **germplasm testing and selection.**

Experimental subjects

Control plant adapted to hypoxic conditions

- Rice



Experimental subjects

High altitude

- Poaceae *Avena barbata* (1385m)

Low altitude

- Poaceae *Taeniatherum caput-medusae* (15m)

Experimental subjects

Fabaceae high altitude

- Fabaceae *Lathyrus hirsutus (1593m)*
- Fabaceae *Medicago monspeliaca (1426m)*

Fabaceae Low altitude

- Fabaceae *Medicago Maxima (17m)*
- Fabaceae *Lathyrus gorgoni (127m)*

Experimental subjects

Growth of 2 month old plant in environmental conditions (20% O2)

Poaceae low altitude

Poaceae high altitude

Experimental subjects

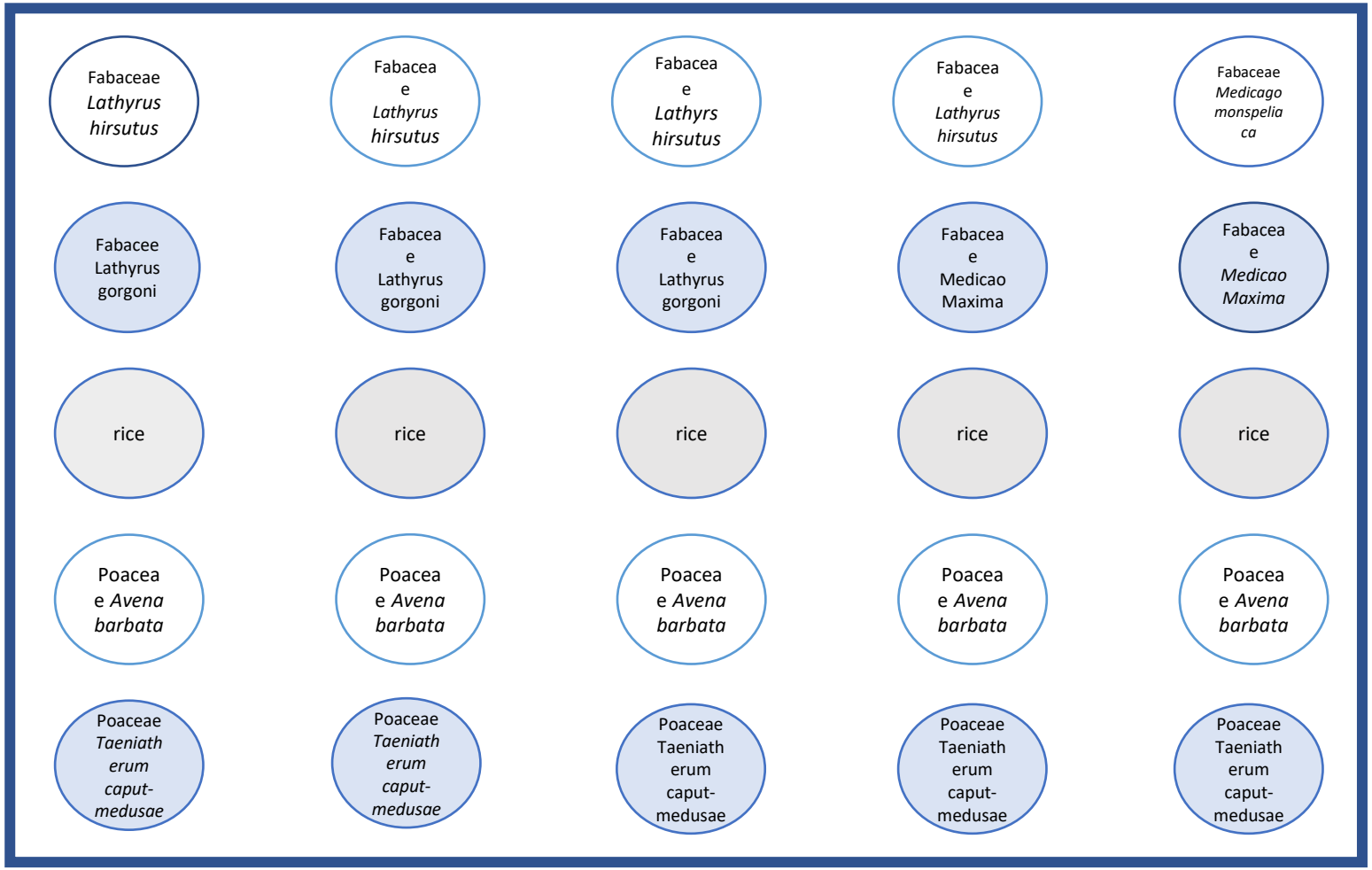
Growth of 2 month old plant in environmental conditions (20% O2)

Fabaceae low altitude

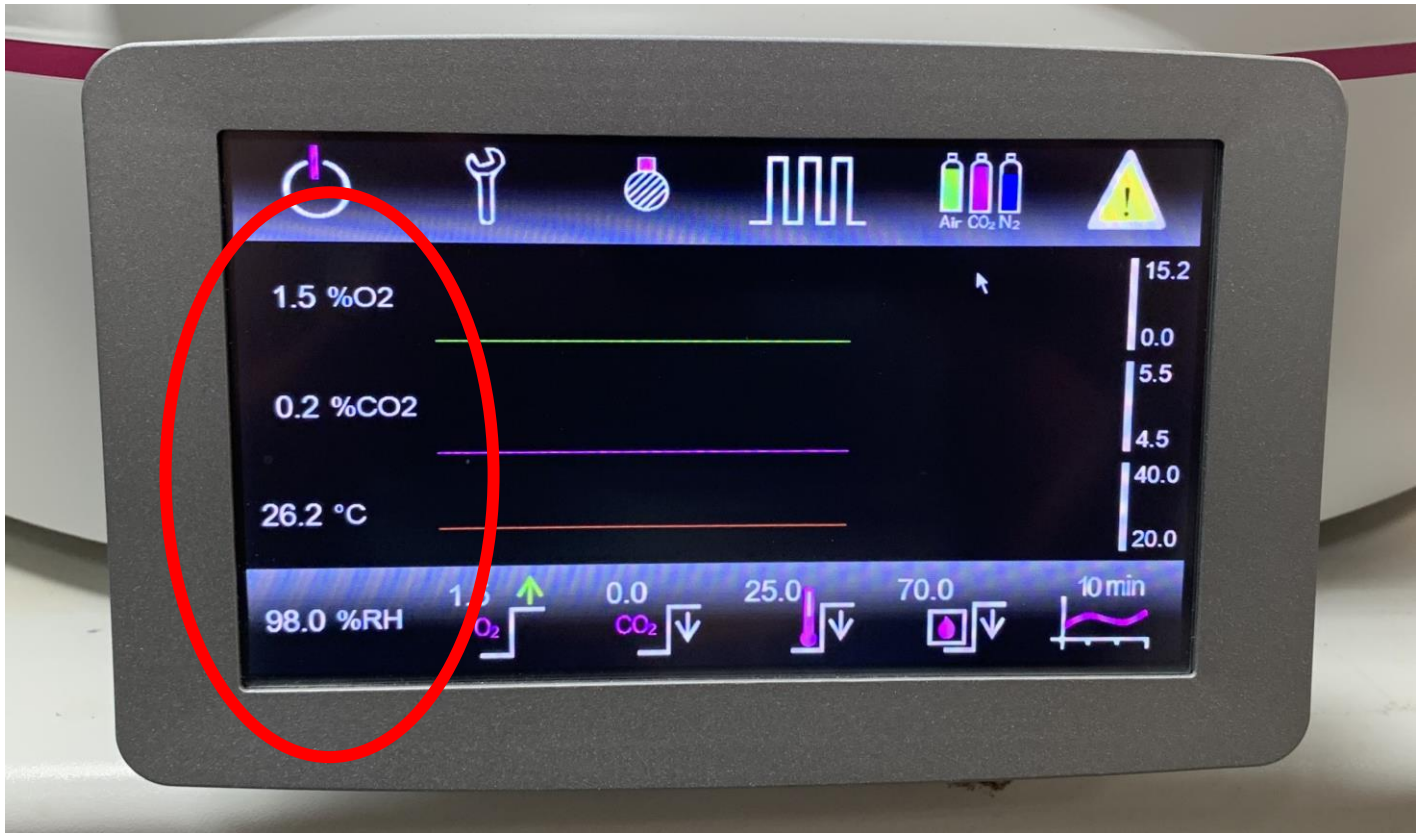
Fabaceae high altitude

Experimental setting

- Control
- High altitude
- Low altitude

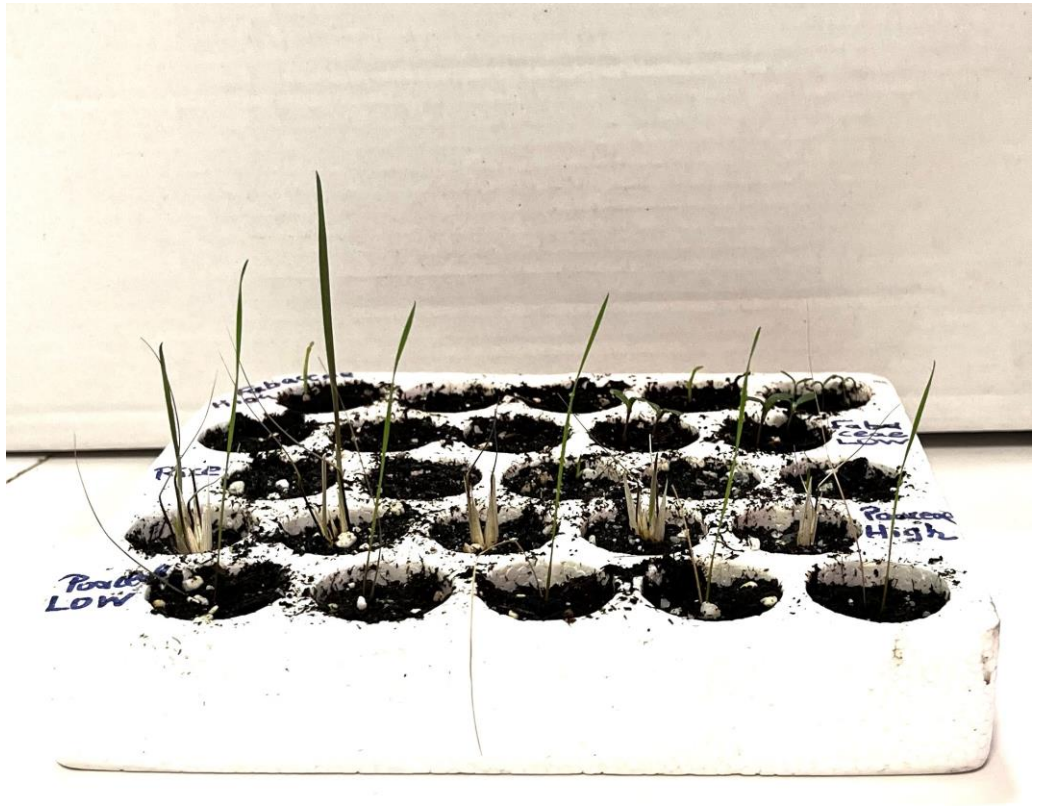


Experimental Conditions

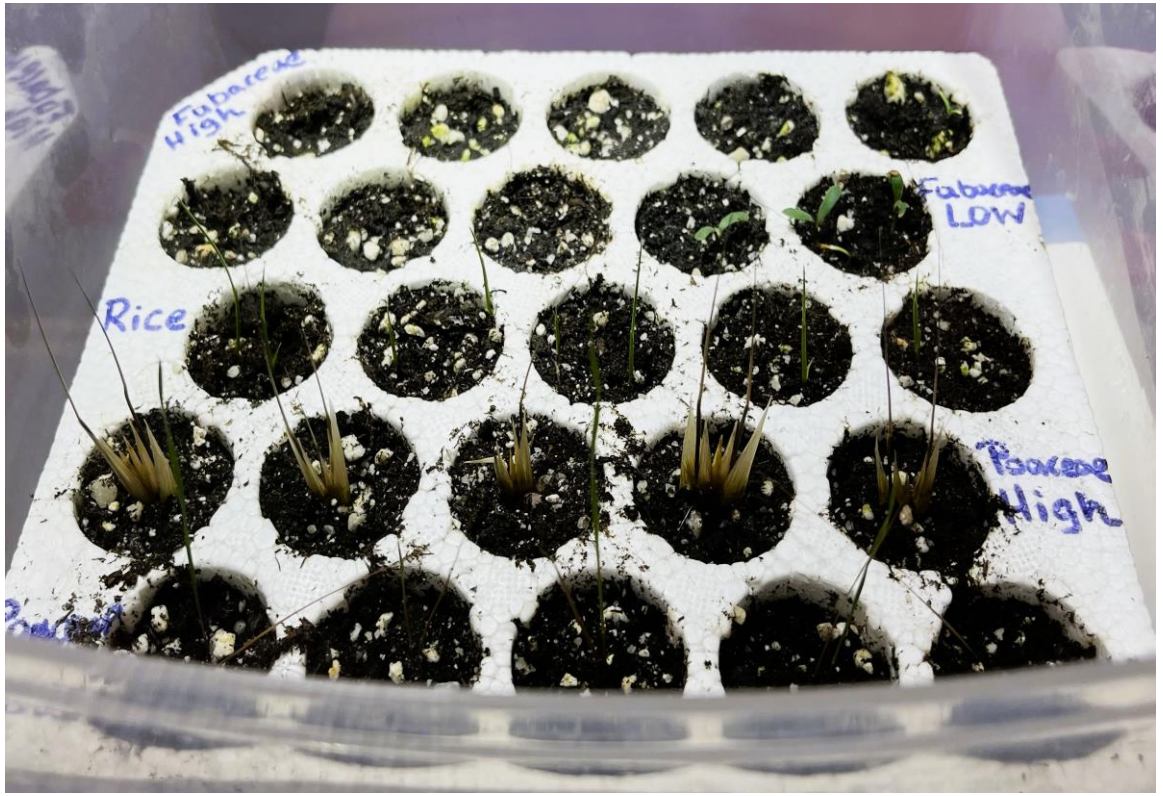


Results- Observations

Normoxia (6 days)



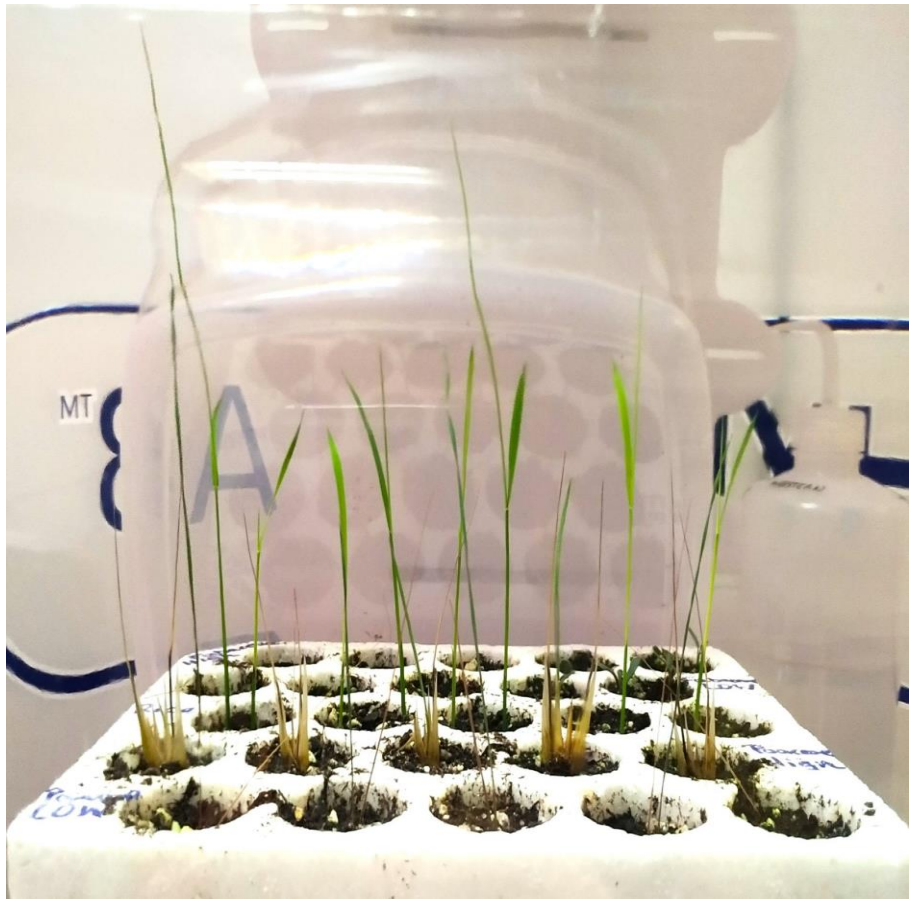
Hypoxia Conditions (6 days)



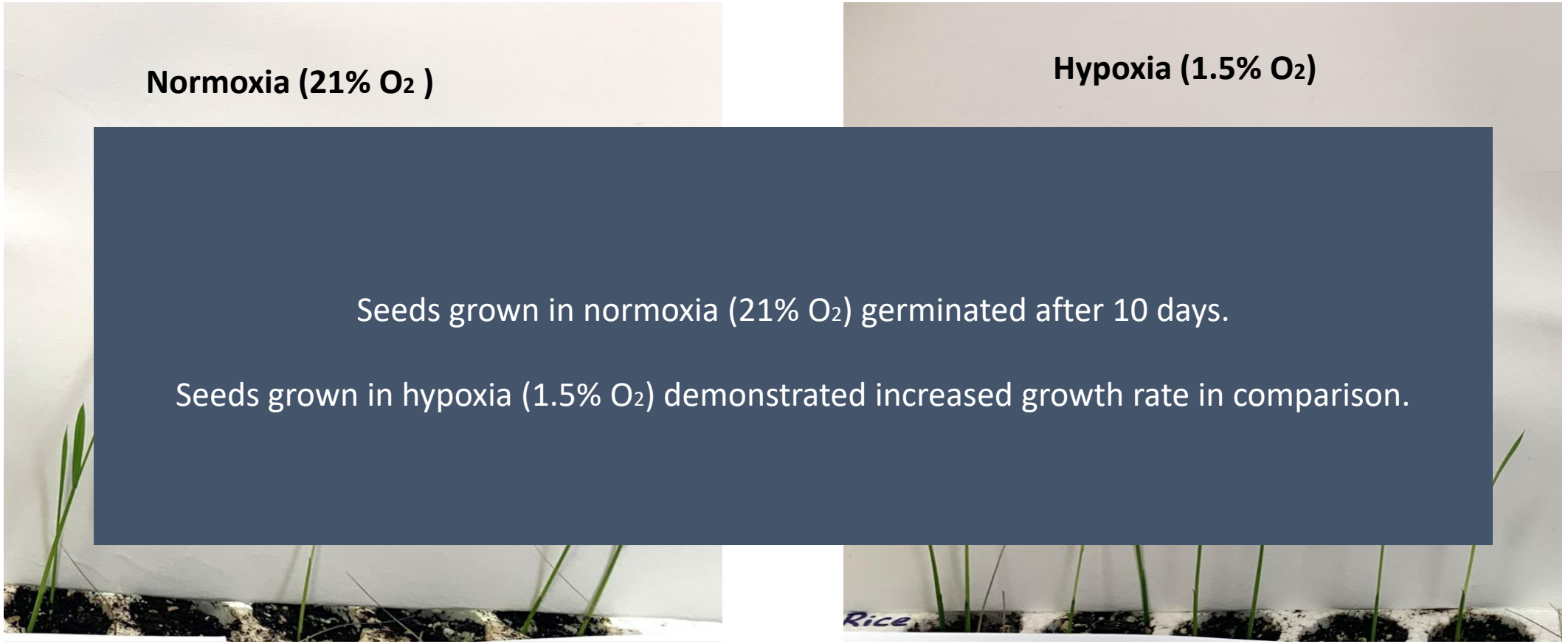
Results- Observations

Normoxia (21% O_2)

Hypoxia (1.5% O_2)



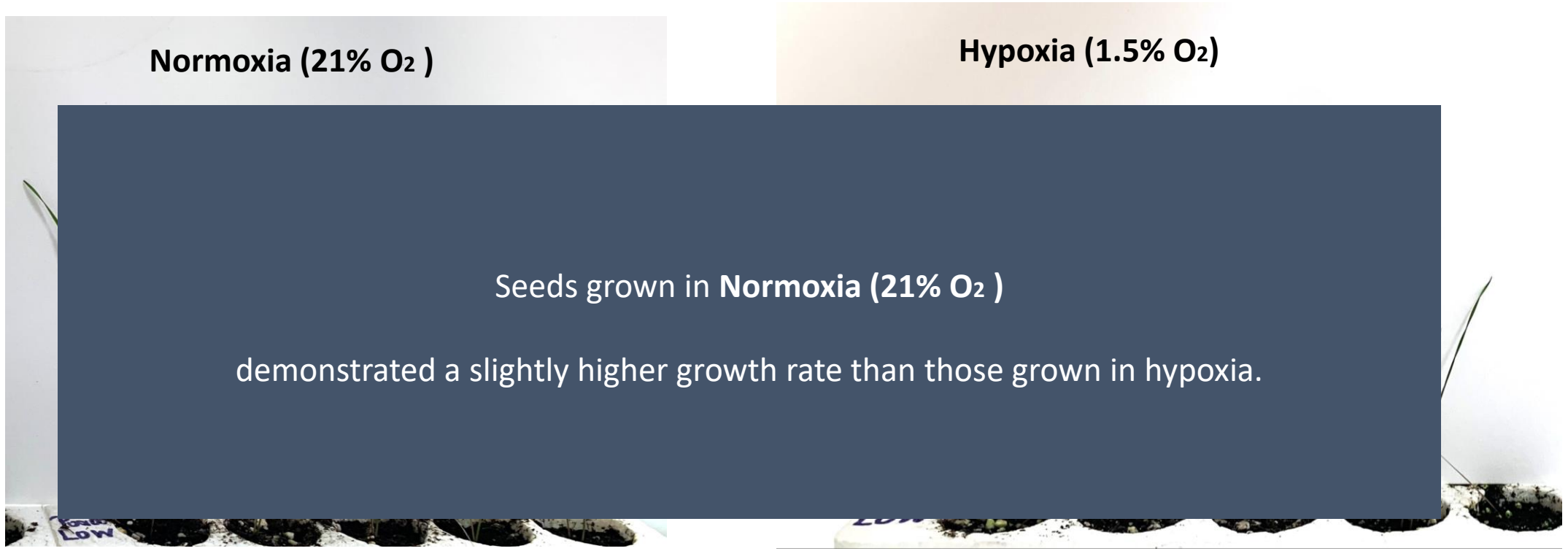
Oryza sativa (rice)



Seeds grown in normoxia (21% O_2) germinated after 10 days.

Seeds grown in hypoxia (1.5% O_2) demonstrated increased growth rate in comparison.

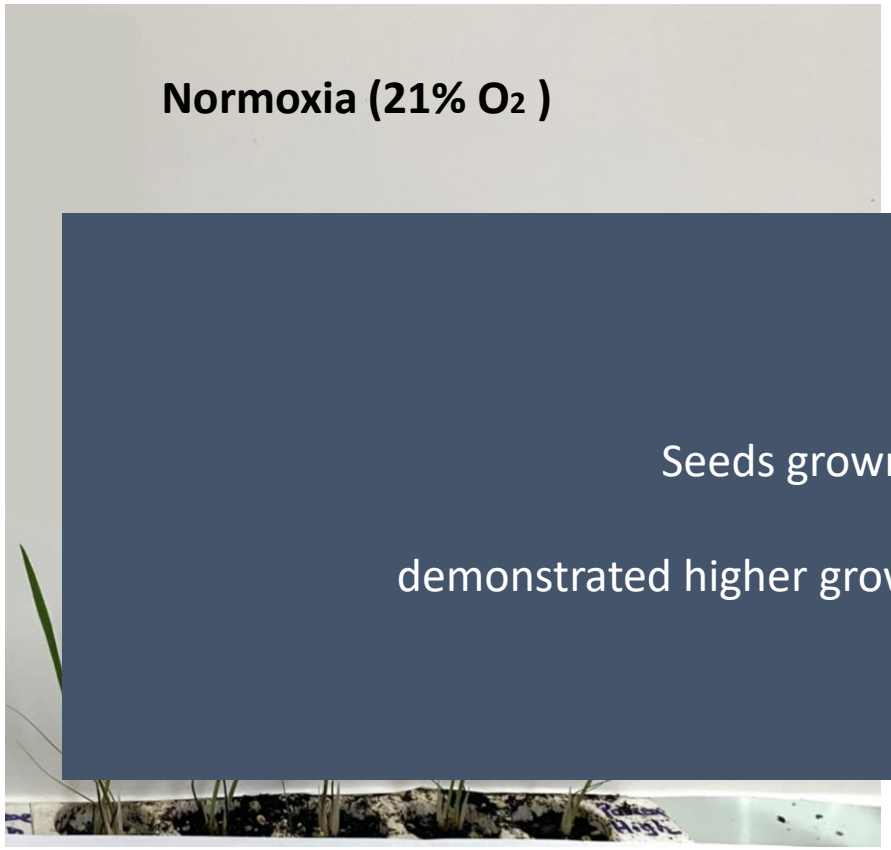
Poaceae low altitude

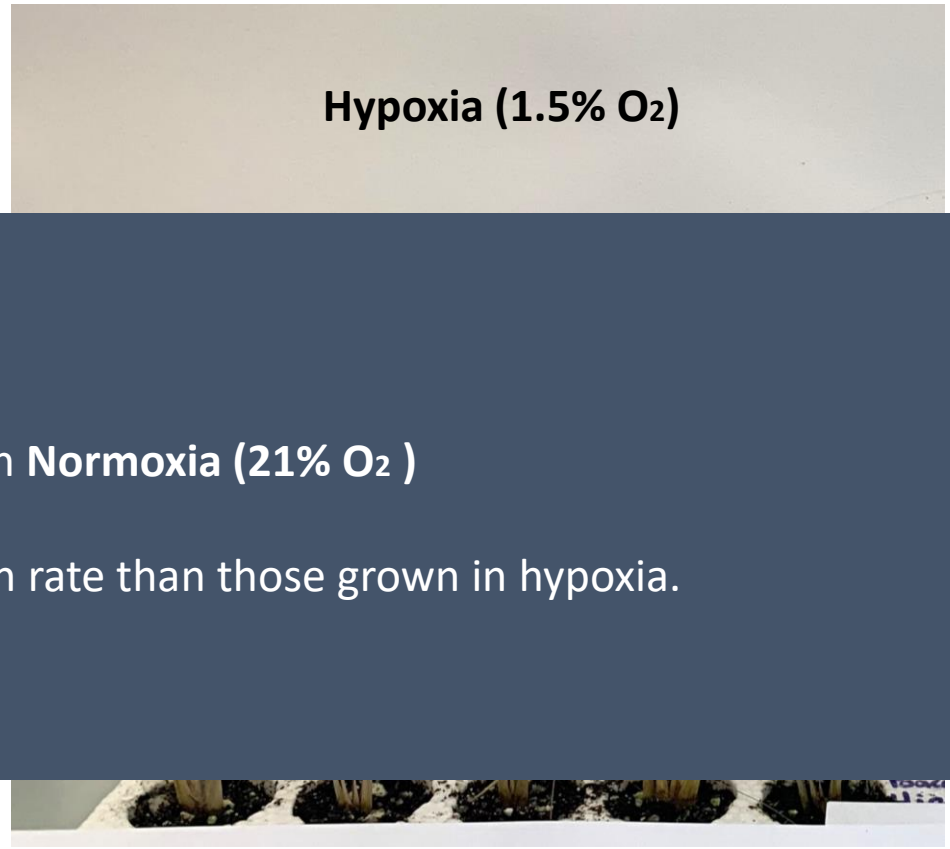


Seeds grown in **Normoxia (21% O_2)**

demonstrated a slightly higher growth rate than those grown in hypoxia.

Poaceae high altitude





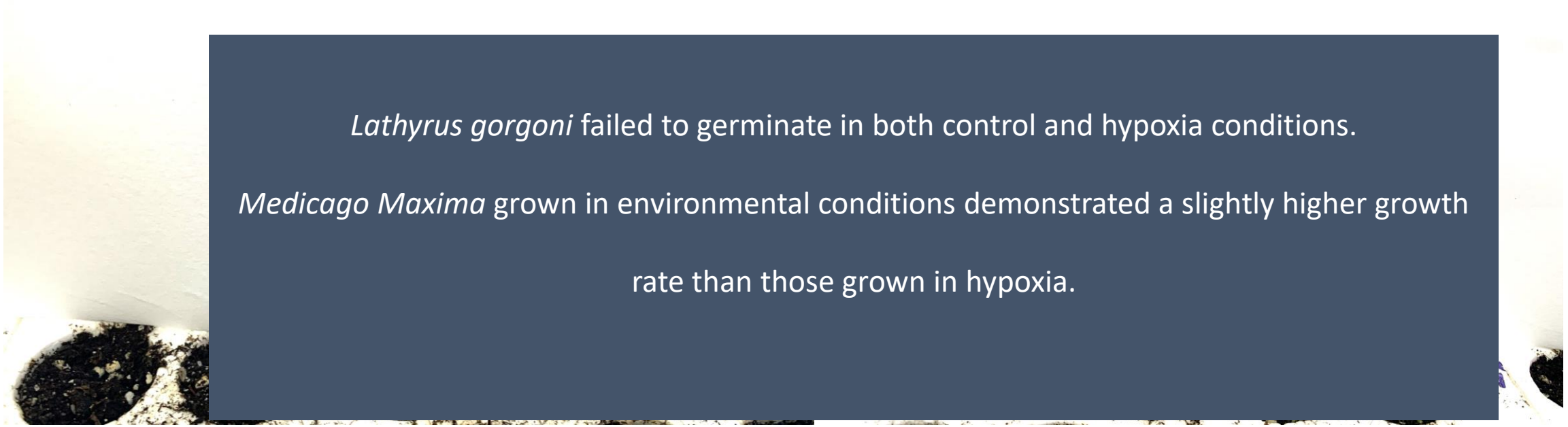
Seeds grown in **Normoxia (21% O_2)**

demonstrated higher growth rate than those grown in hypoxia.

Fabaceae low altitude

Normoxia (21% O_2)

Hypoxia (1.5% O_2)



Lathyrus gorgoni failed to germinate in both control and hypoxia conditions.

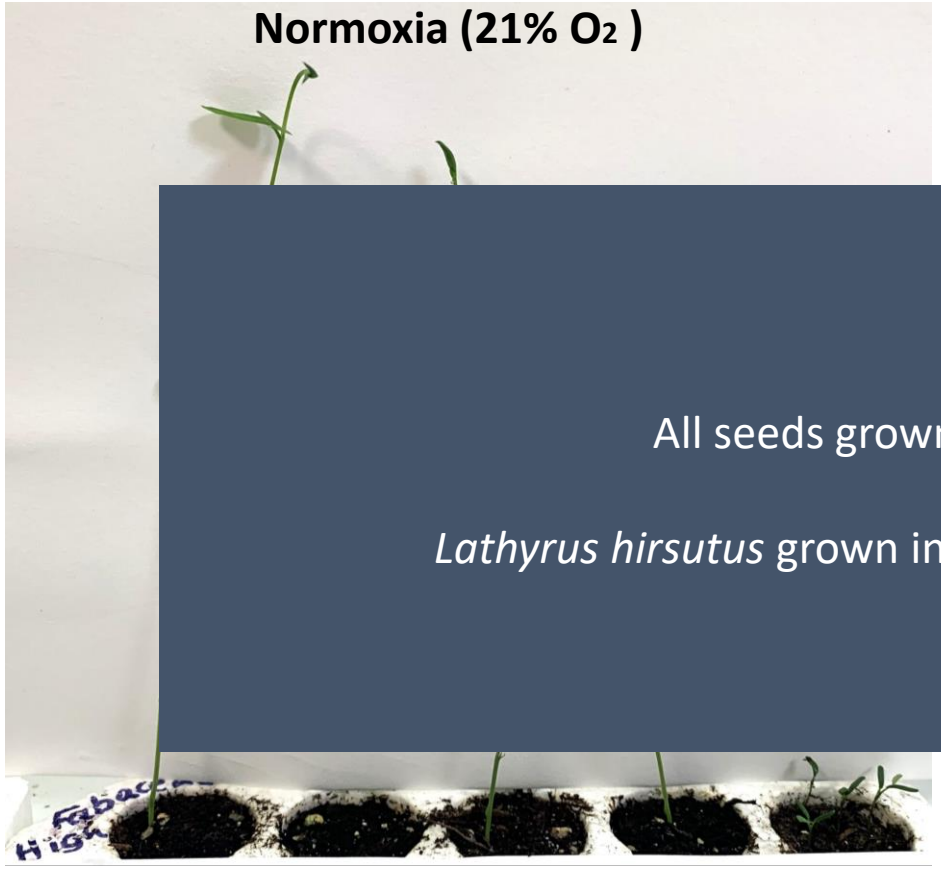
Medicago Maxima grown in environmental conditions demonstrated a slightly higher growth rate than those grown in hypoxia.

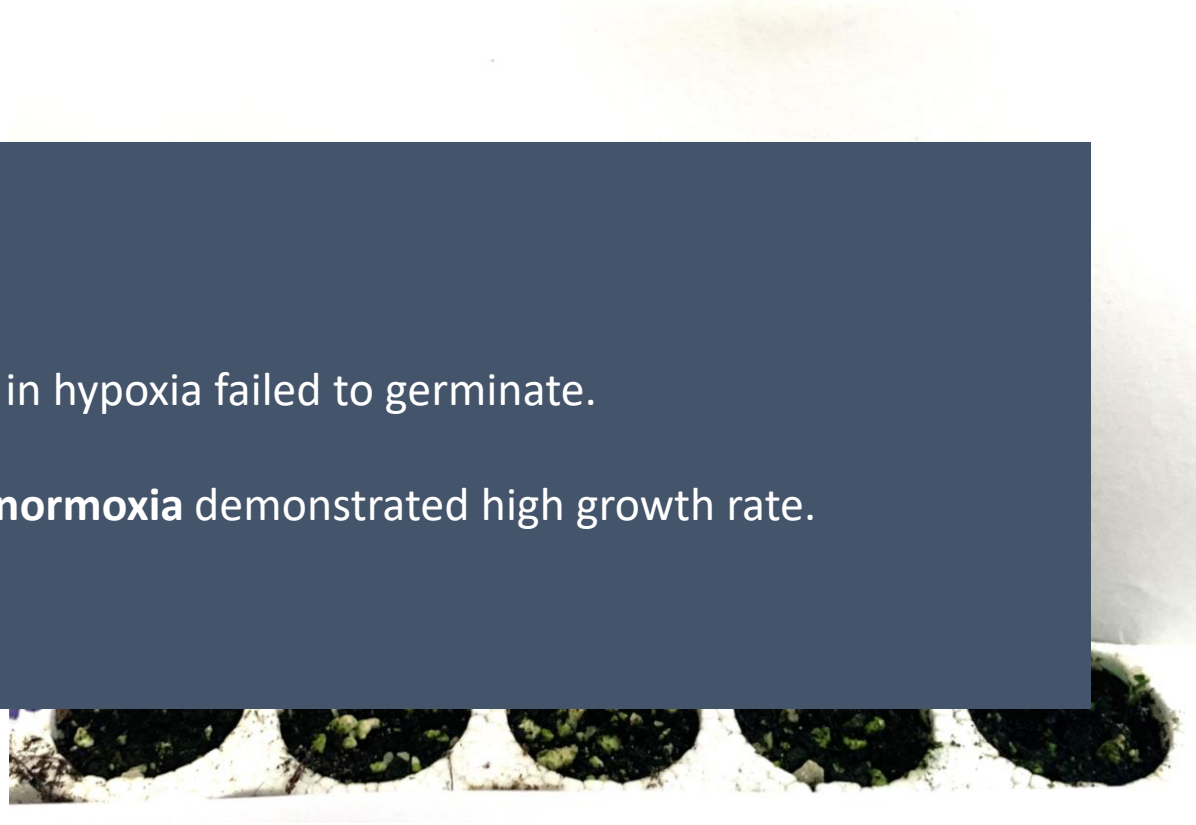
Fabaceae low altitude

Fabaceae low altitude

Normoxia (21% O_2)

Hypoxia (1.5% O_2)





All seeds grown in hypoxia failed to germinate.

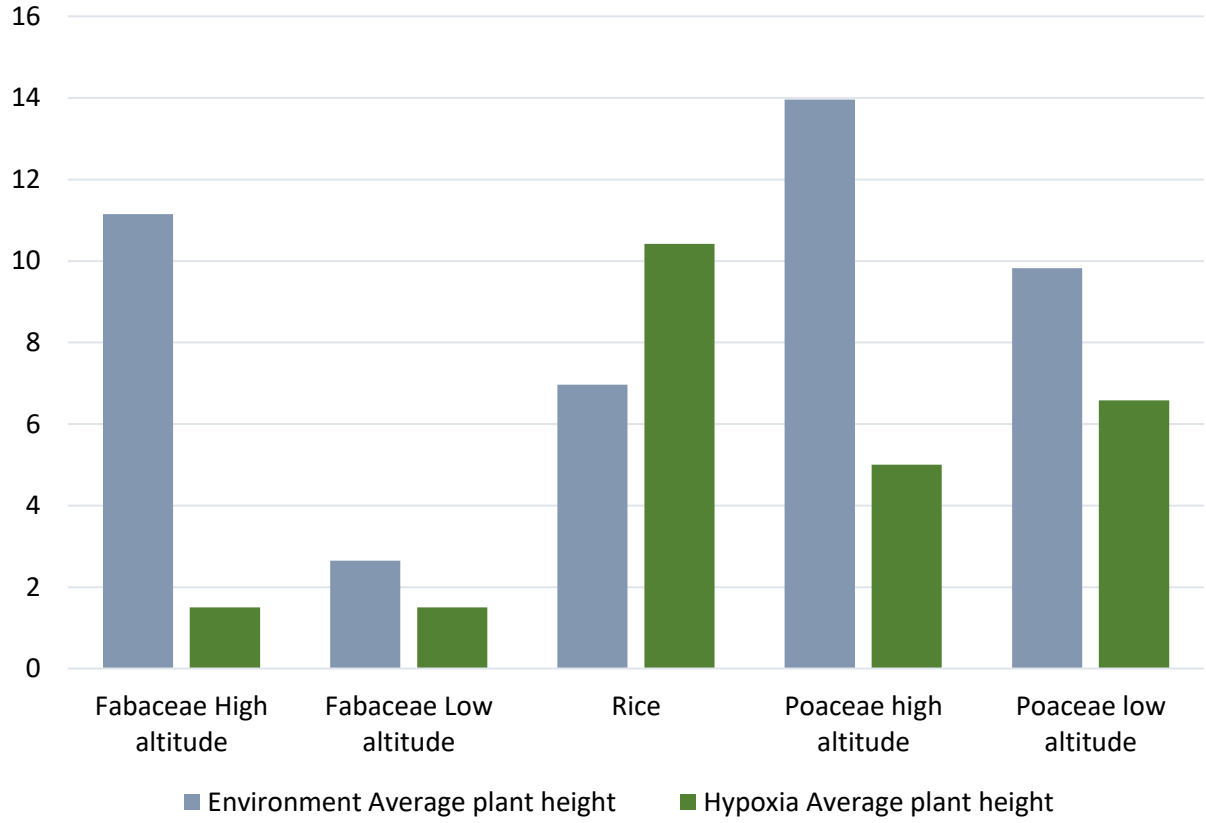
Lathyrus hirsutus grown in **normoxia** demonstrated high growth rate.

Results- Observations

Control plant rice demonstrated increased plant growth in hypoxia conditions as would be expected.

Both high and low altitude adapted, Fabaceae and Poaceae species, demonstrated increased plant growth in normoxia than in hypoxia conditions.

High altitude adapted, Fabaceae and Poaceae species, demonstrated increased plant growth in normoxia than the low altitude adapted species. It remains to be Investigated whether this differential growth is related to long term low oxygen adaptation



Potential significance

Ability to test the response of numerous plant species in:

- fully controlled, stable atmospheric conditions
- different oxygen concentrations
- a wide range of time periods and different developmental stages (hypoxia as short term stress or as long term condition)

Potential significance

Ability to test the differential response of high and low altitude adapted plants of the same family or species under normoxia and hypoxia.

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Q&A

Thank you for your attention

This publication has been produced with the financial assistance of the European Union under the ENI CBC Mediterranean Sea Basin Programme. The contents of this document are the sole responsibility of the Mediterranean Agronomic Institute of Chania (MAICh--PP4) and can under no circumstances be regarded as reflecting the position of the European Union or Programme management structures.

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