Smart Diaspora 2023

Revoluții și evoluții ale științelor omice în epoca postgenomică

10 - 13 Aprilie 2023, Timișoara

www.diaspora-stiintifica.ro

Eveniment aflat sub înaltul patronaj al Președintelui României

SeedOmics: what have we learned from seed priming and germination studies

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https://web-en.unipv.it/

- Situated only **35** km from Milan
- Trains to Milan every **10** minutes
- Population of **70,000**

- **18** departments
- **77** courses taught in Italian
  - **39** Bachelor's degrees
  - **38** Master's courses
- **12** Master's degree courses taught in English
- **19** Ph.D. courses

- **23,500** students
- **1500** international students
- **2700** professors, lecturers, native language teachers and administrative staff

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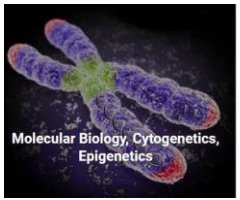
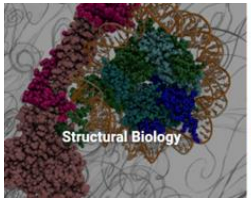
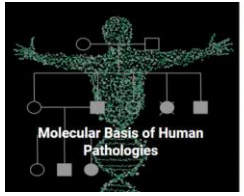
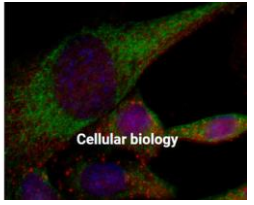
https://dbb.dip.unipv.it/en

Department of Excellence 2018-2022

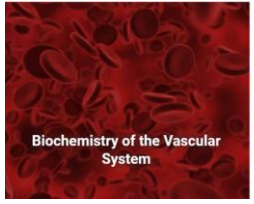


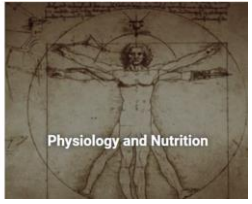






https://dbb.dip.unipv.it/en/research/research-teams-and-topics/plant-biology/laboratorio-di-biotecnologie-vegetali





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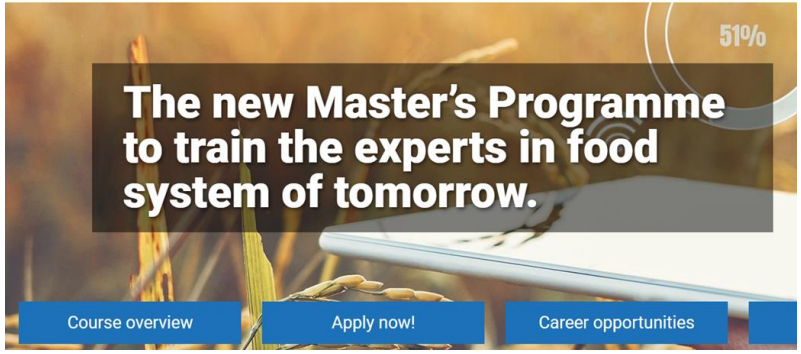
UNIVERSITÀ DI PAVIA
Department of Biology and Biotechnology

IT EN

https://dbb.dip.unipv.it/en/education/degree-programmes/masters-degree-programs

UNIVERSITÀ DI PAVIA
Master in Agri-Food Sustainability https://agrifood.cdl.unipv.it/en



PhD Program in Genetics, Molecular and Cellular Biology

https://dbb.dip.unipv.it/en/education/post-graduate-programs/phd-programs/phd-program-genetics-molecular-and-cellular-biology

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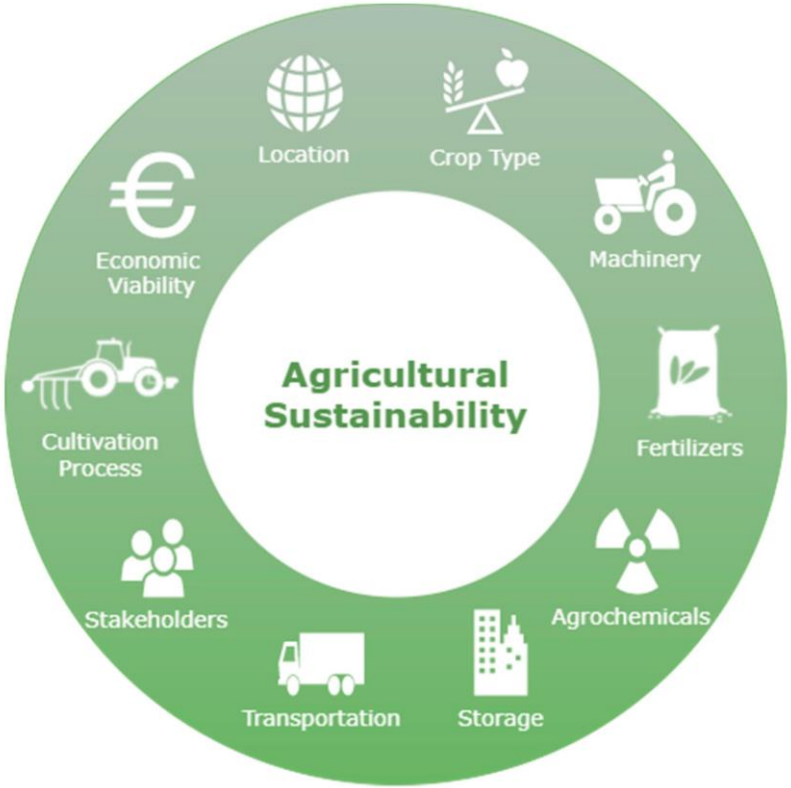
Why study seeds – a worldwide perspective



Quality® Seeds

High-quality Seeds

- Climate change
- Food security
- Development of sustainable agriculture
- Crop productivity and resilience

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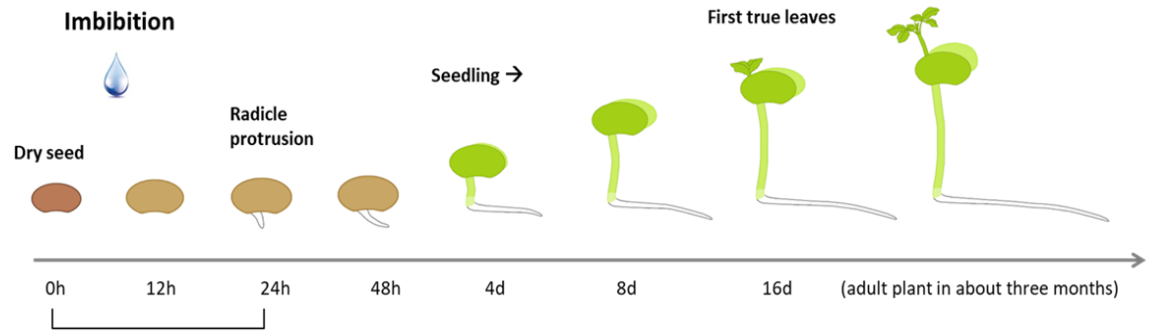
Seed germination & Seed priming



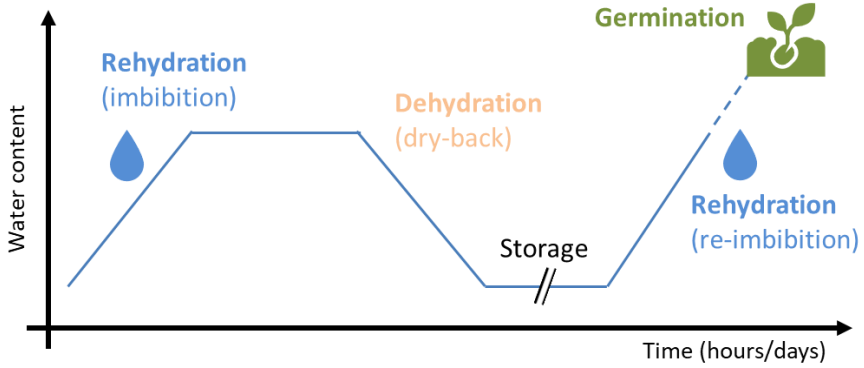
Pre-germinative metabolism
(until radicle protrusion)

The processes activated within pre-germinative metabolism have effects on seed germination and seedling establishment.

Activation of respiration
Accumulation of ROS
Accumulation of DNA damage
Activation of DNA repair
Activation of the pre-germinative metabolism

Seed germination - the sum of events that begin with hydration of the seed and culminate in emergence of the new plantlet

Seed priming - pre-sowing treatment able to improve seed germination



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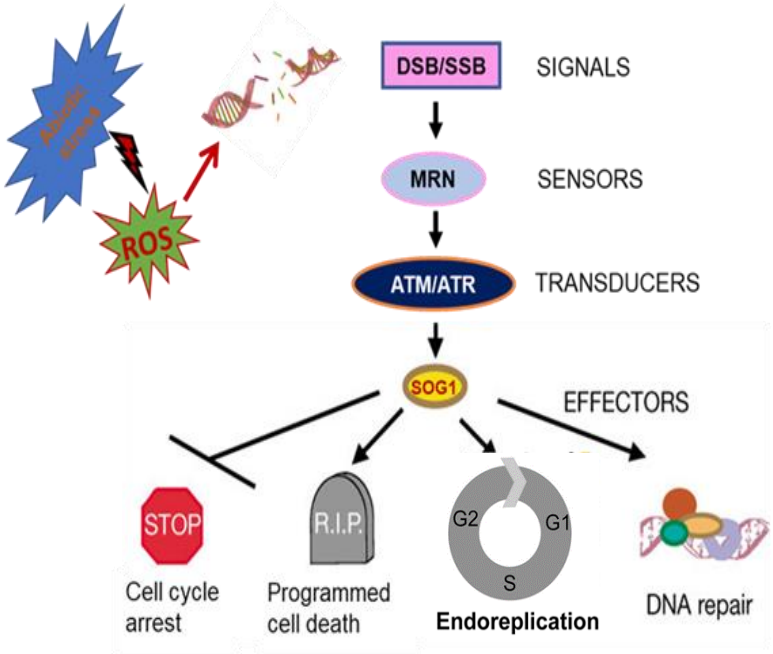
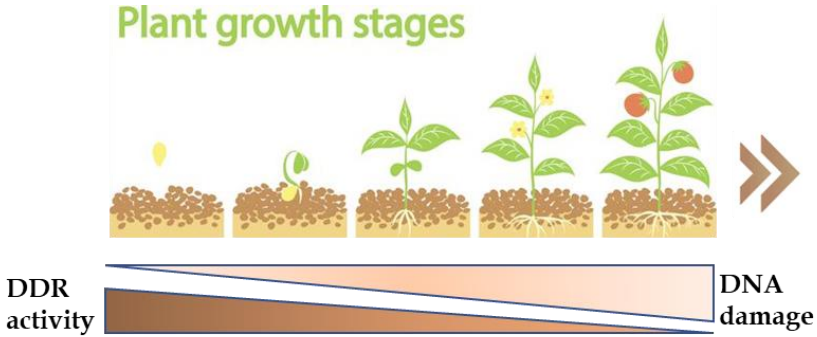
DNA Damage Respose (DDR) & Seeds

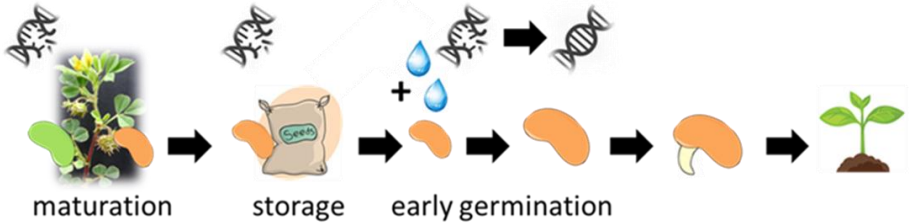
DDR pathway in plants





What happens to DDR during plant life…?

When do seeds accumulate or repair DNA damage?



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Experimental System Design

TIMEPOINTS

- 0 h, dry seed
- 2 h imbibition
- 8 h imbibition
- radicle protrusion
- 4-day old seedling
- 7-day old seedlings
- up to 14 days

X

TREATMENTS

- Gamma irradiation
- Polyethylen glycole (PEG)
- Sodium chloride (NaCl)
- Trichostatin A (TSA)
- Sodium butyrate (NaB)
- Kinetin
- Desiccation-rehydration
- Priming

X

ANALYSES

- Phenotyping
- ROS detection
- DNA damage/repair
- Gene expression profiles
- Metabolomics
- Lipidomics
- Biochemical HPLC
- Ultrastructural TEM

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SeedOmics & Molecular Markers of Seed Quality

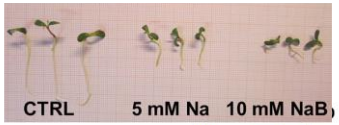
Received: 28 November 2017 | Revised: 3 May 2018 | Accepted: 5 May 2018
DOI: 10.1111/pce.13342

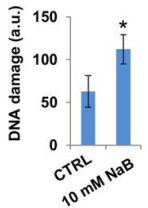
ORIGINAL ARTICLE

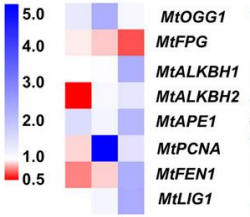
Plant, Cell & Environment

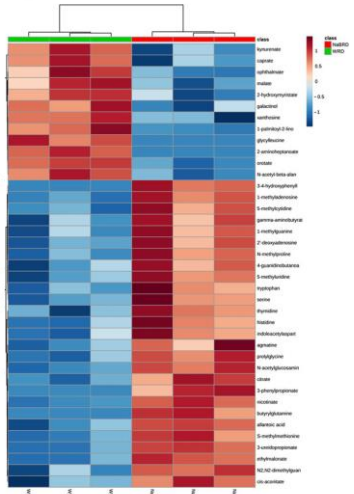
Metabolic and gene expression hallmarks of seed germination uncovered by sodium butyrate in *Medicago truncatula*

Andrea Pagano[1] | Susana de Sousa Araújo[2] | Anca Macovei[1] | Daniele Dondi[3] | Simone Lazzaroni[3] | Alma Balestrazzi[1]









- Polyamine biosynthesis
- Uracil degradation
- Purine and pyrimidine metabolism

➢ METABOLIC HALLMARKS OF SEED RESPONSE TO GENOTOXIC STRESS

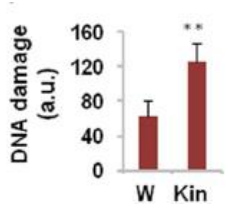
SCIENTIFIC REPORTS

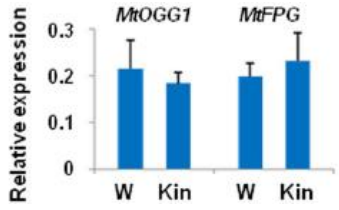
OPEN

Metabolic signatures of germination triggered by kinetin in *Medicago truncatula*

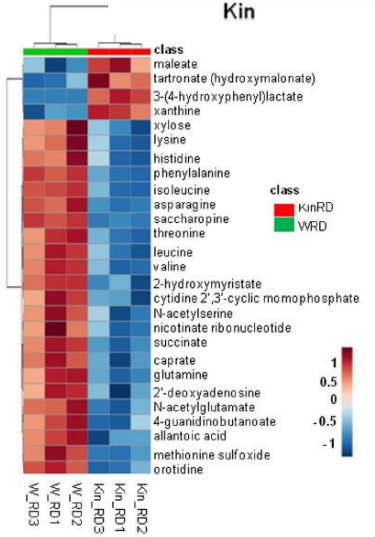
Received: 11 March 2019
Accepted: 1 July 2019
Published online: 18 July 2019

Susana Araújo[1], Andrea Pagano[2], Daniele Dondi[3], Simone Lazzaroni[3], Eduardo Pinela[1], Anca Macovei[2] & Alma Balestrazzi[2]



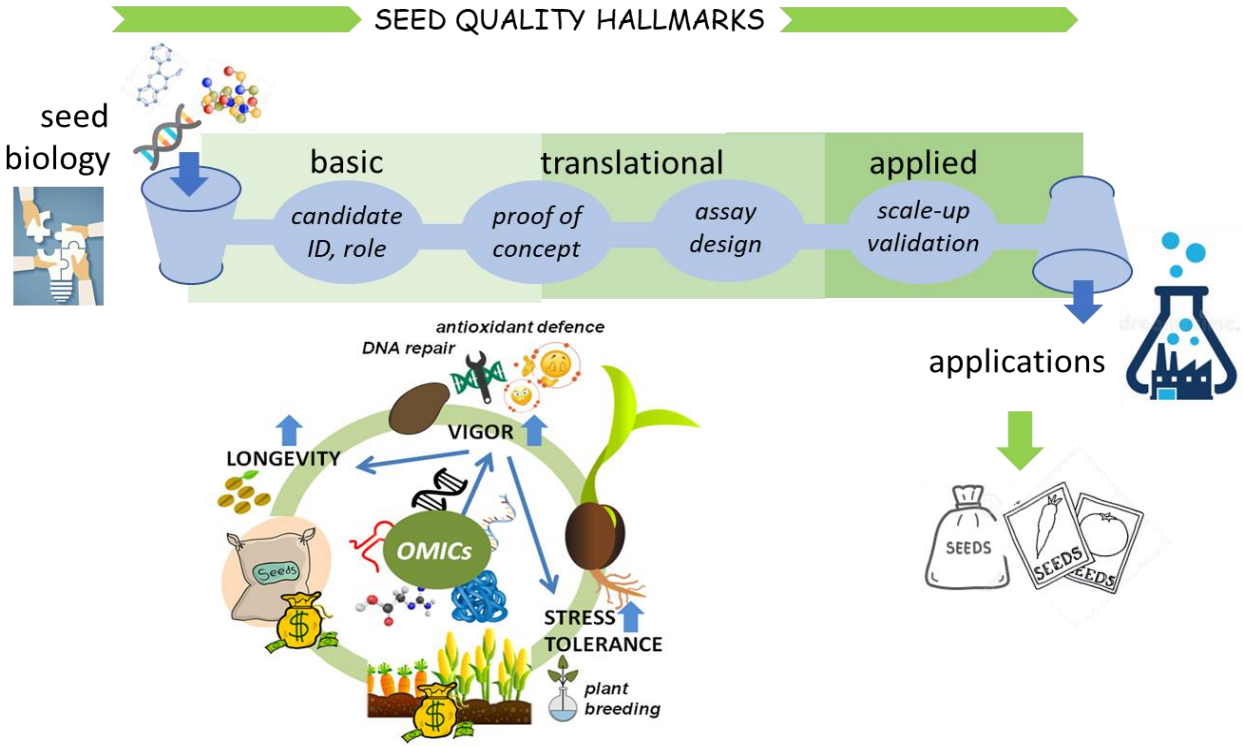


- 27 metabolites showed significant changes triggered by kinetin exclusively at radicle protrusion
- inositol, pentakisphosphate, agmatine, inositol hexakisphosphate, oleoylcholine
- **changes linked to fast metabolic depletion associated with a fast germination**



SeedOmics & Molecular Markers of Seed Quality

- Identification of candidate hallmarks gathered from basic analyses and omics approaches can be put to use to follow the transition from the proof-of-concept phase to dedicated experimental designs suited for scale-up validation and industrial applications.
- Collaborations between academia (researchers) and industry (seed technologists) is essential to define future research targets and sustain the development of high-quality seeds that can be productive even under stress conditions.



Seed biology: from basic to applied research

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