13th Dutch Seed Symposium

For all people who care about the heritage of all time: The Seed.

Location – Wageningsche Berg
Date – October 8nd 2025
Program

Chairperson:	Corine de Groot
09.00 – 09.30	**Registration with coffee/tea**
09.30 – 09.35	**Opening**
09.35 – 10.20	**Steve Penfield (John Innes Centre)** **The role of the mother plant in seed quality variation: how does it work and what can you do about it?** It is well understood that seed quality is affected not just by variety genetics but also by the environment during seed production. In this talk I will describe our new model explaining how seed quality variation is generated, the key role of the mother plant and how she creates diversity in progeny seed performance. Using this new understanding we will discuss interventions we can make to mitigate maternal environment effects, starting with the growth of the grandparental generation.
10.20 – 11.05	**Martin Himmelboe (Aarhus University)** **Seeds through the eyes of a machine.** I will give a general introduction to seed analysis using computer vision, with a focus on practical implementation and model development. The talk will begin with an overview of how visual features can be extracted from images and how they can be used to classify individual seeds. I will then explain how feature selection techniques can be applied to reduce model complexity while improving generalization performance. Lastly, I will talk about how computer vision models can be benchmarked against human analysts and discuss the practical challenges that arise when comparing human judgment to algorithmic decisions.
11.05 – 11.45	**Coffee break**
11.45 – 12.05	**Bejo Zaden** **A story of Brassica weeds and the bacterial pathogen Xanthomonas campestris pv. Campestris.**
12.05 – 12.45	**Makrina Diakaki (WUR)** **Allies or Bystanders? The Involvement of Spinach Seed Microbiota in the Suppression of Globisporangium ultimum Damping-Off.** Recently we demonstrated that the seed microbiome of certain spinach seed lots can confer disease suppression against Globisporangium ultimum damping-off (previously known as

Pythium ultimum). We then moved on to show that a higher relative abundance of basidiomycetous dimorphic yeasts such as Vishniacozyma, Filobasidium, and Papiliotrema and of the bacterial genus Massilia was a key feature of suppressive seed microbiomes. We suggest that the abundance of these genera is indicative of seed lot suppressive potential and believe that seed processing and treatment can become more targeted with indicator taxa being used to evaluate the presence of beneficial seed-associated microbial functions. This process, in turn, could contribute to the sustainable management of seedling diseases.

Dario Ramirez (Universiteit Utrecht)

A walk on the wild side: exploring the functional potential of Andean soil microbiomes to enhance resistance of potato to late blight disease. Modern agricultural practices and plant domestication have disrupted ancient plant–microbiome associations that once supported crop health and resilience. However, the impact of these changes on the microbiome and its functions is largely unknown for most plant species. In this study, we investigated how plant domestication and agricultural practices affect the potato microbiome and its ability to suppress Phytophthora infestans, the causal agent of late blight. By growing potatoes in native and agricultural soils collected from 14 sites in the Ecuadorian Andes, we found that plants grown in native soils had enhanced disease resistance. Through heat treatment and soil transplant experiments, we confirmed that this effect was microbiome-driven. Amplicon sequencing revealed microbial shifts associated with agricultural soils and identified specific microbes linked to disease suppression, referred to as the "missing microbes". Supplementation of agricultural soils with a synthetic community comprising these microbes restored enhanced resistance to late blight. These findings highlight the critical role of native soil microbiota in enhancing crop resistance and underscore their potential for microbiome rewilding strategies.

12.45 – 13.45 **Lunch**

13.45 – 15.45 **Julia Veser (WUR)**

Towards optimal seed drying: Modelling drying and its effect on seed quality. High-quality seeds are the starting point for successful agricultural plant production and seed breeding companies are challenged by producing more and more high-quality seeds for farmers. Therefore, throughout the seed production process after harvest, many dedicated treatments and drying steps are applied. Drying treatments have not yet been intensively studied. In particular, the specific effects of drying on storability and germination, as well as optimal drying routes are largely unknown. Therefore, we investigated drying of seeds by modelling the drying kinetics and linking them to predictions of quality.

We focused on a single seed level of simple shaped cabbage seeds. For validation of the models, a small-scale convective air

dryer was compiled in combination with in-line measurements and a humidifier to precisely control air conditions in terms of temperature and relative humidity (RH). After drying, the germination quality was tested with germination tests on paper. Moreover, lab and industrial fluidized bed trials were performed. To enable optimization, a mechanistic model was derived describing heat and mass transfer during drying of seeds, where diffusivity and moisture sorption were estimated via separate experiments and seed shrinkage was considered. In addition, response surface modelling was used to describe the germination quality data.
Varying drying conditions influenced final seed germination quality whereas higher temperatures above 45°C and RHs below 20% led to decreased quality. The drying curves with varying temperatures could be well described with a mechanistic drying model and the influence of temperature, RH and time on quality could be described with a highly significant regression model. These models were combined to develop process and state diagrams that predict the optimal drying of cabbage seeds.
This might lead to new best practices in industrial seed drying and hence decreased drying time and increased throughput for high-quality seeds.

Richard Immink (WUR)

Effects of the maternal environment on reproduction & seed quality. Seed quantity and quality are highly dependent on genetics and the environmental conditions during seed development. However, due to recent research developments and rapidly changing climatic conditions in areas where crops are grown for seed production, it is becoming clear that conditions throughout the entire life cycle of the parent plants have an effect. Complex interactions between different developmental phases and reproductive processes play a role, as does the ability to remember certain stress factors. In this presentation, some examples will be given from research in Arabidopsis, recent insights into this topic will be summarized, and an outlook will be presented about what this means for seed production.

Tamara Verhoeven (HAS Green Academy)

Putting seed physiology on the menu: ensuring continued empowerment of the global seed business. The demand for employees in the seed business remains unwaveringly high for all levels of education – be it on the work floor in cleaning and sorting seed, in expedition, in seed production, or in breeding. Unfortunately, the course offerings in seed physiology in the standard curricula of vocational schools, higher education or even universities are rather limited or absent. HAS green academy prides itself on its connection with breeding and the seed sector and has taken the initiative to put seed physiology back on its course menu. In this short talk, we want to show what we've achieved in the past ten years. *Contribution by Emile Clerkx (HAS Green Academy)*

Johannes Wolff (phenoLytics)
Linking seed quality to germination, seedling quality and growth dynamics with 3D Xray CT. 3D Xray CT is currently the only physical method which allows to non-destructively measure internal seed quality and follow up the development of whole plants in 3D over time, i.e. 4D, at a high throughput, creating thousands of objective seed:seedling data pairs within hours. The talk will delve into how the big, actionable data on the seed-seedling quality link can be leveraged in seed research as well as in industrial seed production.

15.45 – 16.30 **Jerome Verdier (INRA IRHS)**
Using epigenetic, epigenetically driven (maternal) stress memory to bioengineer climate-SMART seeds. Maternal environments impact seed germination quality. In recent years, we showed that germination performances are epigenetically driven by the maternal environments (i.e. occurring during seed maturation). Our approach is to identify epigenetically driven (maternal) stress memory and their associated epimarkers, with their impacts on germination performances/longevity to ultimately bioengineer "tailor-made" seeds to specific environments, called climate-SMART seeds.

16.30 – 16.45 **Group picture (optional)**

16.45 – 18.00 **Drinks with snacks**