FERNAND LAMBEIN fund

CROP TRUST

INTERNATIONAL LATHYRUS DAY

Book of Abstracts

08.06.2026

Dubrovnik, Croatia

MESSAGE FROM THE FUND

The Fernand Lambein Fund is pleased to present the Book of Abstracts of the second International Lathyrus Day, held on June 8, 2026.

The International Lathyrus Day is an initiative of the Fund that aims to bring together the small yet widely dispersed community working on grasspea through a biannual international conference. The event was first launched in 2024 in Ghent. This year, for the first time, it was held as a satellite meeting of a larger conference: the 5th International Legume Society Meeting.

The program featured two main sessions. *Session 1 – In the Lab* focused on recent advances in laboratory-based research, while *Session 2 – Bridging the Gap* highlighted the translation of scientific findings into practical applications.

A key feature of the event is the emphasis on early-career researchers and travel grant recipients. For this edition, once again in collaboration with the Crop Trust, we awarded several travel grants based on the novelty and relevance of the applicants' research. This approach contributes to making Lathyrus Day a truly collective event, showcasing global efforts, from Bangladesh to Spain, and from Belgium to Ethiopia.

At the Fernand Lambein Fund, we are convinced that science starts with people. We strongly believe in the power of networking as a driver of progress through the exchange of knowledge and ideas. This year, a dedicated networking session, the World Café, provided valuable opportunities for meaningful interaction, and we were delighted to see participants actively engaging with one another.

We extend our sincere appreciation to all contributors whose work is reflected in this volume. The diversity and quality of the abstracts demonstrate the vitality of this research field and its growing importance in addressing global challenges such as climate resilience, food security, and public health.

We trust that this collection will stimulate further dialogue, innovation, and collaboration, and we look forward to continued advances that honor the legacy of Prof. Fernand Lambein.

The Fernand Lambein Fund

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	09:00	Welcome and kick off: Introduction Fernand Lambein Fund, Reflections on the previous Lathyrus Day 2024, Goal of the current meeting **Lieve Ongena**, Fernand Lambein Fund
	09:15	Lathyrus: A Climate-Smart, Nutrient-Rich Pulses for Sustainable Agriculture Shivali Sharma on behalf of **Prof. Dr. T.R. Sharma**, *ICAR*, India
	10:15	Health Break
Session 1 In the lab: molecular, genetic and physiological research on grasspea Chair: **Maria Carlota Vaz Patto**	10:45	Integrating GWAS and aphid bioassays to reveal resistance strategies in grasspea. **Francisco Azevedo Mendes,** *ITQB UNL,* Portugal
	11:05	*Aphanomyces euteiches* causes disease in *Lathyrus sativus* with a globally diverse, polygenic resistance landscape. **Sara Rodríguez Mena**, *CSIC,* Spain
	11:25	High-throughput phenotyping reveals genotypic variation in drought response and water-use strategies in *Lathyrus spp.* under progressive soil drying. **Kamal Hejjaoui**, *CAES*, Morocco
	11:45	From "Poor Man's Meat" to safe climate-smart protein: pioneering genome editing of grasspea (*Lathyrus sativus*) for improved yield in a changing climate. **Keya Akter**, *VIB,* Belgium
	12:05	World Café (Networking Event)
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	14:30	Quiz
Session 2 Bridging the gap: grasspea from the lab to the field Chair: **Diego Rubiales**	15:00	Farmers Video **Shivali Sharma and Petra Pajdakovic**, *Crop Trust*, Germany
	15:10	Bridging the Gaps in Ethiopia: grasspea in the field **Dagnachew Bekele**, *Ethiopian Institute of Agricultural Research,* Ethiopia
	15:30	Strengthening fragile food systems through climate-resilient crops: lessons from grasspea (*Lathyrus sativus*) for conflict-affected smallholder farming in Nigeria **Peret Goar**, *Nasarawa State University,* Nigeria
	15:50	Plenary Session **Maria Carlota Vaz Patto**
	16:20	Wrap up and Welcome Reception

KEYNOTE SPEAKER

Lathyrus: A Climate-Smart, Nutrient-Rich Pulse for Sustainable Agriculture.

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Lathyrus sativus (grasspea) is an orphan and underutilized legume with considerable potential as a climate-resilient, nutrient-dense crop for sustainable agricultural systems. In the context of rising demand for plant-based protein and increasing climate variability, grasspea offers a unique combination of adaptability, nutritional value, and low-input cultivation. It thrives under extreme agro-ecological conditions—including drought, waterlogging, and marginal soils—and serves as a critical food, feed, and fodder resource, particularly for resource-poor farmers.

Despite these advantages, grasspea remains underexploited due to the presence of β-N-oxalyl-L-α,β-diaminopropionic acid (β-ODAP), a neurotoxin associated with neurolathyrism under prolonged excessive consumption. Historical stigma, regulatory restrictions, and limited market integration have contributed to declining cultivation, even as improved low-ODAP varieties have been developed.

Recent advances in breeding and biotechnology provide new opportunities to address these challenges. Conventional selection, mutation breeding, and the use of wild relatives have contributed to genetic improvement, although progress has been constrained by narrow genetic diversity and hybridization barriers. The integration of molecular tools—such as marker-assisted selection, genomics, transcriptomics, and emerging gene-editing technologies—offers promising pathways for developing stable, low-toxin, high-yielding varieties adapted to diverse environments.

In parallel, post-harvest processing and detoxification methods, including boiling, fermentation, and advanced processing technologies, significantly reduce β-ODAP levels, improving safety and enabling value addition. The presence of beneficial bioactive compounds such as homoarginine further enhances the nutritional and functional importance of the crop, although its association with β-ODAP presents a breeding challenge.

Overall, repositioning grasspea as a climate-smart crop requires an integrated approach encompassing genetic improvement, enhanced seed systems, value chain development, and improved public awareness. Harnessing its resilience and nutritional potential could contribute significantly to food and nutritional security in marginal and climate-vulnerable regions.

SESSION 1: IN THE LAB

In the lab: molecular, genetic and physiological research on grasspea.

Integrating GWAS and Aphid Bioassays to Reveal Resistance Strategies in Grasspea.

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Grasspea (*Lathyrus sativus* L.) is a resilient legume with potential for sustainable agriculture in marginal environments but suffers severe yield losses from pea aphid (*Acyrthosiphon pisum* H.) infestation through phloem-feeding and virus transmission. Increasing aphid outbreaks driven by climate change, combined with stricter EU regulations on pesticide use, highlight the urgent need for resistant varieties. However, the genetic basis and mechanisms of aphid resistance in grasspea remain poorly understood, constraining breeding progress.

This study aimed to identify aphid-resistant accessions within a diverse worldwide collection of 160 grasspea accessions, elucidate the genetic basis of resistance through genome-wide association studies (GWAS), and characterize underlying resistance mechanisms.

Resistance was quantified under controlled conditions using infested area (%IA) at 7 days and plant damage (Dam) at 10 days after infestation. Substantial phenotypic variation was observed, with %IA ranging from 0 to 20 and Dam from 0 to 93.

GWAS with 208,317 SNPs and four models (MLM, MLMM, BLINK, and FarmCPU) revealed 6 SNPs significantly associated with resistance traits, with MLMM and BLINK providing the best model fit. Candidate genes were identified based on physical proximity and linkage disequilibrium.

SESSION 1: IN THE LAB

Aphanomyces euteiches Causes Disease in *Lathyrus sativus* with a Globally Diverse, Polygenic Resistance Landscape.

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Aphanomyces euteiches is a major concern in peas and lentils. Along with its ability to adopt resistance structures, its capacity to infect various legume species makes it difficult to manage. Although it was also isolated from vetch, clover, faba bean, snap bean, and alfalfa, its impact on grasspea (*Lathyrus sativus*) remains unreported. This study aimed to assess the susceptibility of grasspea to *A. euteiches* and to identify genomic regions associated with resistance.

A diverse panel of 169 grasspea accessions was inoculated with the *A. euteiches* RB84 strain. Twenty days after the inoculation, foliar and root symptoms were evaluated. These phenotypic data were then used along with a 12,974 single-nucleotide polymorphism (SNP) dataset to perform a genome-wide association study to identify genomic regions associated with resistance.

As a result, a wide range in foliar and root response was observed in the collection, confirming the susceptibility of grasspea to *A. euteiches* for the first time. Notably, several accessions exhibited incomplete or complete resistance, being good candidates to be incorporated in breeding programs. Additionally, the performed genome-wide association study identified significantly associated SNPs across five of the seven grasspea chromosomes. This suggests, as in other legumes, a polygenic base of resistance in this crop. Based on the co-location with significant associated SNPs, seven putative candidate genes involved in vesicle trafficking, signal transduction, nucleotide metabolism, fatty acids metabolism, cell wall synthesis and ethylene signalling are proposed to be implicated in grasspea resistance to *A. euteiche*s.

All in all, this study reveals the susceptibility of grasspea to *A. euteiches* as well as identifies natural sources of resistance and proposes resistance-associated loci with co-located putative genes involved in the response.

SESSION 1: IN THE LAB

High-Throughput Phenotyping Reveals Genotypic Variation in Drought Response and Water-Use Strategies in *Lathyrus spp.* Under Progressive Soil Drying.

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Grasspea (*Lathyrus sativus* L.) is a legume crop with broad adaptation to marginal and stress-prone environments, making it a promising option for climate-resilient agricultural systems. However, its physiological response to soil drying remains poorly characterized. In this study, we assessed the physiological performance of *Lathyrus spp*. diversity panel in response to progressive soil drying (dry-down) at the PHENO-MA high throughput phenotyping platform. Breakpoint (BP) analysis of transpiration declines with decreasing soil moisture (FTSW) revealed significant genotypic variation in drought sensitivity thresholds. The genotypes IG 107703 (*Lathyrus sativus*) IG 114545 (*Lathyrus sativus*) and IG 64990 (*Lathyrus cicera*) exhibited conservative water-use strategies, with BPs at 0.72, 0.70 and 0.64 respectively. Multi-sensor high-throughput phenotyping using RGB, Thermal Infrared, and a spectrometer data showed significant differences between well-watered (WW) and water-stressed (WS) plants across vegetation Indices namely NDVI, PRI, MCARI, red-edge chlorophyll content, and green cover. Ridge plots and heatmaps highlighted distinct genotype-specific responses, particularly under WS conditions. Agronomic and phenological traits (e.g., flowering time, biomass, grain yield) were integrated with sensor-derived data using PCA and TOPSIS-based multivariate analyses. Genotypes were ranked according to drought tolerance, combining physiological resilience with superior yield performance. These results highlight the value of integrating high-throughput phenotyping and physiological screening to identify drought-tolerant candidates for breeding programs targeting water-limited environments.

SESSION 1: IN THE LAB

From "Poor Man's Meat" to safe climate-smart protein: pioneering genome editing of grasspea (*Lathyrus sativus*) for improved yield in a changing climate.

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Grasspea (*Lathyrus sativus*), often referred to as the "poor man's meat" in Bangladesh, is a vital source of affordable protein for millions of low-income households. As a woman scientist from a developing country and as a young mother, I am deeply motivated to transform this climate-resilient legume into a safe, nutritious, and high-yielding crop that can sustainably support vulnerable communities under a changing climate.

Grasspea is uniquely adapted to drought-prone and marginal environments and is widely cultivated across Bangladesh. However, its potential remains constrained by low productivity and the presence of the neurotoxin β-ODAP, which can cause lathyrism in humans and animals. At the same time, climate change induced drought severely threatens crop production through oxidative stress mediated by reactive oxygen species (ROS). Though *Lathyrus* is a stress (particularly drought) tolerant crop, the mechanism behind it has not yet been elucidated through genetic transformation. Moreover, the correlation between stress tolerance and ODAP content need to be assessed.

This PhD project aims to (i) dissect the genetic and molecular basis of drought tolerance in grasspea with a focus on ROS signaling pathways, (ii) evaluate the correlation between ODAP content and stress resilience, and (iii) develop genome-edited grasspea lines with reduced or eliminated ODAP content and improved yield potential. A major technical bottleneck in grasspea research has been its recalcitrance to genetic transformation.

During the first year of my PhD, I successfully optimized an Agrobacterium-mediated transient transformation protocol using a RUBY reporter system, marking a critical breakthrough toward stable transformation and functional genomics in this orphan crop. By enabling genome editing in grasspea, this research seeks to bridge cutting-edge plant biotechnology with real-world food security challenges faced by developing countries.

SESSION 2: BRIDGING THE GAP

Bridging the gap: grasspea from the lab to the field

Farmers' Voices on Grasspea: Resilience Rooted in Tradition.

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Grasspea (*Lathyrus sativus* L.) plays a critical yet often undervalued role in the livelihoods of smallholder farmers across parts of Africa, Asia and Europe. Over time, it has emerged as a vital climate-adaptation crop thanks to its ability to thrive on marginal lands where other crops fail, and its remarkable tolerance to drought, poor soils, and low-input conditions. Despite persistent challenges - including limited market access, production constraints, and insufficient policy recognition - farmers continue to cultivate grasspea. Its persistence reflects the importance of resilient, locally adapted crops in strengthening food security amid increasingly variable climates. Efforts were made to highlight the voices and perspectives of grasspea-growing farmers from major producing countries, including Bangladesh, China, Ethiopia, India, Nepal, Portugal, and Spain. In these regions, grasspea is a historic crop woven into local culture and traditions, yet its potential remains hindered by inadequate research, extension services, and policy support. By featuring farmers' own experiences, we document how the crop fits into agricultural traditions, how cultivation practices and uses have evolved across generations, and what challenges and opportunities farmers identify today. This video offers an authentic, ground-level view of grasspea cultivation across diverse environments and captures firsthand insight to help inform policy and programmatic action aimed at promoting climate-resilient and nutritious crops.

SESSION 2: BRIDGING THE GAP

Bridging the Gaps in Ethiopia: Grasspea in the Field.

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Grasspea (*Lathyrus sativus* L.) is an important food and feed legume crop in Ethiopia. Its vital importance in Ethiopian agriculture emanates from its resistance to drought, salinity, waterlogging and low soil fertility. Currently, grasspea is widely cultivated and regularly consumed as one of the staple food legume crops in Ethiopia.

It is grown on above 160,000 hectares of land by smallholder farms of Ethiopia and both its production and acreage are increasing. Despite generally being cultivated in low-input systems without fertilizer or irrigation, grasspea produces an average yield of 2.1t/ha, providing food security for millions of resource poor farmers in the country.

Farmers want improved grasspea varieties but the crop has had little investment due concerns about β-ODAP. After 50 years of on-station and on-farm research, an improved variety 'Wasie' was released as the first low β-ODAP content variety in Ethiopia. However, Wasie is not yet promoted and scaled up to the farmers and seed growers.

As a result, farmers are forced to continue in producing and regularly consuming the low yielding and more toxic local cultivars. To fill this gap, through external project support, Ethiopian Institute of Agricultural research (EIAR) looking into using 'Wasie' for promotion and scaling up in collaboration with different NGOs, Ministry of Agriculture and others.

Currently, in collaboration with the Norwich Institute for Sustainable Development, EIAR is seeking to establish seed systems and business for large-scale promotion and expansion of improved grasspea in Ethiopia. This effort will bring together key value chain actors in the country, particularly Ministry of Agriculture, Ethiopia Seed Partnership (ESP) project, Ethiopia Agricultural Transformation Institute (ATI), Ethiopia seed enterprise, Oromia seed enterprise, Amhara seed enterprise, different private seed producers, unions, cooperatives, local community-based seed producers and many other stakeholders.

This collaboration will strengthen and speed up the establishment of effective seed systems and businesses that bring long-term adoption of safer and improved grasspea varieties to farmers.

SESSION 2: BRIDGING THE GAP

Strengthening fragile food systems through climate-resilient crops: lessons from grasspea (*Lathyrus sativus*) for conflict-affected smallholder farming in Nigeria.

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To make food security stronger in places that are fragile or have been touched by violence, we need agricultural systems that can handle climate stress, weak institutions, and market disruptions. People have been encouraged to grow climate-resilient crops like grasspea (*Lathyrus sativus*) because they can tolerate drought, bad soils, and changes in the environment. However, how they are managed, embraced, and incorporated into local lives will determine how much they help build food systems.

This research analyzes the lessons that grasspea provides for fortifying vulnerable smallholder food systems in conflict-impacted areas of Nigeria, particularly in Plateau State. It uses evidence from the field about food insecurity and livelihood vulnerability, as well as a review of research from places where grasspea is historically grown. The analysis situates grasspea within the political economy of fragile food systems, emphasizing how conflict, displacement, inadequate extension services, and market volatility influence farmers' production decisions and risk management approaches.

The report contends that grasspea ought to be perceived not as a substitute for current staples, but as a prospective resilience-enhancing ""buffer crop"" in situations of severe stress. But its role in making the food system stronger hinges on things like availability to low-toxin varieties, teaching farmers how to safely process and eat them, integrating with nutrition and public health policy, and providing conflict-sensitive extension support. Without these protections, the dangers of grasspea, especially neurotoxicity when eaten in the same way all the time, might be worse than its possible benefits.

This research uses grasspea as a lens to look at the bigger problem of how to add climate-resilient crops to weak food systems. It adds to the discussion of how to properly turn agricultural innovation into development practice. It emphasizes the necessity of synchronizing agricultural research with social realities, public health imperatives, and institutional capabilities to enhance food security for at-risk rural communities.

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