

NEWS LETTER

What's new around *Lathyrus*?



Science

Edwards et al. (2023) conducted genomics and biochemical analyses to reveal a metabolon crucial for β -L-ODAP biosynthesis in *Lathyrus sativus*. This study might be opening the doors to the development of varieties with substantially less toxin.

Rajarammohan et al. (2023) performed genome sequencing and assembly of *Lathyrus sativus*.

www.lambeinfund.org



People

Professor Fernand Lambein was an esteemed phytochemist. He dedicated his career to grass pea (*Lathyrus sativus*), trying to understand the underlying factors to prevent the occurrence of neurolathyrism and konzo, both debilitating diseases. In this section, we want to tell you more about his work and the fund established in his memory.

Good to know

A message from the board: Lieve Ongena welcomes you to the Fernand Lambein Fund!

Discover the 4th International Legume Society Conference. It takes place in Granada (Spain) in September 2023, and the Fernand Lambein Fund will be there!

FERNAND LAMBEIN

Fernand Lambein was born in Oostende, Belgium, in 1938 and grew up in Ghent. After his bachelor's in agricultural engineering, majoring in chemistry, he continued his studies with a master's degree in molecular biology. Still, at the University of Ghent, in 1969, he obtained his Ph.D. with a thesis titled "New heterocyclic amino acids in *Pisum sativum* L."

As a winner of the prestigious Fulbright Fellowship, Fernand flew to Michigan in 1970, where he worked as a postdoc at Michigan State University. At the MSU-DOE Plant Research Laboratory, Fernand worked with Prof. Peter Wolk on the membrane structure of blue-green algae (*Anabaena cylindrica*).



The years spent in the USA had a tremendous impact on Fernand. Being exposed to the international scientific community, he soon realized the importance of bringing research out of the lab and sharing it with other scientists.

Fernand Lambein was born and raised in Belgium, but his scientific impact resonates from Ethiopia to Bangladesh.

In 1972, Prof. Dr. L. Vandendriessche, previously the adviser of his Ph.D., welcomed Fernand to his laboratory as an associate. After two years in the USA, Fernand returned to Ghent to start a fruitful, career-long collaboration. Fernand worked in the Physiological Chemistry lab, in the Faculty of Medicine, until his retirement as a professor in 2003.

During the first phase of his career, Fernand successfully worked on the

FERNAND LAMBEIN

identification of a series of natural heterocyclic compounds in seedlings of garden pea (*Pisum sativum* L.) and sweet pea (*Lathyrus odoratus* L.). His interest in *L. sativus* and neurolathyrism sparked while attending the International Symposium on Genus *Lathyrus* in 1985. There, he discovered that the biosynthesis of the toxin of *Lathyrus sativus* - beta-ODAP (3-N-oxalyl, 2,3-diamino propionic acid) - was unknown. Talking with Prof. Dr. Arthur Bell, a leading scientist in the field of plant non-protein amino acids from King's College (London), Fernand realized the novel 5-membered isoxazole ring compound he discovered in pea and sweet pea seedlings might be the precursor of the grass pea toxin.

From that moment on, Fernand became passionate about this climbing plant, with 3-meter-long stems and purple-colored flowers. He advised his Ph.D. student, Lieve Ongena, to investigate the bioproduction of the toxin of *L. sativus*. His intuition was confirmed: the biosynthesis pathway of ODAP was proven from

BIA (beta-isoxazolin-5-on-2-yl-alanine). In grass pea, Fernand saw a plant with great potential and a nasty danger. This legume has a unique drought resistance, but when overconsumed, it can cause a neuro-degenerative crippling disease, neurolathyrism. The condition occurs mainly in Asia and Africa, where grass pea has become a staple food due to drought-triggered famine. Since symptoms of neurolathyrism are identical to the ones of konzo ('tied legs' in the Yaka language), a crippling disease due to eating unprocessed bitter cassava (*Manihot esculenta*), Fernand was interested to find out the common cause which leads to the same motor neuron degeneration by consuming utterly different food.

Aware that science is human work and needs to be passed on, Fernand was always actively creating awareness and interest among the scientific community. His goal was to eradicate neurolathyrism by promoting *L. sativus* as a nutritious food in a balanced diet, not as a staple food. He worked hard to gain funds from the Belgian government and the EU Commission to set up multidisciplinary projects within Asian (India, Bangladesh), African (Ethiopia), and European (UK) countries. Throughout his career, Fernand has collaborated with researchers in China, Japan, and Canada, as well as with the International Center for Agricultural Research in the Dry Areas (ICARDA).



In the picture, from left to right: Prof. Dr. Fernand Lambein, Dr. Peter Nunn, and Prof. Dr. Arthur Bell

FERNAND LAMBEIN

In 2009 Fernand organised an International Workshop on konzo and neuroleptism at Ghent University. The goal was to gather researchers working on cassava/grass pea.

With his PhD student, Delphin Dissolua Ngudi, working on konzo and cassava toxicity in Congo, Fernand got into contact with prof. Dr. James Howard Bradbury from the Australian National University, Canberra, to deliver free kits to assess the cyano compounds in cassava.

In 2018 Fernand received from ICARDA the “Lifetime Achievement Award” for his support to research on *Lathyrus sativus*. In 2012, Prof. Dr. Bradbury (the founder of Cassava Cyanide Diseases Network in 2001) asked Fernand to become the coordinator of Cassava Cyanide Diseases and Neuroleptism Network (CCDNN).

Fernand was not only a great scientist but also an inspiring mentor. He continued to guide Ph.D. students until the end of his life in 2020 due to cancer. He was a devoted editor of the CCDNN Newsletter, a journal dedicated to like-minded scientists.

THE FERNAND LAMBEIN FUND: WHY AND BY WHOM

Following their father’s footsteps, Ingrid and Kathleen Lambein are dedicating their careers to science. Ingrid holds a Master’s degree in Bio-engineering sciences from Ghent University, and she completed her Ph.D. at Hokkaido University, Japan, in the faculty of Agricultural Sciences. Currently, she serves as a global trial leader at Janssen Pharmaceutica, contributing her expertise to ground-breaking research. Her younger sister, Kathleen, obtained her medical degree and Ph.D. in Medical Sciences from Ghent University. She is a pathologist at St. Lucas General Hospital in Ghent, providing valuable insights into the healthcare field. Additionally, she serves as a postdoctoral researcher at Leuven University, further expanding her knowledge and contributing to advancements in medical research. In her free time, Kathleen practices karate, actively engaging in training

and sharing her profound passion for martial arts.

Together, they have established a fund to honor their father’s ground-breaking research on *Lathyrus sativus*. In the following interview, Ingrid and Kathleen will shed light on their father’s vision and the inspiring work carried out by the Fernand Lambein Fund.

When and why was the Fernand Lambein Fund established?

Our beloved father, Fernand, who passed away in early 2020, believed his work was unfinished. His mission was to eradicate neuroleptism and promote *Lathyrus sativus* as a nourishing food source on par with other legumes.

FERNAND LAMBEIN

He would occasionally play the lottery, hoping to establish a fund to support further research on grass pea if he won.

Inspired by his unwavering passion, we are committed to making his dream come true. We joined forces with two exceptional professionals who shared Fernand's vision and worked closely with him during his career. Lieve Ongena, his former Ph.D. student, and Marc Heijde, his former colleague, have been essential in establishing the Fernand Lambein Fund.

With their support and our collective determination, we have embarked on a journey to honor our father's legacy and continue his invaluable work. The Fernand Lambein Fund is a testament to our father's unwavering dedication to science and his profound desire to make a lasting impact on the world.

What is your connection with grass pea?

As kids, conversations around *Lathyrus sativus* were our bread and butter. Sitting at the dinner table, we would listen to our parents talking about this plant. At the time, we would find the scientific discussions boring and overwhelming. However, we like to think our father's scientific passion for grass pea drew us to science. And we are now two passionate and committed scientists ourselves!

Can you give an overview of the fund's mission and purpose?

The Fernand Lambein Fund wants to honor our father's efforts and ensure his work lives on. The focus is, of course, on *Lathyrus sativus*. However, we did not want to limit the impact of the fund, so we broadened its mission. We aim to promote knowledge and technology transfer to developing countries, with a focus on sustainable food solution.



From the left: Kathleen and Ingrid Lambein

Fernand was not only a brilliant scientist but also a strong networker. Our father recognized the added value of collaborating with scientists from diverse disciplines and countries to drive societal changes. We want to bring this same mindset to his fund: we aim to continue his groundbreaking research and foster a spirit of cooperation within the scientific community.

The Fernand Lambein Fund represents our commitment to carrying forward our father's legacy and bringing a positive impact on scientific research.

We aim to continue our father's groundbreaking research and foster a spirit of cooperation within the scientific community.

FERNAND LAMBEIN

Are there any projects or initiatives the Fernand Lambein Fund plans to support?

First and foremost, we want to create a community of scientists who share our and Fernand's mission and vision. We hope this newsletter will help in bringing together minds physically apart. We also wish to give visibility to all the work done around grass pea, both within and outside the scientific community.

In addition, one of the fund's initiatives is to organize an annual Lathyrus Day, with the first edition scheduled in Ghent on June 3rd, 2024, which coincides with Fernand's birthday. We envision this day as an opportunity for scientists to meet fellow researchers and spread awareness among citizens regarding this legume full of potential!

We also believe in supporting researchers, especially in the first phases of their careers. We are still defining the best strategy to achieve that, but there will be for sure some sponsorship provided.

How can individuals or organizations contribute to the fund or get involved in supporting its activities?

You can find the link on the [The King Baudouin Foundation website](#) if you want to contribute. For those interested in being involved with the fund, please get in touch with us via email!

From the left: Ingrid, Kathleen and Fernand Lambein



Genomics and biochemical analyses reveal a metabolon key to β -L-ODAP biosynthesis in *Lathyrus sativus*

Anne Edwards, Isaac Njaci, Abhimanyu Sarkar, Zhouqian Jiang, Gemy George Kaihakottil, Christopher Moore, Jitender Cheema, Clare E M Stevenson, Martin Rejzek, Petr Novák, Marielle Vigouroux, Martin Vickers, Roland H M Wouters, Pirta Paajanen, Burkhard Steuernagel, Jonathan D Moore, Janet Higgins, David Swarbreck, Stefan Martens, Colin Y Kim, Jing-Ke Weng, Sagadevan Mundree, Benjamin Kilian, Shiv Kumar, Matt Loose, Levi Yant, Jiří Macas, Trevor L Wang, Cathie Martin, Peter M F Emmrich

Nat Commun. 2023 Feb 16;14(1):876.
doi: [10.1038/s41467-023-36503-2](https://doi.org/10.1038/s41467-023-36503-2).

Grass pea (*Lathyrus sativus*) is a leguminous crop, high in protein and resilient to drought and flooding. It is cultivated as an insurance crop in Ethiopia, Eritrea, India, Bangladesh, and Nepal. Because of its resistance to extreme weather conditions, *L. sativus* is considered of interest in ensuring food security in a changing climate. However, two factors have limited the cultivation of the grass pea. On one side, the association with a neuro-degenerative crippling disease, neurolathyrism. Additionally, more genetic resources are needed. In this article, the authors present an annotated, long read-based assembly of the 6.5 Gbp genome of *L. sativus*. Drawing from that, they show a biosynthetic pathway leading to the formation of the neurotoxin, β -L-oxalyl-2,3-diaminopropionic acid (β -L-ODAP). At the final stage, an interaction between *L. sativus* acyl-activating enzyme 3 (LsAAE3) and a BAHD-acyltransferase (LsBOS) forms a metabolon activated by CoA to produce β -L-ODAP. In light of this discovery, suitable premises exist to develop varieties with substantially less toxin.

Genome sequencing and assembly of *Lathyrus sativus* - a nutrient-rich hardy legume crop

Sivasubramanian Rajarammohan, Lovenpreet Kaur, Anjali Verma, Dalwinder Singh, Shrikant Mantri, Joy K Roy, Tilak Raj Sharma, Ashwani Pareek, Pramod Kaitheri Kandoth

Sci Data. 2023 Jan 17;10(1):32.

doi: [10.1038/s41597-022-01903-4](https://doi.org/10.1038/s41597-022-01903-4).

Lathyrus sativus, commonly known as grass pea, is a legume crop with interesting values regarding drought tolerance, salinity, waterlogging, insects, and other biotic stresses. However, it is not widely spread due to the accumulation of a neurotoxin - β -N-oxalyl-L- α , β -diaminopropionic acid (β -ODAP) in the seeds: when overconsumed, this plant can lead to neurolathyrism. In this study, the genome of *Lathyrus sativus* cultivar Pusa-24, an elite Indian cultivar popular in breeding programs, has been sequenced and assembled. The genome assembly of grass pea had a length of 3.80 gigabases (Gb), and it exhibited a scaffold N50 value of 421.39 megabases (Mb), indicating good continuity in the assembly. An assessment using BUSCO revealed that the assembly contained 98.3% of highly conserved genes specific to *Viridiplantae*, highlighting the completeness of essential plant genes. Within the *L. sativus* assembly, there were 3.17 Gb (83.31%) of repetitive sequences, and a total of 50,106 protein-coding genes were identified. As a result, this work offers a significant and reliable basis for future diverse genetic and genomic investigations on this important legume crop.

Critical Sites of Serine Acetyltransferase in *Lathyrus sativus* L. Affecting Its Enzymatic Activities.

Ma H, Song Y, Zhang Y, Guo H, Lv G, Chen H, Liu J, Liu X, An Z, Wang L, Xu Q, Jiao C, Chen P. J Agric Food Chem. 2023 May 24;71(20):7858-7865.
doi: [10.1021/acs.jafc.3c00678](https://doi.org/10.1021/acs.jafc.3c00678).

Impact of Grass Pea Sweet Miso Incorporation in Vegan Emulsions: Rheological, Nutritional and Bioactive Properties.

Simões S, Carrera Sanchez C, Santos AJ, Figueira D, Prista C, Raymundo A. Foods. 2023 Mar 23;12(7):1362.
doi: [10.3390/foods12071362](https://doi.org/10.3390/foods12071362).

Lathyrism in Spain: Lessons from 68 publications following the 1936–39 Civil War.

Giménez-Roldán S, Palmer VS, Spencer PS. J Hist Neurosci. 2023 Jun; 5:1-33.
doi: [10.1080/0964704X.2023.2195442](https://doi.org/10.1080/0964704X.2023.2195442).

Lathyrus sativus resistance against the existing and emerging pathogens *Erysiphe pisi* and *E. trifolii*: A case of commonalities or total discrepancy?

Martins D, Santos C, Margarida Sampaio A, Rubiales D, Vaz Patto MC. Phytopathology. 2023 May 2.
doi: [10.1094/PHYTO-06-22-0227-FI](https://doi.org/10.1094/PHYTO-06-22-0227-FI).

Scientists say poisonous pea could be made vital climate crisis crop.

Robin McKie
Guardian. 2023 July.
<https://www.theguardian.com/science/2023/jul/08/uk-scientists-could-make-poisonous-grass-pea-a-valuable-food-crop>

People

Science

Good to know

WHAT'S GOING ON AROUND LATHYRUS?



A MESSAGE FROM THE CHAIR



Welcome to this first Lambein Fund newsletter! In honor of my PhD promoter, I'm happy to take on the challenge as the chair of this newly established research fund focusing on grass pea (*Lathyrus sativus*). We hope the research efforts and dedication of Dr. Fernand Lambein will inspire this community to walk in his footsteps and continue his dream to create a lively 'Lathyrus' community. Enjoy the reading and looking forward to embrace your contributions to this grass pea community.

Lieve Ongena

"The fund aims to promote knowledge and technology transfer related to the grasspea to developing countries and to promote research collaboration and open science."



ILS4, 18-22/09/2023

The 4th International Legume Society Conference takes place in Granada (Spain) from the 19th to the 22nd of September, 2023. This conference follows the previous events held in Novi Sad (2013), Tróia (2016), and Poznań (2019). This International Conference aims to foster knowledge exchange and interactions among researchers and stakeholders around increased cultivation and utilization of grain and forage legumes. These efforts are crucial in advancing sustainable food and feed systems and promoting healthier diets.



The Fernand Lambein Fund will be there. Look for our booth and get your seed bags of grass pea!

