



The Cameroon Edition

Welcome to the July 2021 edition of the Kirkhouse Times, dedicated to the research team led by Dr Sobda Gonné at the Institute of Agricultural Research (IRAD), Regional Centre of Maroua, Cameroon. In this issue we celebrate the recent release of two cowpea varieties resistant to the parasitic weed Striga, Lori-2 and Lori-3, and hear about current research activities and future plans. These include further improving the Striga resistant varieties by introducing resistance to aphids and important local diseases. We also meet the members of the team in Cameroon.

In our Announcements section, KT is happy and honoured to welcome Dr Joseph DeVries as consultant for seed systems. And last but not least, we congratulate Professor Paul Gepts, Dr Hamadou Sibide, Dr Kelvin Kamfwa and Mr Felicien Zida.

Striga resistant cowpea varieties available to farmers in Cameroon



Dr Gonné (far right) with members of the GIC Wassakay women farmers' group during a participatory selection event in Meskine, Maroua, in 2017. The involvement of farmers and consumers in choosing the final varieties is essential as researchers may miss qualities that are important for those who will grow, cook and eat the cowpeas.

Striga, sometimes described as the Purple Witch because of its flower, is a parasitic weed that attaches itself to the roots of a number of crops, including cowpea, robbing them of water and nutrients. In heavily infected fields it can wipe out the entire harvest, and because it produces a large number of small seeds that can lie dormant in the soil for many years, this weed is very difficult to control, which makes the development of resistant varieties the most sustainable, environmental friendly and economical solution.

Vya and Lori are popular cowpea varieties among farmers in Cameroon, but both are susceptible to Striga. Work to develop Striga resistant versions of Lori and Vya began in 2011, by crossing these varieties to IT97K-205-8 and IT99K-573-1-1: varieties resistant to Striga but lacking many of the qualities of Vya and Lori that farmers and consumers in Cameroon want.

In order to recover all the important attributes of Lori and Vya, the progenies of the first cross were crossed back to the female parent varieties, and this procedure (called backcrossing) is repeated for a number of successive generations. In this process, it is important to ensure that the resistance to Striga introduced isn't lost along the way. The use of molecular markers allows plant breeders to identify the Striga resistant plants without the need to test them on a weed infested field. In other words, the genetic difference between susceptible and resistant individuals can be visualised using molecular biology techniques. This test can be done on seedlings, anywhere and at any time, making the selection process more efficient, cheaper and faster.



Plant molecular breeding in action!

First row, left: Vya and Lori, the varieties targeted for improvement (called the recurrent or recipient parents in the breeding scheme). Centre: Mr Moussa, field technician at IRAD and former team member, making crosses in the screenhouse. Right: successful crosses lead to fully elongated pods, labelled to indicate their pedigree. Second row, left: the progeny of the crosses are grown in the screenhouse and tested with molecular markers to identify the Striga resistant individuals. Centre: Dr Liliane Iyale preparing samples for PCR. Right: 2% Agarose gel profile for 13 plants of the third backcross generation (BC3F1) screened with the C42-2b molecular marker to identify the individuals that inherited the genetic resistance to Striga from IT99K-573-1-1, the donor parent. Four plants (numbers 4, 6, 9 and 12) were selected to be taken further in the breeding process. The rest of the plants can be discarded.

The improved Striga resistant Lori and Vya varieties, named IR15-MA02 and IR15-MA33, were officially released by the Ministry of Scientific Research in May 2019. The release of a new variety is however much more a beginning than the end of a process: the job isn't over until the seeds are in the hands of farmers. The team in IRAD is currently producing foundation seed of IR15-MA02 and IR15-MA33, which is then used to produce certified and quality assured seed types, and they are engaging with farmers' associations and seed companies to make these varieties available to farmers. The aim is to develop a sustainable operation: the sale of improved seed should finance its continued production.



Top row, left: farmers checking the presence of Striga in improved cowpea rows to compare with the Striga susceptible row (shown by arrows). Right: a cowpea plant infested by Striga. Bottom row, left: field photographs of the Striga-susceptible Vya variety (arrows point at Striga plants). Centre: the new Striga-resistant IR16- MA-P variety (right). Right: IR15-MA02 seeds.



Left: official hand-over ceremony of IR15-MA02 and IR15-MA33 to the Mayor of Kaele Council by the Representative of the Ministry for Science and Innovation of Cameroon. Right: participants to the ceremony receive seeds, May 2019.

What's up in the lab?

Plant breeders never run out of work: Striga is not the only trouble cowpea farmers face. Insect pests and diseases are problems too, and they tend to occur together. Dr Gonné and his team continue to improve the Vya and Lori derived varieties, and current work aims at introducing resistance to insects. This time the cowpea variety “donating” the genetic resistance to aphids came from Ghana, SARC1-57, as a result of an exchange of cowpea varieties between PIs of KT's West African Cowpea Consortium (WACC). Ongoing work also includes the study of the distribution of important fungal diseases, such as *Colletotrichum* and *Fusarium*, and the identification of cowpea disease resistant varieties with the aim of starting the corresponding breeding programmes. A cowpea variety with resistance to *Colletotrichum* (KN-1) was provided by the KT cowpea improvement programme in Burkina Faso. The links established between WACC members has also resulted in the exchange of protocols, including those for screening for pathogen and aphid resistances.



Top row, left: development of a breeding population for an improved IR16-MA-A population with resistance to aphids. Right: bioassay set-up for brown blotch screening. Bottom row, left: Miss Fankou inoculating plans for the bioassay, and performing the microscopic analysis of single spore cultures (right).



Left: screen to identify *Fusarium* resistant cowpea varieties. Susceptible plants wilt seven weeks after being inoculated with the pathogen, while resistant varieties (CB46 shown here) display no symptoms. The second panel shows the damage to the stem in susceptible cowpea plants. The two photos on the right (third and fourth panels) show the difference between healthy roots and the roots of susceptible, infected plants.

Dr Gonné's time with Kirkhouse Trust

In 2007, Dr Ousmane Boukar introduced Dr Gonné to Professor Sir Ed Southern, Founder and Chair of KT, and Professor Mike Timko, WACC's Scientific Lead. In this Q&A Dr Gonné recalls some of the main events that lead to this introduction and of what happened next.

2002 Recruitment at IRAD, Cameroon

My collaboration with KT started when Dr Ousmane Boukar, one of the pioneers of this project and the cowpea PI of Cameroon, left IRAD to continue his duty at IITA in Nigeria. Before then, I worked under his supervision since my recruitment at IRAD in 2002, and he is the person who introduced me to KT.



2007 Master's degree, Belgium

My first contact with KT was in September 2007 when I was completing my Master's degree in Belgium. I received an invitation to travel to London, UK, and have an interview with the KT team.



2008 Visit to Professor Timko's lab, USA



A few months after my return to Cameroon, KT offered me an opportunity to train on molecular breeding and modern lab techniques at Professor Timko's lab at the University of Virginia, USA, from April 2008 to August 2008.

2013 PhD study at the West African Centre for Crop Improvement

This was a four-year programme including one year course at the University of Ghana and three years of field work at the student's home country. During my absence the project activities went well as the plan was made available to technicians and field workers. The work was temporary supervised by Dr Lenzemo, our Head of Research, who assisted us and stayed in touch with me for feedback during the time I was in Ghana.



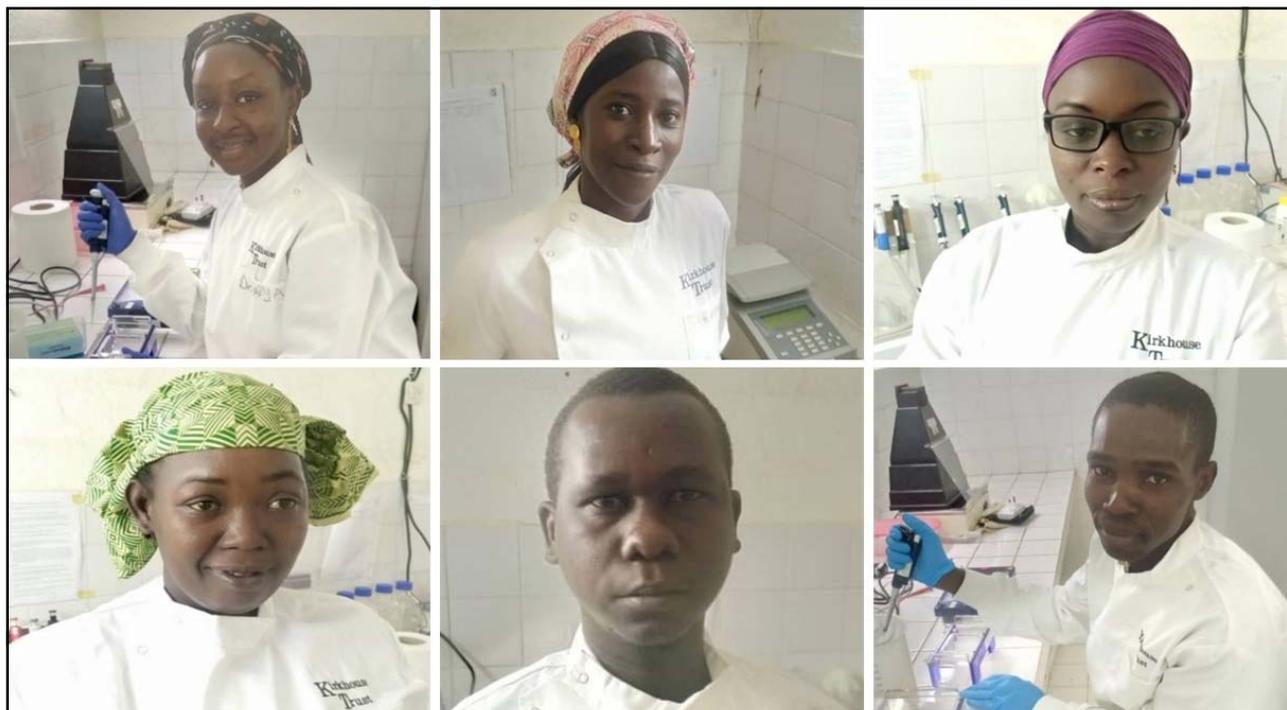
2021



The KT project team (left to right): Mr Dieudonné Gnapou, Miss Yvonne Djeoufo, Dr Arlette Zaiya Zazou, Dr Sobda Gonné, Miss Merline Fankou, Mr David Amedep, Dr Liliane Iyale.

The process for improvement undertaken so far has led to the release of two high yielding and Striga resistant varieties: IR15-MA02 and IR15-MA33. In addition, these varieties have large seeds which is another trait of interest that farmers want.

Meet the Cameroon team



Top row, left to right: Dr Arlette Zaiya Zazou, molecular breeder, Dr Liliane Iyale, lab technician and Ms Merline Fankou, plant pathologist and PhD student. Bottom row left to right: Ms Yvonne Djeoufo, Mr David Amedep and Mr Dieudonné Gnapou, data management scientists.



Dr Arlette Zaiya Zazou

Dr Zaiya ZaZou joined the research team in 2020. She completed a PhD as part of the *Innovation et Amélioration Variétale en Afrique de l'Ouest (IAVAO)* programme, using mapping populations to understand how peanut, a crop originally from South America, adapted to West African conditions. When not at work, Dr Zaiya ZaZou likes to spend time with family and friends and travelling.

In conversation with Dr Zaiya Zazou

What do you like about your work?

It's a job where the answers are never taken for granted. There are a lot of unknowns, and doubts that must be clarified every day. There are so many questions that you feel a real satisfaction when you manage to pierce a part of the mystery every day. It is motivating.

Why did you choose to work in plant breeding?

I chose this field to contribute to the development of my country. I come from a region where famine is a regular problem. And by going to the laboratory every day, I keep in mind that I can change something in my community, and even beyond, thanks to this. I tell myself that science exists to provide concrete solutions to problems.



Dr Liliane Iyale

Dr Iyale is the laboratory technician responsible for the molecular work carried out in the project. Her academic background was originally agro-forestry, and she completed a Masters' degree in this topic before turning to extracting DNA and running gels.

In conversation with Dr Iyale

What do you like about your job?

I like the fulfilment that this job offers me, and the passion that I find in this work positions me at a high level. Thanks to this work I am known outside the country, through my scientific publications.

Why did you choose to work in plant breeding?

I chose this field because molecular biology is fascinating, exciting, concrete and practical concrete solutions to everyday problems.



Ms Merline Fankou

Ms Fankou joined the team in 2017 as a Master's student. In her project, she screened a set of cowpea varieties to identify those resistant to brown blotch disease. Building on the experience gained in a training in Burkina Faso, she plans to study the diversity of brown blotch disease in Cameroon, and develop molecular markers for resistance in cowpea to this disease.

In conversation with Ms Fankou

What do you like about your job?

I love this work because it gives me the opportunity to experience, develop my curiosity and force me to assess my perseverance. And also, what we do there is natural. It allows me to make discoveries day-to-day.

Why did you choose to work in plant breeding?

I chose to work in this field because there is a special satisfaction that you feel when you set up an experiment, an innovation. We are flattered to contribute to the advancement of life through science.



Ms Yvonne Djeoufo

Ms Djeoufo takes part in the collection of field data and in the molecular analysis of markers in the lab. In her spare time, she likes cooking, admiring nature and going for walks.

In conversation with Ms Djeoufo

What do you like about your job?

I like the use of innovative techniques and methods, the open-mindedness of the work and making discoveries. I also enjoy the team spirit and the conviviality that exists between us.

Why did you choose to work in plant breeding?

I am passionate about genetics, molecular biology, plant breeding and their understanding.



Mr David Amedep

In conversation with Mr Amedep

What do you like about your job?

I love doing research, which is my real passion. I personally wish that IRAD would receive funding to improve the work done by the researchers it employs.

Why did you choose to work in plant breeding?

I chose this field because I have a dream to develop an improved variety of cowpea during my research that will meet the requirements of farmers.



Mr Dieudonné Gnapou

Mr Gnapou is a research assistant, and participates in data collection in the field and in the lab. Born in a farming family in North Cameroon, he is the first son of twelve siblings, and worked alongside his schooling to finance his studies. In 2017 he obtained a Diploma in Design Engineer in Environmental Sciences. He likes field work, playing soccer and listening, singing and playing music.

In conversation with Mr Gnapou

What do you like about your job?

I like the work I do because it allows me to better understand the world around me, and to participate in a great collective adventure. I like meeting colleagues around the world who, despite their differences, share the same values, the same enthusiasm.

Why did you choose to work in plant breeding?

I chose this work to make my contribution to agricultural production, which is nowadays confronted with several factors of biotic and abiotic order, including the impact of climate change. I also choose to work in this team to get to know each other, to identify my strengths and weaknesses.

★ Announcements & Congratulations ★



We warmly welcome Dr Joseph DeVries, who joins KT's team of consultants to provide advice on how to make the improved varieties produced by KT-funded breeding programmes sustainably available to farmers. Dr DeVries has worked for over three decades in agricultural development projects in Africa. In 2006 he co-founded the Alliance for a Green Revolution in Africa (AGRA), and established and led the Program for Africa's Seed Systems (PASS) dedicated to increase the capacity to breed, produce and disseminate quality seed in eighteen African countries. In 2019 he founded the Seed Systems Group (SSG), of which he is also President. SSG is devoted to develop a sustainable quality seed supply in the African countries which were not included in the PASS programme.



Dr Hamadou Sidibe of L'Institut de l'Environnement et de Recherches Agricoles du Burkina Faso (INERA) qualified for a PhD at the Université Joseph Ki-Zerbo, Ouagadougou, Burkina Faso on 21st October 2020. Thesis title: "Heredity of resistance to thrips (*Megalurothrips sjöstedti* Trybom) of cowpea varieties (*Vigna unguiculata* [L.] Walp) from the Burkina Faso collection and identification of sources of resistance."



Congratulations to Professor Paul Gepts from the University of California Davis, USA, for receiving the International Crop Science Award from the Crop Science Society of America. The award recognizes positive changes realized for crops at the international level with an emphasis on creativity and innovation. KT is fortunate to have Professor Gepts as the scientific lead of the African Bean Consortium.



Dr Kelvin Kamfwa, University of Zambia, and Dr Juan Osorno, North Dakota State University, USA, for winning a two-year Feed the Future Innovation Lab for Legume Systems Research grant. The proposal, “Strategic collaborations: implementing a gender responsive genetic improvement program for bruchid resistant beans in Southern Africa” was submitted by the University of Zambia on behalf of the Bruchid Resistant Bean Team, which include members from the University of Nebraska, USA, the Dept. of Agricultural Research and Technical Services, Malawi, and the Instituto de InvestigaçãO Agraria de Mozambique, Mozambique.



Mr Felicien Serge Zida, co-PI for the Stress Tolerant Orphan Legume (STOL) project at the Environmental Institute for Agricultural Research (INERA), was appointed to coordinate a project with the Pan African Beans Research consortium (PABRA). This collaboration will help promote another orphan crop in Burkina Faso: Tepary bean (*Phaseolus acutifolius*).

Contact us: info@kirkhoustrust.org or visit www.kirkhoustrust.org