GBioS
Genetics, Biotechnology and Seed Science Unit
Excellence in Seed Science

Call for Application for the Regional Training in Genomics and Plant Breeding

Deadline: 31 July 2024

Training period: 16 to 22 November 2024

World Vegetable Center

Biosystematics Group
We address fundamental questions about BIODIVERSITY and its ORIGINS

Overview

This training will introduce crop biologists, plant breeders, agronomists, plant physiologists and post-graduate students to methods and approaches for analysing breeding, and crop genomic data to address and improve different agricultural research and development. During the training, participants will learn advanced RNA and DNA extraction techniques, sequence generation, and editing, genotyping experimental design, variant calling, comparative genomics, and relevant tools to analyse breeding and genomic data. They will explore the concepts of genome-wide association studies, genomic selection, mating designs and breeding methods. The content will also address how to use existing genomic public data as well as retrieving, submitting, and sharing data with the community. Experimental designs and best practices in data collection, management and analysis of variety trials data will also be covered.

Trainees will review the basics of diversity analysis using R before analysing various genome datasets to assess diversity using microsatellites and sequence data. The course will be delivered through lectures, hands-on activities, and field activities. Statistical genetics practices require a computer for the courses and exercises that will be assigned (Specifications Will be provided in due course).

Objectives

To provide participants with breeding and genomics approaches, techniques, and analytical capacity for crop improvement research to tackle food and nutrition security and climate change issues.

Outcomes

At the end of the training, participants will be able to:

- Understand molecular biology basics.
- Familiarize with basic equipment in a molecular biology laboratory.
- Extract genomic DNA from plant and animal tissues.
- Quantify DNA and verify its purity using NanoDrop and electrophoresis.
- Apply the basic principle of PCR using molecular markers such as SSR.
- DNA sample preparation for sequencing
- Understand the Sanger sequencing procedure.
- Understand various omics approaches and their role in understanding plant processes and functions.

- Understand plant molecular physiological processes.
- Analyse the information from plant genomic research and recognize its potential applications in crop improvement.
- Design and develop experiments to understand and influence plant function.
- Design and implement experiments, analyse data and report results of variety trials.

Who is this training for?

The targeted audiences of this training are professionals, lecturers, researchers, plant breeders, and post-graduate (doctoral) students who work or can generate their own crop breeding and/or genomic data or work on genotyping research or are active in developing crop data analysis software. Participants must be part of projects in sustainable agricultural production, crop protection, and biodiversity safeguarding. Classes will be taught in English, but some trainers are fluent in French and can offer language support if needed.

Course content

The training is organised in three modules and will be 30% theoretical and 70% hands-on.

Module 1: Advanced Molecular Biology for Plant Breeders

- Structure, functions and variations of nucleic acids (ADN and ARN)
- Gene expression analysis for functional genomic studies.
- Molecular markers for plant genotyping
- Evaluation of genetic resources and genetic diversity analysis
- Molecular data analysis

Module 2: Genome, Bioinformatics, and Applications

- Introduction to Genome project, genome sequencing, and sequencing technologies
- Overview of Omics approaches, comparative genomics, metagenomics and epigenomics
- GWAS, Genomic Selection (GS), and Landscape genomics for plant breeders
- Introduction to Bioinformatics
- Sequence signature databases
- Disease gene prioritization, Data mining

Module 3. Plant Breeding

- Market intelligence and Demand-led breeding
- Mating design & analysis
- Breeding methods
- Experimental designs, On-farm evaluation, Citizen science and METs

Hands-on activities

Activity 1: Genomics DNA Extraction, Nucleic Acid quantification and qualification using Nanodrop.

Activity 2: Nucleic Acid quantification and qualification using Electrophoresis gel analysis and Polymerase Chain Reaction (PCR) amplification.

Activity 3: Practice on GWAS, GS and Landscape genomics analysis.

Activity 4: Bioinformatic data management and analysis.

Activity 5: Demonstration of web tools for genome analysis

Activity 6: Layout of experimental designs

Activity 7: Management and data analysis of multi-environment trials

How to Apply

All applications should be online via the application form (**https://vu.fr/dckNG**). Required documents during the application include:

1. a curriculum vitae;

2. a motivation letter; and

3. two pages about your breeding or research program.

Cost of the training

The cost of the training is USD 650 to cover bench fees, training materials, stationary, coffee/tea breaks and lunches.

Rate for early payment: 10% discount for early payment by 31 August 2024.

Flight/Travel and accommodation are covered by each applicant/participant. Tea and lunch are offered by the organising team during the training days. Any other costs are to be covered by each participant.

Maximum number of seats available: 25.

Important dates

Deadline for online application: **31 July 2024**

Announcement of the preselected candidates: **10 August 2024**

Deadline for early payment: **31 August 2024**

Deadline for late payment: **30 September 2024**

Place of the training

The training will take place from **November 16-22, 2024** at the Genetic, Biotechnology and Seed Science (GBioS) research and innovation center, Faculty of Agronomic Sciences, University of Abomey-Calavi, Republic of Benin. The training is an intensive course over one (01) week. All participants and teachers will be present (no virtual) at the GBioS research and innovation center of the University of Abomey Calavi (Benin).

Contact

For more information, please contact: **gbios.training@gmail.com**