Who are we?

MEICOM is an EU-funded research network encompassing 12 doctoral projects with researchers from all over the world.

Our focus is to study meiotic recombination in plants, which is a natural source of genetic variation.

In a world with a growing population affected by global warming, the development of increasingly efficient and sustainable crops is of utmost importance to ensure food security for future generations.

MEICOM network

Partners:

- University of Birmingham, UK
- University of Leicester, UK
- University of Cambridge, UK
- Institut Jean-Pierre Bourgin INRA-AgroParisTech, France
- University Clermont Auvergne; CNRS, France
- University Complutense Madrid, Spain
- University of Amsterdam, The Netherlands
- University of Wageningen, The Netherlands
- Karlsruhe Institute of Technology, Germany
- Leibniz Institute Plant Genetics & Crop Plant Research IPK, Germany
- University of Hamburg, Germany
- University of Vienna, Austria

Associated Partners:

- KWS UK Ltd
- SESVANDERHAVE
- MEIOGENIX
- NIAB Innovation Farm
- NIKON Instruments UK
- BIOVEGEN
- BAYER CropScience NV

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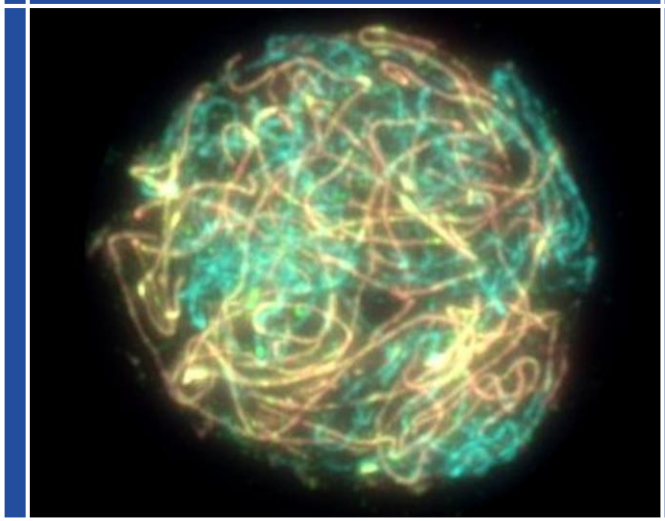
Crop Improvement through Meiotic recombination



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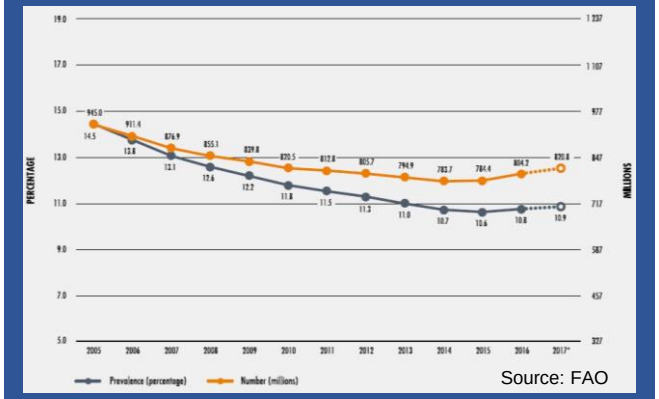
MARIE CURIE ACTIONS
European Commission
Horizon 2020
European Union funding for Research & Innovation

Food Security

"Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life". (World Food Summit, 1996)

Food security is a serious issue facing our society. Its importance is bound to increase in future, due to factors such as a rising population, climate change, changing land usage and conflicts. For instance, in 2017, the absolute number of undernourished people rose to nearly 821 million.



Source: FAO

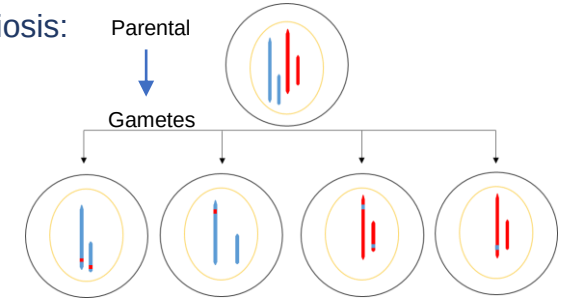
According to the Food and Agriculture Organization (FAO), more than 50% of all human calories come from crop plants. They are also the main source for livestock feed. An increase in crop production is required to cover existing shortages and meet the demand of an increasing population.

Due to a combination of factors such as climate change, the expansion of urban areas and ecological conservation projects, simply expanding cropland to increase production is not a feasible solution. Instead, the key to increasing global yield is the improvement of crop traits through novel, more efficient breeding approaches.

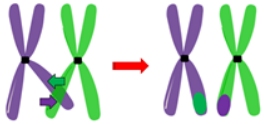
What is meiosis?

Meiosis is a specialized cell division that produces gametes (pollen and ovule in plants). During meiosis, maternal and paternal chromosomes align and fragments of the chromosomes are exchanged, creating new genetic combinations (traits), giving rise to genetic variation in the offspring. The reciprocal exchange of fragments between paternal and maternal chromosomes is called crossover.

Meiosis:



Crossover during meiosis:



Why study meiosis?

Understanding meiosis and the genetic recombination occurring during this process may provide an efficient basis for the development of technology to select and fix desirable traits in crops, with the increase of yield as the main focus.

Oilseed rape (*Brassica napus*) flowers and meiotic nuclei (chromosomes pairing within the cell).

Crop improvement

through exploitation of meiotic recombination

Throughout history, humans have been breeding plants by crossing individuals with desirable traits to obtain offspring carrying a combination of these traits. However, not all offspring produced by a cross will carry the desired combination of traits. The development of new crop varieties can take many years and encompass the production of thousands of plants over multiple generations of crossing.

This is in part due to the low frequencies of meiotic recombination in crop plants and an uneven distribution of the recombination events. In certain cereals, for instance, regions of up to 70% of their chromosomes rarely recombine. These regions include genes that might be interesting to combine for new traits.

Hence, understanding the mechanisms and factors regulating recombination frequency and localisation is a challenge in the pursuit of new technologies to improve crops.

New molecular techniques that have been developed in the last few years, along with al the knowledge accumulated through decades of research, give us the opportunity to contribute to this pursuit with new discoveries.