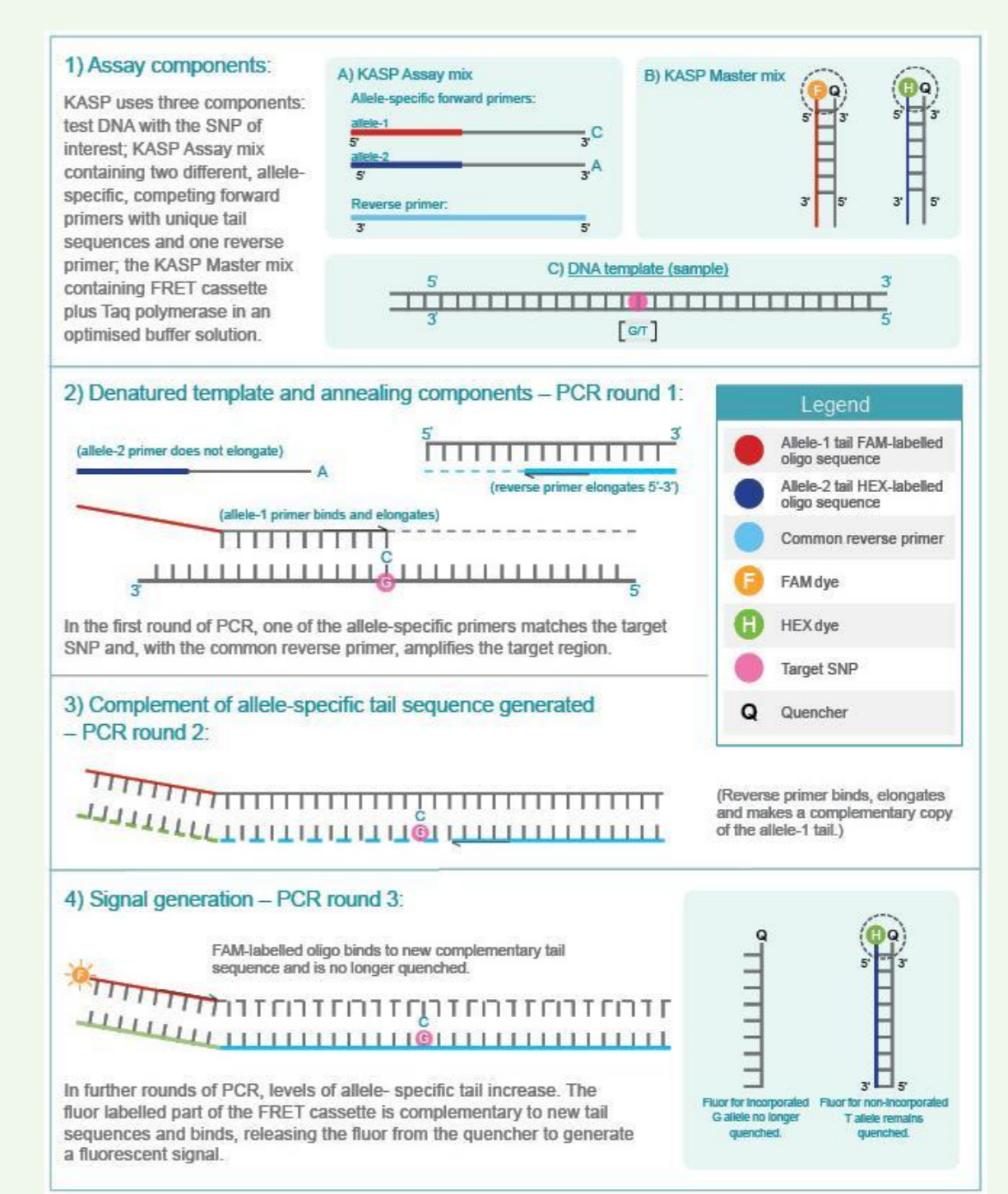
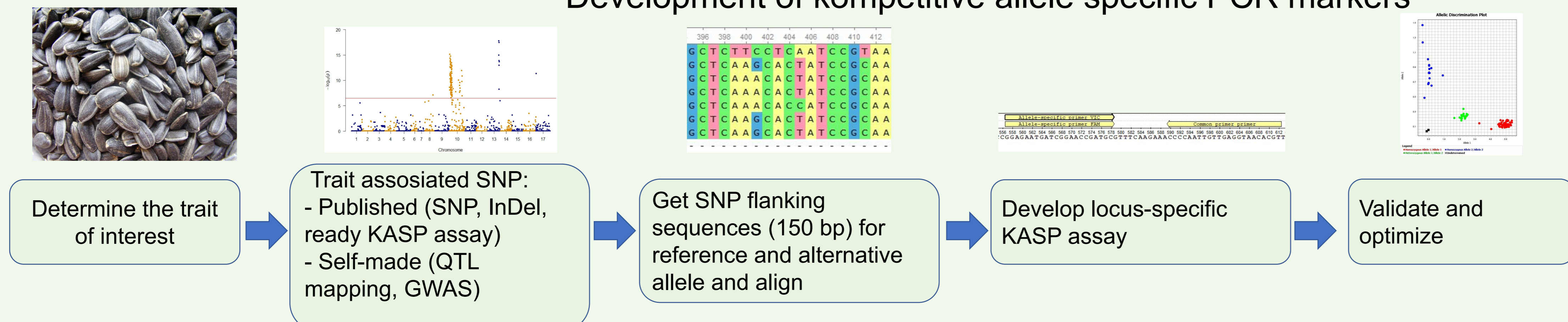


- Pre-breeding
- KASP -genotyping
- NGS for the breeders
- Data-analysis
- Consulting
- Experimental design

## Development of kompetitive allele specific PCR markers



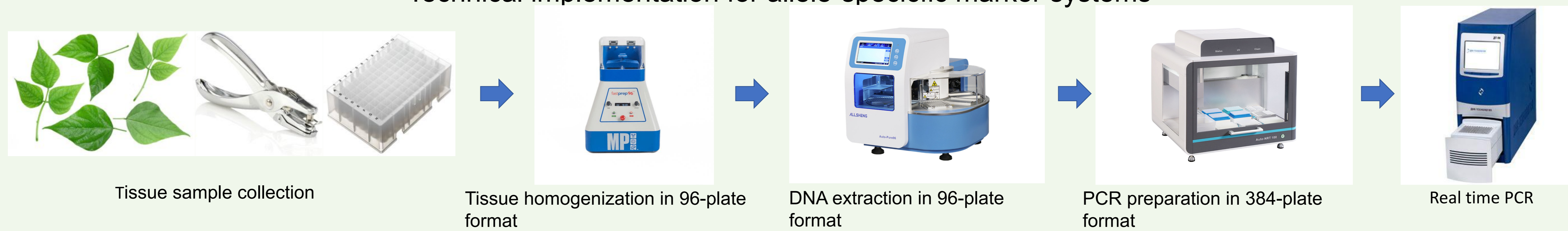
### Advances of allele-specific DNA marker systems in plant breeding:

- Allele-specific DNA markers provide precise identification of specific genetic variants in plants, improving the efficiency and accuracy of breeding.
- These markers can detect even small genetic changes, making them ideal for analyzing samples with limited amounts of genetic material.
- The use of allele-specific markers allows for quick and efficient genetic analysis, speeding up the breeding process and providing results in the shortest time possible.
- Allele-specific markers, due to their ability to accurately identify desired genetic traits, help to enhance the quality and resilience of plants in various stressful environments.

The use of these markers in plant breeding significantly improves the efficiency and precision of the process, leading to the development of more productive and resilient crop varieties.

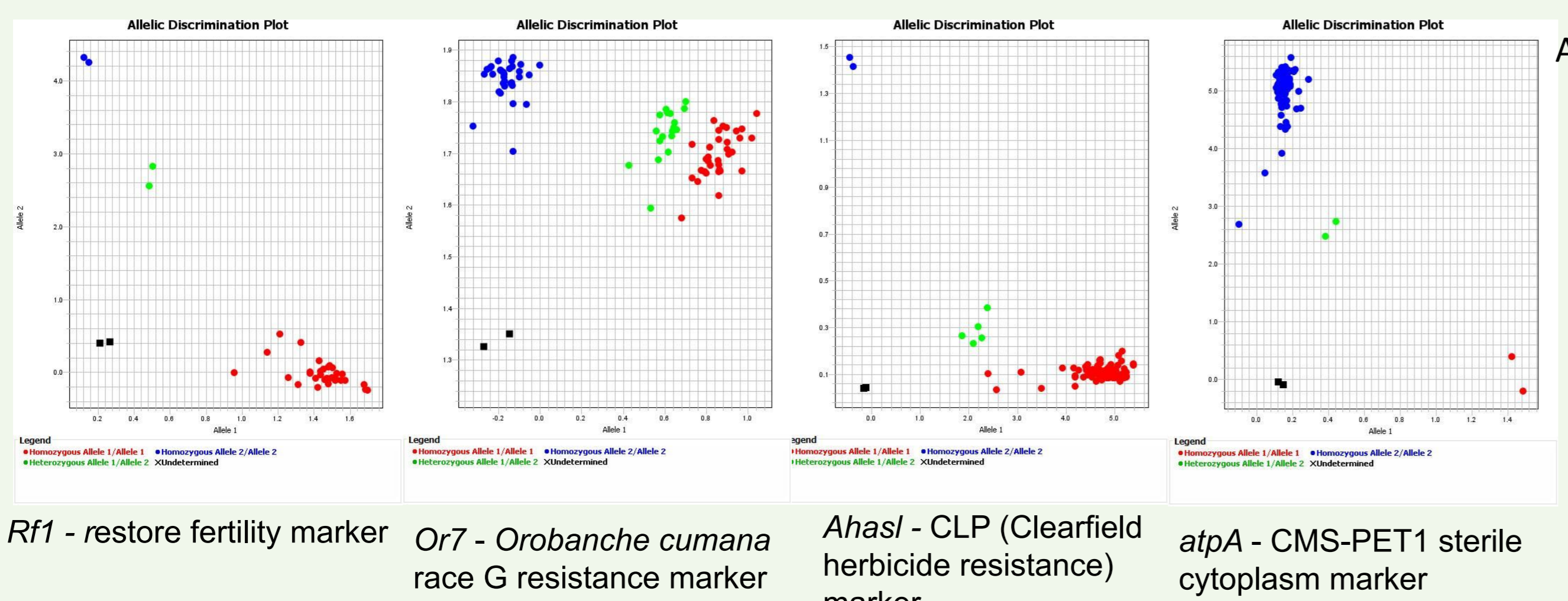
The main technological components of the KASP system

## Technical implementation for allele-specific marker systems



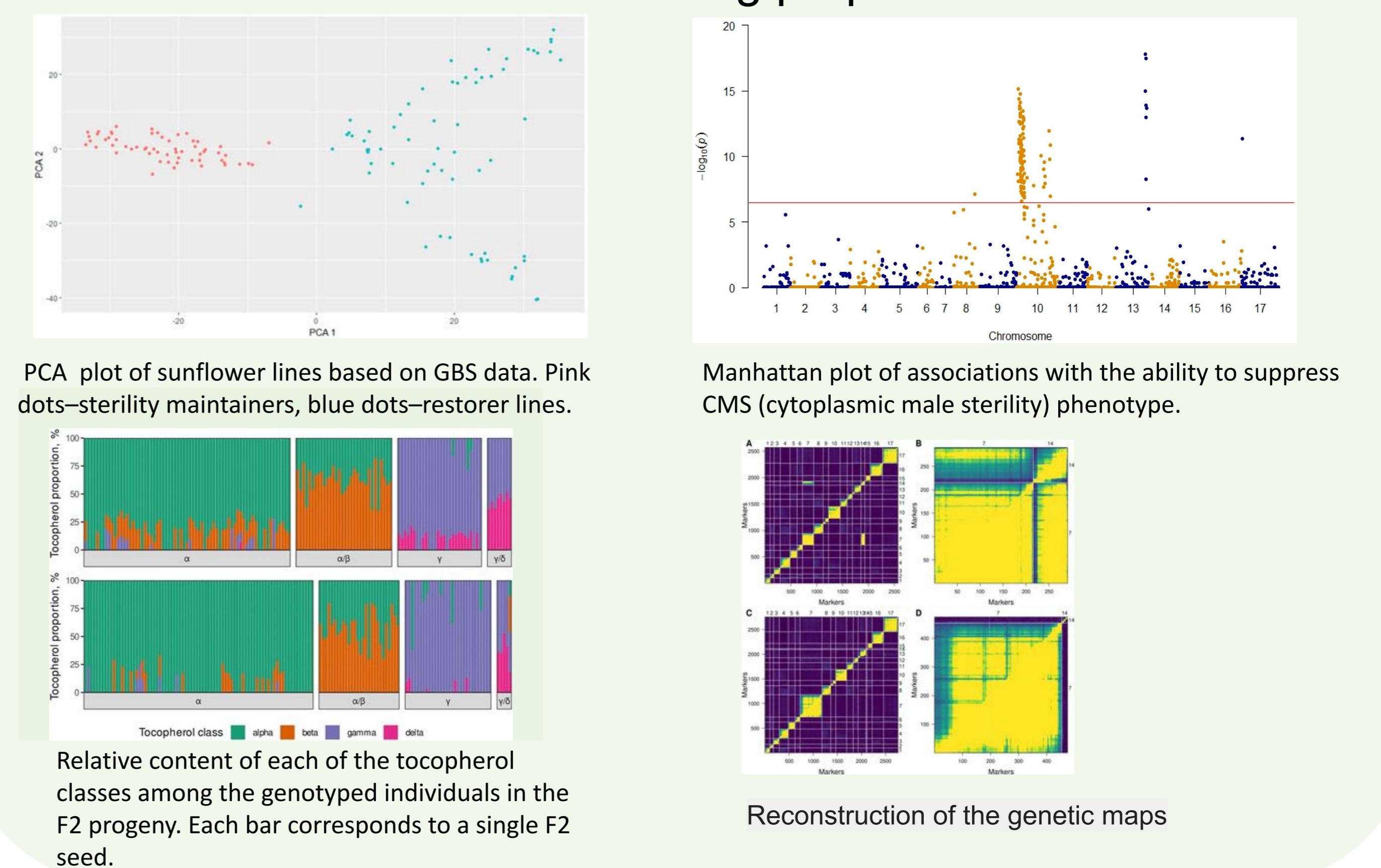
Thanks to modern DNA analysis techniques, allele-specific markers can be automated and scaled to analyze large volumes of samples, making it easier to conduct research on a larger scale.

## Sunflower marker-assisted selection



- We developed KASP markers for
- Broomrape (*Orobanche cumana*) resistance (*Or7*).
  - Fertility restoration (*Rf1*)
  - CMS-PET1 sterile cytoplasm (*atpA*)
  - *Ahas1* allele (*Ahas1-1*) provides herbicide resistance for sulfonylurea group. Commercial name CLP
  - *Ahas1* allele (*Ahas1-2*) provides herbicide resistance for imidazolinone group. Commercial name SURES (ExpressSun is derivative)
  - *Ahas1* allele (*Ahas1-3*) provides herbicide resistance for imidazolinone group. Commercial name Clearfield Plus or CLHA-Plus
  - *Ahas1* allele (*Ahas1-4*) provides herbicide resistance for sulfonylurea and imidazolinone groups. Commercial name AIR
  - Apical branching (*b1*)

## NGS for breeding proposes



### Papers to check

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- Rim Gubaev, Stepan Boldyrev, Martynova, E., Chernova, A., Kovalenko, T., Peretyagina, T., Goryunova, S., Goryunov, D., Zhanna Mukhina, Ben, C., Laurent Gentsbittel, Philipp Khaitovich and Yakov Demurin (2022). Genetic mapping of loci involved in oil tocopherol composition control in Russian sunflower (*Helianthus annuus* L.) lines. *G3 Genes Genomes Genetics*, 12(4).
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- Rim Gubaev, Stepan Boldyrev, Martynova, E., Chernova, A., Kovalenko, T., Yuliya Chebanova, Peretyagina, T., Goryunova, S., Goryunov, D., Zhanna Mukhina, Ben, C., Laurent Gentsbittel, Philipp Khaitovich and Yakov Demurin (2023). QTL mapping of oleic acid content in modern VNIIMK sunflower (*Helianthus annuus* L.) lines by using GBS-based SNP map. *PLoS ONE*, 18(10), pp.e0288772–e0288772.
- LGC Biosearch Technologies. (n.d.). How does KASP work. [online] Available at: <https://www.biosearchtech.com/support/education/kasp-genotyping-reagents/how-does-kasp-work>.

Please meet our team and discuss our future collaborations!

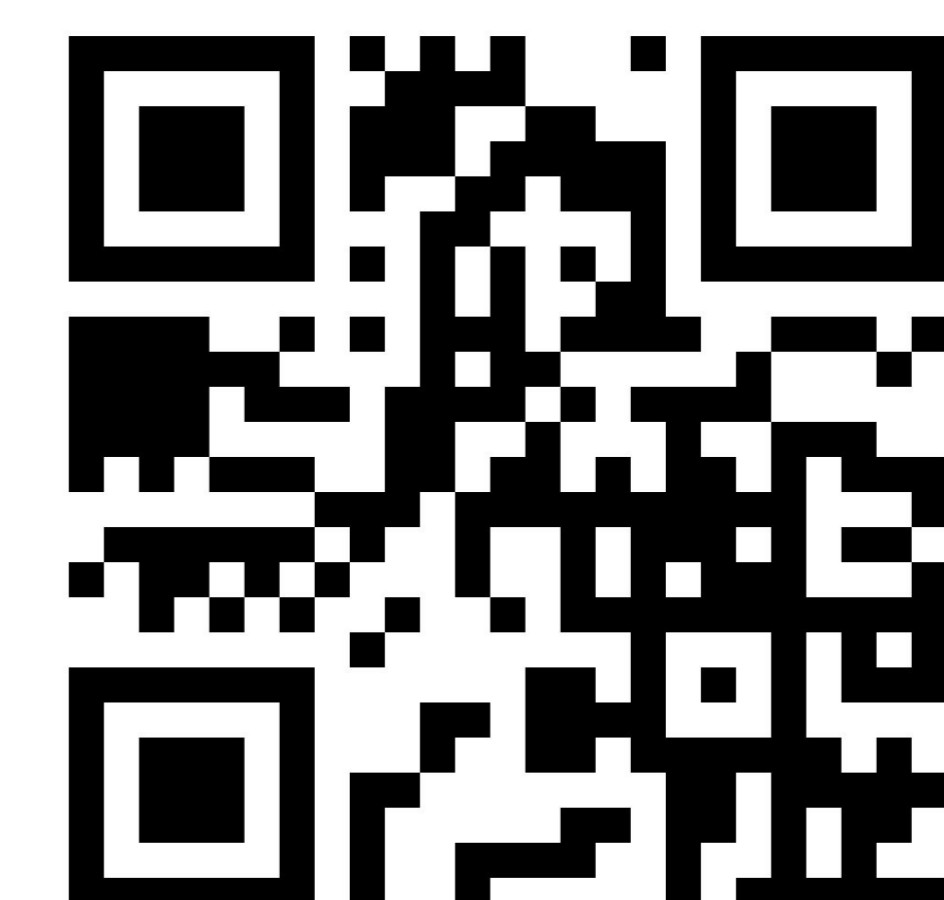


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