

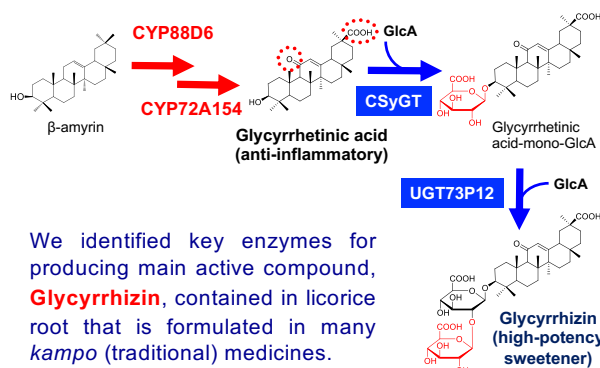


We are at the forefront of research in plant biotechnology, focusing on harnessing the cellular functions and genetic resources of plants for social and industrial purposes. Our discoveries will help promote health, increase food production, and support environmental conservation.

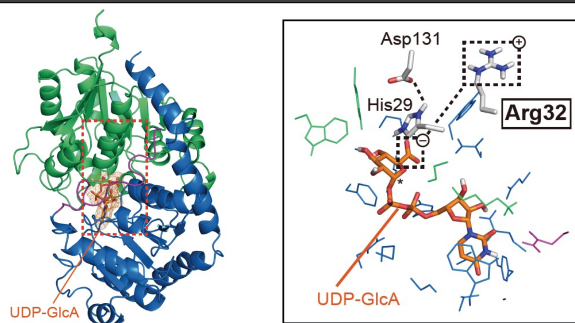
## Gene discovery from medicinal plants:

Terpenoids in plants attract attention as materials for drug. We identify useful genes involved in biosynthesis of terpenoids using genome and transcriptome sequencing and bioinformatics technologies.

### Genome mining of biosynthetic genes



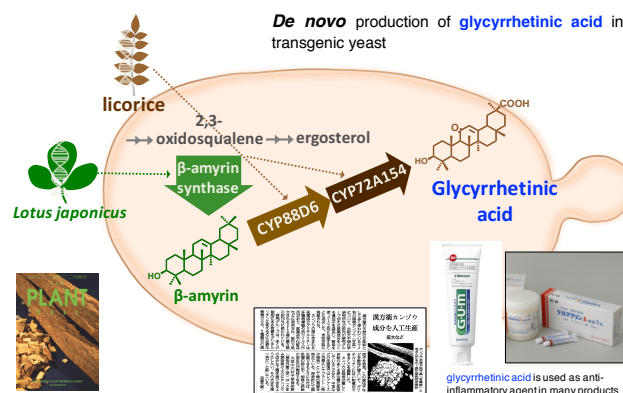
### Biochemistry of biosynthetic enzymes: to improve/manipulate enzyme function



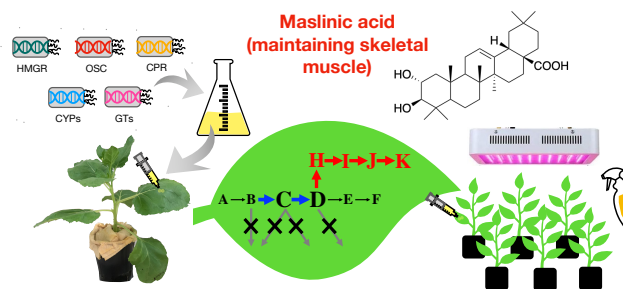
## Synthetic biology:

Synthetic biology, which introduces enzyme genes isolated from plants into microorganisms, such as yeast, to reconstruct the biosynthetic pathways and produce useful plant-derived metabolites.

### De novo production of anti-inflammatory compound in transgenic yeast



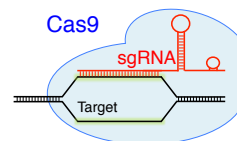
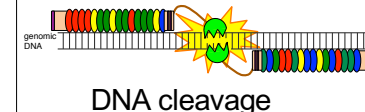
### Transient pathway reconstruction in Nicotiana benthamiana leaves



## Genome editing in plants:

Site specific artificial nucleases (e.g. TALEN and CRISPR/Cas) can introduce targeted mutagenesis in plant genome. We use this new technology to manipulate plant specialized metabolisms to eliminate undesirable compounds in crops.

**TALEN** consists of a TAL effector repeat for specific DNA binding and the FokI nuclease catalytic domain.



**CRISPR/Cas** system uses a nuclease, Cas9, that complexes with small RNAs as guides (gRNAs) to **cleave** DNA in a sequence-specific manner

### Generation of "Toxin-free" potato by genome editing

- Potato sprouts contain **steroidal glycoalkaloids (SGA)**, a type of toxic compound.

- We disrupted SGA biosynthetic genes using TALEN technology.

