

Tomato bioresource development and adaptation of genome editing



Kenji Miura (Tsukuba-Plant Innovation Research Center, Univ. Tsukuba)

Useful genes can be identified from mutants. And the mutation can be introduced into other cultivars by using genome editing technique.

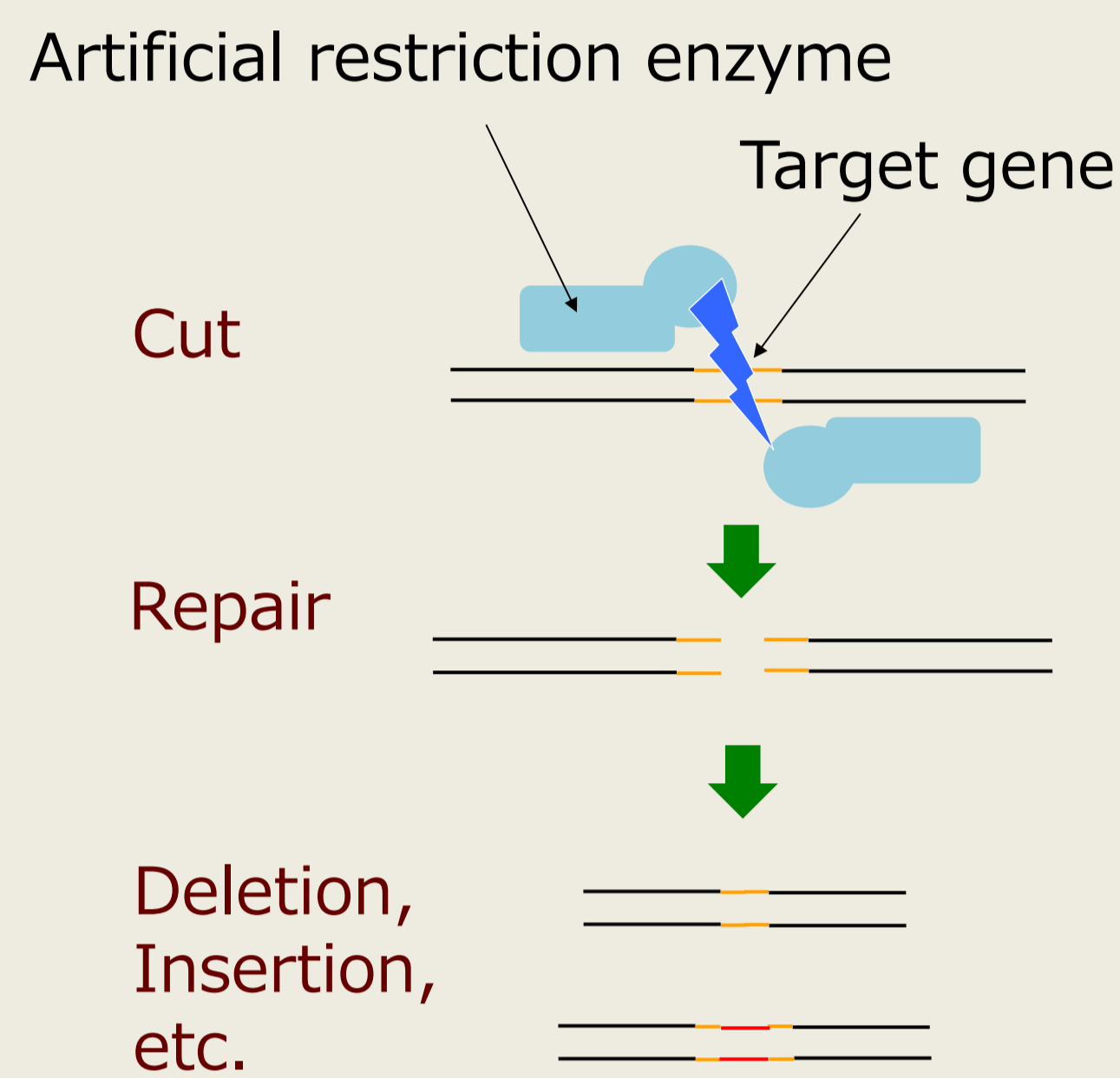


Development of cultivar by genome editing



Genome editing technique

By using artificial restriction enzymes, mutation can be introduced into the gene of interest without leaving foreign genes*.



※The scheme for regulation is not clear in Japan

Long shelf life



Tomatoes 60 days after harvesting
Upper: wild type
Lower: mutant

High sugar content



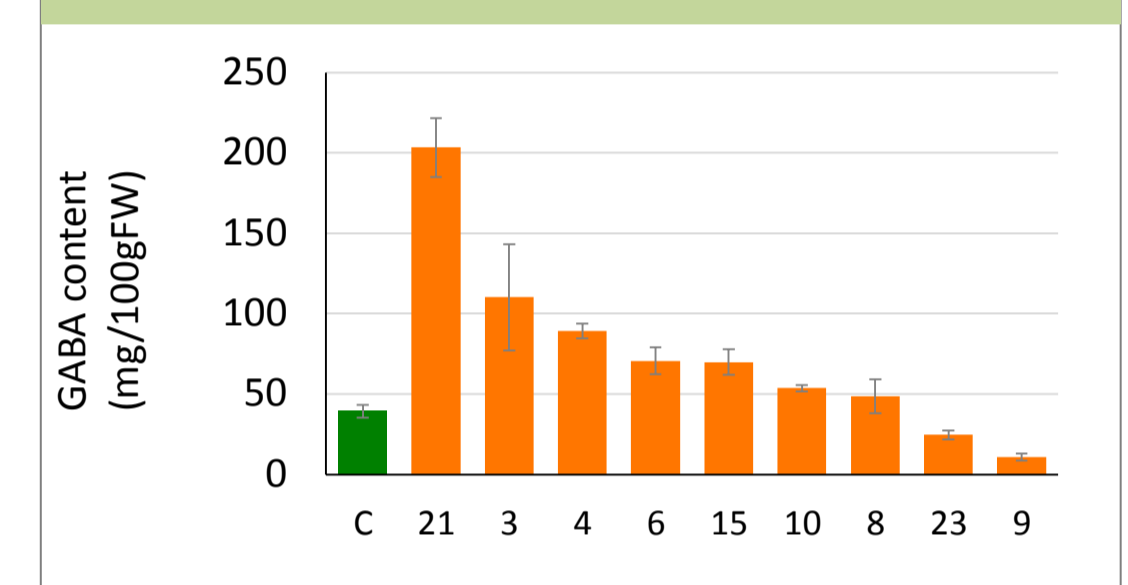
High sugar content (Brix 10%)

Parthenocarpy



Wild type
Genome editing (parthenocarpy)

High functional tomato



High GABA content

③ For public acceptance of genome editing

Natural scientific knowledge

Mutation by genome editing
Protocol for null-segregant

Strategy for public acceptance

Social scientific knowledge

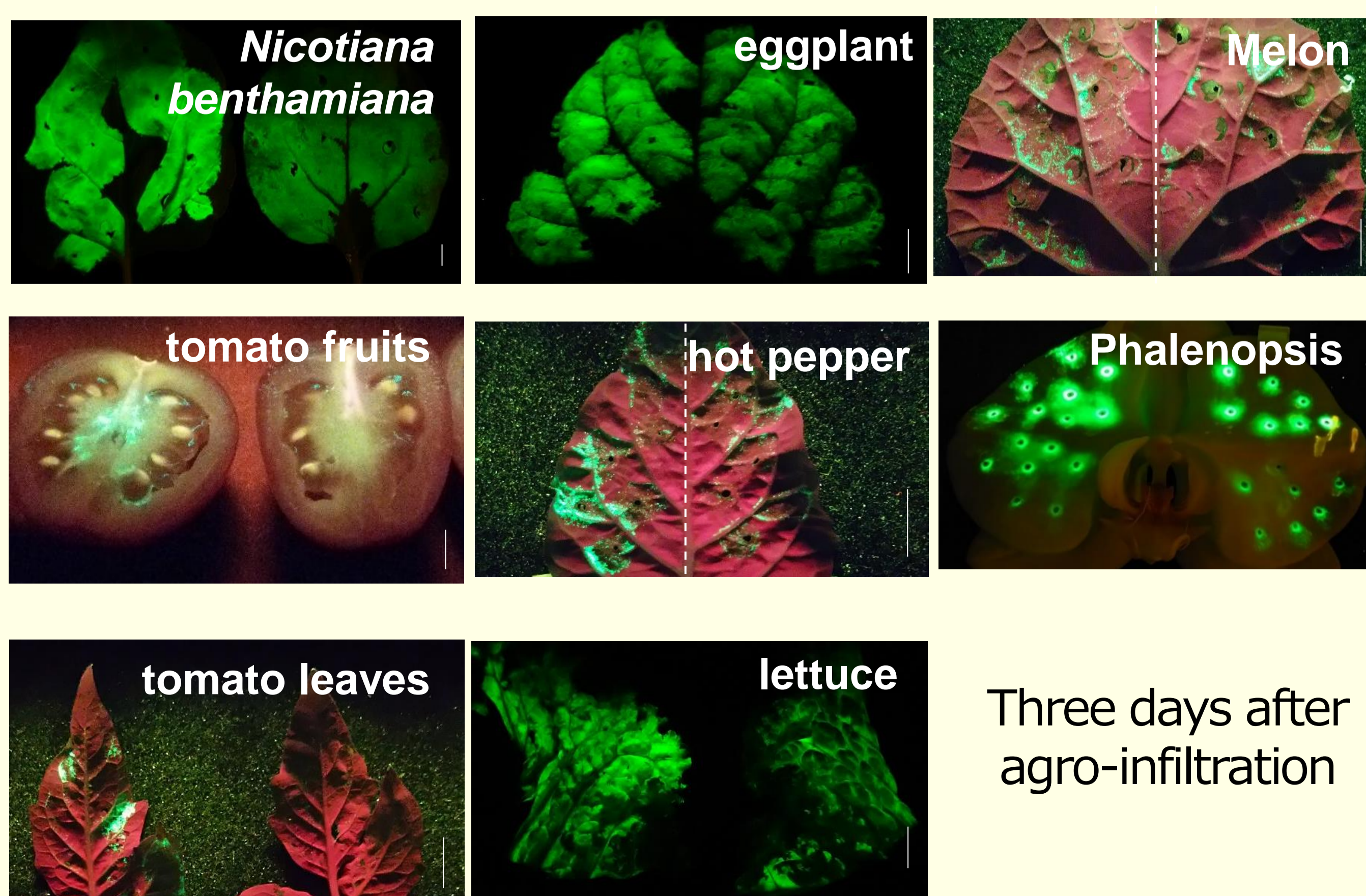
Social implementation
Marketing protocol
Science communication

- Collecting scientific information for regulatory authority
- Explanation about genome editing to citizens

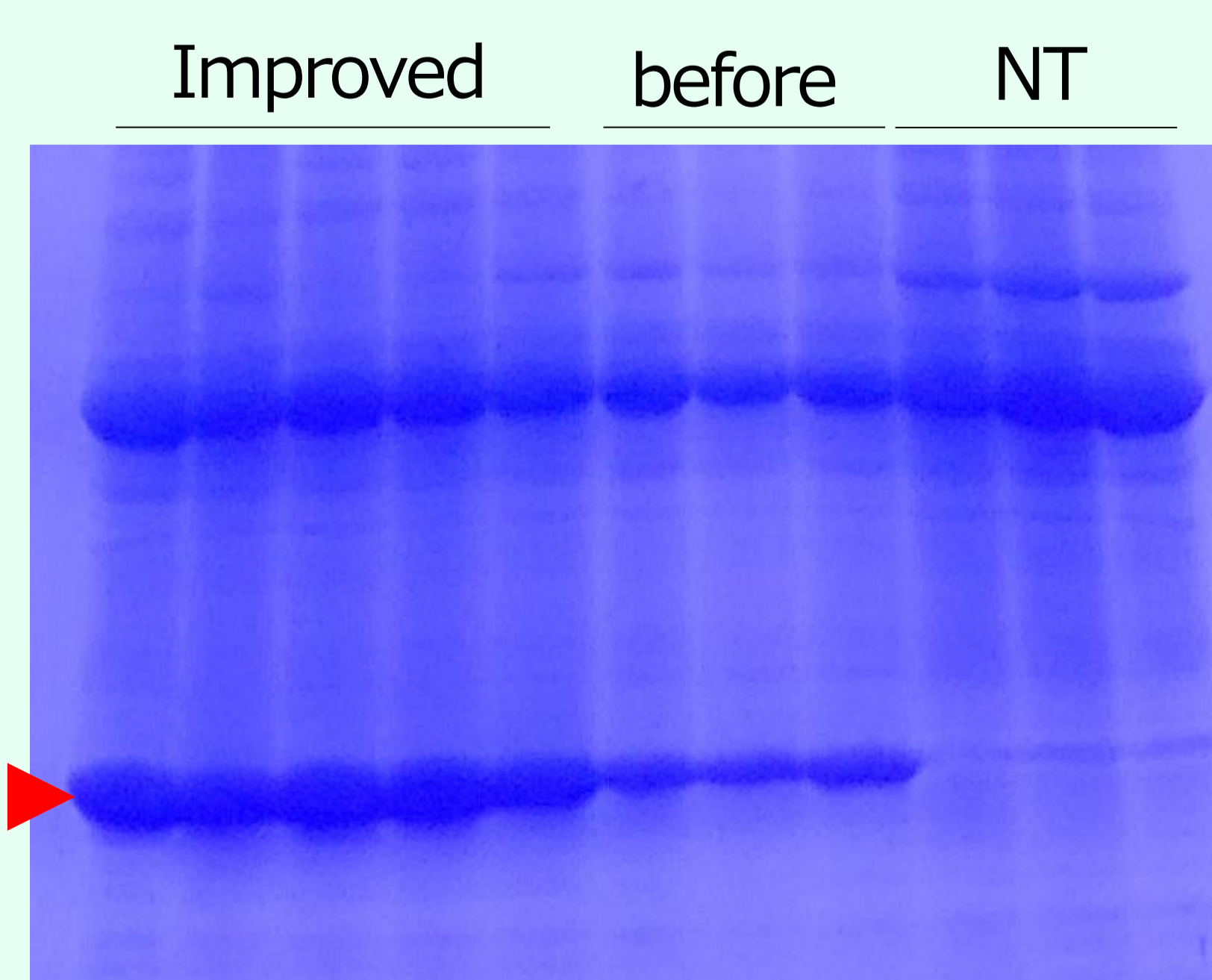
This work is partly supported by SIP.

④ Establishment of a transient protein expression system in plants

Transient expression in several plants



Level of protein expression in plants is similar to that in *E.coli* (~4mg/gFW)



- Establish genome editing technique by expression of Cas9 in plants
- Preparation of protein products

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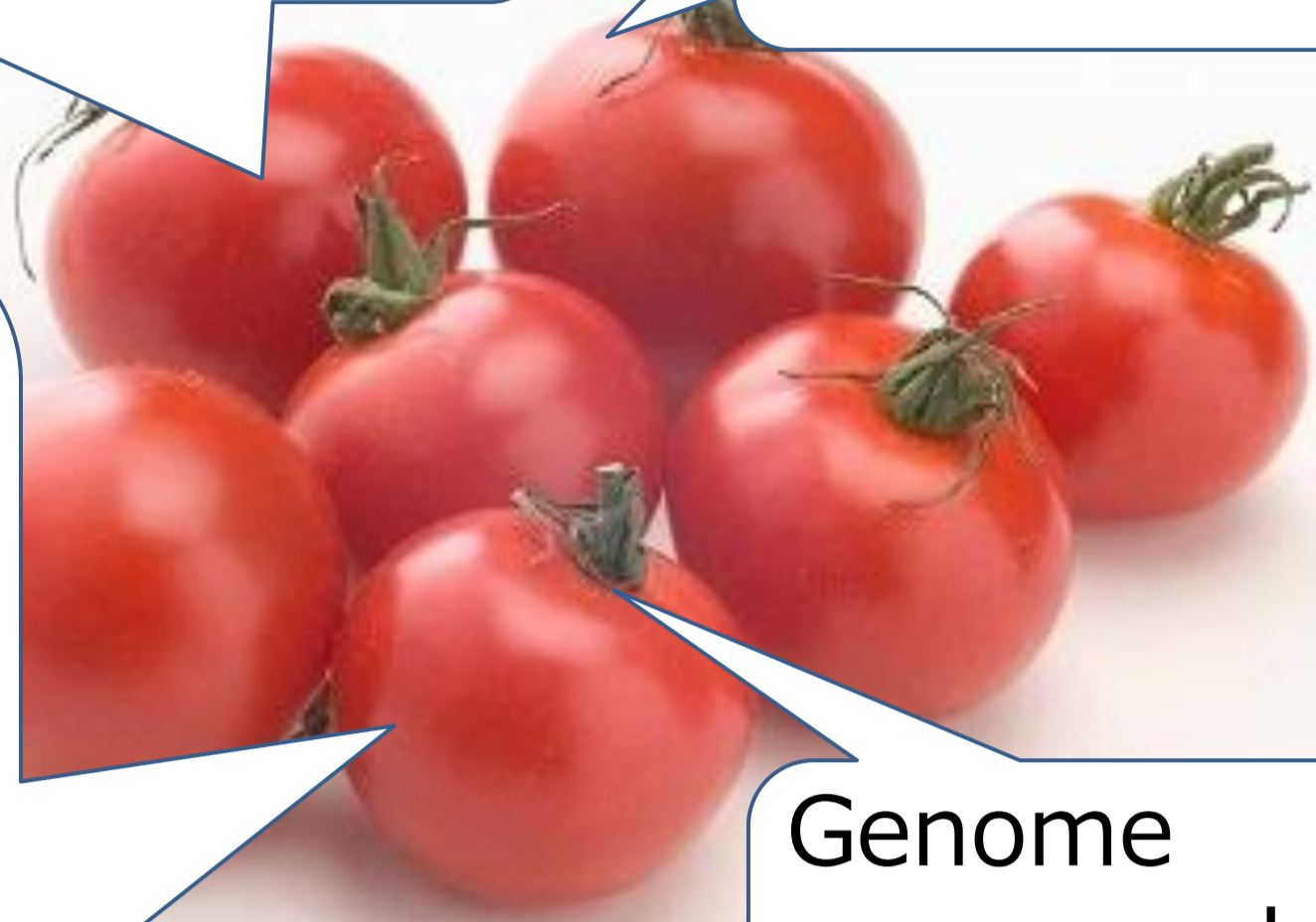
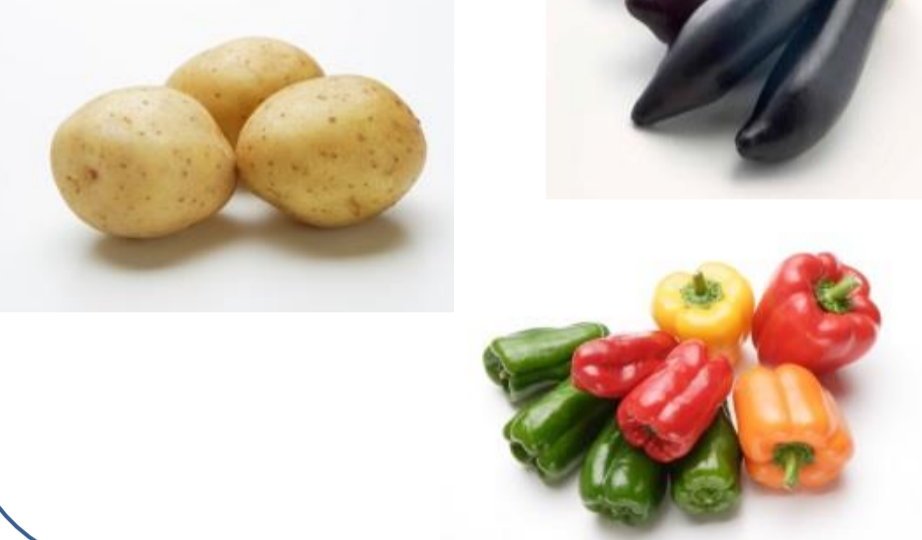


Importance of tomato research

Functional ingredients (Vitamin A&C, lycopene, GABA)

Unique characteristics (fruit development)

Model plants for Solanaceae



Genome sequenced (2012)



Tomato bioresource development is required, because of increase in basic and applied research activity of tomato

Characteristics of Micro-Tom

Tomato cultivars



cv. Micro-Tom



Micro-Tom, as a model tomato for research

- Dwarfism (10-20 cm)
- Normal growth under fluorescent lamp
- Short lifecycle (~3 months)
- High efficient transformation (~10%)
- Cross with other varieties

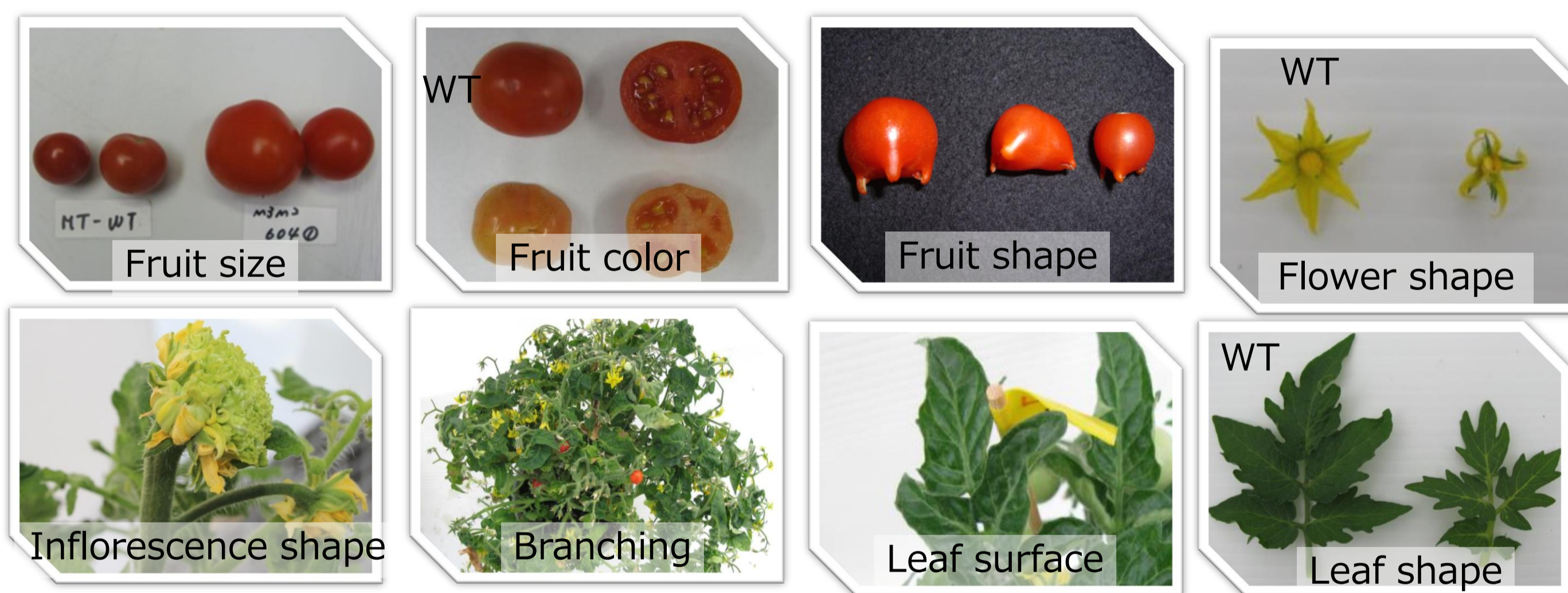
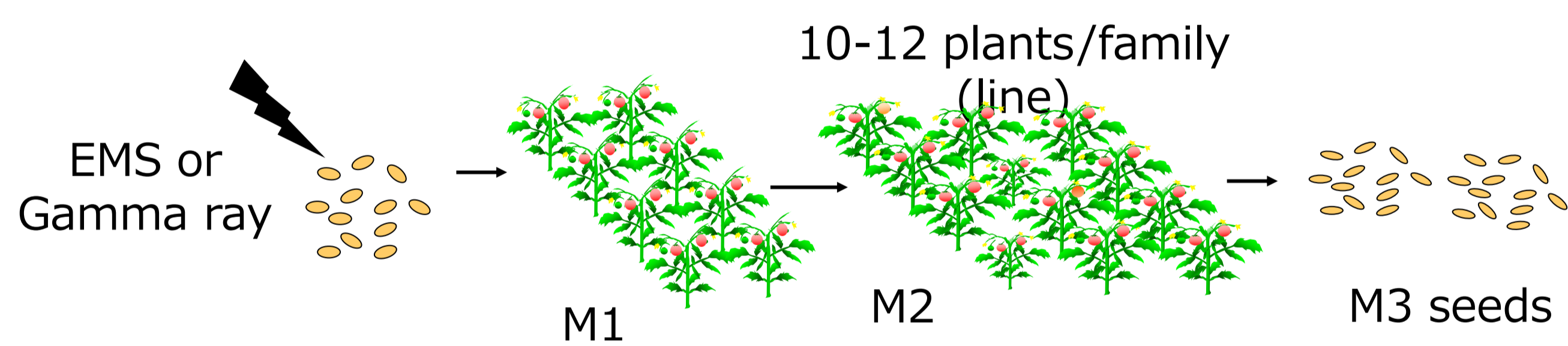


Suitable for cultivation in closed environment

① Development of mutant population

Micro-Tom mutant population

~20,000 population



Now 2,300 mutant lines can be provided TOMATOMA (<http://tomatoma.nbrp.jp/>)

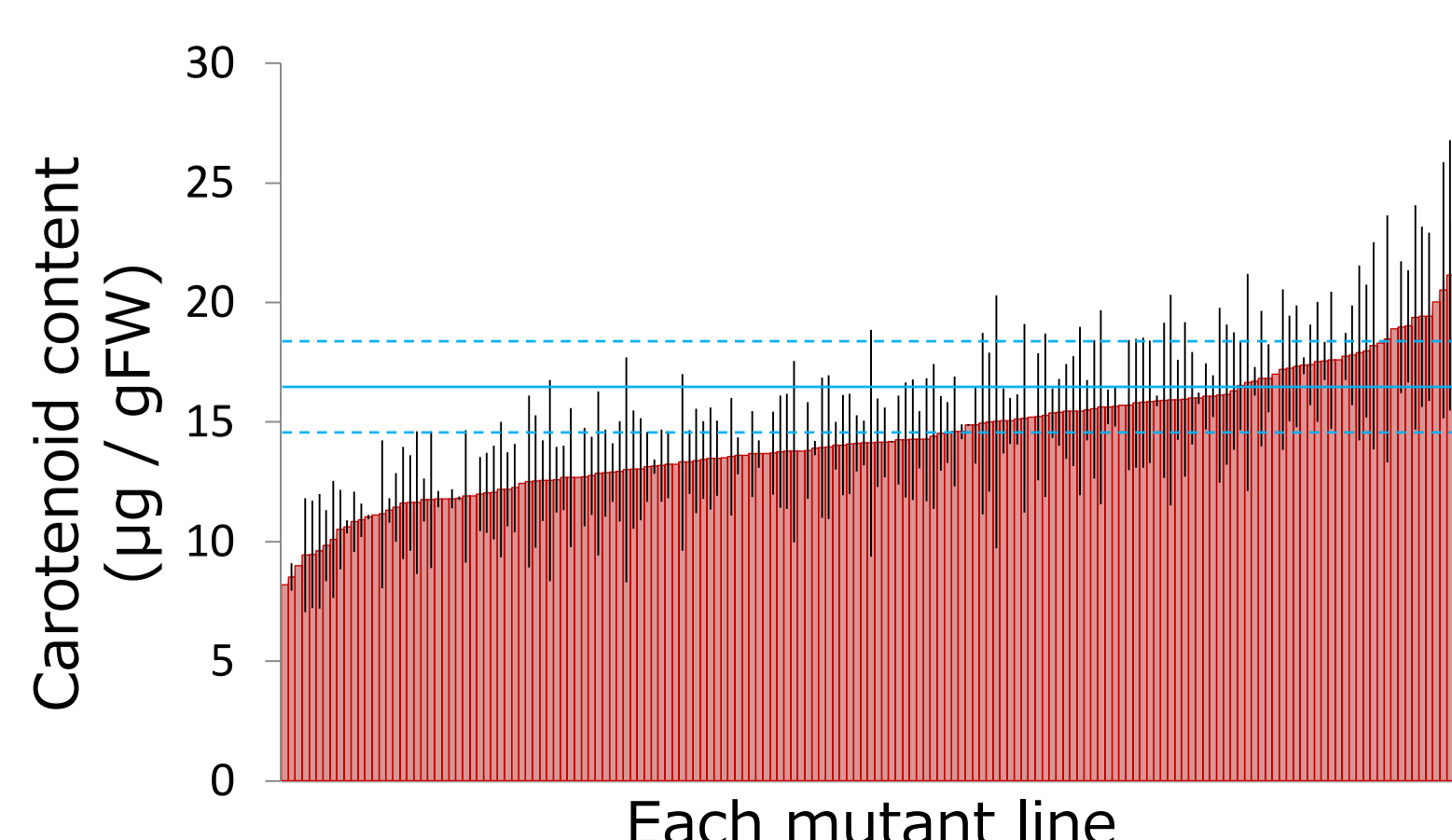
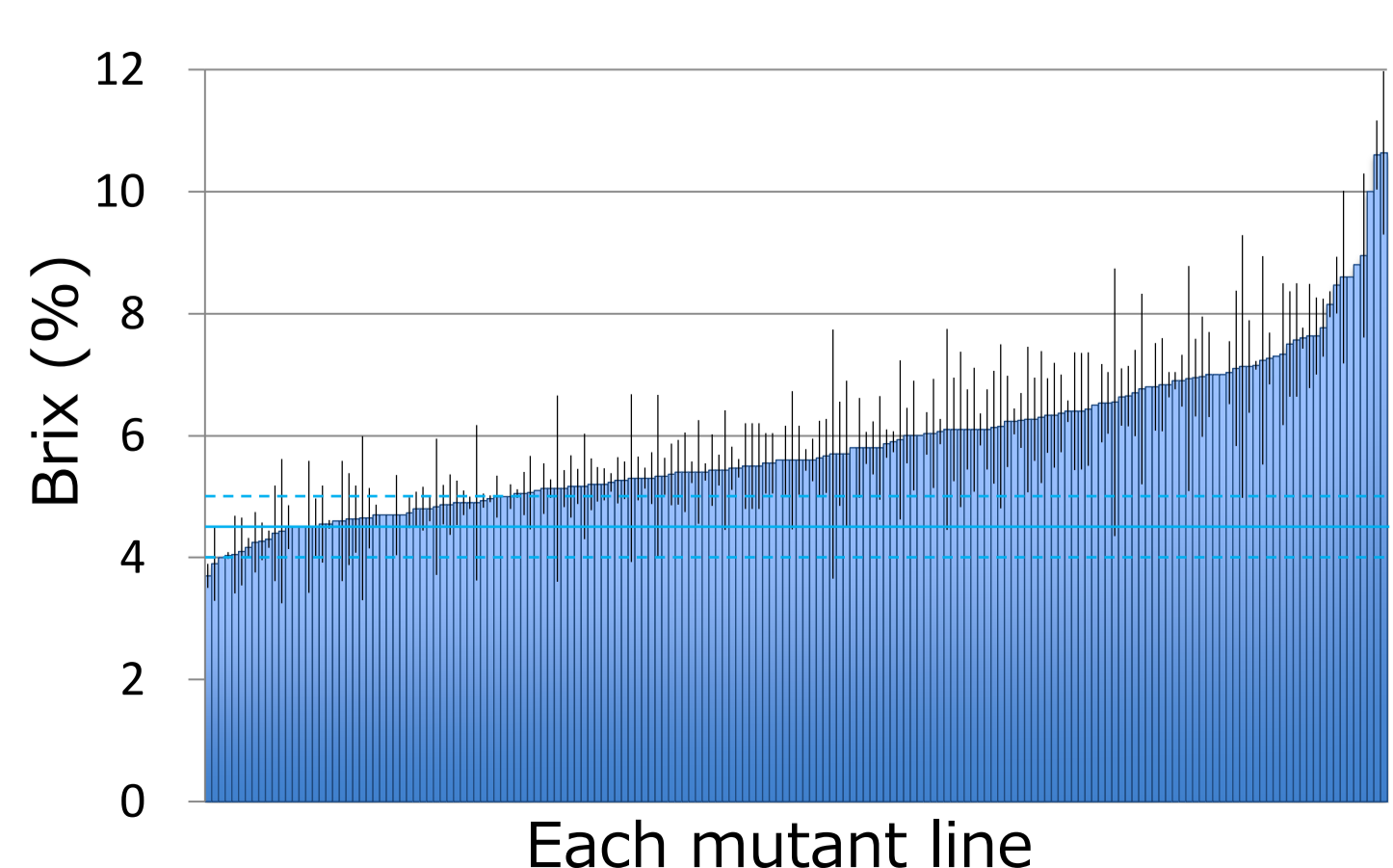
Database for mutant population

Large scale of mutant population (One of largest population)

Information of fruit metabolism

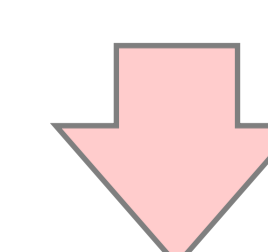
Sugar content

Carotenoid content



Average and SD values of wild-type Micro-Tom were represented by solid and dotted lines in cyan, respectively.

Useful genes can be identified from mutants



Dictionary for breeding