

The 10th users' meeting on mutation breeding in RIBF “Sustainable society and creation of specialty products realized by ion-beam breeding”

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The users' meeting on mutation breeding in RIBF has been held the RIKEN Symposium every two years since 2003. Moreover, we have published the RIKEN Symposium abstracts and user reports. The 10th symposium was initially scheduled to be held in January 2022; however due to the Covid-19 pandemic, it was postponed until January 19–20, 2023. The RIKEN Symposium was held in a hybrid manner with 32 on-site and 50 online participants. Online participation from remote locations was effective. The participants' research fields were categorized by biology (development of fundamental technologies and gene isolation) and breeding as targets (microorganisms, trees, food crops and flowering plants). In the 10th meeting, there were no tree-breeding researchers, and the number of microalgae researchers increased. The proportion of other specialities remained relatively the same from recent trends (Fig. 1).¹⁾

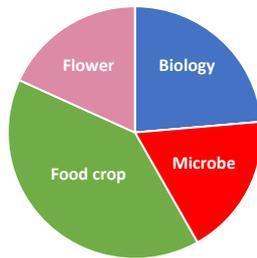


Fig. 1. The specializations of symposium participants in 2022.

The meeting featured ten presentations and two invited lectures on three research topics: developing breeding techniques, identification of novel genes using mutants and analysis of gene function, and breeding new varieties. The invited talks were on biorefinery using microalgae and upgrade concept of the RIBF accelerators. In addition, a tour of the accelerator facility was conducted before the meeting.

(1) Development of breeding technology

It is clear that mutations at 30 keV/ μm , which have a high mutation rate in *Arabidopsis thaliana*, are often base substitutions or small deletions of a few bp. Whereas those at 290 keV/ μm , which have a high lethal effect, are often large deletions of 100 bp or more and chromosome rearrangements. Similar results were observed with rice.²⁾ Furthermore, we investigated ge-



Fig. 2. Photograph of on-site participants.

omic mutations of carbon and argon ions at 100–300 keV/ μm to identify the LETs that increase the rate of large deletions and chromosomal rearrangements in *Arabidopsis*.

(2) Identification of novel genes using mutants and analysis of gene function

A sex-determining gene located on the Y chromosome in a dioecious plant, *Silene latifolia*, was determined.³⁾ Other discovered genes can be used for seed size increase in *Arabidopsis*,⁴⁾ heat-stress marker in rice⁵⁾ and breeding in wheat.

(3) Breeding new varieties

New varieties applied for variety registration in 2018–2022 were three cherry blossoms and one hibiscus by the farmers, two *Chrysanthemum* that blooms in all three colors during the Bon Festival by the Nagasaki Prefecture, and a Satsuma mandarin that can be harvested one month late and suitable for long-term storage by the Shizuoka Prefecture.

Users could deepen their understanding of accelerator facilities and accelerator science through invited lectures and a tour of the accelerator. In the other special lecture, useful mutants, such as those yielding high oil production, have been obtained even in microalgae. It was confirmed that to realize a sustainable world, we will continuously contribute to solving problems of energy, environment and food, and create local speciality products by ion-beam breeding. The next meeting is scheduled to be held in January 2025.

References

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