The effect of accessory bud size on initial growth of taro accessory bud irradiated with heavy ion beams in *Colocasia esculenta* 'Ehimenoushi V2 gou'

M. Okamoto,[*1] T. Tachibana,[*1] and T. Abe[*2]

Colocasia esculenta 'Ehimenoushi V2 gou' is a taro variety bred in Ehime Prefecture. Flowering in this variety has not been confirmed to date. Therefore, it is difficult to apply crossbreeding methods for its improvement, and a mutation breeding approach using heavy ion beams has been adopted instead. We have performed argon or carbon ion irradiation on 'Ehimenoushi V2 gou' and identified the dose corresponding to the survival curve shoulder (SSD) and the LD50.[1)]

In this study, we investigated the effect of different sizes of taro accessory buds on initial growth after irradiation. The plant materials used were accessory buds generated from the mother tuber of 'Ehimenoushi V2 gou' over 30 to 60 days at 28°C. The heavy ion beams were irradiated with 2.5 Gy of argon (184 keV/μm) and 7.5 Gy of carbon (23 keV/μm). Each irradiated accessory bud was measured for maximum diameter and trans planted in 72-hole cell trays. The control accessory buds were not irradiated and were only transported between the Ehime Research Institute of Agriculture and the RIKEN Nishina Center. After planting, the seedlings were grown in a glass room for 30 days, and the form of the emerging leaves was classified according to the standard in Fig. 1, and the plant height was measured. The survey was conducted on 144 individuals in each experimental plot.

Plant form investigation of the germinated leaves, In the control plot, 93.0% of the plants were normal, 2.8% were dwarf, and 4.2% were dead, with no traces (Fig. 2). In contrast, 50.6% of the plants in the argon beam-irradiated plot were normal, 34.1% were dwarf, 12.5% had traces, and 2.8% were dead. In the carbon beam irradiated plot, 25.0% of the plants were normal, 27.1% were dwarf, 34.0% showed trace growth, and 13.9% were dead. The doses were higher than in the SSD, especially for carbon ions at LD50.[1)]

A correlation analysis between maximum diameter of accessory buds and plant height revealed a positive correlation ($y = 17.75x - 8.05$ $r = 0.695^{**}$) in the control plot, with larger accessory bud diameters at planting resulting in higher plant height. In contrast, a weak positive correlation ($y = 6.48x - 0.30$ $r = 0.334^{**}$) was observed in the argon beam irradiated plot and a positive correlation ($y = 11.49x - 10.37$ $r = 0.466^{**}$) in the carbon beam irradiated plot (Fig. 3).

These results indicate that although irradiation adversely affected plant growth, the larger the size of the accessory buds used in the irradiated materials, the better the initial growth of the plants.

Fig. 1. Standard of plant form A: nomal B: dwarf C: traces D: dead.

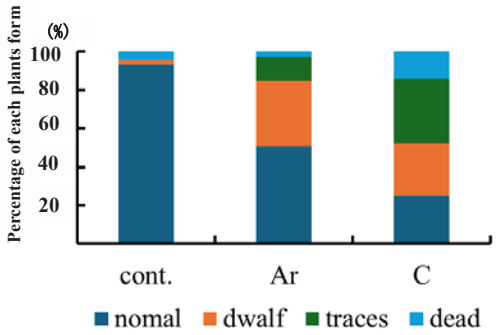

Fig. 2. Results of plant form investigation in the germinated leaves. The change in plant form in the heavy ion beam irradiated accessory buds was statistically significant ($P < 0.001$) by Steel's test.

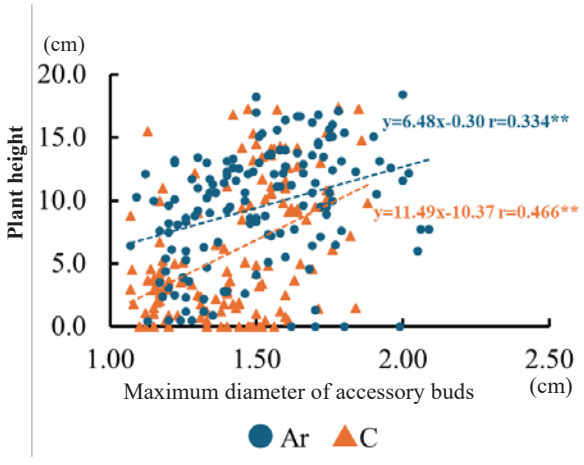

Fig. 3. Correlation between maximum diameter of accessory buds and plant height.

Reference
1) M. Okamoto *et al.*, RIKEN Accel. Prog. Rep. **57**, 189 (2024).

*1 Ehime Research Institute of Agriculture, Forestry and Fisheries
*2 RIKEN Nishina Center

DOI:10.34448/RIKEN.APR.58-204