

The effects of heavy-ion beam irradiation on survival rates in *Colocasia esculenta* ‘Ehimenoushi V2 gou’

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Colocasia esculenta ‘Ehimenoushi V2 gou’ has a high yield and stable production, and its taste has been extensively evaluated in the market thus, it has become one of the driving forces for expanding taro production in Ehime Prefecture. As the breeder’s right of this variety will expire in 2033, it is hoped that a new variety will be bred. Therefore, we aim to breed new varieties using heavy particle beam irradiation.

To determine the dose of heavy ion beam irradiation, we conducted argon- or carbon-ion irradiation in ‘Ehimenoushi V2 gou’ and clarified the shoulder of survival curve (SSC) dose,^{1,2)} which drastically reduces survival rates. The dose of SSC is considered to be typical for mutagenesis using heavy-ion beam irradiation.

The accessory buds from a mother tuber were used as the irradiation material. The ion species and irradiation doses were 0.5, 1.0, 1.5, 2.5, and 5.0 Gy for Ar-ion beam, and 2.5, 5.0, 7.5, 10.0, and 12.5 Gy for C-ion beam. The total number of accessory buds planted after Ar-ion irradiation was 519 individuals, and 155 plants survived. The relative survival rate at each dose is shown in Fig. 1, where the survival rate of the control dose is 100%. As the survival rate at dose 0.5 Gy was low, although there was no clear consensus on the dose for SSC, the appropriate dose was estimated to be 1.0–1.5 Gy. The total number of accessory buds planted after C-ion irradiation was 430 individuals, and 139 plants survived. The relative survival rate at each dose

is shown in Fig. 2. We estimated the dose of SSC to be a range of 5.0–7.5 Gy, which was an appropriate dose. The survival rates in the control were 77.8% for Ar-ion irradiation experiment and 62.5% for C-ion irradiation experiment. The low survival rate of a C-ion irradiation experiment in the control samples was attributed to the low temperature during transportation.

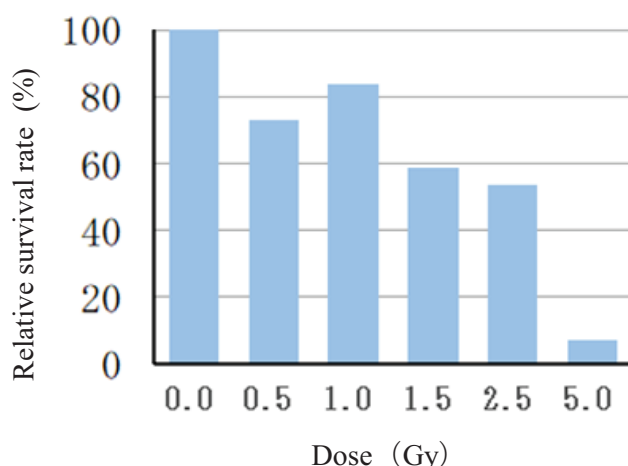


Fig. 1. Relative survival rate at each dose after argon ion beam irradiation. The survival rate of the control dose is 100%.

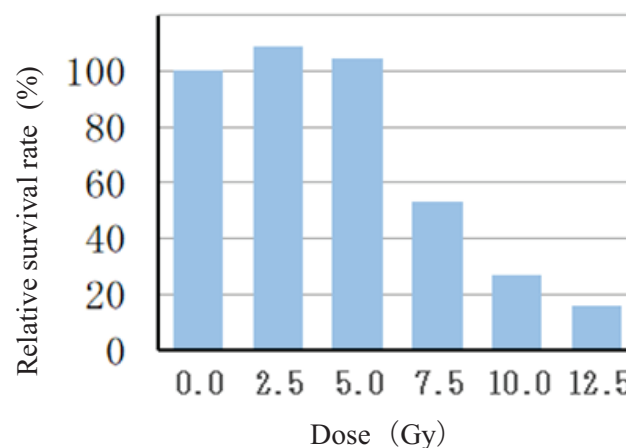


Fig. 2. Relative survival rate at each dose after carbon ion beam irradiation. The survival rate of the control dose is 100%.

No morphological changes were observed in the regenerated plants grown in pots cultivation, and seed tuber cultivation was completed. We will attempt the field characteristics surveys in next year.

References

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