Effect of heavy-ion beam irradiation on mutation induction in *Arabidopsis thaliana* (II)

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To achieve an effective mutagenesis of arabidopsis (*Arabidopsis thaliana*), we examined the effect of heavy-ion beam irradiation on mutation induction. In a previous paper, we reported that although the frequencies of albino plants were significantly different between irradiations using C and Ne with different linear energy transfers (LETs), these ions with similar LETs provided similar frequencies of albino plants.[1)] In the present report, therefore, we examined the effect of the several ions with similar LET on mutation induction in arabidopsis.

Dry seeds of arabidopsis ecotype Columbia were prepared for irradiation treatments as in our previous report.[1)] Seeds were irradiated with ^{12}C, ^{14}N, ^{20}Ne, ^{40}Ar and ^{56}Fe ions in a dose range of 10 to 550 Gy. These ions were accelerated up to 135, 135, 135, 95 and 90 MeV/nucleon, and their LETs were ca. 23, 30, 61, 280 and 640 keV/μm, respectively. To determine the effects of LETs of heavy ions on mutation induction, the LETs of C, N, Ne and Ar ion beams were controlled to ca. 30, 61 and 280 keV/μm, 61 and 280 keV/μm, 280 keV/μm and 640 keV/μm, respectively, after passing through a set of absorbers in the range shifter. All LETs were calculated behind plant materials. The germination and culture of at least 150 M_1 seeds were carried out by the same method as in our previous report.[1)] Flowering rate (FR; number of flowering plants per total number of incubated M_1 seeds) was determined one month after the transfer to soils in the present study.

In the control seeds without irradiation, the germination rate was more than 97% and all seedlings flowered until one month after transfer to soil. Germination was not affected by the irradiations with any ions at the doses tested. The effect of heavy-ion beam irradiations on FR is shown in Fig. 1. Without the range shifter for each ion (open spots), FR curves were markedly different according to the kinds of ion. Ar ions were the most effective in decreasing FR, only a few plants flowered among the seeds irradiated at a dose of 100 Gy. On the other hand, FR was not affected by irradiations with N ions up to 550 Gy. When the LETs were controlled using the range shifter (close spots), similar FRs were observed between the treatments with several ions at the same LETs. Investigations of mutation rate in the M_2 generation, such as that of frequency of albino plants, are in progress.

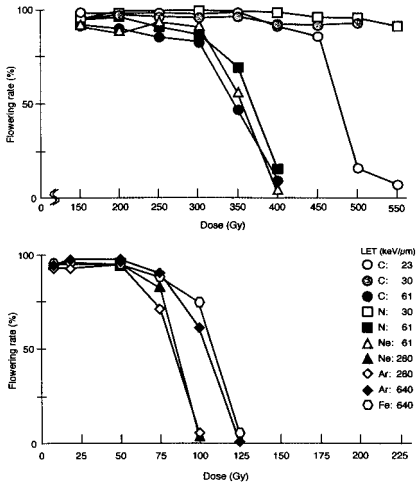

Fig. 1. Effect of heavy-ion beams on flowering rate in arabidopsis.

Reference

1) H. Saito et al.: RIKEN Accel. Prog. Rep. **37**, 147 (2004).