Isolating morning glory mutants using carbon-ion irradiation

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Japanese morning glory (*Ipomoea nil* Roth) is a horticultural plant. Somatic mutation occurs in morning glory via transposon transfer, resulting in many variants being produced during the Edo period that have been cultivated for ornamental purposes. Morning glory is also often used as a model plant in plant physiology studies because its flowering is sensitive to short-day conditions and genetics analyses because of its flower color and shape. 'Kidachi' is a highly fertile and stable dwarf cultivar of morning glory. We identified mutants induced via C-ion irradiation in the 'Kidachi' morning glory cultivar.

'Kidachi' seeds (Q375 line provided by Kyushu University) were irradiated with 40 or 50 Gy of C-ion beams (30 keVμm^{-1}). The M_1 seeds were sown in horticultural soil in individual pots, and the germination rate was determined one month later. The proportion of fertile plants that produced at least one seed among the germinated plants was measured after three months of cultivation (25°C with a 14 hours photoperiod). M_2 seeds obtained from the M_1 plants were sown, and the germination rate was determined using the same method as for the M_1 plants. We observed the morphology of the M_2 plants over three months of cultivation.

The M_1 and M_2 seed germination was not affected by the C-ion irradiation. The number of fertile M_1 plants decreased with the control after 40 and 50 Gy C-ion irradiation (Table 1). Two mutants with crisscrossed flowers (C-85 line, Fig. 1(c), (d)) and an extreme dwarf (C-86 line, Fig. 1(e), (f)) were obtained from the M_2 plants after 40 Gy treatment (Table 1). C-85 yielded three seeds, and three plants survived after sowing. Only one displayed the mutant trait, and one M3 seed was obtained from the crisscrossed flower mutant. C-86 yielded 10 seeds. Four plants survived after sowing; however only one plant showed the mutant trait. Many of the buds on the extremely dwarf mutant were underdeveloped and small, but some occasionally grew and flowered. No seeds were obtained. Artificial pollination and ovule culture will be attempted for each mutant.

Table 1. Effect of C-ion irradiation on germination, fertility, and mutation.

Dose (Gy)	Numbers					
	Seeds	Germinated plants (%)	Fertile plants (%)	M_2 seeds	M_2 plants	Mutants
0	5	5 (100)	5 (100)	-	-	-
40	97	92 (94.8)	70	239	238	2
50	89	80 (89.9)	38	86	85	0

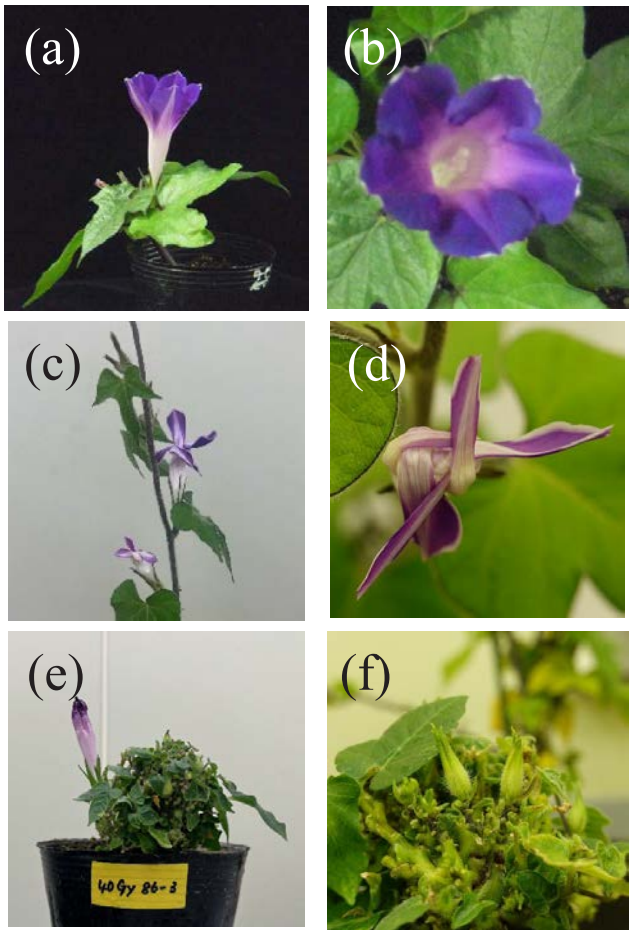

Fig. 1. Photographs of morphological mutants obtained via C-ion irradiation of M_2 'Kidachi' morning glory plants. (a) Nonirradiated wild-type plant, (b) control plant flower, (c) C-85 mutant plant, (d) crisscrossed flower of C-85 mutant, (e) C-86 mutant plant, and (f) flower buds of C-86 mutant.

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