Effect of different conditions of the mutant isolation system on rotifers by using heavy-ion beam irradiation

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Heavy-ion beam mutagenesis is generally recognized as an effective method for mutation breeding.[1,2] Although this method has been greatly successful with plants, its application to animals is limited. Therefore, we plan to acquire more basic data to set up the optimal conditions for a heavy-ion beam irradiation system by using *Brachionus plicatilis sensu stricto* (rotifer) as the model.[3]

In aquaculture, rotifers are used as the live bait for larval fishes that have just been born. As larval fishes grow, they select food based on the mouth size.[4] Rotifers are used for larval fishes at first, and later on the brown shrimp Artemia is used. Rotifers average around 300 μm in length, while Artemia is between 400 μm and 1 cm in length. When switching food from rotifer to Artemia, a live bait of a suitable size (300–400 μm) has not been found yet. During this gap time, larval fishes die of starvation or cannibalize each other, and these problems result in a significant decrease in the number of larval fishes. It is known to be a common bottleneck in aquaculture.

In this study, to overcome the problem of starvation and cannibalization, we plan to establish large rotifers required during the gap time. Using heavy-ion beams accelerated by the RIBF accelerator at RIKEN, we measured the biological effect of heavy-ion beam irradiation on rotifers under different conditions. After irradiation, each rotifer was separated to a plastic culture dish and cultivated at 20°C at a salinity of 1.8%. Nonirradiated rotifers almost survived through the experiment. On the contrary, the survival rate of rotifers irradiated by 600 Gy of carbon-ion beam was decreased to 41.7% by the 16th day after irradiation (Fig. 1). The survival rate of rotifers irradiated by 200 Gy of argon-ion beam was decreased to 15.0% by the 15th day after irradiation (Fig. 2). The survival rate decreased gradually depending on the degree of irradiation dose (Figs. 1, 2). These data will be helpful for the establishment of the mutant isolation system by heavy-ion beam irradiation on rotifers.

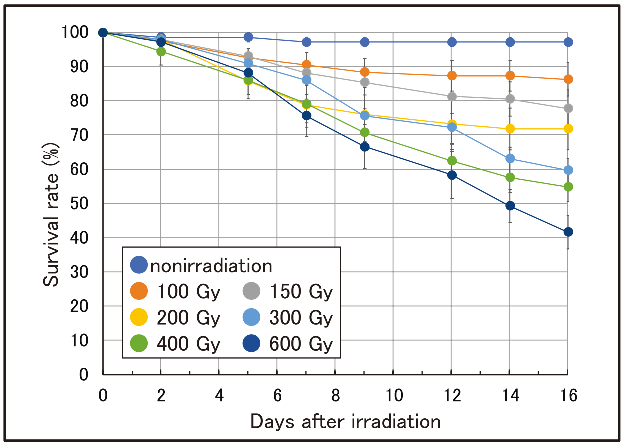

Fig. 1. Effects of different carbon irradiation conditions on survival rate of rotifers. The rotifers were irradiated with carbon-ion beams at different dose levels (100, 150, 200, 300, 400, and 600 Gy). The survival rates were measured every two or three days under each condition after irradiation. The data includes mean ± SE of six independent experiments. The bars represent the SE of data.

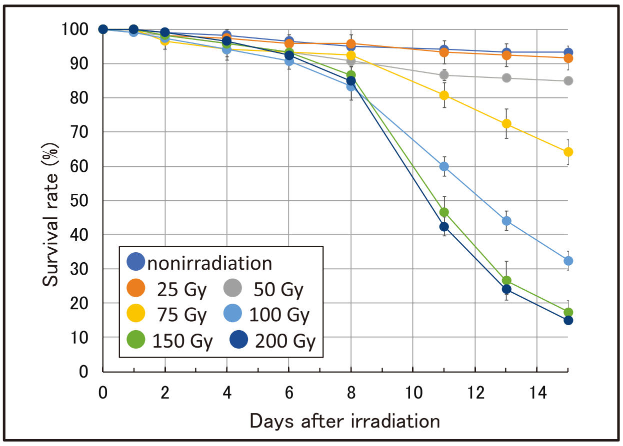

Fig. 2. Effects of different argon irradiation conditions on survival rate of rotifers. The rotifers were irradiated with argon-ion beams at different dose levels (25, 50, 75, 100, 150, and 200 Gy). The survival rates were measured every two or three days under each condition after irradiation. The data includes mean ± SE of six independent experiments. The bars represent the SE of data.

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