

学 位 論 文 要 旨

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題 目	Breeding and cultivation of the Japanese radish ‘Sakurajima daikon’ (桜島大根の品種育成およびその栽培方法に関する研究)

Sakurajima daikon is a traditional cultivar of the Japanese radish mainly produced in Sakurajima, an active volcano, in Kagoshima prefecture in Japan. This study reports the agronomically important genetic traits of Sakurajima daikon. Furthermore, the characteristics of a newly bred F₁ cultivar, ‘Sakurajima Ogojo’, and methods for assessing the purity of F₁ seeds for cultivation adjusted to the new cultivar are described.

Diallel analysis using an 8 × 8 half-diallel cross among inbred lines disclosed several genetic traits of Sakurajima daikon, as described below.

First, the “root weight” was the genetic trait controlling overdominance. Second, the “root shape” of Sakurajima daikon was analyzed using the image analysis software SHAPE based on Fourier descriptors to determine the 1st principal component (PC1), a known standard of the ratio of the root diameter to root length. This suggested that the root shape is genetically controlled by overdominance or complete dominance. Third, cavitation was caused by incomplete or complete dominance.

Next, using the knowledge of the genetic traits of Sakurajima daikon, the F₁ cultivar 'Sakurajima Ogojo' was created, which exhibits cavitation and pithiness at a low rate. As expected, the incidence of cavitation and pithiness in 'Sakurajima Ogojo' was much lower than that in other openly pollinated varieties. Furthermore, 8 microsatellite markers containing polymorphisms were screened between the two parental lines, which can be used to assess the purity of F₁ 'Sakurajima Ogojo'.

Moreover, cultivation techniques, such as “fertilization scheme”, “planting distance” and “planting time”, for ‘Sakurajima Ogojo’ were evaluated. The incidence of cavitation was high when fertilizers were mainly used at the time of planting and then occasionally supplemented, whereas that of cavitation decreased by employing the reversed fertilization scheme. Planting distance and planting time also affected the cavitation incidence; sparser planting and early planting increased cavitation. In addition, the effects of polyolefin-coated fertilizer on the incidence of the two conditions were examined in view of labor-saving. A combination of LPSS100 with normal basal fertilizer (9:1) resulted in a similar production yield to the conventional cultivation procedure.

This study revealed genetic traits determining the root weight, root shape and cavitation of Sakurajima daikon. Furthermore, a high-quality F₁ cultivar named “Sakurajima Ogojo” was bred using these genetic traits, which produced uniform taproots with low rates of cavitation and pithiness. In addition, valuable information regarding seed purity to ensure the stable production of F₁ seeds and a cultivation procedure adjusted to this cultivar were obtained. This study may lead to the high-quality production of Sakurajima daikon in the future.