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Selection and Characterization of Radiation-Induced Mutant with Good Performances in Kenaf

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[Introduction]

Kenaf(*Hibiscus cannabinus* L. 2n=36) is an annual herbaceous crop of the Malvaceae family, which is known for its economic importance. Biological yield of kenaf is about 3-4 times that of forest and CO_2 assimilation capacity is about 4-5 times that of trees. So, the 'green tag' is further associated with kenaf. Thus, the main objective of this study was to generate new kenaf varieties with high biomass through backcross breeding. Also, it aimed to describe pedigrees in regards to their morphological, genetic and histological traits in comparison to the Control varieties, Jangdae and Hongma.

[Materials and Methods]

The kenaf seed variety used for the Control was 'Hongma 300', being originally from China.

Approximately 100g of kenaf seeds were irradiated with 250 Gy from 60Co sources located in Korea Atomic Energy Research Institute (KAERI). Each of the 500 plants (1st generation, M_1) were planted in 2017, grown to maturity in an upland field, and assigned numbers at harvest time. In 2018, the 250 plants of 2nd generation (M_2) were planted and the mutants showing normal seed fertility were investigated on an individual plant basis. An acceleration of generation was processed from Oct. 2019 to Apr. 2020, and from Oct. 2020 to Apr. 2022.

Various characteristics including flowering date, fuel characteristics and RAPD analysis were recorded, compared to two Control plants.

[Results and Discussions]

Kenaf is known as a jack-of-all-trades crop due to being used in many different fields. The elite mutant with superior performances was selected through mutation. Seeds of the original resource named Hongma 300 (Control) were irradiated with 250 Gy gamma-ray. The agronomic performances, histological analysis and genetic variation of the elite mutant line (JBK-1) were investigated at M8 generation in comparison with the Control. The leaf shape of the Control and the JBK-1 mutant was palmate. Significant differences at leaf color were observed comparing JBK-1 mutant and the Control. The JBK-1 was blooming on August 5, which is 97 days after sowing, being comparable to the Control flowering on September 30. Dry weight of the JBK-1 was 5.7 kg/m2,which was the statistical same with 6kg/m2 of Hongma 300. Both genotypes, the Control and JBK-1, had significant difference for seed yield. The latter's amount was 212 g/m2, however, the former didn't set seeds due to a low temperature below 15℃. The total ash content analysis indicated a low value at 3.8% for the JBK-1, which was lower than 4.45% of the Control. Plus, this mutant had a much lower Cl- concentration compared to the Control. In the fuel characteristics analysis, the heating value of the mutant ranged from 4,080 in lower heating value to 4,643 kcal/kg in higher heating value, which was similar to the Control. Based on the histological analysis of the stem, the larger lumens were shown in core fiber of the mutant. The RDPA analysis produceda genetic diversity of 68.7% among the genotypes used. It demonstrated differentiation between the Control and mutant. Taken together, the JBK-1would be useful as a resource for high biomass production in Korea. This work is supported by a fund of project designated as No. PJ01477901, Rural Development Administration (RDA), Republic of Korea.

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