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Growth and Yield Characteristics to Fertilization Levels of New Sweet Sorghum Varieties 'Dalrong' and 'Saerom'

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[Introduction]

Sweet sorghum (*Sorghum bicolor*(L.) Moench) is an annual C4 plant in the family *Cruciferae*. The juice can be processed into sweeteners, alcoholic beverages, and biofuels, and the by-products remaining after squeezing the juice can also be used as livestock feed or biochemical materials. In Korea, native varieties are cultivated for four months from May to September and the juice is used for the production of alcoholic beverages, but there are no registered varieties. The Bioenergy Crop Research Institute (BCRI) bred 'Dalrong' with high sugar content and high amount of juice, and 'Saerom' with high biomass production in 2019. The new varieties have long stems and often falls down when strong winds such as typhoons blow during cultivation. Therefore, growth and yield responses of the new varieties to the level of fertilization were compared with that of native variety, 'Chorong', for the development of cultivation technology.

[Materials and Methods]

This study was conducted from May to August 2022 at the experimental field of BCRI in Muan, Jeollanam-do. The chemical properties of the soil were as follows: 9.2 g kg⁻¹ organic matter, 7.0 pH, 0.08 dS·m⁻¹ EC, 0.5 cmol⁺ kg⁻¹ K, 4.4 cmol⁺ kg⁻¹ Ca, and 1.8 cmol⁺ kg⁻¹ Mg. The standard fertilization (N-P-K 10-7-8) of sorghum was used and calculated into 100% fertilization, 50% fertilization, and non-fertilization. Each treatment was applied with urea, fused superphosphate, and potassium chloride. The varieties 'Chorong', 'Dalrong' and 'Saerom' were used. Seedling started in mid-April, and plugs were planted on May 19th, at intervals of 70 cm between rows and 30 cm between plants. Except for main stems, all new stems emerged later were removed. The stems were supported with a plastic rope in mid-July to prevent them from falling down by the wind. When the ears came out, they were covered with a net to prevent damage to birds. As the growth and yield parameters, heading date of the ears, stem length, and fresh weight of the stems were investigated based on the analysis criteria of agricultural science and technology research of RDA. All investigations were performed in three replications, and 10 plants per replication were investigated. The juice was extracted from the stems with a press-type juicer (GJ-456, Remkorea, S.Korea), and the amount of juice and sugar content (PAL-1, ATAGO, Japan) were measured.

[Results and Discussion]

The new varieties 'Dalrong' and 'Saerom' were headed 5 and 11 days later, respectively, compared to the variety 'Chorong', which were headed on July 20th. In particular, as the levels of fertilization decreased, the heading of 'Saerom' was delayed. Stem length was longer in varieties 'Dalrong' (373 cm) and 'Saerom' (387 cm) than in the 'Chorong' (272 cm) by more than 1 m. As the level of fertilization decreased, stem length increased but stem diameter decreased. There was no difference in the index of lodging because all stems were supported to each other. The fresh yield of stems in 'Chorong', 'Dalrong' and 'Saerom' were 23.8, 31.1, and 42.8 tons/ha, respectively. In particular, the variety 'Saerom', which had a large production of juice, had twice as much juice as 'Chorong'. However, there were no significant differences in the production of juice among the levels of fertilization. The sugar content of the juices of 'Chorong', 'Dalrong' and 'Saerom' were 13.8, 13.9, and 7.3 °Brix, respectively. The variety Dalrong showed a similar sugar content to 'Chorong', but 'Saerom' had a 47% decrease compared to 'Chorong'. Except for 'Chorong', the sugar content significantly decreased as the fertilization levels decreased. Therefore, considering the production of juice and sugar content, appropriate fertilization was required for the new sweet sorghum varieties.

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