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Comparison and Analysis of Functional Materials by Wheat Sprouts Variety according to LED Light Conditions

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[Introduction]

Wheat varieties differentiated from imported wheat are being developed to promote the production and consumption of domestic wheat, but farmers are avoiding it due to low economic feasibility compared to other crops and difficulties in the cropping system due to climate conditions. Therefore, this study was conducted to set light conditions in indoor plant factories that were not affected by weather and natural disasters, compare the analysis of functional substances for each variety of wheat sprouts, and use them as basic data for future plant-style sprout cultivation conditions and high functional cultivation methods.

[Materials and Methods]

To analyze phenol components such as total flavonoids and total polyphenols according to light conditions and compare antioxidant properties (DPPH, ABTS), this study cultivated wheat sprouts of Saegueumgang, Jogyeong, and Ariblack, Arijinblack varieties at the Chungcheongbuk-do Agricultural Research & Extension Services in a plant factory. Wheat seeds are seeds produced by the National Institute of Food Science and were planted on seedbeds (30x60cm) for breeding, immersed in distilled water, and grown after germinating under cancer conditions for 24 hours. The light sources used red LED, blue LED, mixed light (red+blue+fluorescent light), and dark conditions, and each light source set a PPF value of $100 \mu\text{mol}\cdot\text{m}^{-2}\cdot\text{s}^{-1}$ and cultivated under light conditions for 16 hours a day. The temperature was set to 25°C, cultivated 12 days after sowing, and harvested to analyze the functional substance content.

[Results and Discussion]

The total polyphenol content and flavonoid content, which are phenol components, were analyzed to compare the functional substance content between wheat sprouts according to LED light sources, Therefore the total flavonoid content was the highest at 674.6 mgCE/100g in the red light section of arijinblack, and all four species were significantly the lowest in the dark condition treatment section.

The total flavonoid content by light treatment showed different results for each type. numerically, the dark condition section of Ariblack was the highest at 1603.1 mgGAE/100g, and the colored wheat, Ariblack and Arijinblack, showed a high tendency in mixed light, and the general wheat, Saegueumgang, and Jogyeong, showed a high tendency in the mixed light section.

The total polyphenol content by wheat sprout variety was high in the order of Ari black, Saegueumgang, Jogyeong, and Arijinblack, and the mixed light and dark condition treatment section of Ariblack were significantly the highest, and the Arijin black variety showed the lowest tendency. The total polyphenol content by light treatment was different between varieties, and the red light was significantly higher for Saegueumgang, the dark condition treatment section for Ari black, and the mixed light treatment section for Jogyeong and Arijin black varieties.

The DPPH radical-scavenging activity of wheat sprouts according to light treatment was compared. All four varieties of wheat sprouts have improved DPPH radical-scavenging activity. Comparing the average value of each variety, the activity was significantly the highest at 66.7% under the dark conditions of the jogyeong, and the lowest at 60.6% under the dark conditions of the Saegueumgang. In the light treatment conditions, the activity was the highest at 64.5% in the arijin black variety. As a result of evaluating additional antioxidant activity using ABTS+ radical, it showed the highest activity of 80.6% in the light treatment section of Saegueumgang and the lowest activity of 66.6% in the dark treatment section of Saegueumgang. It was confirmed that antioxidant activity was improved in wheat sprouts grown under light conditions in all varieties except Arijin black.

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