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Genome-wide Association Study for Resveratrol Content in 150 Peanut (*Arachis hypogaea* L.) Accessions

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[Introduction]

Resveratrol (trans-3,5,4'-trihydroxystilbene) found in several crops, is a major stilbene phytoalexin component, and it exists in Cis- and Trans- isomeric forms. Among them, the trans- form as a promising functional ingredient has biological effects such as antibacterial, anti-immune, anti-cancer, and antioxidant. In previous studies, it is known that the content of resveratrol is variable due to genetic differences in peanuts, and especially the content increases rapidly when it germinates from a seed and grows as sprout. As a result, a large number of peanut accessions were used to confirm the variation of resveratrol content in peanut sprouts, and identification of genes controlling the content of resveratrol was conducted over 2 years.

[Materials and Methods]

Forty-two Korean accessions from the RDA-GenBank Information Center and 108 core collections from US Department of Agriculture were cultivated for 2 years on a farm affiliated with Pusan National University (35°30'07.5"N 128°43'16.2"E), Miryang. Peanut sprouts were irrigated for 2 minutes every 2 hours at 27 °C and grown for 9 days in the sprout growth chamber. For the resveratrol extraction method, the sample was dried with hot air at 50°C for 20 hours, then 1 g was mixed with 20 ml of 80% methanol (v/v) and homogenized for 1 hour. Finally, high resolution LC/MSMS spectrometer was used for analysis. A genome wide association study (GWAS) analysis was performed using the Fixed and random model Circulating Probability Unification (FarmCPU) model for 15444 SNPs and 2 years of resveratrol content. Significant markers related to resveratrol content in ground peanut sprouts were identified.

[Results and Discussion]

In 2019, 2020, Average of 2 years, the resveratrol content of peanut genetic resources was 0.5-31.3, 0.7-19.89, and 1.04-17.6 $\mu\text{g/g}$, respectively. Variations between years were confirmed, depending on the cultivation environments. Among these resources, GWP063, GWP217, and GWP350 showing high resveratrol content and low annual variation were selected as very useful breeding materials. Based on the threshold of "suggestive association" to which the Bonferroni-correction was adjusted, the markers selected by the GWAS results of 2019, 2020, and Average of 2 years are 9, 1, and 10, respectively. In 2019 and Average of 2 years, AX-147252023, AX-147232722, and AX-176801058 were selected as commonly significant markers. And especially, the p-values of the AX-147252023 marker were 2.35E-14 and 1.55E-14, showing significantly lower values. Through this study, it is possible to provide useful molecular breeding data in peanuts identification of significant markers related to the genes controlling resveratrol content in peanut sprouts as well as by selecting a high-content resveratrol peanut accessions.

[사사]

본 연구는 한국연구재단 기본 연구(과기부)사업(사업 번호: 2019R1F1A1062618)의 지원에 의해 이루어진 결과로 이에 감사드립니다.

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