Genetic Diversity and Tracing the Origin of Wasabi (Eutrema japonicum) on Ulleung Island, Korea

Son, Grace (School: Tabb High School)

Wasabi (Japanese horseradish: Eutrema japonicum, synonym Wasabia japonica) is an endemic species in Japan that has been cultivated as a traditional Japanese condiment. However, Ulleung wasabi, Wasabia koreana has been reported as a native species in a small oceanic volcanic Ulleung Island, which is located between the Korean Peninsula and the Japanese Archipelago. Although a few studies have been conducted to reveal species identity and origin, still several systematic issues concerning the species identity, distribution, nomenclature, relationship with wild wasabi E. japonicum remain a controversial debate. Therefore, I aimed to investigate the origin, species' identity, and phylogenetic relationship between the wild and cultivars of E. japonicum, and genetic structures using whole chloroplast genome sequences and DNA barcoding analysis of the Ulleung wasabi. The plastome sequences using the three accessions of Ulleung wasabi and six cultivar accessions (Daio, Daruma, Green Thumb, Micado, Orochi, and Shogun) suggested that Ulleung wasabi was most closely related to the cultivar 'Shimane No. 3' amongst the Japanese wasabi. The haplotype relationships based on three highly variable intergenic region sequences of chloroplast DNA for 51 accessions Ulleung wasabi revealed the existence of at least three different haplotypes. In conclusion, the current study suggests that Ulleung Island wasabi is most likely a cultivar of Eutrema japonica, while the DD population and some individuals of BR, CS populations holds the potential possibility of being a wild type wasabi. Ulleung Island wasabi's geographical origin could not be determined in this study, but multiple origins could be possible.

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