Flavor formation of cucumber and bitter gourd by salt-squeezing process

Michiko Kawakami, Yuko Konishi, Noriko Himizu, and Akio Kobayashi
Department of Food Science, Ibaraki Christian University

Summary

Cucumber and bitter gourd, vegetables in the melon family, have been salted and squeezed before cooking. In order to check the changes in salt-squeezed vegetable flavor, cucumber and bitter gourd were analyzed using GC-MS analysis. The strength of the aromas of the squeezed cucumber and bitter gourd were measured using sensory tests and statistical processing with the Kruskal-Wallis test. There was a significant difference between the salt-free sample and the 1% salt sample. The 1% salt sample has a mild note, while the salt-free sample has a green note, suggesting the green note disappears and the flavor changes greatly due to salt-squeezing. By salt-squeezing, the cucumber color becomes deeper and the cellular tissue becomes softer from exuding water due to the high osmolarity of the extra cellular domain. The color of the distilled extract and the dichloromethane extract were significantly different in the salt-free and salted groups. This change is more prominent with higher salt concentrations.

Next, we sliced the cucumber in slices 1.5 mm thick, prepared aroma concentrates from the slices using a brewed extraction method, and analyzed using GC-MS. Fifty-two compounds were identified as the cucumber flavor. The samples had strong differences in their (*E*)-2,(*Z*)-6-nonadienal ratios, which are the most important component of cucumber flavor. The salt-free sample contained higher levels of (*Z*)-6-Nonenol and (*E*)-2,(*Z*)-6-nonadienol, while the 3% salt sample contained higher levels of (*E*)-2,(*Z*)-6-nonadienal, 8-nonenoic acid, 8,11-heptadecadienal. This demonstrated the effect from adding salt. The ratios of (*E*)-2,(*Z*)-6-nonadienal, (*Z*)-6-nonenol, 8-nonenoic acid and (*E*)-2,(*Z*)-6- nonadienol decreased, and the ratios of 8-heptadecenal, 8,11-heptadecadienal, and 8,11,14- heptadecatrienal increased in the strongly squeezed sample. This trend was remarkable in the homogenized sample. The effect from adding salt and squeezing promoted transforming the components and promptly changed the aroma pattern. Using an internal standard, aroma concentrates of bitter gourd squeezed samples (salt-free and with 1%, 2%, and 3% salt) were prepared and analyzed by GC-MS. Twenty-five components, containing (*Z*)-3-hexenol(50%), myrtenol(16%), and myrtenal, which were characteristic aroma compounds of bitter gourd, were identified, but no differences were found in the aroma pattern of these samples. The aroma of 1% and 2% salt samples, however, did increase in quantity. These results indicate that the change of flavor from salt-squeezing was caused by the 2 factors, the enzymatic reaction such as lypoxygenase and the osmotic pressure. Then, the cellular water covers the vegetable surface and masks the greenish flavor.