以模式反應模擬油炸蔥屬蔬菜香味形成之研究

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ABSTRACT

Allium vegetables including onion and shallot contain nonvolatile flavor precursors, i.e. S-alk(en)yl-L-cysteiene sulfoxides in the intact cells. After the cellls are physically broken down, these precursors can be transformed into alk(en)yl thiosulfinates, the primary flavor compounds of allium vegetables, and contributing the fresh flavor of allium vegetables. On heating of slice or homogenate of allium vegetables, the primary flavor compounds can further transformed into sulfides, disulfides, polysulfides, or thiophenes, the second flavor compounds. The flavor precursors of allium vegetables can be transformed into the above sulfur-containing volatile compounds or conducting Maillard reactions with sugars during high temperature thermal processing of allium vegetables. In preparing Chinese meals, shallot or onion is usually deep-fried and then used as seasoning vegetable to contribute the pleasant flavor of the meals. In this study, essential oil of onion or shallot (the secondary flavor compounds of onion or shallot) was used and reacted with cysteine, the analogue of the flavor precursors of onion or shallot, in vegetable oil to study if we can use essential oil of allium vegetables to prepare fried allium vegetable flavors. The flavor precursors of onion or shallot, the alk(en)yl-L-cysteine sulfoxides, were also synthesized and then thermally degraded or thermally reacted with or without glucose in vegetable oil to study the contribution of the flavor precursors of alllium vegetables to the flavor of fried allium vegetables. This thesis includes three major parts. In the first part of this thesis onion, oil was reacted with cysteine and the flavor compounds in the reaction mixture were isolated and separated using acid/base fractionation method. In the second part of this thesis, shallot oil was reacted with cysteine also and the flavor compounds in the reaction mixture were isolated and separated using acid/base fractionation method. In the third part of this thesis, three flavor precursors of onion or shallot, i.e. S-methyl-L-cysteine sulfoxide, S-propyl-L-cysteine sulfoxide, S-1-propenyl-L-cysteine sulfoxide, were synthesized and then thermally degraded or reacted with or without glucose in vegetable oil. The volatile compounds generated were then isolated and analyzed to study the potential contribution of the flavor precursors of allium vegetables to the flavor of fried allium vegetables. The followings were some major findings in the thesis: 1. Using initial oil temperature of 200°C and final temperature of 155°C can prepare more favorite fried onion or shallot slices. 2. When comparing with fried onion, onion oil model reaction solution carried similar flavor composition in those compounds having fried fat note and fried onion note but less in those compounds having caramellic or burned note and more in those compounds having dried radish, dried shiitake or meaty note. 3. When comparing with fried shallot, shallot oil model reaction solution carried similar flavor composition in those compounds having fried fat note but different in the flavor composition of acids, furans, pyrazines, and other cyclic sulfur-containing compounds, and other acyclic sulfur-containing compounds. 4. When using acid/base fractionation method to separate the volatile compounds of onion (shallot) essential oil, fried onion (shallot) essential oil, and onion (shallot) oil reaction solution, it was found that most volatile compounds existed in the neutral fraction, especially sulfur-containing compounds, aldehydes, alcohols, and hydrocarbons. Phenols, ethers, and acids were mainly existed in slightly acidic or acidic fractions. Pyridiens, pyrazines, and thiazoles were mainly existed in basic and neutral fractions. Acid/base fractionation method is then proved to be a good method in the separation of the volatile compounds of onion (or shallot) samples. 5. Three flavor precursors of onion or shallot were synthesized and confirmed using FTIR and TLC in this thesis 6. Besides aldehydes, the major volatile compounds found in the thermal degradation oil solution of S-methyl-L-cysteine sulfoxide (MeCySO) were methyl trisulfide, 2-pentyl pyridine, and methyl disulfide. Besides aldehydes, the major volatile compounds found in the thermal reaction oil solution of MeCySO with glucose were methyl trisulfide and methyl disulfide. 7. Besides aldehydes, the major volatile compounds found in the thermal degradation oil solution of S-propyl-L-cysteine sulfoxide (PrCySO) were propyl trisulfide and propyl disulfide. Besides aldehydes, the major volatile compounds found in the thermal reaction oil solution of PrCySO with glucose were also propyl trisulfide and propyl disulfide. More pyrazine compounds were found in the reaction solution of PrCySO wuth glucose than in PrCySO alone. 8. Besides aldehydes, the major volatile compounds found in the thermal degradation oil solution of S-1-propenyl-L-cysteine sulfoxide (PrenCySO) with or without glucose were dimethyl thiophenes. No significant mono-, di-, or trisulfides were found in these reaction systems. 9. Volatile compounds identified in the thermal reaction or degradation solution of MeCySO, PrCySO, PrenCySO with or without glucose can be classified into those mainly degraded from the sulfoxides, those mainly degraded from oil, those mainly degraded from sugars, and those generated from uncertain source

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