Studies on the application of sulfur-containing amino acid of garlic in the development of meat-like flavor

苑永弘、游銅錫

E-mail: 8812470@mail.dyu.edu.tw

ABSTRACT

Allium vegetables, including garlic, 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 break 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 garlic slice or homogenate, the primary flavor compounds can further transformed into sulfides, disulfides, polysulfides, or thiophenes, the second flavor compounds. When the garlic cloves were blanched to deactivate flavor enzymes, the alk(en)yl sulfoxides can be retained in the cells. These sulfoxides can further be transformed into the above sulfur-containing volatile compounds or conducting Maillard reactions with sugars during high temperature thermal processing of garlic cloves. In this thesis, garlic homogenate, blanched garlic homogenate, synthesized alliin (the major sulfoxide of garlic) and deoxyallin (the precurosor of synthesized alliin) were thermally reacted with xylose plus thiamine · HCl and/or cysteine · HCl in a close reactor at 130 C for three hours to study the possibility of using garlic or its flavor precursors to prepare meat flavors. This thesis includes four major parts. In the first part of this thesis garlic homogenate, blanched garlic homogenate were reacted with xylose in the presence of thiamine · HCl and/or cysteine · HCl. The volatile compounds in each reaction solution were compared and the flavor of each reaction mixture was evaluated. The reaction system of blanched garlic homogenate + xylose + thiamine · HCl carrying more preferred meaty flavor than other reaction solutions. Volatile compounds generated in the reaction solutions in the first part were further separated using an acid/base fractionation method in the second part. it was found that most volatile compounds existed in the neutral or slightly acidic fraction. Pyridiens, pyrazines, thiazoles, and oxazoles were mainly existed in basic fraction. Acids and phenols were mainly existed in acidic fraction. Acid/base fractionation method is then proved to be a good method in the separation of the volatile compounds in the reaction solutions prepared in the first part. In the third part, alliin and deoxyalliin were synthesized and then reacted with xylose in the presence of thiamine · HCl and/or cysteine · HCl. The major volatile compounds found in alliin reaction system were mainly thiols, sulfides, and cyclic sulfur-containing compounds. The major volatile compounds found in deoxyalliin reaction system were mainly sulfides. The volatile compounds in each reaction solution were compared and the flavor of each reaction mixture was evaluated. The reaction system of alliin + xylose + thiamine · HCl carrying more preferred meaty flavor than other reaction solutions. Volatile compounds generated in the reaction solutions in the third part were further separated using an acid/base fractionation method in the fourth part. it was found that most volatile compounds existed in the neutral or slightly acidic fraction. Pyridiens, pyrazines, thiazoles, and oxazoles were mainly existed in basic fraction. Acids and phenols were mainly existed in acidic fraction. Acid/base fractionation method is then proved to be a good method in the separation of the volatile compounds in the reaction solutions prepared in the third part.

Keywords : Garlic ; Cysteine ; Xylose ; Thiamine ; Meaty ; Alliin

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