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MAILLARD REACTIN BETWEEN CYSTIENE AND RIBOSE FOR MEAT FLAVOR

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ABSTRACT: The volatiles produced from a phosphate-buffered solution (pH 5.7) of cysteine and ribose heated at 140 ° C for 1hr, were isolate by head space in combination with gas chromatography - mass spectrometry (HS-GC-MS). Data indicated that sulfur aroma compounds in a system containing cysteine and ribose play a significant role in the formation of that aroma compounds such as, 2-methyl-3 furanthiol and 2-furanthiol. On the other hand, all carbon atoms in 3-thiophenethiol stemmed from cysteine. Over 100 aroma compounds were generated from that reaction. These compounds are essential in meat flavor (aroma).

Key words: **Mailland reaction, ribose, cysteine, thiophene, (furfuryl mercaptan).**

INTRODUCTION

Maillard reactin plays a substantial role in flavor generation during the cooking of meat and other heat-processed food such as bread,cereal products and roasted coffee. Beside thiamine, the precursors ribose and cysteine are important for meat aroma and are consequently employed in the production of flavor substances.

Among these compounds, the thiols; 2-methyl-3-furanthiol with meaty flavor and 2- furfurylthiol and 3-mercapto- pentanone belong to the most important aroma impact com- pounds formed during the thermal reaction of ribose and cysteine. These molecules are also found in cooked meat.

Numerous model reactions with ribose and cysteine have been carried out to study meat flavor generation.

The aim of the present study was to distinguish the aroma compounds generated from the reaction between ribose and cysteine. In addition a correlation was made between the volatile compounds of the mentioned reaction and meat flavor.

MATERIAL AND METHODS

Materials:

Ribose and cysteine were produced by Sibma-Aldrich Chemical Co. (Millwaukee, WI USA).

Sodium phosphate buffer solution (0.5, M, pH 5.7).

Methods:

Thermal Reaction:

A known amount of cysteine (0.061 g) and ribose (0.75 g) were dissolved in 2 ml phosphate buffer solution (0.5 M, pH 5.7) and placed in a 10 ml glass vial (2.5 mm x 54 mm) (Pierce Chemical Co. Rochford, IL). The reaction mixture was heated at 140 °C in electric oven for 1 hr.

Analysis: Head space gas-chromatography mass - spectro-metry (HS GS-MS) analysis was used.

The volatile compounds generated from the thermal reaction systems were analyzed by varian 3400 gas chromato- graphy (GC) equipped with RTX-1, 60 m x 0.25 mm i.d. x 0.5 μm film thickness column. Mass-spectrometer (MS) Finnigan MAT 8230 (ISSI Laboratory USA).

Injection port is equipped with splitter type.

Injector Temperature, 250 °C.

Pre-injection incubation, 80 °C for 30 min.

Injection volume 1 mL.

Column Temperature was pro - grammmed from 30 (hold 3 min) to 290 with a rate of 5 °C min.

Identification of volatiles: Identification of the volatile compounds was based on GC-MS analysis. The compounds from the volatile were identified by comparing the mass spectral data with those of authentic compounds available at National Institute of Science and Technology (NIST) Liberary.

RESULTS AND DISCUSSION

The Millard reaction between ribose and cysteine was chosen as an experimental model system for this study.

The reaction mixture of ribose and cysteine at pH 5.7 (the pH of the meat) were heated at 140 °C for 1 hr. Table (1) shows the data of mass spectrum of the volatiles produced from the reaction between ribose and cysteine. Expectedly, sulfur-containing compounds were the major volatile substances shows the most abundant odorant substances were thiophene 6.99% (roast meat aroma), 2-methyl thiophene 7.966%, methyl furan 19.874% (meaty and Pleasant), methyl ethyl ketone (MEK) 4.633% (roast meat aroma) and2-methyl-3-furanthiol 7.95% (onion).

Table (1): The most impact compounds in meat flavor using ribose and cyteine.

Compounds	Character (8)	%
Thiophene	Roast meat	6.998
2-methyl thiophene	Roast meat	7.998
Methyl ethyl Ketone (MEK)	Roast beef	4.633
2-methyl furan	Meaty pleasant	19.876
Dimethyl pyrazine	Cooked meat	0.117
5-methyl thiazole	Nutty pyridine-like	0.178
2-methyl-3-furanthiol	Onion	7.795
2-furan methyl thiol (Furfuryl mercaptan)	sulfurous	2.151
2-thiophene thiol	sulfurous and meaty	0.743
2-methyltetrahydro-thiophene-3-one.	Roast meat	1.673

SUMMARY

Formation and generation of Maillard flavor products in a model system containing ribose and cysteine were studied. Over 100 compounds were identified from the heated model system. In general 10 of the most specific compounds were recognised as the most impact compounds in meat flavors.

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تفاعل ميلارد بين الحامض الأمينى سستئين وسكر الريبوز من أجل نكهة اللحم

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تم تسخين سكر الريبوز وحامض أمينى سستئين على درجة ١٤٠° م لمدة ساعة فى محلول منظم. وقد تم التعرف على المركبات المسئولة عن الطعم والرائحة وتبين أن عددها يزيد عن مائة مركب باستخدام جهاز الكروماتوجرافى الغازى HSGS-MS كما تبين أن عشرة مركبات من المركبات المفصولة لها أهمية ومسئولة عن إكساب الطعم والرائحة للحم المطبوخ.