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APPENDICES

Appendix A

(Commission directive 2002/16/EC)

(10) Member States which have not yet authorised the use and/or the presence of BADGE and/or BFDGE and/or NOGE in materials and articles intended to come into contact with foodstuffs should be able to maintain their prohibition.

(11) The use and/or presence of BADGE, BFDGE and NOGE in plastic materials and articles, surface coatings such as varnishes, lacquers and paints, as well as adhesives, should be regulated at Community level to avoid risks to human health and barriers to the free movement of goods.

(12) Errors due to the presence of other chemical substances may occur during analysis. Validated methods of analysis are, therefore, necessary for correct verification of compliance with the restrictions set out in the Directive.

(13) A transitional period should be provided for in respect of materials and articles which are brought into contact with foodstuffs before the deadline for implementation of this Directive.

(14) This transitional period should also take into account the requirements of Directive 2000/13/EC of the European Parliament and of the Council of 20 March 2000 on the approximation of the laws of the Member States relating to the labelling, presentation and advertising of foodstuffs [1], as amended by Commission Directive 2001/101/EC [2].

(15) In view of the new technical requirements, Commission Directive 2001/61/EC of 8 August 2001 on the use of certain epoxy derivatives in materials and articles intended to come into contact with foodstuffs [3] should be repealed for reasons of clarity.

(16) The measures provided for in this Directive are in accordance with the opinion of the Standing Committee on Foodstuffs,

HAS ADOPTED THIS DIRECTIVE:

Article 1

1. This Directive shall apply to materials and articles which, in the finished product state, are intended to come into contact or are brought into contact with foodstuffs and are intended for that purpose and which are manufactured with or contain one or more of the following substances:

(a) 2,2-bis(4-hydroxyphenyl)propane bis(2,3-epoxypropyl) ether (hereinafter 'BADGE'), and some of its derivatives;

(b) bis(hydroxyphenyl)methane bis(2,3-epoxypropyl)ethers (hereinafter 'BFDGE'), and some of their derivatives;

(c) other novolac glycidyl ethers (hereinafter 'NOGE'), and some of their derivatives.

For the purposes of this Directive, 'materials and articles' are:

(a) materials and articles made of any type of plastics;

(b) materials and articles covered by surface coatings;

(c) adhesives.

2. This Directive shall not apply to containers or storage tanks having a capacity greater than 10 000 litres or to pipelines belonging to or connected with them, covered by special coatings called 'heavy-duty coatings'.

Article 2

The materials and articles referred to in Article 1(1) shall not release the substances listed in Annex I in a quantity exceeding the limit laid down in that Annex.

The use and/or presence of BADGE in the manufacture of those materials and articles may only be continued until 31 December 2004.

[1] OJ L 109, 6.5.2000, p. 29.
[2] OJ L 310, 28.11.2001, p. 19.
[3] OJ L 215, 9.8.2001, p. 26.

COMMISSION DIRECTIVE 2002/16/EC

of 20 February 2002

on the use of certain epoxy derivatives in materials and articles intended to come into contact with foodstuffs

(Text with EEA relevance)

THE COMMISSION OF THE EUROPEAN COMMUNITIES,

Having regard to the Treaty establishing the European Community,

Having regard to Council Directive 89/109/EEC of 21 December 1988 on the approximation of the laws of the Member States relating to materials and articles intended to come into contact with foodstuffs [1], and in particular Article 3 thereof,

After consulting the Scientific Committee on Food,

Whereas:

(1) The use and/or presence of 2,2-bis(4-hydroxyphenyl)propane bis(2,3-epoxypropyl) ether ('BADGE'), bis(hydroxyphenyl)methane bis(2,3-epoxypropyl)ethers ('BFDGE') and novolac glycidyl ethers ('NOGE') in materials and articles intended to come into contact with foodstuffs has led to questions about their safety, mainly when they are used as an additive.

(2) Test results have shown significant levels of these substances and certain derivatives thereof in some foodstuffs.

(3) The Scientific Committee on Food has given an opinion that the specific migration limit for BADGE and some of its derivatives can be extended for another three years pending the submission of further toxicological data for evaluation.

(4) Acceptance of the use and/or presence of BADGE may therefore be provisionally extended.

(5) The Scientific Committee on Food has examined the data available on BFDGE, which are very similar to the corresponding data obtained for BADGE.

(6) Acceptance of the use and/or presence of BFDGE and some of its derivatives may therefore also be continued pending the submission and evaluation of further toxicological data, under certain conditions.

(7) The Scientific Committee on Food has stated that, in the absence of information about the potential exposure and toxicological profile of NOGE components with more than two aromatic rings and their derivatives, it is not in a position to evaluate the safety of use and/or the presence of corresponding products. The Committee is therefore of the opinion that at present, it is not appropriate to use NOGE as an additive in materials and articles intended to come into contact with foodstuffs due to its tendency to migrate in this application.

(8) The use and/or presence of NOGE components with more than two aromatic rings and their derivatives in plastic materials and articles, surface coatings and adhesives intended to come into contact with foodstuffs should be regulated through the establishment of a strict limit, which should, in practice, provisionally rule out their use as additives. This provisional limit should apply pending the submission of adequate data for a more complete scientific risk assessment, in accordance with Article 5(7) of the World Trade Organisation Agreement on the Application of Sanitary and Phytosanitary Measures, and the development of adequate methods for the determination of their levels in foodstuffs.

(9) The use and/or presence of NOGE and BFDGE as starting substances for the preparation of special coatings used to cover the surfaces of very big containers should provisionally be allowed to continue, pending the submission of further technical data. The large volume/surface area ratio of these containers, their repeated use over their long lifetime which reduces migration, and their contact with foodstuffs at ambient temperature in the majority of the applications suggest that it is not necessary to set a migration limit for NOGE and BFDGE in such containers.

[1] OJ L 40, 11.2.1989, p. 38.

Article 3

The materials and articles referred to in Article 1(1) shall not release the substances listed in Annex II in a quantity which, when added, to the sum of BADGE and its derivatives listed in Annex I, exceeds the limit laid down in Annex II.

The use and/or presence of BFDGE in the manufacture of those materials and articles may only be continued until 31 December 2004.

Article 4

As from 1 March 2003, the quantity of NOGE components with more than two aromatic rings and at least one epoxy group as well as their derivatives containing chlorohydrin functions and having a molecular mass less than 1 000 daltons shall not be detectable in the materials and articles referred to in Article 1(1) at the detection limit of 0,2 mg/6 dm^2, including analytical tolerance.

For the purpose of this Directive, the detection limit specified in the first paragraph should be verified by a validated method of analysis. If such a method does not exist, an analytical method with appropriate performance characteristics may be used, pending the development of a validated method.

The use and/or presence of NOGE in the manufacture of those materials and articles may only be continued until 31 December 2004.

Article 5

The requirements of this Directive shall not apply to materials and articles covered by surface coatings, and adhesives, referred to in points (b) and (c) of the second subparagraph of Article 1(1), which are brought into contact with foodstuffs before 1 March 2003. These materials and articles may continue to be placed on the market provided that the date of filling appears on the materials and articles, taking into account the requirements of Directive 2000/13/EC.

Article 6

Directive 2001/61/EC is hereby repealed.

References to the repealed Directive shall be construed as references to this Directive and be read in accordance with the correlation table set out in Annex III.

Article 7

Member States shall bring into force the laws, regulations and administrative provisions necessary to comply with this Directive by 28 February 2003 at latest. They shall forthwith inform the Commission thereof.

When Member States adopt those provisions, they shall contain a reference to this Directive or be accompanied by such a reference on the occasion of their official publication. Member States shall determine how such reference is to be made.

Article 8

This Directive shall enter into force on the 20th day following its publication in the *Official Journal of the European Communities*.

Article 9

This Directive is addressed to the Member States.

Done at Brussels, 20 February 2002.

For the Commission

David BYRNE

Member of the Commission

ANNEX I

Specific migration limit for BADGE and certain of its derivatives

1. The sum of the migration levels of the following substances:
   (a) BADGE (= 2,2-bis(4-hydroxyphenyl)propane bis(2,3-epoxypropyl) ether;
   (b) BADGE.H_2O;
   (c) BADGE.HCl;
   (d) BADGE.2HCl;
   (e) BADGE.H_2O.HCl
   shall not exceed the following limits:
   — 1 mg/kg in foodstuffs or in food simulants (analytical tolerance excluded), or
   — 1 mg/6 dm^2 in accordance with the cases provided by Article 4 of Commission Directive 90/128/EEC (1).
2. The migration testing shall be carried out in accordance to the rules established in Council Directive 82/711/EEC (2), as well as in Directive 90/128/EEC. However in aqueous food simulants, this value should also include BADGE.$2H_2O$ unless the material or article is labelled for use in contact only with those foods and/or beverages for which it has been demonstrated that the sum of the migration levels of the five substances listed in paragraph 1(a), (b), (c), (d) and (e) cannot exceed the limits provided in paragraph 1.
3. For the purpose of this Directive, the specific migration of the substances listed in paragraph 1(a), (b), (c), (d) and (e) should be determined by a validated method of analysis. If such a method does not exist, an analytical method with appropriate performance characteristics may be used, pending the development of a validated method.

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(1) OJ L 75, 21.3.1990, p. 19.
(2) OJ L 297, 23.10.1982, p. 26.

ANNEX II

Specific migration limit for BFDGE and certain of its derivatives

1. The sum of the migration levels of the following substances:

   (a) BFDGE (= bis(hydroxyphenyl)methane bis(2,3-epoxypropyl)ethers);

   (b) BFDGE.H_2O;

   (c) BFDGE.HCl;

   (d) BFDGE.2HCl;

   (e) BFDGE.H_2O.HCl

   added to the sum of those listed in Annex I, shall not exceed the following limits:

   — 1 mg/kg in foodstuffs or in food simulants (analytical tolerance excluded), or

   — 1 mg/6 dm^2 in accordance with the cases provided by Article 4 of Directive 90/128/EEC.

2. The migration testing shall be carried out in accordance to the rules established in Directive 82/711/EEC, as well as in Directive 90/128/EEC. However in aqueous food simulants, this value should also include BFDGE.$2H_2O$ unless the material or article is labelled for use in contact only with those foods and/or beverages for which it has been demonstrated that the sum of the migration levels of the five substances listed in paragraph 1(a), (b), (c), (d) and (e), added to those listed in Annex I, cannot exceed the limits provided in paragraph 1.

3. For the purpose of this Directive, the specific migration of the substances listed in paragraph 1(a), (b), (c), (d) and (e) should be determined by a validated method of analysis. If such a method does not exist, an analytical method with appropriate performance characteristics may be used, pending the development of a validated method.

ANNEX III

Correlation table

Directive 2001/61/EC	This Directive
Article 1	Article 1
Article 2	Article 2
Article 3	Article 3
Article 4	Article 4
Article 5	Article 5
—	Article 6
Article 6	Article 7
Article 7	Article 8
Article 8	Article 9
Annex I	Annex I
Annex II	Annex II
—	Annex III

Appendix B

(Commission directive 90/128/EEC)

21. 3. 90 Official Journal of the European Communities No L 75/19

II

(Acts whose publication is not obligatory)

COMMISSION

COMMISSION DIRECTIVE

of 23 February 1990

relating to plastics materials and articles intended to come into contact with foodstuffs

(90/128/EEC)

THE COMMISSION OF THE EUROPEAN COMMUNITIES,

Having regard to the Treaty establishing the European Economic Community,

Having regard to Council Directive 89/109/EEC of 21 December 1989 on the approximation of the laws of the Member States relating to materials and articles intended to come into contact with foodstuffs (1), and in particular Article 3 thereof,

Whereas Article 2 of Directive 89/109/EEC lays down that materials and articles, in their finished state, must not transfer their constituents to foodstuffs in quantities which could endanger human health or bring about an unacceptable change in the composition of the foodstuffs;

Whereas, in order to achieve this objective in the case of plastics materials and articles, a suitable instrument is a specific Directive within the meaning of Article 3 of Directive 89/109/EEC, the general provisions of which are also applicable to the case in question;

Whereas the scope of this Directive must coincide with that of Council Directive 82/711/EEC (2);

Whereas since the rules established in this Directive are not suitable for ion-exchange resins, these materials and articles will be covered by a subsequent specific Directive;

Whereas the establishment of a list of approved substances accompanied by a limit an overall migration and, where necessary, by other specific restrictions will be sufficient to achieve the objective laid down in Article 2 of Directive 89/109/EEC;

Whereas the stage reached in the work at Community level does not yet permit adoption of a complete list of the authorized substances applicable to all types of plastics materials and articles and therefore the substances which are currently used in at least one Member State can continue to be used pending a decision on inclusion in the Community list; whereas this Directive will accordingly be extended in due course to the substances and sectors provisionally excluded;

Whereas the overall migration limit is a measure of the inertness of the material and prevents an unacceptable change in the composition of the foodstuffs, and, moreover, reduces the need for a large number of specific migration limits or other restrictions, thus giving effective control;

Whereas Directive 82/711/EEC lays down the basic rules necessary for testing migration of the constituents of plastics materials and articles and Council Directive 85/572/EEC (3) establishes the list of simulants to be used in the migration tests;

(1) OJ No L 40, 11. 2. 1989, p. 38.
(2) OJ No L 297, 23. 10. 1982, p. 26.
(3) OJ No L 372, 31. 12. 1985, p. 14.

Whereas Council Directive 78/142/EEC (1) lays down limits for the quantity of vinyl chloride present in plastics materials and articles prepared with this substance and for the quantity of vinyl chloride released by these materials and articles, and Directives 80/766/EEC (2) and 81/432/EEC (3) establish the Community methods of analysis for controlling these limits;

Whereas Commission Directive 80/590/EEC (4) determines the symbol that may accompany any material and article intended to come into contact with foodstuffs;

Whereas in view of potential liability, there is a need for the written declaration provided for in Article 6 (5) of Directive 89/109/EEC whenever professional use is made of plastics materials and articles which are not by their nature clearly intended for food use;

Whereas, in accordance with Article 3 of Directive 89/109/EEC, the Scientific Committee for Food has been consulted on the provisions liable to affect public health;

Whereas the measures provided for in this Directive are in accordance with the opinion of the Standing Committee on Foodstuffs,

HAS ADOPTED THIS DIRECTIVE:

Article 1

1. This Directive is a specific Directive within the meaning of Article 3 of Directive 89/109/EEC.

2. This Directive shall apply to plastics materials and articles and parts thereof:

(a) consisting exclusively of plastics, or

(b) composed of two or more layers of materials, each consisting exclusively of plastics, which are bound together by means of adhesives or by any other means,

which, in the finished product state, are intended to come into contact or are brought into contact with foodstuffs and are intended for that purpose.

3. For the purposes of this Directive, 'plastics' shall mean the organic macromolecular compounds obtained by polymerization, polycondensation, polyaddition or any other similar process from molecules with a lower molecular weight or by chemical alteration of natural macromolecules. Silicones and other similar macromolecular compounds shall also be regarded as plastics. Other substances or matter may be added to such macromolecular compounds.

However, the following shall not be regarded as plastics:

(i) varnished or unvarnished regenerated cellulose film, covered by Council Directive 83/229/EEC (5), as amended by Directive 86/388/EEC (6);

(ii) elastomers and natural and synthetic rubber;

(iii) paper and paperboard, whether modified or not by the addition of plastics;

(iv) surface coatings obtained from:

— paraffin waxes, including synthetic paraffin waxes, and/or micro-crystalline waxes,

— mixtures of the waxes listed in the first indent with each other and/or with plastics;

(v) ion-exchange resins.

4. This Directive shall not apply, until further action by the Commission, to materials and articles composed of two or more layers, one or more of which does not consist exclusively of plastics, even if the one intended to come into direct contact with foodstuffs does consist exclusively of plastics.

Article 2

Plastics materials and articles shall not transfer their constituents to foodstuffs in quantities exceeding 10 milligrams per square decimetre of surface area of material or article (mg/dm²) (overall migration limit). However, this limit shall be 60 milligrams of the constituents released per kilogram of foodstuff (mg/kg) in the following cases:

(a) articles which are containers or are comparable to containers or which can be filled, with a capacity of not less than 500 millilitres (ml) and not more than 10 litres (l);

(b) articles which can be filled and for which it is impracticable to estimate the surface area in contact with foodstuffs;

(c) caps, gaskets, stoppers or similar devices for sealing.

Article 3

1. Only those monomers and other starting substances listed in Annex II, Sections A and B may be used for the manufacture of plastics materials and articles subject to the restrictions specified.

2. From the date of notification of this Directive, the list in Annex II, Section A may be amended:

— either by adding substances listed in Annex 2, Section B, according to the criteria in Annex II of Directive 89/109/EEC, or

— by including 'new substances', i.e. substances which are listed neither in Section A nor in Section B of Annex 2, according to Article 3 of Directive 89/109/EEC.

(1) OJ No L 44, 15. 2. 1978, p. 15.
(2) OJ No L 213, 16. 8. 1980, p. 42.
(3) OJ No L 167, 24. 6. 1981, p. 6.
(4) OJ No L 151, 19. 6. 1980, p. 21.
(5) OJ No L 123, 11. 5. 1983, p. 31.
(6) OJ No L 228, 14. 8. 1986, p. 32.

3. From the date of notification of this Directive no Member State shall authorize any new substance for use within its territory except under the procedure in Article 4 of Directive 89/109/EEC.

4. As from 1 January 1993, only those monomers and other starting substances listed in Annex II, Section A shall be used for the manufacture of plastics materials and articles, subject to the restrictions specified therein. However, before 1 January 1992 it may be decided that, in some justified cases, for certain substances listed in Annex II, section B, this time limit will be postponed.

5. However the lists appearing in Annex II, Sections A and B do not yet include monomers and other starting substances used only in the manufacture of:

— surface coatings obtained from resinous or polymerized products in liquid, powder or dispersion form, such as varnishes, lacquers, paints, etc.,
— silicones,
— epoxy resins,
— products obtained by means of bacterial fermentation,
— adhesives and adhesion promoters,
— printing inks.

Article 4

The specific migration limits in the list set out in Annex II are expressed in mg/kg. However, such limits are expressed in mg/dm² in the following cases:

(a) articles which are containers or are comparable to containers or which can be filled, with a capacity of less than 500 ml or more than 10 l;
(b) sheet, film or other materials which cannot be filled or for which it is impracticable to estimate the relationship between the surface area of such materials and the quantity of foodstuff in contact therewith.

In these cases, the limits set out in Annex II, expressed in mg/kg shall be divided by the conventional conversion factor of 6 in order to express them in mg/dm².

Article 5

1. Verification of compliance with the migration limits shall be carried out in accordance with the rules laid down in Directives 82/711/EEC and 85/572/EEC and the further provisions set out in Annex I.

2. The verification of compliance with the specific migration limits provided for in paragraph 1 shall not be compulsory, if it can be established that compliance with the overall migration limit laid down in Article 2 implies that the specific migration limits are not exceeded.

Article 6

1. At the marketing stages other than the retail stages, the plastics materials and articles which are intended to be placed in contact with foodstuffs shall be accompanied by a written declaration in accordance with Article 6 (5) of Directive 89/109/EEC.

2. Paragraph 1 does not apply to plastics materials and articles which by their nature are clearly intended to come into contact with foodstuffs.

Article 7

1. The Member States shall bring into force the laws, regulations and administrative provisions necessary to comply with this Directive not later than 31 December 1990. They shall forthwith inform the Commission thereof.

2. Member States shall:

— permit the trade in and use of plastics materials and articles complying with this Directive before 1 January 1991,
— prohibit trade in and use of plastics materials and articles intended to come into contact with foodstuffs and which do not comply with this Directive as from 1 January 1993.

Article 8

This Directive is addressed to the Member States.

Done at Brussels, 23 February 1990.

For the Commission
Martin BANGEMANN
Vice-President

Appendix C

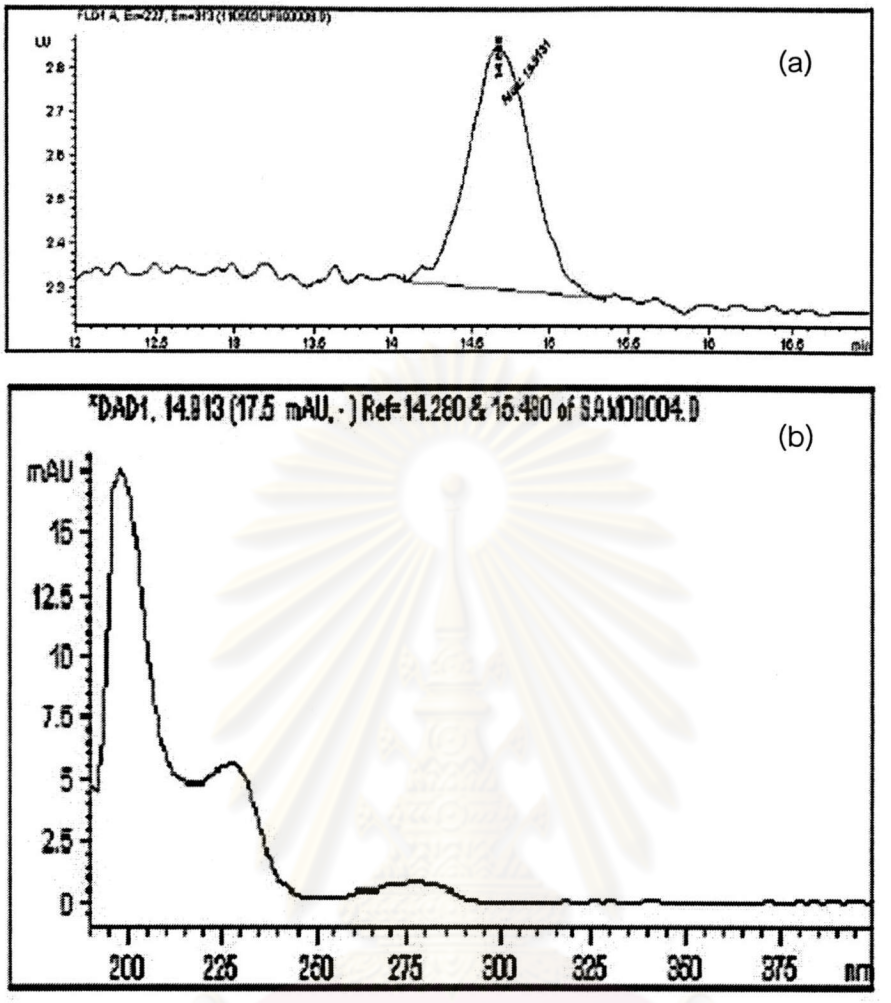

Figure C-1. Chromatogram of BADGE standard by HPLC condition in table 4.1 (a) and UV-visible spectra of BADGE (b)

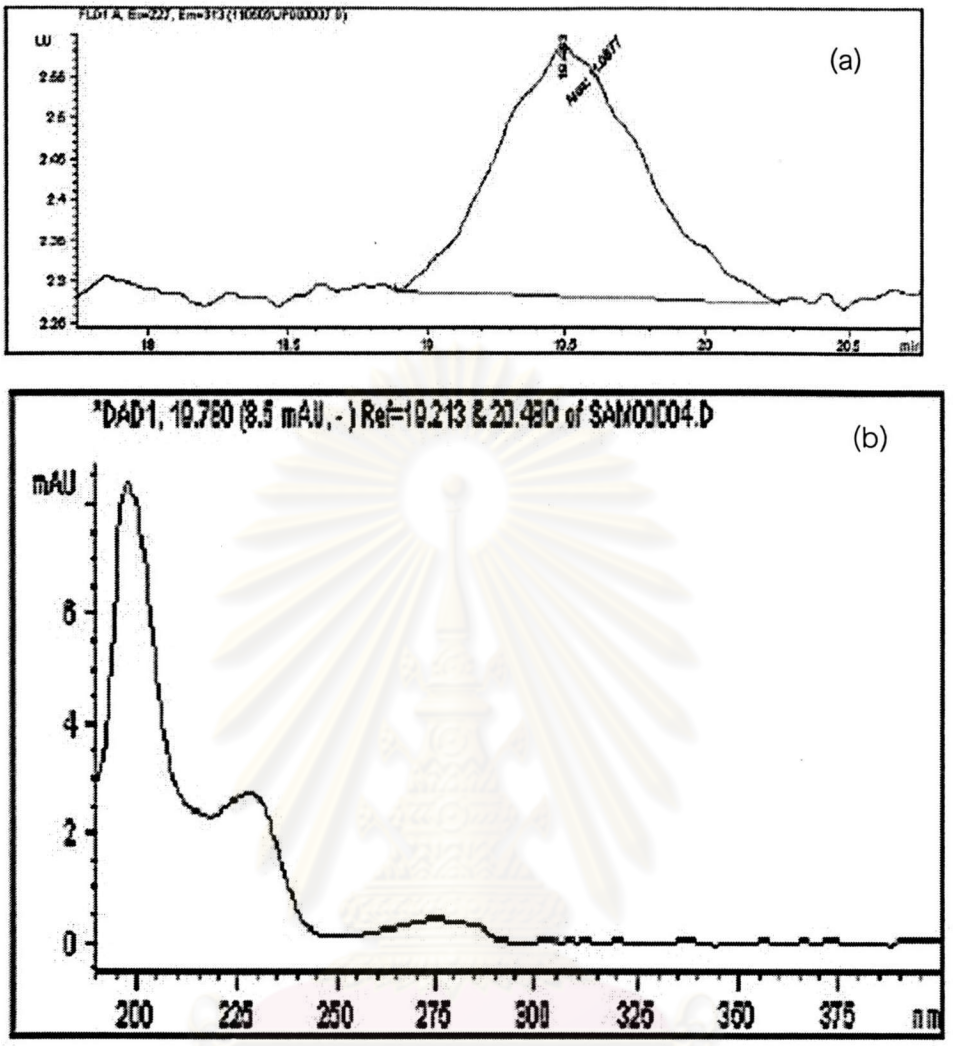

Figure C-2. Chromatogram of BADGE.HCl standard by HPLC condition in table 4.1 (a) and UV-visible spectra of BADGE.HCl (b).

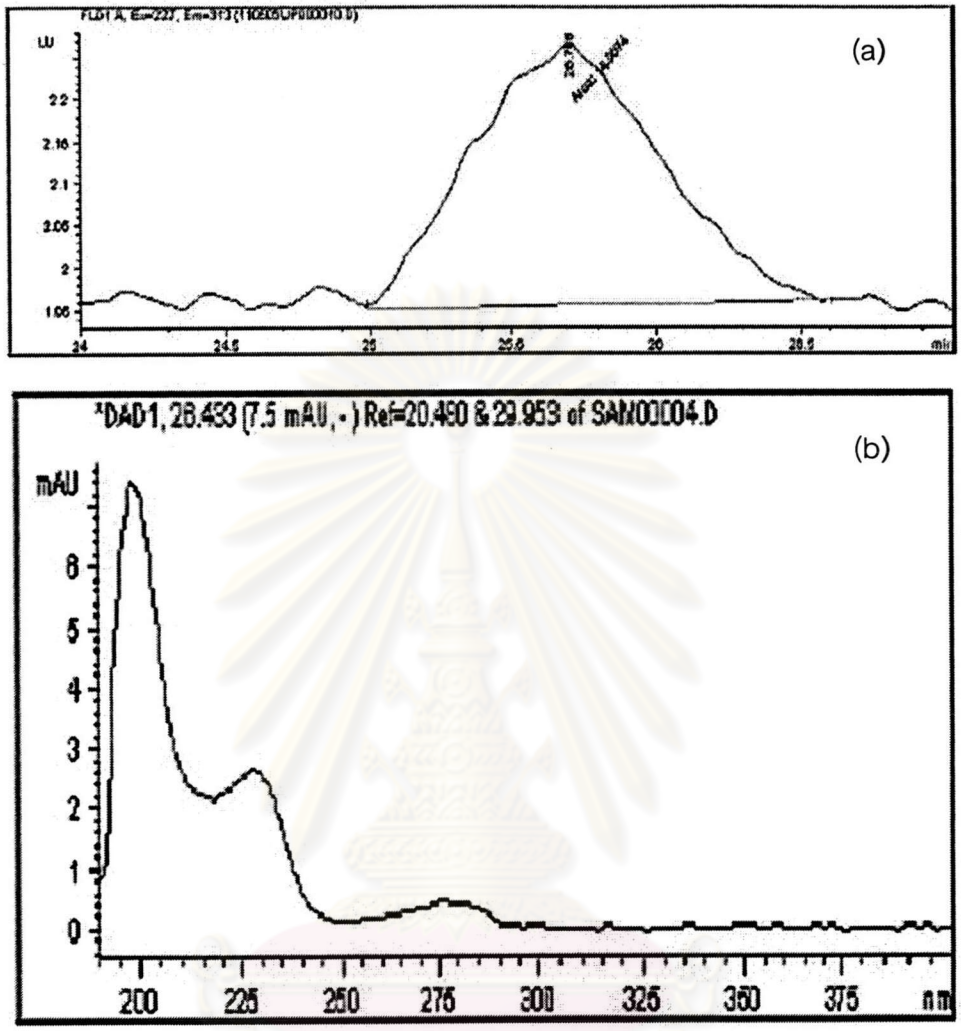

Figure C-3. Chromatogram of BADGE.2HCl standard by HPLC condition in table 4.1 (a) and UV-visible spectra of BADGE.2HCl (b).

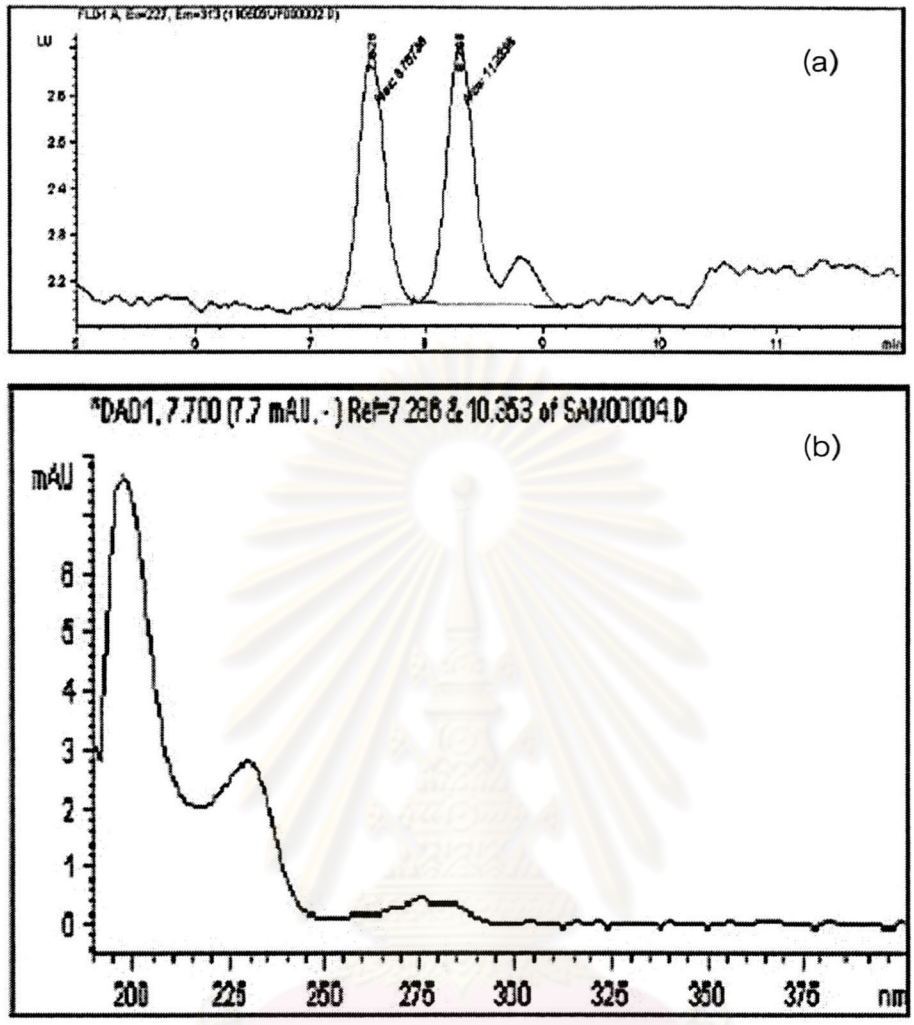

Figure C-4. Chromatogram of BFDGE standard by HPLC condition in table 4.1 (a) and UV-visible spectra of BFDGE (b).

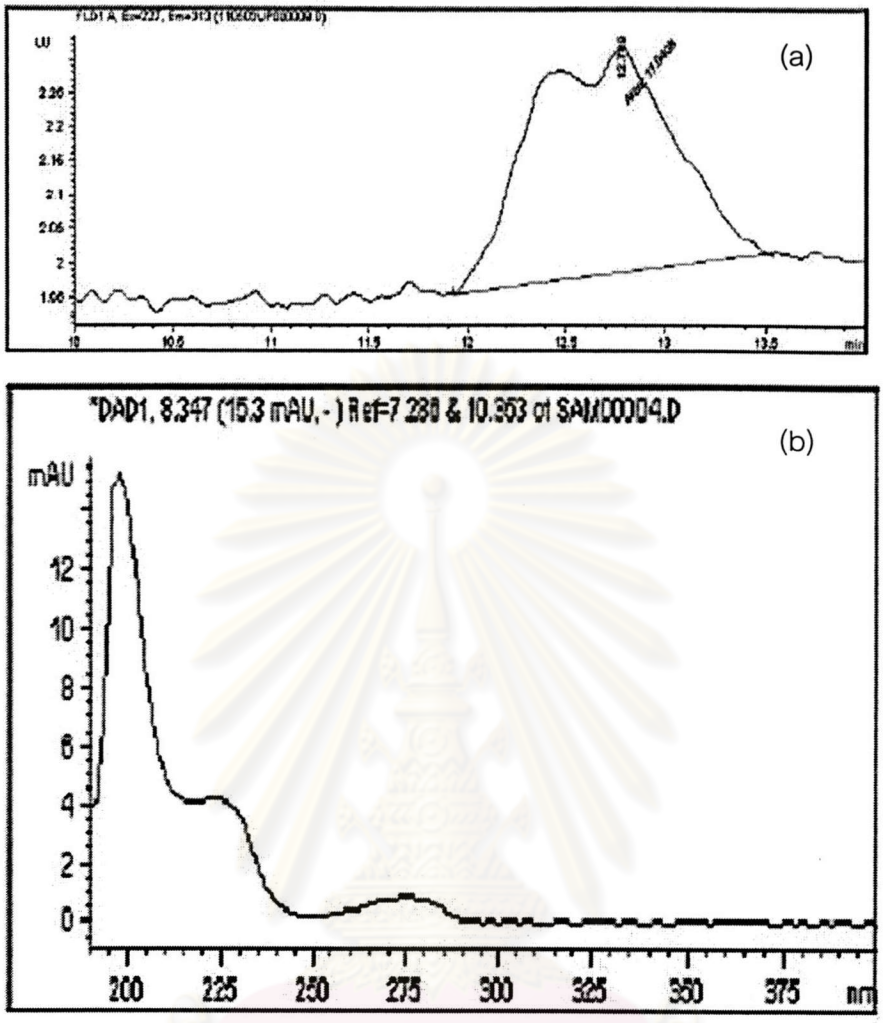

Figure C-5. Chromatogram of BFDGE.2HCl standard by HPLC condition in table 4.1 (a) and UV-visible spectra of BFDGE.2HCl (b).

Appendix D

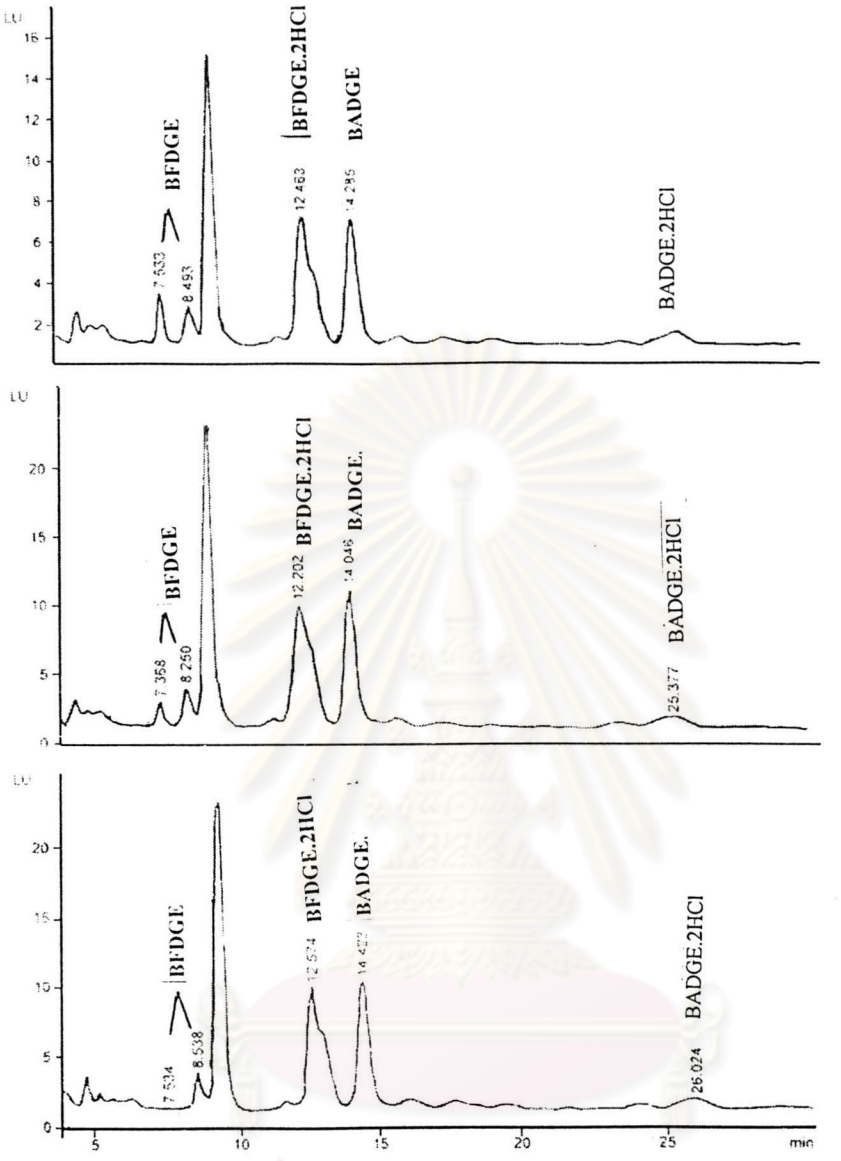

Figure D-1. Chromatograms of canned fried cockles (sample 1) by HPLC condition in Table 4.1. Triplicate analyses of homogenized sample.

A. 1st analysis.

B. 2nd analysis.

C. 3rd analysis.

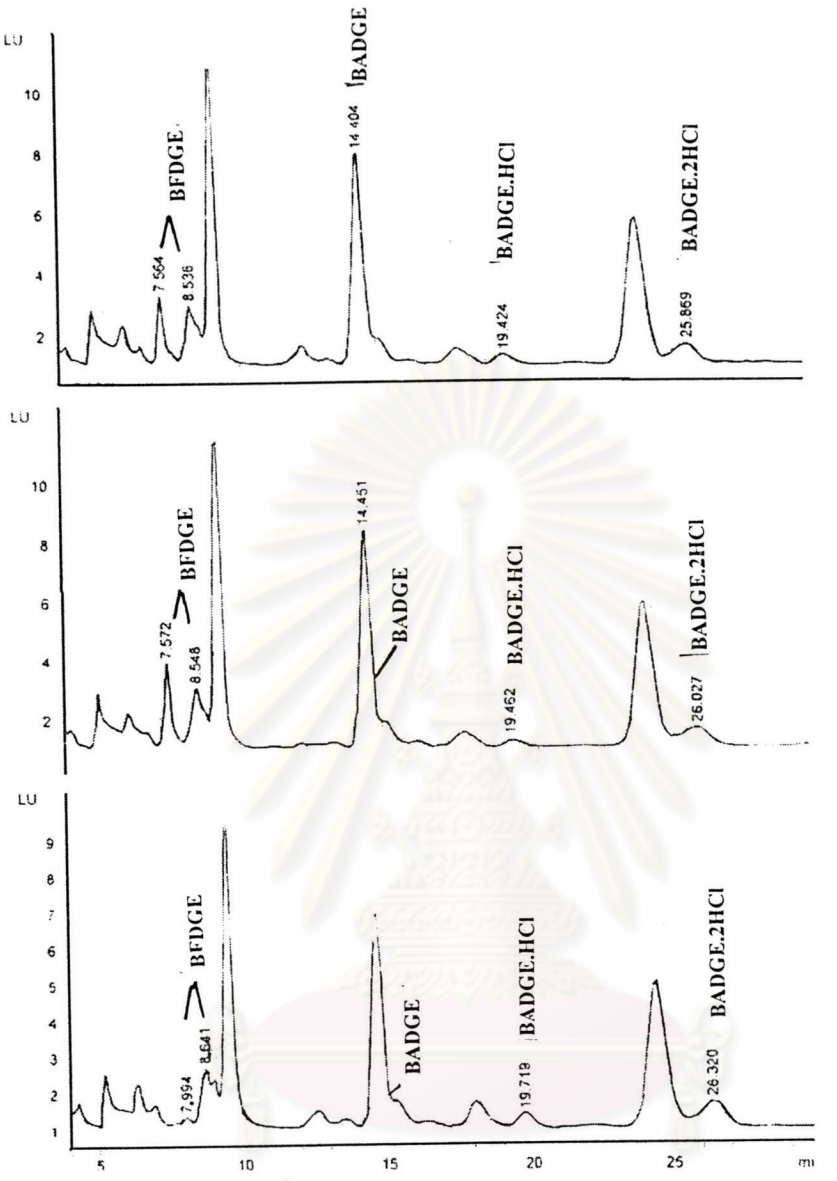

Figure D-2. Chromatograms of canned baby clam (sample 2) by HPLC condition in Table 4.1. Triplicate analyses of homogenized sample.

A. 1st analysis.

B. 2nd analysis.

C. 3rd analysis.

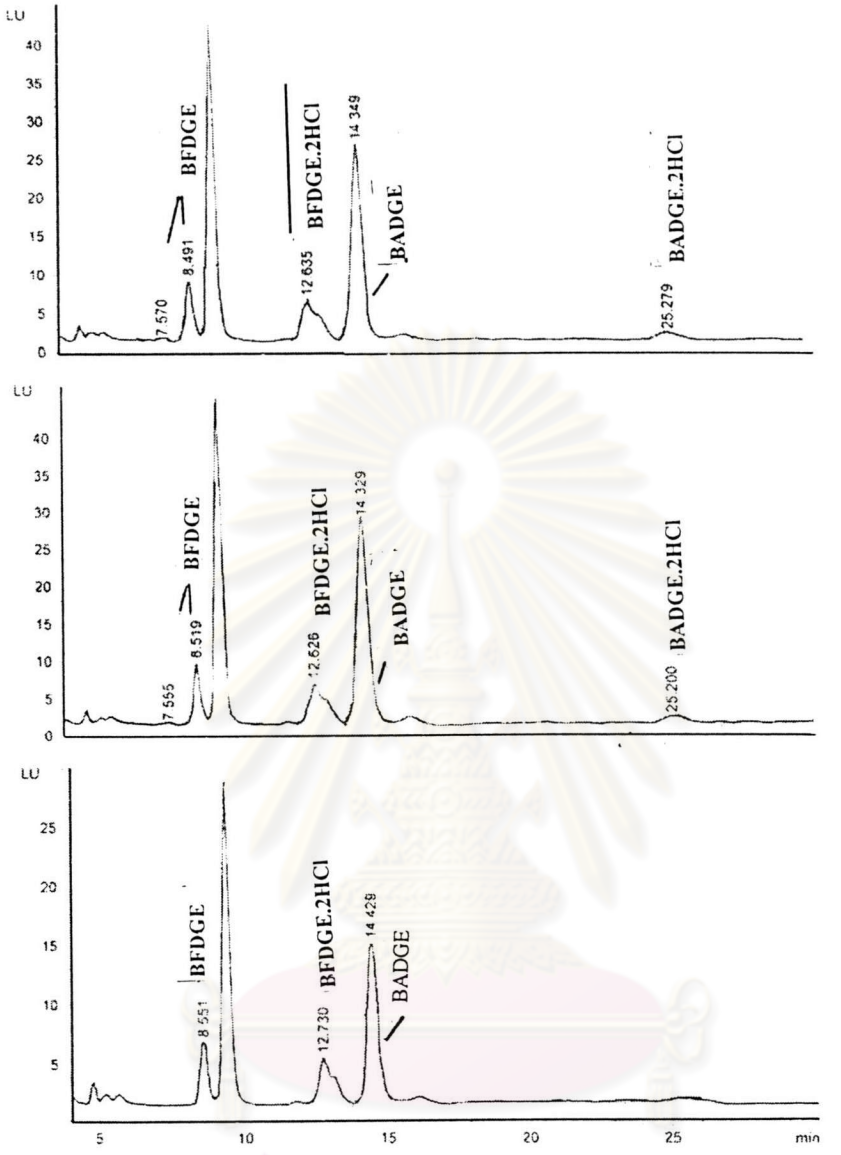

Figure D-3. Chromatograms of canned fried sardines (sample 3) by HPLC condition in Table 4.1. Triplicate analyses of homogenized sample.

A. 1st analysis.

B. 2nd analysis.

C. 3rd analysis.

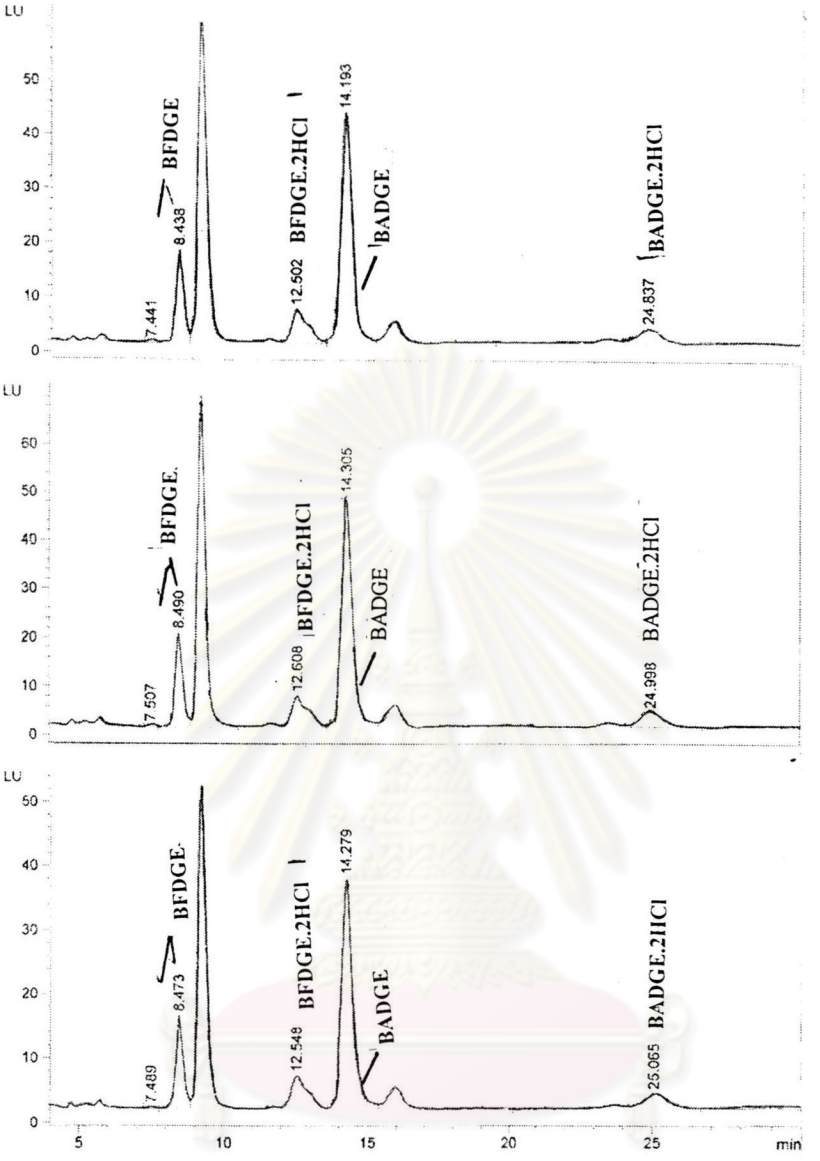

Figure D-4. Chromatograms of canned fried baby clam (sample 4) by HPLC condition in Table 4.1. Triplicate analyses of homogenized sample.

A. 1st analysis.

B. 2nd analysis.

C. 3rd analysis.

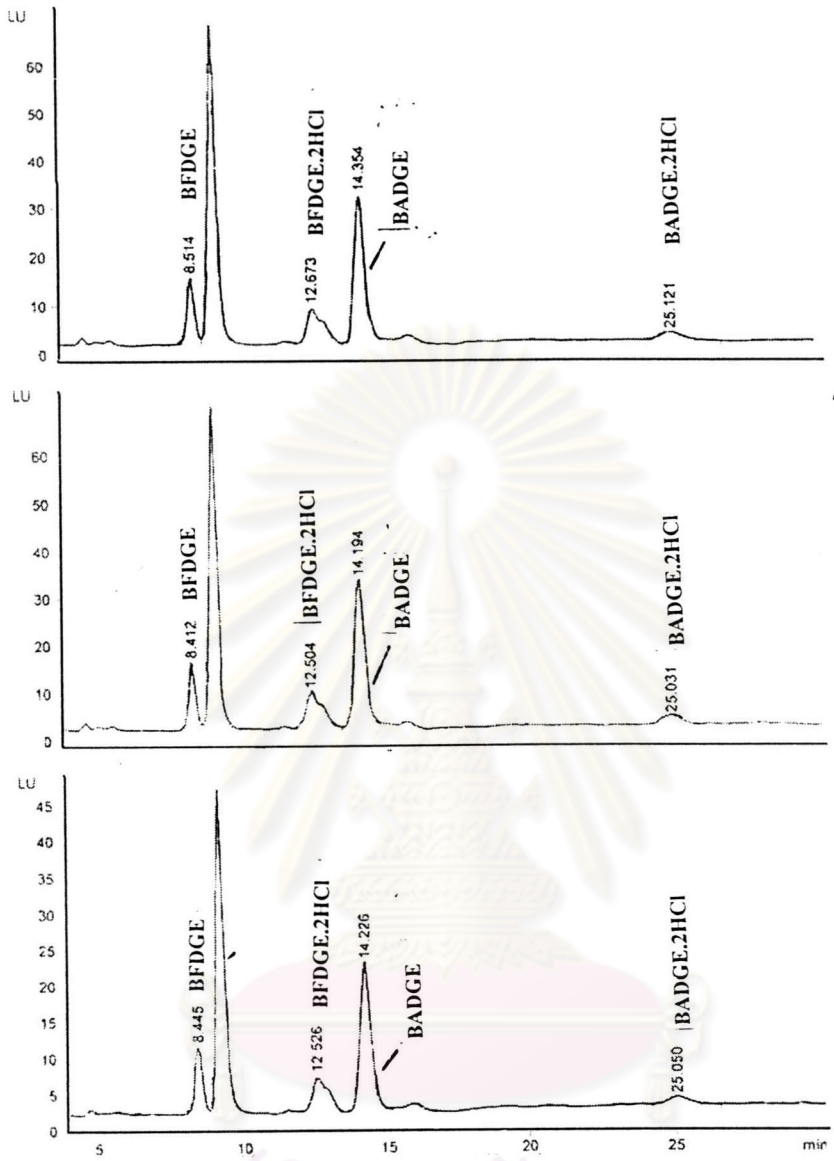

Figure D-5. Chromatograms of canned fried catfish (sample 5) by HPLC condition in Table 4.1. Triplicate analyses of homogenized sample.

A. 1st analysis.

B. 2nd analysis.

C. 3rd analysis.

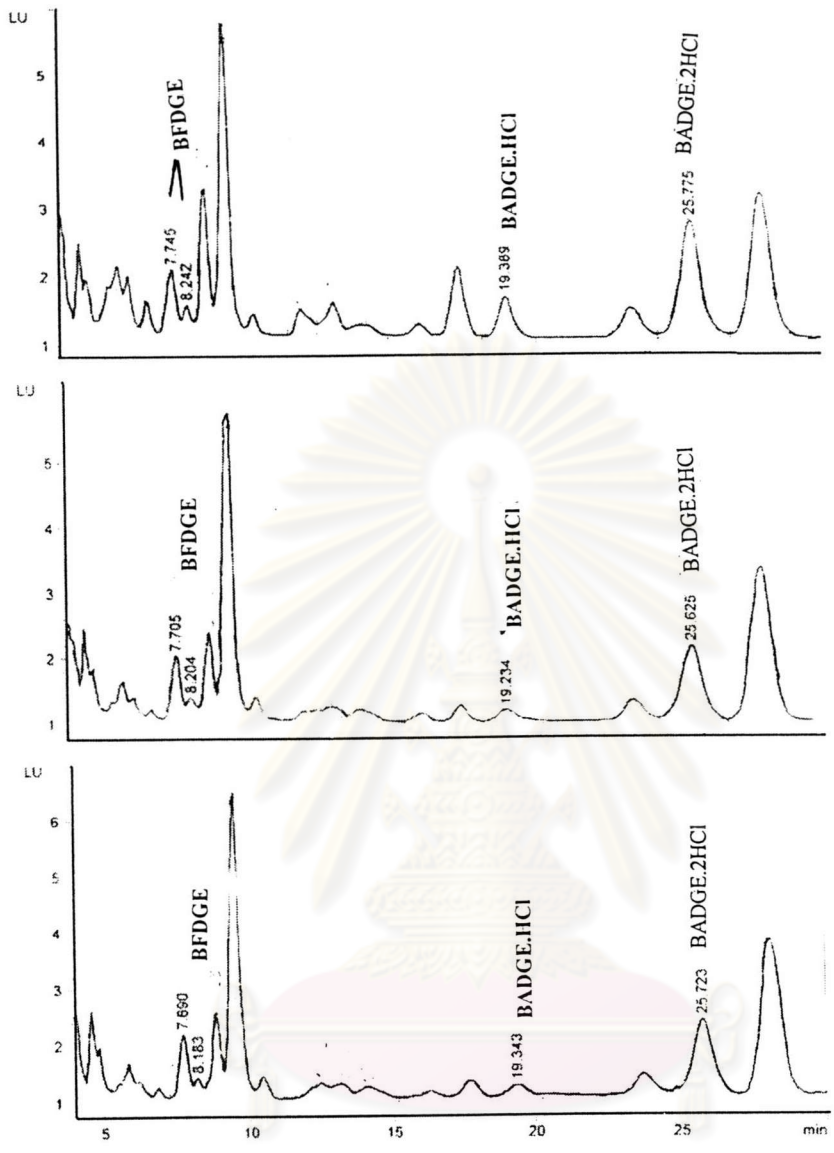

Figure D-6. Chromatograms of canned tuna steak (meat sample 6) by HPLC condition in Table 4.1. Triplicate analyses of homogenized sample.

A. 1st analysis.

B. 2nd analysis.

C. 3rd analysis.

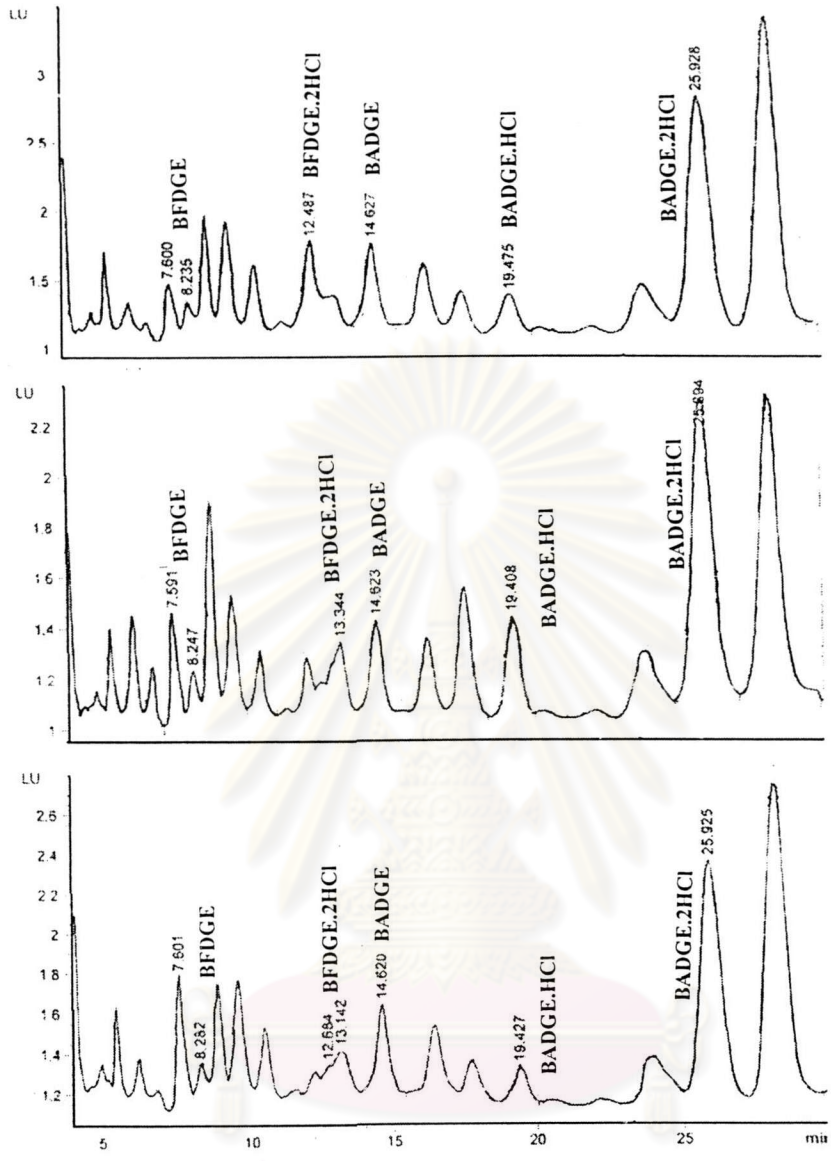

Figure D-7. Chromatograms of canned tuna steak (oil phase sample 6) by HPLC condition in Table 4.1. Triplicate analyses of homogenized sample.

A. 1st analysis.

B. 2nd analysis.

C. 3rd analysis.

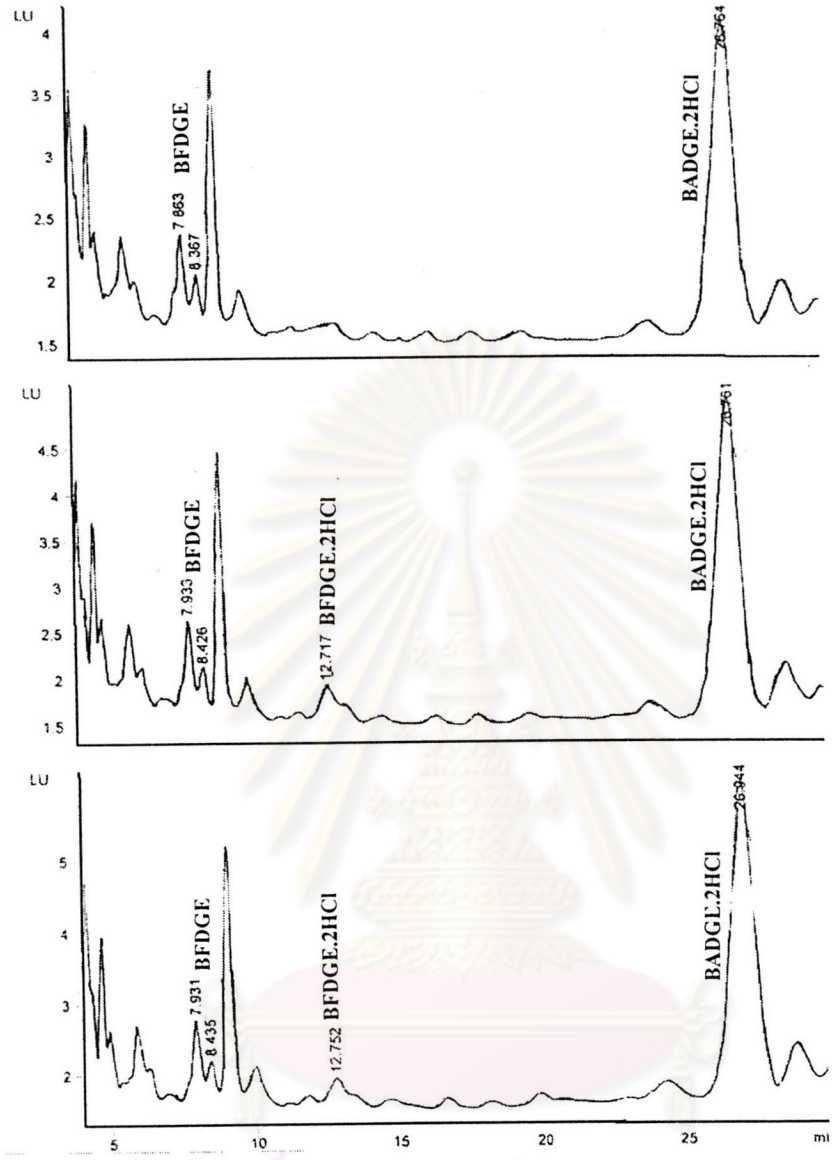

Figure D-8. Chromatograms of canned tuna in mayonnaise (sample 7) by HPLC condition in Table 4.1. Triplicate analyses of homogenized sample.

A. 1st analysis.

B. 2nd analysis.

C. 3rd analysis.

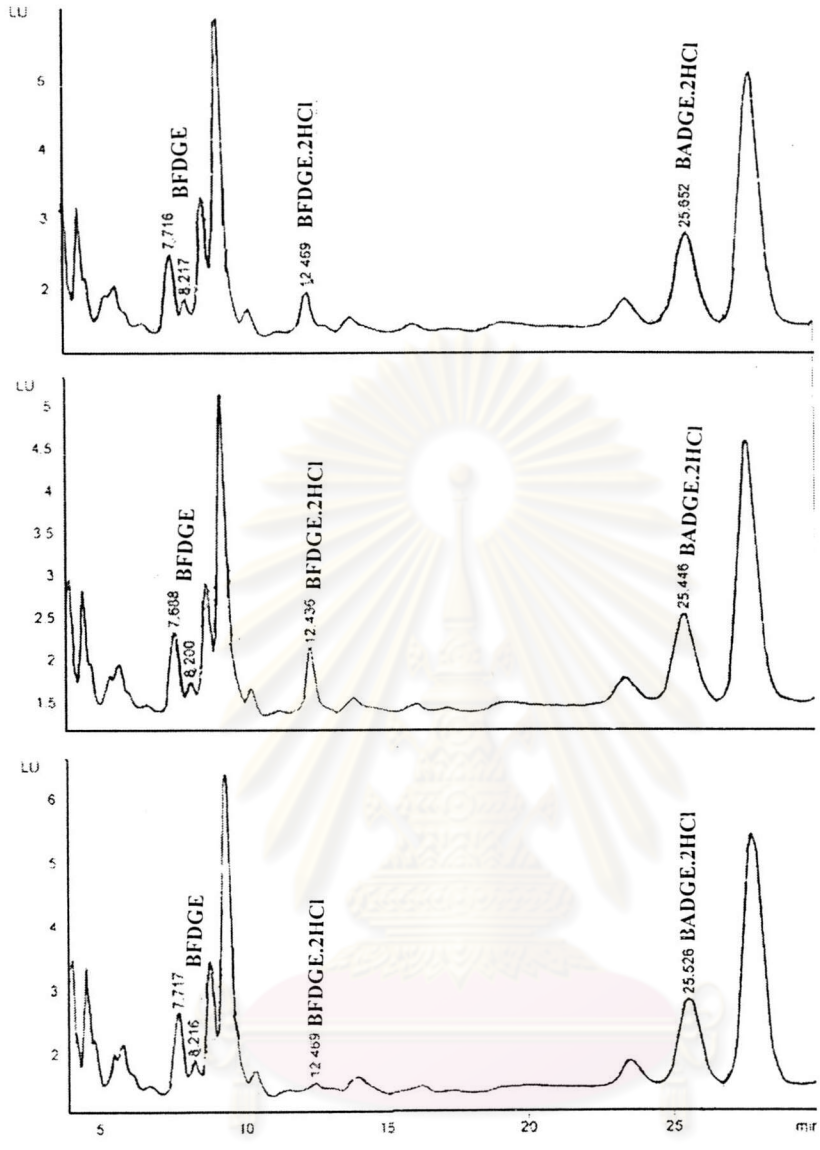

Figure D-9. Chromatograms of canned tuna sandwich (meat sample 8) by HPLC condition in Table 4.1. Triplicate analyses of homogenized sample.

A. 1st analysis.

B. 2nd analysis.

C. 3rd analysis.

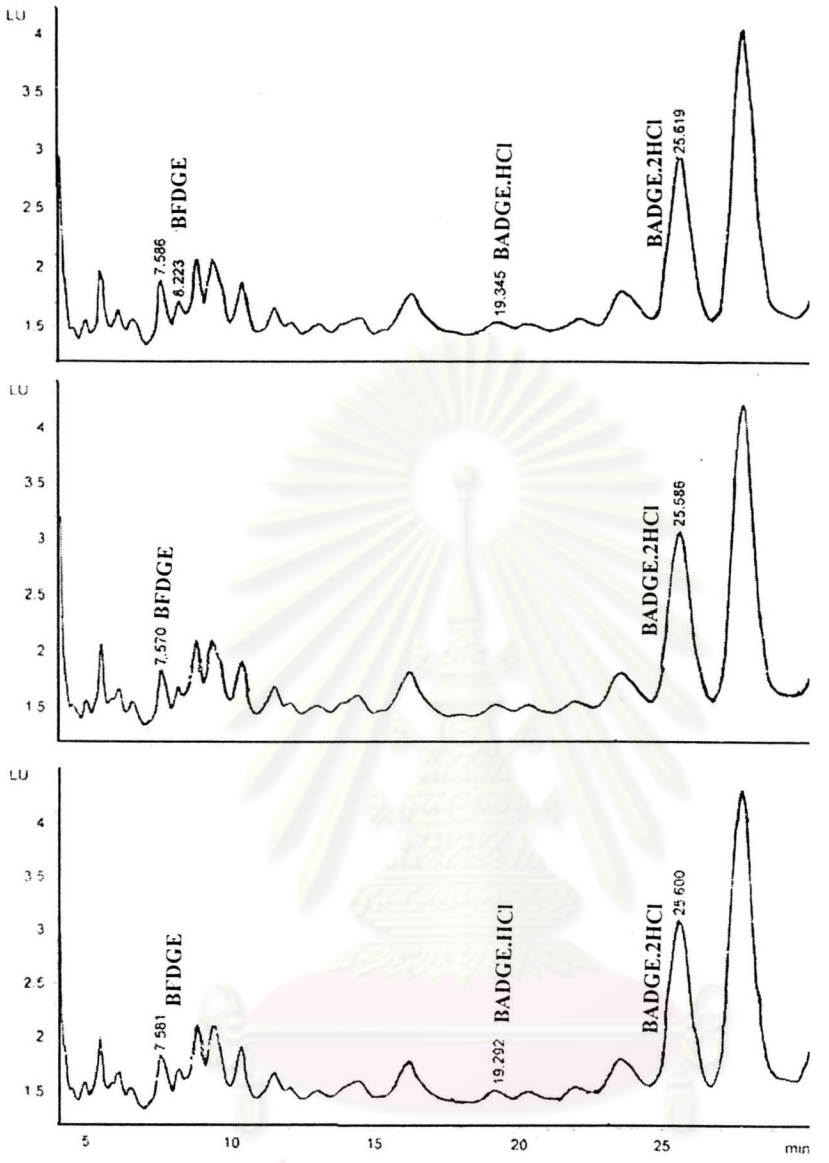

Figure D-10. Chromatograms of canned tuna sandwich (oil phase sample 8) by HPLC condition in Table 4.1. Triplicate analyses of homogenized sample.

A. 1st analysis.

B. 2nd analysis.

C. 3rd analysis.

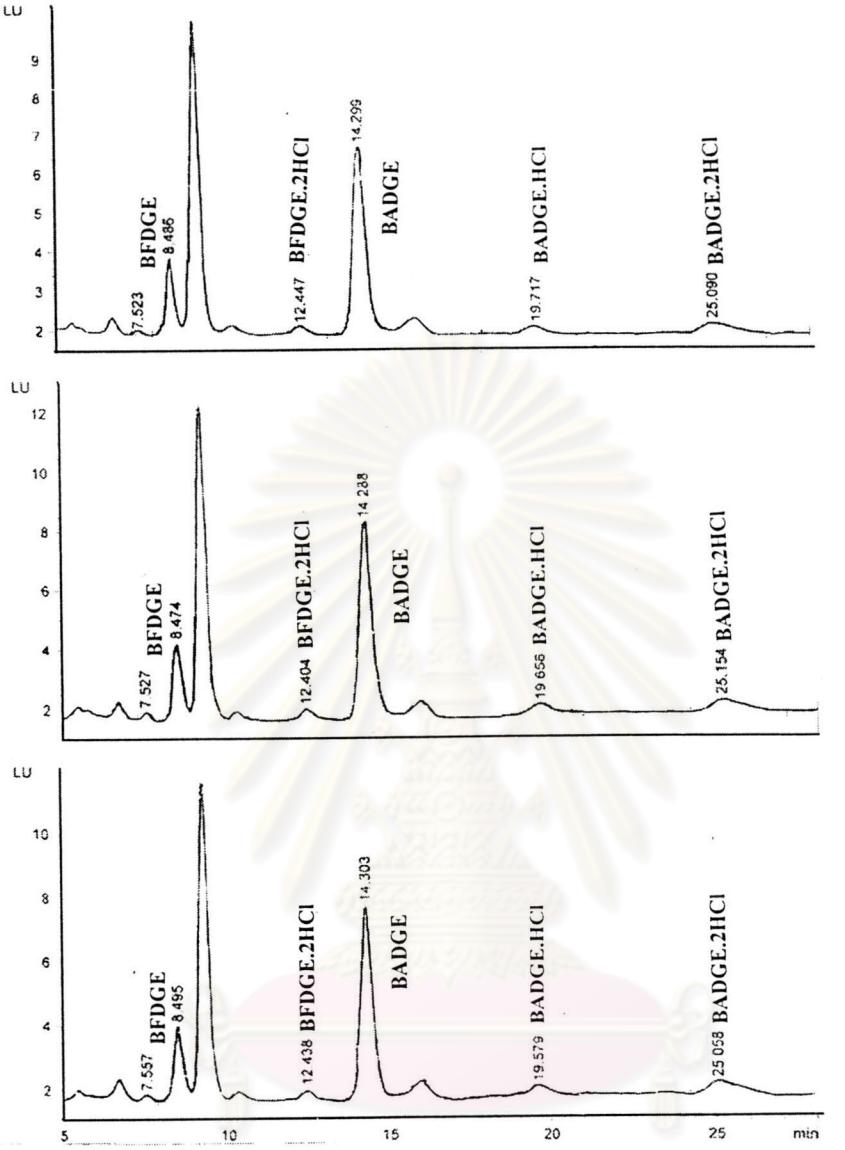

Figure D-11. Chromatograms of canned fried baby clam (sample 9) by HPLC condition in Table 4.1. Triplicate analyses of homogenized sample.

A. 1st analysis.

B. 2nd analysis.

C. 3rd analysis.

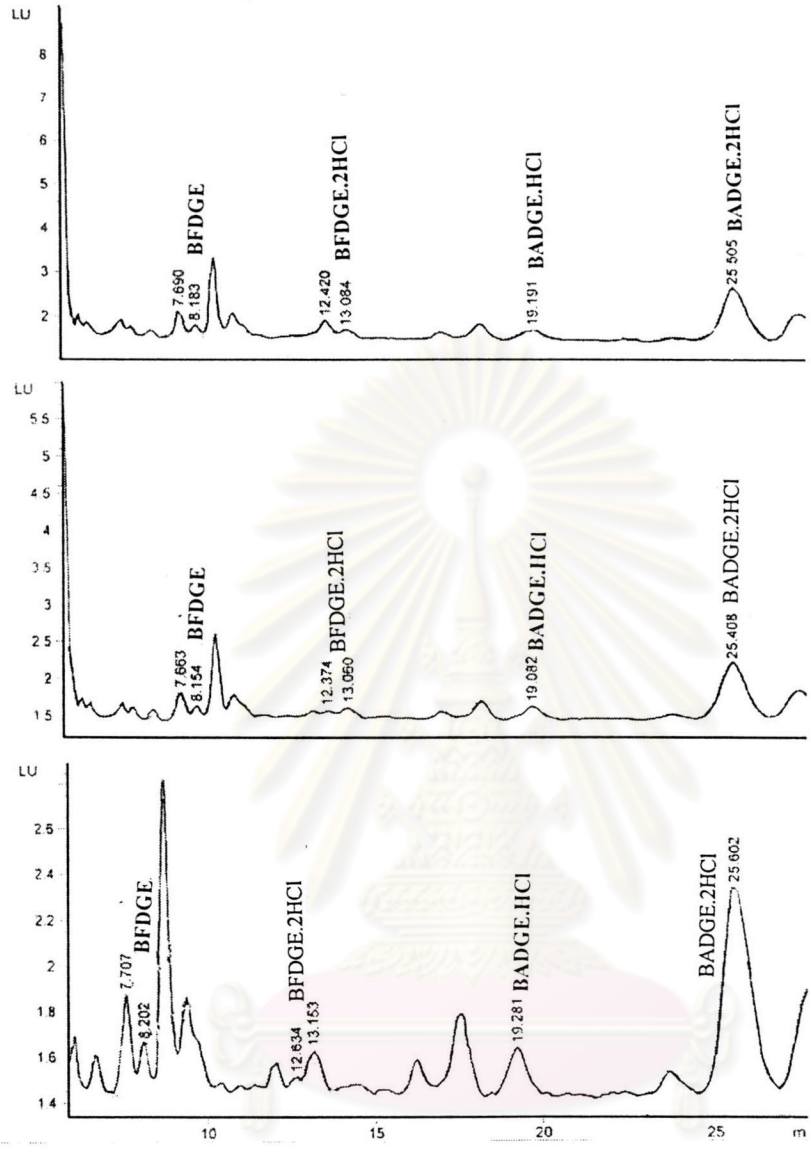

Figure D-12. Chromatograms of canned tuna sandwich (meat sample 10) by HPLC condition in Table 4.1. Triplicate analyses of homogenized sample.

A. 1st analysis.

B. 2nd analysis.

C. 3rd analysis.

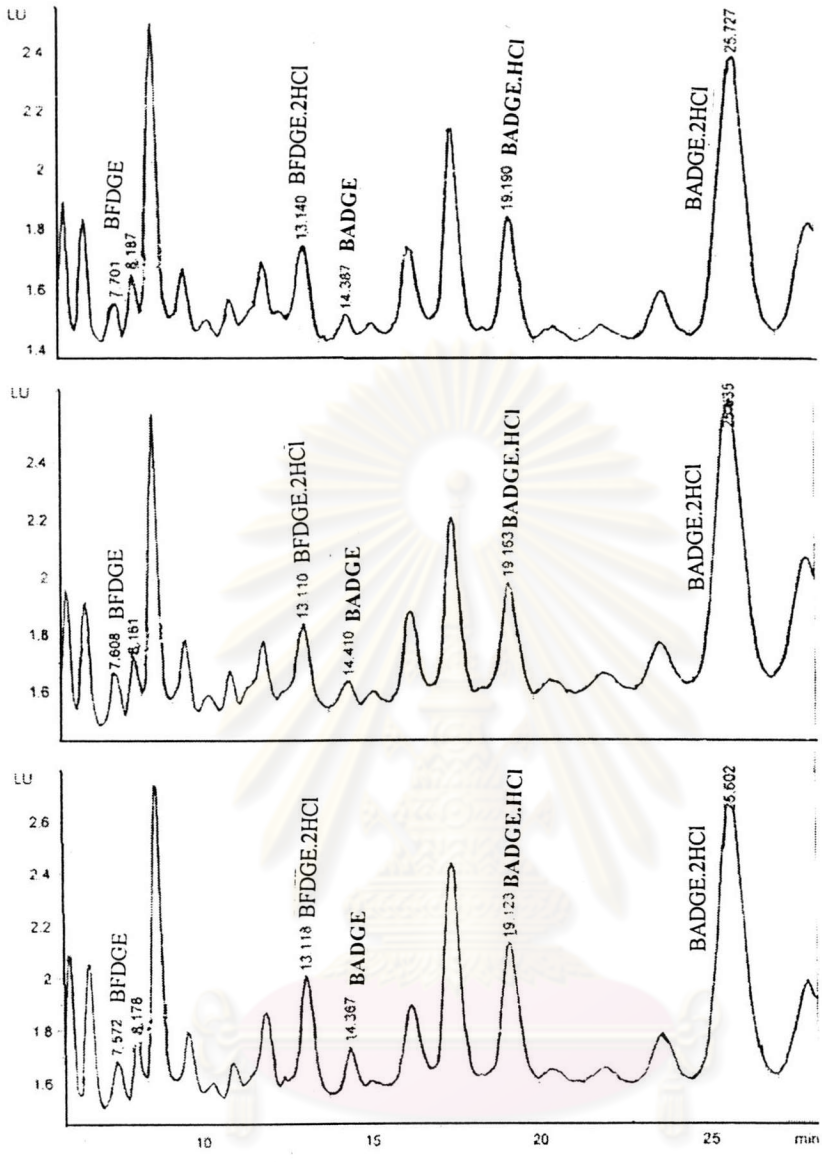

Figure D-13. Chromatograms of canned tuna sandwich (oil phase sample 10) by HPLC condition in Table 4.1. Triplicate analyses of homogenized sample.

A. 1st analysis.

B. 2nd analysis.

C. 3rd analysis.

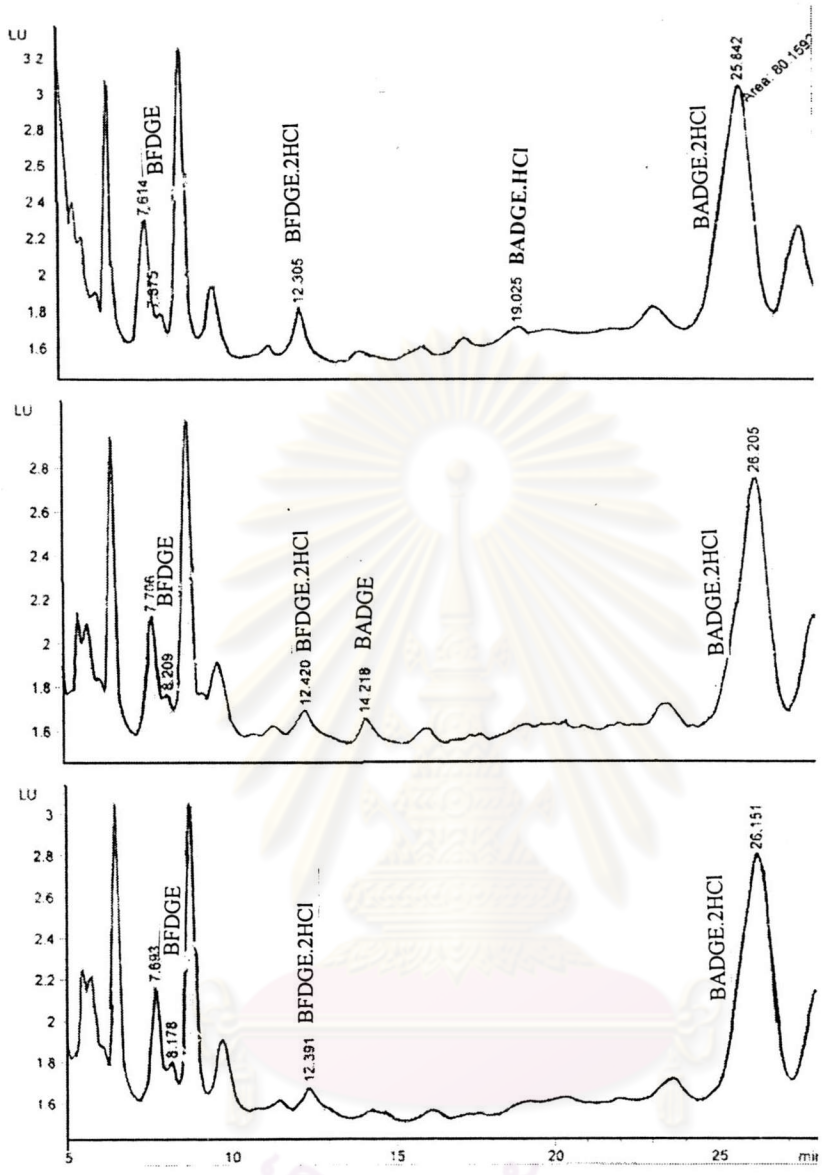

Figure D-14. Chromatograms of canned tuna in mayonnaise (sample 11) by HPLC condition in Table 4.1. Triplicate analyses of homogenized sample.

A. 1st analysis.

B. 2nd analysis.

C. 3rd analysis.

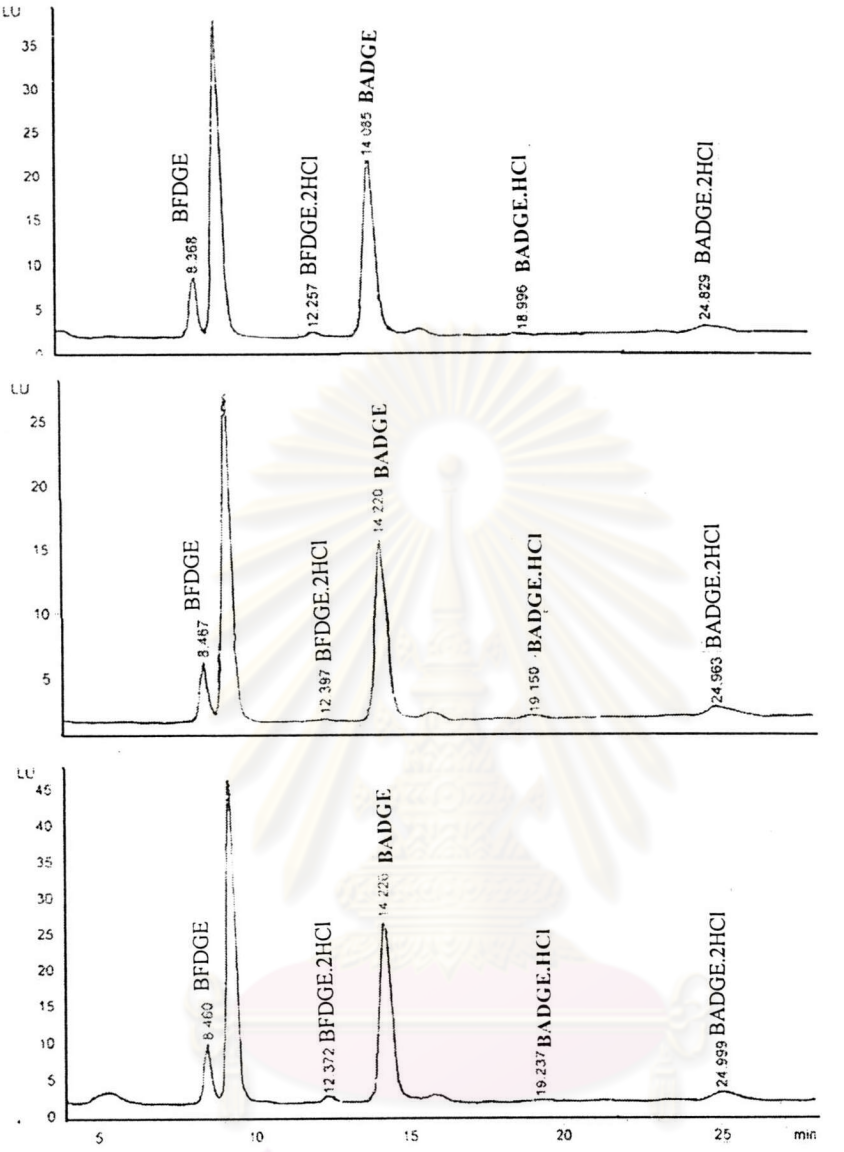

Figure D-15. Chromatograms of canned fried sardines (sample 12) by HPLC condition in Table 4.1. Triplicate analyses of homogenized sample.

A. 1st analysis.

B. 2nd analysis.

C. 3rd analysis.

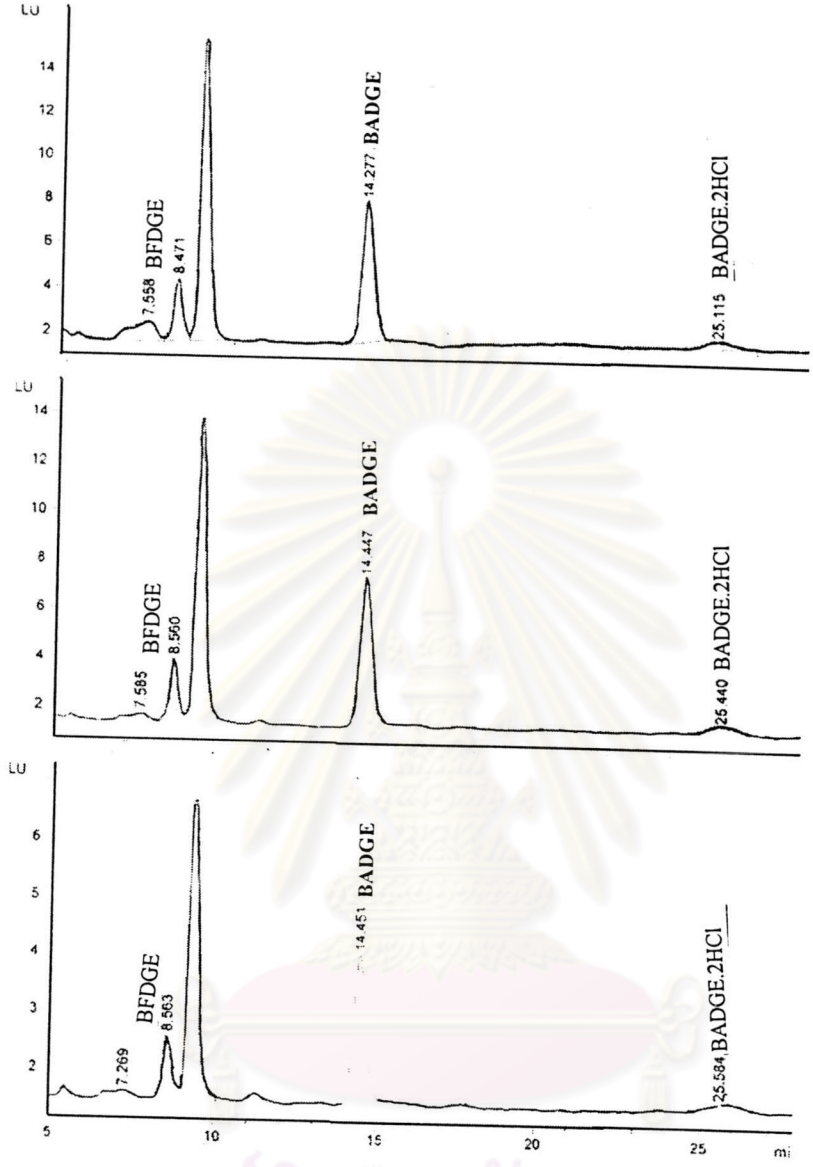

Figure D-16. Chromatograms of canned fried baby clam (sample 13) by HPLC condition in Table 4.1. Triplicate analyses of homogenized sample.

A. 1st analysis.

B. 2nd analysis.

C. 3rd analysis.

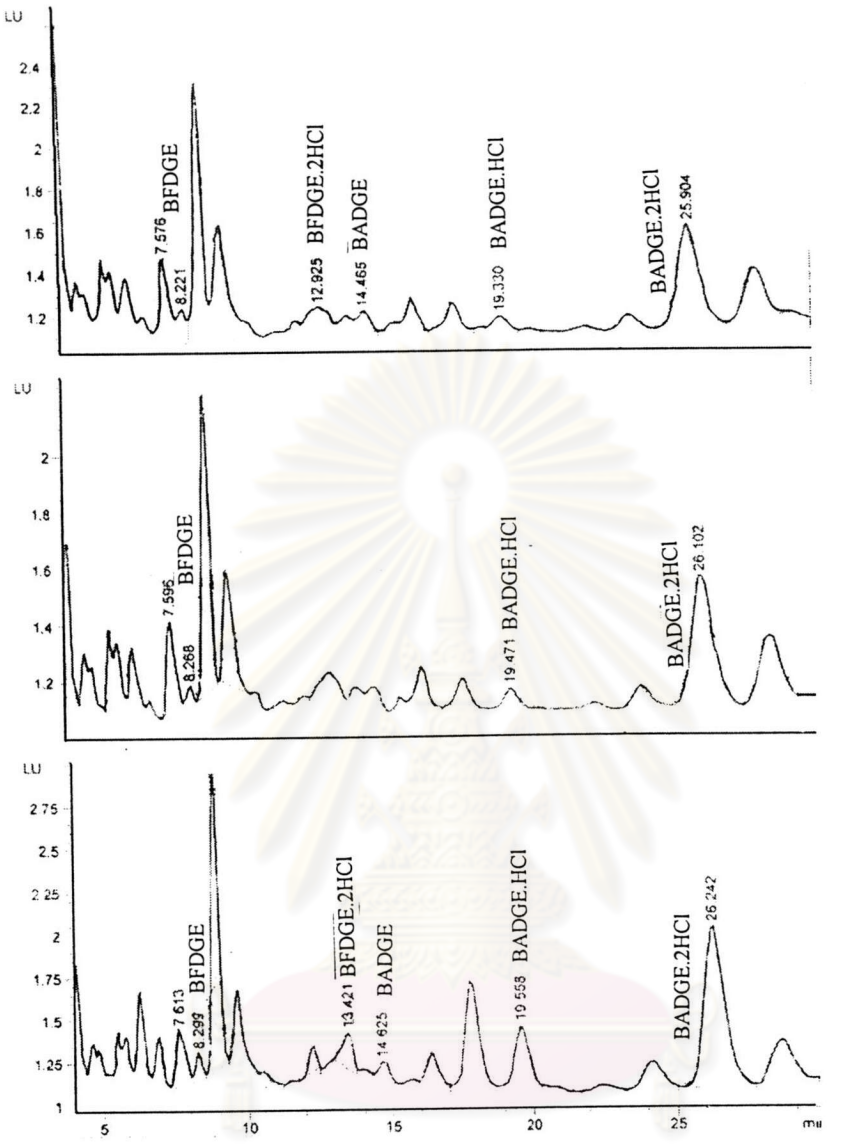

Figure D-17. Chromatograms of canned tuna sandwich (sample 14) by HPLC condition in Table 4.1. Triplicate analyses of homogenized sample.

A. 1st analysis.

B. 2nd analysis.

C. 3rd analysis.

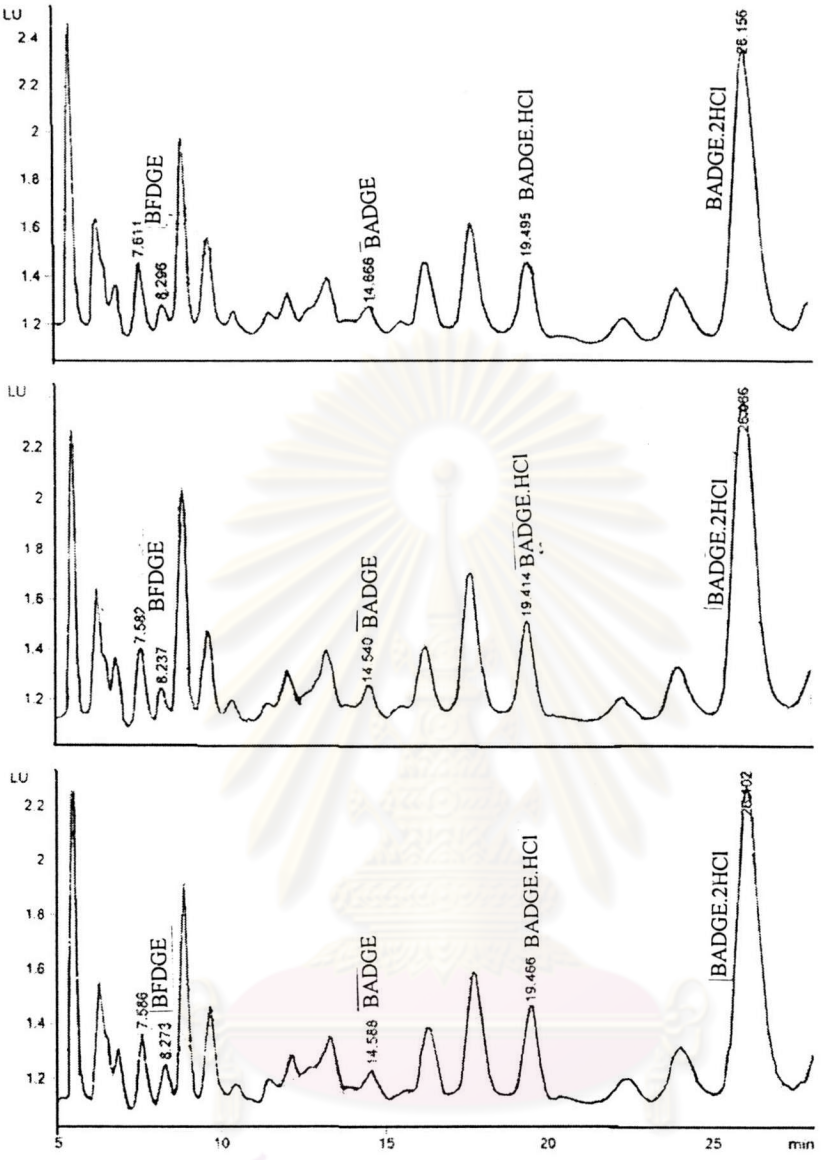

Figure D-18. Chromatograms of canned tuna sandwich (oil phase sample 14) by HPLC condition in Table 4.1. Triplicate analyses of homogenized sample.

A. 1st analysis.

B. 2nd analysis.

C. 3rd analysis.

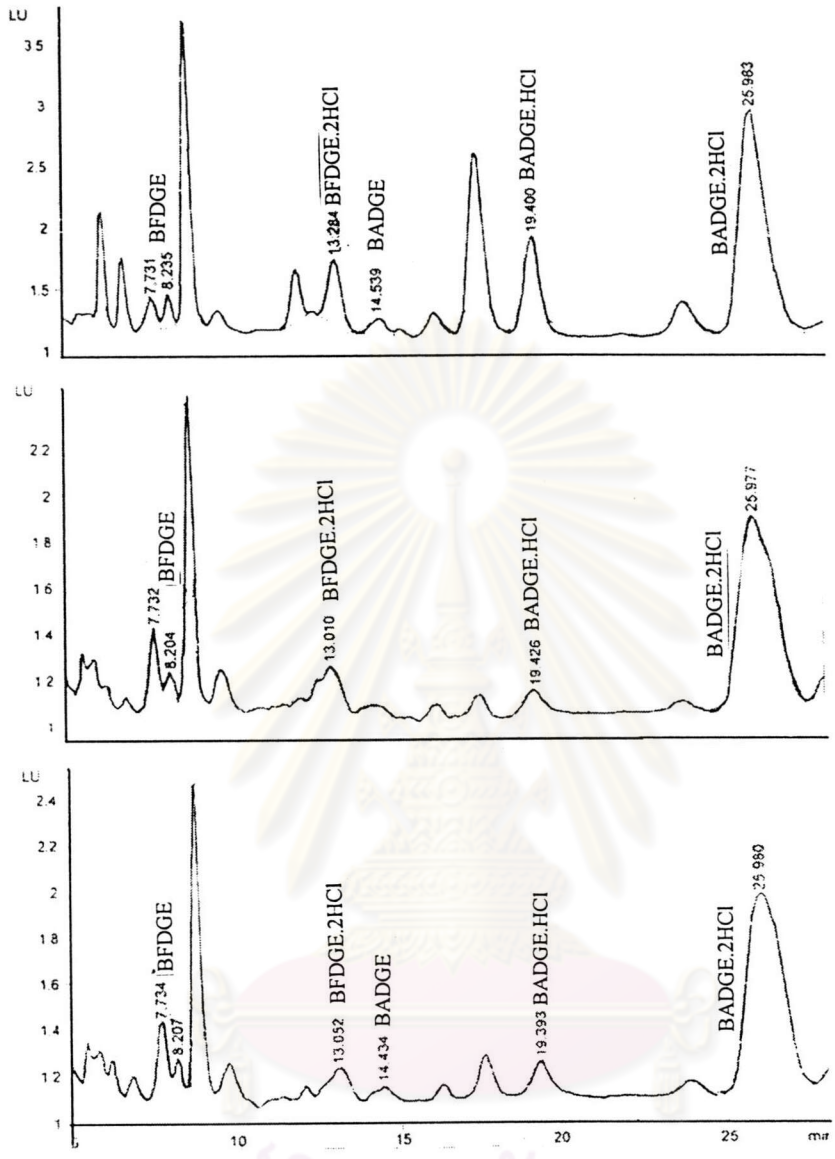

Figure D-19. Chromatograms of canned tuna steak (meat sample 15) by HPLC condition in Table 4.1. Triplicate analyses of homogenized sample.

A. 1st analysis.

B. 2nd analysis.

C. 3rd analysis.

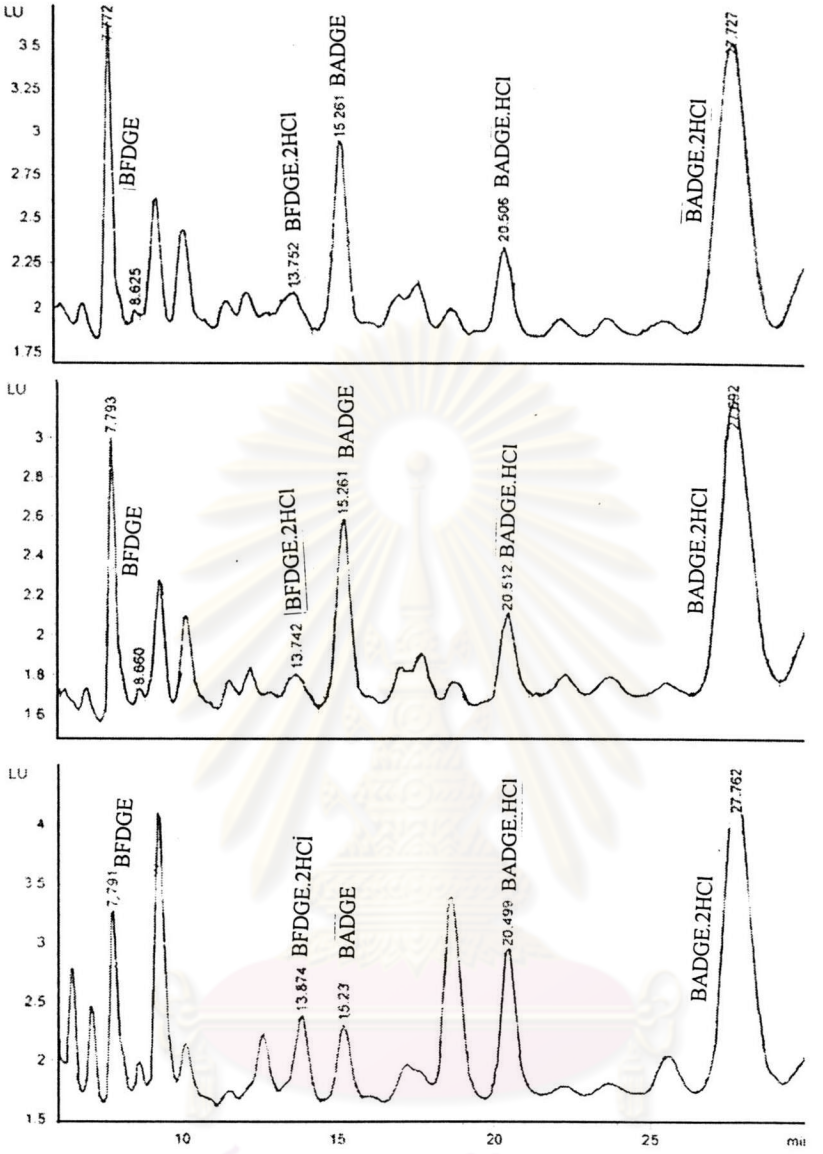

Figure D-20. Chromatograms of canned tuna steak (oil phase sample 15) by HPLC condition in Table 4.1. Triplicate analyses of homogenized sample.

A. 1st analysis.

B. 2nd analysis.

C. 3rd analysis.

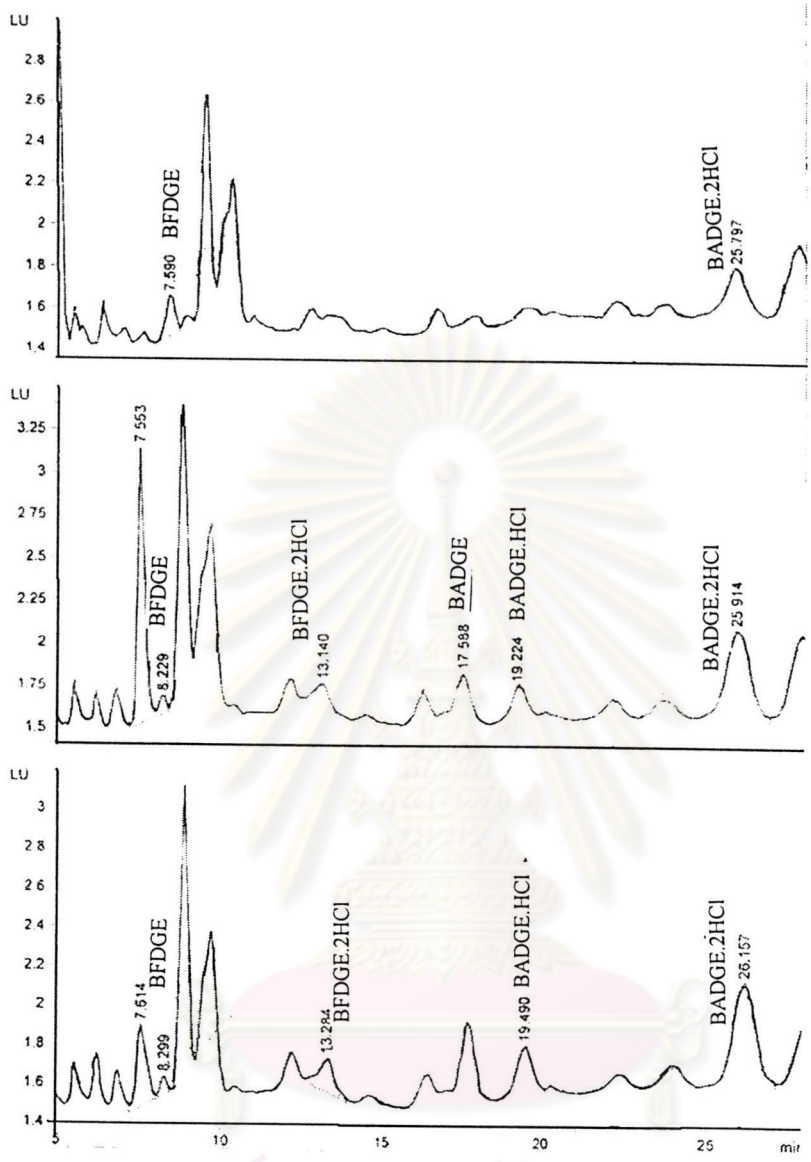

Figure D-21. Chromatograms of canned tuna sandwich (meat sample 16) by HPLC condition in Table 4.1. Triplicate analyses of homogenized sample.

A. 1st analysis.

B. 2nd analysis.

C. 3rd analysis.

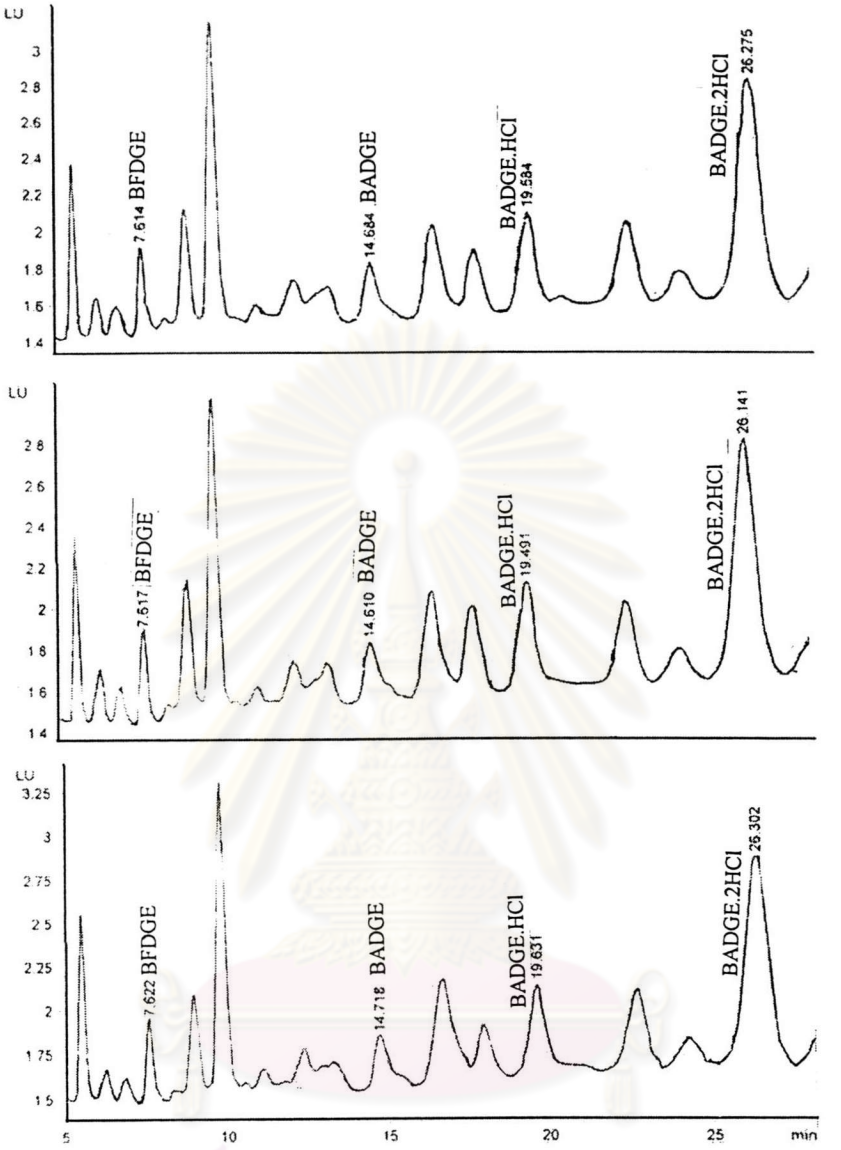

Figure D-22. Chromatograms of canned tuna sandwich (oil phase sample 16) by HPLC condition in Table 4.1. Triplicate analyses of homogenized sample.

A. 1st analysis.

B. 2nd analysis.

C. 3rd analysis.

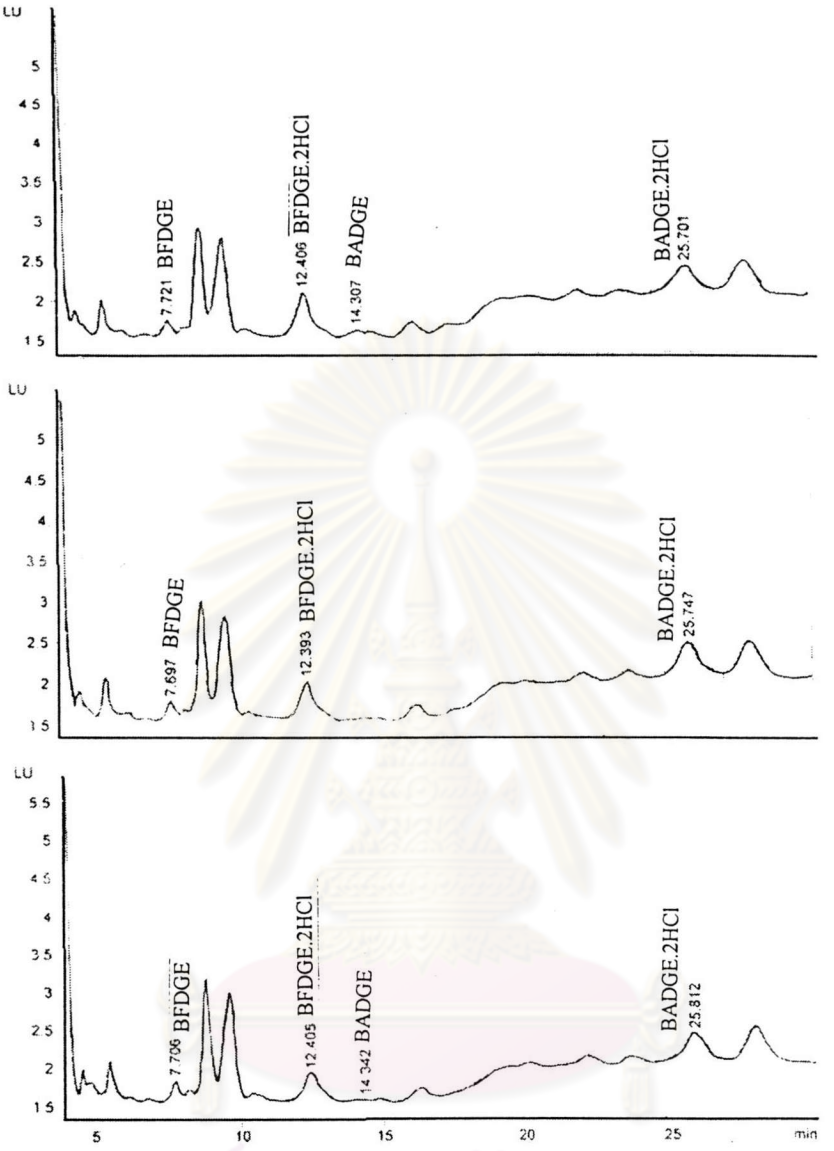

Figure D-23. Chromatograms of canned tuna steak (meat sample 17) by HPLC condition in Table 4.1. Triplicate analyses of homogenized sample.

A. 1st analysis.

B. 2nd analysis.

C. 3rd analysis.

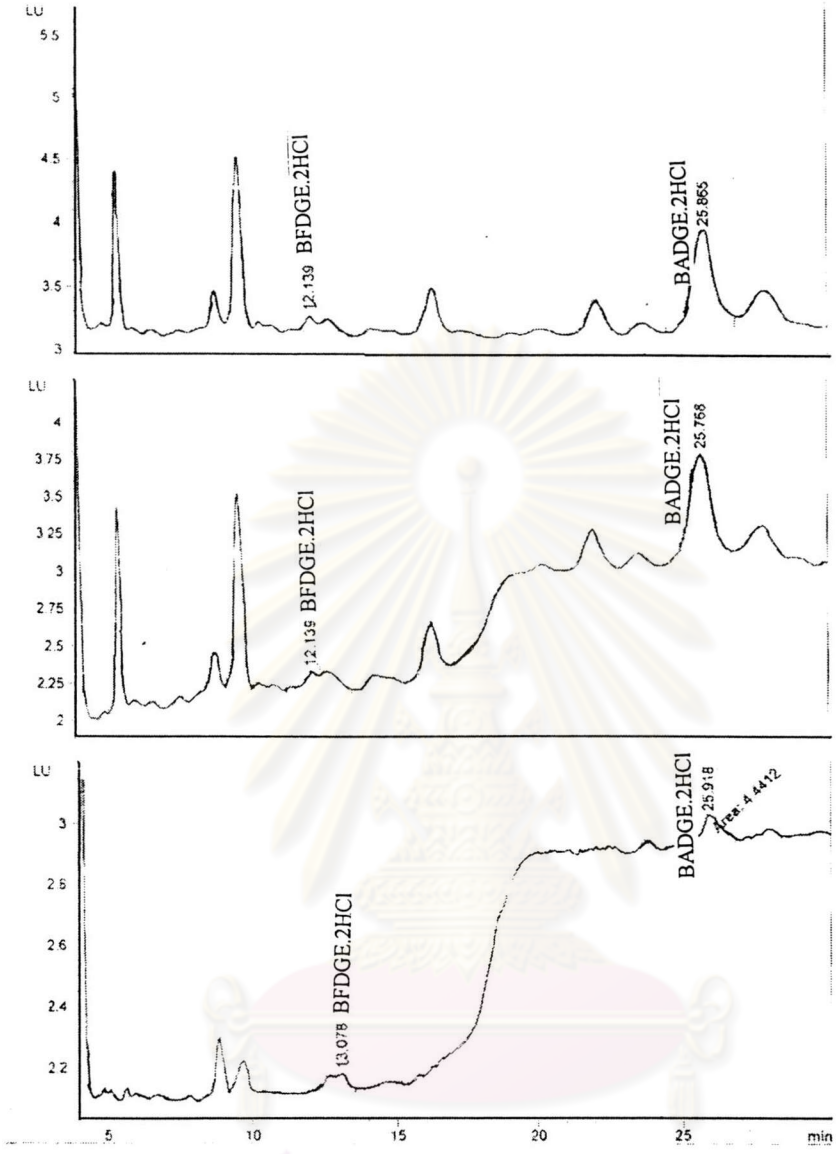

Figure D-24. Chromatograms of canned tuna steak (oil phase sample 17) by HPLC condition in Table 4.1. Triplicate analyses of homogenized sample.

A. 1st analysis.

B. 2nd analysis.

C. 3rd analysis.

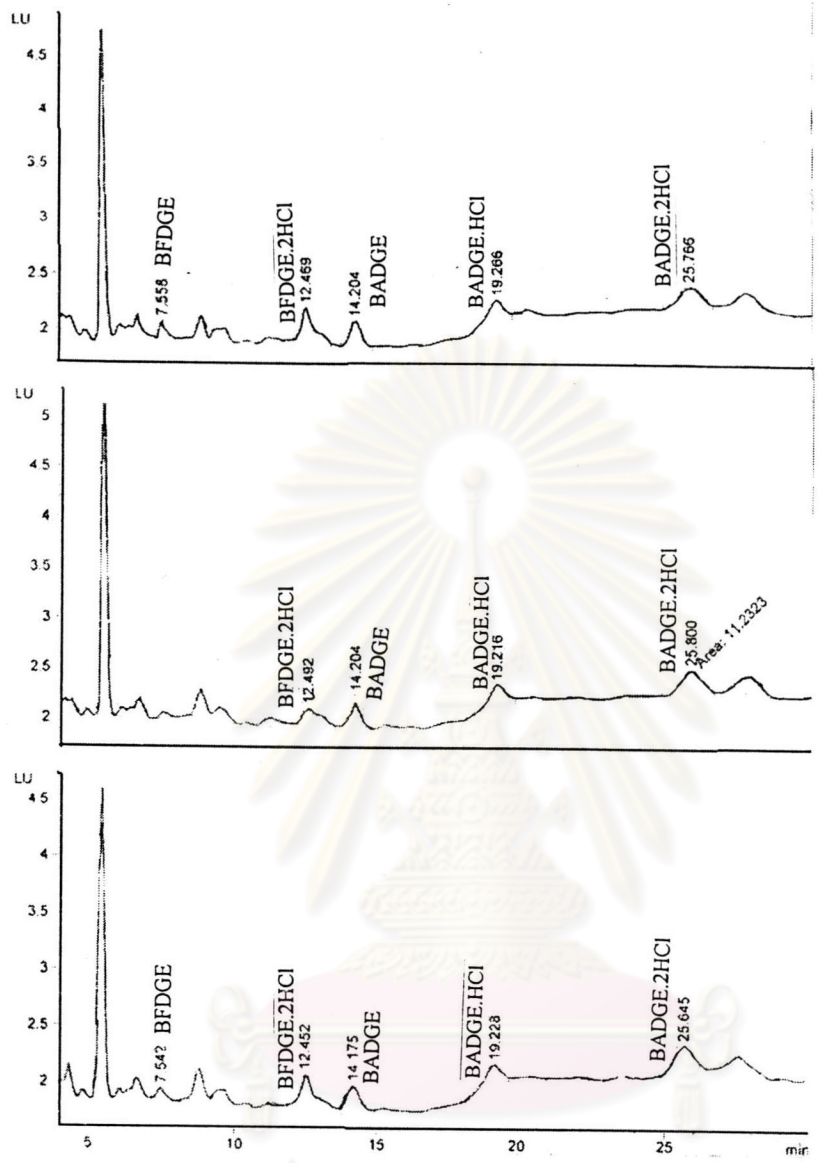

Figure D-25. Chromatograms of canned fried white scale fish (sample 18) by HPLC condition in Table 4.1. Triplicate analyses of homogenized sample.

A. 1st analysis.

B. 2nd analysis.

C. 3rd analysis.

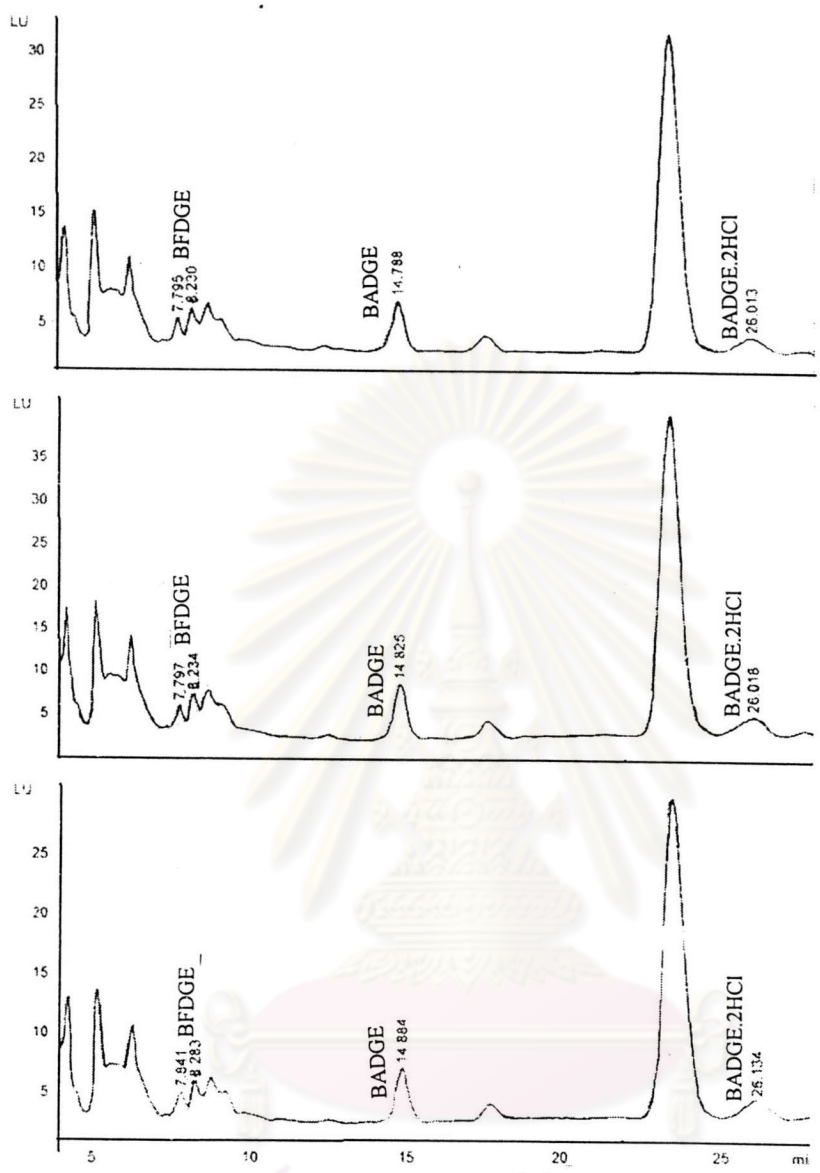

Figure D-26. Chromatograms of canned fried chicken (sample 19) by HPLC condition in Table 4.1. Triplicate analyses of homogenized sample.

A. 1st analysis.

B. 2nd analysis.

C. 3rd analysis.

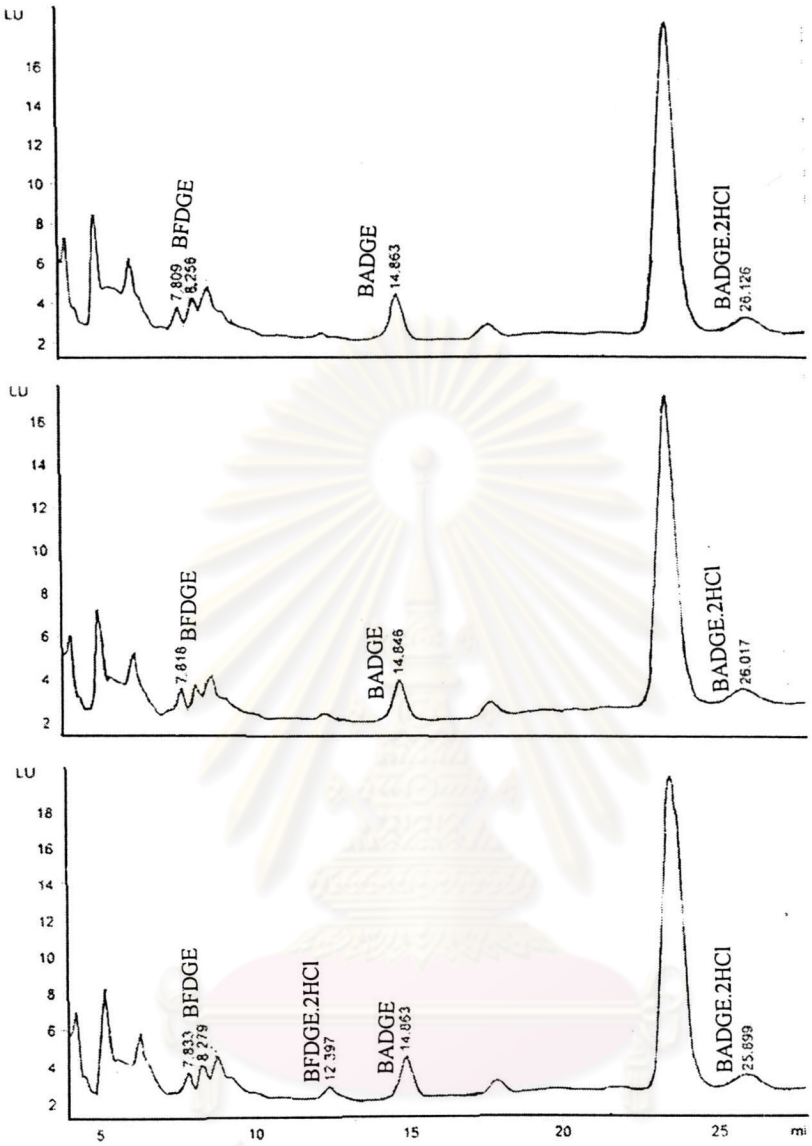

Figure D-27. Chromatograms of canned fried pock (sample 20) by HPLC condition in Table 4.1. Triplicate analyses of homogenized sample.

A. 1st analysis.

B. 2nd analysis.

C. 3rd analysis.

VITA

Worapong Somboonsup was born on December 7, 1977 in Angthong. He received his Bachelor of Science degree in Chemistry from the Faculty of Science, Chulalongkorn University in 1999. Then, he joined the Graduate Program in Analytical Chemistry working in the field of Chromatography and its applications in food analysis. He graduated with a Master of Science degree in Analytical Chemistry in 2004.