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(54) Title: FLAVOURED LOW FAT FOOD PRODUCTS

(57) Abstract

Flavoured food products which contain not more than 4 wt.% fat and at least 50 wt.% water and which produce a taste impact which is comparable to that of equivalent products containing a higher fat content. The concentration of some of the flavouring substances, diacetyl and at least one of the substances 5-decanolide and 5-dodecanolide, deviate very much from their levels normally applied in higher fat food products, which are well above 2 ppm. The food products encompassed by the present invention contain flavouring substances. In contrast to the conventional high fat products, the food products according to the invention are flavoured with only 0.02-2 ppm 5-decanolide and/or from 0.01-1 ppm 5-dodecanolide; and 0.5-40 ppm diacetyl.

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FLAVOURED LOW FAT FOOD PRODUCTS

The present invention relates to flavoured food products containing not more than 4 wt.% fat and at least 50 wt.% water and in particular to food products which can be regarded as low fat alternatives to similar foodstuffs of substantially higher fat content such as spreads, dressings, mayonnaise, creams etc.

We have developed food products which contain not more than 4 wt.% fat and at least 50 wt.% water and which produce a taste impact which is comparable to that of their higher fat equivalents. The food products encompassed by the present invention contain the flavouring substances diacetyl and at least one of the substances 5-decanolide and 5-dodecanolide. The latter two substances are generally applied in conventional high fat products at concentration levels well above 1 ppm.
If the above compounds are added to the present food products at such concentration levels no good flavour is obtained. It is normal that a change in the nature or amounts of ingredients necessitates an adaptation of the flavouring too. We found that with normal variations of the above flavour compounds the flavour known from equivalent higher fat products could not be achieved.
Unexpectedly it was found that for achieving a comparable flavour impact it is necessary to drastically change the concentration levels of some flavouring substances as compared to their normal application levels in higher fat food products. A food product according to the invention

which produces an agreeable flavour impact, should contain 0.02-2 ppm, preferably 0.02-1 ppm 5-decanolide and/or from 0.01-1 ppm 5-dodecanolide; and 0.5-40 ppm diacetyl. The ppm concentrations mentioned in this specification are weight/weight concentrations and always calculated on the total product weight, unless specified otherwise.

An optimum flavour impression was only obtained when the alkanolides are applied in very much lower concentration levels than the corresponding level normally applied in a high fat equivalent. According to a preferred embodiment of the invention the food product contains 0.02-0.5 ppm 5-decanolide and/or 0.01-0.5 ppm 5-dodecanolide. Diacetyl concentration preferably is within the range of 1.0-10 ppm.

In WO 90/00354 a method is described for the delivery of fat-soluble flavour compounds into no-fat and low-fat food products by introducing into said food products fat globules comprising elevated levels of fat soluble compounds. In example 2 of the latter application an experiment is described in which a vanilla extract is added to a low-fat product at a concentration slightly lower than in a similar high fat product.

Throughout this specification the term food product is used to encompass edible compositions intended for human consumption and particularly the low fat varieties of food products which traditionally contain substantial levels of fat, e.g. butter, margarine, creams, dressings, mayonnaise etc. According to a preferred embodiment of the invention the food product is a low fat alternative for a traditional high fat product. In this respect a high fat product is understood to contain more than 30 wt.% fat. In this patent application the terms fat and oil are treated as synonyms, both terms denoting ingredients selected from the group consisting of triglycerides, polyol fatty acid polyesters (e.g. sucrose polyester) and mixtures thereof. Although the

products according to the invention may suitably include ingredients such as mono- and diglycerides these ingredients are not encompassed by the term fat. In a preferred embodiment of the invention the level of mono- and diglycerides in the present product amounts to not more than 5 wt.%, preferably not more than 3 wt.%.

Besides the application of diacetyl and the aforementioned alkanolides we have found it advantageous to include additionally other flavouring substances. According to the present invention these flavouring substances are included in the food product also at concentration levels which are unexpectedly different from the concentration levels normally applied in similar food products containing higher fat levels.
Accordingly the present product, preferably contains from 0.002 to 0.1 ppm 2-heptanone. More preferably the level of 2-heptanone is within the range of 0.005 to 0.5 ppm.
According to yet another preferred embodiment the product contains from 0.001 to 0.04 ppm indol and/or from 0.001 to 0.1 ppm skatol.

Since the aforementioned flavouring substances are particularly appreciated in products having a dairy-like flavour, the overall flavour composition preferably comprises additional flavour components often found in such products. Thus the present food product may advantageously contain from 1-20 ppm butyric acid, particularly non-dissociated butyric acid. Preferably the amount of non-dissociated butyric acid is in the range of 1-10 ppm.

Also the inclusion of dimethyl sulphide at concentration levels from 0.03 to 0.5 ppm is found to yield beneficial results. Another flavouring substance which can advantageously be included in the present food product is acetic acid. The latter acid is preferably present at a concentration level in the range of 10 to 200 ppm.

The benefits of the adjusted flavour composition in accordance with the present invention are particularly pronounced in food products combining an extremely low level of fat with a very high water content. Thus according to a preferred embodiment of the invention the food product contains not more than 3 wt.% fat and from 70-98 wt.% water. Most preferably the present product contains even less than 2 wt.% fat and from 80-98 wt.% water. Since the reduction of fat levels is normally accompanied by the introduction of rheological defects we prefer to include one or more ingredients selected from the group consisting of emulsifiers, thickening and/or gelling agents. The latter ingredients can suitably be used to achieve a rheology which is comparable to the rheology of a similar food product of higher fat content. The latter ingredients are generally present in the food product at a concentration level in the range of 2-25 wt.%, more preferably in the range of 3-15 wt.%. According to a very preferred embodiment of the present invention fat, water and the latter ingredients together constitute at least 95 wt.% of the total food product.

Examples of emulsifiers, gelling agents and thickening agents which can suitably be employed in accordance with the present invention are: monoglycerides, diglycerides, starch derivatives, inuline, gums, gelatin, carrageenan, agar, alginate, gellan, whey protein, soy protein etc. Examples of starch derivatives which can utilized in the present product are native starch, hydrolyzed starch, chemically modified starch and mixtures thereof.

We have surprisingly found that the inclusion of a small amount of fat in the present food product can be advantageous, because it overcomes the quick disappearance of the taste impression after ingestion of the product, which accompagnies the total absence of fat. The latter phenomenon may effectively be tackled by the inclusion of

at least 0.2 wt.%, preferably at least 0.4 wt.% of fat in the food product.

The advantages of the invention are particularly evident in food products which have been developed as low fat alternatives for dairy products such as butter and cream. Accordingly the present food product preferably is a low fat spread or a low fat cream. Most preferably the present food product is a spread.

The invention will be further illustrated by means of the following examples:

Example 1

Two identical fat-free spreads A and B are prepared using the following (overall) composition:

3.0	wt.% gelatin
10.0	wt.% Paselli SA2
1.0	wt.% whey powder (60% protein)
0.04	wt.% xanthan gum
1.0	wt.% NaCl
0.1	wt.% potassium sorbate
0.0005	wt.% beta-carotene
0.10	wt.% dairy flavour cocktail

lactic acid to pH 4.8
the balance of water

All ingredients except the flavour were stirred into the water. The mixture was heated to 80°C to pasteurize it. Then it was cooled down to 65°C and the flavour cocktail was admixed. The composition was cooled down by passage through a scraped surface heat-exchanger (A-unit) to about 1°C.

To the two spreads flavour cocktails are added at a dosage level of 1 part cocktail per 1000 parts of product.

Cocktails A has a usual ingredients composition, cocktail B is constituted according to the present invention.

	Cocktail A	Cocktail B
	ppm	ppm
5-decanolide	4000	300
5-dodecanolide	6000	200
diacetyl	1000	1500
2-heptanone	500	40
indol	100	5
skatol	400	5
dimethyl sulphide	80	60
butyric acid	4000	5000
acetic acid	40000	50000

The pH of both products was adjusted to 4.9 with lactic acid. The carrier material of the flavour cocktails is glycerol. For the results of an organoleptic assessment see Table I. Flavour cocktail A which imparts a pleasant buttery flavour when added to a margarine (containing about 80 wt.% fat and 20 wt.% water) imparts to the fat-free spread, however, an unacceptable pungent flavour. The spread B flavoured with cocktail B on the contrary produces a mild buttery flavour-impression.

Example 2

Example 1 is repeated with the exception that the spreads A and B additionally contain 3 wt.% fat (refined palm oil) which fat is finely dispersed into the water. For the results of an organoleptic assessment see Table I. Again it is found that the spread containing cocktail A has an unacceptable flavour. The spread containing cocktail B is found to have an agreeable flavour and is judged to have an even slightly better flavour than product B of Example 1 containing the same cocktail.

Example 3

Two fat-free spreads A' and B' are prepared using the following ingredients:

Distilled water	93.6%
Monoglycerides (Hymono 1103)	6 %
Co-surfactant (Admul SSL 2004)	0.3%
Potassium sorbate	0.1%
Cold water soluble (=CWS) ß-carotene	trace
Flavour	trace
Lactic acid	trace

The water was heated in a water-jacketed vessel until a temperature of 65°C. At the point all other ingredients were added to the water and the mixture was stirred gently, using a "ribbon stirrer", for about 30 minutes. The pH of the resulting mesomorphic phase was set to a value of 4.6 using lactic acid.
Subsequently the mesomorphic phase was cooled using a scraped surface heat exchanger (Votator, A-unit) until a temperature of 12°C. The A-unit was operated at a throughput of 1 Kg/h and at high speed (2000 rpm).
The flavour cocktails to be added to the 2 spreads have the same compositions as described in Example 1 and again the dosage level is 1 part per 1000 parts of product. Also the pH was again adjusted to 4.9 with lactic acid.

For the results of an organoleptic assessment see Table I. The spread containing cocktail A is found to have an unacceptable flavour which is very much alike that of the product A containing the same cocktail described in Example 1. The spread B flavoured with cocktail B is found to possess a pleasant butter-like flavour.

Table I

ORGANOLEPTIC ASSESSMENT		
Spreads	with cocktail A	with cocktail B
Example 1 0% fat	Pungent flavour	Mild buttery flavour
Example 2 3% fat	Unacceptable	Agreeable flavour
Example 3 0% fat	Unacceptable	Pleasant butter-like flavour

CLAIMS

1. Flavoured food product containing not more than 4 wt.% fat and at least 50 wt.% water, which contains 0.02-2 ppm 5-decanolide and/or from 0.01-1 ppm 5-dodecanolide; and 0.5-40 ppm diacetyl.

2. Food product according to claim 1, which contains 0.02-0.5 ppm 5-decanolide and/or from 0.01-0.5 ppm 5-dodecanolide; and 0.5-40 ppm diacetyl.

3. Food product according to claim 1 or 2, which product contains 0.002-0.1 ppm 2-heptanone.

4. Food product according to any one of claims 1-3, which product contains 0.001-0.04 ppm indol and/or 0.001-0.1 ppm skatol.

5. Food product according to any one of claims 1-4, which product contains 1-20 ppm butyric acid.

6. Food product according to any one of claims 1-5, which product contains 0.03-0.5 ppm dimethyl sulphide.

7. Food product according to any one of claims 1-6, which product contains not more than 3 wt.% fat and 70-98 wt.% water.

8. Food product according to any one of claims 1-7, which product contains one or more ingredients selected from the group consisting of emulsifiers, thickening and gelling agents.

9. Food product according to any one of claims 1-8, which product is selected from the group consisting of spreads and creams.

10. Food product according to any one of claims 1-9, which product contains at least 0.2 wt.% fat.

INTERNATIONAL SEARCH REPORT

International Application No
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A. CLASSIFICATION OF SUBJECT MATTER
IPC 5 A23L1/226 A23D7/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 5 A23L A23D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	EP,A,0 298 561 (UNILEVER) 11 January 1989 see claim 1; examples 1-8	1,4,6-10
Y	NL,A,7 311 820 (STICHTING BEDRIJVEN VAN HET NEDERLANDS INSTITUUT VOOR ZUIVELONDERZOEK) 4 March 1975 see page 6, line 18 - line 22; claims 1,2; examples 1,2	1,4,6-10
A	GB,A,1 400 592 (UNILEVER) 9 July 1975 see claim 1; example 1	3

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DATABASE WPI Week 7733, 1977 Derwent Publications Ltd., London, GB; AN 77-64569Y & SU,A,520 967 (FATS RES INST) 24 November 1976 see abstract	5
A	US,A,2 819 169 (J. BOLDINGH AT AL.) 7 January 1958	

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP-A-0298561	11-01-89	AU-B- 618538	02-01-92
		JP-A- 1086831	31-03-89
		US-A- 4956193	11-09-90
NL-A-7311820	04-03-75	NONE	
GB-A-1400592	09-07-75	AT-B- 329363	10-05-76
		AU-B- 465490	02-10-75
		AU-A- 4719272	04-04-74
		BE-A- 789800	06-04-73
		CA-A- 978796	02-12-75
		CH-A- 572318	13-02-76
		DE-A,B,C 2314607	27-09-73
		FR-A,B 2176650	02-11-73
		JP-A- 49006157	19-01-74
		LU-A- 65039	26-09-73
		NL-A- 7213536	26-09-73
		SE-B- 401777	29-05-78
		US-A- 3924014	02-12-75
US-A-2819169		NONE	