Title: Lipid activation with rhizoma polygonati

The present invention relates to a method for accelerating oxidation of a lipid composition. Further aspects of the invention are the resulting lipid composition as well as food products such as concentrated seasoning or flavoring products, condiments, sauces, gravies, ready-to-eat food products or beverage products comprising said lipid composition.

Oxidation of lipids such as fats and oils is known to generate many natural flavour compounds such as hexanal, 2-octenal, 2-nonenal, 2,4-nonadienal, 2,4-decadienal, trans-4,5-epoxy-2-decanal etc.. There is an interest in the food industry to make good use of those flavour compounds and to have them for example integrated into flavour reaction processes such as Maillard reactions, in order to enhance the generation of certain flavour notes, such as more meaty or fatty flavour notes. Lipid oxidation can be accelerated for example by thermally induced auto-oxidation, photo-oxidation, heavy metal catalysis, activated oxygen and enzymatic catalysis.

Healthy eating is presently one of the main trends worldwide, and the food industry has a growing interest in the development of new food and beverage products having less fat, but still excellent organoleptic properties. Oil and Fat are important providers and carriers of taste and aroma, and it is difficult to maintain a similar good taste and aroma profile of a food product having little oil and fat than a same product having lots of oil and fat. For example, fried flavour is often associated with fat and seriously compromised in

low fat products. Often, a lack of fried flavour is therefore compensated for by longer frying times of the oil product and at higher temperatures. However, such longer and higher temperature treatments of oils and fats may generate undesired, potentially carcinogenic by-products, which are not desired. Furthermore, the stability and shelf life of such highly degraded lipid products is reduced.

It is known in the art that certain metal ions such as Co, Cu, Fe, Mn or Ni ions can work as catalysts for accelerating oxidation reactions of fats and oils. Evidence for this is for example provided by Belitz H.D. et al. in Food Chemistry, third revised Edition, pages 198-200. However, today's consumers prefer food products that are made entirely with natural and authentic ingredients. An addition of chemicals such as metal salts into a e.g. food seasoning products is much less appreciated by consumers.

Spices are known and used since ancient civilizations for their distinguished culinary and medical properties. It is for example common practice in Asia to incorporate spices and herbs in the cooking process, especially also with the combination of oil, for example for the preparation of chili oil in Sichuan, curry in India and tom yam in Thailand. However, the main purpose of these cooking processes is to extract flavours and/or essential oils from those spices and herbs into the oil or fat phase of a food preparation.

Hence, there is still a persisting need in the food industry to find new and better solutions to reduce the

fat and/or oil content of a food product and this without compromising or reducing the natural taste and flavour provided for by that fat and/or oil.

Consequently, there is also a persisting need of enhancing the natural flavour, e.g. the fried flavour, of a fat or oil composition through oxidation of the oil or fat in a more efficient way, at lower temperatures and therefore more cost effective, and for shorter reaction times. Such fat or oil compositions can then be used in food products to reduce the amount of fat or oil without reducing the organoleptic flavour impact.

The object of the present invention is to improve the state of the art and to provide an improved solution to overcome at least some of the inconveniences described above. Particularly, the object of the present invention is to provide a new process for lipid oxidation which is industrially feasible and more cost effective than known processes in the art, and where the process relies on all natural and authentic ingredients.

The object of the present invention is achieved by the subject matter of the independent claims. The dependent claims further develop the idea of the present invention.

Accordingly, the present invention provides in a first aspect a method for accelerating oxidation of lipids comprising the step of holding a lipid composition in the presence of rhizoma polygonati for a time period from 30 minutes to 6 hours at a temperature from 90°C to 180°C.

In a second aspect, the invention relates to a lipid composition obtainable by the method of the present invention.

A third aspect of the invention relates to a method for improving the flavor of a food composition comprising the step of adding the lipid composition of the present invention to said food composition, and then optionally further processing said food composition in a flavor reaction process, such as for example a Maillard reaction process, to result in a flavor reaction product.

A still further aspect is a food product comprising the lipid composition of the present invention or a flavor reaction product made with using the lipid composition of the present invention.

The inventors have evaluated the use of iron provided in the form as a chemical salt and in the form of different natural sources as an ingredient for a use in the process of fat and oil oxidation. Thereby, they have first observed that iron when provided in free chemical form as a salt accelerates the oxidation of oil and fat. In a second step, the inventors have then tested the catalytic activity of different herbs and spices which were provided to the fat and/or oil compositions in amounts equimolar as to their natural content of iron. Thereby, the inventors surprisingly found that rhizoma polygonati had a superior and strong catalytic oxidation effect upon hydrolyzed fat, non-hydrolyzed fat and oil, when compared to free iron and other herbs and spices. The use of rhizoma polygonati as a natural catalyst in oxidative reactions with compositions comprising fats and/or oils

therefore allows significantly reducing the reaction time and lowering the reaction temperature to achieve good oxidation results. Details of the results are provided herein in the Example section below.

Therefore, oxidation of oil and fat can now be accelerated significantly in a simple and natural authentic way by adding rhizoma polygonati e.g. in the form of a food grade powder, to an activating heat treatment reaction with oils and/or fats. Thereby, on one hand the speed of the oxidation reaction is accelerated and on a second hand flavor and taste compounds and precursors thereof are produced more readily and more efficiently. Hence, the present invention is able to reduce the temperature and time used for a thermal activation of oils and fat compositions. It also resolves in more intense and new flavor rich activated fat compositions as the inventive process results: i) in a much lesser loss of volatile low-molecular weight flavor compounds from the reaction composition during the thermal processing, and consequently a more flavor rich activated oil-fat composition; and ii) in a reduction of processing costs due to less costs of energy for the heating reaction and saving of time due to the shorter processing reaction. Furthermore, the use of rhizoma polygonati spice is very natural and does not be declared as a chemical compound and will be well accepted by consumers.

Furthermore, the activated lipid composition is also richer in natural precursors of still further flavor compounds which can for example be activated by making

use of such activated lipid composition as ingredient in still further process flavor reactions.

Brief Description of the Drawings

Figure 1: Plotted P-AV values of activated beef fat obtained with or without Polygonatum sibiricum at 5 wt% at different temperatures for 2 hours.

Figure 2: Plotted P-AV values of activated beef fat with 5 wt% Polygonatum sibiricum at 130°C for different time periods.

Figure 3: Plotted P-AV values of activated beef fat with different amounts of Polygonatum sibiricum used during the activation step at 130°C for 2 hours.

Figure 4: Sensory profile of chicken process flavour without and with the addition of activated chicken fat.

Figure 5: GC-MS profiles of process flavors without (A) and with (B) added activated chicken fat.

Detailed Description of the invention

The present invention pertains to a method for accelerating oxidation of lipids comprising the step of holding a lipid composition in the presence of rhizoma polygonati for a time period from 30 minutes to 6 hours at a temperature from 90°C to 180°C.

"The step of holding" refers to keeping, mixing, incubating a mixture of the lipid composition with the rhizoma polygonati for the specified time period at the specified temperature; and "in the presence of" means herein "mixed with" or "in contact with".

The terms "lipid" or "lipids" are defined herein as a group of naturally occurring hydrophobic molecules

including fatty acids, fats, oils, waxes, sterols and fat-soluble vitamins. Particularly, the terms refer herein to eatable fats and eatable oils, and a combination thereof.

"Fat" is herein defined as a triglyceride which is solid at normal room temperature; and "oil" is defined as a triglyceride which is liquid at normal room temperature.

The term "rhizoma polygonati" refers herein to plant material also known under the name "Huang Jing". In particular, the term "rhizoma polygonati" refers to the rhizome of the perennial herbaceous plant Polygonatum kinganum, Polygonatum sibiricum and Polygonatum cyrtonema.

A "lipid composition" is a composition comprising lipids. Preferably, the lipid composition comprises at least 60wt% of dry weight fat, oil or a combination thereof. More preferably, the lipid composition comprises at least 75wt%, or even 85wt%, of dry weight fat, oil or a combination thereof.

In a preferred embodiment of the present invention, the rhizoma polygonati is present in the lipid composition in an amount of 0.1 to 15 wt% or 20 wt%, preferably however in an amount of 0.5 to 10 wt%, more preferably in an amount of 3 to 6 or 7 wt%. The optimal catalytic efficiency, i.e. between costs of adding rhizoma polygonati and oxidative yield, is between 3 and 6 to 7 wt% as exemplified below.

Preferably, the temperature range of the present method is from 100°C to 160°C. More preferably, the temperature range of the present method is from 110°C to 150°C.

Preferably, the time period according to the present invention of holding the lipid composition in the presence of rhizoma polygonati at a temperature of at least 90°C is at least 1 hour, preferably at least 1.5 hours, more preferably at least 2 hours. The shorter the time period, the less volatile compounds are lost during the heating step and the less the process costs money.

In one embodiment of the present invention, the lipid is a fat, and the fat is an animal fat, preferably selected from beef fat, chicken fat, lamb fat, pork fat or milk fat.

In another embodiment of the present invention, the lipid is an oil. Preferably, the oil is from plant origin, and preferably selected from the group consisting of corn oil, olive oil, soybean oil, sunflower oil, peanut oil, walnut oil, palm oil, rattan pepper oil, rapeseed oil, and sesame oil, or a combination thereof. Those oils are advantageously used in the present invention for the preparation of culinary food products where they provide an enhanced organoleptic experience of fried and fatty flavors. Most preferably, the oil is sunflower oil. Frying typically leads to the formation of (E,E)-2,4-decadienal which is one of the key compound contributing to fried aroma. And (E,E)-2,4-decadienal is typically formed via lipid oxidation of linoleic fatty acid, which is the dominant fatty acid in sunflower oil.

In one embodiment, the method of the present invention comprises a step of hydrolyzing the lipid composition. Preferably, the lipid composition is hydrolyzed before the step of holding said composition at a temperature from 90°C to 180°C in the presence of rhizoma polygonati. The hydrolysis of the fat and/or oil before the oxidation step at a higher temperature has the advantage that the triglycerides and long fatty acid chains are at least partially degraded and provide a better source and access to the following oxidation reaction with rhizoma polygonati as a catalyst.

Preferably, the hydrolysis of the lipid composition is an enzymatic hydrolysis, preferably with making use of a lipase enzyme. Thereby, the enzymatic hydrolysis may be at a temperature from 40°C to 60°C, preferably from 45°C to 55°C. The advantage of using enzymatic hydrolysis over e.g. chemical or other physical hydrolysis methods is that a substantially complete hydrolysis of the fat material can be obtained and this without the use of any harsh chemicals or other dangerous interventions. Furthermore, the hydrolysis reaction can be kept at relatively low temperatures to minimize the loss of any volatile low molecular weight flavor compounds present in the reaction and limiting the costs of heating such reaction volumes. The lipase enzyme for this enzymatic hydrolysis step may be for example Lipase S or Lipozyme TL from Novozymes, Validase lipase AN or Validase lipase MJ from DSM. The enzymes are typically added to the hydrolysis reaction in an amount from 100 to 1500 mg per 100 g of fat.

In a preferred embodiment of the present invention, the rhizoma polygonati is Polygonatum sibiricum, preferably the rhizome of Polygonatum sibiricum. Most preferably, rhizoma polygonati is the dried rhizome of Polygonatum sibiricum in dried, powdered form. This presents the most industrially practical and cost effective way of the present invention.

Another aspect of the present invention relates to a lipid composition obtainable by the method as described above.

A still further aspect of the present invention pertains to a method for improving the flavor of a food composition comprising the step of adding the lipid composition of the present invention to said food composition. Preferably, the food composition comprising the added lipid composition is further processed in a flavor reaction process, preferably in a Maillard reaction process, to result in a flavor reaction product.

The present invention also pertains to a food product comprising the lipid composition or the flavor reaction product of the present invention as described above. The food product can be a concentrated seasoning or flavoring product, a condiment, a sauce, a gravy, a ready-to-eat food product or a beverage product. Preferably, the beverage product is a concentrated or ready-to-drink milk or coffee beverage.

Those skilled in the art will understand that they can freely combine all features of the present invention disclosed herein. In particular, features described for

the method for accelerating oxidation of lipids of the present invention can be combined with the method for improving the flavor of a food composition and with the product claims of a lipid composition and the food product of the present invention; and vice versa. Further, features described for different embodiments of the present invention may be combined.
Further advantages and features of the present invention are apparent from the figures and following examples.

Example 1:

Method and Results of hydrolysed thermal processed activated beef fat

In a first step: Enzymatic hydrolysis of beef fat (tallow) was carried out after the addition of 10 wt% water and 0.5 wt% lipase (Lipozyme TL 100L from Novozymes) to the fat and incubation at 45°C for 2.5 hours in a temperature controlled reaction vessel.

In a second step: Dried plant of Chinese functional ingredients as catalysts listed in Table 1 were bought from the local medicine shop and milled to powder in Shanghai China. All catalysts were added to the hydrolysed beef fat as specified in Table 1. The mixture was then thermally treated under the conditions as specified in Table 1 in a temperature controlled reaction vessel. Thereafter, the mixture, i.e. the activated fat composition, was cooled to room temperature.

The degree of fat oxidation P-AV in the activated fat composition was determined according to the official method provided by the International Organization for Standardization (ISO 6885:2006(E)), i.e. by measuring the

presence of secondary oxidation products such as aldehydes and ketones by reacting them with *p*-Anisidine to form products that absorb at 350 nm wavelength of light. Thereby, the P-AV value is higher the more secondary oxidation products have been built in the fat composition. A P-AV value close to 0 (zero) indicates an absence of secondary oxidation products and hence very little to no fat oxidation. A high P-AV value is indicative to the amount of secondary oxidation products present in the fat mixtures and hence the degree of fat activation.

The P-AV absorption values of the different activated fat compositions were then determined after the cooling step. The P-AV value results are indicated in Table 1.

Table 1

Results of fat activation are as follows:

Sample	**Added catalyst**	**Iron content** (µg/g)	**Zinc content** (µg/g)	**Dosage** (wt%)	**P-AV value**
1	No catalyst	0	0	0	0.33
2	Enteromorpha prolifera	141.85	1.78	5.0	23.40
3	Chrysanthemum indicum	142.76	1.83	4.3	5.307
4	Taraxacum mongolicum	141.75	7.06	8.7	9.527
5	Gardenia Jasminoieds	141.88	8.12	15.4	4.408
6	Polygonatum sibiricum	141.88	21.85	15.5	30.975
7	Bupleurum root	141.64	1.77	5.4	4.801

All samples were reacted under 115°C and air pumping of 2.5 L/min per 100g fat for 2.5 hours.

Samples 2-7 were all provided with equimolar amounts of iron.

It is evident from the above results, that powders from the different Chinese functional ingredients as indicated in Table 1 (i.e. Samples 3-7) and comprising the same amount of iron as sample 2, act as catalyst in the fat activation process. Particularly, it is evident from sample 6, that Polygonatum sibiricum performs very well as catalyst and is the most preferred solution of the present invention. Comparing with sample 1, all tested Chinese functional ingredients perform better as catalyst in the presented method for accelerating oxidation of a fat, than the one without a catalyst.

Example 2:

Method and Results of thermal processed activated beef fat

Dried plant of Chinese functional ingredients as catalysts listed in Table 2 were bought from the local medicine shop and milled to powder in Shanghai China. 5g catalyst was added into 100g beef tallow fat. The mixture was then thermally treated under the conditions as specified in Table 2. Thereafter, the mixture, i.e. the activated fat composition, was cooled to room temperature.

The P-AV values were then determined according to the method indicated in Example 1. The P-AV value results are indicated in Table 2.

Table 2

Results of fat activation are as follows:

Sample	**Added catalyst**	**Iron content** (µg/g)	**Zinc content** (µg/g)	**Reaction temperature**	**P-AV value**
1	No catalyst	0	0	130°C, 2h	<0.01
2	Polygonatum odoratum	32.10	3.50		0.21
3	Polygonatum sibiricum	45.77	7.05		25.17

All samples were reacted under air pumping of 2.5 L/min per 100g fat.

It is evident from the above result that Polygonatum sibiricum (sample 3 in Table 2) performs very well as catalyst in the thermal fat activation process. Comparing with sample 1, Polygonatum odoratum has some catalytic effect which is however less strong than the catalytic effect observed with the equivalent amount of Polygonatum sibiricum (sample 3).

Example 3:

Effect of Polygonatum sibiricum as a catalyst as to reaction temperature in the beef fat oxidation reaction

The effect of the reaction temperature as to the acceleration of the oxidation reaction with and without the presence of Polygonatum sibiricum was determined. The same experimental process as described in Example 2 was used.

The experiment was repeated in the same way as for sample 1 and 3 in Example 2, with the exception that the

temperature of the activation reaction was varied between 70°C and 150°C. The P-AV value of the different reaction end-products were then determined as described above. The results are shown in Figure 1.

It can be concluded from those results that the sample without a catalyst only started to generate secondary oxidation products when heat-treated for 2 hours from about 140°C temperature upwards. The sample with Polygonatum sibiricum as a catalyst, however, started to generate such secondary oxidation products when heat-treated under the same conditions already at about 90°C. At 120°C already a very substantial part of secondary oxidation products is generated, superior as to what the control samples can generate at e.g. 150°C.

Example 4:

Effect of Polygonatum sibiricum as a catalyst as to the time requirement for the beef fat oxidation reaction

The effect of the reaction time period as to the acceleration of the oxidation reaction with and without the presence of Polygonatum sibiricum was determined. The same experimental process as described in Example 2 was used.

The experiment was repeated in the same way as for sample 1 and 3 in Example 2, with the exception that the reaction time period was varied from 1 to 5 hours. The P-AV value of the different reaction end-products were then determined as described above. The results are shown in Figure 2.

It can be concluded from those results that the sample without a catalyst only started to generate secondary oxidation products when heat-treated for at least 4 hours or longer. The sample with Polygonatum sibiricum as a catalyst, however, started to generate such secondary oxidation products when heat-treated under the same conditions already earlier and produced already after 1.0 hour a P-AV value higher than what can be observed with the control sample after 4.0 hours. At 2.0 hours, the sample with the presence of Polygonatum sibiricum already generated substantial amounts of secondary oxidation products, whereas the sample without a catalyst is still in the early phase of starting to generate such compounds.

Example 5:

Effect of dosage of Polygonatum sibiricum to the acceleration of the beef fat oxidation reaction

The effect of different amounts of Polygonatum sibiricum added to the fat activation reaction was determined. The same experimental process as described in Example 2 was used.

The experiment was repeated in the same way as for sample 3 in Example 2, with the exception that the amount of added Polygonatum sibiricum was varied between 0.5 and 7 wt%. The P-AV values of the different reaction end-products were then determined as described above. The results are shown in Figure 3.

It can be concluded from those results that the samples with an amount of 0.5 wt% Polygonatum sibiricum or more are generating secondary oxidation products. It further

can be seen that in this specific experimental set-up a saturation of the catalytic effect is reached with the addition of about 3 wt%, or slightly above, of added Polygonatum sibiricum to the reaction mixture. An optimal amount of Polygonatum sibiricum can be determined to be between ca. 3 wt% and 6-7 wt% of added Polygonatum sibiricum.

Example 6:

Sensory profiling of process flavors with activated versus non activated chicken fat

To verify the influence of the activated fat composition when further used as an ingredient into a Maillard process flavor reaction, an activated chicken fat composition, prepared in the same way as Sample 3 of Example 2 but with chicken fat instead of beef fat, was added to the reaction mixture of a Maillard flavor reaction and further processed. For this, 4 wt% of the activated fat compositions per total reaction mixture was integrated into a chicken flavor seasoning reaction mixture as disclosed in document WO2012/080175A1, Example 1 and 2 respectively, and further processed as described in said document. Comparative results, with and without added activated fat compositions, were then evaluated by a professional sensory panel and by GC-MS analysis. The results are shown in Figures 4 and 5, respectively.

As can be seen from Figure 4, the chicken flavor reaction product with the corresponding activated chicken fat expresses a significantly stronger and more pronounced meaty and fatty note than the corresponding reaction product without the addition of the activated chicken fat. Therein, the activated chicken fat contributed

significantly to the stronger chicken meaty flavor, full body and mouth coating, and fatty note than the corresponding reaction product without the addition of the activated chicken fat.

Example 7:

GC-MS analysis of process flavors with activated versus non activated chicken fat

The samples of chicken process flavors as prepared for Example 6 were further analyzed for volatile compounds using GC-MS technology.

The volatiles compounds were sampled with an SPME-fibre (75µm, carboxen/polydimethylsiloxane) and separated with a gas chromatograph-mass spectrometer (Finnigan trace GC/MS, Finnigan, USA). First, the chicken process flavor was dissolved with water at the dosage of 1.2g/100ml hot water. 3g solution was weighted and placed in a 15ml vial. The vial was sealed with PTFE/BYTL septum and equilibrated at 55°C for 30min, with the presence of SPME- fibre in the headspace. After the equilibration time, the injection was conducted in a split less mode for 3min at 250°C. The volatile compounds were separated with a capillary column DB-WAX (30 m × 0.25 mm × 0.25µm; J&W Scientific, Folsom, CA, USA). The separation was performed as follows: the oven temperature was held at 40°C for 3min, ramped to 100°C at the rate of 5°C/min and then to 230°C at 12°C/min and maintained at 230°C for 10min. Helium (99.999%) was used as carrier gas at a linear velocity of 1.8ml/min. The compounds were analysed by MS. Mass spectra was obtained in the electron impact mode with an energy voltage of 70ev and emission current

of 35Ua. The detector was set at a scanning range of 35-450m/z at a rate of 4.45scans/s.

Identification of the volatile compounds was carried out by comparison of their mass spectra with the Wiley, NIST and Replib libraries and also by comparing their Kovats indices (KIs) with those of standard compounds and data from the literature. Linear KIs of the compounds were calculated, using a series of n-alkanes injected under the same chromatographic conditions and compared with available literature data.

The identified volatile compounds were quantified by GC/MS. The areas of the peaks were measured by calculating the total ion current.

These findings are confirmed in the GC-MS results as presented in Figures 5A and 5B. The volatile flavour compounds of chicken process flavor with 6% raw chicken fat as a control are shown in Figure 5A, while the chicken process flavor with 4% activated chicken fat according to the present invention are shown in Figure 5B.

The results showed that more volatile flavor compounds with stronger flavor intensity are released from the chicken reaction product with the added activated chicken fat composition (Figure 5B), than where not activated chicken fat was added (Figure 5A). Particularly, it could be observed that more aldehyde and furan compounds which contribute to a fatty and meaty flavor were released from the reaction product with the activated fat.

Example 8:

Sensory profiling of chicken bouillon cube with activated versus non activated chicken fat

To verify the influence of the activated fat composition when further used as an ingredient into a chicken bouillon tablet/cubes, an activated chicken fat composition, prepared in the same way as Sample 3 of Example 2 but with chicken fat instead of beef fat, was added to the formulation of a chicken bouillon tablet and further processed. For this, 2 wt% of the activated chicken fat compositions per total formulation was integrated into a traditional chicken bouillon cube processing. Comparative results, with and without added activated fat compositions, were then evaluated by a professional sensory panel. The chicken bouillon cube with the corresponding activated chicken fat expresses a significantly stronger and more pronounced meaty and fatty note and full body and mouth coating than the corresponding reaction product without the addition of the activated chicken fat.

Example 9:

Sensory profiling of coffee beverages with activated versus non activated milk fat

To verify the influence of the activated fat composition when further used as an ingredient into a coffee beverage, an activated milk fat composition, prepared in the same way as Sample 6 of Example 1 but with milk fat (containing 35 wt% fat, 1 wt% protein and 64 wt% water) instead of beef fat, was added to the formulation of a coffee beverage. For this, 0.2 wt% of the activated milk fat composition was added into a pure coffee beverage to induce and enhance the milk flavor. Comparative results,

3 coffee beverage samples, one with added activated milk fat composition and two with commercial milk flavorings, were then evaluated by a sensory panel and the result is shown in Table 3. The coffee beverage with the corresponding activated milk fat composition of the present invention expresses a significantly stronger and more pronounced milk note and full body and mouth coating than the corresponding coffee beverage with the addition of commercial milk flavorings.

Table 3

Sensory evaluation results of milk fat activation are as follows:

Samples	**Sensory description**	**Ranking**
Commercial milk flavor 01	Weak milk flavor, sweet taste	3
Commercial milk flavor 02	Strong milk flavor, bitter taste	2
Activated milk fat 01	Strong milk flavor, rich body, full mouth coating	1

Example 10:

Method and Results of thermal processed activated corn oil

Dried plant of Chinese functional ingredients as catalysts listed in Table 1 were bought from the local medicine shop and milled to powder in Shanghai China. 5g catalysts powder was added into 100g corn oil. The mixture was then thermally treated under the conditions as specified in Table 4. Thereafter, the mixture, i.e.

the activated oil composition, was cooled to room temperature.

The P-AV values were then determined according to the method indicated in Example 1. The P-AV value results are indicated in Table 4.

Table 4

Results of oil activation are as follows:

Sample	**Added catalyst**	**Iron content** (µg/g)	**Zinc content** (µg/g)	**Reaction temperature**	**P-AV value**
1	No catalyst	0	0	130°C, 2h	14.47
2	Polygonatum sibiricum	45.77	7.05		56.12

All samples were reacted under air pumping of 1.5 L/min per 100g oil.

It is evident from the above result that Polygonatum sibiricum (sample 2 in Table 4) performs very well as a catalyst in the thermal oil activation process. Comparing with sample 1, Polygonatum sibiricum showed a significantly accelerated oxidation reaction of the oil composition.

Claims

1. A method for accelerating oxidation of lipids comprising a step of holding a lipid composition in the presence of rhizoma polygonati for a time period from 30 minutes to 6 hours at a temperature from 90°C to 180°C.

2. The method according to claim 1, wherein the lipid composition comprises at least 60 wt% of dry weight fat, oil or a combination thereof.

3. The method according to claim 1 or 2, wherein the rhizoma polygonati is present in the lipid composition in an amount of 0.1 to 20 wt%, preferably in an amount of 0.5 to 10 wt%, more preferably in an amount of 3 to 7 wt%.

4. The method according to one of the claims 1-3, wherein the temperature ranges from 100°C to 160°C.

5. The method according to one of the claims 2-4, wherein the fat is an animal fat, preferably selected from beef fat, chicken fat, lamb fat, pork fat or milk fat.

6. The method according to one of the claims 2-4, wherein the oil is selected from corn oil, olive oil, soybean oil, sunflower oil, peanut oil, walnut oil, rattan pepper oil, rapeseed oil, sesame oil, or a combination thereof.

7. The method according to one of the claims 1-6, comprising a step of hydrolyzing the lipid composition.

8. The method according to claim 7, wherein hydrolyzing the lipid composition is an enzymatic hydrolysis, preferably with making use of a lipase enzyme.

9. The method according to one of the claims 1-8, wherein the rhizoma polygonati is the rhizome of a plant selected from the group consisting of polygonatum kinganum, polygonatum sibiricum and polygonatum cyrtonema.

10. The method according to claim 9, wherein the rhizoma polygonati is a powdered form of the dried rhizome of the plant polygonatum sibiricum.