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Description

The present invention relates to a novel oil and fat composition for food processing machines. More particularly, the present invention relates to a novel oil and fat for food processing machines which is safe for food sanitation, has excellent lubricating property and antioxidation property and is favorably utilized for machines and tools for food processing, machines and tools for agriculture and like other machines and tools.

For processing of agricultural products, livestock products, marine products and other materials to prepare food stuffs, various processes, such as selection, classification, grinding, mixing, baking, heating, fermentation, boiling, freeze drying and the like, are generally applied to the material and various kinds of food processing machines are utilized in these processes.

Examples of the machines for processing of agricultural products are machines and tools for collecting leaves from tea plants, rice cleaning machines, flour mills, brewing apparatus for production of sake, soy sauce, miso and like others and machines for production of noodle, bread, cookies, fruit juice, jam, pickles and like others. Examples of machines for processing of livestock products are machines for processing milk, machines for production of milk products, such as cheese and butter, machines for processing meat and like others. Examples of machines for processing of marine products are machines for processing of fish meat, sea weeds and like others. Other examples of the food processing machines are apparatus for production of food additives, natural flavor and pharmaceutical products, such as a vacuum thin layer evaporator and a mixing apparatus.

For purpose of lubrication of these food processing machines, oils of mineral origin, such as mineral oil and liquid paraffine, liquid vegetable oils, such as soy bean oil, cotton seed oil and rapeseed oil and animal oils and fats, such as beef tallow and lard are generally utilized. However, when oils of mineral origin are utilized, it is unavoidable that the oils are scattered or mixed into the foods or the agricultural products through rotating parts of the machines during long operation of the machines and the scattering and mixing of the oils of mineral origin into the foods and agricultural products are not desirable food sanitation. When liquid vegetable oils or animal oils and fats are utilized, oxidation stability is not sufficient even though they do not have problem on food sanitation.

Following oils and fats have been proposed as materials useful for food processmg machines: (1) oil and fat utilized for spraying which comprise a transesterification product of 30 to 90 weight parts of oil and fat for foods containing less than 20 weight % of saturated fatty acid and 70 to 10 weight parts of a composition containing a triglyceride of medium chain saturated fatty acids having 6 to 10 carbon atoms (MCT) as the main component (Laid Open Japanese Patent Publication Showa 56-72651); (2) a transesterification product of oil and fat made to contain increased amounts of monoene acids, such as oleic acid, and decreased amounts of polyene acids, such as linoleic acid and linolenic acid, by hydrogenation of vegetable oils, such as camellia oil, sasanqua oil, olive oil, safflower oil of high oleic acid content, hazelnut oil and rapeseed oil (Laid Open Japanese Patent Publications Showa 57-67695 and Showa 62-32841); (3) an oil of high oxidation stability and low cloud point which is prepared by transesterification of MCT and oil and fat of the vegetable oils described in (2) or hydrogenation products of oil and fats of the vegetable oils described in (2) (Laid Open Japanese Patent Publication Showa 61-173743).

However, the oils and fats of (1) through (3) contain large amounts of unsaturated acids such as oleic acid because they utilize soy ben oil, cotton seed oil, rapeseed oil, corn oil or oils which were made to contain increased amounts of oleic acid by reducing content of polyene acids by hydrogenation to enhance oxidation stability and have a problem that oxidation stability is not sufficient.

Another material proposed is a lubricating oil composition for food processing machines prepared by compounding triglycerides having linear alkyl group of 5 to 21 carbon atoms as the essential component and fatty acids of 12 to 22 carbon atoms (Laid Open Japanese Patent Publication Heisei 2-209995). However, this composition is based on the low viscosity MCT and has a problem that adjustment of the viscosity of the composition to a desired value is not always easy.

When vegetable oils are utilized as lubricating oils for food processing machines, they have problems that degradation of the oils takes place or seizure of machines takes place by hardening of the oils by polymerization because of unsaturated bonds in fatty acid molecules. Rate of oxidation of unsaturated fatty acids is large than rate of oxidation of saturated fatty acids. For example, the rates of oxidation of linoleic acid and linolenic acid at 20 °C are 12 to 20 times and 25 times, respectively, larger than the rate of oxidation of oleic acid. Esters of saturated fatty acids are stable against oxidation. For example, the rate of oxidation of methyl stearate at 100 °C is 1/11 and 1/100 of methyl oleate and methyl linolate, respectively.

Oxidation stability and cloud point are, in general, related with each other. Oils and fats which contain larger amounts of unsaturated acids having higher oxygen absorption, such as oleic acid, linoleic acid and

linolenic acid, in glyceride have lower oxidation stability and also a lower value of cloud point. Cloud point, pour point and solidifying point are also, in general, related with each other and a material having a higher cloud point has a higher pour point and a higher solidifying point. Property of a material can be compared by utilizing either one of cloud point, pour point and solidifying point. An oil which is prepared by transesterification of MCT and an oil containing a large amount of oleic acid in which the contents of linoleic acid and linolenic acid are reduced by hydrogenation to enhance oxidation stability has a lower cloud point but is not sufficient in oxidation stability because oleic acid is also an unsaturated fatty acid.

Oils and fats containing larger amounts of saturated fatty acids having lower oxygen absorption, such as myristic acid, palmitic acid, stearic acid and the like, in glyceride has higher oxidation stability but higher cloud point at the same time.

Because lubricating oils are utilized for driving parts of various machines and tools, oils having viscosities suitable for all machines and tools are required. MCT which is considered to be the best material for the lubricating oil for food processing machines has satisfactory quality concerning high oxidation stability and low cloud point. However, MCT has too low viscosity when it is utilized without other components because the viscosity is 15 to 20 centipoises at 25 °C and 10 to 15 centipoises at 40 °C.

The present invention accordingly has the object to provide an oil and fat composition for food processing machines which is safe for food sanitation, has excellent oxidation stability, good lubricating property and suitable degree of cloud point as well as a high viscosity and a low temperature fluidity which cannot be attained by MCT and is applied to driving parts of food processing machines and tools, such as chains and shafts, by dropping, by spraying as aerosol, by spraying with a pump and by the like methods.

Thus, the invention concerns the Use of an oil and fat composition comprising
a polyglyceride of a medium chain saturated fatty acid having 6 to 10 carbon atoms and/or
a polyglyceride of a mixed fatty acid comprising a medium chain saturated fatty acid having 6 to 10 carbon atoms and a long chain saturated fatty acid selected from the group consisting of lauric acid,myristic acid, palmitic acid and stearic acid, and
optionally, a triglyceride of a medium chain saturated fatty acid having 6 to 10 carbon atoms
as a lubricant in food processing machines.

Other and further objects, features and advantages of the invention will appear more fully from the following description.

The present inventors investigated extensively to prepare oil and fat compositions for food processing machines having the advantageous properties to achieve the object described above and discovered that the above-defined use is effective for achieving the object of the invention.

The polyglyceride of medium chain saturated fatty acid (MCP) is a polyglyceride prepared from a medium chain saturated fatty acids and polyglycerol. Examples of the medium chain saturated fatty acid are saturated fatty acids having 6 to 10 carbon atoms, such as caproic acid, heptylic acid, caprylic acid, nonylic acid, capric acid. The medium chain saturated acid can be utilized singly or as a combination of two or more kinds.

The mixed polyglyceride of a medium chain saturated fatty acid and a long chain saturated fatty acid (MLCP) is an ester of a mixed fatty acid comprising a medium chain saturated fatty acid and a long chain saturated fatty acid and a polyglycerol. Examples of the medium chain saturated fatty acid are the same as the examples of the medium chain saturated fatty acid for MCP described above. The long chain saturated fatty acid are lauric acid, myristic acid, palmitic acid, stearic acid and the like. The mixed fatty acid may be a mixture of more than one kind of fatty acids suitably selected from the group of the medium chain saturated fatty acids and the long chain saturated fatty acids or an oil prepared by saponification of extremely hardened oil which is prepared by hydrogenation of a vegetable oil, such as soy bean oil, rapeseed oil, palm oil, palm kernel oil, corn oil, coconut oil and the like, or animal fat and oil, such as lard, beef tallow, fish oil and the like. When the oil prepared by saponification of extremely hardened oil is utilized, it is preferable that coconut oil comprising various kinds of fatty acids, such as capric acid, caprylic acid, lauric acid, myristic acid, palmitic acid, stearic acid and the like, is utilized as the raw oil for hydrogenation.

MLCP can be prepared either by esterification of the mixed fatty acid with polyglycerol or by transesterification of MCP with the extremely hardened oil prepared by hydrogenation of the vegetable oils or animal fats and oils, preferably with the extremely hardened oil prepared from coconut oil.

Viscosity of MCP and MLCP can be adjusted by suitably selecting the saturated fatty acids utilized. Emulsifying property and compatibility with water are enhanced by leaving a suitable amount of unreacted hydroxyl group in glycerol by keeping degree of saponification below suitable level and thus the composition of the invention can be washed off, when necessary, from food processing machines easily.

In general, MCP and MLCP have rather high viscosities. The viscosity can be adjusted to a desired level by mixing MCT according to necessity. MCT can be prepared from medium chain saturated fatty acids and glycerol. Examples of the medium chain saturated fatty acid are the same as the examples of medium chain saturated fatty acid for MCP.

Because the oil and fat composition for food processing machines of the invention does not comprise unsaturated fatty acid component, it has excellent oxidation stability, suitable viscosity and cloud point, good lubricating property and is safe for food sanitation.

To the oil and fat composition for food processing machines of the invention, antioxidants, such as tocopherol, 2,6-di-t-butyl-4-methylphenol and the like, fatty acids as the rust preventing and abrasion preventing oil agent and emulsifying agents to facilitate washing off the composition from food processing machines may be added according to desire.

The invention will be understood more readily with reference to the following examples; however these examples are intended to illustrate the invention and are not to be construed to limit the scope of the invention.

The compositions prepared were evaluated by the following methods.

(1) Oxidation stability: oxidation life in minutes at 120 °C was measured by the "method of testing of oxidation stability by a rotating bomb" according to Japanese Industrial Standard K-2514 3.3.

(2) Abrasion resistance: abrasion diameter in millimeter was measured under the condition of 1200 rpm, 15 kg, 30 min, according to the "wear preventive characteristics of lubricating fluid (four-ball method)" by ASTM D-4172.

(3) Rust preventing property: according to the "method of testing of rust preventing property of lubricating oil (the method of using distilled water)" by Japanese Industrial Standard K-2510.

(4) Viscosity: measured at 40 °C by using a B-type visocometer type BL, a product of Tokyo Keiki Co., Ltd.

(5) Cloud point: according to the standard method of analysis of oils and fats 2.3.7-71, by the Japanese Society of Oil and Fat Chemistry.

Examples 1 through 4

Oil and fat compositions shown in the following were prepared from a nona ester utilized as MCP which was prepared from a mixed fatty acid of 75 weight % of caprylic acid and 25 weight % of capric acid and decaglycerol and a triglyceride of a mixed fatty acid of 75 weight % of caprylic acid and 25 weight % of capric acid utilized as MCT.

	Components in the composition (weight %)	
	MCP	MCT
Example 1	100	0
Example 2	90	10
Example 3	60	40
Example 4	40	60

Results of evaluation of the compositions are listed in Table 1.

Examples 5 through 7

A nona ester utilized as MCP which was prepared from a mixed fatty acid of 75 weight % of caprylic acid and 25 weight % of capric acid and decaglycerol and an extremely hardened oil based on rapeseed oil, an extremely hardened oil based on lard or an extremely hardened oil based on coconut oil were mixed in specified amounts and the mixture was dried until the mixture contained 100 ppm or less of water by bubbling nitrogen gas at 80 to 100 °C under stirring by a motor. To the dried mixture, 0.1 weight % of sodium methylate as catalyst was added and the mixture was kept under stirring for about 30 minutes. After the catalyst was removed from the reaction mixture by washing with warm water, the mixture was bleached by activated clay and deodorized by vacuum steam distillation according to the generally practiced method. Thus, MLCP was prepared.

In Example 5, 90 weight % of MCP and 10 weight % of an extremely hardened oil based on rapeseed oil, in Example 6, 90 weight % of MCP and 10 weight % of an extremely hardened oil based on lard and in

Example 7, 60 weight % of MCP and 40 weight % of an extremely hardened oil based on coconut oil, respectively, were treated by transesterification.

Results of evaluation of MLCP thus prepared as the compositions of the invention are listed in Table 1.

Comparative examples 1 through 4

In Comparative example 1, rapeseed oil, in Comparative example 2, a triglyceride of a mixed fatty acid of 75 weight % of caprylic acid and 25 weight % of capric acid, in Comparative example 3, liquid paraffine and, in Comparative example 4, MCT, respectively, were evaluated by the same method as in the preceding examples. Results of the evaluation are listed in Table 1.

It is clearly shown in Table 1 that the compositions of the invention have excellent properties to achieve the object of the invention. In Comparative examples in which the requirements of the invention are not satisfied, one or more of the properties are not satisfactory.

While the invention has been particularly shown and described with reference to preferred embodiments thereof, it will be understood by those skilled in the art that the foregoing and other changes in form and details can be made therein without departing from the spirit and scope of the invention.

To summarize the advantages obtained by the invention, the oil and fat composition for food processing machines is safe for food sanitation, has excellent oxidation stability and lubricating property and a suitable degree of viscosity and cloud point as well as a high viscosity and a low temperature fluidity which cannot be attained by MCT and is applied to driving parts of food processing machines and tools, such as chains and shafts, by dropping, by spraying as aerosol, by spraying with a pump and by the like methods.

When the composition of the present invention comprises the polyglyceride of the medium chain saturated fatty acid and/or the mixed polyglyceride of the medium chain saturated fatty acid and the long chain saturated fatty acid, and the triglyceride of the medium chain saturated fatty acid, the amount of the the polyglyceride and/or the mixed polyglyceride is preferably 30 weight % or above, more preferably 40 weight % or above and the amount of the triglyceride is preferably 70 weight % or less, more preferably 60 weight % or less.

Table 1

Example	oxidation stability, life, min	abrasion resistance, diameter,mm	rust preventing property	viscosity, cp	cloud point, °C
Example 1	142	0.32	no rust	180	-10 or less
Example 2	195	0.38	no rust	130	-10 or less
Example 3	234	0.40	no rust	50	-10 or less
Example 4	336	0.44	no rust	30	-10 or less
Example 5	129	0.34	no rust	170	2
Example 6	145	0.35	no rust	160	2
Example 7	158	0.39	no rust	120	-10 or less
Comparative example 1	12	0.44	no rust	10	-10 or less
Comparative example 2	600	0.52	no rust	12	-10 or less
Comparative example 3	196	0.62	rust	10	-10 or less
Comparative example 4	198	0.39	no rust	10	-5.0 or less

Claims

1. Use of an oil and fat composition comprising
a polyglyceride of a medium chain saturated fatty acid having 6 to 10 carbon atoms and/or
a polyglyceride of a mixed fatty acid comprising a medium chain saturated fatty acid having 6 to 10 carbon atoms and a long chain saturated fatty acid selected from the group consisting of lauric acid,myristic acid, palmitic acid and stearic acid, and
optionally, a triglyceride of a medium chain saturated fatty acid having 6 to 10 carbon atoms
as a lubricant in food processing machines.

2. The use of claim 1 wherein the polyglyceride of a medium chain saturated fatty acid having 6 to 10 carbon atoms is a polyglyceride of caproic acid, heptylic acid, caprylic acid, nonylic acid or capric acid.

3. The use of claim 1 wherein the medium chain saturated fatty acid having 6 to 10 carbon atoms as a component of the mixed fatty acid is caproic acid, heptylic acid, caprylic acid, nonylic acid or capric acid.

4. The use of claim 1 wherein the mixed fatty acid is a compound prepared by saponification of an oil which has been prepared by hydrogenation of vegetable oil and fat or animal oil and fat.

5. The use of claim 4 wherein the vegetable oil is soy bean oil, rapeseed oil, palm oil, palm kernel oil, corn oil or coconut oil.

6. The use of claim 4 wherein the animal oil or fat is lard, beef tallow or fish oil.

Patentansprüche

1. Verwendung einer Öl- und Fettzusammensetzung, die umfaßt
ein Polyglycerid einer gesättigten Fettsäure mit mittlerer Kettenlänge, die 6 bis 10 Kohlenstoffatome hat, und/oder
ein Polyglycerid einer gemischten Fettsäure, bestehend aus einer gesättigten Fettsäure mit mittlerer Kettenlänge, die 6 bis 10 Kohlenstoffatome hat, und einer langkettigen gesättigten Fettsäure, ausgewählt aus der Gruppe, die aus Laurinsäure, Myristinsäure, Palmitinsäure und Stearinsäure besteht, und gegebenenfalls ein Triglycerid einer gesättigten Fettsäure mit mittlerer Rettenlänge, die 6 bis 10 Kohlenstoffatome hat,
als Schmiermittel in Lebensmittelverarbeitungsmaschinen.

2. Verwendung nach Anspruch 1, worin das Polyglycerid einer gesättigten Fettsäure mit mittlerer Kettenlänge, die 6 bis 10 Kohlenstoffatome hat, ein Polyglycerid von Hexansäure, Heptansäure, Octansäure, Nonansäure oder Decansäure ist.

3. Verwendung nach Anspruch 1, worin die gesättigte Fettsäure mit mittlerer Kettenlänge, die 6 bis 10 Kohlenstoffatome hat, als Komponente der gemischten Fettsäure Hexansäure, Heptansäure, Octansäure, Nonansäure oder Decansäure ist.

4. Verwendung nach Anspruch 1, worin die gemischte Fettsäure eine Verbindung ist, hergestellt durch Verseifung eines Öles, das durch Hydrierung von pflanzlichem Öl und Fett oder tierischen Öl und Fett hergestellt wurde.

5. Verwendung nach Anspruch 4, worin das pflanzliche Öl Sojabohnenöl, Rapssamenöl, Palmöl, Palmkernöl, Maisöl oder Kokosnußöl ist.

6. Verwendung nach Anspruch 4, worin das tierische Öl oder Fett Schweineschmalz, Rindertalg oder Fischöl ist.

Revendications

1. Utilisation d'une composition d'huile et de graisse comprenant :
un polyglycéride d'un acide gras sature à chaîne médiane contenant de 6 à 10 atomes de carbone et/ou
un polyglycéride d'un acide gras mixte comprenant un acide gras saturé à chaîne médiane de 6 à 10 atomes de carbone et un acide gras saturé à chaîne longue choisi parmi l'acide laurique, l'acide myristique, l'acide palmitique et l'acide stéarique, et
facultativement, un triglycéride d'un acide gras saturé à chaîne médiane contenant de 6 à 10 atomes de carbone,
à titre de lubrifiant pour les machines de traitement de produits alimentaires.

2. Utilisation selon la revendication 1, dans laquelle le polyglycéride d'un acide gras saturé à chaîne médiane contenant de 6 à 10 atomes de carbone est un polyglycéride d'acide caproïque, d'acide heptylique, d'acide caprylique, d'acide nonylique ou d'acide caprique.

3. Utilisation selon la revendication 1, dans laquelle l'acide gras saturé à chaîne médiane contenant de 6 à 10 atomes de carbone à titre d'un composant de l'acide gras mixte est l'acide caproique, l'acide heptylique, l'acide caprylique, l'acide nonylique ou l'acide caprique.

4. Utilisation selon la revendication 1, dans laquelle l'acide gras mixte est un composé qu'on prépare par saponification d'une huile qui a été préparée par hydrogénation d'une huile et graisse végétales ou d'une huile et graisse animales.

5. Utilisation selon la revendication 4, dans laquelle l'huile végétale est l'huile de soja, l'huile de colza, l'huile de palme, l'huile de coeur de palmier, l'huile de maïs ou l'huile de coprah.

6. Utilisation selon la revendication 4, dans laquelle l'huile ou graisse animale est le lard, le suif de boeuf ou l'huile de poisson.