CHOCOLATE AND PROCESS FOR PRODUCING THEREOF

FIELD OF THE INVENTION

The present invention relates to chocolate which can be marketed at ordinary room temperature in spite of its low softening point.

BACKGROUND OF THE INVENTION

It is well known that chocolate softens at 33 to 34°C, although it is solid at ordinary room temperature. The raw materials thereof are cacao mass, cacao butter, sugar, powdered milk and the like and melting properties of chocolate are mainly derived from the fat ingredient in chocolate, i.e., cacao butter. Cacao butter is mainly composed of POSt, StOSt and POP glycerides, wherein P is palmitic acid, O is oleic acid and St is stearic acid. Typical chocolate to be eaten as it is as sweets (hereinafter referred to as "per se chocolate sweets") contains about 32% by weight of cacao butter. A P/St ratio as an average value calculated from total constituent fatty acids of the glycerides is about 0.7 to 0.8. Other fats (hard butter) are often used as substitutes for all or a part of cacao butter in order to save production cost or to improve physical properties of chocolate.

Chocolate is used not only as solid per se chocolates sweets such as bar chocolate and tablet chocolate for tasting its own flavors, tastes and physical mouthfeel, but also used as raw materials of confectionery in combination with other foods, more particularly used as, for example coating materials, enrobers, filling materials and decorations of iced or baked confectionery. In general, excellent flavor, taste and physical mouthfeel are severely required in the case of the former use, i.e. in the case that chocolate is used as solid per se chocolate sweets.

The above-described hard butter to be used as substitutes for cacao butter is generally divided into tempering and non-tempering types.

Hard butter of tempering type is obtained from shea butter, sal fat, illipe butter, palm oil or a fractionated oil thereof. Like cacao butter, hard butter is mainly composed of 2-unsaturated-1,3-disaturated triglyceride (SUS). Saturated fatty acids thereof are mainly composed of palmitic acid (P) and stearic acid (St). Recently, as a technique for obtaining hard butter rich in SUS, enzymatic interesterification has also been pervading. Because the hard butter of this type is very similar to cacao butter structurally, it is free from problems such as blooming and lowering of heat stability caused by using it in combination with cacao

butter. However, for the production of pre se chocolate sweets, tempering treatment is required.

Palm medium melting point fraction is hard butter of this type and is rich in POP triglyceride. It is effective for improving melting properties of chocolate in the mouth. However, there is a problem that the amount of palm medium melting point fraction used should be small (JP-A 53-115863) because the fraction is unsuitable for per se chocolate sweets, while a relatively larger amount thereof is used for raw materials of confectionery such as a coating material, an enrober, a filling material (for example, JP-A 60-221035). In addition, there is a problem that mixing with triglycerides other than SUS is remarkably limited even when it is used for per se chocolate sweets (for example JP-A 61-209545).

On the other hand, typical hard butter of non-tempering type includes hard butter of trans-acid type or lauric acid type. Hard butter of trans-acid type is obtained by isomerization and hydrogenation of a fractionated soft part of palm oil and the like, or a liquid oil such as soybean oil. Hard butter of trans-acid type is composed of triglycerides containing a relatively larger amount of trans-acids in the constituent fatty acids. On the contrary, hard butter of lauric acid type is obtained from fats containing a large amount of lauric acid moiety such as coconut oil, palm kernel oil, babassu oil or a fractionated oil thereof. Hard butter

of a lauric acid type is composed of triglycerides containing much lauric acid in the constituent fatty acids. Because hard butter of a non-tempering type does not possess remarkable polymorphism, it has an advantage that tempering treatment is not required in the production of chocolate. However, the hard butter of non-tempering type is mainly used as the fat ingredient of chocolate in the above-described combined foods because it is generally recognized that it can be used with cocoa butter only in a limited proportion (JP-A 60-221035).

In the case of per se chocolate sweets such as bar chocolate and combined foods with baked confectionery, temperature of the chocolate to be eaten is usually at a range of ordinary room temperature, i.e., about 20°C. However, in the case of a combined confectionery such as chocolate coating of ice cream, the temperature is at a range of freezing. When chocolate to be eaten at the former temperature range are used for that to be eaten at a temperature range of freezing or refrigerating, mouthfeel of the chocolate is hard to bite and eaten and it is difficult to melt in the mouth. In addition, when per se chocolate sweets are prepared by using a chocolate material mix such as conventional ice coating chocolate, it is unsuitable for per se chocolate sweets because it has very pasty and unpleasant mouthfeel different from conventional bar and tablet chocolate.

JP-A 54-20941 discloses a process for producing chocolate to be cooled and eaten. By rapid cooling without tempering treatment, while maintaining instable crystals, a product having a low melting point which is suitable for eating at a low temperature can be obtained, although a tempering type fat is used. In addition to coating of ice cream, the above patent application discloses the use of chocolate as per se chocolate sweets. The chocolate has somewhat pasty mouthfeel because of the use of a liquid fat and improvement of physical mouthfeel thereof as per se chocolate sweets is still required. However, when the product is maintained at a freezing temperature, conversion of unstable fat crystals into stable crystals is prevented and thereby deterioration of gloss caused by formation of coarse crystals is prevented. In addition, the product has a low melting point and is soft. Therefore, the product is suitable for eating at a low temperature. On the other hand, since conversion of unstable fat crystals into stable crystals proceeds at ordinary room temperature, different from marketing of conventional per se chocolate sweets, marketing thereof is limited to that in a frozen state.

Thus, to develop chocolate having physical mouthfeel suitable for eating at a low temperature which can be marketed at ordinary room temperature has been desired.

In addition, JP-A 63-240745 discloses an additive for chocolate and chocolate production using the additive. The additive comprises pulverized stable crystal form particles mainly composed of SUS the constituent unsaturated fatty acids of which have 18 or more carbon atoms and the constituent saturated fatty acids of which have 20 to 24 carbon atoms. According to the above patent application, the additive is effective for omitting or simplifying tempering treatment in chocolate production and is also effective for obtaining such heat-stable chocolate that fat blooming can be inhibited even after storage at about body temperature, where shape retention of chocolate is lost, for a certain period. However, since the melting point of the pulverized stable crystal form particles mainly composed of SUS is higher than 50°C, melting properties in the mouth at a low temperature are liable to be deteriorated.

JP-A 64-60330 also discloses an additive chocolate and chocolate production using the additive. The additive comprises pulverized stable crystalline form particles mainly composed of SUS the constituent unsaturated fatty acids of which have 18 carbon atoms and the constituent saturated fatty acids of which have 16 to 18 carbon atoms. The additive is effective for omitting or simplifying tempering treatment in chocolate production and the melting point thereof is slightly higher than 40°C.

OBJECTS OF THE INVENTION

One object of the present invention is to provide chocolate which can be marketed at ordinary room temperature in spite of its low softening point.

Another object of the present invention is to provide chocolate having excellent hardness and melting properties in the mouth as per se chocolate sweets upon eating at a low temperature, i.e., not only at a temperature in winter season but also at a temperature range of freezing or refrigerating.

In particular, the present invention is directed to chocolate confectioneries which have excellent physical mouthfeel at the above-described low temperature and scarcely have limitations in marketing as required for conventional combined foods with baked confectionery to be cooled and eaten.

These object as well as other objects and advantages of the present invention will become apparent to those skilled in the art from the following description with reference to the accompanying drawing.

BRIEF EXPLANATION OF DRAWING

Fig. 1 is a graph illustrating the relation between the fat content of chocolate and the P/St ratio of SUS.

SUMMARY OF THE INVENTION

The present inventors have intensively studied with a conception that the marketing limitation as described in the above JP-A 54-20941 would be minimized when chocolate having physical properties suitable for eating at a low temperature can be obtained even with tempering. As a result, the present inventors have succeeded in producing chocolate of tempering type which have a softening point of 30°C or lower.

On the other hand, the present inventors tried to use a chocolate additive containing pulverized stable crystalline form particles mainly composed of SUS the constituent unsaturated fatty acids of which have 18 carbon atoms and the constituent saturated fatty acids having 16 to 18 carbon atoms to improve marketability to the same level as that of conventional chocolate made from cacao butter. However, any remarkable improvement could not be obtained.

The present inventors have unexpectedly found that an additive containing pulverized stable crystal form particles mainly composed of SUS the constituent unsaturated fatty acids of which have 18 or more carbon atoms and the constituent saturated fatty acids of which have 20 to 24 carbon atoms can be used without any trouble, which is seemingly inconsistent with improvement of physical mouthfeel of chocolate at a low temperature, and that limitations in

marketability of products can be further minimized. Thus, the present invention has been completed.

According to the present invention, there is provided chocolate having a softening point of 15 to 30°C, wherein its fat ingredient comprises at least 40% by weight of fats rich in 2-unsaturated-1,3-disaturated triglycerides (SUS), the main constituent saturated fatty acids (S) of which have 16 to 18 carbon atoms, and independent stable crystals of only SUS, the constituent saturated fatty acids of which have 20 to 24 carbon atoms.

The present invention also provides a process for producing chocolate which comprises adding a material containing SUS stable crystals, the constituent saturated fatty acids of which have 20 to 24 carbon atoms, to a chocolate material mix having a softening point of 15 to 30°C and containing at least 40% by weight of fats rich in 2-unsaturated-1,3-disaturated triglycerides (SUS), the main constituent saturated fatty acids (S) of which have 16 to 18 carbon atoms, in its fat ingredient during a cooling step of the melted mix.

DETAILED DESCRIPTION OF THE INVENTION

The term "chocolate" used herein generally includes chocolate containing cacao mass and white chocolate without

cacao mass. The term is not specifically limited to chocolate defined by any law and made from prescribed ingredients.

The softening point of the chocolate of the present invention is 15 to 30°C. The fat ingredient of the chocolate of the present invention comprises at least 40% by weight of fats rich in 2-unsaturated-1,3-disaturated triglycerides the main constituent saturated fatty acids (S) of which have 16 to 18 carbon atoms. The fat ingredient also contains stable crystals of only SUS the constituent saturated fatty acids of which have 20 to 24 carbon atoms.

Hereinafter, all the "percents" and "parts" are by weight unless otherwise stated.

In the present invention, the softening point is measured according to the method described in Japan Oil Chemists' Society, Standard Fats Analytical Test Method 2.3.4.3-86, Softening Point (Ring and Ball Method) except that a sample chocolate is subjected to tempering treatment after melted and filled in a ring and then solidified at 5°C for 30 minutes and that the softening point is measured after aging at 20°C for 24 hours.

In the present invention, the softening point of the chocolate is 15 to 30 °C. When the softening point is too high, excellent hardness and melting properties in the mouth cannot be provided upon eating chocolate at a low temperature range of freezing or refrigerating. Preferably the softening

point is 28°C or lower. When the softening point is too low, melting of the surface occurs unless it is eaten at ordinary room temperature range just after taken out of a low temperature range such as a refrigerator. In addition, it is difficult to hold it by fingers.

The fat ingredient of the chocolate of the present invention comprises 40% or more of fats rich in 2-unsaturated-1,3-disaturated triglycerides (SUS) the main constituent saturated fatty acids (S) of which have 16 to 18 carbon atoms and stable crystals of only SUS the main constituent saturated fatty acids of which have 20 to 24 carbon atoms.

Preferably, the fats rich in SUS in which S has 16 to 18 carbon atoms are a fat containing 40% or more, preferably 50% or more of SUS or a mixture thereof. Preferably, U is oleic acid. Examples of the fats include natural materials such as cocoa butter, palm oil, shea butter, illipe butter and sal fat, synthesized fats such as those obtained by enzymatic interesterification, fractionated oils thereof and mixture thereof.

SUS in which S has 20 to 24 carbon atoms is also known by JP-A 63-58941 and the like. Since the SUS is present alone as stable crystals, the fine structure of chocolate can be maintained without melting even under conditions that the SUS in which S has 16 to 18 carbon atoms melts and a temperature is elevated up to several degrees higher than its

softening point, which results in a loss of shape retention of the chocolate. Thereby, conversion of the SUS in which S has 16 to 18 carbon atoms carbon number into stable crystal is assisted upon cooling afterwards and the chocolate can recover its glossy appearance.

SUS in which the S has 20 to 24 carbon atoms exist solely as stable crystals. That is, the SUS is present in the crystalline form different from other fat crystals (eutectic crystals). Such a state can be detected by DSC analysis, X-ray analysis and the like. Such a state can also be recognized by a phenomenon that chocolate recovers good glossy appearance even after it has exposed to a temperature ranging from its softening point to 2 to 3°C higher than the softening point and then cooled.

The above-described stable crystals are β-form and crystals other than such stable form hardly provide the above-described recovering effect.

It is desired that SUS in which S has 20 to 24 carbon atoms is present in an amount of 0.5 to 3% in the chocolate. However, it is not necessary that all the SUS is in the form of stable crystals. When the amount of the SUS is too small, the desired effect is hardly expected. When the amount of the SUS is too large, the melting properties of the chocolate of the present invention which has a low softening point are deteriorated. In any event, when the SUS is used

within this range, unexpectedly, properties for eating at a low temperature range, particularly a temperature range of freezing or refrigerating are not deteriorated and the limitations in marketing of the product are significantly improved.

Preferred conditions for obtaining chocolate suitable for eating at a low temperature range, particularly a temperature range of freezing or refrigerating have been disclosed in our co-pending Japanese Patent Application No. 227851/1994. The detailed conditions are as follows.

That is, preferably, the fat ingredient of the chocolate contains 95 to 40%, more preferably 90 to 50% of fats rich in SUS in which S has 16 to 18 carbon atoms and 5 to 40%, more preferably 10 to 30% of lauric fats and the ratio of the constituent saturated fatty acid having 16 carbon atoms (P) to that having 18 carbon atoms (St) of the SUS (P/St ratio) is at least 1, more preferably 1.2 to 10.0. For this purpose, from the economical viewpoint, it is advantageous to use, as the fat rich in SUS, palm medium melting point fraction alone or in combination with other fats rich in SUS. Examples of the lauric fats include known lauric fats the main constituent fatty acid of which is lauric acid such as coconut oil, palm kernel oil, babassu oil and the like and fractionated oils thereof.

When the amount of fats rich in SUS in which S has 16 to 18 carbon atoms is small and the amount of lauric fats

is large, hardness or snapping properties upon eating as per se chocolate sweets are deteriorated, or undesirable pasty mouthfeel comes out in the case that the composition has a relatively high fat content. On the contrary, when the amount of the former is large and the amount of the latter is small, the softening point of chocolate derived from the hardness of the SUS cannot be lowered sufficiently and mouthfeel as chocolate to be eaten at a low temperature is hard.

It is desired that the fat content of the chocolate is higher according to the P/St ratio. As seen from Fig. 1, the relation between the P/St ratio of SUS to the fat content in the chocolate is on or in the higher oil content region above line 1 drawn by taking the points of

1.0 of the P/St ratio and 40% of the fat content,

1.2 of the P/St ratio and 35% of the fat content, and

1.5 of the P/St ratio and 30% of the fat content

preferably, on or in the higher oil content region above line 2 drawn by taking the points of

1.0 of the P/St ratio and 45% of the fat content,

1.2 of the P/St ratio and 40% of the fat content, and

1.5 of the P/St ratio and 35% of the fat content

in a graph plotting the fat content as ordinate and the P/St ratio as abscissa. However, preferably, the fat content is not more than 60% as shown by line 3 in Fig. 1.

In the present invention, in order to further improve mouthfeel, particularly preferred conditions other than the above are such that the P/St ratio of SUS in the fat ingredient of the chocolates is 3 or more, preferably, 3 to 10. Alternatively, palm medium melting point fraction having an iodine value (IV) of 40 or more, preferably, 42 to 52 is used as the fat rich in SUS or a low melting fraction of lauric fats as a lauric fat is used regardless of the P/St ratio of SUS in the fat ingredient of the chocolate being 3 or more.

For obtaining 3 or more of the P/St ratio of SUS in the fat ingredient of the chocolate, the use of cacao butter and other SUS type hard butter rich in StOSt is controlled. Although an iodine value (IV) of palm medium melting point fraction most commonly used as hard butter is at a range of 30 to 35, by using palm medium melting point fraction having a relatively higher IV, a wide variety of lauric fats can be used.

However, in the present invention, milk fat can be contained in the fat ingredient (20% or less in the fat ingredient) as whole powdered milk for milk chocolate or white chocolate and it is possible to add a small amount of a fat

having low melting point, for example, a fat which is liquid at ordinary room temperature in so far as desired physical properties are not deteriorated.

The chocolate of the present invention is advantageous in that it recovers the original glossy state by cooling even after it is exposed to a temperature higher than the softening point, i.e. loss of its shape retention. In addition to the glossy state, for maintaining its shape, preferably, the chocolate is held in a mold.

Such a mold is disclosed in, for example, JP-A 62-215346. A flexible mold obtained by providing a suitable number of recesses in the desired shape to a sheet of thermoplastic resin such as polypropylene, hard polyethylene, polyethylene terephthalate, polystyrene or polyvinyl chloride is conveniently and suitably used.

As described hereinabove, the chocolate of the present invention have excellent hardness and melting properties in the mouth at a low temperature range, i.e. not only at a temperature in winter season but also at a temperature range of freezing and refrigerating. Thus, the chocolates is novel frozen or refrigerated chocolate which has not been found in the prior art.

The process for producing chocolates of the present invention is characterized by adding a material containing stable crystals of SUS in which S has 20 to 24 carbon atoms

to a melted chocolate material mix the fat ingredient of which comprises 40% or more of fats rich in SUS the main constituent S of which has 16 to 18 carbon atoms and having a softening point of 15 to 30°C during a cooling step thereof from the melted state.

The chocolate material mix having a softening point of 15 to 30°C the fat ingredient of which comprises 40% or more of fats rich in SUS the main constituent S of which has 16 to 18 carbon atoms and its more preferred conditions are as described above. Likewise, the stable crystals of the SUS in which S has 20 to 24 carbon atoms are as described above.

The chocolate material mix is cooled and solidified from its melted state according to a conventional method. In order to obtain uniform dispersion, it is desired that the material containing stable crystals of the SUS in which S has 20 to 24 carbon atoms is preferably a powdered or plastic additive. The production of such a powdered additive and addition thereof are described in JP-A 63-240745. In addition, the additive is commercially available (sold by Fuji Oil Co., Ltd.). The particle size of the additive is 100 μ or smaller, preferably 50 μ or smaller. In addition, a powdered ingredient known to be an ingredient of a chocolate material mix , for example, sugar, can be added to the additive as a dispersion carrier or medium. The plastic

additive can be prepared according to the method described in JP-A 2-4063.

Preferably, the additive is added to the chocolate material mix at a temperature range between it softening point to about 5°C higher than the softening point during the cooling step. This is most effective because tempering is accelerated in addition to improvement of physical properties of the chocolate. Thereby, the chocolate can be produced without a so-called re-heating step and considerable supercooling and difficulty in operation due to increase in viscosity resulted from supercooling, which are often encountered in the tempering of chocolate having a lower softening point as that of the present invention, can be improved.

After dispersion of the additive, the chocolate material mix is further cooled and solidified. When the solidification is carried out in the above-described flexible mold, not only the gloss of the surface but also the shape can be well maintained and the product is easily eaten.

The following reference examples, examples and comparative examples further illustrate the present invention in detail. However, they are not to be construed to limit the scope of the present invention.

Reference Example 1

Preparation of a material containing stable crystals of SUS in which S has 20 to 24 carbon atoms

Ethyl ester of behenic acid and high-oleic sunflower oil were interesterified with a lipase having 1,3-selectivity. After subjecting the interesterified product to solvent fractionation and concentration, the product was recrystallized from hexane and the solvent was distilled off by a vacuum pump with preventing melting of the crystals. The crystals were pulverized with cooling, mixed with an equal amount of powdered sugar and freeze-pulverized in liquid nitrogen to the mean particle size of about 20 μ or smaller to obtain a powdered additive. The crystal form of the SUS was β form. According to HPLC analysis, the additive was composed of AOS 0.2%, BOS 2.8%, BLB 2.5%, BOA 14.0%, BOB 75.9%, BOLi (2-oleylbeheniclignocerine) 4.3% and other glycerides 0.4% (A: arachic acid, B: behenic acid and Li: lignoceric acid).

Reference Example 2

Preparation of a material containing stable crystals of SUS in which S has less than 20 carbon atoms.

A high melting point fraction was obtained from alanbrachia extracted oil with an yield of 59.1% and this fraction was aged for a long period of time. Then, it was freeze-pulverized in liquid nitrogen to obtain an additive of β-form crystal powder (mean particle size: 11.4 μ).

The fatty acid compositions and the melting points of the additives of Reference Examples 1 and 2 are shown in Table 1. The melting point was measured by putting a sample

into a glass tube up to about 5 mm height from the closed bottom of the glass tube the inner diameter of which was 1 mm. The closed bottom of the tube was contacted with a globe part of a thermometer. The measurement was carried out by heating in a water bath.

Table 1

Fatty acid composition

	(chain length:number of double bond)						
Example	C16:0	C18:0	C18:1	C18:2	C20:0	C22:0	C24:0
Reference Example 1	0.1	0.8	27.9	1.1	5.9	61.5	2.5
Reference Example 2	0.6	64.1	35.2	-	0.1	-	-

Melting point

Example	beginning of melting/end of melting
Reference Example 1	51.4°C/52.8°C
Reference Example 2	42.4°C/43.6°C

Examples 1 to 7 and Comparative Examples 1 to 5

Experiments for illustrating suitability for chocolate material mix having low softening point

According to the formulations as shown in Tables 2-1 and 2-2, cacao butter, palm medium melting point fraction (PMF) (IV = 34.0 and elevated melting point = 30.0°C, or IV = 45.0 and open tube melting point (slipping point of A.O.C.S. Official Method Cc 3-25) = 26.0°C), a lauric fat (a palm

kernel low melting point fraction i.e., palm kernel olein having IV of 25.0 and open tube melting point 21°C, or coconut oil having IV of 8.5 and open tube melting point 24.1°C) were melted and mixed together. Then, lecithin was added to the mixture to prepare a fat phase. On the other hand, cacao mass, whole powdered milk and sugar were mixed together and then a part of the above fat phase was added to the mixture and the mixture was subjected to roll-refining. After conching at 50°C, the remaining fat phase was admixed to the mixture.

Table 2-1

Preferred chocolate formulations (parts)

Ingredient	Ex.1	Ex.2	Ex.3	Ex.4	Ex.5	Ex.6	Ex.7
Cacao mass	15.0	15.0	15.0	15.0	15.0	0.0	15.0
Whole powdered milk	20.0	20.0	15.0	20.0	10.0	30.0	20.0
Sugar	40.0	35.0	35.0	45.0	25.0	35.0	34.0
Cacao butter	0.0	10.0	15.0	0.0	20.0	0.0	12.0
PMF(IV 34)	15.0	0.0	0.0	15.0	20.0	30.0	0.0
PMF(IV 45)	0.0	10.0	16.0	0.0	0.0	0.0	9.0
Palm kernel olein	10.0	10.0	0.0	5.0	10.0	0.0	10.0
Palm oil	0.0	0.0	4.0	0.0	0.0	5.0	0.0
Lecithin	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Flavor	pq	pq	pq	pq	pq	pq	pq

pq: proper quantity

Table 2-2

Unsuitable chocolate formulations (parts)

Ingredient	Comp. Ex.1	Comp. Ex.2	Comp. Ex.3	Comp. Ex.4	Comp. Ex.5
Cacao mass	15.0	15.0	15.0	15.0	15.0
Whole powdered milk	20.0	20.0	15.0	15.0	20.0
Sugar	40.0	40.0	35.0	35.0	45.0
Cacao butter	25.0	15.0	15.0	5.0	9.0
PMF(IV=45)	0.0	0.0	18.0	10.0	6.0
Palm kernel olein	0.0	10.0	0.0	20.0	5.0
Palm oil	0.0	0.0	2.0	0.0	0.0
Lecithin	0.4	0.4	0.4	0.4	0.4
Flavor	pq	pq	pq	pq	pq

pq: proper quantity

The fat composition in the raw material is shown in Table 3. In Table 3, the fat content (%) represents the amount of the fat ingredient in the chocolate material mix and the amounts of SUS and lauric fats represent the amounts thereof in the fat ingredient of the chocolate. Analysis of SUS composition was carried out using high performance liquid chromatography. The P/St ratio represents that of the constituent fatty acids of the SUS.

Table 3

Fat Composition

mix	fat content(%)	POP	POS	SOS	P/St	lauric fats
Ex.1	38.4	29.2%	9.5%	6.4%	3.04	26.0%
Ex.2	43.5	18.8	18.7	11.0	1.38	23.0
Ex.3	47.2	25.5	22.9	13.1	1.51	8.4
Ex.4	33.5	33.5	15.4	7.0	2.80	14.9
Ex.5	60.9	24.4	20.0	12.3	1.54	16.4
Ex.6	42.8	45.6	9.9	1.3	8.14	11.7
Ex.7	44.5	17.6	21.3	13.0	1.20	15.0
Comp.Ex.1	38.4	15.4	31.8	21.7	0.83	0.0
Comp.Ex.2	38.4	11.0	22.2	15.0	0.81	26.0
Comp.Ex.3	47.2	27.6	21.6	13.2	1.60	4.2
Comp.Ex.4	47.2	15.4	12.2	7.5	1.58	42.4
Comp.Ex.5	33.4	17.8	21.3	13.0	1.20	15.0

The underlined data in Table 3 are outside of the preferred range. The chocolate material mix thus obtained was subjected to tempering and the mix was put into a flexible mold made of a synthetic resin. After cooling at a cold temperature range of about 5°C for 30 minutes, the chocolate was released from the mold. Hardness and mouthfeel of the chocolate were evaluated at temperature ranges of freezing

(-20°C) and refrigerating (5°C). The results are shown in Table 4-1. Tempering treatment was carried out by a conventional typical method, i.e. by heating and melting the chocolate material mix, cooling the mix to a temperature somewhat lower than the softening point of the chocolate to form fat crystals and re-heating after detection of increase in viscosity of the mix, or rise in temperature of the mix due to release of crystallization heat. Then, only instable crystals were melted and the mix was cooled to 5°C to solidify it, followed by aging at 20°C.

Table 4-1

Results of evaluation

	softening point °C	mouthfeel at freezing	mouthfeel at refrigerating
Ex.1	27.0	excellent	excellent
Ex.2	26.0	excellent	excellent
Ex.3	27.2	good	excellent
Ex.4	28.0	good	good
Ex.5	26.0	good (somewhat oily)	good (somewhat oily)
Ex.6	27.0	excellent	excellent
Ex.7	27.5	excellent	excellent
Comp.Ex.1	33.0	bad (hard, difficult to melt in mouth)	bad (difficult to melt in mouth)
Comp.Ex.2	27.0	bad (pasty)	not good (pasty)
Comp.Ex.3	26.5	not good (pasty)	not good (pasty)
Comp.Ex.4	23.0	not good (soft)	bad (soft)
Comp.Ex.5	27.5	not good (hard)	not good (hard)

The underlined data are outside of the desired range.

Examples 8 and 9 and Comparative Example 6

Production of chocolate containing stable crystals of only SUS in which S has 20 to 24 carbon atoms

According to the same manner as decried in the above Examples, chocolate was produced except that the additive prepared by Reference Example 1 was added to the chocolate material mix in an amount of 3% based on the chocolate and uniformly dispersed when the mix was cooled to a temperature higher than the softening point, i.e., 34°C instead of cooling the heated and melted mix to below the softening point by the conventional typical tempering method.

Softening points, mouthfeel in freezing and mouthfeel in refrigerating of the products are shown in Table 4-2. Any significant difference was not recognized in comparison with the above product without addition of the additive. mentioned.

Table 4-2

Results of evaluation

mix	additive	softening point (°C)	mouthfeel at freezing	mouthfeel at refrigerating
Ex.8	Ref.1	26.5 °C	excellent	excellent
Ex.9	Ref.1	25.8	excellent	excellent
Comp.Ex.6	ref.1	<u>32.5</u>	bad (hard, difficult to melt in mouth)	bad (difficult to melt in mouth)

The underlined data is outside of the preferred range.

In addition, the chocolate was subjected to a temperature cycle test between 20°C and 32°C (for 11 hours at each temperature, heating and cooling between the both temperatures for 30 minutes, 10 cycles) and the gloss of the surfaces were evaluated. The results are shown in Table 5.

Table 5

Results of the cycle test

mix	conventional typical tempering	use of the additive of Reference Example 1
Ex.8	blooming	good gloss
Ex.9	blooming	good gloss
Comp.Ex.6	blooming	good gloss

When the same cycle test was carried out by using the additive of Reference Example 2 instead of that of Reference Example 1, fat blooming caused.

As described hereinabove, according to the present invention, it is possible to produce chocolate which can be marketed at ordinary room temperature in spite of its low softening point. In addition, it is possible to obtain solid chocolate which has excellent hardness and melting properties in the mouth when it is eaten at a temperature range of freezing and refrigerating. Therefore, the present invention contributes very much to development of a new chocolate market.

THIS SHEET HAS BEEN
REPLACED

* C L M S *

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What is claimed is:

1. Chocolate having a softening point of 15 to 30°C, wherein its fat ingredient comprises at least 40% by weight of fats rich in 2-unsaturated-1,3-disaturated triglycerides (SUS), the main constituent saturated fatty acids (S) of which have 16 to 18 carbon atoms, and stable crystals of only SUS, the constituent saturated fatty acids of which have 20 to 24 carbon atoms.

2. The chocolate according to claim 1, the amount of SUS the constituent saturated fatty acids of which have 20 to 24 carbon atoms is 0.5 to 3% by weight based on the chocolate.

3. The chocolate according to claim 1 which is eaten as it is as chocolate sweets.

4. The chocolate according to claim 1 which is held in a flexible mold.

5. The chocolate according to claim 1, wherein the fat ingredient comprises 95 to 40% by weight of fats rich in SUS in which S has 16 to 18 carbon atoms and 5 to 40% by weight of lauric fats and the ratio of the constituent saturated fatty acid having 16 carbon atoms to that having 18 carbon atoms of SUS (P/St ratio) is at least 1.

6. The chocolate according to claim 1, wherein the relation of the P/St ratio of SUS to the fat content (% by

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weight) of the chocolate is on or in the higher region than a line drawn by taking the points of

1.0 of the P/St ratio and 40% of the fat content,

1.2 of the P/St ratio and 35% of the fat content, and

1.5 of the P/St ratio and 30% of the fat content

in a graph plotting the fat content as ordinate and the P/St ratio as abscissa.

7. The chocolate according to claim 5, wherein the P/St ratio of SUS in the fat ingredient is at least 3.

8. The chocolate according to claim 5, wherein palm medium melting point fraction having an iodine value of at least 40 is used as the fats rich in SUS.

9. The choclate according to claim 5, wherein a low melting is used point fraction of lauric fats as a lauric fat.

10. A process for producing chocolate which comprises adding a material containing SUS stable crystals, the constituent saturated fatty acids of which have 20 to 24 carbon atoms, to a chocolate material mix having a softening point of 15 to 30°C and containing at least 40% by weight of fats rich in 2-unsaturated-1,3-disaturated triglycerides (SUS), the main constituent saturated fatty acids (S) of which have 16 to 18 carbon atoms, in its fat ingredient during a cooling step of the melted mix.

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11. The process according to claim 10, wherein the material containing stable crystals of the SUS in which S has 20 to 24 carbon atoms is a powder or plastic additive.

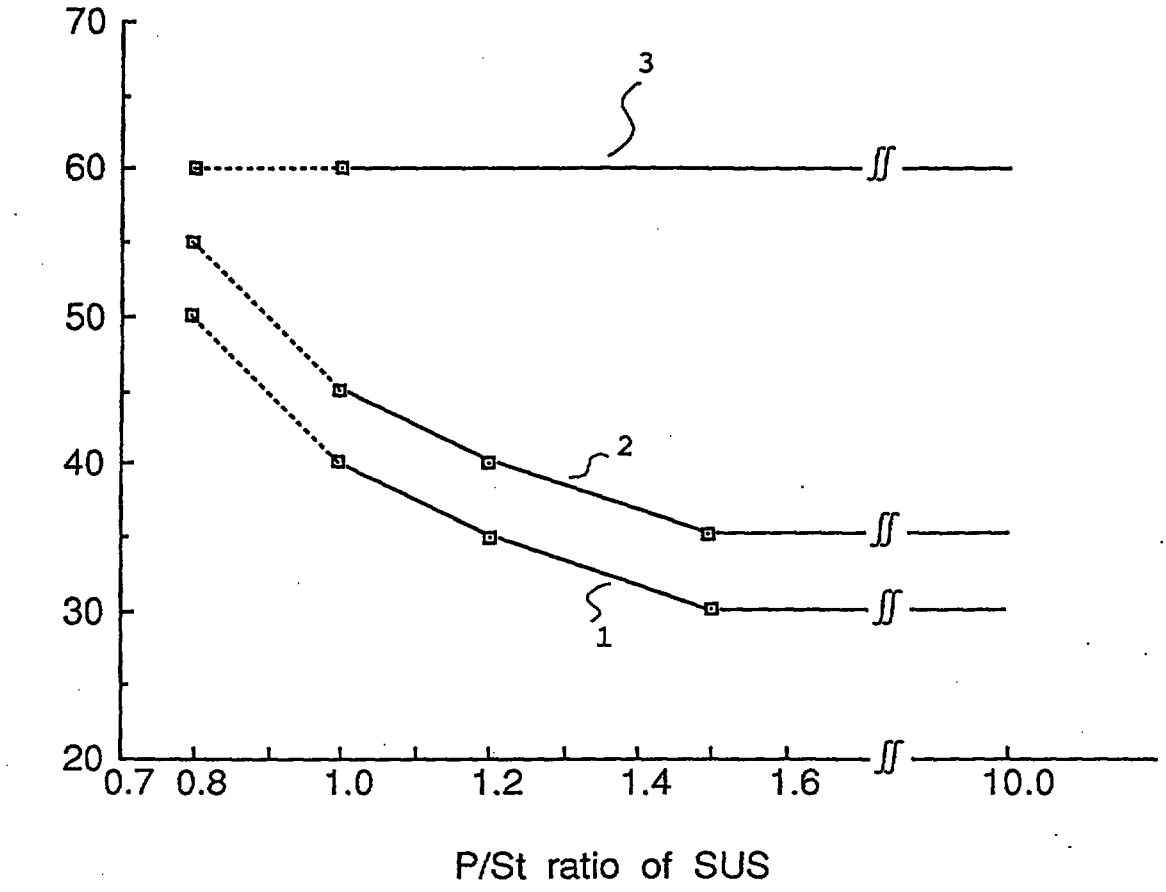

Fat content(%)
70
60
50
40
30
20
3
2
1
0.7
0.8
1.0
1.2
1.4
1.6
10.0
P/St ratio of SUS

Fig. 1

CHOCOLATE AND PROCESS FOR PRODUCING THEREOF

Abstract of the disclosure:

Chocolates which can be marketed at ordinary room temperature in spite of its low softening point is disclosed. The chocolate has a softening point of 15 to 30°C and its fat ingredient comprises at least 40% by weight of fats rich in 2-unsaturated-1,3-disaturated triglycerides (SUS), the main constituent saturated fatty acids (S) of which have 16 to 18 carbon atoms, and stable crystals of only SUS, the constituent saturated fatty acids of which have 20 to 24 carbon atoms. Its production is also disclosed.

(Figure 1)

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. Chocolate having a softening point of 15 to 30°C, wherein its fat ingredient comprises:

95 to 40% by weight of fats rich in "2-unsaturated-1,3-disaturated triglycerides (SUS), the main constituent saturated fatty acids (S) of which have 16 to 18 carbon atoms,

5 to 40% by weight of lauric fats, and

stable crystals of only SUS, the constituent saturated fatty acids of which have 20 to 24 carbon atoms,

the ratio of the constituent saturated fatty acid having 16 carbon atoms to that having 18 carbon atoms of SUS (P/St ratio) being at least 1.

2. Chocolate having a softening point of 15 to 30°C, wherein its fat ingredient comprises:

at least 40% by weight of fats rich in "2-unsaturated-1,3-disaturated triglycerides (SUS), the main constituent saturated fatty acids (S) of which have 16 to 18 carbon atoms, and

stable crystals of only SUS, the constituent saturated fatty acids of which have 20 to 24 carbon atoms,

the relation of the ratio of the constituent saturated fatty acid having 16 carbon atoms to that having 18 carbon atoms of SUS (P/St ratio) to the fat content (% by weight) of the chocolate being on or in the higher region than a line drawn by taking the points of:

1.0 of the P/St ratio and 40% of the fat content,

1.2 of the P/St ratio and 35% of the fat content,

and

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1.5 of the P/St ratio and 30% of the fat content in a graph plotting the fat content as ordinate and the P/St ratio as abscissa.

3. The chocolate according to claim 1 or 2, the amount of SUS the constituent saturated fatty acids of which have 20 to 24 carbon atoms is 0.5 to 3% by weight based on the chocolate.

4. The chocolate according to claim 1 or 2 which is eaten as it is as chocolate sweets.

5. The chocolate according to claim 1 or 2 which is held in a flexible mold.

6. The chocolate according to claim 1, wherein the P/St ratio of SUS in the fat ingredient is at least 3.

7. The chocolate according to claim 1, wherein palm medium melting point fraction having an iodine value of at least 40 is used as the fats rich in SUS.

8. The chocolate according to claim 1, wherein a low melting is used point fraction of lauric fats as a lauric fat.

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