

# Smart Blends In Confectionery Fats

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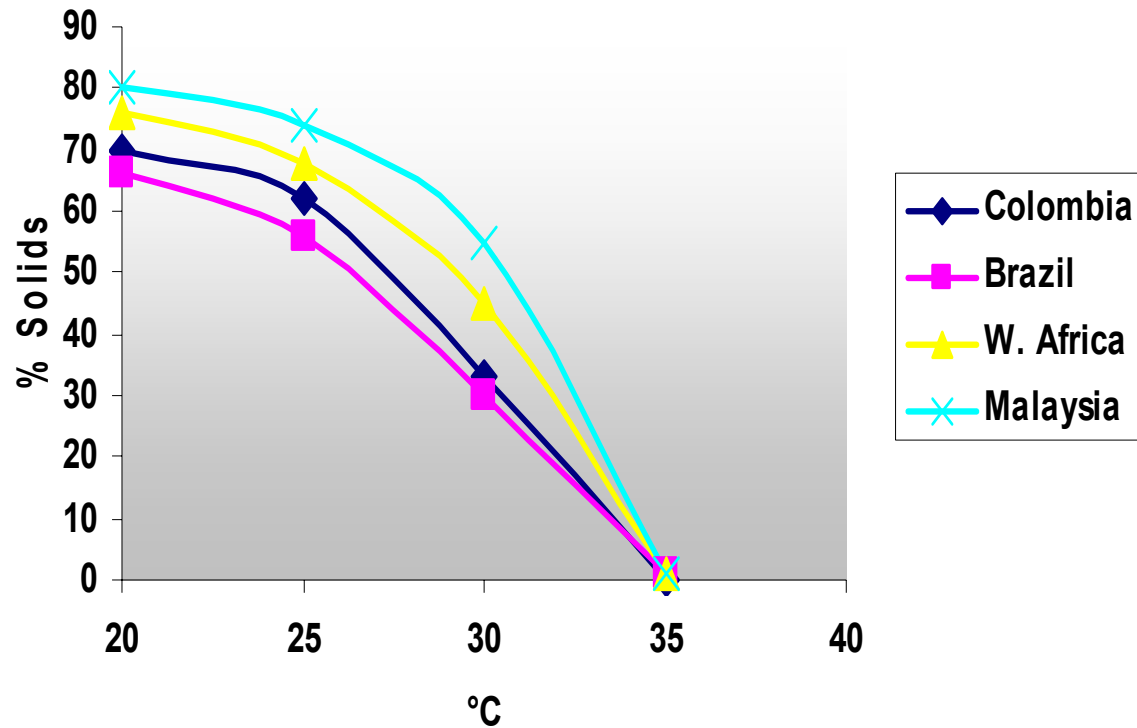
4th GOOF

San Diego, CA September, 2005

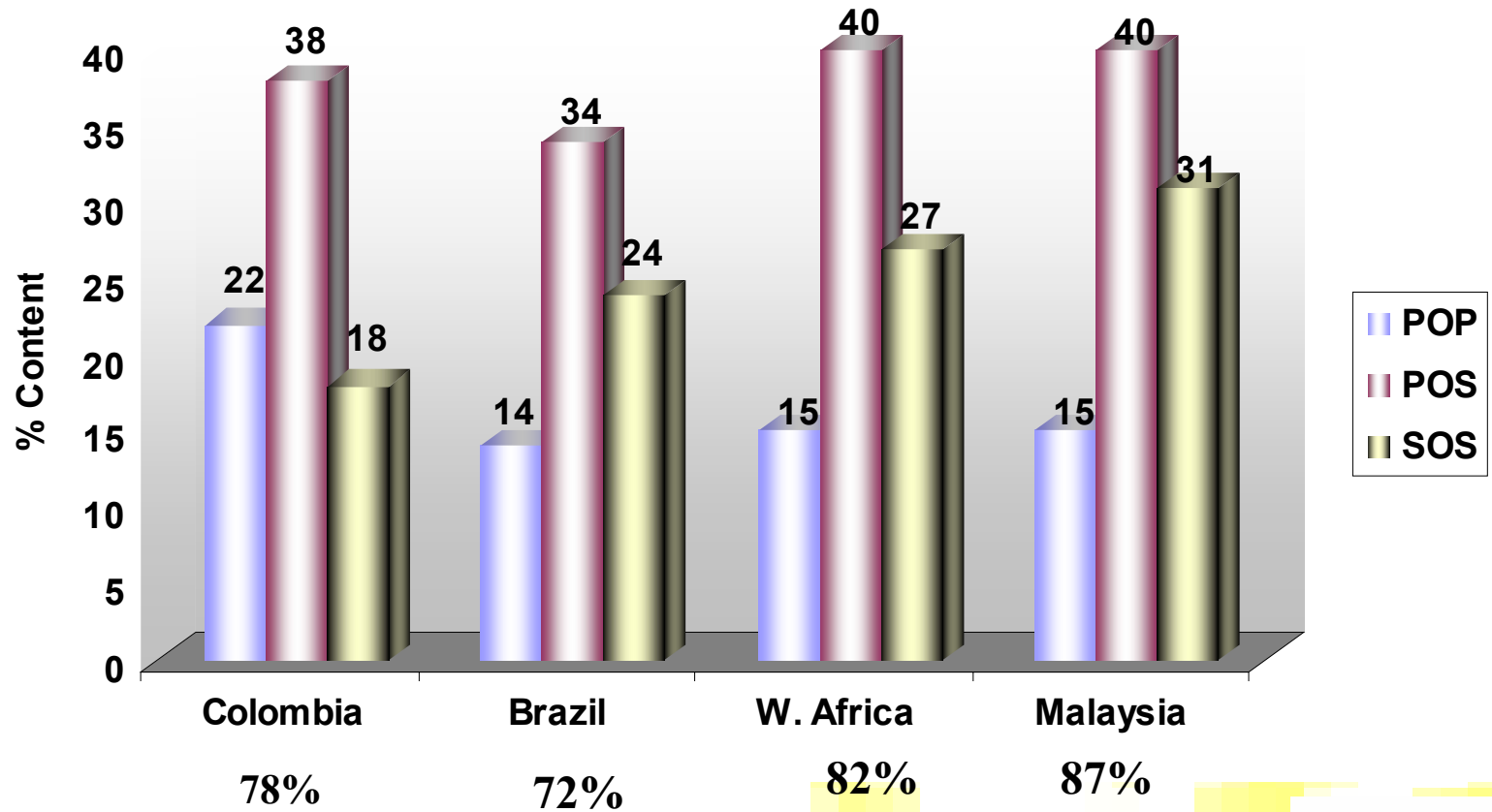
# Cocoa Butter Unique Properties

- CB is a natural fat that constitutes about 50-55% of the dry cocoa nib.
- CB has unique triglyceride composition which provide its desirable physical properties.
- CB has a sharp melting profile which imparts a desirable cooling sensation in chocolate products
- Key component of the different chocolate products along with cocoa and/or liquor mass (cocoa plus cocoa butter)

# NMR Solids Cocoa Butters



# Symmetric SOS TAG in CB



# Polymorphism of Fats



- **$\alpha$  Crystals**
  - Unstable, Waxy
- **$\beta'$  Crystals**
  - Preferred form for most baking applications, small, needle like
  - Smooth texture, better creaming
  - Obtained from diversity of FA chain length and TAG diversity
- **$\beta$  Crystals**
  - Most stable form. Big plate like structure
  - Grainy, sandy and oily texture in margarine products
  - Found when FA and TAG are very similar

# Polymorphs of Cocoa Butter

Form	Melting Point °C	Systematic Nomenclature	
I	17.3	$\beta'_3$ (sub- $\alpha$ )	
II	23.3	$\alpha$ -2	
III	25.5	$\beta'_2$ -2	
IV	27.5	$\beta'_1$ -2	Untempered chocolate
V	33.8	$\beta_2$ -3	Tempered chocolate
VI	36.2	$\beta_1$ -3	Bloomed chocolate

Wille & Lutton, 1966

# Crystal Form of Some TAG

# C	TAG	Type	# C	TAG	Type
42	PPC	$\beta$	42	LPM	$\beta'$
44	PPL	$\beta$	46	LSP	$\beta'$
48	PPP	$\beta$	50	PSP	$\beta'$
50	POP	$\beta$	50	PPO	$\beta'$
52	SPS	$\beta$	52	POO	$\beta'$
52	POS	$\beta$	52	SPO	$\beta'$
54	SOS	$\beta$	54	SSO	$\beta'$

# Crystal Habit of Some Fats & Oils

$\beta$

Cocoa Butter

Palm Oil Stearine

Sunflower Oil

Soybean Oil

$\beta'$

Palm Oil

Palm Olein

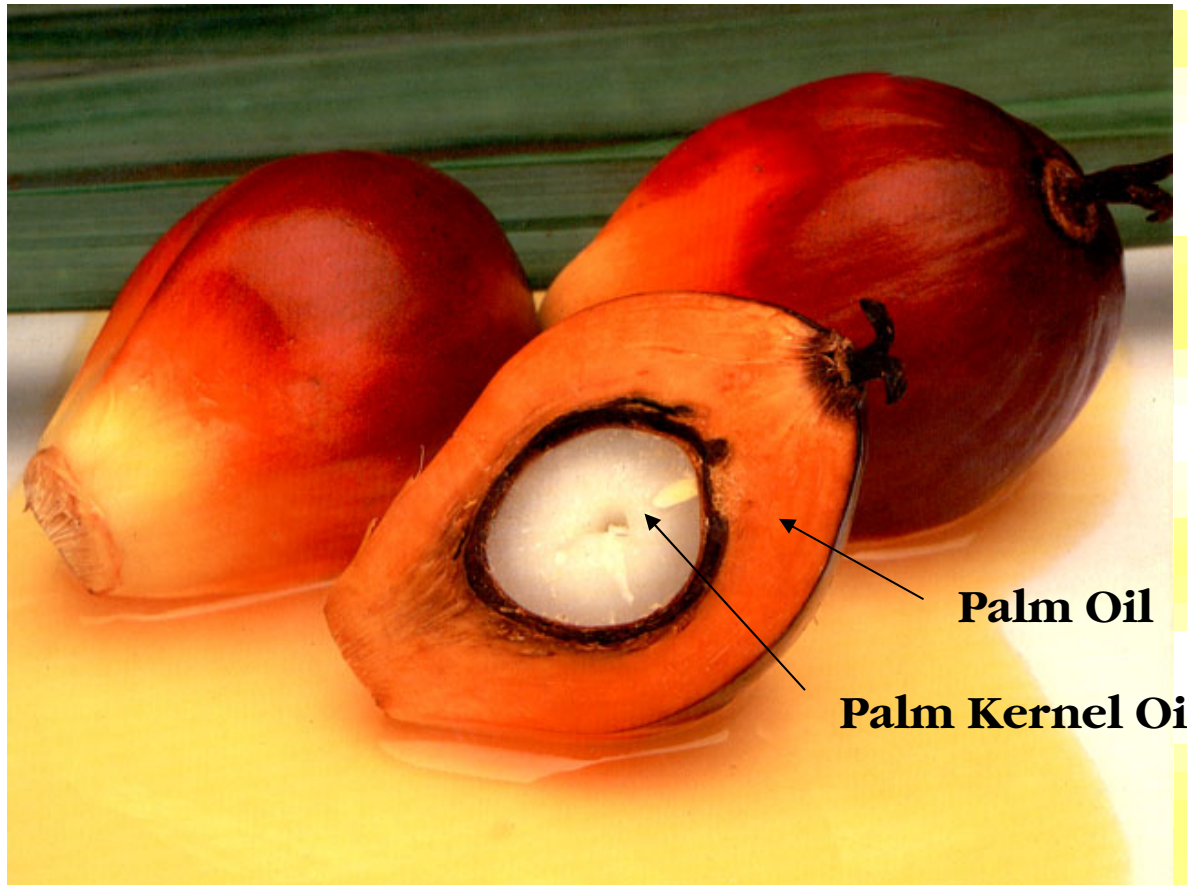
Palm Kernel Oil

Palm Kernel Stearine

# Confectionery Fats

- Vegetable fats designed to resemble the functional properties of cocoa butter with sharp melting profile.
- Palm and palm kernel oils have demonstrated excellent functionality for the development of those specialty fats.
- Main driver for their development would be cost reduction as they are much less expensive than CB.
- They can be designed to meet specific functional properties in chocolate products and they can improve cocoa butter functional limitations.
- Depending on the type of the fat and application, they can be used as 100% of the fat portion, or blended with CB

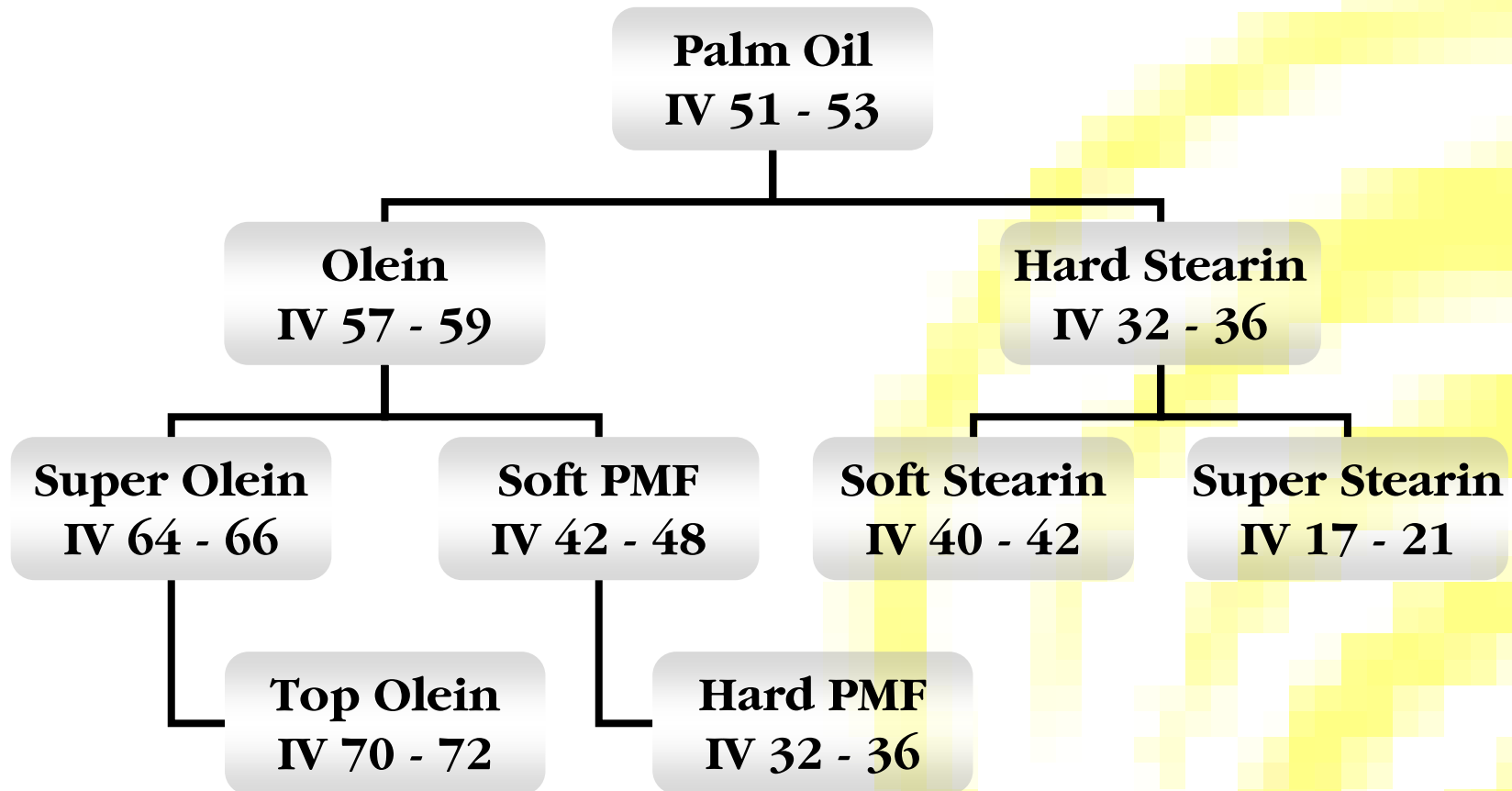
# Palm Fruit



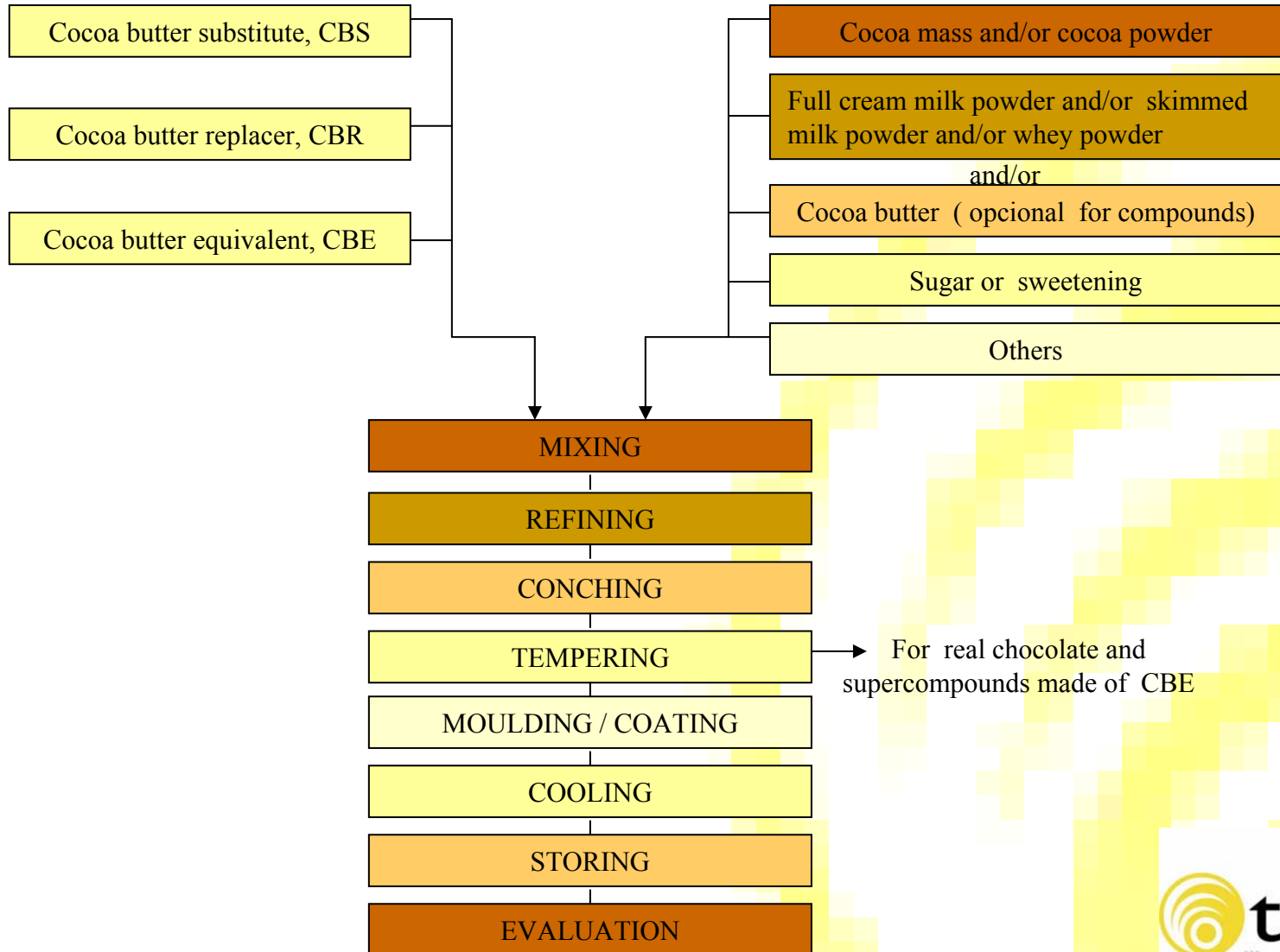
**Palm Oil**

**Palm Kernel Oil**

# Palm Oil Fractions



# Chocolate Making Process



# COCOA BUTTER ALTERNATIVES

## LAURIC FATS

### COCOA BUTTER SUBSTITUTES CBS

- Vegetable lauric Fat used to substitute the cocoa butter.
- High percentage of lauric acid C12:0 > 54%
- It is not compatible with cocoa butter, it's possible to add only up to 5% of cocoa butter in the fat phase.
- High contraction degree.
- Fast crystallization, growing B' stable crystals that impart high gloss and gloss retention.
- It doesn't need tempering.

## NON LAURIC FATS

### COCOA BUTTER REPLACERS CBR

- Vegetable non lauric fat used to replace the cocoa butter.
- High percentage of elaidic acid C18:1 trans > 50%
- Partially compatible with cocoa butter, adding up to 30% of cocoa butter in the fat phase.
- Contraction is lower than CBS but still good for moulding applications (TCR-05).
- Fast crystallization, growing B' stable crystals that impart high gloss and gloss retention. It's not necessary to make tempering phase.

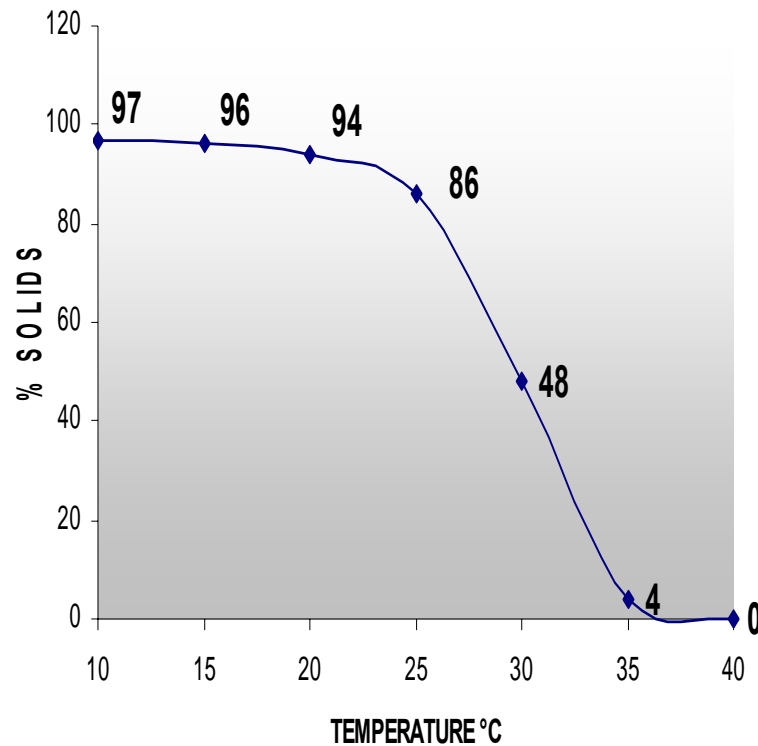
### COCOA BUTTER EQUIVALENTS CBE

- Vegetable non lauric fat which has a similar triglyceride composition (POS, SOS y POP) than cocoa butter.
- Fully compatible to cocoa butter, it has a 100% tolerance in whichever proportion.
- The crystallization process occurs slower than in CBR and CBS.
- Because of its polymorphic behavior, it has to be tempered to get the B stable crystals.

# Cocoa Butter Substitute

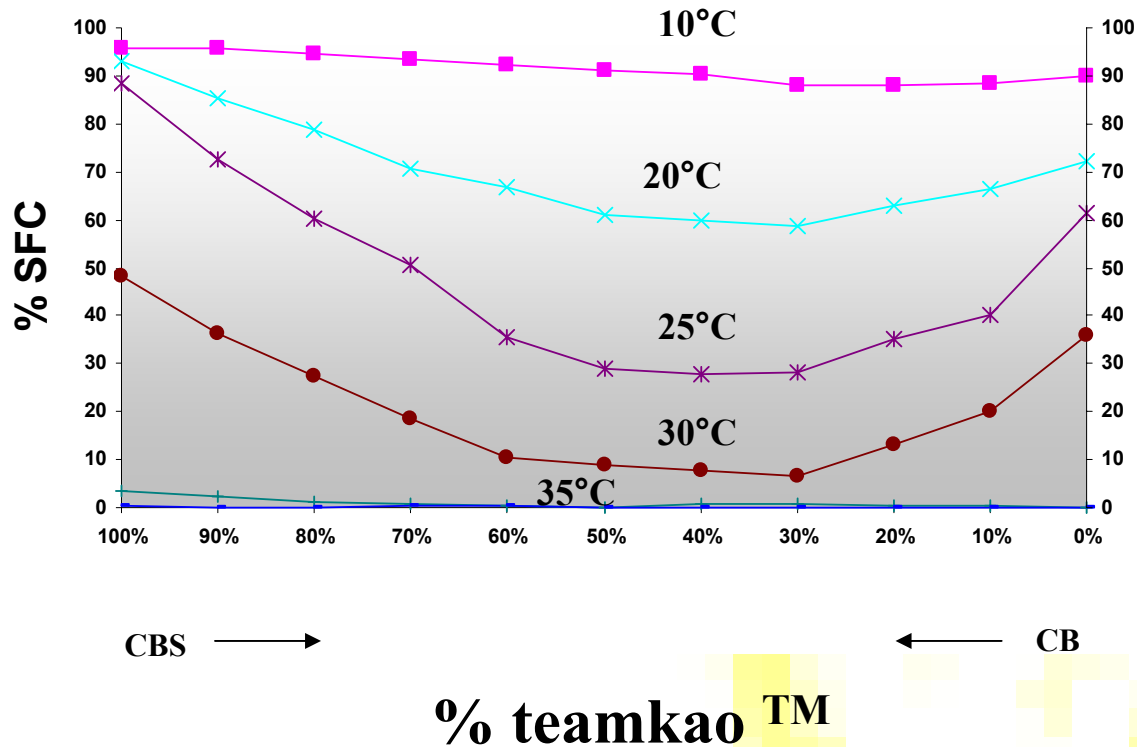
- Form eutectics with CB and therefore a maximum of 5% CB can be used.
- Products have to be formulated with cocoa powder.
- Conching time is low because because cocoa powder has the flavor almost totally developed.
- Quick crystallization in stable  $\beta'$  crystals and therefore doesn't require tempering.
- Excellent gloss and high gloss retention through the time.
- Excellent contraction and therefore ideal for molded products with very good snapping.
- Palm kernel oil is preferred over coconut oil because its higher oleic content and therefore better melting profile.

# Solids Profile CBS



- **teamkao™ TCS**
- Primarily used for molded products because its excellent gloss and snapping.
- Ideal for making compound chocolate.
- Can be used for enrobing and panning of hard centres.

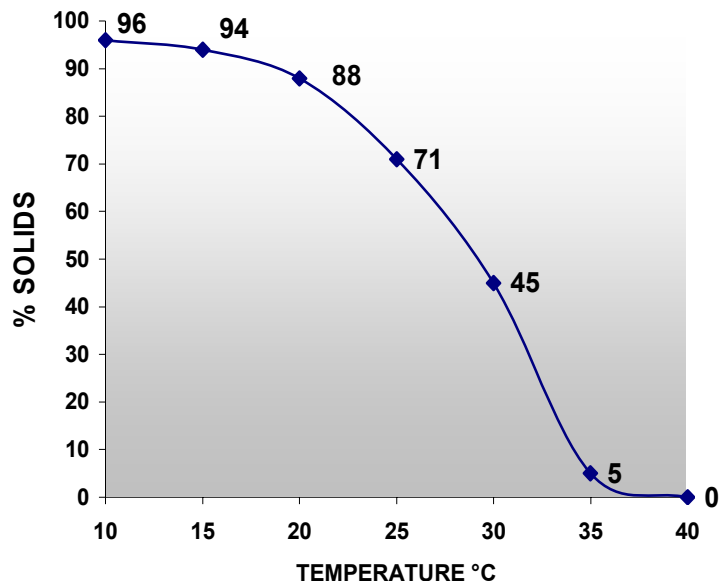
# CBS Tolerance to Cocoa Butter



# Cocoa Butter Replacer

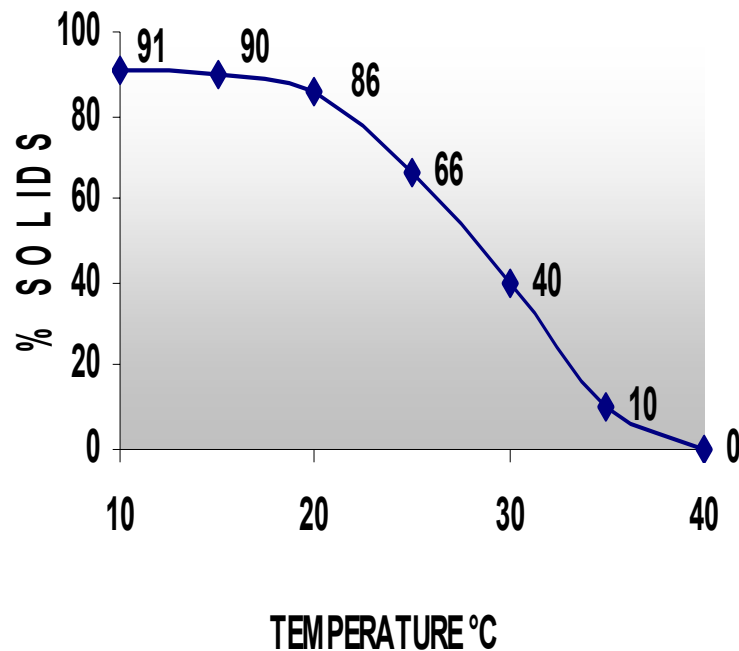
- Partial tolerance to CB and therefore up to 20% CB can be used in formulations.
- Quick crystallization in  $\beta'$  crystals and therefore it doesn't need tempering.
- Good gloss and gloss retention through the time.
- Can be used in molding and coating applications.
- The melting profile is obtained via the development of a high level of *trans* isomers.

# CBR Solids Profile



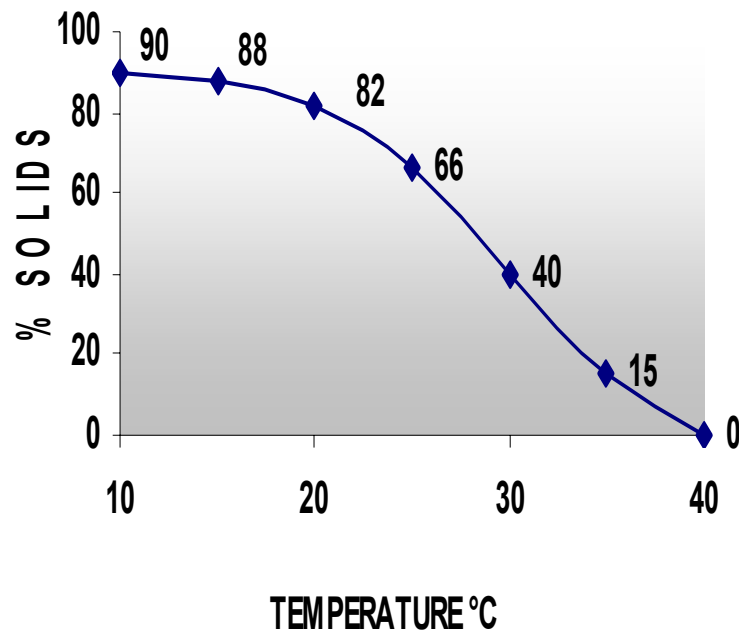
- **teamcao™ 05**
- Used in high quality molded products with or without fillings.
- Enrobing applications with excellent melting profile.
- It doesn't give waxy sensation.
- Good resistance in cold and moderate warmth weather.

# CBR Solids Profile



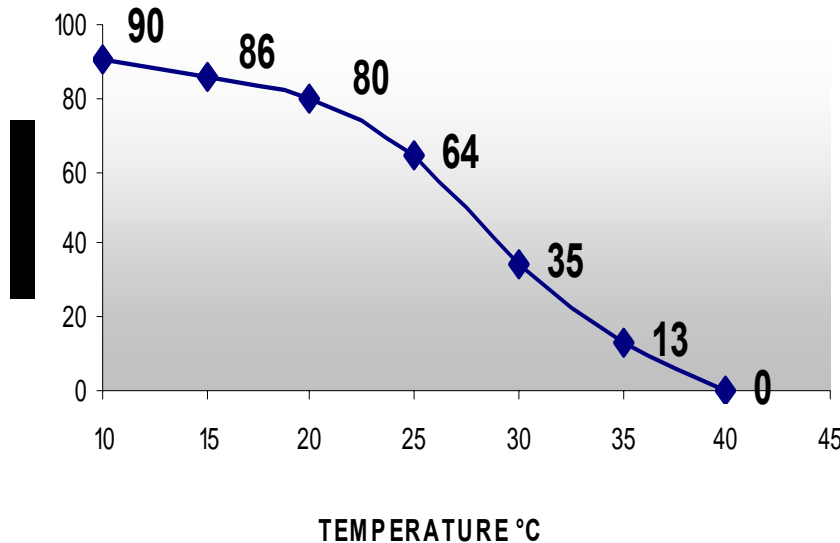
- **teamcao™ 10**
- Used in good quality coatings.
- Could be used in molded products but with a slight waxy sensation.
- Good resistance in cold and moderate warmth weather.

# CBR Solids Profile



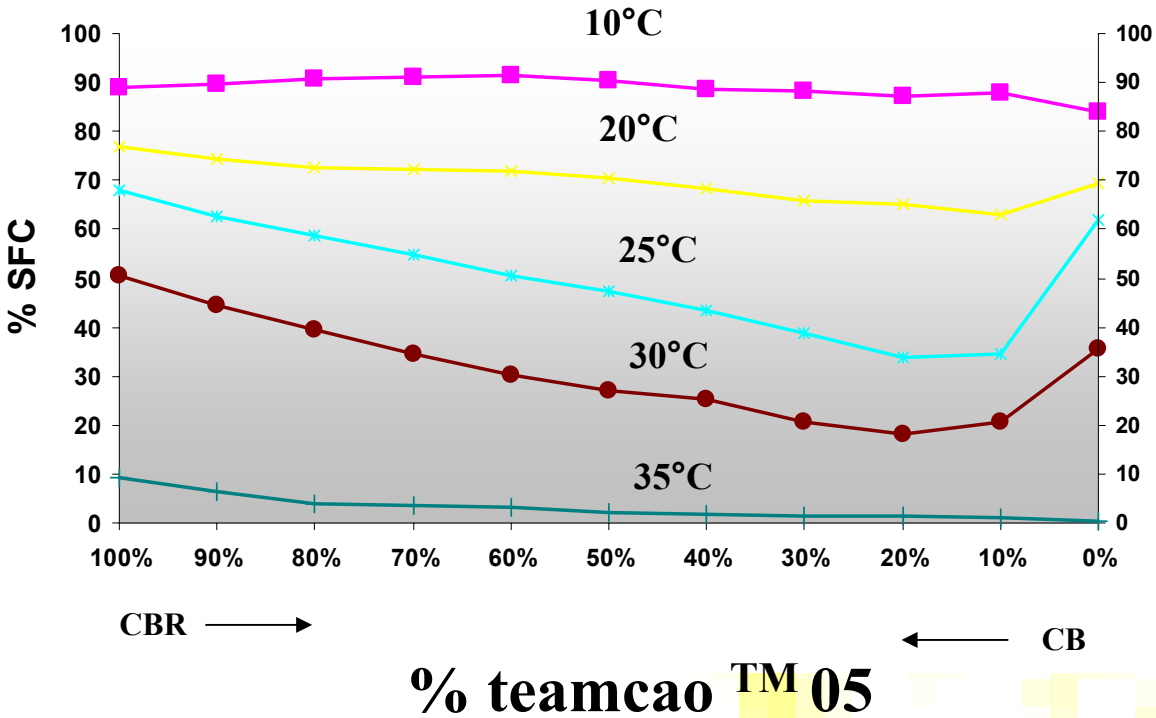
- **teamcao™ 15**
- Used only in enrobing applications for hard and soft centres.
- Good resistance in cold and moderate warmth weather.

# CBR Low Trans



- **teamcao<sup>TM</sup> LT** developed as a response to the low trans needs.
- 50% lower *trans* than traditional CBR
- Ideal for coatings
- Slower crystallization than regular CBR

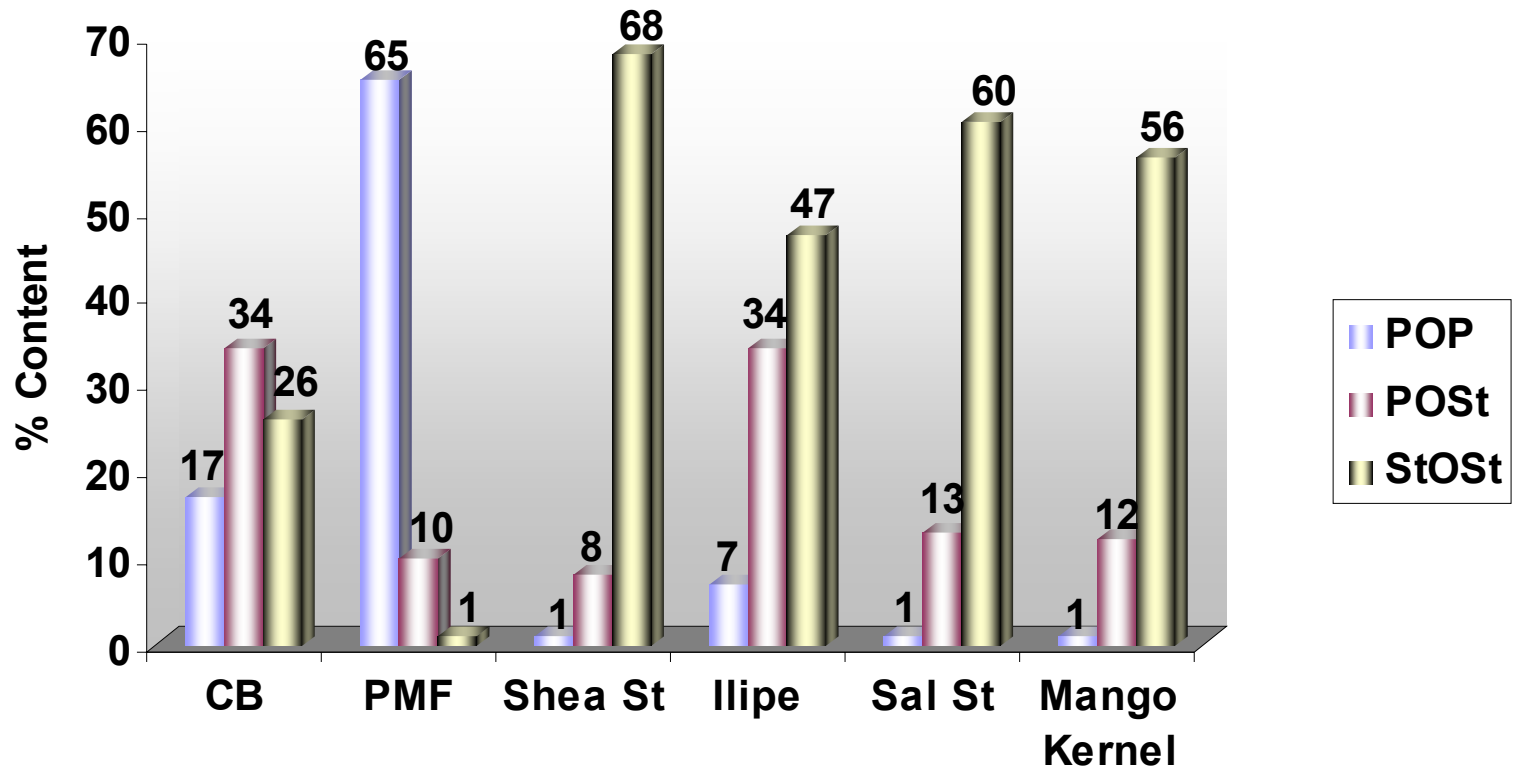
# CBR Tolerance to Cocoa Butter



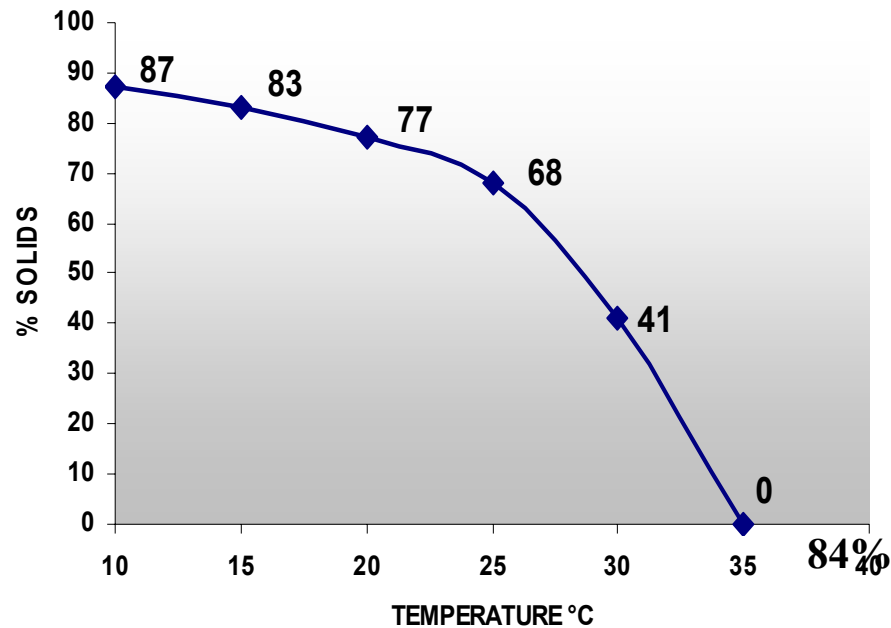
# Cocoa Butter Equivalents

- Similar SOS TAG to CB
- Same physical properties or functionality of CB
- Obtained from special palm oil fractions combined with “exotic” fats.
- CBE and CB show similar polymorphic behavior
- Require tempering
- 100% Compatible with CB
- Product with 0% *trans* fat

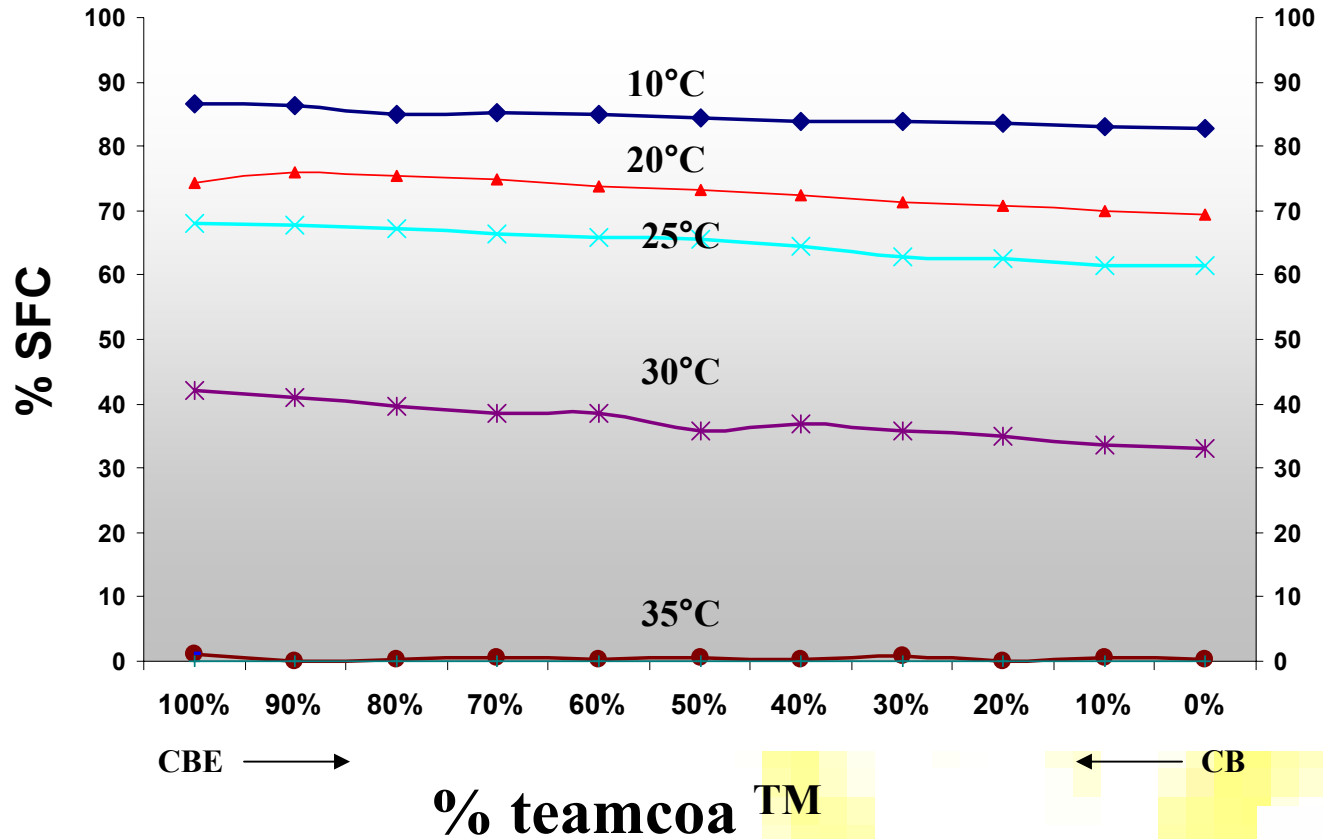
# SOS TAG of Main Raw Materials



# SFC Solids and TAG Profile for teamcoa™



# CBE Tolerance to Cocoa Butter



# Conclusions



- Palm oil and palm kernel oil fractions provide ideal functional properties in the development of confectionery fats.
- Special palm oil fractions are making possible the development of low *trans* CBR and 0% *trans* CBE.
- Alianza team offers solutions to the CBA's needs in the marketplace with their line of **teamcoa™**, **teamcao™** and **teamkao™** products.