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INVESTIGATIONS ON THE COMPATIBILITY OF MILK FAT FRACTIONS AND LAURIC FATS

Untersuchungen zur Mischbarkeit/Verträglichkeit von Milchfettfraktionen mit laurischen Fetten

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The compatibility of a lauric fat with several milk fat fractions (MF) was investigated. The enthalpy of crystallization was measured by differential scanning calorimetry (DSC). These values were related to the corresponding values calculated for an "Ideal Blend". The different compatibility of the milk fat fractions with the lauric fat could be shown by this method very clearly.

INDRODUCTION

The quality of several foodstuffs can be improved by the use of milk fat fractions instead of unmodified milk fat [1,2], as we could verify for lauric coatings [3,4].

However, the substitution of the lauric fat by the milk fat influences the solidification undesirablely. The extent of this influence depends on the quality and quantity of the added milk fat.

This influence includes a depression in melting point, a reduced hardness or a decreased solid fat content (SFC).

With our investigations via DSC we aimed to find out the milk fat fraction and its amount which can be added without altering the crystallization of the blends essentially.

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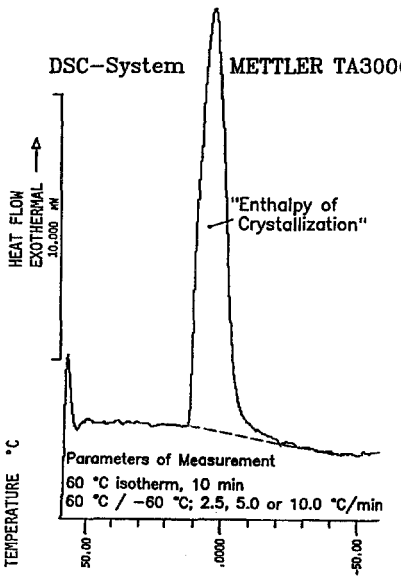

METHOD

The crystallization thermogram of the used lauric fat (COCO-PUR®, W. Rau AG, D-Neuss) and the parameters of measurement are illustrated in Fig. 1.

Fig. 1

Crystallization Thermogram of a Lauric Fat

The evaluation is based on the measured values of the enthalpy of crystallization (H) compared to the corresponding values which are calculated for a thermodynamical "Ideal Blend" (Fig. 2).

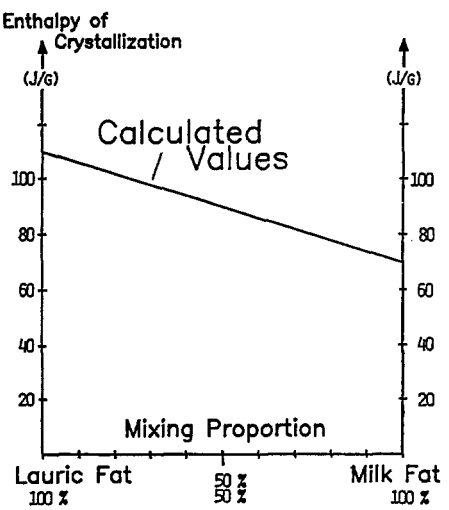

Fig. 2

Ideal Blend: calculated Enthalpy of Crystallization

RESULTS

The differences $\triangle H$ between the measured and calculated values dependent on the mixing proportion are given in Fig. 3 for four series of measurement of blends with several milk

fat fractions:

$\triangle H$ = H (measured) - H (calculated)

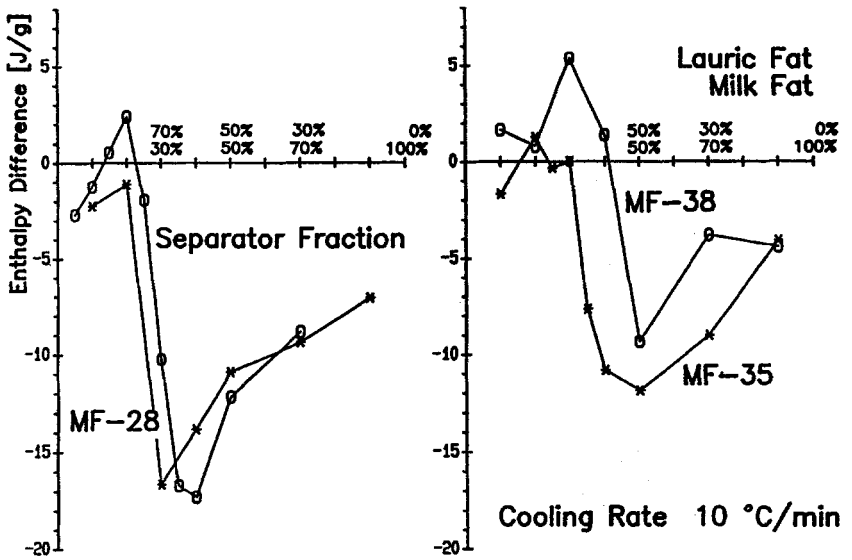

Fig. 3 Differences $\triangle H$, Blends of the Lauric Fat and Milk Fat Fractions

The undesirable influence on the crystallization is shown by negative differences. Positive differences indicate that the added milk fat amounts can contribute to the realization of a closer triglyceride crystal lattice.

The corresponding results dealing with the well known noncompatibility of lauric fats and cocoa butter [5] or trilaurin are given in Fig. 4.

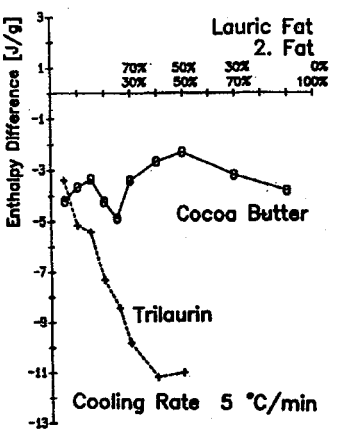

Fig. 4

Differences $\triangle H$, Blends of the Lauric Fat and Cocoa Butter respectively Trilaurin

CONCLUSIONS

1) Dependent on the triglyceride composition milk fat fractions can be added to the used lauric fat up to 40 % without disturbing the crystallization.

2) Middle melting milk fat fractions (mp. approx. 35 - 38 °C) have a better compatibility with the lauric fat than a low melting fraction (mp. approx. 28 °C).

3) A decrease of the long chain milk fat triglycerides improves the compatibility of the fractions with the lauric fat (Fig. 5, fractionation of milk fat by preparative HPLC, analytical control).

4) A soft separator fraction (fractionation of milk fat using carbon dioxide in the supercritical state) with a reduced amount of oleic acid has a better compatibility with the lauric fat than the low melting milk fat fraction (28 °C) obtained by a fractional crystalization.

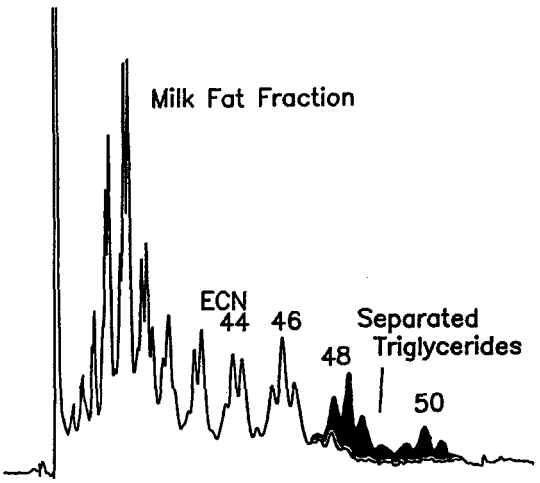

Fig. 5

Fractionation of Milk Fat by Preparative HPLC

ACKNOWLEDGMENT

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REFERENCES

[1] O. Tolboe; Lipidforum-Symposium "Milkfat and its Modifications", Göteborg, 1984
[2] K.F. Gander; Lipidforum-Symposium "Milkfat and its Modifications", Göteborg, 1984
[3] H. Büning-Pfaue, H. Stelter; Lebensmittelchem. Gerichtl. Chem. 42, 12 - 13 (1988)
[4] H. Büning-Pfaue, A. Bartsch; Deutsche Milchwirtschaft 39, 449 - 454 (1988)
[5] J. Kroll, Cl. Franzke; Lebensmittelindutrie 31, 82 - 84 (1984)

ZUSAMMENFASSUNG

Die Mischbarkeit/Verträglichkeit von Milchfettfraktionen mit einem laurischen Fett wurde differenzkalorimetrisch untersucht. Die Auswertung der Befunde bezieht sich auf die entsprechenden Rechnungswerte einer "Idealen Mischung". Es wurde nachgewiesen, daß sich diese Milchfette deutlich in ihrer Mischbarkeit unterscheiden.

Резюме – Изучена совместимость лауринового жира с некоторыми фракциями молочного жира. С помощью дифференциальной сканирующей калориметрии измерена энтальпия кристаллизации. Полученные данные были сопоставлены с соответствующими значениями, вычисленными для какой-либо „идеальной смеси". Данным методом очень ясно может быть показана различная совместимость фракций молочного жира с лауриновым жиром.