TEGO® Xymenynic

The skin firmer

- Is a highly purified, phytochemical compound extracted from Sandalwood seeds
- Is a unique, stabilized composition containing 20% Xymenynic Acid
- Xymenynic Acid, also known as Santalbic Acid, is extracted from the seeds of the sandalwood tree (*Santalum album*)
- Visually improves skin texture
- Skin appears more firm and resilient
- Minimizes the appearance of imperfections due to cellulite
- Significantly diminishes the appearance of orange peel skin
- Recommended usage level: 1.0–2.5%

INCI Name (PCPC name)

Caprylic/Capric Triglyceride; Xymenynic Acid

Chemical and physical properties (not part of specifications)	
Form	yellowish solution
Active matter	approx. 20% Xymenynic Acid

Santalum album, the sandalwood tree, grows in the mountain regions of South India. All trees are owned by the government, and the harvest of the trees is strictly controlled. The seeds are collected by the Indian Government Forest Department in order to maintain the sustainability of the species. Traditionally, the plant is used in Arjuvedic treatments to make the skin appear smoother, tauter and more velvety.

Xymenynic acid (santalbic acid) is extracted from the seeds of the sandalwood tree using a standardized process. It is a yellow, crystalline powder and its structure falls into the monoacetylenic fatty acid family (figure 1).

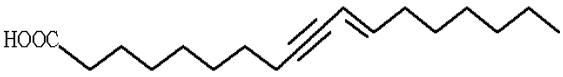

Figure 1: Chemical structure of Xymenynic Acid

Due to the triple and double bond in the molecule, it is sensitive to oxidation. To stabilize Xymenynic Acid, it is solubilized in Caprylic/Capric Triglyceride (TEGOSOFT® CT). To guarantee color stability, Tocopherol is also present in this composition.

Cellulite is a cosmetic condition affecting nearly all adult women globally, and is one of their primary aesthetic concerns. Published studies to date have concluded that this is a highly complex condition and have pointed to at least four causes that may give rise to the physiological manifestation of cellulite (Figure 2) (1). Among these are gender-specific differences in cutaneous tissue architecture, which may explain why cellulite is so prevalent in women, and almost never in men. Histological studies have revealed that female adipocyte structure is three-dimensionally different from that found in men, and lends itself to forming the dimpled structures characteristic of cellulite more readily (2). Hormonal and microvascular changes have also been implicated, along with genetic characteristics and inflammatory factors.

The extracellular matrix (ECM) is by volume the largest component of normal skin and gives the skin its unique properties of elasticity, tensile strength and compressibility. It also restricts the movement of any mobile adipocyte tissue (3).The accurate composition of ECM proteins, especially a proper production of its major components, collagen and hyaluronic acid, is very important for strong and tight-looking skin.

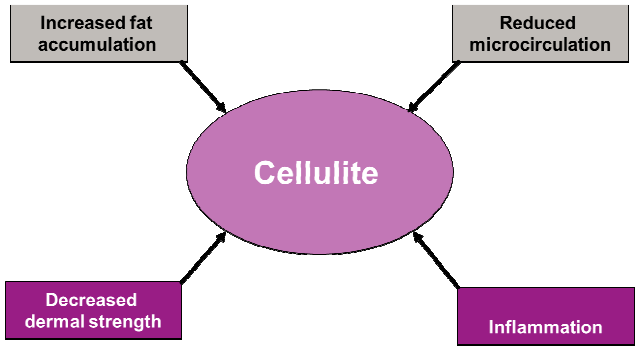

Figure 2. Contributory factors proposed to explain the appearance of cellulite

Preventing any unnecessary degradation of hyaluronic acid and collagen also leads to an overall strengthening of the ECM, which in turn leads to an improvement in skin elasticity and tighter looking skin. A formulation containing TEGO® Xymenynic can minimize the appearance of imperfections due to cellulite.

- ***Effect* of TEGO® Xymenynic on masking cellular stress**

The skin is highly susceptible to harmful external and internal influences causing cell damage. Free radicals and toxic molecules can accumulate in skin cells and interact with cellular macromolecules, such as DNA, lipids and proteins. As a consequence, the metabolic capacity of the cells is impaired, biosynthesis of macromolecules declines and severe structural alterations occur. This in turn leads to a loss of skin elasticity and strength. To protect the cells from those harmful effects, the skin has evolved sophisticated anti-oxidation and detoxification mechanisms.

In vitro experiments have shown the potential of TEGO® Xymenynic (0.5%) to support detoxification under unstressed conditions, as well as under physiological stress (data not shown). A beneficial reduction in the appearance of inflammation may result as a consequence.

- **Cosmetic consumer panel evaluation of TEGO® Xymenynic: skin elasticity (Cutometer)**

With the above mentioned *in vitro* studies, it was shown that TEGO® Xymenynic strengthens the ECM. The aim of the following *in vivo* study was to assess if TEGO® Xymenynic can improve the appearance of skin tone.

Method: For the study, 20 volunteers were recruited. They received two formulations: one containing 0.5% Xymenynic Acid, the other one containing no active

ingredient (vehicle). They applied one test formulation on the left inner forearm and the other on the right inner forearm twice daily over a period of 8 weeks.

At the beginning of the study, and after 8 weeks, skin elasticity was assessed using a Cutometer (Courage & Khazaka, Cologne). The difference of the elasticity parameters R1, R2, R5 and R6 compared to vehicle was calculated after 8 weeks application.

The measurements were performed in a climatic room at 21 – 22 °C and 50% relative humidity. Before the measurement started the volunteers had to acclimatize for at least 15 min.

After 8 weeks skin that was treated with the formulation containing Xymenynic acid showed considerably improved skin tone compared to the skin treated with the vehicle (figure 3-6).

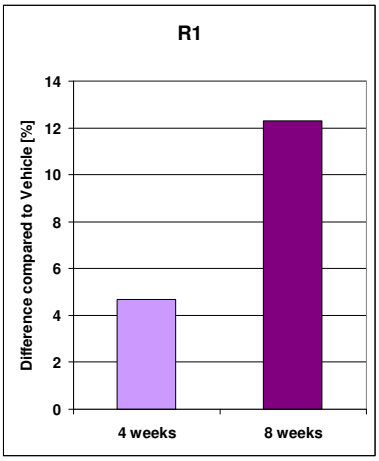

Figure 3: R1 = remaining deformation after first stretching cycle

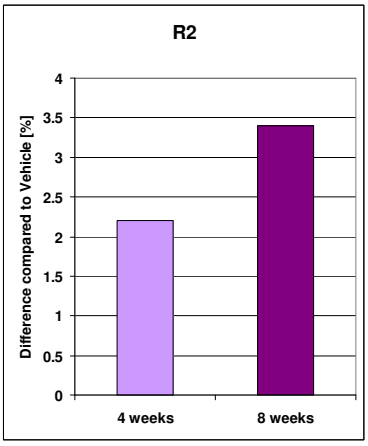

Figure 4: R2 = overall elasticity

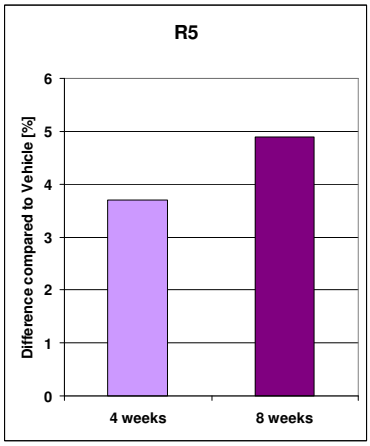

Figure 5: R5 = net elasticity

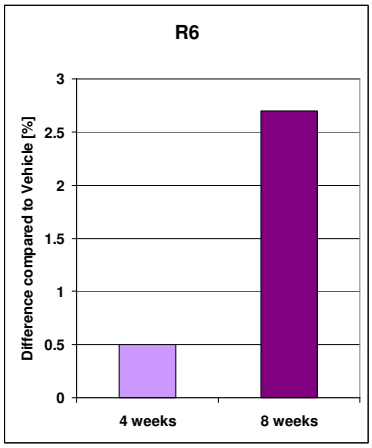

Figure 6: R6 = ratio of viscous and elastic deformation

- Cosmetic consumer panel evaluation of TEGO® Xymenynic: anti-cellulite study

As describedpreviously,the appearance of cellulite is the consequence of different interacting impacts: increased fat accumulation in the adipocytes, reduced dermal strength and reduced microcirculation. In addition to this, cellulite may be accompanied by a constant inflammation.To combat all visual signs of cellulite, a combination of different ingredients is used in cosmetic anti-cellulite formulations.

Caffeine is a commonly- used ingredient with a well known lipolytic activity. In the following study, it was combined with Xymenynic acid.

Method: For this study, 30 volunteers were recruited. They received two test formulations; one containing 1.0% Caffeine (vehicle), the other contained a combination of 1.0% Caffeine and 0.2% Xymenynic Acid. They applied one test formulation on the left thigh and the other on the right thigh twice daily over a period of 8 weeks.

At the beginning of the study, and after 4 and 8 weeks, the following analyses were performed:
- the orange peel skin degree was assessed by

dermatologists (expert grading),
- determination of skin thickness using ultra sound (Dermascan C, Cortex Technology),
- digital photos were taken.

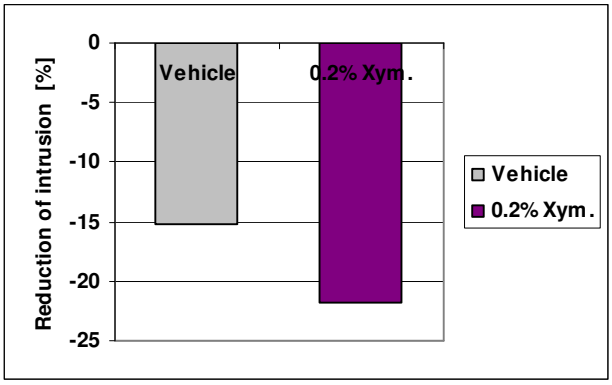

Figure 7: Skin Thickness: assessment of skin texture and firmness

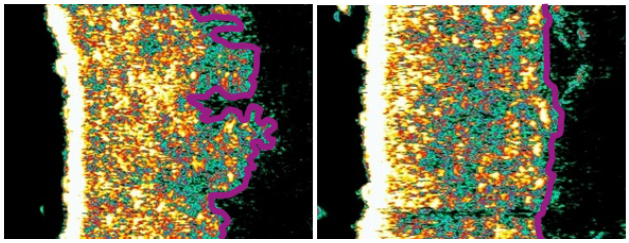

Figure 8: Ultra sound pictures before the application started and after 8 weeks.

Results: There was visible improvement in skin firmness and texture by caffeine alone. However, a further, significant reduction of these skin properties was achieved by the addition of Xymenynic Acid.

The ultra sound pictures clearly demonstrate that Xymenynic Acid led to a significantly improvedthe firmness and resiliency of skin. There was a visual reduction of bumps and a reduced appearance of orange peel skin. The apparent body imperfections due to cellulite were minimized.

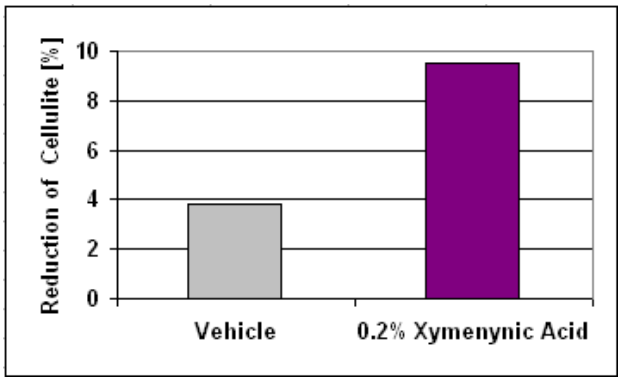

Figure 9: Expert grading of orange peel skin degree

Figure 10: left photo: before application started, right photo: after 8 weeks of application.

It can be seen that already Caffeine alone (vehicle) reduced the appearance of cellulite slightly. By the addition of Xymenynic Acid, animprovement can be achieved. This success is confirmed by the digital pictures.

Formulation hints

TEGO® Xymenynic is oil soluble and can be added directly to the oil phase of an emulsion. Then the emulsion (O/W or W/O) is prepared as usual.

TEGO® Xymenynic might decrease the viscosity of an O/W-emulsion. In this case it is recommended to increase the concentration of waxes like fatty alcohols or Glyceryl Stearate (TEGO® Alkanol 16, TEGO® Alkanol 1618, TEGO® Alkanol 18, TEGIN® M Pellets) or adjust the viscosity by increasing the concentration of hydrocolloids like Carbomer (TEGO® Carbomer) or Xanthan Gum.

Recommended usage concentration

1.0-2.5 % of TEGO® Xymenynic

Applications

- Anti-cellulite applications
- Body firming products
- Contouring treatments
- Bust firming lotions
- Skin tightening face creams
- Anti-sagging eye creams

References

1. de la Casa Almeida, M. *et al.* (2013) "Cellulite's aetiology: a review" *JEADV* **27**:273-278.
2. Avram, M.M. (2004) "Cellulite: a review of its physiology and treatment" *J Cosmet Laser Ther* **6**:181-185.
3. Khan, M.H. *et al.* (2010) "Treatment of cellulite: Part I. Pathophysiology" *J Am Acad Dermatol* **62**:361-370.

Processing hint

TEGO® Xymenynic can show crystallization which is reversible. In this case it has to be heated to 30-40 °C and homogenized before use. After that it is again ready for use.

Packaging

4 kg

Hazardous goods classification

Information concerning

- classification and labelling according to regulations for transport and for dangerous substances
- protective measures for storage and handling
- measures in accidents and fires
- toxicity and ecological effects

is given in our material safety data sheets.

Guide Line Formulations

Moisturizing Anti-Cellulite cream gel MAC 685/3/1	
Phase A	
TEGOSOFT® DC (Decyl Cocoate)	8.0%
TEGOSOFT® OP (Ethylhexyl Palmitate)	5.0%
TEGOSOFT® CR (Cetyl Ricinoleate)	2.0%
TEGO® Alkanol 1618 (Cetearyl Alcohol)	1.0%
TEGO® Xymenynic (Caprylic/Capric Triglyceride; Xymenynic Acid)	**2.5%**
Tocopheryl Acetate	0.5%
Phase B	
TEGOSOFT® PSE 141 G (Sucrose Stearate)	2.0%
TEGO® Care CG 90 (Cetearyl Glucoside)	0.5%
HyaCare® (Sodium Hyaluronate)	0.1%
Caffeine	1.0%
Propylene Glycol	4.0%
Glycerin	4.0%
Water	40.9%
Phase C	
TEGO® Carbomer 341 ER (Acrylates / C10-30 Alkyl Acrylate Crosspolymer)	0.45%
Water	29.55%
Phase D	
Sodium Hydroxide (10 %)	q.s.
Phase Z	
Preservative, Perfume	q.s.

Preparation:

1. Heat phase A and B separately to 75-80 °C.
2. Add phase A to phase B with stirring[1)].
3. Homogenise.
4. Cool with gentle stirring.
5. Add phase C at approx. 45 °C with stirring.
6. Homogenise for a short time.
7. Add phase D at 40 °C while stirring.

[1)] Important: If phase A has to be charged into the vessel first, phase B must be added without stirring.

Energizing & firming body lotion MAC 650/3/3	
Phase A	
TEGO® Care LTP (Sorbitan Laurate; Polyglyceryl-4 Laurate; Dilauryl Citrate)	1.5%
TEGOSOFT® CI (Cetearyl Isononanoate)	5.0%
TEGOSOFT® DEC (Diethylhexyl Carbonate)	3.5%
TEGOSOFT® OP (Ethylhexyl Palmitate)	1.1%
TEGOSOFT® CT (Caprylic/Capric Triglyceride)	2.5%
TEGO® Carbomer 140 (Carbomer)	0.15%
TEGO® Carbomer 141 (Carbomer)	0.15%
Xanthan Gum	0.1%
TEGO® Xymenynic (Caprylic/Capric Triglyceride; Xymenynic Acid)	**2.5%**
Phase B	
TEGO® Cosmo C 100 (Creatine)	0.5%
Glycerin	3.0%
Water	80.0%
Phase C	
Sodium Hydroxide (10 %)	q.s.
Phase Z	
Preservative, Perfume	q.s.

Preparation:

1. Mix ingredients of phase A.
2. Combine phase A and B without stirring.
3. Homogenise.
4. Adjust the pH with Sodium Hydroxide (phase C).
5. Add phase Z and stir well.

Skin tightening cream for mature skin MAC 650/4/3	
Phase A	
ABIL® Care XL 80 (Bis-PEG/PPG-20/5 PEG/PPG-20/5 Dimethicone; Methoxy PEG/PPG-25/4 Dimethicone; Caprylic/Capric Triglyceride)	2.5%
TEGIN® M Pellets (Glyceryl Stearate)	1.0%
TEGO® Alkanol 18 (Stearyl Alcohol)	2.0%
TEGOSOFT® CT (Caprylic/Capric Triglyceride)	4.9%
TEGOSOFT® OP (Ethylhexyl Palmitate)	4.5%
TEGOSOFT® DEC (Diethylhexyl Carbonate)	4.0%
TEGOSOFT® APS (PPG-11 Stearyl Ether)	3.0%
Avocado (Persea Gratissima) Oil	1.0%
TEGO® Xymenynic (Caprylic/Capric Triglyceride; Xymenynic Acid)	**1.0%**
Phase B	
SKINMIMICS® (Ceteareth-25; Glycerin; Cetyl Alcohol; Behenic Acid; Cholesterol; Ceramide NP; Ceramide NS; Ceramide EOS; Ceramide AP; Caprooyl Phytosphingosine; Caprooyl Sphingosine)	5.0%
Glycerin	3.0%
Water	66.0%
Phase C	
TEGO® Carbomer 134 (Carbomer)	0.2%
TEGOSOFT® OP (Ethylhexyl Palmitate)	0.8%
Phase D	
Sodium Hydroxide (10%)	q.s.
Phase Z	
Preservative, Perfume	q.s.

Preparation:

1. Heat phase A and B separately to approx. 80 °C.
2. Add phase B to phase A without stirring[1)].
3. Homogenise.
4. Cool with gentle stirring to approx. 60 °C and add phase C.
5. Homogenize for a short time.
6. Cool with gentle stirring and add phase D below 40 °C.

[1)] Important: If phase A has to be charged into the vessel first, phase B must be added without stirring.

Anti-Cellulite body lotion MAC 685/1/1	
Phase A	
TEGO® Care LTP (Sorbitan Laurate; Polyglyceryl-4 Laurate; Dilauryl Citrate)	1.5%
TEGOSOFT® CI (Cetearyl Isononanoate)	10.0%
TEGOSOFT® DEC (Diethylhexyl Carbonate)	3.5%
TEGOSOFT® OP (Ethylhexyl Palmitate)	1.1%
TEGO® Xymenynic (Caprylic/Capric Triglyceride; Xymenynic Acid)	**2.0%**
TEGO® Carbomer 140 (Carbomer)	0.15%
TEGO® Carbomer 141 (Carbomer)	0.15%
Xanthan Gum	0.1%
Phase B	
Caffeine	1.0%
Glycerin	3.0%
Water	77.5%
Phase C	
Sodium Hydroxide (10%)	q.s.
Phase Z	
Preservative, Perfume	q.s.

Preparation:

1. Mix ingredients of phase A.
2. Combine phase A and B without stirring.
3. Homogenise.
4. Adjust the pH with Sodium Hydroxide (phase C).
5. Add phase Z and stir well.

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