

Evaluation of a Grape Extract and Coenzyme Q10-Based Nutricosmetic Formula on Cellulite-Related Parameters

Keywords: Nutricosmetic; Cellulite; Long-term efficacy; Grape extract; Coenzyme Q10

Abstract

Background: Cellulite is a common cosmetic concern in women, associated with alterations in microcirculation, adipocyte hypertrophy, and connective tissue remodeling. Nutricosmetic formulations based on natural extracts may represent a non-invasive option to support long-term skin appearance.

Objectives: To evaluate the effects of a patented oral formulation (Celluvine™) containing grape extract and coenzyme Q10 on cellulite-related parameters in women under real-world conditions.

Methods: This real-world study included women aged 30-50 years with a body mass index between 25 and 30 and visible cellulite. Participants consumed one capsule per day (283 mg) for two months, followed by a one-month follow-up without supplementation. Self-assessed parameters (orange peel appearance, water retention, physical complexes, self-confidence, body well-being, sensation of lightness) were rated on a 0-10 scale at baseline, 1 month, 2 months, and after follow-up. Objective measurements (weight, body fat, body circumferences) were performed at baseline and 2 months.

Results: Forty participants completed the protocol. After two months, significant improvements were reported in orange peel appearance (-22%), water retention (-25%), and physical complexes (-22%). Self-confidence (+56%), body well-being (+61%), and sensation of lightness (+98%) increased in parallel. Objective measures confirmed reductions in body weight (mean -2.3 kg), body fat (mean -12.4%), and waist (-5.9 cm), hips (-4.9 cm), and thighs (-4.4 cm) circumference. No adverse effects were reported. Benefits were maintained after the follow-up period.

Conclusions: Daily intake of the formulation was safe, well tolerated, and associated with measurable improvements in cellulite-related parameters and well-being. Larger placebo-controlled trials are needed to confirm these findings.

List of abbreviations

BMI: Body Mass Index; FMD: Flow-Mediated Dilation; NO: Nitric Oxide; UHPLC-DAD: Ultra-High Performance Liquid Chromatography coupled with Diode Array Detection; WHO: World Health Organization

Introduction

Cellulite is a widespread cosmetic concern, affecting 80 to 98% of post-pubescent women, compared to just 2% of men. This disparity is due to differences in connective tissue structure: in women, the fibers are organized in parallel, whereas in men they are arranged in a crisscross pattern to provide greater resistance to the phenomenon.

The presence of cellulite is also influenced by hormonal factors and the distribution of fat, both of which play a crucial role in body weight [1,2]. In a context where rates of overweight and obesity continue to rise, this trend does not seem likely to reverse. Among women, the



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Emmanuelle Arnaud*, Ilona Gille, Maïté Jeanroy, Benoit Lemaire and David Gaudout

Activ'Inside, Beychac-et-Caillau, France

*Address for Correspondence

Emmanuelle Arnaud, Activ'Inside, Beychac-et-Caillau, France, Email: e.arnaud@activinside.com

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prevalence of being overweight increased from 19% in 1990 to 26% in 2022, while the prevalence of obesity doubled over the same period to reach 18% [3]. According to the World Health Organization (WHO), 43% of adults aged 18 and over were overweight in 2022, including 16% who were obese.

In 2023, 24% of consumers on diets in Europe used nutritional supplements to support weight loss, demonstrating a growing awareness of these issues and a proactive approach to addressing them [4,5].

Cellulite is a cosmetic change to the skin and subcutaneous tissue, producing a dimpled or "orange-peel" appearance. There are three types of cellulite that can coexist:

- Aqueous cellulite, linked to water retention, is caused by poor blood and lymphatic circulation, leading to inadequate waste elimination, which causes tissue swelling and visible skin deformation. It often manifests as a feeling of heaviness in the legs and is visible without pinching the skin.
- Adipose cellulite, linked to fat deposits, results from an increase in the size and number of fat cells, which disrupts local circulation. This contributes to the skin's visible deformation, characterized by an irregular appearance and loss of smoothness. It is often visible when pinching the skin.
- Fibrous cellulite is older and more ingrained. It results from the hardening of collagen fibers around fat cells, particularly due to glycation. This rigidity creates tension that pulls the skin downwards, resulting in the dimpled appearance characteristic of cellulite [6].

Despite its prevalence, current anti-cellulite solutions remain largely topical or invasive, including creams, radiofrequency, and cryolipolysis. These methods often provide transient or localized results, without addressing the deeper physiological mechanisms underlying cellulite formation. Consequently, there is a growing need for innovative and more attractive, evidence-based nutricosmetic strategies capable of acting from within, an alternative offering durable benefits.

In this context, natural active ingredients such as green tea and grape polyphenols, collagen and, coenzyme Q10 have attracted increasing scientific and consumer interest. These compounds are known to act on key biological pathways involved in cellulite development, including microcirculation, adipocyte metabolism, collagen synthesis, and oxidative stress, making them promising candidates for oral formulations targeting skin firmness and texture.

To address these multifactorial mechanisms, Activ'Inside has developed a patented nutricosmetic formula (Celluvine™). Its main ingredients, grape extract and coenzyme Q10, are scientifically validated and recognized active ingredients. The formula has been specifically designed to target microvascular function, lipid metabolism and collagen synthesis and protection.

Grape extract is rich in polyphenols, such as epicatechin and ϵ -viniferin, which play a key role in improving microcirculation. *In vitro*, ϵ -viniferin stimulates nitric oxide (NO) production, thereby enhancing vasodilation [7,8]. Clinically, 200 mg of grape extract has been shown to significantly improve flow-mediated dilation (FMD) within two hours of ingestion, confirming its rapid effect on blood flow [9]. Grape extract also affects fat metabolism, with *in vivo* studies showing that it reduces adipocyte hypertrophy induced by a high-fat diet. Grape also increases GLUT4 expression in muscle, therefore improving glucose uptake and reducing its storage in the form of fats [10,11]. Grape's strong antioxidant properties further support these effects by reducing oxidative stress, protecting micro vessels and preventing extracellular matrix degradation, all of which are involved in the development of cellulite [12]. Grape extract therefore helps to preserve skin structure from degrading collagen and elastin, helping to maintain firm and elastic skin [13].

Coenzyme Q10 is a documented ingredient known for its ability to stimulate natural collagen synthesis. *In vitro* studies show that it significantly increases the expression of collagen types I, IV, and VII, and enhances fibroblast proliferation. This supports dermal structure, improving skin firmness and elasticity [14]. In a clinical study, daily supplementation with 50 mg of coenzyme Q10 improved the texture and appearance of the skin of healthy women, reducing the visible signs of cellulite, such as an uneven surface and a lack of elasticity [15]. In addition to its structural role, coenzyme Q10 offers antioxidant protection by helping to neutralize reactive oxygen species (ROS), which contribute to collagen breakdown and microvascular damage, two factors that exacerbate cellulite [16].

The objective of this article is to investigate the potential physiological effects of the combined oral intake of grape polyphenols and coenzyme Q10 in the context of cellulite management. These two bioactive ingredients are suggested to contribute to microcirculation, adipocyte metabolism, and dermal structure maintenance.

Previous mechanistic studies indicate that grape polyphenols may promote nitric oxide-dependent vasodilation, limit adipocyte hypertrophy, and help preserve the extracellular matrix, while coenzyme Q10 may contribute to collagen synthesis. Based on this scientific rationale, we examined the relevance of these pathways under real-world conditions using both subjective and objective assessments of cellulite-related parameters.

Through this approach, the study aims to provide preliminary

evidence supporting the safety and mechanistic contribution of grape extract and coenzyme Q10, which are the key bioactive components of the patented nutricosmetic formulation Celluvine™. These ingredients act through several complementary pathways, including the improvement of microcirculation and antioxidant activity. They also help maintain skin viscoelasticity, firmness, and microrelief. Together, these effects contribute to visible and long-term improvements in skin quality and overall well-being.

Materials and methods

I. Product under investigation

The product under investigation is a patented, proprietary oral formulation containing grape extract, rich in monomers and ϵ -viniferin, with coenzyme Q10 (Celluvine™, Activ'Inside, France, patent FR3114497). Celluvine™ is standardized in flavanol monomers (catechins and epicatechins) $\geq 10.6\%$, and total viniferins (including ϵ -viniferin) ≥ 15 ppm using ultra-high performance liquid chromatography coupled with diode array detection (UHPLC-DAD). This patented combination is characterized by specific levels of ϵ -viniferin and flavanol monomers, two phenolic compounds naturally found in grapes, whose synergistic action contributes to the improvement or maintenance of endothelial function [17]. The product was packaged as hard-shell capsules in bottles with a plain white label.

II. Real-world study – Design and participants

This real-world study was conducted on 40 healthy French women. The main inclusion criteria were being aged between 30 and 50 (mean age 43), having cellulite and/or water retention, a body mass index (BMI) between 25 and 30 kg/m², and having consented to participate in the study. Women who were pregnant or breastfeeding, perimenopausal or menopausal, suffering from chronic illnesses, taking oral or topical slimming/anti-cellulite treatments, or other treatments likely to alter the appearance of their skin were not eligible, nor were those who had made significant lifestyle changes (diet or physical activity) in the 12 months preceding the study. Participants were asked not to change their dietary or exercise habits for the duration of the study (3 months). Throughout the three-month duration of the study, participants were specifically instructed to maintain their usual dietary patterns and physical activity routines. This meant that they were asked not to introduce any significant changes to the types or quantities of foods they consumed, nor to alter the frequency, intensity, or type of exercise they regularly performed. The purpose of this instruction was to minimize potential confounding factors, ensuring that any observed effects could be more confidently attributed to the intervention being studied, rather than to changes in diet or physical activity.

They received one daily capsule containing 283 mg of the nutricosmetic formula, to be taken with breakfast and a glass of water for two months. An additional one-month follow-up phase without supplement intake was added to assess the persistence of the effects after stopping the supplementation. Compliance was verified at the end of the supplementation.

To obtain consumers' feedback, various parameters were self-assessed by women, including orange peel appearance, water

retention, physical complexes, self-confidence, physical well-being, and the sensation of lightness. These parameters were evaluated using a self-administered numerical rating scale ranging from 0 (“not at all” / “none”) to 10 (“a lot” / “very high”). Assessments were performed at baseline (T0), after one month (T1) and two months (T2) of supplementation, and at the end of a one-month follow-up period (T3) without supplementation.

At the same time, the effectiveness of the supplementation was objectively evaluated by an anthropometric assessor. Weight (using a weighing scale), body fat (using a body fat caliper), and circumference of waist, hips, thighs, calves, arms, back/chest, and buttocks (using a measuring tape) were objectively measured at the beginning of the study and after two months of supplementation, as they are relevant indicators of cellulite.

Statistical analyses were performed using the Student’s *t*-test for paired samples, with results expressed as mean and a significance threshold of *p* < 0.05.

Results

I. Compliance & safety

The nutricosmetic formula was well tolerated during the 2-month supplementation program. At the end of the study, participants answered the question “During the last 60 days, have you forgotten or have you not been able to take the product?”, to which 100% of the women replied that they had followed the protocol completely, without missing a single dose. In addition, 98% of women declared that the supplementation was easy to follow.

No side effects were reported during the study, supporting the formula’s safety and tolerability.

II. Self-assessment of cellulite-related parameters

Participants rated six subjective parameters: orange peel appearance, water retention, physical complexes, self-confidence, body well-being, and sensation of lightness, on a 0-to-10 self-rating scale at baseline (T0), after one (T1) and two (T2) months of supplementation, and following a one-month observation period without supplementation (T3).

The average scores obtained at each time point and their percentage changes versus baseline are presented in [Table 1].

At baseline, participants reported a marked perception of discomfort related to cellulite. Mean scores for initial data for negative parameters such as orange-peel appearance, water retention, and body-image concerns ranged from 6.5 to 7.8 out of 10, indicating a moderate-to-high level of dissatisfaction.

After one month of supplementation (T1), all three parameters showed a statistically significant decrease (*p* < 0.05), which continued throughout the supplementation, reaching values between 4.8 to 6.1 at the end, reflecting a perceived improvement. After two months of supplementation, the mean percentage changes from baseline were -22% for orange-peel appearance, -25% for water retention, and -22% for physical complexes (*p* < 0.01), suggesting a visible improvement in perceived skin texture and comfort.

Meanwhile, parameters related to well-being and self-perception, for which lower scores reflect greater discomfort, such as self-confidence, body well-being, and sensation of lightness, increased progressively over time. Baseline scores for these parameters were relatively modest, ranged from 2.4 to 3.6, reflecting reduced self-perceived well-being. After two months, these scores dropped significantly, reaching values between 4.8 and 6.1, reflecting a perceived improvement. At the end, the average improvements reached +56% for self-confidence, +61% for body well-being, and +98% for sensation of lightness (*p* < 0.001).

These results highlight that the formulation was associated with significant improvements in reducing the appearance of cellulite and improving the psychological aspects related to it.

One month after stopping supplementation (T3), scores remained stable across all domains, with no significant difference compared to T2, indicating a persistence of perceived benefits after the supplementation period.

III. Objective measurements of cellulite-related parameters

Objective assessments were conducted to complement the self-reported data. Anthropometric parameters, including body weight, body fat percentage, and body circumferences (waist, hips, thighs, arms, calves, back/chest, buttocks) were measured at baseline (T0) and after two months of supplementation (T2) by anthropometric assessors.

a. Body weight

Participants’ weight was collected using an electronic scale (Table

Table 1: Self-assessment ratings of cellulite parameters throughout the study and after 1-month follow-up. Calculation of the rate of improvement vs. baseline.

Parameters to assess	Average/10				Rate of improvement vs. T0 (%)		
	T0	T1	T2	T3 follow-up post-supplementation	T1	T2	T3 follow-up post-supplementation
Orange peel appearance ↳ Inverted scale	7.55	6.6*	5.9***	5.93 ^{n.s.}	-13%	-22%	-21%
Water retention ↳ Inverted scale	6.48	5.25*	4.83**	5.0 ^{n.s.}	-19%	-25%	-22%
Physical complexes ↳ Inverted scale	7.83	6.03***	6.08***	5.65 ^{n.s.}	-23%	-22%	-28%
Self-confidence	3.55	5.28***	5.53***	5.85 ^{n.s.}	+49%	+56%	+65%
Body well-being	3.25	5.75***	5.23***	4.93 ^{n.s.}	+77%	+61%	+52%
Sensation of lightness	2.43	4.6***	4.8***	5.18 ^{n.s.}	+89%	+98%	+113%

p* < 0.05; *p* < 0.01; ****p* < 0.001 statistically significant vs. T0; ^{n.s.} non-significant between T2 and T3

2). By comparing initial and final data, it was possible to calculate the weight loss of each individual.

After two months, 80% of women experienced weight loss, with an average of 2.3 kg. Although the overall weight distribution of the cohort remained comparable, a slight shift toward lower weight categories was observed, particularly among women initially in higher weight ranges, suggesting a beneficial redistribution. Nearly 40% of participants lost more than 2 kg, supporting a moderate yet consistent effect on body weight regulation (Table 3).

b. Body fat index

Body fat percentage, another key indicator in cellulite assessment, was measured using a fat caliper. After two months, 88% of participants lost body fat, with an average decrease of 12.4%. The proportion of women with a body fat percentage above 49% dropped fivefold, while those with levels below 29% increased from 7% to 25%, indicating a favorable rebalancing of body composition (Figure 1). According to the American Council on Exercise, a healthy body fat percentage for women is between 13% and 31%. At the start of the study, approximately 22% of participants were in this range. After two months of taking the nutricosmetic formula, this proportion reached nearly 50%, demonstrating its positive impact on body composition and helping women to achieve a healthy body fat amount [18].

c. Body circumference

Finally, circumference measurements showed that 98% of participants had reduced at least one body area affected by cellulite (waist, hips, thighs, arms, calves, back/chest, or buttocks). The most marked decreases were observed at the waist (-5.9 cm), hips (-4.9 cm), and thighs (-4.4 cm) (Table 4). These consistent reductions in peripheral measurements suggest an overall improvement in tissue tone and water distribution.

Altogether, the objective findings align with the self-assessed improvements, supporting a concordance between perceived and measurable outcomes following two months of supplementation.

Discussion

This real-world study provides new evidence that daily supplementation with Celluvine™, a patented nutricosmetic combining grape extract and coenzyme Q10, improves multiple parameters related to cellulite. After two months of supplementation, women reported significant improvements in orange-peel appearance, water retention, and self-perceived body image. These subjective improvements were supported by objective reductions in body weight (-2.3 kg on average), body fat (-12.4% on average), and circumferences of cellulite-prone areas, particularly the waist (-5.9 cm), hips (-4.9 cm), and thighs (-4.4 cm), suggesting a multidimensional benefit on both skin appearance and body composition.

These outcomes are consistent with data in the literature on bioactive compounds derived from grapes and other antioxidant-based nutricosmetics. In a randomized, placebo-controlled trial, Parandoosh et al. reported that supplementation with 300 mg/day of grape seed extract for 12 weeks significantly reduced body weight (-3.9 kg), waist circumference (-4.4 cm), and hip circumference

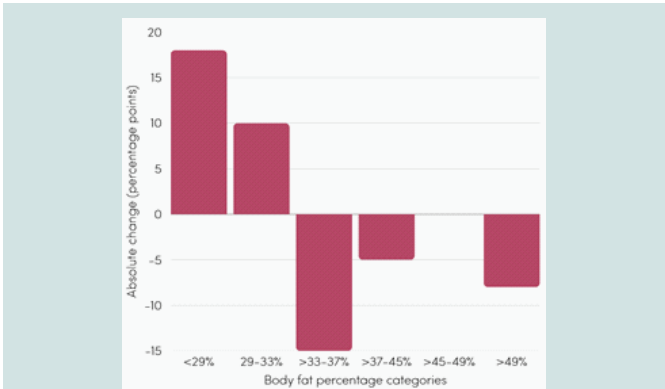


Figure 1: Absolute change in the percentage of women by body fat category (T0 – T2).

Table 2: Distribution of participants according to their weight category at baseline and after 2 months.

Time	Weight categories							
	<60 kg	60-65 kg	>65-70 kg	>70-75 kg	>75-80 kg	>80-85 kg	>85-90 kg	>90 kg
T0	0%	12%	17%	25%	20%	10%	13%	3%
T2	3%	13%	15%	27%	25%	9%	5%	3%

Table 3: Distribution of participants who lost weight according to the number of kilograms lost after 2 months.

Weight loss categories	<1 kg	1-2 kg	>2-3 kg	>3-4 kg	>4-5 kg	>5 kg
Percentage of women according to their weight loss (after 2 months)	28%	34%	10%	3%	16%	9%

Table 4: Distribution of women according to the reduction in body circumference experienced after 2 months.

Body parts	cm lost after 2 months							Average circumference reduction (cm)
	< 1 cm	> 1-2 cm	> 2-3 cm	> 3-4 cm	> 4-6 cm	> 6-8 cm	> 8 cm	
Arms	0%	32%	7%	4%	36%	7%	14%	-5.1 cm
Hips	9%	21%	15%	7%	24%	9%	15%	-4.9 cm
Waist	7%	22%	11%	15%	15%	8%	22%	-5.9 cm
Thighs	13%	33%	10%	8%	13%	3%	20%	-4.4 cm
Calves	14%	36%	4%	4%	21%	7%	14%	-4.1 cm
Back/chest	9%	29%	11%	9%	11%	11%	20%	-5.4 cm
Buttocks	10%	42%	13%	13%	6%	6%	10%	-3.4 cm

(-3.5 cm) in overweight adults, compared to baseline values [19]. Participants in the placebo group also showed a decrease in weight (-1.9 kg), waist circumference (-1.2 cm), and hip circumference (-1.2 cm), probably due to the low-calorie diet associated with the study. However, the more marked reductions observed in the supplemented group suggest an additional physiological role for the polyphenols in grape seed extract, linked to its antioxidant activity.

As a complex rich in polyphenols, grape seed extract has powerful antioxidant activity capable of limiting adipocyte hypertrophy, as demonstrated *in vivo* [20,21].

In this study, a similar reduction in waist and hip circumference was observed, suggesting that the grape-derived polyphenols contained in Celluvine™ may contribute to visible improvements in skin surface and body shape. The participants did not follow a low-calorie diet, which reinforces the hypothesis that the changes observed are mainly related to the physiological effects of the formula's active compounds on adipogenesis, lipolysis, and microcirculation, rather than to a change in lifestyle.

Compared with existing nutricosmetic data, the effects observed with Celluvine™ are consistent with those reported for other clinically validated anti-cellulite formulas. For example, Lemaire et al. showed that daily supplementation with 40 mg of SOD B Dimpless®, a superoxide dismutase extract from melon with strong antioxidant and anti-inflammatory properties, resulted in a visible reduction in cellulite on the thighs of -6.8% after 56 days in a randomized, double-blind, placebo-controlled study [22]. Although the assessment methods differ between studies, the conclusions are consistent. Oral nutricosmetic supplementation containing antioxidants, which can also modulate inflammatory pathways, appears to visibly improve the appearance of cellulite.

However, this study under real-life conditions has several limitations that should be acknowledged, including the small sample size, absence of a placebo group, and lack of dietary standardization, which may introduce variability. Future investigations should involve larger, more diverse populations, randomized, placebo-controlled trials, and advanced assessment methods such as laser Doppler imaging to clarify underlying mechanisms.

Conclusion

These results support the relevance of a targeted, multifactorial nutricosmetic approach in cellulite management. By improving microcirculatory function, modulating adipose tissue, supporting collagen synthesis, and reducing oxidative stress, Celluvine™ has been associated with measurable improvements in both subjective and objective cellulite-related parameters and provides both visible aesthetic benefits and improvements in physical comfort and psychological well-being, with effects that appear sustainable beyond the supplementation period.

The significant improvements observed in both subjective perceptions and objective measures suggest that the formulation may influence not only the appearance of the skin but also deeper physiological processes such as tissue oxygenation, lipid mobilization, and extracellular matrix integrity. The consistency of these effects across multiple endpoints, combined with the absence

of adverse events and a high level of compliance, underscores the safety, tolerability, and consumer acceptability of this nutricosmetic solution.

Beyond aesthetic enhancement, the reported improvements in physical comfort, sensation of lightness, and self-confidence further support the holistic value of Celluvine™ in promoting overall well-being. Taken together, these results strengthen the growing body of evidence supporting the use of natural bioactive ingredients as effective, non-invasive, and scientifically substantiated tools in beauty-from within strategies. Future placebo-controlled clinical studies integrating imaging, vascular, and biochemical assessment will help confirm these outcomes and further elucidate the synergistic mechanisms through which Celluvine™ contributes to long-term improvement in skin quality and body contour.

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Conflicts of interest: All authors are full-time employees of Activ'Inside, the company that developed the product tested in this study. This affiliation did not influence the objectivity of the research or the interpretation of the results.

Ethics approval and consent to participate: This interventional study was based on the voluntary use of a food supplement for two months. Our consumer study did not require approval from an institutional ethics committee, as it involved no medical intervention, biological sampling, collection of sensitive personal data, or medical procedure. However, the study was conducted in accordance with internationally recognized ethical principles for research involving human participants, as outlined in the Declaration of Helsinki, and followed good practices guidelines for market and consumer research (ICC/ESOMAR International Code). All participants were of legal age and provided written informed consent prior to their inclusion. Their participation was entirely voluntary, with the option to withdraw at any time, without any pressure.

Availability of data and materials: All relevant data supporting the conclusions of this study are presented in this article.

Authors' contributions: E.A. and I.G. contributed to the development of the study protocol, supervised the study, performed data analysis and interpretation, and were involved in manuscript writing. M.J., B.L., and D.G. also participated in manuscript writing, contributed to its critical revision, and approved the final version for publication.

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