

Green tea-eco



CareMotives

EcoCares

Anti-aging



Green tea-eco



BOTANY

Camellia sinensis (L.) Duntze; *Thea sinensis* (L.) Sims. Tea is a small tree original from Asia. However at present it is cultivated in different regions and therefore classified according to the country where it comes from.

This tree has evergreen, petiolate, simple, elliptical leaves, 5 to 10 cm long and 2 to 4 cm wide, blunt at apex, the first two thirds of margin shortly serrate.

The young, still undeveloped leaves are harvested manually and only the terminal undeveloped buds (pekoe, pekko) and the first young small leaves (tips) are selected.

In manufacturing Green Tea, the harvested leaves are steamed to prevent fermentation, which would yield black tea. According to the original method, leaves are firstly placed on matting, which are in turn placed on boiling-water so that the exposition to steam inactivates the enzymes (polyphenol oxidases) thus preventing polyphenol oxidation and preserving chlorophyll. Subsequently, the Tea is spread under the sun, pressed and dried.

According to a different procedure, the harvested product immediately undergoes pressure steaming into rotating cylindrical containers and is subsequently pressed and dried in several steps.

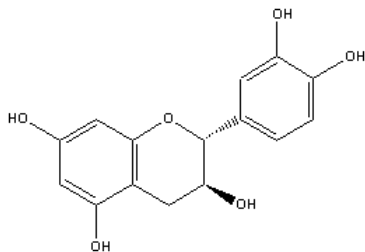
Green tea Eco is obtained from the leaves of *Camellia sinensis* L., coming from an organic crop.



CHEMISTRY

The presence of **polyphenols** and **methylxanthines** is the basic characteristic of the Green Tea chemical composition.

Polyphenols are the most abundant compounds in the Green Tea leaves, its abundance depending on the area where the tea plant has been cultivated and the age of the leaves. They amount up to 17 to 30 % of the dry leaf weight. The most important ones are flavonols (**catechins**), which include the following compounds (Ho et al., 1992):

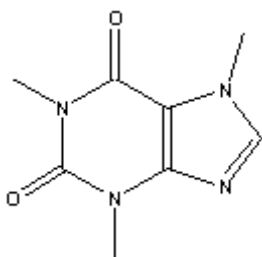


Chemical structure of catechin

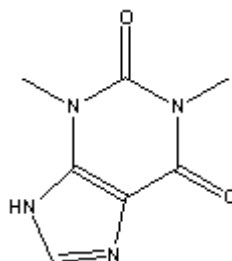
TEA CATECHIN

- (+)-Catechin
- (-)-Epicatechin (3.0 – 9.0%)
- (+)-Gallocatechin
- (-)-Epigallocatechin (1.0 – 12.0%)
- (-)-Epicatechin gallate (8.0 – 18.0%)
- Epigallocatechin gallate (30 - 53%)

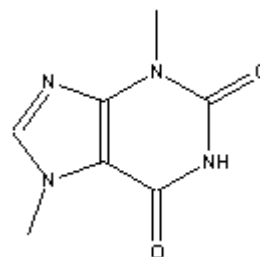
The **Methylxanthine** contents, which vary between 2 and 6 % depending on the tea variety, consist of caffeine (1.5 – 5.5%) and smaller amounts of theophylline (0.002 – 0.02%) and theobromine (0.1 – 0.4%). Additionally, traces of adenine and xanthine can be found. These methylxanthines are partially combined with tannins.



CAFFEINE



THEOPHYLLINE



THEOBROMINE



The compounds responsible for the flavour and aroma of Tea are about 0.01-0.02% of the dry leaf weight. They conform a heterogeneous group of substances consisting of alcohols (1-hydroxy-3-hexene, geraniol), monoterpenic aldehydes and also free amino acids.

Other compounds present in these leaves are vitamins (C and the group B) although the most relevant one is folic acid since vitamin C gets completely degraded as a consequence of the processes applied to the plants. There are also enzymes involved in the fermentation process.

Structure	Components
METHYLXANTHINES	Caffeine, Theophylline, Theobromine
POLYPHENOLS (Catechins)	(+)-Catechin; (-)-Epicatechin; (+)-Gallocatechin; (-)-Epigallocatechin; (-)-Epicatechin gallate; Epigallocatechin gallate

TRADITIONAL USES

Tea is a well-known plant in China since 4000 years. They used to employ it in the traditional medicine. In cosmetic applications it is used in anti-aging products, sun protection products and anti-cellulite body products.



COSMETIC PROPERTIES

Its cosmetic properties are based on the specific action of its active compounds:

- **Polyphenols:** anti-radical action, anti-metalloproteinase, anti-inflammatory, photo protective.
- **Methylxanthines:** lipolytic and anti-lipogenic action, blood flow stimulation.



Polyphenols, mainly epigallocatechin gallate, are the compounds responsible for the **anti-oxidant** and **anti-inflammatory** effects of Green Tea. In this context, Lunder et al. 1992, demonstrated that external applications of a polyphenolic Tea extract before exposition to the sun resulted in a decreased lipid peroxidation and a reduction of the leukocyte infiltration, the later being responsible for inflammation. Santosh et al., 1999 confirmed these results and mentioned that the compound responsible for this action was (-)-epigallocatechin gallate.

Ho et al., 1992 assessed the anti-oxidant action of Green Tea extracts by using the Rancimat method. This method measures conductivity changes caused by the generation of small free fatty acids when certain oil undergoes oxidation at high temperatures and ventilation rates. Ho et al., 1992 and Guo et al., 1996 found that the polyphenols present in Green Tea inhibit the enzyme lipooxygenase, which is responsible for the metabolism of arachidonic acid and the peroxidation of inflammation- and tumour-promoting lipids, thus demonstrating their anti-radical action against the hydroxyl radical. Fourneau et al., 1996 also demonstrated the anti free radical action of Green Tea. The **inhibitory effect** of Green Tea on



the **collagenase activity** is another important action from the cosmetic point of view. Several studies demonstrate that polyphenols have the ability to inhibit the enzymatic activity of metalloproteinases, specifically collagenase, the enzyme responsible for the degradation of structural components in the extra-vascular matrix (collagen) and the vascular endothelium (Morazzoni et al., 1995; Makimura et al., 1993). Such an inhibitory action is mainly due to the presence of polyphenols with the gallic radical (epicatechin gallate and epigallocatechin gallate).



Because of this later activity Green Tea extracts may be added to anti-aging products to reduce the detrimental effects of skin metalloproteinases.

Several studies reported the positive **photo protective** effects resulting of external applications, as well as of oral intake, of the Green Tea polyphenols (Wang et al., 1992). UV radiations produce several harmful effects such as inflammation and immune suppression, which cause carcinogenesis (Ahmad et al., 2001). Additionally, it induces IL-1 proliferation, which plays an important role in skin hypersensitivity and skin tumour proliferation. It has been found (Craig et al., 2001) that Green Tea exerts photo protective actions preventing this kind of problems and reducing erythema formation. Its action mechanism is based on the anti-oxidant and anti free radical properties of this plant and on its immunoregulatory effects, which result from its ability to inhibit UVB-induced infiltration of macrophages into the epidermis.

Because of the later action, Green Tea extracts may be added to sun protection products and facial products, in which protection against the harmful effects of UVB is required.

Several studies demonstrated that Green Tea has an effect **on the lipidic metabolism**, the methylxanthines being responsible for this effect. Methylxanthines act by inhibiting the enzyme phosphodiesterase thus inducing cAMP accumulation. However, there are other additional mechanisms involved, such as the calcium mobilization induced by this group of active compounds and the increased membrane permeability.

Their action results in a potent inhibition of lipogenesis and a slight lipolytic effect, all of which reduces lipid accumulation into the adipocytes.

Additionally, methylxanthines stimulate cutaneous microcirculation since they act as adenosine antagonists and influence the beta-adrenergic system (Tofovic et al., 1991) thus promoting the vasodilator response.

Recent studies demonstrated a possible synergistic action between caffeine and catechin polyphenols in the Green Tea, which seems to modulate and prolong the adrenergic stimulation.

Because of the later action it can be added to anti-cellulite products and products aimed at the control of adipose tissues.



EFFICACY TEST

Enzymatic inhibition

Collagen is the main structural protein in skin representing almost 90% of the proteins present in dermis. Skin aging is related to deep functional alterations in these protein fibers. The abundance of the enzyme collagenase in skin is rather important. Its main function is to catalyse the collagen degradation. Thus, collagenase inhibition would allow maintaining the protein levels and the flexibility of skin.

One method used to evaluate the efficacy of an anti-aging product is to determine its ability to inhibit collagenase. An assay to evaluate the inhibition of collagenase by **GREEN TEA – ECO** has been carried out.

1. Experimental Method

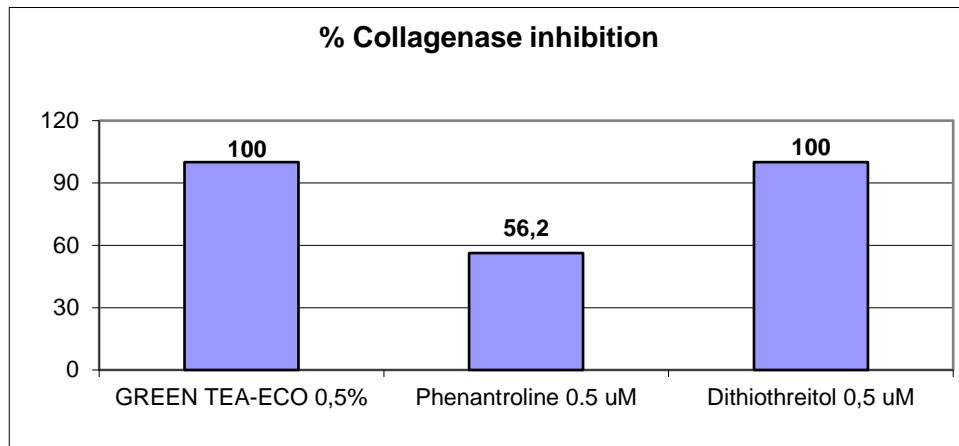
The degradation reaction of the substrate (collagen) starts when it is incubated with the enzyme (collagenase from *Clostridium histolyticum*, type I-A) and the tested substances into a bath at 37°C. The final concentration of **GREEN TEA – ECO** in the assay medium was 0.5%. After 5 hours, L-leucine was measured by staining with Ninhydrin and reading at 600 nm.

TES buffer 0.05 M pH=7.5 was used as the negative control. 1,10-Phenanthroline and Dithiothreitol at a final concentration of 0.5 µM in the assay medium were used as positive controls.

The maximal absorbance values were recorded for the tubes containing the negative control. Collagenase inhibition would result in smaller amounts of L-leucine residues and consequently, smaller absorbance values.

2. Results

The following graphic shows the values recorded for the present assay.



It can be observed that **GREEN TEA – ECO** exerts an inhibitory action on collagenase. After incubating this product with the enzyme, a 100 % inhibition was recorded.

According to the present results, it can be concluded that GREEN TEA – ECO has an ability to completely inhibit the collagen degradation, which produces beneficial effects on skin such as maintenance of skin elasticity.

COSMETIC APPLICATIONS

- SKIN CARE treatments: for all types of skins with free radical scavenger action and for sensitive or irritated skins with anti-inflammatory effect.
- BODY CARE: slimming and anti-cellulite treatments.
- Skin and Body Sun Protectors with anti-ageing and anti-wrinkles effects.
- HAIR CARE: repairing and protector products, to improve gloss and strength.

RECOMMENDED DOSE

The recommended dose is between 0.1% and 2.0%.



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