

Natural Cosmetics and Perfumes

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Introduction

The word cosmetics is defined as “Substances of diverse origin, scientifically compounded and used to cleanse, allay skin troubles, cover up imperfections and beautify”. The history of cosmetics spans at least 6000 years of human history, and almost every human society on earth. The ancient science of cosmetology is believed to have originated in Egypt and India, but the earliest records of cosmetic substances and their application dates back to circa 2500 and 1550 B.C, to the Indus valley civilization. Some argue that cosmetic body art was the earliest form of ritual in human culture, dating back to over 100,000 years from the African Middle Stone Age. The evidence for this comes in the form of utilized red mineral pigments (red ochre) including crayons associated with the emergence of *Homo sapiens* in Africa.

Archaeological evidence of cosmetics certainly dates from ancient Egypt and Greece civilizations. According to a source, early major developments include the use of castor oil in ancient

Egypt as a protective balm and skin creams made of beeswax, olive oil, and rose water described by the Romans. The Ancient Greeks also used cosmetics.

The role played by Natural Products from plants in cosmetics is numerous. Whole plants, leaves, flowers and other parts of the flowers have been incooperated in to cosmetics. In addition to facilitating the reproduction of flowering plants, flowers have long been admired and used by humans to enhance the beauty of their environment, as objects of romance, ritual, religious activities,

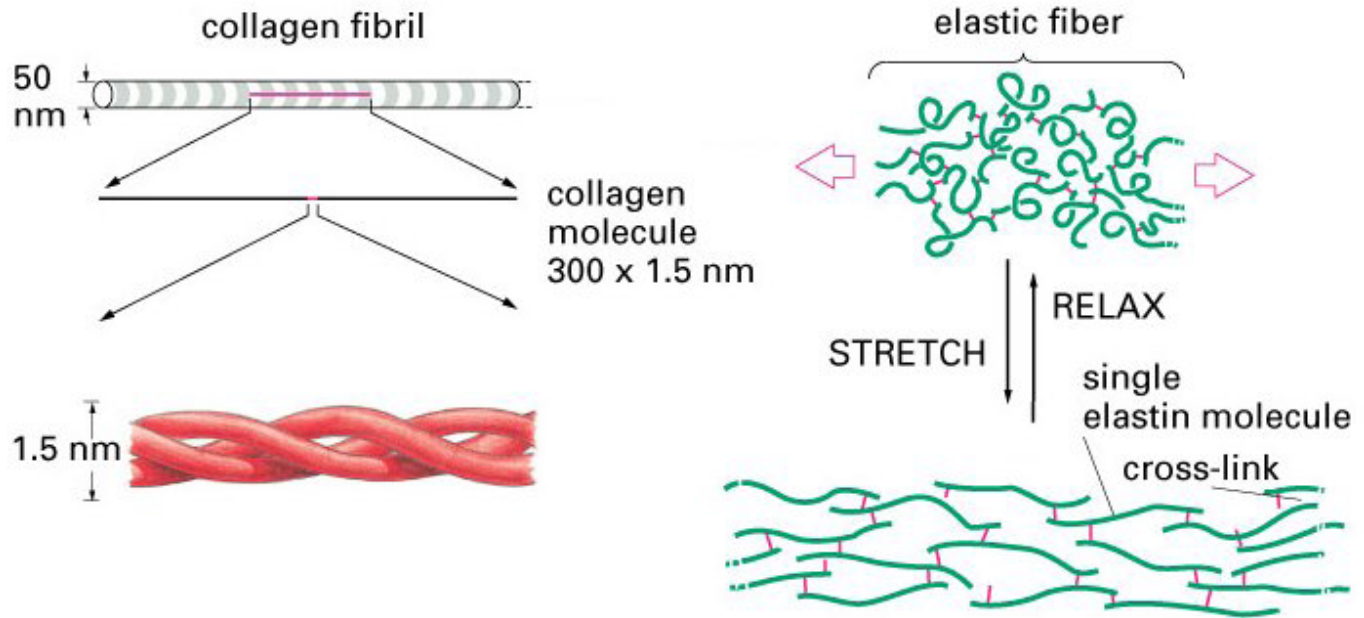
recreational purposes, medicinal applications, as a source of food and the cosmetics and perfumery applications.

Application of Natural Products in Cosmetics

The majority of cosmetics are associated with skin and therefore brief description of association between connective tissues, aging and anti-aging mechanisms are outlined.

Skin and Extra-Cellular Matrix Connective tissues, particularly skin, undergo significant alterations





fibrous proteins

during aging. These alterations are characterized by epidermal thinning and appearance of facial lines and furrows. The reason for these alterations lies in morphological changes in the extra-cellular matrix (ECM). ECM is made up of glycosaminoglycans, interwoven with fibrous matrix proteins like collagen, elastin and fibronectin forming a cross linked meshwork that gives ECM strength and resilience

Collagen

Collagen is made of protein and is the main component of connective tissues such as skin, tendons, ligaments, cartilage, blood vessels and bone. There are five types of collagen fibers, with the type 1 variety the most common in the human body. Collagen is the important structural

component of skin that represents 70% to 80% of the dry weight.

Elastin

Elastin is also a protein found in connective tissues that allows for stretching and elastic properties. Its elastic properties are especially useful for the skin, large arteries, ligaments, bladder and lungs. Elastin is usually combined with collagen fibers to form collagen bundles. To make elastin, the body needs the same amino acids as for collagen, namely lysine and proline, as well as a few other basic amino

acids found in a variety of foods. Hyaluronic acid and copper are needed to bind the collagen and elastin fibers together to form collagen bundles and for repairing and replacing collagen fibers. Elastin accounts for only about 1-2% of the dry weight of skin but it is important for the maintenance of skin's elasticity and resilience.

Hyaluronic Acid

Hyaluronic acid is mucopolysaccharide that holds the water and keeps the body moist, lubricated and smooth. These connective tissue proteins are constantly attacked by several enzymes like collagenases, elastases and matrix metalloproteinases, which leads to decrease in thickness of skin which consequently, becomes dry and wrinkled. To maintain the youthful appearance



of the skin, there are two methods, to promote the synthesis of matrix proteins in the skin, or to inhibit matrix protein degrading enzymes like hyaluronidase and elastase. As people age and their skins are exposed to environmental pollutants and the sun's ultraviolet rays, the cells gradually lose the ability to produce hyaluronic acid. Skin begins to thin and become more fragile. Wrinkles develop as collagen, elastin and hyaluronic acid break down, causing the skin to lose elasticity and volume.

Skin and Pigmentation

Melanogenesis has been defined as the entire process leading to the formation of dark macromolecular pigments, i.e., melanin. Melanin is formed by a combination of enzymatically catalyzed and chemical reactions. Melanogenesis is initiated with the first step of tyrosine oxidation to dopaquinone, catalyzed by tyrosinase. This first step is the rate-limiting step in melanin synthesis because the remainder of the reaction sequence can proceed spontaneously at a physiological pH value.

Therefore the key enzyme responsible for the skin pigmentation is tyrosinase. Tyrosinase is a multifunctional, glycosylated and copper-containing enzyme, which catalyzes the first two steps in mammalian melanogenesis, and is responsible for enzymatic browning reactions in

damaged fruits during post-harvest handling and processing. Neither hyperpigmentation in human skin nor enzymatic browning in fruits is desirable. These phenomena have encouraged researchers to seek new potent tyrosinase inhibitors for use in foods and cosmetics.



Anti-collagenase, Anti-elastase, Anti-hyaluronidase and Anti-tyrosinase Enzyme Activities

The basis of selection of any natural products including plant material is to find out whether the material exhibit the anti-collagenase, anti-elastase, anti-hyaluronidase and anti-tyrosinase activities. In cosmetic science anti-collagenase, anti-elastase, anti-hyaluronidase activities are known as anti-aging properties. The anti-tyrosinase activity is mainly connected with

skin-whitening properties.

Chemical Composition of Natural Products used in Cosmetics

Plants are the richest sources of secondary metabolites, while flowers also contain a wide array of chemical constituents that belong to different chemical classes. Among these the group polyphenol or flavonoids plays the major role imparting inhibition of collagenase, elastase and hyaluronidase activities as anti-aging properties. Anti-tyrosinase activity, another cosmetically significant enzyme inhibition is shown by many flavonoid and related compounds.

The chemical composition of plants is the major contributory factor to its use in cosmetics and perfumery. Therefore, chemical constituents responsible for cosmetological application are outlined as plant

pigments and have been widely studied, particularly from the genetical point of view, and much information is now available about them. The most important group of plant and flower pigments are the flavonoids, since they contribute cyanic colours (orange, red to blue) as well as yellow and white. The only other major groups are the carotenoids, which provide principally yellow colours with some oranges and reds. The same compounds that impart an attractive colour to flowers are also full of antioxidant properties which

contribute to the anti-elastase, anti-collagenase, anti-hyaluronidase, anti-tyrosinase activities.

Flavonoids are one of the main determinants of leaf and flower colours. The biochemistry and genetics of flavonoids predominantly decide the colour of a flower. Flavonoids in flowers also provide protection against UV irradiation and may serve as chemical defense compounds against pathogens, similar to their roles in other parts of the plant. In addition, a group of flavonoids has been identified to be important for pollen germination thus playing central roles in the primary purpose of flowers, i.e. plant reproduction.

Among flavonoids, anthocyanins, flavonols (kaempferol, quercetin, myricetin, luteolins and apigenin) and related compounds are the major compounds that impart cosmetological properties to flowers. In addition carotenoid pigments in flowers containing beta-carotene, zeaxanthin, lycopene, flavoxanthin, crocein also add to chemical constituents in flowers that have been proven to have the above mentioned cosmetological effects.

Application of Flowers in Perfumery

The word perfume is derived from the Latin word *per fume* meaning "through smoke". In its modern meaning perfume is a concentrated essence of fragrant material diluted in minimum amount of high grade alcohol.

People have used perfume and oil on their bodies for thousands

of years in lesser or greater amounts dependant on fashion whims. The early Egyptians used perfumed balms as part of religious ceremonies, and later as part of pre love making preparations. It is interesting to note that perfume has come through a full circle today as more and many of us seek out high quality aromatherapy perfumed oils to use in exactly the same way as our ancestors did.



The late 19th century was the first real era of perfumes when new scents were created because of advances in organic chemistry knowledge. Synthetic perfume products were used in place of certain hard to find or expensive ingredients.

Grasse in Provence, France became a centre for flower and herb growing for the perfume industry. The men who treated leathers in the same area found the smells so bad that they perfumed themselves and the leathers. They were knowledgeable about making the botanical essences and were the early perfume noses.

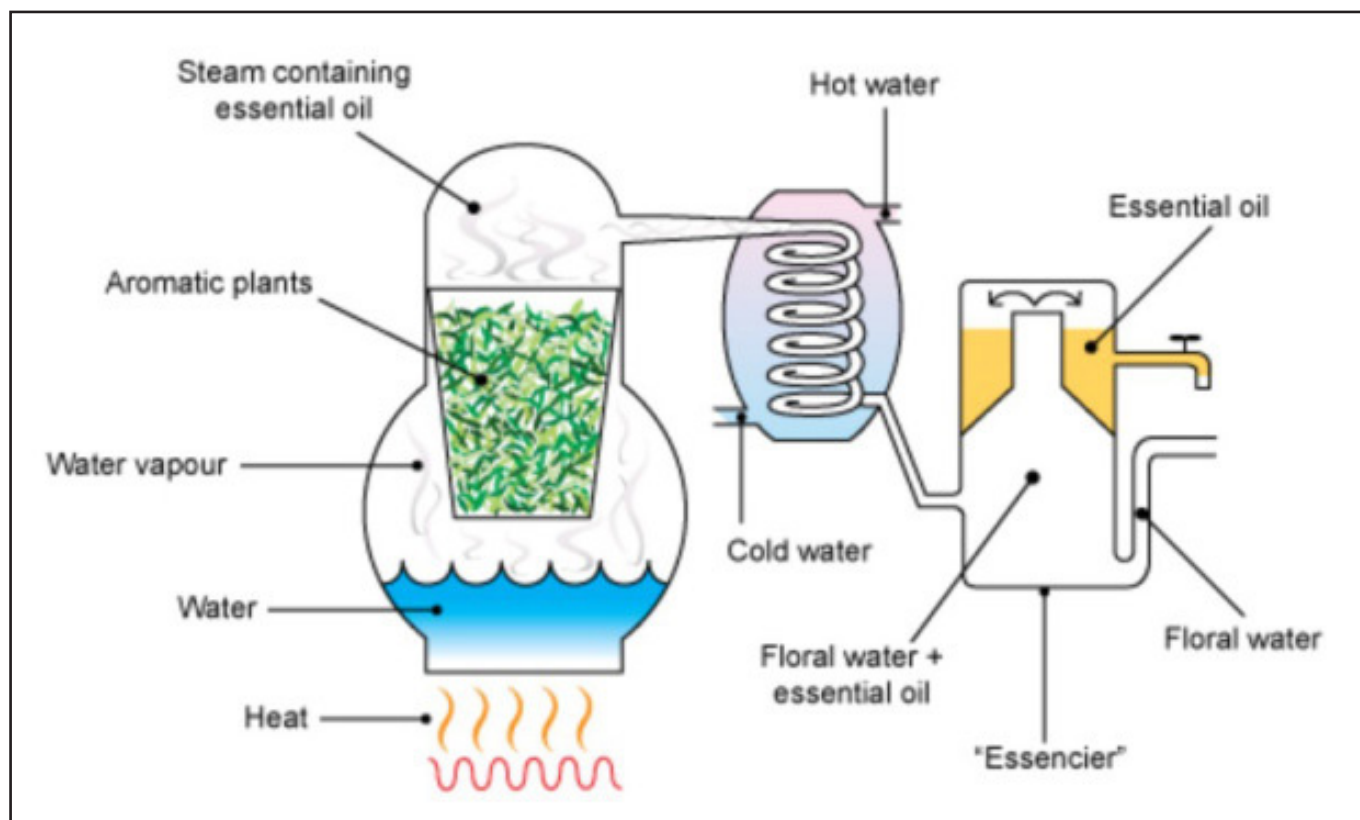
The essential oils of many flowers are used in the making of perfumes. The scents of flowers are affected by characteristics of the soil and the climate in which they are grown. Oils are often extracted by distilling them. Although there are numerous flowers that are used in perfumes, some are more frequently chosen for their strong fragrance. The most popular flowers include roses, jasmine, violets, lilies, orange flowers and plumeria. Others that are used include lavender, magnolia, moonflower, chamomile, rosemary and sweet pea.

Many flowers are still used in perfumes as essential ingredients. Actually, the perfume comes from the essential oils extracted from the flowers. The oils are extracted by a special distillation process.

Plants create fragrance by producing organic compounds on their surfaces. Fragrant flowers produce their perfume in glands on the petals known as "osmophores", to attract pollinators. Some plants have scented foliage. The smell comes from water-repellent essential oils produced by glandular leaf hairs known as "trichomes", to repel leaf-eating predators, especially insects

Important Flowers Used in Perfumery Industry

Although many flowers are fragrant, some flowers gained popularity because of their exceptional fragrances. Some flowers with high fragrances include the following:



Rose - In the history of perfumery it is recorded that the credit goes to Geronimo Rossie who discovered roses in 1574. From ancient times the essential oil of roses was an important commodity in perfumery. Until the modern method of solvent extraction was developed rose oil was obtained mainly by distillation. One of the most valuable elements of a fine perfume is provided by the rose, which is known as the “queen of flowers”. Rose perfumes were very popular with the Romans and the Greeks. Rose flowers are gathered at night since they carry fragrance before sunrise. The two main species of roses used in perfume are the *Rosa centifolia*, found in South of France, and the *Rosa damascena* (Damask Rose) located primarily in Arab countries. The damask rose is most widely grown for perfumery.

Jasmine - Jasmine is prepared from

the flowers of *Jasminum grandiflorum*. The oil obtained through distillation was not of good quality. Therefore, solvent extraction was adopted. Jasmine, another “absolute,” or pure essence, gives a perfume with a well-rounded, finished quality. Jasmine flowers are harvested when their fragrance is at its peak just before dawn. The flowers must be processed immediately before their freshness and fragrances fade away.

Orange - For orange flower oil the process of distillation was widely used. But today this is being practiced by solvent extraction with acetone or isopropyl alcohol. Quality of oil obtained is very high. Orange flower oil or Neroli was named after the Italian princess of Neroli, because it is believed that she was the first to use the oil for scented gloves. Neroli oil is plentiful and widely used in finer

citrus colognes. Orange flowers are grown in the south of France, Spain, Italy and North Africa. Violets - The victoria violet and the parma violet are used most often in perfume. Violets have been used in perfumes throughout the ages because of their varied fragrances. They used violets in both perfumes and medicines. Violets produce only a scant amount of essential oils, and are rarely used today. A synthetic replacement for violet is most commonly used, along with other essential oils resembling the violet.

Lilies - There are many varieties of lilies and their scents differ as well. General types of lilies include asiatic, trumpet, aurelian and oriental. One of the most frequently used in perfumes is Lily of the Valley. The Lily (*Lilium*) is a hearty bulb that can be planted in fall or spring. In the entire lily



spectrum, there is something for everyone, from easy-to-grow, long-lived garden plants to the more difficult and rare species. Their summer blooms are the highlight of the garden, and they are long-lasting as cut flowers. Most lilies bloom between June and August, and the large, trumpet shaped flowers feature a variety of colours, designs and fragrances.

Ylang-ylang -Ylang-ylang is widely used for fine fragrance. This flower is found throughout South-East Asia. The ylang-ylang is not picked until the buds have remained open for two to three weeks. After they have been gathered, they must be processed quickly. This oil is commonly used, but synthetic versions and cananga oil is often substituted in less expensive perfumes.

Chemistry of Natural Perfumes

There is a wide array of fragrant compounds produced by flowers. Most of these compounds belong to the chemical group of terpenoids. The chemical composition of floral scents has been extensively investigated for hundreds of years because of the commercial value of floral volatiles in perfumery. More recently, several ecological studies have examined the roles of floral scent in the biology of the plant. However, in contrast to the chemical emphasis of the perfumers and the organismal emphasis of the

ecologists, until recently, there have been few studies concerning the biochemical synthesis of floral scent compounds, as well as the enzymes and genes that control these processes.

Flower fragrance is a composite character that is determined by a complex mixture of low-molecular-mass volatile molecules. For many years, research into flower fragrance focused on its chemical elucidation and as a result, hundreds of compounds were identified. Most of these compounds belong to three major biosynthetic pathways: phenylpropanoids, fatty acid derivatives, and terpenoids. Although the complete pathways leading to the final products have not been characterized, common modifications such as hydroxylation, acetylation, and methylation have been described.

Floral scent compounds belong to seven major compound classes, of which the aliphatics, the benzenoids and phenylpropanoids, and among the terpenes, the mono- and sesquiterpenes occur in most orders of seeds plants. C5-branched compounds, irregular terpenes, nitrogen-containing compounds and a class of miscellaneous cyclic compounds have been recorded in about two-thirds of the orders. Sulfur-containing compounds occur in a third of the orders, whereas diterpenes have been reported

from three orders only. The most common single compounds in floral scent are the monoterpenes limonene, (E)- β -ocimene, myrcene, linalool, α - and β -pinene, and the benzenoids benzaldehyde, methyl 2-hydroxybenzoate (methyl salicylate), benzyl alcohol, and 2-phenyl ethanol, which occur in 54-71% of the families investigated so far. The sesquiterpenecaryophyllene and the irregular terpene 6-methyl-5-hepten-2-one are also common and occur in more than 50% of the families.

Therefore it could be concluded that the application of Natural Products from plants in cosmetics and perfumery is numerous. The Natural Products should be harnessed while protecting the precious environment.



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