

# Natural Product

Prof. Madhuri Santu Shete

Ashoka College of Education, Nashik, Maharashtra, India

## ABSTRACT

Natural products are small molecules produced naturally by any organism including primary and secondary metabolites. They include very small molecules, such as urea, and complex structures, such as Taxol. As they may only be isolable in small quantities, have interesting biological activity and chemical structures, natural product synthesis poses an interesting challenge in organic chemistry.

**Keywords :** Taxol, Chemical Structures, Organic Chemistry, Natural Product , Terpenoids, Alkaloids, Acyclic Monoterpenes, Monocyclic Monoterpenes, Bicyclic Monoterpenes, Acyclic Monoterpenes

## I. INTRODUCTION

A **natural product** is a chemical compound or substance produced by a living organism that is, found in nature. In the broadest sense, natural products include any substance produced by life. Natural products, including plants, animals and minerals have been the basis of treatment of human diseases. Natural products containing no additives or chemicals can easily be integrated into our beauty routine. Natural products sometimes have therapeutic benefit as traditional medicines for treating diseases, yielding knowledge to derive active components as lead compounds for drug discovery.

### Classification of Natural Product:

- ✓ Terpenoids
- ✓ Alkaloids

### ✚ Terpenoids

**Definition:** Any of a large class of organic compounds including terpenes, diterpenes, and sesquiterpenes. They have unsaturated molecules composed of linked isoprene units, generally having the formula  $(C_5H_8)_n$ .

The **terpenoids**, sometimes called **isoprenoids**, are a large and diverse class of naturally occurring organic chemicals similar to terpenes, derived from five-carbon isoprene units assembled and modified in thousands of ways.

### Classification:

- ✓ Acyclic Monoterpenes
- ✓ Monocyclic Monoterpenes
- ✓ Bicyclic Monoterpenes
- ✓ Acyclic Monoterpenes

Biosynthetically, isopentenyl pyrophosphate and dimethylallyl pyrophosphate are combined to form geranyl pyrophosphate. Elimination of the pyrophosphate group leads to the formation of acyclic monoterpenes such as ocimene and the myrcenes. Hydrolysis of the phosphate groups leads to the prototypical acyclic monoterpenoid geraniol.

- **Citral :** Citral, or 3,7-dimethyl-2,6-octadienal or lemonal, is either a pair, or a mixture of terpenoids with the molecular formula  $C_{10}H_{16}O$ . The two compounds are double bond isomers. The *E*-isomer is known as geranial or citral A. The *Z*-isomer is known as neral or citral B.
- **Occurrence :** Citral is present in the oils of several plants, including lemon myrtle (90–98%), *Litsea citrata* (90%), *Litsea cubeba* (70–85%), lemongrass (65–85%), lemon tea-tree (70–80%), *Ocimum gratissimum* (66.5%), *Lindera citriodora* (about 65%), *Calypranthes parriculata* (about 62%), petitgrain (36%), lemon verbena (30–35%), lemon ironbark (26%), lemon balm (11%), lime (6–9%), lemon (2–5%), and orange.
- **Uses :** Geranial has a strong lemon (citrus) odor. Neral's lemon odor is less intense, but sweeter.

Citral is therefore an aroma compound used in perfumery for its citrus effect. Citral is also used as a flavor and for fortifying lemon oil. It also has strong antimicrobial qualities, and pheromonal effects in insects.

- **Health and safety information:** Two studies have shown 1–1.7% of people to be allergic to citral, and allergies are frequently reported. Citral on its own is strongly sensitizing to allergies; the International Fragrance Association recommends that citral only be used in association with substances that prevent a sensitizing effect. Citral has been extensively tested and has no known genotoxicity, and no known carcinogenic effect, but animal tests show dose-dependent effects on the kidneys.

#### ➤ *Monocyclic Monoterpenes:*

In addition to linear attachments, the isoprene units can make connections to form rings. The most common ring size in monoterpenes is a six-membered ring. A classic example is the cyclization of geranyl pyrophosphate to form limonene. The terpinenes, phellandrenes, and terpinolene are formed similarly. Hydroxylation of any of these compounds followed by dehydration can lead to the aromatic p-cymene. Important terpenoids derived from monocyclic terpenes are menthol, thymol, carvacrol and many others.

- **Terpineol :** Terpineol has a pleasant odor similar to lilac and is a common ingredient in perfumes, cosmetics, and flavors.  $\alpha$ -Terpineol is one of the two most abundant aroma constituents of lapsang souchong tea; the  $\alpha$ -terpineol originates in the pine smoke used to dry the tea. (+)- $\alpha$ -Terpineol is a chemical constituent of skullcap.
- **Uses:** Terpineol has a pleasant odor similar to lilac and is a common ingredient in perfumes, cosmetics, and flavors.  $\alpha$ -Terpineol is one of the two most abundant aroma constituents of lapsang souchong tea; the  $\alpha$ -terpineol originates in the pine smoke used to dry the tea
- **Benefits:** Terpineol is antibacterial and antiviral, an immune system stimulant, a good general tonic. In Essential Oils it is warming and uplifting.

#### ➤ *Bicyclic Monoterpenes*

Geranyl pyrophosphate can also undergo two sequential cyclization reactions to form bicyclic monoterpenes, such as pinene which is the primary constituent of pine resin. Camphor, borneol and eucalyptol are examples of bicyclic monoterpenoids containing ketone, alcohol, and ether functional groups, respectively.

- ❖ **Camphor :** Camphor is a waxy, flammable, white or transparent solid with a strong aroma. It is a terpenoids with the chemical formula  $C_{10}H_{16}O$ . It is found in the wood of the **camphor laurel** (*Cinnamomum camphora*),

- **Physical uses:**

## II. Explosives

Camphor is used as a plasticizer for nitrocellulose, an ingredient for fireworks and explosive munitions. During the late 19th Century, as Western manufacturers developed machine guns and other rapid fire ordnance, it became imperative to reduce the smoke that obscured battlefields and revealed hidden gun emplacements.

## III. Pest deterrent and preservative

Camphor is believed to be toxic to insects and is thus sometimes used as a repellent. Camphor is used as an alternative to mothballs. Camphor crystals are sometimes used to prevent damage to insect collections by other small insects. It is kept in clothes used on special occasions and festivals, and also in cupboard corners as a cockroach repellent.

- **Medicinal uses:**

Camphor is readily absorbed through the skin, where it selectively stimulates nerve endings sensitive to cold, producing a warm sensation when vigorously applied, or a cool sensation when applied gently. This effect also induces a slight local anaesthesia, and has an antimicrobial secondary effect. These effects are particularly noticeable in the lungs and airways if camphor is inhaled as an aerosol.

- **Traditional uses:**

Camphor has been used in traditional medicine from time immemorial in countries where it was native. It was probably the odour of the substance and its decongestant effect that led to its use in medicine.

Camphor was used in ancient Sumatra to treat sprains, swellings, and inflammation. It has long been used as a medical substance in ancient India, where it generally goes by the name Karpūra. It has been described in the 7th-century Āyurvedic work Mādhvacikitsā as being an effective drug used for the treatment of fever. The plant has also been named Hima and has been identified with the plant *Cinnamomum camphora*. According to the *Vaidyaka-śabda-sindhu*, it is one of the “five flavours” used in betel-chewing, where it is also referred to as *Candrabhasma* (‘moon powder’).

#### ▪ **Modern uses:**

Camphor was a component of paregoric, an opium/camphor tincture developed in the 18th century. Paregoric was used in various formulations for hundreds of years. It was a household remedy in the 18th and 19th centuries when it was widely used to control diarrhea in adults and children, as an expectorant and cough medicine, to calm fretful children, and to rub on the gums to counteract the pain from teething. Today the main use of camphor is as a cough suppressant and as a decongestant. It is an active ingredient (along with menthol) in vapour-steam decongestant products, such as Vicks VapoRub.

#### ✚ **Alkaloids:**

Alkaloids are a group of naturally occurring chemical compounds that mostly contain basic nitrogen atoms. This group also includes some related compounds with neutral and even weakly acidic properties. Some synthetic compounds of similar structure are also termed alkaloids.

More recent classifications are based on similarity of the carbon skeleton (*e.g.*, indole-, isoquinoline-, and pyridine-like) or biochemical precursor (ornithine, lysine, tyrosine, tryptophan, etc.)

Alkaloids are often divided into the following major groups:

1. "True alkaloids" contain nitrogen in the heterocycle and originate from amino acids. Their characteristic examples are atropine, nicotine, and morphine.
2. "Protoalkaloids", which contain nitrogen and also originate from amino acids. Examples include mescaline, adrenaline and ephedrine.
3. Polyamine alkaloids – derivatives of putrescine, spermidine, and spermine.
4. Peptide and cyclopeptide alkaloids.
5. Pseudoalkaloids – alkaloid-like compounds that do not originate from amino acids. This group includes terpene-like and steroid-like alkaloids, as well as purine-like alkaloids such as caffeine, theobromine, theacrine and theophylline.

## IV. CONCLUSION

The proposed payment system combines the Iris recognition with the visual cryptography by which customer data privacy can be obtained and prevents theft through phishing attack [8]. This method provides best for legitimate user identification. This method can also be implemented in computers using external iris recognition devices.

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