

## THE PIPER NIGRUM - AN OVERVIEW

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### ABSTRACT

Piper nigrum, a member of the Piperaceae family, is one of the most often used spices worldwide. The distinct sharp flavor is ascribed to the presence of piperine, a phytochemical. In Ayurveda, since ancient times, it is known as Yogvahi. It is One of the most important alkaloids of pepper fruits. It has various pharmacological activities like anti-inflammatory, antioxidant, anticancer, anti-obesity, anti-convulsant, hepatoprotective, antitumor, bio-availability enhancer, antimutagenic, insecticidal, antithyroid, anti-asthmatic, this review offers in-depth expertise on piperine, paving the path for future research.

**Keywords:** Piperine, Bio-enhancer, Piperine nigrum, Anti-inflammatory, Antioxidant.

### 1. INTRODUCTION

One useful medicinal herb is Piper nigrum (family Piperaceae). Among other spices, it is regarded as "The King of Spices" and is one of the most often used ones. Brazil, Indonesia, and India are just a few of the tropical locations where black pepper is cultivated.

Nigrum piper is popularly known as Peppercorn, Milagu in Tamil, Pippali in Sanskrit, Kali Mirch in Hindi and Urdu, and Madagascar pepper in English. One of the most well-known and widely used spices globally, black pepper is the source of hot and spicy peppercorns.

It is one of the world's most common kitchen species and is well known for the pungent chemical constituent piperine (1-peperoyl piperidine) discovered in 1819 by Hans Christian, which has diverse pharmacological activities<sup>[1]</sup>.

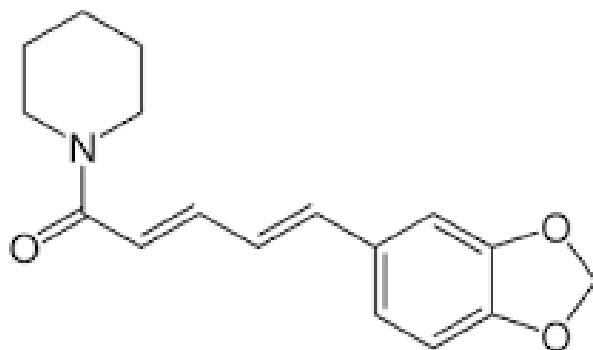


Figure: 1 Structure Of Piperine

### PHARMACOGNOSY OF THE PIPER NIGRUM

#### Taxonomical Classification of *Piper nigrum*:

**Kingdom:** Plantae

**Class:** Equisetopsida

**Sub class:** Magnoliidae

**Family:** Piperaceae

**Genus:** Piper

**Species:** nigrum

Many pharmacological activities are displayed by piperine, including antihypertensive and anti-platelet properties, antioxidant and antitumor properties, antipyretic, analgesic, anti-inflammatory, anti-diarrheal, antispasmodic, hepatoprotective properties, and antibacterial, antifungal, anti-thyroid, anti-apoptotic, anti-spermatogenic, insecticidal, and larvicidal properties.<sup>[2]</sup>

## **2. VARIETIES OF P. NIGRUM**

The fruit of *P. nigrum*, which consists of small spherical green berries that turn bright red when fully ripe, is the most common pepper on the market. Depending on the period of collection and/or processing undertaken, we can distinguish the following types of pepper. There are over 600 varieties of pepper (genus *Piper*), but few are used as spice, often distinguished only by the degree of maturation and the type of processing.

### **1] Black Pepper**

This pepper is made from a pepper seed that was picked when it was still young and dried, giving it a wrinkled, black appearance. Grain shape and fine form can also be achieved by marketing. Additionally, this pepper is used as a spice in recipes for stir-fried foods, beef steaks, and soups.

### **2] White Pepper**

White pepper is created from the seeds of the pepper that is old then peeled, resulting in a white color. There pepper varieties used in rough shape, those that are sold in powder form. In the usage of generally blended in the seasoning. It has a characteristic flavor and scent.

### **3] Green Pepper**

As green peppers are collected when still young and green, they are picked for commercial purposes. It appears he was still using Fresh. He combined it with a seasoning solution to preserve freshness. Excellent with seafood and poultry meals.

### **4] Red Pepper**

No red pigment in the skin is then peppercorns make this kind of pepper called red pepper. The taste of red pepper pepper is different from the others. It is no less spicy and sweeter taste in this type of pepper. This pepper is suitable to be used as a spice in seafood processing. Shown in figure 2. Marketing is in the form of fresh and dried.<sup>[3]</sup>



**Figure 2: Varieties of *Piper Nigrum***

## **3. PHARMACOLOGICAL EFFECTS OF PIPERINE**

### **3.1 ANTI - INFLAMMATORY ACTIVITY**

Many medicinal uses in contemporary medicine and pharmacy to treat various diseases are known to benefit from the diverse anti-inflammatory properties of chemicals isolated from plants. Specifically, employing various dosing regimens, many ethanolic and hexane extracts of black pepper have demonstrated a significant anti-inflammatory action in mice and rats. Additionally, piperine demonstrated the same effect in fibroblast-like synoviocytes triggered by interleukin (IL) 1 $\beta$ , blocking endotoxins generated by lipopolysaccharide (LPS). Moreover, piperine may be considered a strong immunomodulator as it reduces airway inflammation in a mouse asthma model by upregulating the expression of the TGF-beta gene in the lungs.

### **3.2 ANTI-CANCER AND HEPATOPROTECTIVE ACTIVITY**

After piperine was taken orally to lower the incidence of certain types of gastric malignancies, anti-tumour efficacy was shown. By modifying lipid peroxidation, which promotes the propagation of free radical reactions and cellular damage, an alcoholic black pepper extract containing piperine has been shown to be beneficial against lung cancer. Additionally, piperine may decrease the proliferation and migration of HUVECs (human umbilical vein endothelial cells) by restricting the cell cycle to the G1/S phase. In animal studies, piperine can impede angiogenesis by inhibiting the phosphorylation of protein kinase B and the endothelial cells' ability to produce tubules. Applying piperine in conjunction with the FDA-approved anti-tumor drug docetaxel to treat castrate-resistant prostate cancer reveals some of its anti-cancer properties.<sup>[4]</sup>

### **3.3 ANTIMICROBIAL ACTIVITY**

An antimicrobial is an agent that kills micro-organism or inhibits their further growth. These antimicrobial agents can be grouped into different categories according to their primary activity, like antibacterial, antifungal, antiviral, anti-parasitic, pesticide, etc. Many plants have been used as an antimicrobial agent throughout time and will be in future. Although any modern synthetic antimicrobial agents are developed rapidly, the resistance towards them is also growing rapidly. Usually, the resistant against plant source seems less when compared to modern chemical drugs, this may be due to presence of a wide variety of different chemical constituent within a single plant.<sup>[5]</sup>

### **3.4 ANTIOXIDANT ACTIVITY**

Piperine is a naturally occurring spice component that is used in nutritional and medicinal formulations because it has strong antioxidant potential. Piperine is a co-adjuvant used to treat and prevent conditions related to ageing, such as atherosclerosis, hypertension, diabetes, tumours, obesity, and overweight; hypertriglyceridemia; hypercholesterolemia; skin ageing; alopecia; panniculopathia (cellulite); osteoporosis; cerebral ageing (dementia, Parkinson, Alzheimer, etc.); memory loss; stress; depression; menopausal syndromes; and benign prostate hypertrophy.

### **3.5 EFFECT OF PIPERINE ON THE GIT AND BRONCHO-PULMONARY SYSTEM**

Piperine quickly influences the metabolism of the intestines, liver, and tissues, which in turn influences the absorption of nutrients and gastrointestinal xenobiotics. It has been demonstrated, nonetheless, that piperine functions as a polar molecule by forming polar complexes with nutrients and xenobiotics. Because the chemicals have appropriate partitioning, they can pass across membrane barriers. The findings also show that piperine has an impact on the neuroregulation of the whole gastrointestinal system because it directly interacts with the intestinal epithelial layer, which in turn influences how well food, nutrients, and medications are absorbed. Additionally, piperine prevents rats and mice's stomach emptying and GIT.<sup>[6]</sup>

### **3.6 BIO ENHANCING ACTIVITY**

It is a bio enhancer, meaning that it can increase the bioavailability of medications that are delivered together. It has strong bioenhancer properties. either by accelerating the rate at which medications like phenytoin, tetracycline, rifampicin, and sulfadiazine are absorbed or by slowing down their metabolism. It has been discovered to have bio-transformative effects since it is increasing their bioavailability. In the stomach, bile acid creates micelles that help dissolve and absorb fats and medications that are soluble in fat. It also slows the metabolism of bile acid, which enhances the creation of micelles by boosting bile acid synthesis.<sup>[7]</sup>

## **4. OTHER PHARMACOLOGICAL ACTIVITIES AND USES**

Black pepper, *Piper nigrum*, has a wide range of pharmacological effects, including antiplatelets, anti-hypertensive, antispasmodic, antiprotozoal, bioavailability enhancer, memory enhancer, immunomodulator, antimutagenic, insecticidal, antithyroid, anti-asthmatic, and anxiolytic properties.<sup>[8]</sup>

### **SIDE EFFECTS**

Given its extensive use, one may wonder if there are any negative consequences associated with black pepper. In mice administered 1.12, 2.25, or 4.5 mg/kg body weight of piperine for five days, the immunotoxin effects of the alkaloid have been studied. Higher dosages, 2.25 and 4.5 mg/kg, when given haematologically, decreased total leucocyte counts while increasing the proportion of neutrophils. However, no harmful effects were observed at these levels. These amounts prevented B lymphocytes from responding mitogenically to lipopolysaccharide.<sup>[9]</sup>

## **5. APPLICATIONS**

- Numerous biological and medicinal functions are exhibited by piperine.
- It can significantly boost the absorption of certain minerals, including βcarotene, vitamin B, and selenium. When taken orally, it can enhance the release of biliary bile acid and pancreatic and intestine-digesting enzymes.
- It also lowers the buildup of intestinal fluid in the mouse gut and avoids diarrhoea caused by different oils.
- Apart from its role in enhancing the body's absorption of other nutrients, piperine has additional unique uses, such as aiding in the prevention of colon cancer.
- Its properties include anti-thyroid, anti-inflammatory, thermogenic, growth-stimulating, and chemo preventive effects.
- Additionally, this has immunomodulatory, anticancer, antidepressant, insecticidal, antipyretic, and anti-apoptotic properties.
- Here was no evidence of toxicity or signs of excessive piperine consumption. During stressful periods, more piperine may be needed.<sup>[10]</sup>

## **6. CONCLUSION**

The alkaloid piperine, which gives them their pungent qualities, is found in the fruits and roots of the Piperaceae family species *P. nigrum* and *P. longum*. The two species are prized for having this significant alkaloid, which is used medicinally to treat respiratory and stomach illnesses. It is used in a variety of pharmaceutical and food sectors. To improve the availability of selenium, vitamin B,  $\beta$ -carotene, and other dietary components, it is utilised as a bioavailability enhancer. It also functions as a chemo preventive agent and has anti-inflammatory, thermogenic, growth-stimulating, and anti-thyroid properties. Additionally, this has immunomodulatory, anticancer, antidepressant, anti-apoptotic, anticonvulsant, anti-arthritis, anti-ulcer, antioxidant, and cytoprotective properties. It is also antipyretic and analgesic. It has recently been demonstrated that this influences mood and cognitive disorders in addition to acting as an enhancer of bioavailability in various medication formulations. This alkaloid's numerous actions are responsible for the preparation of numerous medicinal formulations in the pharmaceutical industry. This review can offer a wealth of information for conducting study on this priceless natural substance.

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