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A review on antithyroid activity of black pepper

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Abstract

Black pepper is grown as a tropical and subtropical plant throughout the world. Black Pepper is a spice that belongs to the Piperaceae family and is very famous due to its pungent principal Piperine. Historically Black pepper is used as a spice and medicine for its sundry benefits but it gained popularity during Corona Pandemics for its bronchodilator and Immunomodulatory property. From ancient times it is not only used for culinary purpose but also for its diverse therapeutic properties like Anti-Bacterial, Antidiarrheal, Immunomodulatory, Anti-tumor, Anti-depressant, Hepatoprotective Activity, Bronchodilator, Anti-obesity, Anti-Oxidant, Anti-Thyroid, Antihypertensive effect, Anti-Inflammatory, Anticonvulsant effect, Anti-Diabetic, Anti-Fertility, Anti-fungal, Bioavailability Enhancer, Anti-Allergic, Vitiligo, etc. The aim of this review article is to collect data on Black pepper for its Antithyroid activity.

Keywords: Black pepper, piperine, piperaceae, antithyroid activity, etc.

Introduction

Black Pepper the King of Spices also known as *Piper nigrum* used for both culinary and medicinal purposes. Black pepper is famous for its pungent taste which is due to the presence of Piperine. Black pepper is native to South Asia and Southeast Asia. It is a flowering vine generally cultivated for its fruits. The fruits are known as a peppercorn. The dried ripe fruits are used as a spice and for seasoning.

Botanical Name- *Piper nigrum*.

Family- Piperaceae.

Synonyms: Black Piper (English), Kalimirch (Hindi), Kalamiri (Marathi), Filfil Siyah (Urdu), Milagu (Tamil), Miriyalu, Marichamu (Telugu). Black Pepper is a woody climbing vine growing up to 9 meters or more in length. Its stems are generally greyish in color with 1.2 cm in diameter as shown in figure no.1. The color of the Leaves is dark green above and pale green beneath. Leaves appear glossy, ovate, and acutely tipped with sizes ranging from 13-25 cm in length. Each flower spike produces 50-60 single-seeded berries, which appear on the stem opposite to the leaves. Hence, the yield of the berries depends upon leaf number ^[1].

Black pepper is native and cultivated in Sri Lanka, Indonesia, Brazil, and Malaysia. India ranks first in the cultivation of this drug. Cultivation of Black pepper is done by using seeds and stem cutting. The plant bears fruits after 7-8 years and can survive up to 60 years. During planting a minimum of 3-4 meters distance in either direction should maintain while planting cuttings in the month of March-April ^[2]. Black pepper is also known as "Black Gold" because of its higher prized trade.

Chemical composition

Black pepper is one of the commonly used kitchen spices and is famous for its pungent principal Piperine which was discovered by Hans Christian in 1819. Mainly Black pepper contains various alkaloids with volatile oils, 100 carbohydrates, starch, phenols, flavonoids, steroids, lignans, neolignans, terpenes, chalcones, and proteins ^[3, 4]. The aromatic and Volatile Compounds Present in Black Pepper are given in table no.1 ^[3].

Ground Black pepper also contains moderate amounts of vitamin K, iron (10% DV) and calcium, potassium, phosphorus, manganese with trace amounts of other essential nutrients, and dietary fibre ^[5, 12].

Pharmacological Activity

The Thyroid is a small, butterfly-shaped gland that is located at the front of your neck under the skin. The thyroid gland produces and releases certain hormones that help to regulate various body functions. It mainly controls the metabolic rate by which the body transforms food into energy. When your thyroid gland is not working properly it may impact your entire body. The thyroid gland produces and releases the hormones as shown in table no.2.

Black pepper has wide-ranging biological properties. But in this article, we are going to discuss the Antithyroid activity of Black pepper. Sundry synthetic drugs are used in the treatment of various thyroid diseases but perhaps the risk of the development of cancer in the long run. So restricted proximity made the herbal medicinal approach the choice for treatment^[10].

Side effects of Synthetic Antithyroid drugs and Benefits of Herbal Medicines are given in table no.3.

Sunanda Panda and Anand Kar evaluated Piperine for its thyroid hormone and glucose regulatory efficacy in adult male Swiss albino mice. They found that when Swiss albino mice were orally administered with 2.50 mg/kg piperine for 15 days, it lowered the serum levels of both the thyroid hormones, thyroxine (T₄) and triiodothyronine (T₃) as well as glucose concentrations with a concomitant decrease in hepatic

5'D enzyme and glucose-6-phosphatase (G-6-Pase) activity. They also observed that there is no significant alterations when animals were treated with 0.25 mg/kg of piperine in any of the activities studied except an inhibition in serum (T₃) concentration. From their study, it was proved that the action of *Piper nigrum* on thyroid functions is mediated through its active alkaloid Piperine. They suggested that a higher dose of piperine may inhibit thyroid function and serum glucose concentration in Euthyroid individuals^[11]. Vijayakumar RS and Nalini N reported that when piperine in combination with carbimazole was administered, it has been observed that the combination dramatically reduced the lipoproteins and plasma lipids, furthermore, such combination increases the high-density lipoproteins level^[13]. Singh and Duggal also reported that piperine supplementation significantly reduced TSH and apo B, however, the testosterone, apo A-I, T₄, and T₃ level were increased^[14]. From the various species of the Piperaceae family, Black pepper is most famous due to Piperine. Piperine has sundry pharmacological activities like anti-thyroid, antibacterial, antioxidant, anti-obesity, antitumor, antipyretic, anticonvulsant, antifungal, anti-inflammatory, antidiabetic, bio-availability enhancer, antiepileptic, antifertility, GI stimulant, lipid metabolism accelerator, anticancer, CNS stimulant, diuretic, aphrodisiac, blood purifier, antiplatelet activities, etc. as shown in figure no.1^[15, 16, 17, 18, 19].

Table 1: The aromatic and Volatile Compounds Present in Black Pepper

Monoterpenes	Sesquiterpenes	Others
Sabinene	α -Cis-Bergamotene	Cinnamic acid
Limonene	α -Copaene	Benzaldehyde
δ^3 -Carene	Caryophyllene oxide	Methyl eugenol
Camphene	β -Elmenes	Piperonic acid
α -Pinene	α -Cubebene	Safrole
1,8-Cineole	α -Selinenes	Trans-Anethole
γ -Terpinene	δ -Cadinene	m-Methyl acetophenone
β -Pinene	ar-Curcumene	Eugenol
Cis-Ocimene	α -Trans Bergamotene	n-Butyrophenone
α -Thujene	β -Caryophyllene	Phenyl acetic acid
Myrcene	β -Bisabolene	Piperonal
Terpinolene	β -Cubebene	P-Methyl acetophenone
α -Phellandrene	γ -Cadinene	Phenyl acetic acid
β -Phellandrene	δ -Cadinene	Myristicin
α -Terpinolene	ar-Curcumene	

Table 2: Hormones produce by thyroid gland.

Hormones	Function
1. Thyroxine (T ₄)	- Primary hormone -It regulates body weight, growth of hair, nail, and skin, and internal temperature.
2. Triiodothyronine (T ₃)	-Thyroid gland produces less amount of T ₃ than T ₄ but it has greater impact than T ₄ . -It regulates the body's metabolic rate, brain development and its function, maintenance of bones, heart and digestive functions, and muscle control.
3. Reverse triiodothyronine (RT ₃)	-The thyroid gland produces a very small amount of RT ₃ . -RT ₃ reverse the effects of T ₃ hormone. -Its level gets increased in Euthyroid sick syndrome.
4. Calcitonin	-Calcitonin helps to regulate the amount of calcium in the blood.

Table 3: Side effects of Antithyroid drugs and Benefits of Herbal Medicines

Side effects of Antithyroid drugs	Benefits of Herbal Medicines
Short-term use- Fever, sore throat, reduce WBCs count. Long term use- Disease remission, hematopoietic damage.	Economical Minimal side effects Prevent hepatic and renal damage.



Fig 1: Black Pepper fruit

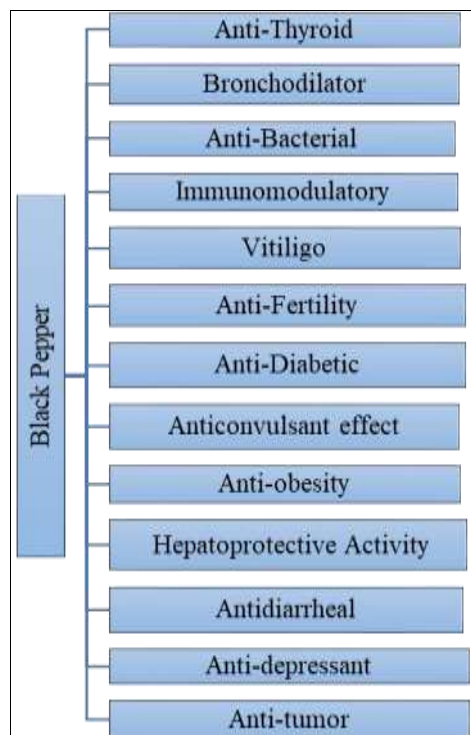


Fig 2: Diagrammatic representation of black peppers potential biological activities

Conclusion

Since ancient time's people were aware about black pepper that being used as spice only. After advances in science we get to know various pharmacological activities of black pepper. Many research articles on the Pharmacological potential of Black pepper revealed that it possesses significant potential to cure numerous diseases and ailments. In different studies it was found and proved that Piperine has the action on thyroid functioning. A higher dose of piperine may inhibit thyroid function. More studies are needed to obtain data on the Antithyroid activity of Black pepper.

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