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6-Paradol, a Vital Compound of Medicinal Significance: A Concise Report

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ABSTRACT

Herbal medicines have been preferred for the treatment of numerous disorders in the world since a very early age owing to easily available and fewer side effect. Ginger is a traditional medicine, having some active ingredients used for the treatment of numerous diseases. During recent research on ginger, various ingredients like zingerone, shogaol, and paradol have been obtained from it. Paradols are phenolic ketones which are structurally related to gingerols and shogaols. Zingerone which is also known as 0-paradol, is a paradol analogue and the major pungent component of ginger. 6-Paradol is the characteristic pungent component of the extract of the seeds of Amomum melegueta Roscoe (zingiberaceae), which are also known as grains of paradise. This review is written to shed light on the various pharmacological properties of Paradol. This review will be beneficial to the scientist, manufacturer and consumers in order to explore the potential health benefits of Paradol.

Key Words: 6-Paradol, Medicinal significance, Zingiberaceae

INTRODUCTON

Ginger (*Zingiber officinale* Roscoe, family: Zingiberaceae) is a pungent, aromatic spice which extends a special flavor and zest to our food. Ginger is the underground rhizome of the ginger plant. This perennial herb is largely grown as both a spice and a condiment. [1] Besides, being used to give beautiful aroma to Indian food, [2] ginger is also used as a potent medicine. It has always been appreciated for its aroma, culinary, and, above all, distinct medicinal properties.

It is widely known to treat a number of different diseases throughout the world. It is due to varied phytochemistry of ginger that it has large health benefits. It contains various minerals and vitamins as well as enzymes like zingibain, a proteolytic enzyme. Ginger contains numerous active components which vary significantly between plant varieties and regions in which it is grown. More than 60 active constituents are known to be present in ginger, which have been broadly divided into volatile and nonvolatile compounds. Hydrocarbons mostly monoterpenoid hydrocarbons and sesquiterpene include the volatile component of ginger and provide distinct aroma and taste to ginger. On the other hand, nonvolatile compounds include gingerols, shogaols, paradols, and also zingerone. [3] 6- Paradol is a pungent phonolic component of ginger which possess so many pharmacological activities. [4]

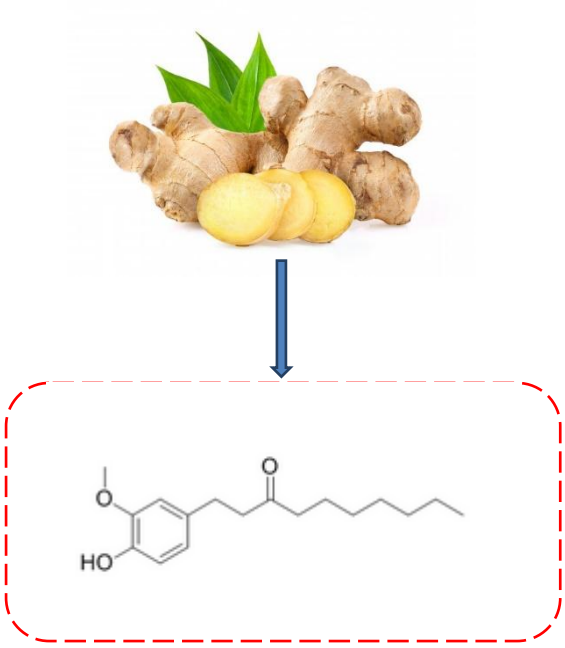
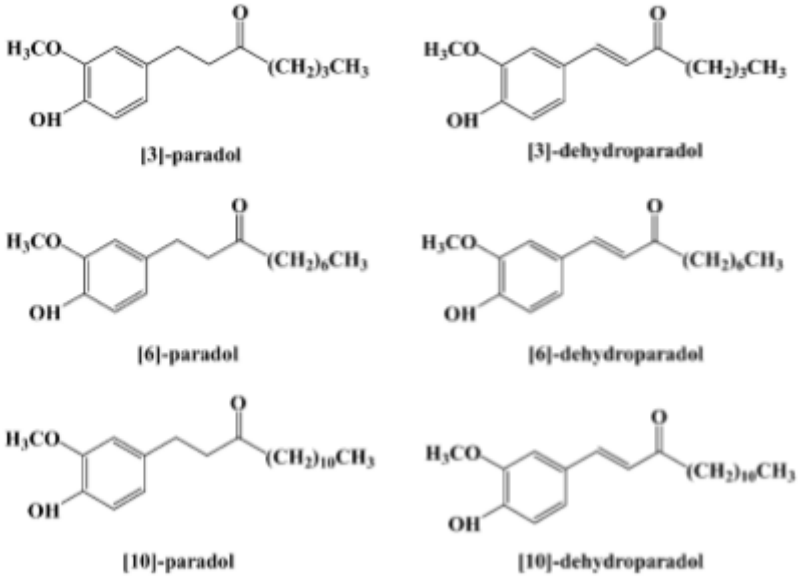


Fig 1: Chemical structure of 6-Paradol

1. 6-PARADOL: ANTICANCER ACTIVITY

Won-Yoon Chunga et.al, determined the anticancer activity of 6-Paradol and its derivatives. Topical application of [6]-paradol and its derivatives inhibited TPA-induced ear edema and H2O2 production and myeloperoxidase activity in the dorsal skin of mice. Induction of TPA-induced mouse epidermal ornithine decarboxylase (ODC) activity and H2O2- and UV-induced formation of oxidized DNA bases in vitro were also diminished by these compounds. All the results show that [6]-paradol and its derivatives possess the cancer chemopreventive potential. [5]



Kathiresan Suresh reported the Oral administration of 30 mg/kg b.w. (6)-paradol to DMBA-treated hamsters on alternate days from DMBA painting for 14 weeks, considerably reduced the formation of tumors and enhanced the grade of detoxification agents, lipid peroxidation and antioxidants. Hence, he pointed that (6)-

paradol has potent chemopreventive, anti-lipid peroxidative and antioxidant capacities as well as a modulating effect on phase II detoxification enzyme and decreased glutathione in DMBA-induced hamster buccal pouch carcinogenesis. [6]

Young-Sam Keumaet.al, described about the induction of apoptosis and caspase-3 activation by chemopreventive [6]-paradol and structurally related compounds in KB cells. [7]

Eunyong Lee, et.al, described that, [6]-gingerol and [6]-paradol were found to put forth inhibitory effects on the viability and DNA synthesis of human promyelocytic leukemia (HL-60) cells. The cytotoxic and antiproliferative effects of both compounds were related with apoptotic cell death. The above results recommend that [6]-gingerol and [6]-paradol hold potential cytotoxic/cytostatic activities. [8]

Arokia Vijayaanand Mariadoss et.al, found out that, oral administration of [6]-paradol at a dose of 30 mg/kg b.wt to DMBA treated animals on alternative days for 14 weeks significantly reduced the neoplastic changes and improved the status of apoptosis associated gene expression. These observations confirmed that [6]-paradol acts as a tumor suppressing agent against DMBA induced oral carcinogenesis and also conclude that [6]-paradol effectively enhances apoptosis- associated gene expression in DMBA treated animals. [9]

2. 6-PARADOL: NEUROPROTECTIVE ACTIVITY

Bhakta Prasad Gaire et.al, found out that 6-paradol administration obviously reduced neuroinflammation in M/R-challenged brains via diminishing microglial activation and reducing the number of cells expressing iNOS and TNF-α, both of which are known to be produced in microglia following M/R challenge. Collectively, this study offers evidences that 6-paradol successfully protects brain after cerebral ischemia, likely by reducing neuro inflammation in microglia, signifying it as a potential therapeutic agent to treat cerebral ischemia. [10]

Ji Won Choi et.al, investigated biotransformation of 6-shogaol to 6-paradol from 6-shogaol enriched ginger extracts by Schizosaccharomyces pombe and he described about the neuroprotective effect of 6-paradol ginger extract by fermentation using Schizosaccharomyces pombe. [11]

3. 6-PARADOL; ANTIINFLAMMATORY ACTIVITY

NyiMekarSaptarini et.al, explained the structure-Based in Silico Study of Paradol, active Compound of Ginger (Zingiberofficinale) as COX-2 Inhibitors and it could be developed as an anti-inflammatory drug. [12]

Nebojsa M. Ilic et.al, explained evaluated the ethanolic extract of grains of paradise (Aframomum melegueta Schum, Zingiberaceae) for inhibitory activity on cyclooxygenase-2 (COX-2) enzyme, in vivo for the anti-inflammatory activity and expression of several proinflammatory genes. Bioactivity-guided fractionation displayed that the peak active COX-2 inhibitory compound in the extract was [6]-paradol. In a rat paw edema model, the entire extract reduced inflammation by 49% at 1000 mg/kg. Major gingerols from the extract [6]-paradol, [6]-gingerol, and [6]-shogaol reduced inflammation by 20, 25 and 38%. respectively when administered individually at a dose of 150 mg/kg. Grains of paradise extract has demonstrated an anti-inflammatory activity, which is in part due to the inhibition of COX-2 enzyme activity and expression of pro-inflammatory genes. [13]

4. 6-PARADOL: BLOOD SUGAR REDUCING ACTIVITY

Chien-Kei Wei et. al, described bout 6-paradol and its ability to promote Glucose Utilization in Adipocytes and Myotubes, and about Reduction of Blood Glucose in High-Fat Diet-Fed Mice. [14]

5. 6-PARADOL: ANTIOBESITY ACTIVITY

Akinori Haratake et.al, described that 6-Paradol is known to trigger thermogenesis in brown adipose tissue (BAT), and paradol analogues with different acyl chain lengths hold different pungency thresholds. In this study, the influence of the acyl chain length on the antiobesity action of the paradol analogues was explored. The antiobesity activity of 6-paradol in mice nursed a high-fat diet for 8 weeks was superior than that of dihydrocapsiate. An evaluation of the antiobesity activities of zingerone and 6-paradol exhibited that the size of the acyl chain in the paradol analogue was important for strong activity. Additionally, the antiobesity activities of 6-, 8-, and 12-paradol seemed to decrease in an acyl chain length-dependent mode. The mechanism of the antiobesity activity of 6-paradol was improved by increasing levels of energy metabolism in the BAT, in addition to an increase in the expression of uncoupling proteins 1 through the activation of sympathetic nerve activity. [15]

CONCLUSION

Ginger is used worldwide as a cooking spice, condiment and herbal medicine, and it is likewise extensively consumed as a flavouring agent. Herbal remedies and other nutraceuticals are increasingly and broadly used by a substantial part of the population. Hence, treatment with natural herbal medicine especially ginger, non-synthetic drug is recommended.

This review has fulfilled significant information about various medicinal properties of 6-paradol. It may be concluded that 6-paradol is a resourceful and vital compound possessing medicinal importance and is a promising lead compound for the drug design and development of potent therapeutic agents.

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