

## A REVIEW ON BIOLOGICAL POTENTIAL OF CURCUMA LONGA AND PIPER NIGRUM

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### ABSTRACT

People are using herbal medicine from centuries for safety, efficacy, cultural acceptability and lesser effects. It is due to increase of awareness and knowledge about plants. Plant and plant product utilized with varying success to cure and prevent diseases throughout history. Therapeutically interesting and important drugs can be developed from plant sources which are used in traditional system of medicine is based on empirical knowledge of observation and experience over millenia and more than 5000 plants are used in different ethnic communities in India. Curcuma longa and Piper nigrum are indigenous medicinal plants. In which Curcuma longa and Piper nigrum have large biodiversity in India. The present communication constitutes a review on biological potential of Curcuma longa and Piper nigrum used in

Indian traditional medicine. These plants are known to contain various active principles of therapeutic values and to possess biological activity against number of diseases.

**KEYWORDS:** Curcuma longa, Piper nigrum, curcumin, piperine, traditional uses, Pharmacological action.

### INTRODUCTION

God has gifted us with this beautiful nature which contain resourceful wild life. Herbal plants have a great growth potential in global market.<sup>[1]</sup> According to an estimate, 80% of the world's population relied upon plants for their medication.<sup>[2]</sup> Turmeric, fresh rhizomes of plant known as Curcuma longa Linn, belonging to family Zingiberaceae. Curcuma is about 70 species of rhizomatous herbs distributed in south east Asia, India, China, Italy, Malaysia. Commercially C. longa, C. amada, C. angustifolia, C. cacsia, C. zedoaria are important.<sup>[3]</sup> The

whole plant, its various parts and extract of *Curcuma longa* have been used for treatment of number of diseases.<sup>[4]</sup>

Pepper is dried unripe fruit of perennial climbing vine, *Piper nigrum* linn, family Piperaceae. It is indigenous and cultivated in south India. The plant also have reported or used in various diseases.<sup>[5]</sup>

### **PHYTOCHEMICALS**

A number of phytochemical studies have demonstrated the presence of several classes of chemical compounds of *Curcuma longa* and *Piper nigrum*, the main ones being alkaloid, tannin, saponin, glycoside, proteins etc.<sup>[6]</sup>

In *Curcuma longa* organic solvent like ethanol extract of dried powdered rhizomes are reported to contain more percentage (25%) of phytochemicals like(carbohydrate, proteins, starch, amino acids, steroid, glycoside, flavonoid, alkaloid, tannin and saponin).<sup>[7]</sup> In phytochemical analysis of crude extract and solvent fractions of *Piper nigrum* linn seeds. Ethanol extract, diethyl ether and chloroform fractions of *Piper nigrum* contained all the phytochemical analyzed.<sup>[8]</sup>

### **Traditional uses**

*Curcuma longa* and *Piper nigrum* used as traditional medicines in many countries.<sup>[9]</sup> From many years awareness of turmeric and its use as medicine is continuously increasing. A flowering plant, turmeric in ginger family, is commonly used as a food colouring and is to heal many health disorders like liver problem, digestive disorders, treatment for skin diseases and wound healing turmeric has long been used in medicinal as an anti-inflammatory.<sup>[10]</sup>

*Piper* species have been used in traditional medicine for intermittent fevers and to promote the secretion of bite. They are also recommended for neurological broncho-pulmonary and gastrointestinal disorders, (Including dyspepsia, flatulence, constipation and hemorrhoids).<sup>[11]</sup>

### **PHARMACOLOGICAL EFFECTS OF CURCUMA LONGA**

#### **Wound healing activity**

The study on ethanolic extract of turmeric shows excellent healing score without any postoperative complication and plays important beneficial role in surgical wound healing.<sup>[12]</sup> Evaluation of ethanolic extract of *Curcuma longa* (turmeric) rhizomes for wound healing activity through topical route on excision wound model. The activity was compared with

standard drug. Ethanolic extract of *Curcuma longa* (turmeric) rhizomes was found to have better and faster wound healing effect than standard drug (povidone-iodine ointment) on excision wound model.<sup>[13]</sup>

### **Antimicrobial activity**

There is vital need to develop new classes of antibiotics as currently used antibiotics developing a dangerous microbial resistance. Different study showed that *Curcuma longa* is a herb with good antimicrobial activity. The ethanolic and methanolic extract of rhizome and leaves were subjected to microbial susceptibility assays using agar well diffusion method. The rhizome extract showed high inhibition over *E. coli*, *S. pyrogens*, *B. subtilis*, *C. albicans*. The leaf extract possessed antimicrobial potential against *S. pyrogens*, *B. subtilis* and *C. albicans*.<sup>[14]</sup>

### **Anticancer activity**

Cancer is the second leading causes of death worldwide. The activity of turmeric was evaluated prophylactically and therapeutically (as pre-induction treatment and post-induction treatment) against MNU induced mammary tumors. The anticancer activity was assessed using latency period, tumor incidence, tumor volume, tumor growth parameters. Topical application of turmeric was found more effective in pre-induction treatment and topical treatment was more effective than compared to oral treatment.<sup>[15]</sup> In addition other study showed the ethanolic extract of curcumin showed considerable anticancer activity against in cell line of human hepatocellular liver carcinoma.<sup>[16]</sup>

### **Analgesic activity**

The activity was carried using hydroalcoholic extract of *Curcuma longa* (HAECL). The HAECL (100,200 and 400mg/kg:p.o) was evaluated for its analgesic activity by employing tail immersion and hot plate test. The HAECL rhizome contain various phyto-constituents and may be responsible for analgesic activity and was also compared with standard. (drug like pentazocine).<sup>[17]</sup>

### **Hypoglycemic activity**

Now-a-days rate of diabetes is increasing day by day. The activity of curcumin was evaluated against aqueous root extract of methanol and n- hexane. The methanol fraction showed highest potency with a significant ( $p < 0.05$ ) decrease in blood glucose level when compared to diabetic control. N- hexane fraction showed a marked hypoglycemic activity.<sup>[18]</sup>

**Anti-inflammatory activity**

Search for novel natural anti-inflammatory substances are still necessary due to intolerable side effects of synthetic anti-inflammatory drugs.<sup>[19]</sup> A compound isolated from methanol extract of rhizomes of Curcuma to showed the significant anti-inflammatory effect. Anti-inflammatory action was assessed by using mice models.<sup>[20]</sup>

**Anti-mycoplasma activity**

The anti-mycoplasma activity of extract and curcumin were evaluated using a broth micro-dilution technique to determine the minimum inhibitory concentration (MIC). The best activity was observed in the ethanolic and acetonic extracts, which had high curcumin content.<sup>[21]</sup>

**Antimutagenic activity**

The present study was conducted to evaluate the mutagenic potential of sodium azide at a concentration of 200µg/ml on allium cepa root meristem cells and to determine the anti-mutagenic effect of curcumin at doses ( 5µg/ml)(10 µg/ml)20µg/ml. curcumin is anti-mutagenic and has capacity to reduce the mutagenic potential of sodium azide.<sup>[22]</sup>

**In Vitro Cytotoxicity and Antiviral Action**

The present study, aim to investigate the anti-PRRSV property of Curcuma compound. Turmeric extraction was obtained and was increase dissolved by solid dispersion technique and found that at concentration of 0.00005-1.56µg/ml. Showed no cytotoxicity effect on MARC-145 cells. Curcuminoids showed significantly inhibit PRRS virus replications.<sup>[23]</sup>

**Antifungal activity**

Methanol extract of rhizomes of turmeric, Curcuma longa L, effectively controlled the development of red pepper and anthracnose caused by colletotrichum coccodes. In addition three antifungal substances were identified from methanol extract of Curcuma longa rhizome as Curcumin, de-methoxycurcumin and bisdemethoxycurcumin using mass and <sup>1</sup>H-NMR spectral analysis.<sup>[24]</sup>

**Antifertility activity**

Control and Curcumin treated albino rats were observed for ovulation by vaginal smear method. Animals were scarified and histopathological examination of ovaries and uteri were done. The result obtained from study provide evidence that Curcumin has anti-ovulatory effect probably by it's anti-oestrogenic activity through suppression negative feedback effect of estrogenic on pituitary.<sup>[25]</sup>

### **Hepatoprotective and renoprotective activity**

Turmeric has been shown to have renoprotective and hepatoprotective properties similar to silymarin. The hepatoprotective and renoprotective effect of turmeric are mainly due to it's ability to decrease the formation of pro-inflammatory cytokines.<sup>[26]</sup>

## **PHARMACOLOGICAL EFFECTS OF PIPER NIGRUM**

### **Antidepressant activity**

The study an aqueous extract of Piper nigrum fruit showed antidepressant activity. Present study was aimed to evaluate antidepressant activity of Piper nigrum fruit aqueous extract and to compare with standard (Imipramine).<sup>[27]</sup>

### **Analgesic and anti-inflammatory activity**

In the present study analgesic activity of pure compound Piperine, hexane and ethanol extracts of Piper nigrum linn. was analyzed by four different methods. (Tail immersion, analgesy-meter, hot plate and writhing method). While anti-inflammatory activity was determine by carrageenan induced paw edema. The hexane and ethanol extract of Piper nigrum possess no analgesic at all dose while pure compound of Piperine showed maximum activity and increase in reaction time. However anti-inflammatory effects of hexane and ethanol extract of Piper nigrum linn. Was increased till 120min.<sup>[28]</sup>

### **Antioxidant and antidiabetic activity**

The study showed that leaf of Piper nigrum was extracted with ethanol for further studies of antioxidant and antidiabetic. The leaf extract of Piper nigrum has shown that antioxidant activity is maximum in non-enzymatic method that fruit sample were as the in-vitro antidiabetic against  $\alpha$ -amylase is maximum with leaf sample than essential oil sample from Piper.<sup>[29]</sup>

### **Wound healing activity**

Black pepper is commonly mixed in home remedies to heal wounds and cuts. The study on extract of black berries of *Piper nigrum* L. (0.32-1.0 µg/ml) encouraged cell migration activity under condition in which no direct cytotoxicity was observed. The wound healing activity was probably due to presence of phytochemicals, viz; flavonoids and triterpenes.<sup>[30]</sup> In addition other study showed sub fraction PNE37 isolated from fraction PNE3, which is from crude ethanolic extract of *Piper nigrum* L. berries was found to contain most profound bioactive wound healing property. Piperine, an alkaloid, which was accountable for wound healing activity identified.<sup>[31]</sup>

### **Antimicrobial activity**

In the past 70 years, the antibiotics have saved lives of millions of people all over the globe and participated in development of modern medicine.<sup>[32]</sup> The study showed Piperine was evaluated against all tested bacteria with zone of inhibition ranged from 8-18mm. Maximum zone of inhibition was against gram+ve bacteria *Staphylococcus aureus* (18mm) and minimum against gram -ve bacteria *Escherichia coli* (8mm). Piperine showed maximum antifungal activity towards *Fusarium oxysporum* (14mm) and very least effect against *Aspergillus niger* (38mm).<sup>[33]</sup> In addition other study assessed, the phytochemicals and antimicrobial activities of different leaves extract (cold water, hot water and pepper soup) of *Piper nigrum*. The study found that *Piper nigrum* leaves contain phytochemicals such as tannin, flavonoids, cardiac glycoside and alkaloids. The *Piper nigrum* leaf extract exhibited significant antimicrobial effect against microorganisms.<sup>[34]</sup>

### **Antioxidant activity**

The study was aimed to extract the phytochemical compounds in different solvent system in *Piper nigrum* and *Piper cubeba*. In preliminary screening and confirmatory test was identified as alkaloids. High antioxidant activity was found in *Piper cubeba* ethanol extract. i.e, 77.61±0.02% in comparison to *Piper nigrum* extract with 74.61±0.02% with IC<sub>50</sub> values 10.54±0.12 µg/mg and 14.15±0.02 µg/mg respectively.<sup>[35]</sup>

### **Hypoglycemic activity**

The effect of ethanol leaves extract of *Piper nigrum* on some biochemical parameters in alloxan induced diabetic rats was carried. The result on this study indicates that ethanol leaves extract of *Piper nigrum* has hypoglycemic tendencies in diabetic condition.<sup>[36]</sup>

### **Antidiarrhoeal activity**

Aq. Extract of black pepper was tested for its antidiarrhoeal, antimotility and antisecretory activity in mice. It was concluded that Aq. Black pepper extract (ABPE) possess antidiarrhoeal effect may be due to its antimotility and antisecretory effect. antimotility and antisecretory effect of Black Pepper may be due to presence of carbohydrate and alkaloids.<sup>[37]</sup>

### **Anticancer Activity**

Piper nigrum is well known for its cytotoxic and pharmacological benefits. However, there is minimal documented evidence about its cytotoxic efficacy against colorectal carcinoma. Study concluded that Piper nigrum as a novel therapeutic spice for treatment of colorectal carcinoma.<sup>[38]</sup>

### **Anthelmintic Activity**

The present study deals with anthelmintic evaluation of fruits of Piper nigrum. The ethanol extract exhibited maximum anthelmintic activity comparable to standard drug albendazole and isolated piperine. Hydroalcoholic extract shows modest activity.<sup>[39]</sup>

### **Anti-Mutagenic Activity**

Antigenotoxic activity of piperine and its antimutagenic effects in reducing and preventing the DNA damages which can be induced by carcinogens in somatic and germ cells. The underlying molecular mechanisms now require attention.<sup>[40]</sup>

### **Cardioprotective Activity**

Curcumin alone and different doses of Curcumin when combined with piperine show a significant beneficial effect against cp-induced cardiotoxicity. Among combination groups, that is Curcumin (50mg/kg,p.o) combined with piperine (20mg/kg,p.o) shows maximum cardioprotection.<sup>[41]</sup>

## **CONCLUSION**

The present review tried to look at Curcuma longa and Piper nigrum on a broad perspective, with knowledge that a lot of research has already been done on the plants. This paper tried to expose the different traditional uses of Curcuma longa and Piper nigrum such as their use for skin diseases, wound healing, anti-inflammatory, neurological broncho pulmonary and GIT disorders etc. The different biological activities of plants have been investigated such as antimicrobial, wound healing, anticancer, analgesic, hypoglycemic, anti-inflammatory, anti-mycoplasma, anti-depressant, antioxidant activities. These plants have tremendous potential

for research due to their versatile pharmacological actions and active constituents. Further investigations are necessary to validate their many other traditional uses.

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