

## **A REVIEW ON POTENCY OF SOME CUCURBITACEAE PLANTS AGAINST HEPATITIS AND ANTIMICROBIAL ACTIVITIES**

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### **ABSTRACT**

India is called the botanical garden of the world for its rich natural resources. Over 6000 plants in India are used in traditional, folklore and herbal medicine. Plants have a long history over thousands of years and still considered to be a promising source of medicine. The efficacy and safety of herbal medicines have turned the major pharmaceutical population towards medicinal plants research. The medicinal plants have very important place in the health and vitality of human beings as well as animals. As per the WHO estimates, about three quarters of the world's population currently use herbs and other traditional medicines to cure various diseases, including liver disorders. Hence, several phytomedicines (medicinal plants and herbal drugs) are now used for prevention and treatment of various liver diseases. Medicinal plants may serve as a vital source of potentially useful new compounds for the development of effective therapy to combat a variety of liver problems. Many herbs have been proven to be effectual as hepatoprotective agents. In view of increasing resistance to existing antimicrobial agents, herbal drugs are being looked as very important source for discovery of new agents for treating various ailments related to bacterial infections. In this review, information on potential use of some Indian Cucurbitaceae plants for hepatitis and antimicrobial activities are being discussed.

**Key Words:** *Cucurbitaceae, Hepatitis, Antimicrobial activity, Lagenaria, Trichosanthes*

### **INTRODUCTION**

Many researchers have paid attention towards the Cucurbitaceae family because the fruits, seeds and vegetables are traditionally consumed in various Ayurvedic preparations and confectionary. The family Cucurbitaceae includes a large group of plants which are medicinally valuable. It is a family of about 130 genera and about 800 species distribute mainly in tropical and subtropical regions of the world. The plants of the family are collectively known as cucurbits (Kocyan *et al.*, 2007). The important genera belonging to the family are *Trichosanthes*, *Lagenaria*, *Luffa*, *Benincasa*, *Momordica*, *Cucumins*, *Citrullus*, *Cucurbita*, *Bryonopsis* and *Corallocarpus* (Pandey, 1969).

Cucurbits are among the largest and most diverse plant families, cultivated worldwide in a variety of environmental conditions. The fruits of cucurbits are very useful in terms of human health, i.e. purification of blood, removal of constipation and good for digestion and give energy. Seeds or fruit parts of some cucurbits are reported to possess purgatives, emetics and antihelmintics properties due to the secondary metabolite cucurbitacins content (Rahman *et al.*, 2008 and Bisognin, 2002).

Cucurbitacins constitute a group of diverse triterpenoids substances which are well known for their bitterness and toxicity. The cucurbitacins are of great interest because of the wide range of biological activities they exhibit in plants and animals. They are predominantly found in the family Cucurbitaceae but are also present in several other families of the plant kingdom (Guha *et al.*, 1975). A number of compounds of this group have been investigated for their cytotoxic, hepatoprotective, anti-inflammatory and cardiovascular effects (Dhiman *et al.*, 2012 and Miro, 1995).

Medicinal plants have very important place as they not only maintain the health and vitality of human beings and animals, but also cure several disease, including liver disorders without causing any toxicity. Over past few decades, herbal medicines have been accepted universally and they put the impact on both

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world health and international trade. As per the WHO estimates, about three quarters of the world's population currently use herbs phytomedicines (medicinal plants or herbal drugs) and other traditional medicines for the treatment of various diseases (Pandey, 2011; Madhuri *et al.*, 2008; Madhuri *et al.*, 2009; Pandey *et al.*, 2008 and Pandey *et al.*, 2011). A number of edible plants have been traditionally used to cure illness. For example, bulbs of *Curcumin longa* Lin has been consumed to treat stomach ulcers and is believed to help prevent liver cancer (Fransworth, 1992). The fruits and leaves of *Momordica charantia* Linn have been consumed to cure symptoms of liver diseases (Itharat *et al.*, 2007). In addition, several studies have confirmed the medical properties of these edible plants. For example, curcumin extracted from *C. longa* has been reported to have anti-inflammatory and antioxidant properties and shows antiviral activity for HBV and hepatitis C virus (Buhrmann *et al.*, 2011; Kim *et al.*, 2009 and Kim *et al.*, 2010). Liver has a pivotal role in regulation of physiological process. It is involved in several vital functions such as metabolism, secretion and storage. The liver diseases are mainly caused by toxic chemicals (certain antibiotics, chemotherapeutics, peroxidised oil, aflatoxin, carbon tetrachloride, acetaminophen, chlorinated hydrocarbons, etc.) excess consumption of alcohol, infections and autoimmune disorders (Pandey, 2011; Pandey, 1980; Pandey, 1990 and Kumar *et al.*, 2011).

The word hepatitis comes from the Ancient Greek word “hepar” (root word hepat) meaning 'liver' and the Latin 'itis' means inflammation. Hepatitis means injury to the liver with inflammation of the liver cells (Khan *et al.*, 2012 and Nordqvist, 2009).

Most of the hepatotoxic chemicals damage liver cells mainly by inducing lipid peroxidation and other oxidative damages in liver. Enhanced lipid peroxidation produced during the liver microsomal metabolism of ethanol may result in hepatitis and cirrhosis. It has been estimated that about 90% of the acute hepatitis is due to viruses. The major viral agents involved are Hepatitis B, A, C, D (delta agents), E and G. A vaccine has become available for immunization against Hepatitis B virus (Kumar *et al.*, 2011). The hepatoprotective activity is probably due to the presence of flavonoids in all few herbal plants (Shaik *et al.*, 2012).

### Hepatotoxicity Inducing Agents

Several chemicals have been known to induce hepatotoxicity. Carbon tetrachloride (CCl<sub>4</sub>), galactosamine, d-galactosamine/lipopolysachharide (GalN/LPS), thioacetamide, antitubercular drugs, paracetamol, arsenic etc. are used to induce experimental hepatotoxicity in laboratory animals (Vishwanath *et al.*, 2012). Herbal based therapeutics for liver disorders has been in use in India for a long time and has been popularized world over by leading pharmaceuticals. Despite the significant popularity of several herbal medicines in general and for liver diseases in particular, they are still unacceptable treatment modalities for liver diseases.

The limiting factors that contribute to this eventuality are

- (i) Lack of standardization of the herbal drugs;
- (ii) Lack of identification of active ingredient(s)/principle(s);
- (iii) Lack of randomized controlled clinical trials (RCTs) and
- (iv) Lack of toxicological evaluation (Vishwanath *et al.*, 2012 and Radha *et al.*, 2005).

In the recent years, research on medicinal plants has attracted a lot of attentions globally. Large body of evidence has accumulated to demonstrate the promising potential of Medicinal Plants used in various traditional, complementary and alternate systems of treatment of human diseases. Plants are rich in a wide variety of secondary metabolites such as tannins terpenoids, alkaloids, flavonoids, etc. which have been found in vitro to have antimicrobial properties (Sher, 2009).

The non-availability and high cost of new generation antibiotics with limited effective span have resulted in increase in morbidity and mortality. Therefore, there is a need to look for substances from other sources with proven antimicrobial activity. Consequently, this has led to the search for more effective antimicrobial agents among materials of plant origin, with the aim of discovering potentially useful active ingredients that can serve as source and template for the synthesis of new antimicrobial drugs (Balkhande *et al.*, 2013).

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**Table 1: Plant Parts Used for the Treatment of Hepatitis**

| Family               | Botanical Name               | Plant Part Used |
|----------------------|------------------------------|-----------------|
| <i>Cucurbitaceae</i> | <i>Citrullus colocythis</i>  | Fruit           |
|                      | <i>Citrullus lanatus</i>     | Ripe fruit      |
|                      | <i>Cucumins sativus</i>      | Fruit           |
|                      | <i>Cucumins trigonus</i>     | Fruit           |
|                      | <i>Cuscuta reflexa</i>       | Whole plant     |
|                      | <i>Diplocyclos palmatus</i>  | Whole plant     |
|                      | <i>Lagenaria siceraria</i>   | Leaves          |
|                      | <i>Luffa acutangula</i>      | Fruit           |
|                      | <i>Luffa echinata</i>        | Bark            |
|                      | <i>Momordica charantia</i>   | Leaf            |
|                      | <i>Trichosanthes cordata</i> | Root            |

Clinical microbiologists have two reasons to be interested in the topic of antimicrobial plant extracts. First it is very likely that these phytochemicals will find their way into the arsenal of antimicrobial drugs prescribed by the physicians; several are already being tested in humans. Scientists realize that the effective life span of any antibiotic is limited, so new sources especially plant sources are also being investigated. Second the public is becoming increasingly aware of the problems with the over prescription and misuse of traditional antibiotics. In addition many people are interested in having more autonomy over their medical care. A multitude of plants compounds (often of unreliable purity) is readily available over the counter from herbal suppliers and national food stores and the self medication with these substances is a common practice to certain extent (Sher, 2009).

The minimum inhibitory concentrations (MICs) can be determined. Evidently there are no scientific studies about effect of root extracts against pathogenic microorganisms (Balkhande *et al.*, 2013).

Detailed survey made on all important *Cucurbitaceae* plants in respect of Hepatitis and antimicrobial activity. It is found that the information is available only on plants named: *Trichosanthes*, *Lagenaria*, *Luffa*, *Benincasa*, *Momordica*, *Cucumins*, *Citrullus* and *Cucurbita*, *Bryonopsis*. Furthermore, information on antimicrobial activity on plant *Trichosanthes*, *Lagenaria*, *Momordica* and *Bryonopsis* are available. Therefore in present review, we have projected description of antimicrobial activity of these selected plants.

***Momordica charantia***

*Momordica charantia*, belonging to the family *Cucurbitaceae*, is a successful medicinal and vegetable plant for human health and one of the most promising plants. This plant has a number of potential biological and pharmacological activities including anti-diabetic, anti-opacity, anticancer, hypoglycemic, antifertility activities.

Bitter gourd commonly called “Karela” in India; consist of number of constituents which contribute to nutritional value of the plants. Bitter gourd (*Momordica charantia*), a vegetable indigenous to tropical regions of Asia, belongs to the *Cucurbitaceous* family, contains an array of biologically active photochemical. These include triterpenes, proteins and steroids. Fruit and seeds of bitter gourd are traditionally used as medicinal herbs as, anti-HIV, anti-ulcer, anti-inflammatory, anti-leukemic, antimicrobial, anti-diabetic, and anti-tumor, to name a few (Amira *et al.*, 2013 and Mazza *et al.*, 2001). Bitter gourd has some interesting biological and pharmacological activities, e.g. anticancer, antiviral, antibacterial, analgesic, anti-inflammatory, hypotensive, anti-fertility, hepatotoxicity and antioxidant (Young *et al.*, 2009).

***Antimicrobial Activity of Momordica charantia***

Extracts of various plant parts of *Momordica charantia*, including leaf, fruit and seeds have been investigated and found to be pharmacologically active against microbes. A leaf, in addition to whole plant

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extracts have been shown to have anti-HIV activity (Sharma *et al.*, 2011). *Bacillus subtilis*, *Escherichia coli*, *Pseudomonas aeruginosa*, *Staphylococcus aureus* are inhibited by the extracts of chloroform and ethanol (95%) of dried fruit (Sharma *et al.*, 2011).

#### Anti HIV Agents

Bitter gourd has also been suggested as a treatment for AIDS, but the evidence thus far is too weak to even mention. Laboratory tests suggest that compounds in bitter gourd might be effective for treating HIV infection. As most compounds isolated from bitter gourd that impact HIV have either been proteins or glycoprotein (Lectins), neither of which are well-absorbed, it is unlikely that oral intake of bitter gourd will slow HIV in infected people (Kumar *et al.*, 2010).

#### *Bryonopsis laciniosa*

*Bryonopsis laciniosa* is a shrub known as “Shivlingi” in India and it is used commonly as an aperient medicine and tonic. *B. laciniosa* belongs to the Cucurbitaceae family and traditional healers use the leaves and the seeds of this plant for treatment of fevers. It is also taken in impotency and used as a tonic. Whole plant is used to treat adenopathy, ague, asthma, bronchitis, carbuncles, cholera, colic, consumption, convulsions, cough, delirium, fertility, headache, megalosplenly, paralysis, phthisis, snake bite.

Antimicrobial activity of ethanolic extract of the leaf, stem, seed and fruit of an Indian medicinal plant, *Bryonopsis laciniosa*, used traditionally as potent medication in healing several ailments such as adenopathy, ague, asthma, bronchitis, cholera, colic, consumption, convulsion, cough, fertility and phthisis was tested against different pathogenic microorganisms by agar well diffusion method. Leaf and stem extracts of *B. Laciniosa* exhibited antimicrobial activity against different Gram positive and Gram negative bacteria. Evidently there are no scientific studies about this plant on activities against pathogenic microorganism. Therefore, the objective of this study was to investigate the antimicrobial activity of this plant (Bonyadi *et al.*, 2009).

#### *Lagenaria siceraria*

*Lagenaria siceraria*, commonly known as Bottle gourd, belonging to the family *Cucurbitaceae* called as “Lauki”. Fruits and seeds of *Lagenaria siceraria* have been extensively studied for their pharmacological activity. *Lagenaria siceraria* is one of the excellent fruit for human being made and gifted by the nature having composition of all the essential constituents that are required for normal and good human health (Habibur, 2003). Seeds are also used in dropsy, worm infection and as nutritive.

In Ethiopian traditional medicine, *Lagenaria siceraria* is widely used for treatment of skin disorders. Goji evaluated antimicrobial activity of methanolic extracts of the leaves, seeds, and fruit-flesh of *L. siceraria* using the agar-well diffusion method. *Lagenaria siceraria* extract to show activity against *Pseudomonas aeruginosa* and *Streptococcus pyogenes*, but not against clinical isolates of *S. aureus* and *Escherichia coli*. Thus *Lagenaria siceraria* can be used to treat various skin disorders (Badmanaban and Patel, 2010 and Goji *et al.*, 2006).

#### *Trichosanthes cucumerina*

*Trichosanthes cucumerina*, the fruit of which is mainly consumed as a vegetable. It is commonly called as Snake gourd, Viper gourd, Snake tomato and long tomato. It is used in the treatment of headache, fever, abdominal tumors and skin allergy.

Seeds have antibacterial, anti-spasmodic and insecticidal properties. Antimicrobial activities of petroleum ether, chloroform, ethyl acetate and methanol extract of the leaves gives activity against various pathogenic bacteria such as *Bacillus cereus*, *Enterobacter faecalis*, *Salmonella paratyphi*, *Staphylococcus aureus* and *Escherichia coli* by agar well diffusion method. The antimicrobial potency of this plant extract is due to the presence of phenolic compounds flavonoids and carotenoids (Reddy *et al.*, 2010).

#### Conclusion

The medicinal plants play an important role in the health and vitality of humans and animals lives. Medicinal and vegetable plants are recommended for the essential source of nutrition and the prevention of human disease including cancer and diabetes that they have to offer. Several medicinal plants are now prevalent for treatment of various liver diseases. From the study it can be concluded that Cucurbitaceae

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plants have potential against Hepatitis and furthermore, it also gives antimicrobial activities. These plants can be further use for therapeutic uses. Further study needs for the development of new drugs for treatment of hepatitis which gives antimicrobial activity against pathogenic bacteria.

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