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PHARMACOGNOSTICAL, PHYSICOCHEMICAL AND PHARMACEUTICAL PARADIGM OF ASH GOURD, *BENINCASA HISPIDA* (THUNB.) FRUIT

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ABSTRACT

Benincasa hispida (Ash gourd, Family: Cucurbitaceae), It was a popular vegetable crop widely used for nutritional and medicinal purposes. *B. hispida* is a well-known plant and is cultivated throughout the plains of India and on the hills up to 1200m altitude. It is a large climbing herb with slabby high-speed stems. The fruits are 30-45cm long, cylindrical, covered with a waxy coating. Phytochemical analysis of *B. hispida* fruits showed that the major constituents are volatile oils, glycosides, sacchrides, proteins, carotenes, flavonoids, vitamins, minerals, ß-sitosterin and uronic acid. The peoples usually knew it as vegetable fruit. All parts of the fruit can be used as medicine. The current review provides pharmaceutical information about the herb. Fruits used as an aphrodisiac, blood disease, cardiotonic, diuretic, dyspepsia, epilepsy and fever, etc.

Keywords: *Benincasa hispida*, climbing herb, flavonoids, aphrodisiac, cardiotonic, diuretic.

Introduction

The efficacy of the medicine depends upon the genuine nature of the raw material, so correct identification of medicinal plant is essential (Sharma *et al*., 2020). The accurate and truthful study is required for drugs as it deals with life (Ajeet *et al*., 2017; Singh *et al*., 2020; Malik *et al*., 2019a). Drug quality starts with correct identification, method of collection, manufacturing process and finished product etc. (Singh *et al*., 2018, 2019, 2020a; Malik *et al*., 2019b). The researchers have led to increased emphasis on the use of plant materials *viz.* stem, roots, leaves, fruits and flowers etc. as a source of medicines for different human diseases. The rises in population, inadequate supply of drugs, cost of treatments, side effects of allopathic drugs and development of resistance to infectious diseases have motivates the peoples towards the traditional systems of medicine (Singh *et al*., 2020b, 2020c; Devi *et al*., 2020). *Benincasa hispida* is an extensive consecutive or climbing annual herb cultivated all over the plains of India and on the hills up to 1200m altitude as vegetable. It is a large, climbing herb with stout, angular hispid stem, cultivated as a vegetable throughout India. It showed significant gastroprotective, anti-oxidant and antipyretic effects. The extract of seed is anti-angionic, the bronchodilator and anti-ulcer effects reported in the methanolic extract of plant, n-triacontanol, lupeol and β-sitosterol are present (Anonyms, The Wealth of India, 1988). The carotenes, flavonoids, glycosides, sacchrides, proteins, vitamins, minerals, volatile oils, ß-sitosterin and uronic acid are present in the fruit. The presence of terpenes, flavanoid C, glycosides and sterols makes it a potent antioxidant. The ulcer index decreases as a result of reduction in damage to gastric mucosa (Brihatphala, 2011). *B. hispida* has been used in Ayurveda since ancient times for various therapeutic purposes like 'Mutra Vikara' (Sen, 2005). Its fruits contain a relatively high level of potassium and low sodium and from the index of nutritional quality value, it has been adjudged as a quality vegetable (Pandey, 2008). Fruits were usually used as an aphrodisiac, cardio tonic, urinary calculi, laxative, diuretic, tonic, blood disease, psychosis, schizophrenia, epilepsy and other psychologic disorders, dyspepsia, fever, jaundice, menstrual amenorrhea, dysmenorrheal, menorrhagia and premenstrual syndrome (Blatter, 1975; Sharma, 2005; Jayasree, 2011).

Taxonomic summary

Class	Dicotyledonae
Sub-Class	Polypetalae
Series	Calyciflorae
Order	Passiflorales
Family	Cucurbitaceae
Genus	*Benincasa*
Species	*hispida*

Vernacular name: It is known as ash gourd, wax gourd, white gourd, winter melon, fuzzy melon, hairy melon in english, kush in sanskrit, petha and pethakaddu in hindi, neer

poosanikai in tamil, kumbalam, and kumbalanga in malayalam, boodida gummadikaaya in telugu, boodu gumbala and budekumbalakayi in kannada (Fig. 1)

Fig. 1: Fresh fruit of ash gourd, *Benincasa hispida*.

B. hispida is a monoecious, stem-hairy, 5-angled, climbing or trailing herb with suborbicular stipuliform bract at the petiole-root; simple, very hairy leaves on both surfaces, alternate, palmate or ovate blade in young plant, root cordate (Table 1). When young, the fruits are 30-45 cm long, succulent, densely hairy, with a thick waxy deposit when ripe (Figs. 1, 2). The multiple medicinal properties might account for the percentage of crude protein, ash, starch, lipid, crude fibre, alkaloid, flavonoid, tannin and phytate. In the treatment of different conditions, the biochemical activity of the fruit includes anti-oxidative, anti-inflammatory, anti-angiogenic, detoxifying and curvative impact. Ca, Mg, Fe, Cu, Zn and Se important minerals are present. Powder microscopy was used to further determine the comprehensive anatomical characteristics of various sections (Fig. 3)

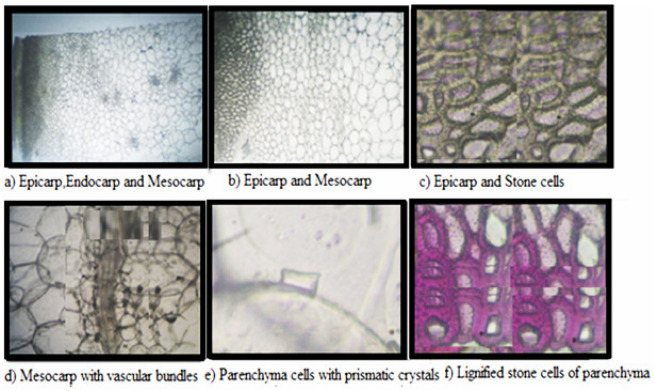

Fig. 2: Microphotographs of *Benincosa hispida* fruit showing characteristics differential tissues.

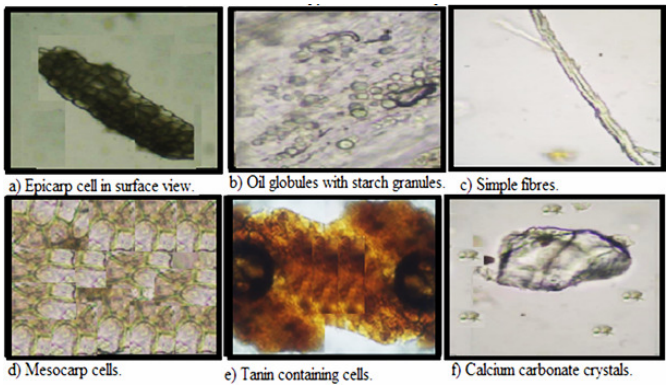

Fig. 3: Powder microscopy of *Benincosa hispida* fruit.

Table 1 : Macroscopy of *Benincasa hispida* root.

S. No.	Structures	Result
1	Outer appearance	Stiff and fragile
2	Taste perception	Characteristic
3	Outline shape	Cylindrical
4	Dimension	7.8 cm length and 0.7 cm width
5	A distinctive smell	Unclear
6	Specific color	Yellowish-brown

Physicochemical study

a. Organoleptic character

Its texture is fine, yellowish white in color, taste slightly acidic, smell slightly aromatic, nature course and odor is nonspecific.

b. Physicochemical parameters

It contains foreign matter, total ash value and acid insoluble ash not more than 1%, 12%, and 1% respectively. Whereas, alcohol-soluble extractive and water soluble extractive not less than 10% and 24%.

Table 2 : Chemical constituents found in whole plant of *Benincasa hispida*.

S. No.	Part of plant	Chemical constituents
1	Root	Pentacyclic triterpene, Bryonolic acid.
2	Fruit	Lupeol, β-sitosterol, cucurbitin, rhamnose, mannitol, triacontenol, alkali, fat, vitamin, glucose, adenine, trigonelline, histidine, pentacyclic triterpene, hexanal and pyrazine compounds.
3	Seeds	24z- ethylidene, cholesterol -7 enol and 24- β- ethyl cholesterol.

c. Biochemicals

In *B. hispida* fruits the major ingredients were volatile oils, flavonoids, sacchrides, proteins, glycosides, carotenes, vitamins, uronic acid minerals and ß-sitosterin (Table 2). In *B. hispida* peels the chemical analysis report showed that galactose, glucose, xylose and sorbose are the main sugar (Chidan *et al.*, 2012). The activity of antioxidants and the total phenolic content (TPC) of B. Conventional Soxhlet extraction (CSE) and DPPH and ABTS scavenging activity experiments examined the extract of hispida seeds. The highest total phenolic content was 11.34±1.3 mg GAE / g and antioxidant activity was achieved by the ethanolic extract followed by ethyl acetate and n-hexane extract (Mandana *et al.,* 2012). The chemical analysis of seeds revealed that total dietary fiber are (58.43%), crude protein (11.63%) and crude fat (20.70%). The seed oil consisted of linoleic acid (67.37%), palmitic (17.11%), oleic (10.21%), and stearic acids (4.83%) (Sew *et al.*, 2010). Phytochemical analysis of root aqueous extract revealed that carbohydrates, sugars, lipids absent and glycosides, alkaloids, tannins are present. The strength of colour or precipitate formation has been used for these experiments as analytical responses (Pal *et al.*, 2018). Usually, deep pharmacological activities are performed on the entire ash gourd plant, including fruit peel, flower, seed, and leaves (Table 3).

Table 3 : Pharmacological activity found in whole plant of *Benincasa hispida*

S. No.	Pharmacological activity	Part of plant used	Method applied	Reference
1	**Central nervous effects**			
	Anxiolytic effects	Fruit (Alcoholic extract)	Elevated plus maze and light-dark transition test	Nimbal *et al*., 2011
	Anticonvulsant effects	Fruit (Alcoholic extract)	Maximal electroshock test (MEST)	Nimbal *et al*., 2011
	Antidepressant effects	Fruit (Methanolic extract)	Swimming test	Dhingra and Joshi, 2012
2	Gastrointestinal effect			
	Antioxidant effect	Seeds (Methanolic extract)	DPPH Method	Gill *et al*., 2011
	Antiulcer effect	Seeds (Methanolic extract)	Indomethacin induced gastric ulcer model	Gill *et al*., 2011
	Antihelmintic activity	Fruit peel (Ethanol extract)	Assay in vitro using adult earthworm	Muley *et al*., 2012
3	Antioxidant effect and total phenolic content	Fruit (Methanolic extract)	DPPPH and ABTS scavenging	Mandana, 2012
4	Anti-inflammatory and analgesic activity	Fruit (Petroleum ether and methanolic) extract	Carragenan induced method of paw edoema, histamine induced method of paw edoema, cotton pellet induced method of granuloma	Rachchh, 2011
5	Antiasthmatic activity	Fruit (Methanolic extract)	Guinea pig histamine induced bronchospasm	Kumar and Ramu, 2002
6	Effects on renal System	Fruit rind (Hydro-alcoholic extract)	Evaluated in adult male guinea pig	Jayasree *et al*., 2011
7	Hypoglycemic effect	Stem (Chloroform extract)	Wistar normal rats	Jayasree *et al*., 2011
8	Hypolipidemic effect	100g freshly prepared salad of ash gourd	200 hyperlipidemic diabetics patient in morning for 30 patients for 90 days	Amerthaveni and Priya, 2011
9	Antimicrobial effect	Seed oil	Zone of inhibition against *Candida albicans*	Natarajan *et al*., 2003

d. Adverse effects

To observed acute toxicity in rats, the concentration of 5g/kg body weight of the aqueous and ethanolic extract of *B. hispida* was found to be safe (Qadrie *et al.,* 2009 and Jayasree, 2011). In the albino rats chloroform extract was also tested for its (0.25g/kg, 0.5g/kg, 0.75g/kg and 1g/kg) concentrations**.** The hyperactivity, loss of righting reflex, sedation, convulsions and respiratory rate parameters were observed during the investigations. The toxic effects and mortality were not reported (Jayasree *et al.*, 2011).

Conclusions

Benincasa hispida is one of the most common vegetables, Due to its nutritional and medicinal value, including its ability to reduce chronic diseases , improve digestion, strengthen the immune system, protect the heart, increase vision, and increase energy levels. B. Hispida produces active phytochemicals such as triterpenes, proteins , vitamins and steroids, etc., showing important gastroprotective, anti-oxidant and antipyretic effects Much has not been investigated among various activities; therefore, there is a number of researchers. B. For their health value, hispida has been explicitly documented, so it can be inferred that wax gourd holds promise as useful ingredients for the medicinal, functional food and nutraceutical industries.

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Conflict of interest

Certified that there is no conflict of interest pertaining to publication of this manuscript.

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