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## *Benincasa hispida*, an Ailment Bliss: A Review

			
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### ABSTRACT

*B. hispida* is traditionally cultivated in households of the South East regions. It has found its importance in the healing of the Liver, skin, Stomach etc. It has different regional vernacular names all around the globe. Every viable part of the plant is abundant in useful chemical constituents but has an overall high phenolic content. In general, Ash gourd or the kundur fruit is extensively used for its anti-inflammatory and antioxidant properties. It can also be used as an ingredient for a Calorie-deficit diet since it has very low nutritional caloric values.



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## INTRODUCTION:

The ash gourd plant is a perennial trailing vine. It belongs to the Cucurbitaceae family and is known by the scientific name *Benincasa hispida* (Thunb.). It has a distinctive fruit that resembles a melon and is frequently consumed for its therapeutic and practical benefits. In South East Asia, including India, Japan, China, Myanmar, Malaysia, China, Indonesia, and Taiwan, ash gourd plants are grown in warm, humid tropical regions.

Since ancient times, this green vegetable has been valued for its great medicinal properties, which are well-documented in Ayurvedic writings. Today, it is still praised for its enormous health advantages and is frequently used to treat ailments of the stomach, liver, and skin, to mention a few. It is also commonly used in popular local cuisine throughout India.

## Vernacular Names:

<i>B. hispida</i>
Chalkumra
Kundur Fruit
Ash Pumpkin
Tallow Gourd
Winter Melon
Ash Gourd
Winter Gourd
Wax Gourd

## Plant Profile:

<b>Kingdom</b>	Plantae
<b>Division</b>	Angiosperms
<b>Phylum</b>	Tracheophytes
<b>Class</b>	Magnoliopsida
<b>Order</b>	Cucurbitales
<b>Family</b>	Cucurbitaceae
<b>Subfamily</b>	Cucurbitoideae
<b>Tribe</b>	Benincaseae
<b>Genus</b>	<i>Benincasa</i>
<b>Species</b>	<i>B. hispida</i>

### Chemical Constituents:

The fruit, pectic polysaccharides, hemicellulose polysaccharides, terpenes and terpenoids, flavonoid C-glycosides, sterols, proteins, phenols, alkaloids, glycosides, tannins, saponins, hydroxybenzoic acids, flavonols, hydrocinnamic acids, and triterpenes are all present in the leaf.

Proteins, carbohydrates, phenolic compounds, amino acids, flavonoids, sterols, glycosides, alkaloids, fixed oils and fats, flavonoids, sterols, steroids, and unsaturated fatty acids are all present in the seeds. Alkaloids, saponins, steroids, sugars, flavonoids, tannins, carotenoids, oxalates, and phytate are all present in the peel.

The root has proteins in it. The fruit contains a variety of volatile chemicals, such as (E,E)-2,4-nonadienal, (E)-2-hexenal, n-hexanal, n-hexyl formate, (E,E)-2,4-heptadienal, (Z)-3-hexenal, (E)-2-heptenal, 1-octen-3-ol [30], 2,5-dimethylpyrazine.

*B. hispida* has a lot of phenolic substances. It also contains isomultiflorenyl acetate, isovitexin, 1-sinapoylglucose, multiflorenol, 5-gluten-3-ylacetate, alnusenol, and benzylalcohol-O-1-arabinopyranosyl-(1-6)-d-glucopyranoside as additional bioactive substances.

### Medicinal Use:

Following are the beneficial uses of Ash gourd's juice:

1. Ash gourd possesses anti-inflammatory and antioxidant characteristics that aid in the body's excretion of fat and bile, which, in turn, aids in the treatment of liver problems.
2. Promotes heart health: Ash gourd juice's high fibre content aids in lowering blood levels of harmful cholesterol and preventing cardiovascular disorders.
3. Ash gourd juice has a number of bioactive and medicinal components, including sterols, glycosides, and phenolics, which are helpful in treating epilepsy and other nerve illnesses. This juice also aids in the treatment of epilepsy.
4. Muscle-relaxing characteristics can be found in the pulp of the ash gourd fruit, which also contains antioxidant capabilities. As a result, ash gourd juice can be used to alleviate anxiety and sleeplessness.

5. Helps in fighting the common cold, pneumonia:- According to research, the ash gourd comprises various phytochemicals like carotenoids and peptides. They serve as antibiotics and help in treating infections like the common cold, flu, and pneumonia.
6. Hemorrhage is treated and helps in wound healing: The ability of ash gourd juice to alleviate internal bleeding and promote wound healing is another advantage to health. According to studies, the juice from ash gourd leaves soothes bruises.
7. Aids in kidney detoxification: Ash gourd juice has cleansing characteristics that are helpful in treating urinary tract infections and kidney detoxification. According to a study done on albino rats, ash gourds can lessen renal impairment or damage. Kidney stones are also avoided because to it.
8. Aids in the treatment of respiratory illnesses: Ash gourd is also helpful in the treatment of respiratory illnesses like bronchitis, asthma, and cough. The juice of the ash gourd aids in clearing mucus from the respiratory tract and eases breathing difficulties.
9. Traditional medicine has utilised *B. hispida* to treat intestinal worms, neurological disorders, renal illness, fever, and coughs with thick mucus. *Benincasa hispida*'s primary bioactive ingredients include cytotoxic, anti-inflammatory, and anticancer effects.

**Nutritional Value: Amount per 100 grams**

**Calories 13**

	<b>% Daily value</b>
<b>Total Fat 0.2g</b>	0
<b>Saturated Fat 0g</b>	0
<b>Total Cholesterol 0mg</b>	0
<b>Sodium 111mg</b>	4
<b>Potassium 6mg</b>	0
<b>Total Carbohydrate 3g</b>	1
<b>Dietary Fibre 2.9g</b>	11
<b>Protein 0.4g</b>	0
<b>Vitamin C</b>	1
<b>Iron</b>	2
<b>Calcium</b>	1
<b>Vitamin D</b>	0
<b>Vitamin B6</b>	0
<b>Cobalmin</b>	0
<b>Magnesium</b>	2

### **Traditional Use:**

Since ash gourds are low in calories, high in fibre, and high in water, they may aid in bettering digestion and fostering a healthy body weight. Additionally, ash gourd has a notably low carbohydrate content, making it excellent for those on low carb diets.

For its digestive, diuretic, and aphrodisiac qualities, this fruit is frequently commended. Additionally, it's said to provide health advantages including improved mental clarity, more energy, easier digestion, and a decreased risk of illness.

Traditionally, according to the Ayurvedic and Chinese medicines, Ash gourd or Winter melon was used in ailment of some common diseases such as Ulcers; reducing inflammation, Type 2 diabetes mellitus, antimicrobial effects etc.

Typically, the fruit is diced, cooked, and eaten on its own or as an ingredient in soups and stews. It may also be peeled and added to salads, roasted, fried, candied, or just eaten raw in a manner similar to how you would consume sliced cucumbers.

Additionally, ash gourd may be used to produce petha, a sweet Indian treat, as well as candies, jam, ketchup, cakes, and ice cream. Juices and smoothies frequently contain it as an ingredient.

### **Pharmacological Importance:**

#### **1. Antioxidant Effects**

The effects of the methanolic seed extract on hydrogen peroxide radicals and 2,2-diphenyl-1-picrylhydrazyl (DPPH) were concentration-dependent (25-200 g/mL). Another study found that the ethanolic seed extract outperforms the ethyl acetate and n-hexane extracts in terms of DPPH and 2,2'-azino-bis(3-ethylbenzothiazoline-6-sulfonic acid (ABTS) radical scavenging as well as total phenolic content (TPC). The seed oil's potential to scavenge DPPH and ABTS radicals was also notable (0.1 mg/mL). The TPC in seed oil was also established by this investigation. Reactive oxygen species (ROS) were decreased in human umbilical vein endothelial cells (HUVECs) by the aqueous extract of this plant. With an EC<sub>50</sub> value of 0.98 mg/mL, fruit extract polysaccharides demonstrated DPPH free radical scavenging activity. The seed oil demonstrated the ability to scavenge DPPH and ABTS radicals. At the same quantity (0.1 mg/mL), the antioxidant activity was, however, less potent than that of catechin and BHT. Fruit extracts in petroleum ether and methanol raised the levels of catalase (CAT)

in stomach ulcer-prone mice. This herb's extracted hispidalin also exhibited DPPH radical scavenging and lipid peroxidation capability suppression. The aqueous fruit extract considerably raised the levels of vitamin C content and antioxidant status in rats' gastric juice.

## 2. Anti-Inflammatory Effect

On a rat model of carrageenan-induced paw oedema (n = 6), the methanolic seed extract (100-300 mg/kg, p.o.) demonstrated dose-dependent anti-inflammatory properties. Rats with egg albumin-induced inflammation responded favourably to the fruit peel methanolic extract's anti-inflammatory properties. Rats' cotton pellet-induced granuloma models, carrageenan-induced paw oedema, and histamine-induced paw oedema all responded well to the petroleum ether and methanolic fruit extract of *B. hispida* (300 mg/kg, p.o.).

## 3. Antimicrobial, Antihelmintic, and Larvicidal Effects

It was discovered that the 500 g/disc methanolic whole plant extract has antibacterial effects against *Vibrio parahaemolyticus* and *Pseudomonas aeruginosa*. The zone of inhibition in the latter instance was barely 6 mm wide. *Escherichia coli*, *Pseudomonas aeruginosa*, *Staphylococcus aureus*, and *Salmonella enterica* are just a few of the bacteria and fungi that hispidalin, an isolated compound from this herb, has been found to act against. Other bacteria and fungi that it has been found to act against include *Aspergillus flavus*, *Penicillium chrysogenum*, *Fusarium Solani*, and the minimum inhibitory concentrations (MIC) for the bacterial and fungal strains in this instance were 30-120 and 100-200 g/mL, respectively. Additionally, the methanol extract of seeds was the most equivalent to the antibiotic ciprofloxacin, with the aqueous, methanol, and petroleum extracts also demonstrating notable therapeutic activity. The aqueous peel extract shown significant antibacterial activity against *S. aureus* in another investigation (MIC = 14.5 g/mL), In a different experiment, the aqueous peel extract shown significant antibacterial action against *S. aureus* (14.5 g/mL MIC), *Micrococcus luteus* (8.6 g/mL MIC), *E. coli* (6.1 g/mL MIC), and *Klebsiella pneumoniae* (13.4 g/mL MIC).

## 4. Cytotoxic and Anti-cancer effects:

*Artemia salina* was subjected to a concentration-dependent cytotoxic impact from the fruit, seed, and root proteins (10–1000 g/mL). Fruit, seed, and root extract had median lethal concentrations (LC50) of 44, 41, and 50 g/mL, respectively. The root proteins in this study reduced HeLa and K-562 cell growth by 28.50 and 36.60%, respectively. According to a

different investigation, *A. salina* was cytotoxic to the whole plant methanolic extract (5-50 g/mL; LC50: 45.187 g/mL). Furthermore, HUVECs and regular fibroblast (NIH/3T3) cells did not experience any harmful effects from the aqueous seed extract (20-800 g/mL). The extract had a strong inhibitory impact on angiogenesis produced by basic fibroblast growth factor (bFGF) in male C57BL/6 mice. Additionally, the aqueous extract (1–20 g/mL) decreased cell adhesion. High glucose (25 mM)-induced HUVECs cells are activated by molecules by preventing monocyte adhesion, reactive oxygen species (ROS), and nuclear factor kappa-light-chain-enhancer of activated B cells (NF- $\kappa$ B).

#### **5. Anti-diabetic effect:**

In alloxan-induced diabetic rats, the methanolic stem extract (50, 100, 200 mg/kg, p.o.) dose-dependently reduced blood glucose levels. After 14 days of therapy, the derangements in lipid metabolism in alloxan-induced diabetic albino rats were significantly improved by the chloroform fruit extract (250 and 500 mg/kg, p.o.). According to the study, peel extracts in methanol, ethanol, and aqueous form significantly inhibited the activity of the enzyme - amylase. The diabetic mice's blood glucose levels were reduced by ethanol and ethyl ethanoate leaf extracts in a dose-dependent manner.

#### **6. Anti-obesity and Lipid-lowering agents:**

Fruit extract in methanol (0.2-1 g/kg, i.p.) decreased food intake in rats, indicating anorectic action. By inhibiting leptin gene expression, PPAR, and CCAAT enhancer-binding protein alpha (C/EBP), hexane fraction from the aqueous fruit extract prevented adipocyte differentiation. This led to a decrease in lipid accumulation and an increase in the release of glycerol and intracellular triglycerides in 3T3-L1 cells.

#### **7. Resulting Impacts on Alzheimer's Disease:**

A 400 mg/kg (p.o.) dosage of the fruit extract prevented the development of Alzheimer's disease in rats that had been exposed to colchicine. This benefit may be attributed to the presence of vitamin E and beta-carotene, which protect rat neurons from oxidative stress. On the other hand, in the colchicine-induced Alzheimer's rat model, the aqueous fruit pulp extract (100-450 mg/kg, p.o.) dose-dependently enhanced SOD, CAT, and GSH levels while decreasing LPO levels.

## 8. Analgesic and Antipyretic Results:

A dose-dependent analgesic effect was demonstrated by the methanolic fruit extract in a hot plate model and acetic acid-induced writhing in mice (200, 400, and 600 mg/kg, p.o.). Rats responded to the ethanolic seed extract's dose-dependent analgesic effects at 250 and 500 mg/kg, p.o. Additionally, the fruit peel methanolic extract decreased mice's writhing, pain licking, and hot plate pain in a dose-dependent manner (0.25-1.5 g/kg).

### Toxicological Profile:

The total white blood cells (WBC), red blood cells (RBC), haemoglobin (HB), mean corpuscular haemoglobin (MCH), hematocrit (HCT), mean corpuscular volume (MCV), sugar, and urea levels in rats and mice were unaffected by the fresh juice (5% v/v) administration for three months. Animals utilised in experiments exhibited no behavioural changes as a result of the medication. In dosages up to 3.0 g/kg, the methanolic extract of fruit was not poisonous and did not kill mice, rats, or guinea pigs. Other research with female and male rats found that an oral administration of a standardised hydroalcoholic (70% ethanol) extract of *B. hispida* fruit pulp was generally safe. In the 90-day toxicity trial, the extract showed no detectable side effects up to an oral dosage level (1000 mg/kg body weight/day). Rats did not experience any toxicity from the ethanolic seed extract up to 5000 mg/kg (p.o.). A common plasticizer that is detrimental to human health is di-2-ethylhexyl phthalate (18.3-75.5 mg/kg), which was isolated from the fruit of this plant.

### CONCLUSION:

Ash gourd is low in calories, fat, carbs, and protein. However, it has a lot of fibre and antioxidants, which are thought to support health and shield the body from disease. Due to its high water, high fibre, low calorie, and low carbohydrate content, ash gourds may help you maintain a healthy weight and support digestive health. It is employed in many different ways in the pharmaceutical sector. It has anti-inflammatory, analgesic, anticancer, and antioxidant properties, among others. The fruit has been prized for its numerous therapeutic purposes and significant health benefits since ancient times. The fruits are additionally used in Ayurveda to treat epilepsy, lung conditions, asthma, coughing, and urine retention. The current paper analysed the most recent in vivo and in vitro pharmacological studies that revealed the molecular pathways that supported the ethnopharmacological uses, starting with these historical usages. Although experimental toxicological studies in animals have not revealed any negative effects, there have been no human clinical trials to show off



pharmacological characteristics or to methodically evaluate toxicity and safety in humans. These investigations are crucial for assessing both clinical therapeutic efficacy and short- and long-term toxicity.

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