JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

NUTRITIONAL SIGNIFICANCE AND PHARMACOLOGICAL IMPORTANCE OF BENINCASA HISPIDA

Prof. Puja Vyawhare[1], Miss Neha Tare[2], Mr. Milind Thombare[3], Dr. Rupali Tasgaonkar[4].

Professor in pharmaceutics, Yadavrao Tasgaonkar institute of pharmacy, University of Mumbai, Mumbai.

Bachelor of Pharmacy, Department of Pharmacy, Yadavrao Tasgaonkar institute of pharmacy, University of Mumbai, Mumbai.

Principal and professor in Pharmaceutics, Yadavrao Tasgaonkar institute of pharmacy, University of Mumbai, Mumbai.

ABSTARCT: -

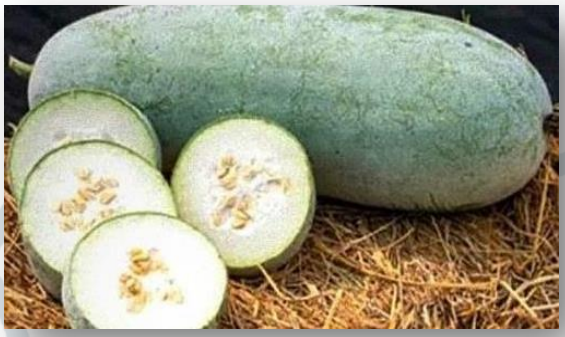
Ash gourd, scientifically known as "Benincasa hispida," also called B. cerifera, is a member of the Cucurbitaceae family and is sometimes referred to as wax gourd. The origins of B. hispida are attributed to Java and Japan, although it was extensively grown in warm climates. It is one of the most well-known crops, grown mostly for its fruits, and is well-known, especially in Asia, for its nutritional and medicinal qualities. It's a well-known vegetable example that has been utilized in both medicine and nutrition. Phytochemical analysis reveals that the main components of B. hispida fruits include volatile oils, flavonoids, saccharides, glycosides, vitamin, proteins, B-sitosterin, minerals, carotenes, and uronic acid. Pharmacological studies have revealed that this plant possesses a variety of pharmacological activities, including effects on the central nervous system (such as anxiolytic, antidepressant, and muscle relaxant), antioxidant, antiasthmatic, diuretic, anti-inflammatory, hypolipidemic, antidiabetic, nephroprotective, and antimicrobial properties. In this review, the pharmacological effects and chemical components of B. hispida were highlighted. This paper addresses the medical and therapeutic uses of this versatile fruit as one of the possible sources of bioactives for functional foods, as well as its cultivation, nutritional and chemical composition, and other related topics.

Key words: Cucurbitaece, wax gourd, phytochemical.

INTRODUCTION: -

Ash gourd known by other names like winter melon or, wax gourd (Benincasa hispid) is one of the most valuable plants in the Cucurbitaceae family. Wax gourd fruits are prized for their high-water content and potential health benefits and beneficial phytochemicals (such as vitamins, carbohydrates, organic acids, and amino acids). Numerous research revealed the medicinal properties of wax gourd, including its antiviral, antihypertensive, antioxidant, and anti-obesity properties anti-inflammatory and anticancer properties. The fruit of the wax gourd stores a significant quantity of biomass in a brief growth cycle, along with modifications to the metabolism and production of carbohydrates (sugars and organic acid). Fruit's organoleptic quality and consumer acceptability are also significantly and directly impacted by sugars and organic acids. The source of sweetness in Cucurbitaceae fruits is soluble sugars, which are primarily made up of the disaccharide sucrose and its two hydrolysis products, the hexoses, such as glucose and fructose. Various sugar components produce varying levels of sweetness. Most wax gourd cultivars produce enormous fruits that typically weigh more than 20 kg or even up to 50 kg in certain circumstances. Therefore, the primary form of carbohydrates in Wax gourds are intriguing, so this study will concentrate on the kinds and amounts of sugar, acid, and citrulline as well as the associated genes. Numerous studies have previously reported on the biosynthesis, degradation, and developmental regulation of the genes/enzymes in some cases of sugar, organic acid, and citrulline. Cucurbitaceae family members, but there isn't enough information available on the sugar, organic acid, and citrulline metabolites in wax gourds. These days, the excellent draft genome sequence of the wax gourd and the genomic data databases [Cucurbit Genomics Database (CuGenDB)] would probably offer a genetic information basis for investigating the nutrition and flavour metabolism product. In addition to its flavour and culinary versatility, ash gourd is a vegetable that is consumed throughout the world and has strong anti-inflammatory and antioxidant properties Value of ash gourd nutrition Ash gourds have a total of 13 calories per 100 grams. Their nutritional value is further broken down into the following categories: protein (less than 1 gram), carbohydrates (three grams), fiber (less than 1 gram), vitamin C (14% of daily value), riboflavin (8% of daily value), and zinc (6% of daily value). Ash gourd's many health benefits include aiding in digestion due to its high-

water content. It has an elevated soluble fiber content and boosts immunity and energy. Ash gourds are high in micronutrients, vitamins, and minerals, and contain 92% edible water weight. They are also high in moisture and low in fat. Additionally, B. hispida is used to treat various psychological conditions, laxatives, and tonics. Ash gourds are grown in very easy conditions, with 3-5 plants per pit and 1-2 cm of soil depth. It grows more slowly than pumpkin does. Fruit extracted from B. hispida significantly aids in the healing process of rat ulcers. Fruits with substantial amounts of triterpenoids, vitamins, saccharides, carotenes, flavonoids, glycosides, and uronic acid are indicative of phytochemical screening of different fruit extracts. Antioxidant-rich substances taken from the fruit of the ash gourd are also a natural ulcer remedy. Terpenes, flavonoids, and other antioxidants are abundant in it. Furthermore, B. hispida exhibits excellent results in Alzheimer's disease. It induces colchicine in rats flawlessly. Rats with diabetes are helped by the hypoglycaemic effect of the water extract from B. hispid stems. Including the pulp and peel, nearly 96% of the edible portion of ash gourd juice is composed of total soluble solids. 12 g of protein, 2.9 g of fiber, 3.96 g of carbohydrates, and 0.6 mg of zinc are included in 100 g of ash gourd. There is certainly no fat in the ash gourd's juice.



NUTRITIONAL VALUES -

Winter melon is extremely low in calories, carbs, and fats and mostly composed of water (approximate 90%). Vitamin C and the vitamin B complex, especially niacin (vitamin B3), thiamine (vitamin B1), and riboflavin (vitamin B2), are included in it. Moreover, other macro and microminerals like iron, manganese, sodium, potassium, zinc, calcium, magnesium, iodine, and sodium are still abundant in it.

An excellent source of dietary fibre, ash gourds have a high-water content of about 96%. Ash gourd dietary fibres have superior prebiotic activity. Ash gourds are low in calories, carbs, proteins, and fats, but they are high in vitamin C, flavonoids, and carotenoids. The antioxidant qualities of the fruit's ingredients may be responsible for the ash gourd's effectiveness in preventing cell damage, type 2 diabetes, and cardiac disease. The therapeutic compounds phenolics, glycosides, and steroids found in ash gourd have important functional properties and can be used to treat neurological disorders, ulcers, and epilepsy. Ash gourd's antacid properties help the body's pH stay stable and balance out the acidity that comes from certain meals. Moreover, the distinct nutritional components promise to facilitate weight loss and improve digestive health.

MACRO NUTRIENTS	VITAMIN	MINERAL
Total fat-3.9g	Vit.A-9.8%	Calcium-5.1%
Saturated fat-0.5g	Vit.B6-11.33%	Magnesium-6.7%
Total carbohydrate-12.5g	Vit.B3-0.5%	Phosphorus-5%
Dietary fibre-0.6g	Vit.C-30.5%	Zinc-7.2%
Protein-2g	Vit.E-1.1%	Iron-5.75
Cholesterol-0.0mg		Manganese-12.5%
Sodium-33mg		Iodine-5.9%

PLANT DESCRIPTION: -

Benincasa hispida is a large trailing gourd that climbs using tendrils. Its stem is thick, sharp, and has a hispid taste. With 5-7 lobes and a length of 4-6 inches, the leaves are reniform-orbicular in form. The lobes that are hairy have an ovate-triangular shape. Male peduncles are 7.5–10 cm long, while female peduncles are shorter. Flowers are yellow and unisexual. The fruits are broadly cylindrical, have a length of 30-45 cm, are hairy all over, and are finally covered in a waxy bloom. The fruit's waxy bloom vanished once it reached maturity.
Fruiting & Blooming: June through October. After sowing, harvesting of the mature fruits begins 90–100 days later and can last up to 150 days.
Part used: Leaves, seeds, seed oil, fruit.

Synonyms: Kushmanda, Pushpaphala, Pitaphushpa, Karkaru, Aaru

Vernacular Name:

Hindi: kumhra, Petha

Kannada: Bood Kumbala Kayi

Malayalam: Elavan, Kumbalam,

Marathi: Kohla

Punjab: Petha

Sanskrit: Kushmanda

Tamil: kalyana pooshni, Pushanikai

Telugu: Budida-gummadi

Properties and action: -

According to Charakacharya, mature fruit known as Pakva Kushmanda (Laghu) has the qualities of Madhura rasa, alkalinity, lightness of digestion, laxative and diuretic action, and Tridosahara property. In addition to outlining the characteristics of Kusmanda beeja tailam, Susruta acharya also describes the characteristics of Pakwa kushmanda (mature fruit) and Balam (immature fruit). The immature fruit is said by Susruta Samhita to have nootropic, kapha-inducing, and Pitta-alleviating qualities. Mature fruits are said to have the following benefits: they ease Tridosa, boost digestive fire (Deepanam), act as a diuretic (Vasti shodanam), act as an appetiser (Hrdyam), and help with psychiatric disorders (Chetoroga haram). It is also referred to be a health food of the highest caliber, or Pathya ahara. The seed oil of Kushmanda, as per Acharya Susrutha, has a cold potency (Seetha veerya), a sweet taste (Madhura rasa), and an aftertaste (Madhura vipaka). The seed oil acts as a laxative-diuretic (Srit vit-mutra), pacifies Pitta and Vata dosas, and may impede Srotas (Abhishyandi) and decrease digestive fire (Agni Saada).

Immunomodulator effect: -

Human immune systems function as defense mechanisms to keep the body safe by removing different pathogens (antigens) from the environment, including bacteria, viruses, fungi, and hazardous substances. They also prevent diseases and inflammation brought by these pathogens from occurring. It is essential to the body's ability to maintain homeostasis. An overreaction to antigen stimulation can cause hypersensitivity reactions; acquired immunodeficiency can result from immune system defects brought on by innate or acquired factors; and autoimmune reactions can happen when the body's immune system is unable to distinguish between foreign and self-antigens. These are just a few of the result of immune imbalance. As a result, immune system dysfunction can make the body more vulnerable to illnesses like cancer and infections. On the other hand, hypersensitivity reactions like allergies and arthritis and autoimmune diseases are brought on by an overactive immune system. The interplay of different immune cells, including phagocytes, neutrophils, and monocytes, maintains the immune system. Macrophages consume foreign antigens, release cytokines that promote inflammation to increase their phagocytic activity and stimulate natural killer (NK) and dendritic cells, which are innate immune cells.

EFFECT ON CENTRAL NERVOUS SYSTEM BY B. *hispida*:

Tests were conducted on mice with elevated plus maze and spontaneous motor activity to determine the anxiolytic effect of alcohol extracted from B. hispida. The methanolic extract of B. hispida has potent anti-compulsive properties. It contributes to increased serotonin activity. Ash gourd (B. hispida) anticonvulsant properties are observed using the Maximal Electroshock Test (MEST) ks technique. owing to the methanolic extract found in B. hispida fruit. It displays immediate motor activity without any muscle atrophy. In addition to using traditional antidepressants such as fluoxetine (20 mg/kg), imipramine (20 mg/kg), and phenelzine (20 mg/kg), the antidepressant activity was assessed on Swiss albino mice for a continuous period of 14 days. By inhibiting MAO-A, methanolic extract demonstrates its activity and interacts with the GABAA, dopamine, serotonin, and adrenergic systems. Ash gourd juice exhibits a significant response to morphine withdrawal symptoms. Consequently, it aids in the prevention of morphine addiction and its suppression in comparison to other drugs and addictive substances like opioids.

Effects over kidneys and Renal Functioning:

At an average daily dose of 100 mg/kg, B. hispida fruit extract significantly lowers potassium excretion in rats while also exhibiting diuretic activity that increases urine volume, sodium volume, and chloride volume. Histopathological observations showed that the degenerative changes brought on by paracetamol could be reversed by treatment with a hydro-alcoholic whole fruit extract of B. hispida. Additionally, it aids in the rat model of mercury poisoning's nephroprotective activity production.

Phytochemistry of ash gourd:

Ash gourd's bio accessibility and bioavailability are influenced by phenolic and flavonoid compounds. Plant-based foods contain a variety of phenolic compounds that have a wide range of chemical and structural acetone, ethanol, methanol, and ethyl acetate in aqueous mixtures for the purpose of extraction, isolation, and identification. Ash gourd's high dietary fibre and lipid content interacts with sugar to increase the bio

accessibility of polyphenols linked to dietary fiber. Ash gourd dietary fiber has strong probiotic properties. Epilepsy, ulcers, and other neurological disorders can be treated with ash gourd's bioactive and therapeutic compounds, phenolics, sterols, and glycosides. These compounds are highly functional. Ash gourd's antacid properties compensate for some foods' acidic effects and aid in preserving the pH of

Volatile composition of ash gourd:

Ash gourd contains three main volatiles: n-hexanal, n-hexyl formate, and (E)-2-hexenal. The (E)-2-hexenal smells strongly of green fruit and vegetables. Ash gourds contain the following compounds: 2 S-dimethylpyrazine, 2, 6-dimethylpyrazine, 2, 3, Strimethyl-pyrazine, 2-methylpyrazine, and 2-ethyl-S-methylpyrazine. Pyrazine is a volatile substance that gives drinks their flavor. During the juice extraction process for value-added products, the Millard reaction releases the flavors. Pyrazines contribute to the distinct flavors and scents that come with cooking. It has been possible to isolate naturally occurring pyrazines from food systems without heat treatment to stop flavor deterioration. The volatile compounds 1-octen-3-ol, (Z)-3-hexenal, and (E)-2-heptenal are also found in ash gourds at low concentrations and aid in the preservation of beverage flavor.

Food use:

Ash gourd can be eaten raw, much like cucumber slices, but it's usually best boiled either by itself or with meat. It can be added to beverages, cakes, ice cream, jam, and ketchup as a value-added product. Peeled and immature fruit that has been stripped of its seeds and fiber is used to make highly spiced stir-fries, braises, and steams.

Medicinal and industrial use:

Ash gourds contain all the necessary nutrients needed to stay healthy. The pulp, flowers, seeds, and leaves are all medicinal. The high level of total dietary fiber is linked to a reduction in blood cholesterol, the risk of coronary heart disease and bowel disorders. Ash gourd is a good source for people with diabetes and hypertension who need to follow low-sugar diets because of its low carbohydrate content. The vitamins aid in the treatment of migraines, pneumonia, the flu, and the common cold. When the peel is extracted and separated from its wax, it can be used as a substitute for primary packaging material and as a substrate for the growth of different microorganisms that are used to produce industrially significant products through fermentation. The leaves have been utilized in traditional medicine to treat epilepsy, other nervous disorders, haemorrhages from internal organs, wound healing, and peptic ulcers. As an antidiabetic, hypolipidemic, hypoglycemic, and antioxidant, ash gourd is therapeutic.

OTHER RESEARCH UPDATE: -

Antioxidant property: Research conducted in vivo and in vitro revealed that ash gourd fruit extract and juice have antioxidant activity, particularly in the human liver and mind. Furthermore, research indicates that ash gourd fruit may lessen renal damage in albino rat models following ischemia or reperfusion injury to the kidney.
Anti-inflammatory activity: The potential role of ash gourd seed's free radical scavenging activity in the reduction of inflammation in Rats with paw edema caused by carrageenan.
According to a study, testosterone-induced hyperplasia of the prostate in an experimental rat model was inhibited by petroleum ether extract and Benincasa hispida seed oil. The Benincasa hispida seed extract has been shown to have anti-angiogenic properties because it prevents the growth of endothelial cells stimulated by bFGF.
Hypoglycaemic and hypolipidemic: Rats treated with ash gourd extract had 60% lower levels of blood glucose, plasma TGs, and free fatty acids.
After 45 days, the alcoholic extract of ash gourd at 200 mgkg−1body weight decreased blood glucose levels in alloxan-induced diabetic rats (from 195 to 118 mgdL−1) compared to normal rats.

Antidiabetic action: Majumdar et al.'s clinical assessment of Ash gourd fruit juice over the course of 21 days in patients with Type 2 Diabetes revealed a 42% decrease in blood glucose levels.

Conclusion:
This study provided insight into the nutritional makeup and flavor of wax gourds as well as the ways in which these substances accumulate during fruit development. Ash gourd is a valuable plant because of its high nutritional content, health benefits, and nutrient composition. Ash gourd is extremely necessary in the formulation of products with significant food and pharmaceutical value due to its multifunctionality. This will necessitate creating novel applications for ash gourd in industrial, medicinal, and food formulations.

Reference:
1. Al-Snafi, A.E. 2013. The pharmacological importance of Benincasa hispida. Int. J. Pharm. Sci.
Res. 4(12):165–170.
2. Battu, G.R., S.N. Mamidipalli, R. Parimi, R.K. Viriyala, L. Patchula, and R. Mood. 2007.
3. Bello, M.O., G. Owoeye, A.M. Hammed, and T.A. Yekeen. 2014. Characterization of gourd fruits (Cucurbitaceae) for dietary values and anti-nutrient constituents. Res. J. Pharm. Biol.
Chem. Sci. 5(4):416–424.
4. Bhalodia, Y., N. Kanzariya, R. Patel, N. Patel, J. Vaghasiya, N. Jivani, and H. Raval. 2009.
5. Renoprotective activity of Benincasa cerifera fruit extract on ischemia/reperfusion-induced
renal damage in rat. Iran. J. Kidney Dis. 3(2):80–85.

6. Bimakar, M., R.A. Rahman, F.S. Taip, N.M. Adzahan, Z.I. Sarker Md., and A. Ganjloo. 2012.
7. Optimization of ultrasound-assisted extraction of crude oil from winter melon (Benincasa hispida) seed using response surface methodology and evaluation of its antioxidant activity, total phenolic content and fatty acid composition. J. Mol. 17:11748–11762. doi: 10.3390/molecules171011748.
8. Chen, P., J. Bornhorst, and M. Aschner. 2018. Manganese metabolism in humans. Front. Biosci. (Landmark Edition) 1(23):1655–1679. doi: 10.2741/4665.
Chistiakov, D. A., Orekhov, A. N., & Bobryshev, Y. V. (2016)
9. Alhazmi, H. A., Najmi, A., Javed, S. A., Sultana, S., Al Bratty, M., Makeen, H. A., … Khalid, A. (2021). Medicinal plants and isolated molecules demonstrating immunomodulation activity as potential alternative therapies for viral diseases including COVID-19. *Frontiers in Immunology, 12*, Article 637553.10. Kulkarni, R., Girish, K. J., & Kumar, A. (2012). Nootropic herbs (Medhya Rasayana) in Ayurveda: An update. Pharmacognosy reviews, 6(12), 147–153. https://doi.org/10.4103/0973-7847.99949

11.Chandre, R., Upadhyay, B. N., & Murthy, K. H. (2011). Clinical evaluation of Kushmanda Ghrita in the management of depressive illness. Ayu, 32(2), 230–233. https://doi.org/10.4103/0974-8520.92592
12. Vijitha Vijayan. A review of Kushmanda (Benincasa hispida) with special reference to Visha Chikitsa. The Pharma Innovation Journal. 2018. Available at https://www.thepharmajournal.com/archives/2018/vol7issue12/PartE/7-11-96-168.pdf
13. Benincasa hispida (Thunb.) Cogn. India Biodiversity Portal. Available at https:// indiabiodiversity.org/species/show/244546
14.Majumdar A. Evaluation of Anti-nephrolithic & Diuretic Activity of Seeds of Benincasa hispida R.Br. Inventi Rapid: Planta Activa Vol. 2012, Issue 3 Available at
https://www.researchgate.net/ publication/315117711
15.Lee KH, Choi HR, Kim CH. Anti-angiogenic effect of the seed extract of Benincasa hispida Cogniaux. J Ethnopharmacol. 2005 Mar 21; 97(3): 509-13. doi: 10.1016/j.jep.2004.12.008. PMID: 15740888.