

How to Cite:

Pahari, N., Mahanti, B., Banerjee, M., Mandal, K., Bhowmick, B., & Roy, A. (2022). A concise review on Benincasa hispida (Thunb.) Cogn. Plant. *International Journal of Health Sciences*, 6(S6), 844–853. <https://doi.org/10.53730/ijhs.v6nS6.9704>

A concise review on Benincasa hispida (Thunb.) Cogn. Plant

Nilanjan Pahari*

School of Pharmacy, Techno India University, Salt Lake, Kolkata, 700091 | Dept. of Pharmacology, Calcutta Institute of Pharmaceutical Technology and Allied Health Sciences, Uluberia, Howrah. 711316

Beduin Mahanti

School of Pharmacy, Techno India University, Salt Lake, Kolkata, 700091

Mrityunjay Banerjee

Dept. of Pharmaceutical chemistry, Institute of Pharmacy and Technology, Salipur, Cuttack, Odisha

Koyel Mandal

Dept. of Pharmacology, Calcutta Institute of Pharmaceutical Technology and Allied Health Sciences, Uluberia, Howrah. 711316

Biprojit Bhowmick

Dept. of Pharmacology, Calcutta Institute of Pharmaceutical Technology and Allied Health Sciences, Uluberia, Howrah. 711316

Arpan Roy

Dept. of Pharmacology, Calcutta Institute of Pharmaceutical Technology and Allied Health Sciences, Uluberia, Howrah. 711316

Abstract--Benincasa hispida (Thunb.) Cogn. which belongs to Cucurbitaceae family, is annual climbing plant, fruits are commonly called as winter melon or ash melon. It is a popular vegetable crop, which is especially available among Asian communities both for nutritional and medicinal purposes. It was probably native in both Japan and Java, cultivated more or less throughout the India and also in warm countries. It has been used as a medicinal plant by Ayurvedic treatment and Sri Lankan traditional physicians since antiquity. It is used singly or in various formulations in the combination with different types of medicaments in Ayurveda and traditional medicine both. The fruits, pericarp, seeds, stems, roots and leaves of this plant are used in various types of preparations like vegetable, and in pickles, curries and preserves. It is used in the internal treatment for the urinary disorders such as calculi, dysuria, pain in pelvis and

genitals, disorders like gastritis, gastric ulcers, worm infestation, hyperdipsea, anaemia, jaundice, diabetes mellitus, piles, fever, internal haemorrhages, hemoptysis, general debility, epilepsy, cough, hoarseness, all kinds of the asthma, bronchitis, tuberculosis, ulceration of the lungs, heart diseases, testosterone-induced prostatic hypertrophy and especially in the vitiated condition of the Pitta Dosha. Externally, it is showed such a anti-inflammatory, anti-asthmatic and antimicrobial effects. Rejuvenate, antioxidant, anti-ageing, nutritive, tonic, diuretic, aphrodisiac, nephron protective, styptic, vermin fugue, antidiabetic, hyperlipidemic, anxiolytic, muscle relaxant property, antidepressant and antimicrobial in the properties of *Benincasa hispida* are significant and scientifically proven. It is concluded that *Benincasa hispida* is with the multi-faceted medicinal values. Fruits were traditionally used as a laxative, diuretic, tonic, aphrodisiac, cardiogenic, urinary calculi, blood disease, insanity, epilepsy, schizophrenia and other psychologic disorders, jaundice, dyspepsia, fever, and menstrual disorders etc. The major chemical constituents of *Benincasa hispida* fruits are likes volatile oils, flavonoids, glycosides, saccharides, proteins, carotenes, vitamins, minerals, β -sitosterin and uronic acid. *Benincasa hispida* has been reported with the active principles such as terpenes, flavanoid, cardio glycosides and sterols which have antioxidant effects.

Keywords---*benincasa hispida*, phytoconstituents, taxonomy, therapeutic uses, cultivation.

Introduction

Benincasa hispida (Thunb.) Cogn. which belongs to Cucurbitaceae family, is annual climbing plant, fruits are commonly called as winter melon, ash gourd, winter gourd, white pumpkin and wax gourd, white gourd, tallow gourd, gourd melon and Chinese watermelon. It was probably occurring in Japan and Java, cultivated more or less throughout India and in the warm countries. It is a very much popular vegetable crop, especially among in the Asian communities both for nutritional and pharmaceutical purposes. It was preferred as a cooked vegetable, boiled alone, boiled with meat, or included in enormous variety of dishes. It was also used as raw, like sliced cucumbers. However, the plant was used medicinally in various disorders such as gastrointestinal problems, respiratory disease, heart diseases, diabetes mellitus and urinary diseases. These fruits were also used as a laxative, diuretic, tonic, aphrodisiac, insanity, in epilepsy, cardiogenic, urinary calculi, various types of blood disease, dyspepsia, schizophrenia and other psychologic disorders, jaundice, fever, and menstrual disorders. The morphological characteristics of the *B.hispida* studied confirm to the existing information on the species.

Benincasa hispida is a monoecious climber with yellow flowers, hairy stem, petiole, leaf, petals and young fruits. The male flowers are solitary or in a slender-pedunculate racemes, fairly coxillary with the female flowers. However, the majority of cucurbits such as *Telfiaria esculenta*, *Citrullus lanatus* Thunb and

Cucurbita pepo L. are dioecious. while some other species are hermaphroditic (Hutchinson and Dalziel, 1954). *B. hispida* exhibits similar characteristics with these species. This however supports the placement of these species in the Cucurbitaceae family.[1]

The major chemical constituents of the *Benincasa hispida* fruits were volatile oils, flavonoids, glycosides, saccharides, proteins, carotenes, vitamins, minerals, β -sitosterin and uronic acid. *Benincasa hispida* seeds contained high number of fatty acids (24.3%), saturated fatty acids represented (75.38%) and unsaturated fatty acids (75.38%). It was apparent that linoleic and oleic acids are the principal fatty acid components in the extracts of seeds.[2] The fruits are can be eaten when it is young or old and raw or cooked. It is used as a vegetable, and in the pickles, curries and preserves etc. It can be picked as early as one week after the fertilization process. The wax gourd or winter melon has been used as a food and in medicine for thousands of years in the Orient. All parts of the fruit are used as medicinally. An infusion of the roots is used in the treatment of gonorrhoea. Fruits is used in the ayurvedic medicine in the treatment of epilepsy, lung diseases, asthma, coughs etc. [3] It occurs in India to Japan, Malaya, Ceylon, Burma and Indonesia in general cultivation. Cultivated as a vegetable throughout India up to an altitude of 1200m. It is suited to warm lowland conditions. It does better in dry areas or drier seasons. Fruit, Seed, Seed Oil are used in the various types of pharmacological activities.

Benincasa Hispida and its Profile

Plant name: *Benincasa hispida*

Botanical name: *Benincasa hispida* (Thunb.) Cogn.

Family: Cucurbitaceae



Fig 5. *Benincasa hispida* Leaves

Profile of Benincasa hispida

Botanical source: It consists of dried fruit of *Benincasa hispida* (Thunb.) Cogn.

Family: Cucurbitaceae

Synonyms: *Benincasa cerifera*, *Cucurbita hispida*, *Benincasa cylindrica* Ser., *Cucurbita farinosa* Blume, *Cucurbita littoralis* Hassk., *Cucurbita pruriens* Seem, *Cucurbita villosa* Blume.

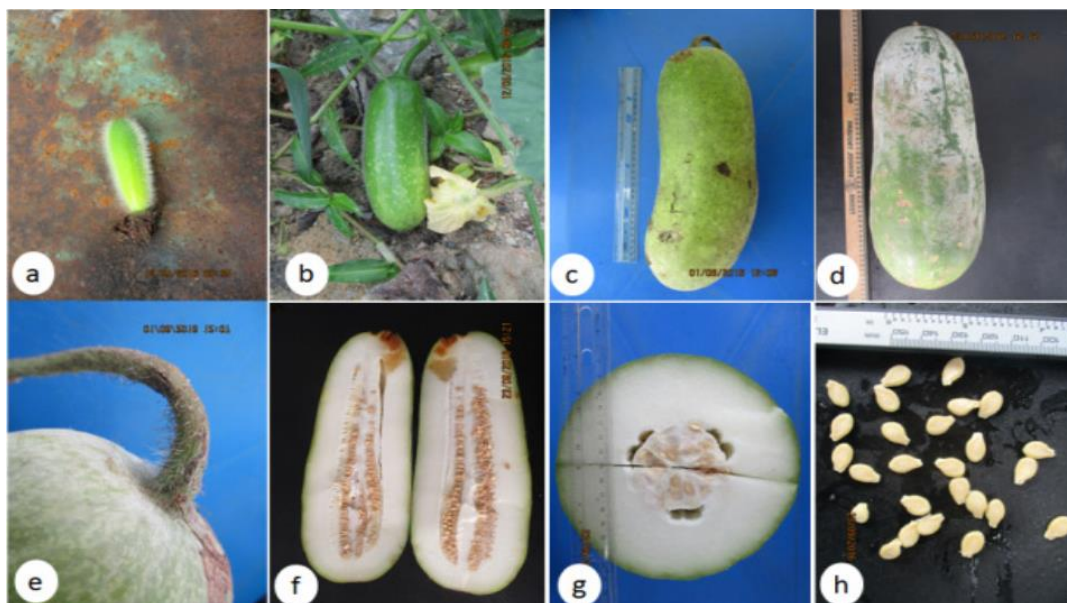
Common names [4]: Wax gourd, Chinese winter melon, Chinese fuzzy gourd, Ash pumpkin, Petha, White gourd, Ash gourd, White pumpkin, Tallow gourd, Winter melon.

Ayurvedic names: Brihatphala, Valliphala, Karkotika, Kushmanda, Kshirphala, Kushmandaki, Pushpaphala, Peetpushpa, Somaka.

Indian names: Petha, Kohala, Golkadu.

Morphological Characteristics

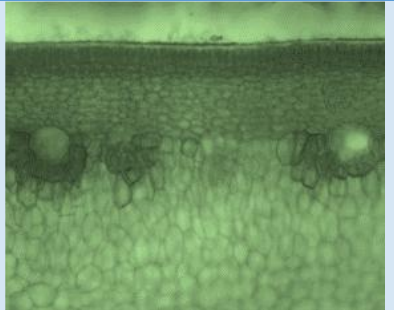
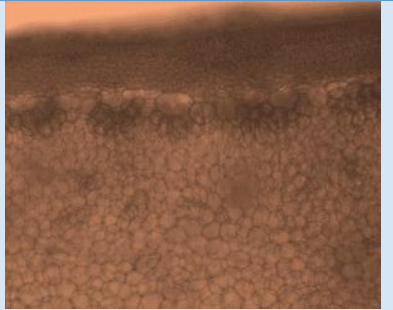
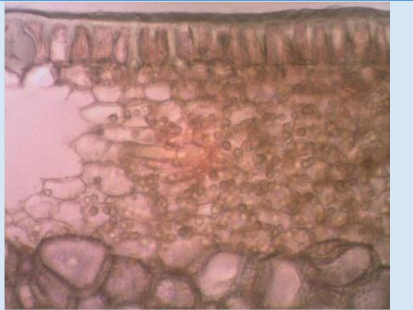
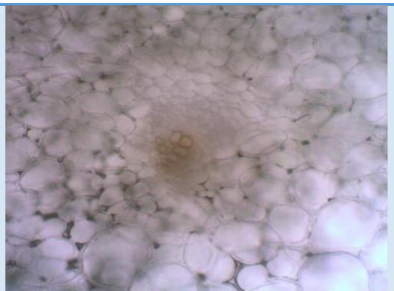

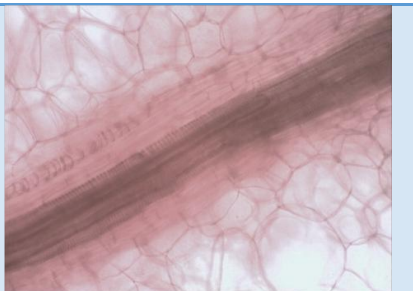
The morphological characteristics of the *B. hispida* studied confirm to the existing information on the species. An average fruit size and weight of two accessions of *B. hispida* is 55.5 cm x 24.7 cm and 11.7 kg for green winter melon and 48.9 cm x 22.1 cm and 6.1 kg for fuzzy white gourd. An average fruit weight is 3.06 kg to 13.67 kg and equatorial diameter of 52.99 cm to 80.11 cm in 34 accessions of *B. hispida* in India and in our study, we are recorded fruit size is 58.6 - 59.4 cm long, 14.0 - 15.5 cm wide and 8.5 - 9.0 kg. *B. hispida* is a monoecious climber with the yellow flowers, hairy stem, petiole, leaf, petals and young fruits. The male flowers are solitary or in a slender-pedunculate racemes, fairly coxillary with female. However, the majority of cucurbits such as *Telfiaria esculenta*, *Citrullus lanatus* Thunb and *Cucurbita pepo* L. are dioecious. while some other species are hermaphroditic. *B. hispida* exhibits similar characteristics with these species. This however, supports in the placement of these species in the Cucurbitaceae.

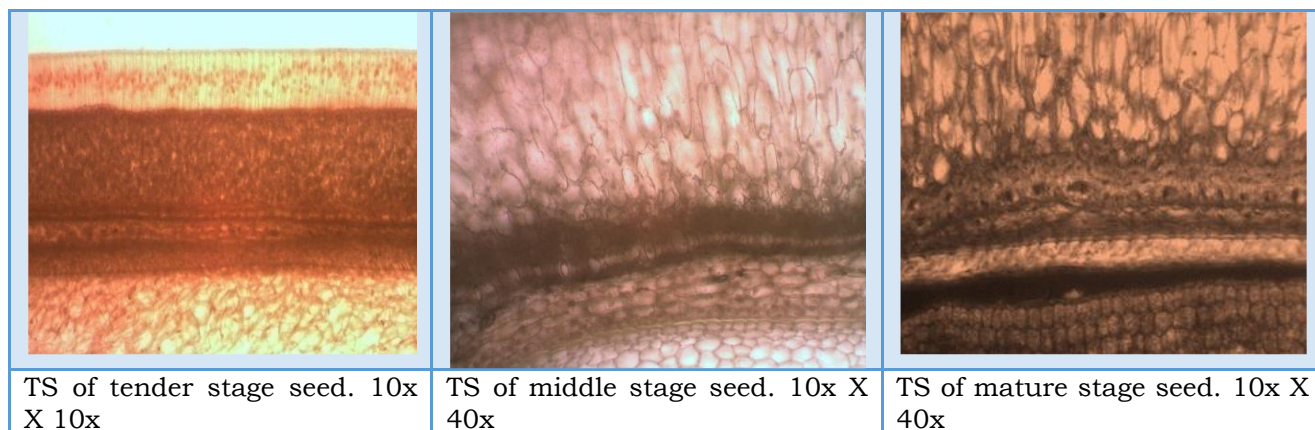


Fruits and seeds of *B. hispida*: - a – c. young/immature fruits, d. mature fruits, e. hairy fruit-stalk, f. longitudinal view of the fruit, g. transverse view of the fruit, h. seeds

Microscopical Characteristics

Transverse Section of the fruit shows a single layer of epidermis, made up of rectangular shaped parenchyma cells which are covered by a waxy ash on outer surface, followed by the epidermis multiple layers of hypodermis composed of tangentially elongated, thin walled, parenchymatous cells and starch grains are seen embedded in these cells. Next to hypodermis, 4 to 6 layers of stone cells runs continuously in the mature stage of the fruits and found in patches in tender stage fruits. This is followed by mesocarp parenchyma cells which are of different sizes, the size of the cells increases from periphery region to inside mesocarp. The cells are thin walled and oval shaped and the mesocarp is very much watery. Interior to this seed is present which are arranged in the parietal placentation. T.S. of seed shows outer part of epidermis which is slimy in nature, next to this is outer sclereids which are thin walled in tender seeds. It is followed by the stone cells, perisperm, endosperm and collapsed cells layer and in the centre cotyledon portion which contains loosely arranged parenchyma cells in tender seeds and compactly arranged palisade parenchyma is present in the mature stage of seeds and these cells are containing starch grains.

Tender stage	Middle stage	Mature stage
		
<p>TS of tender stage fruit showing pericarp and bundles of stone cells. 10x X 10x</p>	<p>TS of middle stage fruit showing pericarp and discontinuous layer of stone cells. 10x X 10x</p>	<p>TS of mature stage fruit showing epidermis, starch grains in hypodermis and continuous layer of stone cells. 10x X 40x</p>
		
<p>TS of tender stage fruit showing mesocarp and vascular bundle embedded in it. 10x X 10x</p>	<p>TS showing annular and spiral xylem vessels in middle stage fruit. 10x X 40x</p>	<p>TS showing group of xylem vessels in mature stage fruit. 10x X 40x</p>



Phytochemical constituents of *Benincasa hispida*

The major constituents of *Benincasa hispida* fruits were volatile oils, flavonoids, glycosides, saccharides, proteins, carotenes, vitamins, minerals, β -sitosterin and uronic acid. Chemical analysis showed that the main sugars in the *Benincasa hispida* peels were galactose, glucose, xylose and sorbose. The antioxidant activity and total phenolic content (TPC) of *Benincasa hispida* seeds extract was investigated using conventional Soxhlet extraction (CSE), and DPPH and ABTS scavenging activity tests. The ethanolic extract gave the highest total phenolic content 11.34 ± 1.3 mg GAE/g and antioxidant activity followed by ethyl acetate and n-hexane extract. *Benincasa hispida* seeds contains High number of fatty acids (24.3%), Saturated fatty acids represented (75.38%), Unsaturated fatty acids (75.38%). It was apparent that linoleic and oleic are the principal fatty acid components in the seed's extracts. The seed also contains minute amounts of a triterpenoid known as iso-multiflorenol, proteins such as trigonelline, coffearin, and osmotin, steroids such as beta-sitosterol and stigmast-5-ene-3-beta-ol, alkaloids such as 5-methylcytosine, and triterpenoids such as cucurbitacin. The major constituents of this fruits are triterpenoids, flavanoids, glycosides, saccharides, carotenes, vitamins, β -sitosterin, and uronic acid. Also shows the presence of triterpenes: alnusenol, multiflorenol, isomultiflorenol; flavone: iso-vitexin; and sterols: lupeol, lupeol acetate, and beta-sitosterol. The iodine and fluorine contents of ash gourd are reported to be 0.38 and 3.5 ppm of drug edible matter respectively. The calcium and phosphorus contents of ash gourd are found to be 821.4 and 544 mg % dry weight respectively. The zinc content is reposted to be 16.6 ppm of dry edible matter. It also has higher fibre content (0.8%) [7].

Chemical Constituents found in the whole plant of the *Benincasa hispida* plant:[8]

Sl No.	Part of the Plant	Active Chemical Constituents
1.	Root	Pentacyclic triterpene, Bryonolic acid.
2.	Fruit	Lupeol, β -sitosterol, cucurbitin, rhamnase, mannitol, triacontenol, alkali, fat, vitamin, glucose, trigonelline, histidine, triterpene, hexanal and pyrazine compounds.
3.	Seeds	24z- ethylidene, cholesterol -7 enol and 24- β - ethyl cholesterol.

4.	Leaves	Flavonoids, glycosides, alkaloids, steroids and resins
----	--------	--

Pharmacological and edible uses of *Benincasa Hispida*

Pharmacological uses

- **Fruit:**

According to Ayurveda, fruit is used as a laxative, diuretic, tonic, aphrodisiac, Memory enhancer, tranquilizer, coagulative, spermatogenesis, restorative, anabolic, styptic, antidote for alcohol poisoning, brain tonic, anti-pyretic, anthelmintic and carminative. The fruit pulp is useful in urinary discharges, calculi, thirst, biliousness, blood and heart troubles, dyspepsia, constipation. schizophrenia, epilepsy, memory loss, bleeding piles due to its coagulative properties, abdominal colic, rakta-pitta, hematemesis, chest pain, cachexia, tuberculosis, bronchial asthma, cough, fever, epigastric burning, generalized debility, weakness and mercurial poisoning. In combination with *Rheum palmatum* it is used to treatment of intestinal abscesses. The ash of fruit rind is applied on painful swelling. According to Unani system of medicine, fruit is antiperiodic, cardiac and general tonic, aphrodisiac etc.

- **Seed:**

Seeds have cooling effect and useful in dry cough, fever, urethral discharges, biliousness, thirst etc. Its oil is soporific, sweetish and good for brain and liver. The seeds are used as anthelmintic, anti-inflammatory, demulcent, diuretic, expectorant, febrifuge, laxative and tonic. Syrup of seeds and sweets prepared from the fruits are used to relieve the burning sensation and as well as fever. It is also used in the treatment of the chronic fever. The fruit pulp and seeds are used in nephritis, enuresis and renal calculi.

- **Root:**

An infusion of the root is used in the treatment of gonorrhoea.

Pharmacological activities of different parts of the plant: [9,21]

SL NO.	PHARMACOLOGICAL ACTIVITIES	PART OF PLANT USED	METHODS APPLIED	
1.	Central nervous effects	Anticonvulsant effects	Fruit (Alcoholic extract)	Maximal electroshock test (MEST) [9]
		Antidepressant effects	Fruit (Methanolic extract)	Swimming test [10]
		Anxiolytic effects	Fruit (Alcoholic extract)	Elevated plus maze and light- dark transition test [11]
2.	Gastro-intestinal effect	Antioxidant effect	Seeds (Methanolic extract)	DPPH Method [12]
		Antiulcer effect	Seeds (Methanolic extract)	Indomethacin induced gastric ulcer model
		Anthelmintic activity	Fruit peel (Ethanol extract)	Assay in vitro using adult earthworm [13]
3.	Antioxidant effect and total phenolic content	Fruit (Methanolic extract)	DPPPH and ABTS scavenging [14]	
4.	Anti-inflammatory and	Fruit (Petroleum ether and	Carragenan induced	

analgesic activity	methanolic) extract	method of paw oedema, histamine induced method of paw edoema, cotton pellet induced method of granuloma [15]
--------------------	---------------------	--

Dose of various parts to be useful [5]

Part	Dose
Fruit pulp	10 -20g
Fresh Fruit juice	6 -12 ml
Seed powder	0.5 - 1.5 gm
Beej churna	3 - 6 g
Beej tail	5-10 ml.

Popular Ayurvedic Formulations

The pulp of *Benincasa hispida* finds its use in Kushmandkhand, Kushmand Chuma, Kushmandgud, Kalyanak ghrita, Kushmandaka Rasayan, Kushmandghrita^[6].

Edible Uses

Edible Parts mainly used: Flowers, Fruit, Leaves, Seed.

Fruit

Fruits are mainly used as raw or cooked. It is used as a vegetable and in pickles, curries and preserves. The fruit that can be eaten when it is old or may be young and it can be picked as early as one week after the fertilization process. A juicy texture with a mild flavour. The flavour that is somewhat stronger in the younger fruits. Because of its waxy coating, it can be stored for several months, sometimes as long as a year. Mature fruits can be varying in the weight from 2 - 50 kg. The mature fruits are also be used to make an indigenous sweet which is called 'Morabba'. The fruits of petha are candied with sugar and used to prepare a popular sweet called "Petha". In the Raipur, those confectioners are limited to the heart of city that is known as 'Petha-line' or lane. They sell it in the name of 'Agre Ka Petha' (Agra is a city in Northern India, famous for Taj Mahal), but infact they prepare it in Chhattisgarh. In case of natives, petha is just only a sweet dish, but for the traditional healers this is a most valuable medicinal preparation.

Young leaves and flower buds:

Steamed and eaten as a vegetable, or are added as a flavouring to soups.

Seed: It generally used cooked. Rich in oil and protein.

Conclusion

Benincasa hispida (Ash gourd) is a commonly used as vegetable, which has found mention in 'Charaka Samhita' for its medicinal properties. This is employed as a main ingredient in kusmanda lehyam, in the Ayurvedic system of medicine. The

leyham is used as rejuvenate agent and also used in numerous nervous disorders. For thousands of years, the wax gourd or *Benincasa hispida* has been used as a traditional medicine in the Orient. Many empirical applications have been used in Indian centuries for various ailments like as GIT problems like dyspepsia, burning sensation, heart disease, vermifuge, diabetes, and urinary disease. A multitude of studies in the animals have been shown that the Pharmacological activities possessed by this herb are due to the major constituents of this fruits such as triterpenoids, flavanoids, glycosides, saccharides, carotenes, vitamins, β sitosterin, and uronic acid. *Benincasa hispida* leaves extract may give the wound healing activity due to its flavonoid content.

A large number of the medicinal plants and their purified constituents have been shown beneficial therapeutic potentials. In some cases, the crude extracts the medicinal plants may be used as medicaments. The isolation and identification of the active principles and elucidation of the mechanism of action of a drug is of paramount importance. Hence, works in both the mixture of traditional medicine and single active compounds are very important. Where the active molecules cannot be synthesized economically, the product must be obtained from the cultivation of plant material. About 121 (45 tropical and 76 subtropical) major medicinal plant drugs have been identified for which no synthetic one is currently available. Thus, the scientific study of the traditional medicines such as *Benincasa hispida*, derivation of drugs through bio-prospecting and systematic conservation of the concerned medicinal plants are of great importance.

References

1. Sew C C, Zaini N A M, Anwar F, Hamid A A and Saari N. Nutritional composition and oil fatty acids of Kundur [*Benincasa hispida* (Thunb) Cogn]. Pak J Bot 2010; 42(5): 3247-3255.
2. Nimbalkar SK, Venkatrao N, Ladde S and Pujar B. Anxiolytic evaluation of *Benincasa hispida*(Thunb) Cogn. fruit extracts. International Journal of Pharmacy and Pharmaceutical Science Research 2011; 1 (3) 93-97
3. Zaini NAM, Anwar F, Abdul Hamid A and Saari N. Kundur [*Benincasa hispida* (Thunb.) Cogn.]: A potential source for valuable nutrients and functional foods. Food Res Int 2011; 44:2368-2376.
4. Nadkarni KM, Nadkarni AK. Indian Materia Medica, Volume-1. Mumbai, Popular Prakashan, 2005; pp:, 185-6, 709-10, 861-2, 1011-2.
5. Mishra B, Vaisya R. Bhavaprakash Nighantu, Volume-1. 6th edition. Varanasi, Chowkhamba Sanskrit Sansthan, 1984; pp: 512-3, 588, 591, 679.
6. Gogte VM. Medicinal plants. In, Ramakrishnan S (ed). Ayurvedic Pharmacology and Therapeutic uses of Medicinal Plants, 1st edition. Mumbai, Bhartiya Vidya Bhavan Prakashan, 2000; pp: 337- 8,351-53,718-19.
7. Rastogi RP, Mehrotra BN. Compendium of Indian Medicinal Plants, Volume-I and Volume-II CDRI, Lucknow, New Delhi, Publication and Information Directorate, 1991.
8. Vinod Doharey, Manish Kumar, Sushil Kumar Upadhyay, Raj Singh and Beena Kumari , PHARMACOGNOSTICAL, PHYSICOCHEMICAL AND PHARMACEUTICAL PARADIGM OF ASH GOURD, BENINCASA HISPIDA (THUNB.) FRUIT , Vol. 21, Supplement 1, 2021 pp. 249-252

9. Nimbal, S.K.; Venkatrao, N.; Ladde, S. and Pujar, B. (2011). Anxiolytic evaluation of *Benincasa hispida* (Thunb) Cogn. fruit extracts. *Int. J. Pharm. Pharma. Sci. Res.*, 1: 93-97.
10. Dhingra, D. and Joshi, P. (2012). Antidepressant-like activity of *Benincasa hispida* fruits in mice: Possible involvement of monoaminergic and GABAergic systems. *J. Pharmacol. Pharmacotherap.*, 3: 60-62.
11. Nimbal, S.K.; Venkatrao, N.; Pujar, B.S. and Ladde, S.,. Evaluation of anticonvulsant activity of alcoholic extract of *Benincasa hispida* (Thunb) Cogn. Fruit extracts. *Inter. Res. J. of Pharma.*, 2: 166-168.
12. Gill, N.S.; Dhiman, K.; Sharma, P.; Bajwa, J.; Sood, S.; Sharma, P.D.; Singh, B. and Bali, M. (2011). Evaluation of free radical scavenging and antiulcer potential of methanolic extract of *Benincasa* seeds. *Res. J. Med. Plants*, 5: 596-604.
13. Muley, B.; Dhongade, H.; Upadhyay, A. and Pandey, A. (2012). Phytochemical screening and anthelmintic potential of fruit peels of *Benincasa hispida* (curcubitaceae). *Int. J. Herb Drug Res.*, 11: 5-9.
14. Mandana, B. (2012). Antioxidant activity of winter melon (*Benincasa hispida*) seeds using conventional soxhlet extraction technique. *Int. Food Res. J.*, 19: 229-234.
15. Rachchh, M.A. (2011). Anti-inflammatory activity of *Benincasa hispida* fruit. *Inter. J. of Pharma and Bio Sci.*, 2: 98-106.
16. Kumar, A. and Ramu, P. (2002). Effect of methanolic extract of *Benincasa hispida* against histamine and acetylcholine induced bronchospasmin Guinea pigs. *Indian J. Pharmacol.*, 34: 365-366.
17. Jayasree, T.; Kishore, K.; Vinay, M.; Vasavi, P.; Chandrasekhar, N.; Manohar, V.S. and Dixit, R. (2011). Evaluation of the diuretic effect of the chloroform extract of the *Benincasa hispida* rind (Pericarp) extract in guinea-pigs. *J. Clin. Diagnost. Res.*, 5: 578-582.
18. Jayasree, T.; Kishore, K.K.; Vinay, M.; Vasavi, P.; Dixit, R.; Rajanikanth, M. and Manohar, V.S. (2011). Diuretic effect of the chloroform extracts of the *Benincasa hispida* rind (Pericarp) extract in Sprague – Dawley rats. *Int. J. Appl. Biol. Pharma. Technol.*, 2: 94-99.
19. Amerthaveni, M. and Priya, V. (2011). Hypoglycemic and hyperlipidemic effect of ash gourd (*Benincasa hispida*) and curry leave (*Murraya koenigii*). *Int. Journal of Current Research*, 3: 37-42.
20. Natarajan, D.; Lavarasan, R.J.; Chandra Babu, S.; Sahib Thambi Refai, M.A.C. and Thameemul-Ansari, L. H. (2003). Antimicrobial studies on methanolic extract of *Benincasa hispida*. *Anc. Sci. Life*, XXII: 98-100.
21. Sarmad Abdul Razak Abood Alsaadi and Kasim Sakran Abass 'BENINCASA HISPIDA IS AN ANTIOXIDANT OF POSSIBLE PHYSIOLOGICAL IMPORTANCE : A COMPARATIVE REVIEW, Vol. 20(2), 2020 pp. 2833-2838Suryasa, I.W., Sudipa, I.N., Puspani, I.A.M., Netra, I.M. (2019). Translation procedure of happy emotion of english into indonesian in kṛṣṇa text. *Journal of Language Teaching and Research*, 10(4), 738–746
22. Suryasa, W. (2019). Historical Religion Dynamics: Phenomenon in Bali Island. *Journal of Advanced Research in Dynamical and Control Systems*, 11(6), 1679-1685.
23. Suryasa, W., Sudipa, I. N., Puspani, I. A. M., & Netra, I. (2019). Towards a Change of Emotion in Translation of Kṛṣṇa Text. *Journal of Advanced Research in Dynamical and Control Systems*, 11(2), 1221-1231.