1. LITERATURE REVIEW

A. Bauhinia variegata (Caesalpiniaceae) (Linn.) Benth:

Joaquim M.D.A. et al., (2004) isolated five flavonoids from the different organs of Bauhinia variegata was identified as quercetin, rutin quercetin, apigenin and apigenin 7-O-glucoside.

Paarakh P. M. et al., (2009) studied pharmacognostical and phytochemical screening of Bauhinia variegata Linn leaves which showed the presence of thin walled epidermis, parenchymatous cells, abundant solitary calcium oxalate crystals, vascular bundles and multicellular covering trichomes. Physiochemical parameter such as total ash, water soluble ash value, acid insoluble ash value, alcohol extractive value, water soluble extractive value and loss on drying were also determined. Phytochemical screening showed the presence of steroids, saponins, flavonoids, alkaloids and tannins.

Saumya R. P. et al., (2011) evaluated nephroprotective effect of Bauhinia variegata (Linn.) whole stem ethanolic extract against cisplatin-induced nephropathy in rats. Acute nephrotoxicity was induced by i.p. injection of cisplatin. Ethanol extract at 400 mg/kg decreased the serum level of creatinine and urea associated with a significant increase in body weight and urine volume output as compared to the toxic control group. The ethanol extract of B. variegata at 400 mg/kg (b.w.) exhibited significant and comparable nephroprotective potential to that of the standard polyherbal drug cystone.

Patil J. K. et al., (2010) studied the in-vitro immunomodulatory activity of Bauhinia variegata Linn (Caesalpiniaceae) stem bark extracts n human neutrophils. The acetone-water, aqueous extracts and isolated compound (tannin) were screened for their possible Immunomodulatory activity by assessing nitroblue tetrazolium test, phagocytosis of killed Candida Albicans, candidacidal assay, neutrophil locomotion and chemotaxis. The acetone:water and isolated compound of Bauhinia variegata Linn stem bark showed predominantly significant activity on in-vitro human neutrophils in all parameters, which are comparable to standard and control.

Sharma R. K. (2011) studied effect of ethanolic and aqueous extracts of Bauhinia variegata Linn. on Gentamicin-induced nephrotoxicity in rats. The antioxidant activity of both ethanolic and aqueous extracts of root of Bauhinia variegata Linn. was carried out by in-vitro models such as scavenging of free radicals like 1,2-diphenyl1-2-picrylhydrazyl (DPPH), nitricoxide and
superoxide. Both ethanolic and aqueous root extracts of *Bauhinia variegata* Linn. produced significant free radical scavenging activity. Both the extracts produced significant nephroprotective activity in Gentamicin induced nephrotoxicity model as evident by decrease in elevated serum creatinine, serum urea, urine creatinine and BUN levels, which was further confirmed by histopathological study.

**Singh A. et al., (2005)** studied anthelmintic activity of methanolic extracts of leaves of *Bauhinia variegata* against both mature male and female *Haemonchus contortus* at 5 h post-incubation. The concentration of the crude extract required for anthelmintic activity against female worms was much higher than for male worms (4000-8000 vs. 1000-2000 µg/ml, respectively).

**Rajkapoor B. et al., (2006)** studied chemoprevention and cytotoxic effect of *Bauhinia variegata* against *N*-nitrosodiethylamine induced liver tumors and human cancer cell lines. They found that oral administration of ethanol extract of *Bauhinia variegata* effectively suppressed liver tumor as revealed by decrease in levels of serum glutamate pyruvate transaminase, serum glutamate oxaloacetate transaminase, alkaline phosphatase, total bilirubin, gamma glutamate transpeptidase, lipid peroxidase, glutathione peroxidase and glutathione S-transferase. The extract produced an increase in enzymatic antioxidant (superoxide dismutase and catalase) levels and total proteins when compared to those in liver tumor bearing rats. The histopathological changes of liver samples were compared with respective controls. Plant extract was found to be cytotoxic against human epithelial larynx cancer and human breast cancer cells.

**Sharma R.N. et al., (1996)** evaluated that methanolic extracts of leaves of *Bauhinia variegata* shown antimicrobial activity & antifungal activity was shown against *Aspergillus fumogalus*, *Aspergillus niger*.

**Ojha J.K. et al. (1995)** reported that Kanchanar along with Manjishtha was given orally in non-healing diabetic foot ulcers and gangrene.

**Singh D.C. et al., (1991)** found that the Kanchanar guggulu is an ethical preparation advocated for the management of various glandular swellings like galgand, gandmala, granthi and arbuda.

**Pandit R.K. et al., (1992)** studied that oral administration of Kanchanar bark and Ghanastava of Manjishtha (*Rubia cordifolia*) root to the patients of diabetic microangiopathy gave satisfactory results in newly formed ulcers.

**B. *Benincasa hispida* (Cucurbitaceae) (Thunb.) Cogn.**

Keyon H.L. et al., (2005) found that seeds of *Benincasa hispida* are mainly composed of saponins, urea, citrulline, linoleic acid, oleic acid and fatty acids and triterpenoids known as isomultiflorenol, proteins such as trigonelline, fooffarin, and osmotin, steroids such as beta-sitosterol and stigmast-5-ene-3-beta-ol, alkaloids such as 5-methylcytosine, and triterpenoids such as cucurbitacin B.

Grover J.K. et al., (2001) found that *Benincasa hispida* has shown the presence of four triterpenes and two sterols together with a flavonoid C-glycoside, an acylated glucose, and a benzyl glycoside.

Mazumder S. et al., (2004) found that the fruit is an important source of water-soluble and hemicellulosic polysaccharides. Pectic polysaccharides were obtained from chalkumra (*Benincasa hispida*) fruit by sequential extraction with ammonium oxalate, dilute acid, and cold dilute alkali. The highest yield of polysaccharides was obtained with oxalate and HCl. BOX was enriched in partly methyl-esterified galacturonic acid, whereas BHCl and BOH contained mostly galactose. All of the extracts showed similar elution patterns in size exclusion chromatography although the intrinsic viscosities (η) were different. From fractionation by anion exchange chromatography, homogalacturonan accounted for more than half of BOX and 11% of BHCl. Methylation analyses and hydrolysis of BHCl with endo-β-(1→4)-d-galactanase showed the presence of β-(1→4)-d-galactan. The neutral galactan represented more than 76% of BHCl and 40% of BOH. The other polysaccharides were complex galactans in BOH and an acidic arabinan (<1%) in BOX and BHCl.

Uchikoba T. et al., (1998) From sarcocarp a protease has been purified by two steps of chromatography and identified that protease in a cucumisin like serine protease. A protease has been purified by two steps of chromatography. The enzyme was strongly inhibited by diisopropyl fluorophosphate, but not by EDTA and cysteine protease inhibitors. The substrate having alanine at the position of P1 was the best among the Ala-Ala-Pro-X-pNAs (X = Ala, Lys, Phe, Glu, and diaminopropionic acid (Dap). The N-terminal sequence of the first 33 residues was
determined and 25 of the residues agreed with that of cucumisin (EC 3.4.21.25), a protease from the sarcocarp of melon fruit (Cucumis melo L. var. Prince).

**Grover J. K. et al., (2000)** found that the juice of *Benincasa hispida* (BH) showed significant activity against symptoms of morphine withdrawal, such as jumping response and diarrhoea, in mice. These results seem to indicate that BH may prevent the development of morphine addiction and also suppress symptoms of opioid withdrawal in animals.

**Qadrie ZL et al., (2009)** studied antinociceptive and anti-pyretic activity ethanolic extract of seeds of *Benincasa hispida* (thunb.) cogn. in wistar albino rats. Brewer’s yeast (15%) was used to induce pyrexia in rats. The extract significantly increased the antinociceptive effective in a dose dependent manner in rats. Similarly, at doses of 250 and 500 mg/kg b.w the extract significantly decreased yeast induced pyrexia in rats.

**Grover J. K. et al., (2001)** Extracts of *Benincasa hispida* prevent development of experimental ulcers. Anti-ulcerogenic activity of different extracts of *B. hispida* (fresh juice, supernatant and residue fraction of centrifuged juice, alcoholic and petroleum ether extract) were studied in aspirin plus restraint, swimming stress, indomethacin plus histamine and serotonin-induced ulcers in rats and mice. The oral feeding of different doses of the extract significantly reduced the ulcer index produced by various ulcerogens.

**Shetty B.V. et al., (2008)** studied the effect of extract of *Benincasa hispida* on oxidative stress in rats with indomethacin induced gastric ulcers. Malondialdehyde (MDA) in RBC and antral homogenate was determined to measure tissue oxidation. Superoxide dismutase (SOD) in RBC and antral homogenate, plasma and homogenate vitamin C were estimated as measures of antioxidant defense. On induction of gastric ulcer, there was significant increase in SOD in RBC and homogenate levels and vitamin C in plasma. There was an apparent decrease in ulcer index in animals treated with fruit extract. There was significant decrease in MDA with concomitant decrease in SOD and vitamin C levels in the treated rats when compared to those not treated with fruit extract. *Benincasa hispida* has been shown to contain certain active principles like terpenes, flavanoid C--glycosides and sterols which have antioxidant effects.

**Atiwetin P. et al., (2006)** found serine proteinase inhibitor from wax gourd (Benincasa hispida [Thunb] Cogn.) seeds. Even though they were distinctly separated by reversed-phase chromatography, the amino acid sequences of two inhibitors were identical. Both inhibitors were
converted into each other, perhaps due to cis-trans isomerization of characteristic Pro in the C-terminal region.

Huang H.Y. et al., (2004) found antioxidant and angiotension-converting enzyme inhibition capacities of various parts of *Benincasa hispida* (wax gourd) angiotensin-converting enzyme (ACE) activity of wax gourd pulp, core, seed, and peel prepared by different extraction methods. The fresh weights required to reach 50% inhibition of linoleic acid oxidation were higher in fresh extracts, compared to other extraction methods. Fresh weights required to reach 50% inhibition were the lowest in seed. The seed had the lowest Cu2+ -induced low-density lipoprotein (LDL) oxidation percentage and inhibition level of ACE activity among all parts. The higher antioxidant capacity of the seed may result from the higher total phenolics contents and superoxide dismutase activity. The abilities of antioxidation and ACE activity inhibition may provide protective effects against cardiovascular diseases and cancers.

Lee K.H. et al., (2005) evaluated anti-angiogenic effect of the seed extract of *Benincasa hispida* Cogniaux. Basic fibroblast growth factor (bFGF) is a potent angiogenic factor found in various tumors. In this study, we found that the seed extract decreased bFGF-induced endothelial cell proliferation and tube formation in a dose-dependent manner. Besides, seed extract showed no cytotoxicity on HUVECs and normal fibroblast cells. Furthermore, the seed extract of *Benincasa hispida* showed a potent inhibitory effect on bFGF-induced angiogenesis in vivo.

Yoshizumi S.et al., (1998) found that methanol extract from the fruits of *Benincasa hispida* Cogn. shown inhibitory activity on the histamine release from rat exudate cells induced by antigen-antibody reaction. Through bioassay-guided separation, four known triterpenes and two known sterols were isolated as active components together with a flavonoid C-glycoside, an acylated glucose, and a benzyl glycoside. Among the active triterpenes and sterols, two triterpenes, alnusenol and multiflorenol, were found to potently inhibit the histamine release.

Jayasree T. et al., (2011) investigated diuretic effect of chloroform extract of *Benincasa hispida* rind (pericarp) in sprague-dawley rats using standard diuretic hydrochlorothiazide. The urinary volume, pH, and urinary excretion of sodium, potassium and chloride were measured and compared. The extract produced significant increase in urine volume, sodium and chloride levels, and significant decrease in potassium excretion.
Kumar A. D. & Ramu P. (2002) investigated the effect of methanolic extract of *Benincasa hispida* against histamine and acetylcholine induced bronchospasm in guinea pigs.

Rachchh M. A. & Jain S. M. (2008) evaluated the antiulcer activity of Petroleum ether and methanol extracts of *Benincasa hispida* Cogn. fruit in rats against ethanol-induced gastric mucosal damage, pylorus ligated gastric ulcers, and cold restraint-stress-induced gastric ulcer models. Ulcer index was common parameter studied in all the models. Both the extracts produced significant reduction in ulcer index in all the models and the results were comparable with that of omeprazole-treated group. Further, significant reduction in vascular permeability was observed. In CRS model, MDA content was significantly reduced along with increase in CAT levels as compared to control group.