Chapter-2
Review of Literature
CHAPTER 2
REVIEW OF LITERATURE

MORINA LONGIFOLIA

*Morina*, a small genus of perennial herbs, belong to the family *Dipsacaceae* is native to Asia. Six species occurs in India. *Morina longifolia* Wall, a tall spinous herb, 60-120 cm high found in temperate and alpine regions of Himalayas from Kashmir to Bhutan at an altitude of 2400 - 4200 meters is commonly known as “Whorlflower”. The stem, leaves and flowers are used in Tibetan medicine, they are said to have a sweet and astringent taste with a heating potency. They are digestive, emetic and stomachic and are used in the treatment of stomach disorders [1]. *Morina longifolia* has been reported to be useful in the treatment of worm infestation during ethnobotanical survey of Kashmir Himalaya [2]. The chloroform extract of *Morina persica* showed antiplasmodial activity against the multi drug resistant *Plasmodium falciparum* strain (IC50 1.9 µg/ml) [3].

The patented Tibetan medicinal composition comprising (by weight parts) *Batrachuperus pinchonii* 3-8, *Cordyceps sinensis* 0.5-1, *Morina nepalensis* 7-13, *Gymnadenia orchidis* 7-13, *Terminalia chebula* 12-18, *Terminalia billerica* fruit 12-18, *Piper longum* 3-8, *Amomum tsao-Ko* 1-5 and *Areca catechu* 3-8 has been reported to have effects of tonifying kidney, improving sexual function, replenishing qi and blood, eliminating pathogenic wind-dampness, dredging meridians, regulating physiological functions and prolonging life. It is effective in relieving neurasthenia, insomnia, dreaminess, mental fatigue, soreness of waist and knee joints, sexual disorders, frequent micturition, alopecia, spermatorrhea, menoxenia and climacteric syndrome [4].

The plant possess strong aromatic properties and used as an incense and in the preparation of dhup, agarbatties etc. The plant yields 0.34% essential oil [5]. Literature survey revealed that Ursolic acid, rutin [6]. Melissic acid and β-Sitosterol
[7] were isolated from *Morina kokanica* leaves. Thirty-two components were characterized in the essential oil of fresh flowers of *Morina persica* representing 96% of the total components detected. The main components were (2E, 6E)-farnesol (58.79%) and germacrene-D (10.99%) [8]. Morinins A-G, along with five known compounds, 4-O-methylecinnamyl alcohol, 4-O-methylecinnamyl methyl ether, 4-O-methylecinnamyl acetate, p-methoxybenzaldehyde, and 4-O-methyl-(E)-coniferyl alcohol, have been isolated from the roots of the *Morina chinensis* [9]. 7-Deoxyloganic acid, citrusin C, 3,4-dihydroxy benzoic acid and (E)-caffeic acid were isolated from the water-soluble fraction of ethanol extract of *Morina nepalensis* Alba [10].

![Figure 2.1: Morina longifolia Wall plant](image-url)
Figure 2.2: *Morina longifolia* Wall flowering twig
Two new triterpenoid saponins, monepaloside K and monepaloside L, together with a known saponin, mazusaponin I, were isolated from the water-soluble part of the whole plant of *Morina nepalensis* Alba [11]. From the water-soluble part of *Morina nepalensis* Alba extract two new ursane saponins, monepaloside A (II) and monepaloside B (III) were isolated. On the basis of spectroscopic and chemical evidences, their structures were assigned as 3-O-α-L-arabinopyranosyl(1→3)-α-L-arabinopyranosyl pomolic acid 28-O-β-D-glucopyranosyl(1→6)-β-D-glucopyranoside and 3-O-α-L-arabinopyranosyl(1→3)-β-D-xylopyranosyl pomolic acid 28-O-β-D-glucopyranosyl(1→6)-β-D-glucopyranoside, respectively [12]. A novel triterpenoid saponin, monepaloside K (IV) and acylated flavonol glycoside, quercetin 3-O-[2'''-O-(E)-caffeoyl]-α-L-arabinopyranosyl-(1→6)-β-D-galactopyranoside (I), were isolated from *Morina nepalensis* Alba [13,14]. The unique tetrahydropyran sesquiterpenoids morinols A and B have been isolated from the *Morina chinensis* as a racemic mixture [15].
(II) Monepaloside A and (III) Monepaloside B
IV- Monepaloside K
BAUHINIA VARIEGATA

The various parts of the Bauhinia variegata (Leguminosae) viz., flower buds, flowers, stem, stem bark, leaves, seeds and roots are practiced in various indigenous systems of medicine and popular among the various ethnic groups in India for the cure of variety of ailments. Following a large number of claims on the wide range of folk curative properties of Bauhinia variegata Linn (Leguminosae), considerable efforts have been made by the researchers to justify its efficacy as a curative agent through pharmacological investigations. In Ayurvedic literatures the plant is known by various names as Kachnar, Gandari, Yugmapatra and Karbudara. It is reported to have Kasaya rasa, Ruksha guna, Shita virya and Katu vipaka. The stem bark of B. variegata is used in the treatment of krimiroga (worm infestation), gundamala (scrofula), apaci (cervical lymphadenitis) and vrana (wounds) [16-17].

The aborigines of Ghatigaon forests, Gwalior (Madhya Pradesh) have been using the flower buds of B. variegata for the treatment of diarrhoea, dysentery and hemorrhoids [18]. The flowers are used in piles, edema, dysentery [19], as laxative and anthelmintic [20]. The bark of the plant is medicinally more important and used by tribals for cure of variety of ailments. The bark is used in fever, as tonic and astringent [21], as antileprotic, in skin diseases and wound healing [22], antigoitrogenic [23], and as antitumour [24]. The leaves are used in treatment of skin diseases and stomatitis [25]. The roots of the plant are used as an antidote for snake poisoning, in dyspepsia, flatulence and as carminative [18, 21]. They are also reported to be useful as antitumour and in obesity [26].

In Unani system of medicine bark of the plant is described as astringent to the bowels, tonic to the liver. It is reported to be useful in treatment of leucoderma, leprosy, menorrhagia, asthma, wounds and ulcers [27, 28].
Figure 2.3: *Bauhinia variegata* Linn. flowering twig
PHYTOCHEMICAL STUDIES:

Root bark and root: Phytochemical analysis of the root bark of Bauhinia variegata Linn yielded a new flavanone, (2S)-5,7-dimethoxy-3',4'-methylenedioxyflavanone and a new dihydrodibenzoxepin, 5,6-dihydro-1,7-dihydroxy-3,4-dimethoxy-2-methylidibenz[b,f]xepin together with three known flavonoids [29]. A novel flavonol glycoside 5,7,3',4'-tetrahydroxy-3-methoxy-7-O-α-L-rhamnopyranosyl (1→3)-O-β-D-galactopyranoside was isolated from the roots of Bauhinia variegata [30].

Stem bark and stem: The stem bark showed presence of hentriacontane, octacosanol, stigmasterol [31], glycosides, reducing sugars and nitrogenous substances [32]. The stem yielded a flavonone glycoside characterized as 5,7-dihydroxyflavonone-4'-O-α-L-rhamnopyranosyl-β-D glucopyranoside [33]. The isolation of β-sitosterol, lupeol, kaempferol-3-glucoside and a 5,7-dimethoxyflavonone-4'-O-α-L-rhamnopyranosyl-β-D-glucopyranoside was also reported from the stem of the plant [34, 35]. A flavanol glycoside, characterized as kaempferol-3-glucoside, was isolated from stem of this plant [36]. A new phenanthraquinone, named Bauhinione, has been isolated from Bauhinia variegata L., and its structure has been elucidated as 2,7-dimethoxy-3-methyl-9,10-dihydrophenanthrene-1,4-dione on the basis of spectroscopic analysis[37].

Leaves: Two new long chain compounds, heptatriacontan-12,13-diol and dotetracont-15-en-9-ol have been isolated from the leaves of B. variegata. Structures of these compounds have been elucidated by spectral data analysis and chemical studies [38]. A new chalcone, 2'-hydroxy-4',6'-dimethoxy-3,4-methylenedioxy chalcone together with 2 known flavonol glycosides, kaempferol-3-O-D-glucopyranoside and kaempferol-3-O-α-L-rhamnoside were isolated from the leaves Bauhinia variegata. These compounds were found to display interesting antifungal activity against Aspergillus niger and Candida albicans [39].
Leaves of *B. variegata* provided low amount of volatile oils. The oil consisted almost exclusively of sesquiterpenes, \( \beta \)-Caryophyllene, germacrene D and spathulenol [40].

**Flowers:** The ethanolic extract of the white flowers of *B. variegata* yielded flavonoids and were identified as kaempferol-3-galactoside and kaempferol-3-rhamnoglucoside [41].

**Seeds:** A new flavone glycoside was isolated from the acetone fraction of the concentrated 95% ethanolic extract of the seeds of *Bauhinia variegata* (Linn). It was identified as 5-hydroxy-7,3',4',5'-tetramethoxyflavone 5-O-\( \beta \)-D-xylopyranosyl-(1→2)-\( \alpha \)-L-rhamnopyranoside by various color reactions, chemical degradations and spectral techniques [42].

**PHARMACOLOGICAL STUDIES:**

**Antitumour activity:**

The antitumor activity of the ethanol extract of *Bauhinia variegata* (EBV) has been evaluated against Dalton's Ascetic Lymphoma (DAL) in Swiss albino mice. A significant enhancement of mean survival time of EBV-treated tumor bearing mice was found with respect to control group. EBV treatment was found to enhance peritoneal cell counts. After 14 days of inoculation, EBV was able to reverse the changes in the hematological parameters, protein and PCV consequent to tumor inoculation [43]. The antitumour activity of ethanol extract of *B. variegata* was evaluated against Ehrlich Ascites carcinoma in Swiss albino mice and found to be a potent cytotoxic towards Ehrlich ascites carcinoma tumor cells [44]. The chemopreventive and cytotoxic effect of ethanol extract of *B. variegata* (EBV) was evaluated in N-nitrosodiethylamine (DEN, 200 mg kg) induced experimental liver tumor in rats and human cancer cell lines. Oral administration of ethanol extract of *B. variegata* (250 mg kg) effectively suppressed liver tumor induced by DEN as revealed by decrease in DEN induced elevated levels of *serum glutamate pyruvate transaminase* (SGPT), *serum glutamate oxaloacetate transaminase* (SGOT), *alkaline phosphatase* (ALP), total bilirubin, *gamma glutamate transpeptidase* (GGTP), *lipid peroxidase* (LPO), *glutathione peroxidase* (GPx) and *glutathione S-transferase*...
(GST). 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. EBV was found to be cytotoxic against human epithelial larynx cancer (H1Ep2) and human breast cancer (HBL-100) cells [45].

**Antidiabetic activity:** A chloroplast protein with a molecular mass similar to that of bovine insulin was extracted from the leaves. The activity of this insulin-like protein (0.48 mg/mL) on serum glucose levels of four-week-old Swiss albino (CF1) diabetic mice was similar to that of commercial swine insulin used as control [46].

**Antigoitrogenic activity**

The effects of *B. variegata* were studied on rats with goiter induced by neomercazole and found to be effective in bringing the goitrogenic thyroid to normal level at a dose of 200 mg/day [47].

**Antimicrobial activity**

The methanolic extract of leaves exhibited antibacterial activity against *Proteus vulgaris*, *Bacillus anthracis*, *Escherichia coli*, *Streptococcus agalactiae* and antifungal activity against *Aspergillus fumigatus* and *A. niger* [48]. The leaf extract also exhibited toxicity against ringworms causing fungi *Epidermophyton floccosum*, *Trichophyton mentagrophytes* and *Microsporum gypseum* [49]. The aqueous and methanolic extract *B. variegata* was evaluated against five bacterial strains, viz., *Bacillus cereus*, *Staphylococcus aureus*, *Klebsiella pneumoniae*, *Escherichia coli* and *Pseudomonas pseudoalcaligenes*. The most susceptible bacteria were found *K. pneumoniae* and the most resistant bacteria were *E. coli* [50]. The alcoholic extract of the plants exhibited significant activity against *Staphylococcus aureus*. The extract of *B. variegata* was also found active against *Herpes simplex* [51].

**Insecticidal activity**

The extract of stem of the plant showed juvenilizing activity against *Dysdercus cingulatus* nymphs [52].
**Hemagglutination activity**

The saline extract of seed exhibited hemagglutination activity against erythrocytes of man, monkey, rabbit, rat, goat, sheep, cow, buffalo, horse, mule and fowl [53]. Wassel et al reported the hemagglutinating effects of seed proteins of Bauhinia species. The crude protein contents of Bauhinia variegata showed much higher hemagglutinating activity than for B. purpurea [54].

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\text{5,7-dihydroxyflavonone-4'–O–}\alpha-L-\text{rhamnopyranosyl-} \beta-D-\text{glucopyranoside}
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\[
\text{Bauhinione}
\]
5-hydroxy-7,3',4',5'-tetramethoxyflavone 5-O-\(\beta\)-D-xylopyranosyl-(1→2)-\(\alpha\)-L-rhamnopyranoside
REFERENCES

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