



"Photochemical Properties and Biological Activities of Bauhinia Variegata: A Comprehensive Review"

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ABSTRACT

A little orchid tree is known as *Bauhinia variegata* linn. It also goes by the name "kachnar." It is a member of most archaic subfamily of the (Caesalpinoideae) and family "Leguminosae". It is a medicinal plant & different parts of plant are used in hemio-pathy, unani & ayurveda in India to treat a variety of diseases. These parts of plant include leaves, flower buds & flowers, stem bark, root bark & stem seed. All crude evaluations of the arial portion of the *bauhinia variegata* linn for in (vitro and vivo) were made. The chemical components flavonoids, glycoside, steroids, tannins & reducing sugar that were so far identified from plants. The pharmacological properties of *Bauhinia variegata* Linn include anti-oxidant, antibacterial, anti-cancer, anti-diabetic, anti-inflammatory, antiulcer, Nephroprotective action, immunomodulator effect & last wound healing activity. The current study is based on a review article that presented screening of B.V. linn in phyto-chemical activity and biological activity as well as future research on B.V. linn.

Keywords: *B.V. linn (leguminosae) phyto-chemical activity and biological activity.*

Introduction:

English name for the *Bauhinia variegata* linn family (leguminosae) is mountain ebony hurb and Hindi name is kachnar, respectively. Other names include orchid tree and camel foot tree. It is a tiny medicinal plant that has long been used in Ayurvedic medicine to treat illnesses and heal them. The B.V. Linn medicinal plant is a tiny plant that is 8-10metres long & 4-5metres broad. Its leaves are 1-2 folio late, 2-

lobed, and are referred to as camel foot leaves. The bark is brownish grey or grey. The pink-colored, sessile flowers have pods that are 15.-30cm long by 1-2mm wide & senescent. In pods, seeds measure 10-15 mm. The plant's many parts, including its leaves, flowers, stems, bark, seeds, roots, are used in many ways. The traditional ayurvedic treatment reported by research screening improves pharmacological impact on illness prevention

greatly. Asthma, diarrhoea, haemorrhoids, pits, edoema, laxative in skin illness, anti-tumor in obesity, and snake bite are just a few of the numerous human diseases that B.V. Linn's natural organic compounds have been utilised to treat in vivo & in vitro. The B.V. Linn of aerial part of plant of extraction with (ethanolic and methanolic) reported by study the chemical constituents isolated from B.V. Linn such as flavonoid, B-sito steroid, tannin, carbohydrate amide, kaempferol-3, glucoside, vitamin c, The crude protein, apigenin-7-o-glucoside. the B.V. Linn method of extraction (1 kilogramme stem, 1.2 kg leaves, and 1.2 kg flowers) of plant acts as an effective measure against improving exhibit activity, antibacterial or antimicrobial etc.

Photochemistry & Morphological:

Experimental:

Stem Bark & Stem:

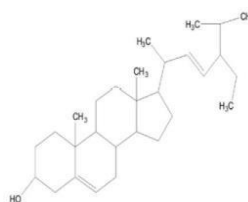


The stem bark of B.V. Linn is extracted with ethanol & methanol for use in phytochemical studies and contains a variety of components. Early phyto-chemical analysis identified the presence of stigma-sterol, octaco-sanol & hentria-contane, as well as 5, 7-di-hydroxy-

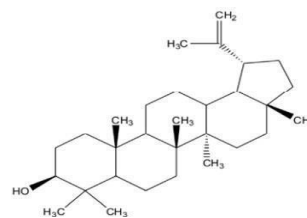
flanone, 4-o-alpha-L-rhamnopyranoside, sterols, glycol-sides, reducing sugars & nitrogenous substances. Bauhinione is name of a new phen-anthra-quinine. Its structure has been elucidate-ed as 2, 7-di-mithoxy -3-methyl- 9, 10-dihydro-phenan-threne-1, 4-dione-135, 7- di-hydroxy-flavanone-4-o-a-L-rhamno-pyranosyl-b-D-gluco-pyrannoside-145, 7-di-hydroxy & 5, 7-di-methoxy flavanone-4-o-a-L-rhamno-pyranosyl-b-D-gluco-pyranosides-8, neringeni-5, 7-di-methylether- 4-rhamno-glucoside & lupeol 4-tetrahydroxy-3-methoxy- 7-o - alpha-L-rha-mno-pyrano-syl-o-b- galacto-pyrano-side¹⁵.



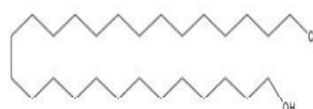
Hentriacontane



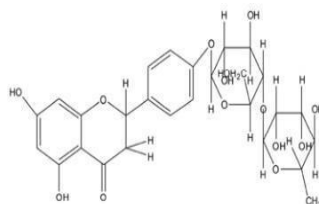
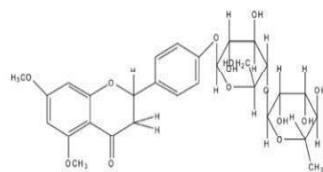
Stigmasterol



Lupeol



Octacosanol



5,7-di-methoxy-flavo-none-4-o-L-

5, 7-dihydro-methoxy-flavonone-4-o- α

L-rhamno-pyrano-syl- β -D-gluco-pyrano-side
rhamno-pyranosyl β -D-gluco-pyranoside

Leaves:



The ethanol and methanol extract of leaves of Bauhinia Veriegata linn is reported to contain new two long chain compound, heptatriacontan 12,13-diol & dotetra-cont -15, 9-ol¹⁶ & other likes flavonoids as Quercetin rutin kaempferol that have significant effect on blood glucose level. The B.V. linn is effectively decrease elevated plasma glucose level & phyto-chemidiline in treatment of type 2 diabetes¹⁷ & insulin contain protein (0.48mg/kg) on serum glucose levels of four

week old Swiss albino mice that commercial swine insulin used to control. Further characterization of this molecule by RP-HPLC of Chromato-graphic analyst is done. its anti-diabetic activity on alloxan induced mice showed. Its insulin-like characteristics. Transmission electron microscopy was use to immunolocalize insulin-like protein in leaves of Bauhinia varie-gata use in polyclonal anti-insulin human anti-body. The insulin-like protein was use to be mostly concentrated in chloro-plasts, where it was also shown to be connected with crystals that may be calcium-oxalate, accord-ing to localization in leaf blades. A protein that resembles insulin is found in chloro-plasts, which may indicate that it is involved in metabolism of carbohydrates¹⁸.

Do-tetracont-15-en-9-ol



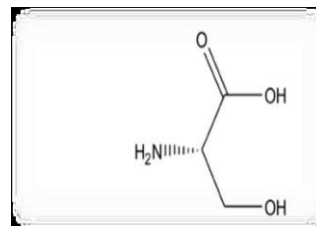
Heptatatriacontan-12, 13-diol

Buds:



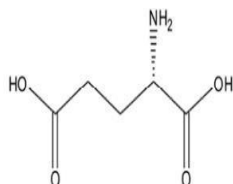
The B.V. Linn of flower buds of extract with (ethanol and methnol) reported by experiments of B.V. Linn have phyto-chemical compound

& extracted from the flower buds of B.V. Linn that contain components -keto acid of flower buds have amino acid, amides. Alanine, aspartate acid, pyruvic acid, phos-phoenol, oxalo-acitic acid, & -keto glutaric acid are four acids that make up an amino acid.

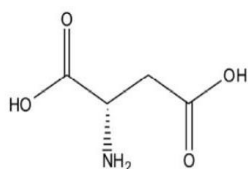


serine

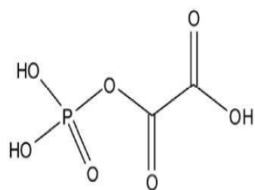
Flower:



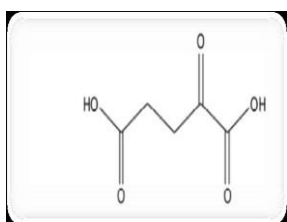
Glutamic acid



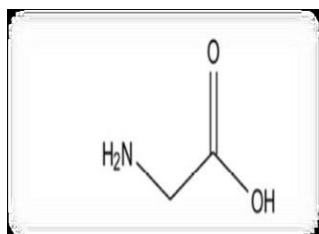
Aspartic acid



Phosphoenolpyruvic acid

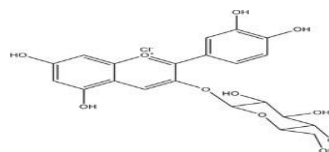


Oxaloacetic acid

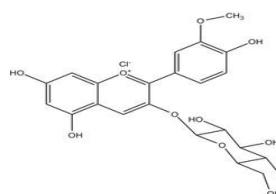


Glycine

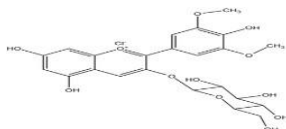
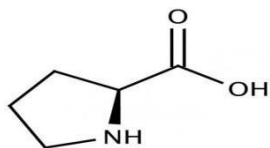
According to studies, B.V. linn of floral extract with (ethanol & methanol) contains components such malvidin-3-gluco-side & malvidin-3-Di-gluco-side, a phyto-chemical molecule identified from B.V. linn flower. Peonidin-3-Dig-lucoside, 3-galacto-side, 3-rhamno-gluco-side of kaem-ferol, quercitroside, iso-quercitroside, ruto-side, glutamic acid, keto acid, amino acid, tann-ins & cyanid-ing-3-gluco-side are all examples of peo-nidin derivatives.



Cynidin-3-glucoside



Malvidin-3-glucoside

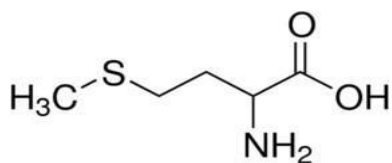


Peonidin-3-glucoside

Seed Bark:

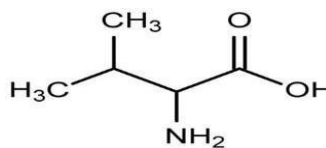


The B.V. Linn of seed bark & seed of extract with (ethanol & methanol) reported by studies that contain chemical compounds by spectra data analysis of B.V. Linn of seed of structure compounds such as structure compound such as 5- hydroxyl-,7, 3, 5- tetra-methoxy-



flavonon-5-β-D-xylo-pyranosyl-α-rhamno-pyranoside, tyrosine, valine, tyrosine, valine, theronine, serine, proline, phenyl-alomine, alkaloid, flavonoid, amino acid, ascorbic acid, glutamic acid, aspartic acid, lucoanthacyanines, protein carbohydrates.

Threonine Tyrosine



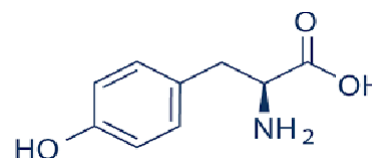
Proline

Valine

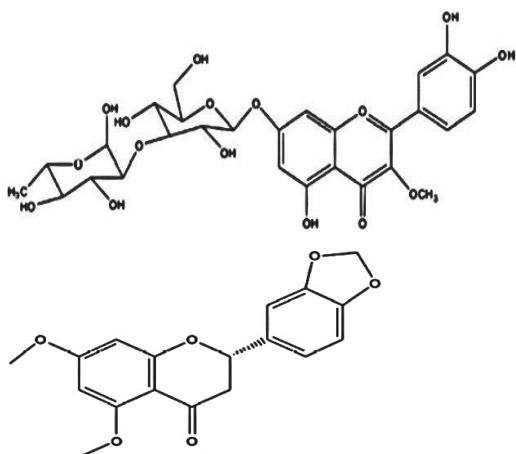
Root and root bark:



The B.V. Linn root and bark ethanolic extract. The list of phyto-chemical analyses shows that the roots and bark of B.V. Linn include components such flavonoids (2s).5,6,-dihydro-1,7dihydroxy-3, 4-dimerhoxy-2- methyl-di-benzoxepin²³ 5, 7-di-methoxy-3, 4-methylene dioxy flavonone, and noval flavonoids glycol-side Flavon-one di-hydro di-benzoepin



flavonol glycol-side 5, 7, 3, 4, - Tetra-hydroxyl-3-methoxy-7-o-L-rhamno-pyranosyl (1-3) -o-galacto-pyranoside is a flavonone. The compound known as 5, 6-di-hydro-1, 7-di-hydroxy-3-4-di-methoxy-2-methyl-benz (b, f) oxepine²³



5, 7, 3',4'- tetra-hydroxyl -3- methoxy-7-O- α -L- (2s)-5, 7-dimethoxy-3,'4-oxy-flavonone
Rhamnopyranosyl (1-3)-o- β -galatopranoside

Morphological Activity:

Anti-cancer activity:

The pharmacological studies by confirmed the indication of apoptosis by flavonoids fraction of B.V.linn in cytotoxicity compound can significant with the sensitivity of cell & (MTT) microculture tetrazolium test assay to clearly identified cyto-toxicity in HaLa cell line. 3, 4, 5 di-methyl thiazole -2-y, 2-di-phenyl tetra-zoleum bromide & double staining result in increased number of opoptic cell necrotic nuclei²⁴.

Skin papilloma models in Swiss albino mice were used to determine if B.V. Linn was more successful at causing cancer. The effectiveness of B.V. Linn bark extract was examined using a 2-stage method-logy skin papi-lloma models in Swiss albino mice & mela-noma models in mouse tumors (C57B1). In mice treated with Bauhinia, tumor incidence

dropped to 30-40% against 134% in untreated control animals. On basis of pre-liminary testing for anti-carcino-genic activity & chemo-preventive rate, anti-cancer is identified²⁵.

The mechanism of B.V. linn of processes that pro-tection against carcinogen & in the gluta-thio-nine level. That has been mediated through modu-lation of cellular anti-oxidant²⁶ & chemo-pre-ventive rate is a specific important condition have strategy for controlling process of cancer But most effect in chemo-pre-vantive activity showed on by DMBA induced skin carcinogenesis in Swiss albino mice in decrease tumor activity²⁷.

Anti- microbial Activity:

The alcoholic extract of Bauhinia varie-gata linn contain shown significant anti-microbial activity effect against (Gram +ve & -ve) bacteria & other species Escherichia coli MTCC by microbes entrobactos aerogenes MTCC-11, klebsiella pneumonia MTCC-39, Bacillus sub-tilis MTCC-14, Staphylo cocus aurenus²⁸.

The B.V. linn elevated clear report that is inhibited the growth of microbes & range developed (50/300ug/ml). The experimental process that found anti-microbial activity within in-hibit agar diffusion method in growth. Microbes then that extract process anti-microbial activity in a conc. dependant manner against test organism²⁹.

Anti-inflammatory activity:

A new flavo-nol glycoside's anti-inflammatory activity was said to have been aided by ethano-lic extract stem bark & bark of B.V. Linn. 6-flavonoids are recovered from ethyl acetate soluble fraction of extract of B.V. Linn extraction, include-ing kaemp-ferol, ombu-in, kaemp-ferol-7, 4-di-methyl ether-3-o-D gluco-pyranoside, iso-rhamnetin-3-o-D gluco-pyranoside, her-peridine & other tri-terpene caffeate³⁰.

According to B.V. Linn anti-inflammatory activity experiments, various macro-phage functions involved in inflammatory process were suppressed by chemicals 1-7. Compounds -3, 7-shwed had little effect on inhibiting macro-phage production, while compounds 1-4-6 lowered it by about 10-30% for 24hrs when expressed with LPS/IFN-LEMMA, inducible no synthesis is determined. These experimental results provide pharmacological support for plant B.V. linn's alleged folklore use in treatment of inflammatory conditions³¹.

Wound healing activity:

Recently, through wound healing activity extract have been used in excision & incision wound model in albino rates. The dose (200-400mg/kg). However, both aqueous & ethanolic extract of B.V. Linn caused significant wound healing in excision & wound

models & results were equivalent those of framy-citin in ex-cision wound model³².

Anti-ulcer activity:

In order to combat stomach ulcers brought on by pylo-ric ligation & aspirin-induced ulcer model rates, & etha-nolic extract of stem & stem bark B.V. Linn has been extensively utilized. Regarding regulating anti-ulcer activity, etha-nolic B.V. Linn decreases volume of stomach secretion, total free acidity & ulcer index³³.

Nephro-protectivity activity:

Medically relevant is the gentamicin-induced nephro-protective action of the alcoholic extract of Bauhinia variegates root bark and root. Wister rates received 100mg/kg/day of genta-micin intra-peritoneally for eight days in order to harm their kidneys. The dosage extract (200-400mg/kg b.w.) was tested on mice. After 9 days, serum creatinine, urea, & uric-reatinin levels as well as blood urea nitrogen (BUN) levels were evaluated. Check the histology of the kidney. BUN levels were subsequently confirmed by a histo-pathology study³³.

In groups receiving root extract of B.V. Linn together with genta-micin, which was reported to be more effective as a nephroprotective³⁴, caused by genta-micin were found to be reduced.

Immuno-modulatory activity:

The stem bark ethanolic extract of Bauhinia variegata was shown to also increase in phagocytic index & presence neutrophil adhesion & immune-modulatory activity on primary & secondary antibody response effect of extract was evaluated by carbon clearance test for phagocytic activity & neutrophil adhesion test for neutrophil activity³⁵.

Hypolipidemic activity:

Female rats fed a hypercaloric diet were investigated for the presence of alcohol extract of B.V. Linn's bark. With a steady decrease in content of total cholesterol, triglycerides, & low density lipoprotein (LDL), extract of B.V. Linn, when administered to obese mice, boosted brain serotonin levels & (HDL) high density lipoprotein. Thus, methanolic extract of B.V. Linn's anti-obesity properties might have a tendency to lower lipid profiles & raise brain serotonin levels³⁶.

Anti-oxidant activity:

The antioxidant potential of crude extract and fraction B.V. Linn was assessed. By using a DPPH radical screening technique, the antioxidant activity was measured. The scavenging activity of the ethyl acetate and methanol hexane fractions is comparable to that of normal quercetin³⁷⁻³⁸.

Oleic acid and beta-sitosterols are two more phytonutrients that help to lower hyperlipidemic conditions³⁹.

Additionally, *B. variegata*⁴⁰ has previously been linked to such components. Female rats fed a hypercaloric diet have shown a B.V. of bark extract with (methanolic) studied anti-obesity effect⁴¹. The strong association between antioxidant activity and the total quantity of phenolic/flavonoids⁴². Lupeol, beta-sitosterol, kaempferol, and quercetin are the four isolated bioactive phytoconstituents identified by B.V.

Anti-diabetic activity:

Through improving glucose metabolism, the ethanolic extract of B.V. Linn's leaves & stem bark has also been associated to anti-diabetic benefits in (vitro) oral doses of 200–400mg/kg in streptozotocin (STZ) & alloxan-induced diabetes rate reduction⁴⁴.

DPPH, nitrous oxide, hydroxyl radical, & reducing sugar scavenging activities, as well as phyto-chemical screening. Revealed presence of phenolic, sugar, phenolic compounds, glycosides & terpenoids. While ethanolic extract showed N2O scavenging action, aqueous extract was significantly more effective against formation of reactive O2 species (ROS) & reactive nitrogen species (RNS). The research supports its traditional uses for treating a wide range of illnesses & as a source of free radical-scavenging natural anti-oxidants that protect cells from oxidative stress⁴⁵.

The metabolism of glucose has been revealed to be controlled by insulin-like proteins present in *B. vigorum* leaves. The chloroplast protein may help to contribute to overall anti-diabetic properties⁴⁶ by increasing release of insulin in beta-cell line INS-1 cell line.

Molluscidal activity

Researchers tested molluscidal potential of *B.V. Linn* aerial portions on vector snail *Lymnaea acuminata*. The 96-hr. LC₅₀ of ethanolic extract of *Bauhinia variegata*'s aerial component was 14.4mg/L, while 24-hr. LC₅₀ column-purified fraction was 20.3mg/l. A functional molluscicidal component was studied & identified as sponin & quercetin⁴⁷.

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