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Experimental Study on the Modulatory Effect of Bauhinia Variegata Extract in Thyrodism (Wistar Rats).

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Abstract-

Background- Hormonal imbalance, oxidative stress, and pharmacological disruptions can be caused by thyroid disorders such as hypothyroidism, which also modify metabolic processes. Levothyroxine along with other chemical-based drugs are helpful, but prolonged administration may have negative side effects. As a more secure option, medicinal plants with hormonal-modulating and antioxidant functions are being studied.The flavonoids, phenolics, and glycosides found in Bauhinia variegata (Kanchan tree) have been appreciated for their endocrine-modulating, anti-inflammatory, and antioxidant properties. There is, however, little scientific evidence about its impact on thyroid disorders. Therefore, it must be done to assess the potential for treatment in hypothyroidism models.

Aim- To investigate the antioxidative and histology beneficial properties of Bauhinia variegata ethanolic bark extract, and to examine its modulatory effect on PTU-induced hypothyroidism in Wistar rats that are albino.

Method- Albino Wistar rats were given propylthiouracil (PTU) to induce hypothyroidism. The animals were split up into groups for control, disease (PTU- controlled), standard (levothyroxine), also test groups receiving B. variegata ethanolic One hundred, two hundred, and four hundred milligrams per kilogram for bark extracted for a duration of 21 days. Plasma levels of the mineral thyroxine (T4), the triiodothyronine (T3), as well as hormone that stimulates the thyroid (TSH) were determined. utilizing Immunoassay. Body weight, thyroid gland histopathology, and In addition, evaluations were carried out of oxidative stress markers such as malondialdehyde, but also catalase , as well as super oxygen dismutase.

Results- PTU administration resulted in decreased T3 and T4 levels, increased TSH levels, and elevated oxidative stress markers. Treatment with B. variegata extract produced a dose-dependent restoration of thyroid hormone levels and normalization of TSH. The extract also significantly reduced MDA levels while enhancing SOD and CAT activities, indicating antioxidant potential. Histopathological analysis revealed near-normal follicular architecture in extract-treated rats compared to the PTU group.

Conclusion- Effective preventing and therapeutic benefits against PTU- induced hypothyroidism have been identified by the ethanolic bark extract of Bauhinia variegata. Thyroid hormone levels are raised, antioxidant enzyme activity is increased, and normal thyroid histology has been restored. According to these results, B. variegata may be an effective natural treatment option for oxidative stress and thyroid gland disorders.

Index Terms- Bauhinia Variegata, Propylthiouracil, Thyroid Hormones, Hypothyroidism, And Wistar Rats.

I. INTRODUCTION

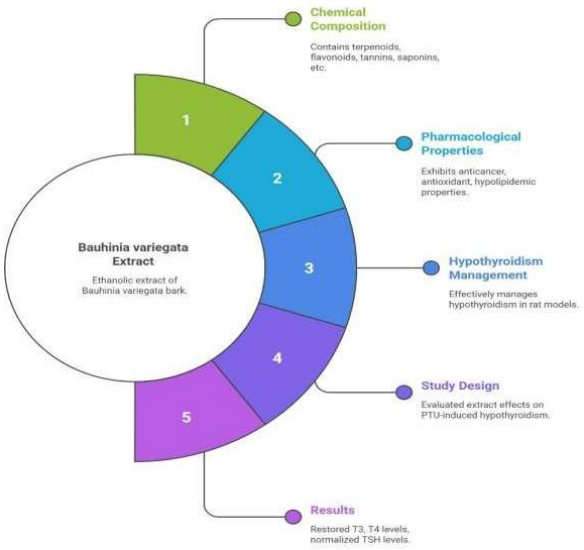

Figure1: Exploring Bauhinia variegata potentical in hypothyroidism management.

Medicinal plants are important sources of raw materials for medicines that treat many human

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illnesses. A World Health Organization (WHO) report states that around 80% of people globally depend on traditional remedies for primary healthcare(1). This reliance brings notable financial benefits for addressing various health issues. The ancient medical method known as Ayurveda has several potential application in treating a variety of modern non-communicable disorders, including hypothyroidism. In underdeveloped nations as well, thyroid disorders have grown to be serious health issues (2). Two thyroid stimulating hormones are thyroxine, also known as T4, and triiodothyronine, also known as (T3).that function as Pitta in the body(3). The Indian medical system refers to and uses different kinds of Bauhinia as Kanchnara. This is Bauhinia variegata Linn as illustrated by Watt. the racemosa Linn of Bauhinia and Rakta Kanchnar. Bauhinia tomentosa, Bauhinia purpurea Linn., and Bauhinia variegata Linn., Shveta Kanchnar was also known as Peeta Kanchnar in Bhavaprakash(4). The Indian medical system refers to and uses different kinds of Bauhinia as Kanchnara(5). This is Bauhinia variegata Linn as illustrated by Watt. the racemosa Linn of Bauhinia and Rakta Kanchnar. Alongside Bauhinia tomentosa, Bauhinia purpurea Linn., and Bauhinia variegata Linn., Shveta Kanchnar was also known as Peeta Kanchnar in Bhavaprakash(6). The many plant parts— Buds, blossoms, leaves, seeds, roots, stems, and stem bark are used in many indigenous medical systems in addition to well-liked by India's diverse ethnic groups for the administration of multiple illnesses. Following several assertions regarding the diverse spectrum of traditional healing qualities of B. variegata, researchers have worked hard to support its effectiveness as a curative agent through pharmacological studies(7). The illness caused by thyroid gland dysfunction is linked to both Gandmala and Galganda in Ayurveda. These days, sedentary lifestyles, poor diets, stress, and hormone imbalances are the main causes of disorders like Galganda and Gandamala(8)(9). The condition can have three main causes: primary, secondary, and tertiary. Peripheral or primary hypothyroidism, which accounts for about 99% of cases of hypothyroidism, is caused by irreversible thyroid destruction or loss brought on by being exposed to radiation, autoimmune problems, etc.(10).

In various languages, Kachnar is referred to by different names(11)(12).

Common name : Bengali Ebony Mountain.
Hindi: Gwiar, Barial, Gurial, Khairwal, Khawairaal, Koliar, Padrian, Kachnar, Kandan, and Kaniar.
Konkani: Kanchan. Malayalam: Unna.
Marathi: Thaur, Raktakanchan. The Mundari: It's Buruju.
Sanskrit: Chamarika,
Tamil: Mandarai.

Bauhinia variegata's phytochemistry and botanical identification :

The medium-sized deciduous tree Bauhinia variegata Linn., often called Kanchanar, is found in India, China, Pakistan, Thailand, Myanmar, and Sri Lanka. It is widely used in Ayurveda for wounds, tumors, ulcers, lymphadenopathy, diseases of the thyroid (Kanchanar Guggulu), and as an antibacterial and anti- inflammatory(13).

- Family: Caesalpiniaceae (Fabaceae).
- Alternate Names: Orchid Tree, Mountain Ebony, Kanchanar
- Name in Ayurveda: Kanchanar
- Bark, leaves, flowers, flower buds, and roots are among the parts used.

II. PHYTOCHEMICAL STUDIES

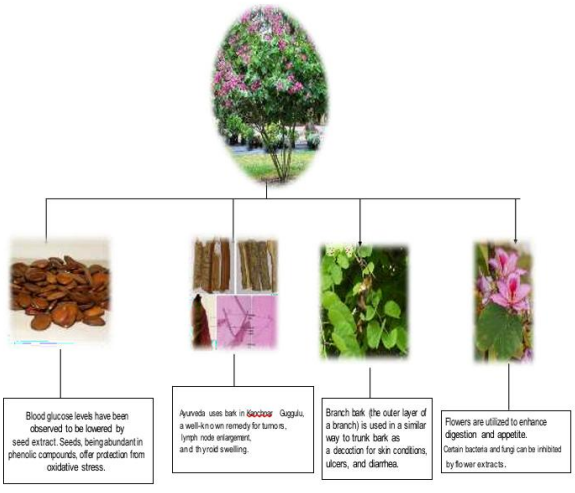

Figure 2. Medicinal uses of different parts of Bauhinia variegata.

Preliminary Phytochemical Studies

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Its many parts, which include leaves, flowers, bark, and the roots were used by ancient herbalists and healers to make remedies for various illnesses.. It was first used as a medical substance to treat a range of ailments. In the Ayurvedic system of India, the Bauhinia variegata flower is known as "Kachnar." It's said to have purifying and cooling properties. Additionally, since it is thought to help the respiratory system, In formulations to improve respiratory health, it has been combined with Bauhinia variegata(14)(15). An initial phytochemical analysis of the ethanol extract revealed the presence of flavonoids, tannins, alkaloids, steroids, and glycosides as active components; however, proteins and carbohydrates were also present in the water extract, alkaloids, tannins, and flavonoids(16).

Root and bark

Bauhinia variegata Linn's root bark underwent a phytochemical examination.This study led to the discovery of a new compound, 2S-5, Dimethoxy-3',4'-2S-5,7a new flavanone, and the compound 5,6-dihydro-1, 7-d Spectrum analyses were used to identify the structures of these novel compounds. Additionally, through spectrum analysis and chemical degradations, researchers determined the structure of a new 5,7,3',4'-tetrahydroxy-3 alpha opyranosyl (13)- O-beta the flavonolglycoside, which was extracted from the roots of Bauhinia variegata(7)(17).

leaves

The leaves also contain crude protein, calcium, and phosphorus. Additionally, the leaves have volatile oil. The oil contained spathulenol, germacrene D, and δ- and γ-cadinene, according to a GC/MS analysis. The leaves include flavonoids such as kaempferol, rutin, and quercetin(18). Research has shown that flavonoids have a substantial impact on blood glucose levels. According to one study, Bauhinia variegata leaf aqueous extract can successfully reduce high The level of plasma glucose is elevated and may have been used to manage diabetes of type I as a medicinal plant(19)(20).

Seeds

Palmitic, linoleic, stearic, aspartic, serine, glutamic, and oleic acids are all found in seeds. Histidine, arginine, tyrosine, Threonine, valine, methionine, proline, glycine, lysine, alanine, leucine, isoleucine, and phenylalanineare among the other substances in addition to proteins(21).

Roots

Contain various phytochemical components, including proteins, gums, mucilages, flavonoids, tannins, phenolic chemicals, carbohydrates, and glycosides. From the root, researchers have isolated new flavone glycosides, such as (5S) 75, 7-dimethoxy-30,40-methylenedioxy synthetic flavanone with 5,7,3'- 4-tetrahydroxy-3-meth5oxy-7-O-α-L-rhamno pyranosyl (1--3)-O-β- galactopyranoside. Moreover, 5,6-dihydro-1 3,4-dimethoxy-2-dihydroxy-7- methyldibenz b,foxepin, a new dihydro dibenz waoxepin,s discovered. (21).

III. PHARMACOLOGICAL STUDY

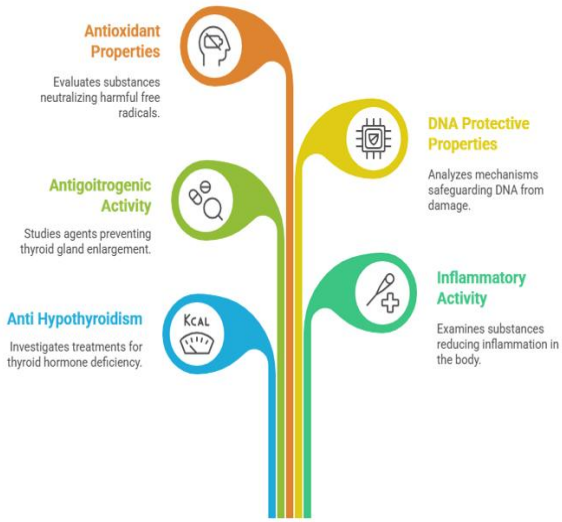

Figure3: Exploring health dimension in pharmacology study.

Antihyperthyrodism activity

The thyroid, or thyroid gland, is a tiny, butterfly-like organ situated near the base of the throat apple of Adam. This endocrine gland is found in the front and sides of the lower neck. The thyroid is responsible for producing hormones. Control the development and maintenance of the brain, heart, muscles, and digestive system. Common Issues with the thyroid include goiter, Hashimoto's thyroiditis has been linked to hypothyroidism, a condition called hyper and tumors of the thyroid. Thyroid malfunction is especially prevalent of them.The thyroid hormones

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triiodothyronine and tetra iodo thyroxine affect every part of our metabolism and significantly impact human health(8)(22).

Inflammatory activity

Researchers assessed the mast cell stabilizing qualities of an Bauhinia variegata bark extract containing ethanol. They used mouse mast cells to look into this stabilizing potential. The number of animals that died following exposure to the dangerous chemical poly-p-methyl phenethyl methylamine (also known as compound 48/80) was used to determine anti-anaphylactic activity. 400 mg/kg of B. variegata ethanol extract (BVEE) markedly decreased mortality by 50% and prevented mast cells from degranulating by 71.18%(23)(24).

Antigoitrogenic activity

In rats suffering from goitre brought on by neomercazole, B. Variegata was shown It can effectively return the goiter-associated thyroid function to its original state at a two hundred milligram everyday dosage(21)(7).

DNA protection and antioxidant properties.

Herbs are applied on piles in order to create an excretory infusion. Dried buds help cure diarrhea, tumors, and worms, as well as piles and dysentery (Asima, 1992). The antioxidant both in vitro and DNA protective properties of The bark of Bauhinia variegata was extracted using methanol help prevent oxidative damage to pBR322 DNA caused by H2O2(25). Powerful antioxidant qualities are exhibited by MEB and its polar sub-fractions (EAB, NBB, and REB, respectively)(26). According to the study's findings, they can stop pBR322 DNA from being oxidatively damaged by H2O2. The different varieties of Bauhinia bark extracts and fractions have substantial antioxidant activity and DNA- protective properties due to their high concentration of phenolic and flavonoid components(26).

Histological studies of thyroid :

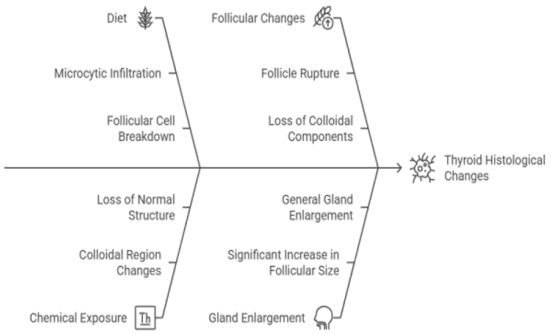

Figure 4: causes of thyroid histological changes(27).

Normal thyroid histology showed well-formed, colloid-filled cells and even epithelium. In the thyroid of the BS-fed animal, when compared to normal, there was generally microcytic infiltration and breakdown of thyroid follicular cells(28). The rupture of follicles and the loss of follicular colloidal components, along with the significant increase in follicular size, indicated clear enlargement of the gland(29). In the glands of thiourea-treated animals, there were obvious changes in the colloidal region and a complete loss of normal structure. Hyperplasia was marked by the resorption of colloidal materials, congestion of follicles due to an increase in their number, and extensive folding and papillae on the epithelium(11)(30).

Table 1- The model and reported activity are displayed in the table(8)

Sr .no.	Activity reported	s that are helpful	The model utilized
1.	Anti-diabetic	leaves	Diabetes caused by Glycogen.
2.	An anti-tumor	A stem	Produce the austere carcinoma of Dalton.
3.	Anti-bacterical	bark	In comparison to strains of bacteria.
4.	Preventing ulcers	A stem	Aspirin-induced ulcers and gastric ulcers brought on by pyloric ligation in the DMBA model
5.	Chemoprevention and cytotoxic effect	Stem	Rats with experimental liver tumors caused by N-nitrosodiethylamine

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6.	Cancer prevention	A Stem bark	Medical mice get skin cancer as a result of DMBA and croton oil.
7.	Hepatoprotective	A Stem bark	CCl4 induced hepatotoxicity
8.	Anti- inflammatory	Non woody aerial part	Edema in the hind paw caused by carrageenan
9.	Anti-thyroidism	Stem bark	impeding the production and distribution of hormones related to the thyroid by the gland that regulates thyroid function

IV. METHODS AND MATERIALS

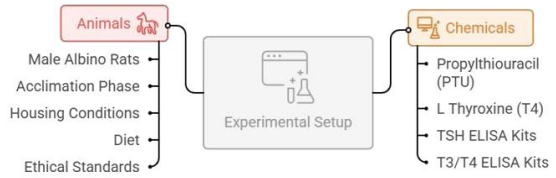

Figure 5: experimental setup for thyroid hormone study(31).

Chemical.

The source of propylthiouracil (PTU) and L thyroxine (T4). TSH was performed using commercially available kits.. Mouse/rat tri-iodothyronine (T3) and (T4) total ELISA kits (32).

Animal

Thirty male albino rats, weighing between 150 and 200 grams, were obtained from the animal house and veterinary medicine .Before the experiment, they were kept for three weeks in an acclimation phase without any therapy. The animals were housed at 21±3ºC in an organized environment with a 12-hour cycle of both light and darkness. They received regular commercial rat chow and free access to tap water. The experiment followed national animal use standards(33)(32).

Prepration of test solutions

PTU was dissolved in 0.01 N sodium hydroxide to make the PTU solution. The remaining volume was filled with injection water. O-phosphoric acid was added to keep the pH between 6.8 and 7.5. Levothyroxine dissolved in distilled water, and the resulting solution was given right away. The tea bag was steeped in water at 90°C for two minutes. The tea mixture was then cooled and given to the rats (34)(35).

Grouping of animal

Table 2. Experimental design for the study of *B. variegata* extract on PTU-induced hypothyroidism in rats(36).

Sr.no	Group	Therapy
1.	Group I	Normal control (just for vehicles)
2.	Group II	Hyperthyroid control (l- thyroxine only)
3.	Group III	L- thyroxine + low dose (200mg/kg) of B. Variegata extract
4.	Group IV	L- thyroxine + high dose (400 mg/kg) B. Variegata of extract
5.	Group V	L-thyroxine + standard drug (propylthiourical 10 mg)

Materical and method

Studies that have been published in a variety of peer-reviewed online and offline journals as well as online databases like PubMed, MedlinePlus, Information regarding the Pharmacological mechanisms as well as preclinical outcomes of chemically induced hypothyroidism in mammalian was gathered through searches on sites like Sodhganga, Google Scholar, and others, and summarized for an evidence-based study. In order to derive useful conclusions from classical data,Ayurvedic classics such as the Charaka Samhita and Sushruta Samhita were also examined(37).

Analysis of serum

The blood tests for T3, T4 and thyroid stimulating hormone (also known as TSH) levels have been checked using internal radiation-induced immune methodologies for assessment.triglycerides using a

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laboratory analytical analyzer, glucose, and NEFAs. A rat insulin enzyme-linked immunosorbent assay (ELISA; Mercodia, Uppsala, Sweden) measured serum insulin concentrations (38)(39).

V. TOXICITY EVALUATION

These rats were administered given dosages of 2000 or 5000 mg/kg body weight of the aqueous extract (AE) in order to assess the immediate toxic effects of B. variegata bark. The research team monitored activity, mortality, and other hematopoietic parameters associated with medical conditions, biological chemistry, and logic(40). The greatest allowable dosage (maximum tolerated dose) for the side effects has been found to be 5,000 mg/kg.Repeated-dose tests showed the lowest level of adverse effects at 1000 mg/kg. Compared to control groups, The organs' weight and shape were unaffected by oral B. variegata administration(23).

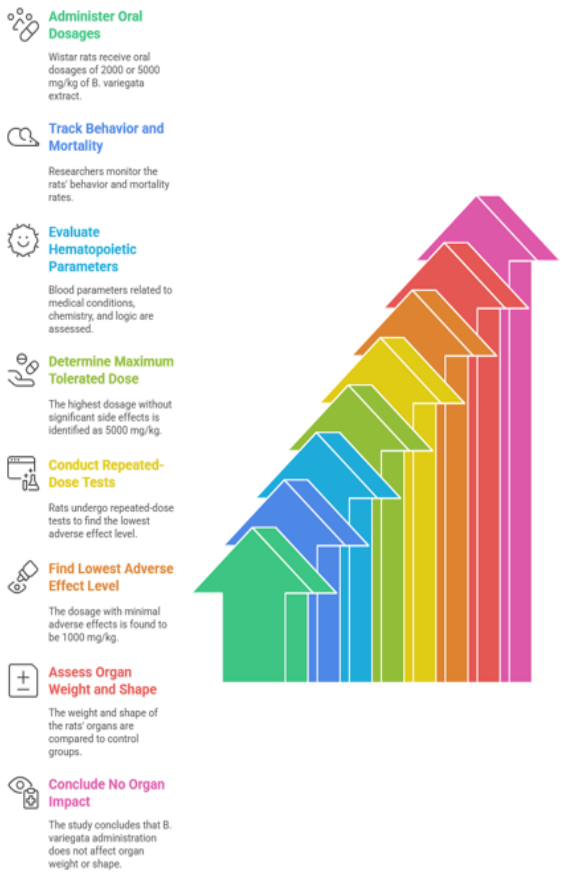

Figure 6: Toxicity evaulation *b. variegata* bark (26)

VI. CONCLUSION

The effects during this process investigation unequivocally demonstrate that the ethanolic extracted of Bauhinia variegata bark has a noteworthy modulatory influence on the thyroid hormone imbalance that Wistar rats are subjected to. Propylthiouracil TSH levels significantly increased as a result of treatment, but serum levels of T3 as well as T4 significantly decreased, confirming the induction of hypothyroidism, weight gain, and structural damage to thyroid follicles. Nevertheless, all of these changed parameters significantly improved after receiving therapy with Bauhinia variegata extract, particularly at the higher dosage of 400 mg/kg. The findings substantiate the great therapeutic potential of Bauhinia variegata bark extract, which can be regarded as a safe, natural, and efficient supportive treatment for thyroid problems. To identify the active chemical or compounds and assess clinical uses in people, more research is advised.

REFERENCE

[1] Hina Gul a, Muhammad Awais a, h,∗, Salina Saddick b, Yazeed Ahmed c, Falak Sher Khan d, Eilaf Ahmed c, Umara Afzal a, g, Syed Muhammad Zaigham Abbas Naqvi e, Muhammad Asghar Khan f, Muhammad Gulfraz a GKR a. PMC Disclaimer | PMC Copyr Not.

[2] Verma A, PG Scholar, Dept. of Kayachikitsa PKSG (Auto. . AC and, Institute, Bhopal, Madhya Pradesh I, Ninama R, PG Scholar Dept. of Ras Shastra and Bhaishajya Kalpana, Pt. Khushilal Sharma Govt. (Auto.) Ayurveda College and Institute, Bhopal, Madhya Pradesh I, Meshram R, et al. Evaluation of efficacy of an Ayurvedic treatment protocol in the management of Hypothyroidism- A randomized clinical study. J Ayurveda Holist Med. Vol. 11 No.

[3] Shrestha DS. Review on Hypothyroidism as per Ayurveda. Heal. 2021 Feb 3;2(1):74–9.

[4] THE AYURVEDIC PHARMACOPOEIA OF INDIA. VOLUME – I.

[5] Naresh S, Garg K, Sharma O. A REVIEW ARTICLE ON : KANCHNARA (BAUHINIA VARIEGATA LINN .). 2021;7(6):143–7.

[6] Singh A, Singh N, Pabla D. A Review on Medicinal Uses of Bauhinia Variegata Linn. Pharma Tutor. 2019;7(6):12–7.

[7] Mali RG, Mahajan SG, Mehta AA. Phcog Rev. : Plant Review Rakta Kanchan (Bauhinia variegata): Chemistry, Traditional and Medicinal uses- a review. Pharmacogn Rev. 2007;1(2):14–9.

[8] Article R, Systems A, Singh P, Tiwari RC, Bhutiani R, Singh V. Review Article. 9583:3349–53.

[9] Kathleen Dungan 10, JohannKenneth R Feingold 1, S. Faisal Ahmed 2, Bradley Anawalt 3, Marc R Blackman 4, Alison Boyce 5, George Chrousos 6, Emiliano Corpas 7, Wouter W de Herder 8, Ketan Dhatariya 9es Hofland 11, Sanjay Kalra 12, Gregory Kaltsas 13, Nit DPW 33.

[10] Joshi AM, Yadav RA, Shrestha S, Shrestha J. Efficacy of Ayurvedic herbal formulation and Ayurvedic herbo- mineral formulation in hypothyroidism patients. 2021;7(4):237–46.

[11] Irchhaiya R, Kumar A, Gurjar H, Gupta N, Kumar S, Kumar M. PLANT PROFILE, PHYTOCHEMISTRY AND PHARMACOLOGY OF BAUHINIA VARIEGATA LINN. (KACHNAR): AN-OVERVIEW. Int J Pharmacogn 279 IJP. 2014;1(5):279–87.

[12] Tanika A, Tanika T, This person is not on ResearchGate or hasn't claimed this research yet., Vaishnavi, Ravinder K, Sharma S.

[13] K. Sudheerkumar, S. Seetaramswamy, K. Ashok Babu PKK. Phyto pharmacognostical and isolation of chemical constituents from bauhinia variegata leaf extract. J Pharmacogn Phytochem.

[14] Surya K, Road K, Pradesh M. THE REVIEW ON THE IMMUNOMODULATORY POTENTIAL OF BAUHINIA VARIEGATA

[15] FLOWER EXTRACT Kiran Surya * and Akhlesh Kumar Singhai School of Pharmacy, LNCT University, Kolar Road, Bhopal - 462042, Madhya Pradesh, India. 2024;15(10):2895–905.

[16] Bhargav1 MDK, 1Department of Pharmaceutical Chemistry, Krupanidhi College of Pharmacy, Bangalore, Karnataka I. Isolation and Characterization of Major Phytochemical Constituents from Bauhinia variegata Leaf Extract.

[17] Mali R, Dhake A. Evaluation of effects of Bauhinia variegata stem bark extracts against milk-induced eosinophilia in mice. J Adv Pharm Technol Res. 2011;2(2):132.

[18] Mopuru V B Reddy 1, Muntha K Reddy, Duvvuru Gunasekar, Cristelle Caux BB. A flavanone and a dihydrodibenzoxepin from Bauhinia variegata.

[19] Raghuveer Irchhaiya 1, Anurag Kumar * 1, Himanshu Gurjar 2, Nikhil Gupta 3 SK 3 and MK 1, Department of Pharmacognosy 1, Department of Pharmaceutics 3, Institute of Pharmacy, Bundelkhand University, Jhansi - 284128, Uttar Pradesh I, Department of Pharmacognosy, Institute of Pharmacy 2, LNCT Gwalior - 474002, Madhya Pradesh I. PLANT PROFILE, PHYTOCHEMISTRY AND PHARMACOLOGY OF BAUHINIA VARIEGATA LINN. (KACHNAR): AN-OVERVIEW. Int J Pharmacogn.

[20] Vijay Kumar MMJ1*, Eswarappa B2, Yadav D. Bodke3, Jayadevaiah KV1 BH, 1PG Dept. of Pharm.Chemistry, SJM College of Pharmacy, SJMIT Campus, Chitradurga, Karnataka I. ISOLATION OF PHYTOCONSTITUENTS FROM THE STEM BARK OF BAUHINIA VARIEGATA LINN.

[21] Shahana S, Pratima A, Nikalje G. Brief Review on Bauhinia variegata: Phytochemistry, Antidiabetic and Antioxidant potential. Am J PharmTech Res. 2017;7(1).

[22] Kumari I, Kaurav H, Choudhary G. Bauhinia variegate (Kanchnara), An ornamental Plant with significant value in Ayurvedic and Folk Medicinal system. Himal J Heal Sci. 2021;6(2):1–16.

[23] ByLaura Boucai, MD WCMC, Reviewed ByGlenn D. Braunstein, MD CSMC. Overview of Thyroid Function.

[24] Oy AS· VC· S. Exploring the bioactive properties and diverse uses of Bauhinia variegata: a comprehensive review. Discov Plants. 2025;2(1).

[25] Ansari KA, Assistant Professor F of, Unani Medicine J, Hamdard, New Delhi I. The assessment of the effect of extracts of Bauhinia variegata against the compound 48/80 induced mast cell degranulation and systemic anaphylaxis . J Med Plants Stud 2014; 2(4) 73-76Bauhinia variegata, Compd 48/80, mast cell Stab Syst anaphylaxis.

[26] Neha Sharma1, Renu Bhardwaj1 SK and SK. Evaluation of Bauhinia variegata L. bark fractions for in vitro antioxidant potential and protective effect against H2O2-induced oxidative damage to pBR322 DNA.

[27] Khare P, Kishore K, Sharma DK. Historical aspects, Medicinal uses, Phytochemistry and Pharmacological review of Bauhinia variegata. Asian J Pharm Pharmacol. 2018;4(5):546–62.

[28] Megumi Horiya, Takatoshi Anno, Fumiko Kawasaki, Yuichiro Iwamoto, Shintaro Irie, Yasumasa Monobe, Koichi Tomoda, Kohei Kaku SN& HK. Basedow's disease with associated features of Hashimoto's thyroiditis based on histopathological findings.

[29] Müşerref Bostancı 1, Burak Kaptaner 2 AD 3. Thyroid-disrupting effects of bisphenol S in male Wistar albino rats: Histopathological lesions, follicle cell proliferation and apoptosis, and biochemical changes.

[30] David S. Cooper BB. Subclinical thyroid disease. Lancet. Volume379(Issue number9821).

[31] Singha MB, Sarma T, Lahakar M. Effect of Ethanolic Extract of Bauhinia variegata and Commiphora mukul in Regulating Thyroid Stimulating Hormone in Hypothyroidism Induced Albino Wistar Rats. J Drug Deliv Ther. 2019;9(2-s):35–9.

[32] Chad Deisenroth, Valerie Y Soldatow, Jermaine Ford, Wendy Stewart, Cassandra Brinkman, Edward L LeCluyse, Denise K MacMillan RST. Development of an In Vitro Human Thyroid Microtissue Model for Chemical Screening. Volume 174(Issue 1 March 2020).

[33] Asim SF, Hamzah FZ, Al-Sharafi NMN. Ameliorative effect of rosemary leaves extract on thyroid gland function in hyperthyroid male albino rats. Biochem Cell Arch. 2020;20(1):1241–6.

[34] Iraj Salehi 1, Maryam Sahab Soleimani 2, Mona Pourjafar 3, Fahimeh Ghasemi Moravej 4, Sara Soleimani Asl 1 4*. Vitamin C Can Alter Lead- Induced Passive Avoidance Learning Impairment in Rat.

[35] Chen YK, Lin CL, Chang YJ, Cheng FTF, Peng CL, Sung FC, et al. Cancer Risk in Patients with Graves' Disease: A Nationwide Cohort Study. Thyroid®. 2013 Feb 19;23(7):879–84.

[36] Sneha Singh a, Vandana Panda a,*, Sudhamani S b PD c. Protective effect of a polyherbal bioactive fraction in propylthiouracil-induced thyroid toxicity in ratsby modulation of the hypothalamic–pituitary–thyroid and hypothalamic–pituitary–adrenal axes. PMC Disclaimer.

[37] Nellufar1, Konica Gera2 P (Dr. . BSS and P (Dr. . BK. Bauhinia Variegata & Hypothyroidism–An Evidence Based Literary Review. Int J Multidiscip Innov Res ISSN 2583-0228 Vol 2, Number 3 (Jul' 2022) pp 22-26 © CIIR, Noida, INDIA.

[38] Dixit AK, Sarkar M, Nair PG, Puia L, Bora M, Gaidhani SN, et al. Efficacy of Ayurvedic Interventions in Hypothyroidism. J Res Ayurvedic Sci. 2019;3(4):157–63.

[39] Negi A, Sharma N, Singh M. Spectrum of Pharmacological Activities from Bauhinia variegata: A Review. J Pharm Res. 2012;5(2):792–7.

[40] Annika Herwig 1,, 2, Gill Campbell 1, Claus-Dieter Mayer 3, Anita Boelen 4, Richard A Anderson 1, Alexander W Ross 1, Julian G Mercer 1 PB.

[41] Makadiya, Vikash S. | Kulkarni, Yogesh A. | Apte KG. Acute and 28-Day Repeated Dose

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