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A REVIEW ON *TRICHODESMA INDICUM*

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Abstract:

The aim of the proposed study was to collect the useful information of the traditional medicinal plant Trichodesma indicum and upgrade the knowledge about the plant. It mainly belongs to the family Boraginaceae. This plant is mainly used to cure various diseases like Arthritis, Fever, Skin disease, Arthralgia and Dysentry traditionally. Each part shows the activity of anti-inflammatory, analgesic, antipyretic, antimicrobial and antidiabetic activity. This review founds that Trichodesma indicum is valuable medicinal plant for various therapeutic uses.

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INTRODUCTION:

The plant kingdom is the most important treasure of the nature. Mother earth has given vast resources of flora and fauna both terrestrial and marine. The Indian subcontinent is enriched by a variety of aromatic and medicinal plants. This extensive flora has been greatly utilized as a source of many drugs in the Indian traditional system of medicine.[1]

PHARMACOGNOSY

Pharmacognosy is defined as the study of crude drugs obtained from plants, animals and mineral kingdom and their constituents. The word Pharmacognosy is derived from two Latin words pharmakon, 'a drug' and gignoso, 'to acquire knowledge of'. It means 'knowledge or science of drugs. The word 'pharmacognosy' were probably first coined by Johann Adam Schmidt (1759-1809) in his manuscript *Materia Medica*, which was published in Vienna in 1811. It was C.A. Seydler, a medical student at Germany, in 1815 that created the term Pharmacognosy in his doctoral thesis *Analectia Pharmacognostica.*

In India medicinal properties of plants are described in Rigveda and in Atharvaveda (3500-1500B.C). The basic medicinal texts in this world region are Charaka Samhita, Susruta Samhita, Ashtanga Hrdayam Samhita.[2]

SCOPE

During the first half of the nineteenth century apothecaries stocked the crude drugs for the preparation of herbal tea mixtures, all kinds of tinctures, extracts and juices which in turn were employed in preparing medicinal drops, syrups, infusions, ointments and liniments. Then medicinal plants became one of its major objects of interest and in time.

The second half of the nineteenth century witnessed a galloping growth in the field of medicinal plants where by the Phytochemist's gainfully succeeded in isolation and characterization of the pure active constituents. Eventually, these active constituents replaced the crude drugs, with the development of semisynthetic and synthetic medicine. Thus, the fate of herbal drugs became more prominent and brighter gradually.

Even up to the beginning of twentieth century pharmacognosy was a descriptive subject mainly to botanical science, now disciplines like organic chemistry, biochemistry, biosynthesis, pharmacology and modern methods are incorporated.

Today applied science of pharmacognosy has a better knowledge of the active constituents and the prominent therapeutic activity on the human beings. Researchers are exploiting not only the classical plants but also related species all over the world that may contain similar type of constituents. Just like terrestrial germplasm, investigators had also diverted their attention to marine flora and fauna, and wonderful execution of genetic engineering aspects and tissue culture which provides a step towards a genetically modified products and bio transformed natural products. Population rises, inadequate supply of drugs, prohibitive cost of treatments, side effects of several allopathic drugs and development of resistance to currently used drugs for infectious diseases have led to increased emphasis on the use of plant materials as a source of medicines for a wide variety of human ailments.[3,4]

Lastly, crude drugs and their products are profitable commercial products, it is estimated that world market for plant drugs may account for about 2,00,000 crores. When these are collected from wild sources, the amount collected could only be small, the price commanded was exorbitantly high. Drug plants, standardised extracts and therapeutically active pure constituents have become a significant market commodity in the international trade. In the light of these glorious facts, scope of pharmacognosy seems to be enormous in the field of medicine, bulk drugs, food supplements, pharmaceutical aids, pesticides, dyes, tissue culture, biotechnology, engineering and so on.[4]

DRUG DISCOVERY FROM PLANTS

Green plants synthesis and preserve a variety of biochemical products, many of which are extractable and used as chemical feed stocks or as raw material or various scientific investigations leading to the discovery of drugs from plant. Current research in drug discovery from natural source includes numerous interdisciplinary fields and various methods of analysis including botanical, phytochemical, biological and molecular techniques

Ethnobotanical approaches are the base for selecting the appropriate model for investigation. After that botanical identification and stabilization is done which is further subjected to extraction and isolation of constituents. Purity of isolated is obtained using modern chromatographic techniques, then it is subjected to characterization and confirmation of compounds. Bioassays are performed to find its therapeutic potential and toxicities, then subjected to development of formulations. Prepared formulations are standardized and subjected to various clinical and non- clinical examinations.[5]

FUTURE

Today, herbs are staging a comeback and herbal 'renaissance' is happening all over the globe. The blind dependence on synthesis is over and people are returning to the naturals with hope of safety and security. Plant kingdom still holds many species of plants containing substances of medicinal value which have yet to be discovered; now the large numbers of plants are constantly being screened for their possible pharmacological value. The use of modern isolation techniques and pharmacological testing procedures may find their way into medicine as purified substances rather than in the form of galenical preparations. An integrated approach for the cultivation, conservation and preservation of important plant species through plant molecular biology, plant tissue culture; research on the rationale and methodology of ayurvedic medical practice; isolation of active constituents and their development into new therapeutics; standardization and validation of known herbal medicines and other related aspects needed to be focused upon.

The future development of herbal drug industry and pharmacognosy would be largely dependent upon the reliable methodologies for identification of marker compounds and also upon the standardization and quality control. The extend of development will be based on pharmacognosists and Phyto chemists that is how they explore the wonder drug molecules from nature.[6,7]

PLANT INTRODUCTION

The Genus Trichodesma

Trichodesma R.Br. is a genus of about 45 species known from tropical and subtropical regions of Africa, Asia and Australia. Brown described *Trichodesma* in 1810. It belongs to the family Boraginaceae established by Jussieu. The group comprises predominantly perennial herbs, the flowers characterized by anthers with prolonged connectives, often twisting above the thecae, and a prominent accrescent calyx, the absence of fomices, anthers usually with fairly long, soft hairs on the back. The name *Trichodesma* is derived from the Greek words, *thrix* or *trikhos* (hair), *desme* (band or bundle). *Trichodesma* plants have been used in traditional medicines throughout the world to treat common diseases such as ear pain, intestinal worms, wounds, cough, fever, dysentery, and rheumatism.[8,9]

Trichodesma indicum R. Br

Trichodesma indicum R. Br is generally known as Indian Borage and belongs to Boraginaceae family which is a major group of angiosperms. The plant is found as a weed throughout the greater parts of India and stony dry wastelands of Pakistan. Later it has been distributed in many south Asian region such as Bhutan and Burma. The plant is acrid and bitter in taste. It is an erect, spreading, branched and annual herb, about 50 centimetres in height with hairs springing from tubercles.[10,11]

Fig no 1: *Trichodesma indicum*

VERNACULAR NAMES [12,13]

Hindi	-	Chhotakalpa
Gujarati	-	Undhanphuli
Kannada	-	Kattetumesoppu
Tamil	-	Kalluthaithumbi
Telugu	-	Guvvagutti
Marati	-	Chotakalpa
Sanskrit	-	Adhapushpi
English	-	Indian borage

SYNONYMS

- *Boraginella indica (L.) Kuntze*
- *Borago indica L.*
- *Borago spinulosa Roxb.*
- *Borraginoides sagittate Moench*
- *Pollichia indica (L.) Medic.*
- *Trichodesma amplexicaule Roth*
- *Trichodesma hirsutum Edgew.*
- *Trichodesma perfoliatum Wall.*
- *Trichodesma spinulosum Voigt*
- *Trichodesma subsessile Wall.*

SCIENTIFIC CLASSIFICATION [10]

Kingdom - Plantae
Phylum - Tracheophyta
Class - Magnoliopsida
Order - Boraginales
Family - Boraginaceae
Genus - *Trichodesma*
Species - *Trichodesma indicum*

BOTANICAL DESCRIPTION OF TRICHODESMA INDICUM[10,14]

Habitat	Altitude – 1500m Found throughout India on roadside and stony dry wasteland.
Habit	Erect, spreading, branched and annual herb.
Height	50 cm
Leaves	Stalkless, opposite, lanceolate, 2- 8cm long pointed at the tip and heart-shaped at the base.
Flowers	Flowers occurs singly in the axils of the leaves and usually violet, light blue or purple in colour. The calyx is green, hairy and 1- 1.3cm long with pointed sepals. The corolla is pale blue with limb about 1.5cm in diameter and the petals are pointed.
Fruits	Fruit is ellipsoid and is enclosed by the calyx. The nutlets are about 5mm long and rough on the inner surface.
Seeds	4 Nutlets
Fruiting season	Throughout the year
Flowering season	September – November and January – March

Fig no 2: Flower of *Trichodesma indicum*

Fig no 3: Flower bud of *Trichodesma indicum*

Fig no 4: Root of *Trichodesma indicum*

Fig no 5: Leaf of *Trichodesma indicum*

Usage of *Trichodesma indicum* plants in folk medicine[11]

S.No	Plant part used	Uses	Place of use
1.	Roots	To reduce swelling. To cure body ache and anasarca.	Chota Nagpur, India. Kandhamal district, Orissa.
2.	Leaves	Healing of cuts, wounds, and bleeding.	Kandhamal district, Orissa, and various places in Tamil Nadu, India.
3.	Fresh leaves	To cure stomach upset and dysentery to children.	Tiruchirappalli, Tamil Nadu, India.
4.	Leaves and roots	To cure tumor, snake bite and urinary diseases.	Chattisgarh, India.

CHEMICAL CONSTITUENTS[11,15]

The major chemical constituents of *Trichodesma indicum* are steroids, triterpinoidal saponins and flavonoids. Phytochemical investigation revealed the presence of phytosterols, tannins, sugars, flavonoids, protein, saponins and free amino acids.

S.No	Category of phytocompounds	Constituents present
1.	Terpenoids	Alpha-amyrin, lupeol
2.	Fatty acids and esters	Oleic acid, linoleic acid, palmitic acid, stearic acid, linolenic acid, n-decyl laurate, n-tetradecanyl laurate, n-nonacosanyl palmitate, stigmast-5-en-3β-ol-21(24)-olide, and lanast-5-en-3β-D-glucopyranosyl-21(24)-olide(18,19)
3.	Alkaloids	Monocrotalline, supinine (13-15)
4.	Aliphatic hydrocarbons and ketones	Hexacosane, n-pentacos-9-one, n-dotriacont-9-one-13-ene
5.	Steroidal compounds	Stigmast-5-en-3β-ol-23-one

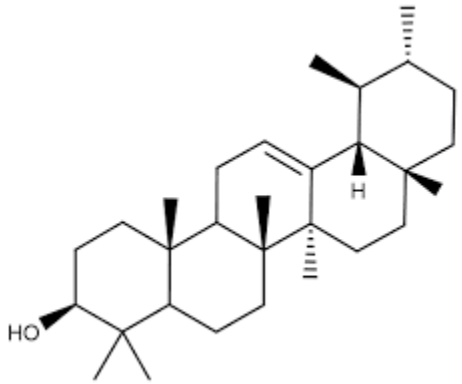

Fig no 6: Structure of α – amyrin

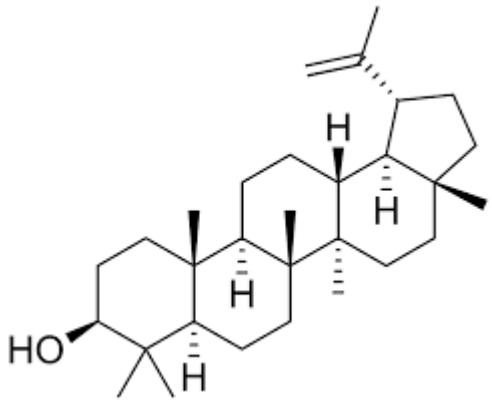

Fig no 7: Structure of Lupeol

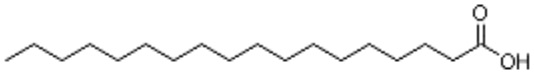

Fig no 8: Structure of Stearic acid

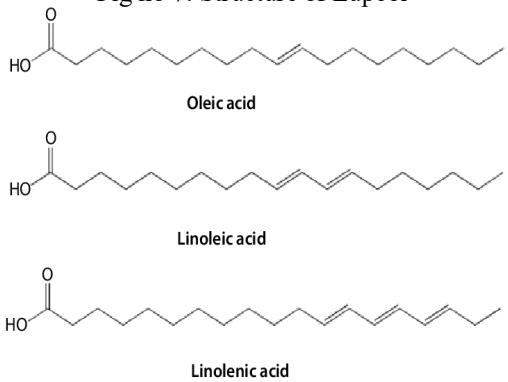

Fig no 9: Structure of Oleic acid, Linoleic acid, Linolenic acid

REVIEW OF LITERATURE:

K. Srikanth*; et al*; in 2002 observed that the methanol extract of whole plants of *Trichodesma indicum* R.Br. has significant inhibition in frequency of sulphur dioxide induced cough reflux in Swiss albino mice. It is effective in all the tested doses when compared with untreated control group.

James B. Perianayagam; *et al;* in 2006 studied that the chloroform extract of *Trichodesma indicum* has been evaluated for anti- inflammatory activity against oedema produced carrageenan, dextran, histamine and serotonin, and against formation of granulation tissues by cotton pellet in rats. The effect was compared with

the activity of indomethacin, cyperoheptadine and dexamethasone against different types of inflammation.

K. Ravi Shankar; *et al*; in 2008 subjected various extract of the plant *Trichodesma indicum* to preliminary phytochemical screening and it was shown that flavonoids, triterpenes, tannins, saponins were present. Flavonoids and triterpenes were present in alcoholic extract, tannins and saponins in aqueous extract, steroids and saponins in petroleum ether and chloroform extract and these were confirmed by thin layer chromatographic study.

Neelambra Verma; *et al;* in 2008 found that *Trichodesma indicum* of family- Boraginaceae is a cross pollinated species. Its complete regeneration was accomplished through in vitro techniques. The zygotic embryos placed on Murashige and Skoog medium fortified either with kinetin, n- benzyl aminopurine or alpha naphthalene acetic acid produced callus and adventitious shoots, whereas those placed on medium supplemented with 2,4 dichlorophenoxy acetic acid formed callus. On subculture, the nodal pieces produced axillary shoots and that were suitable for further proliferation.

Shweta S. Saboo; *et al;* in 2009 found that *Trichodesma indicum* has been used for its therapeutic effect in folk medicine that include anti-inflammatory, analgesic and anticancer properties. In this work the shoot extract of Trichodesma indicum are screened for their antimitotic and antiproliferative activities.

James B. Perianayagam; *et al;* in 2011 evaluated the ethanol extract of *Trichodesma indicum* for possible analgesic and antipyretic potential using several experimental models and the ethanol extract at doses of 100, 200 and 400 mg/kg exhibited in significant inhibition of acetic acid induced abdominal constrictions in mouse. The extract also produce a dose related fall in rectal temperature in rat for up to 4 hrs after its administration in a dose dependent manner and the efficacy was similar to that of aspirin.

Sudharshan Reddy Dachani; *et al;* in 2012 done study to provide *in-vitro* evidences for antioxidant and antidiabetic potential of *Trichodesma indicum* and to generate a stronger biochemical rationale for further investigation animal models and support traditional claim.

Vanitha A; *et al;* in 2015 studied the phytochemical and anatomical structure of *Trichodesma indicum R.Br.* In this study the macroscopic and microscopic characters were used to establish botanical identity of the herbal drug. The methanolic extract showed the presence of secondary metabolites like flavonoids, alkaloids, steroidal compounds, saponins, tannins and phenolic compounds. Aqueous extract showed the presence of flavonoids, alkaloids, steroids, saponins and tannins.

K. Narendra; *et al*; in 2015 screened four extracts (HETI, ACTI, METI and AQTI) of *Trichodesma indicum* and invitro anti-inflammatory enzymatic assay showed significant inhibition against lipoxygenase. *In-vivo* and inflammatory activity was determined by carrageenan induced rat paw oedema method in experimental rats. The findings of studies demonstrated both *in-vitro* and *in-vivo* anti-inflammatory activity of the leaves of *Trichodesma indicum.*

P.L.Rajagopal; *et al;* in 2016 studied the phytochemical screening and *in-vitro* anti-inflammatory activity of the alcoholic and aqueous extracts of the flowers of *Trichodesma indicum.* The phytochemical screening revealed the presence of flavonoids, terpenoids and steroids. During screening it was found that the ethanolic extract of the flower has significant anti-inflammatory activity in comparison with the aqueous extract of the same plant.

K. Narendra; *et al;* in 2016 investigated the antidiabetic activity of *Trichodesma indicum* in both *in-vitro* amylase assay and *in-vivo* streptozotocinnicotinamide induced type 2 diabetic rats. *Trichodesma indicum* leaves where extracted with four solvents hexane, acetone, methanol and aqueous. The results showed that methanolic leaf extract has moderate α- amylase inhibitory activity when compared to acarbose. The antidiabetic activity of four extracts prominently reduces blood glucose level in streptozotocinnicotinamide induced diabetic rats. Methanol extract has shown estimable decrease of blood glucose level along with glibenclamide. These findings suggest that antidiabetic property of *Trichodesma indicum* methanol extract in type 2 diabetic mellitus is potential.

CONCLUSION:

The study of *Trichodesma indicum* plant revealed that this plant is used traditionally in the treatment of various diseases. The presence of certain phytochemicals shows medicinal properties such as alkaloids, glycosides, flavonoids, saponins, steroid and cardiac glycosides. Ethanobotanical studies shows that various parts of this plant are useful for anti-inflammatory, anti-pyretic, anti-diabetic, antioxidant, antimitotic, analgesic activity. Monocrotalline, supinine (13-15) are some alkaloids and Alpha-

amyrin, lupeol are some terpenoids that are mostly found in this plant. Still, many of potentials of this plant towards a number of diseases are unexplored.

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