Review Article

CULTIVATION, PHYTOCHEMISTRY, PHARMACOLOGICAL ACTIONS AND THERAPEUTIC APPLICATIONS OF ERYTHRINA INDICA. Lam.

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ABSTRACT: Medicinal plants are the nature's gift to human being to make disease free healthy life. It plays a vital role to preserve our health. In our country more than 2000 medicinal plants are recognized. *Erythrina indica* (Fabaceae) is one of the important medicinal plants of coasts of India and Malaysia. Some of its medicinal usage has been mentioned in traditional system of medicine such as ayurveda, siddha and unani. This review attempts to encompass the available literature of *Erythrina indica* with respect to traditional uses, phytochemistry and summary of its pharmacological activities and clinical effects. Other aspects such as toxicity are mentioned.

Keywords: Erythrina indica, phytochemistry, clinical applications, pharmacological actions.

INTRODUCTION

Plant and plant products are being used as a source of medicine since long. According to world health organization (WHO) more than 80% of the world's population, mostly in poor and less developed countries depend on traditional plant based medicines for their primary healthcare needs. Medicinal plants are the nature's gift to human being to make disease free healthy life. It plays a vital role to preserve our health. India is one of the most medico culturally diverse countries in the world where the medicinal plant sector is part of a time honored tradition that is respected even today. Here, the main traditional systems of medicine include Ayurveda, unani and siddha. The earliest mention of the use of plants in medicine is found in the Rigveda, which was written between 4500 and 1600 BC. In recent times, focus on plant research has increased all over the world and a large body of evidence has collected to show immense potential of medicinal plants used in various traditional systems (Ayurveda, Siddha and Unani). Medicinal plants are assuming greater importance in the primary health care of individuals and communities in many developing countries. There has been an increase of demand in international trade because of very effective, cheaply available, supposedly have less or no side effects and used as alternative to allopathic medicines.

Erythrina indica: [1] [2]

Plant species:

Erythrina indica is a showy, spreading tree legume with brilliant red blossoms belonging to family Fabaceae. Commonly known as the 'Indian coral tree' in Asia or 'tropical coral' in the Pacific, this highly valued ornamental has been described as one of the gems of the floral world. It has also proven valuable for fodder production and as a sturdy component of windbreaks. It is a useful species for soil enrichment because it modulates readily and prolifically in both acid and alkaline soils. Farmers in India appreciate *E.indica* as fodder, light timber and, more recently, pulp for the paper industry.

Taxonomy: [3] [4]

Erythrina indica falls under the scientific classification as follows

Scientific classification

Kingdom	:	Plantae
Division	:	Magnoliophyta
Class	:	Magnoliopsida
Order	:	Fabales
Family	:	Fabaceae
Genus	:	*Erythrina*
Species	:	*E. indica*
Binomial name		*Erythrina indica*

Vernacular names: [4] [5]

Indian coral tree or tropical coral tree or tiger's clow or moochy wood tree or variegated coral tree is called as *erythrina indica* in English, paribadra in Sanskrit, ferrud, dadap, pharad in Hindi, badisa, bodita in Telugu, murukku, mulmurukku in malyali, varjipe, harivana in kannada, palidhar palitu-mudar in Bengali, kalyan – morangai in Tamil and in siddha system of medicine, panarawas, pararoo in Gujarati, pangara in marati.
Paribhadra, paaribhadraka, paarijaataka, Mandaara, Kantaki-palaasha, kant-kimsshuka, rakta pushpa nimbataru.

- In unani system of medicine it is called as "Pangrah".

In other countries

French	:	Arbre immortel
German	:	Indischer korallen baum
Nepalese	:	Phaludo
Japanese	:	Deigo
Tibetan	:	Pa-ri
Indonesian	:	Thong baan, dede bineh
Thailand	:	Thong laang laai.

Botanic description [6] [7]:

E. indica is a compact shrub with knobby stems. It posses dense clusters of deep crimson flowers, that spread broadly open. Erythrina indica is a medium-sized, spiny, deciduous tree normally growing to 6-9 m (occasionally 28 m) tall and 60 cm dbh. Young stems and branches are thickly armed with stout conical spines up to 8 mm long, which fall off after 2-4 years; rarely, a few spines persist and are retained with the corky bark. Bark smooth and green when young, exfoliating in papery flakes, becoming thick, corky and deeply fissured with age. Leaves trifoliate, alternate, bright emerald-green, on long petioles 6-15 cm, rachis 5-30 cm long, prickly; leaflets smooth, shiny, broader than long, 8-20 by 5-15 cm, ovate to acuminate with an obtusely pointed end. Leaf Petiole and rachis are spiny. Flowers in bright pink to scarlet erect terminal racemes 15-20 cm long; stamens slightly protruding from the flower. Fruit a cylindrical torulose pod, green, turning black and wrinkly as they ripen, thin-walled and constricted around the seeds. There are 1-8 smooth, oblong, dark red to almost black seeds per pod. Erythrina comes from the Greek word 'eruthros' meaning red, alluding to the showy red flowers of the Erythrina species.

Origin and distribution [6] [7] [8]:

Erythrina indica is a native of costal forest communities from east Africa, through southeast to Australia. Frequently planted inland throughout the Philippines. In India it is distributed in coast forests from Bombay to Malabar and from the sundribuns along the coast through arkan, pegu and tenasserim and in the Andaman's and nicobars much planted for ornament. This tree common in Bengal and many parts of India especially in southern often grown in gardens as a support for black pepper vines and for providing shade to young cinchona plants.Parts used: stem bark, leaves, and roots.

Cultivation [9] [10] [11]

Cultivation Parameters

Ecology

E.indica is indigenous to the low-elevation deciduous forests of South Asia, found widely scattered throughout the region on plains and undulating terrain up to about 750 m elevation.
The tree occurs in a wide range of soils frequently on deep alluvial loams, silts and clays. On gravelly skeletal soils, its growth is normally stunted. It is somewhat frost-sensitive, tender shoots dying back but quickly re-grows under favourable conditions. Preferred rainfall is in the range 500-1500 mm annually; survives with less when planted along water courses or irrigation channels

Climate

The tree is found in the humid tropics and subtropics and can tolerate a wide variety of climates within this zone. It does particularly well in monsoonal climates that have a wet summer and a dry winter, and it requires little water during the winter dry season, because it drops its leaves
at that time. The rainfall in its natural environment ranges from 800 mm (32 in) to 1500 mm (60 in). It is usually found in the lowlands from near sea level to 250 m (800 ft), but it can be planted up to 1500 m (5000 ft) elevation. Elevation range is Lower: near sea level, upper: 250 m (800 ft) or more in nature, but can be grown at up to 1500 m (5000 ft) near the equator

Soils

It can be grown in a wide range of soil types. Although it prefers sandy loams, it will do well in clay and loam soils. It also is tolerant of a wide range of soil pH, ranging from 4.5 to 8.0. It can do well in nutrient-poor soil, as it fixes nitrogen. Soil texture Tolerates light to heavy texture soils (sands, sandy loams, loams, and sandy clay loams, sandy clays, clay loams, and clays).

Management

The seed storage behaviour is orthodox. Seeds germinate well (60-75% for fresh seeds); they can be stored for a long time if kept in cool, dry and insect free conditions. There are about 4500-6250 seeds/kg. This is also dependant on use; if for example, it is used as a support crop for the betel vine. It should be planted 3-4months before the main crop is planted out. When used as a shade tree for coffee it should be pollarded at 2-3m yearly.
Propagation and planting: Propagation is by two common methods, cuttings and seeds. Large branch cuttings can easily be planted to form new trees, as described below. Cuttings are the only way to propagate clonal varieties, as seeds are not true to type.

Propagation from cuttings

Cutting collection

This tree is most commonly propagated vegetatively for live fences, windbreaks, and establishment in areas where livestock is present (which could eat shoots from small seedlings). Large-size branch cuttings are used, usually 2–3 m (6.6–10 ft) in length and 5–10 cm (2–4 in) in diameter. Smaller cuttings may be used, a minimum of 30 cm (1 ft) in length and a diameter of 4–5 cm (1.8–2 in). However, larger cuttings at least 1.5 m (5 ft) long will establish more quickly, survive better against competition from weeds, and be less susceptible to damage or destruction from grazing animals. It is best to retain the terminal bud of branch cuttings to ensure fast new top growth. However, in many cases growers cut one Long Branch into several cuttings, and therefore this is not always feasible. Cuttings can be taken any time of year, although the ideal time is when the new growth is appearing, usually at the onset of the rainy season.

Storage of cuttings: Cuttings are stood upright in shady, dry, and cool conditions for a minimum of 24 hours and a maximum of 2 weeks. This standing time allows the cuttings to dry slightly and helps prevent rotting and fungal problems.

Out planting

Whether planted directly in the field or in nursery containers, the cuttings should be grown in sunny conditions. After planting, soil moisture should be maintained, although overwatering can easily cause the buried part of the cutting to rot. For larger stakes 2–2.5 m (6.6–8.3 ft) tall, the lower portion of the cutting is buried 20–40 cm (8–16 in) deep.

For smaller cuttings, generally about 20% of the cutting's length should be underground. Planters should make sure to plant cuttings correct side down! Some recommend dipping the top portion of the cutting in pruning wax to help keep moisture from rotting the wood. Another strategy for avoiding rot on the top portion of the cutting is to make sure the top is cut at an angle so that rainwater is shed. The planting holes may be sprinkled with VAM mycorrhizal fungi inoculant (an aid to establishment and growth in P-deficient soils) and rhizobia bacteria inoculant. The soil should be firmed around the base of the cutting. Incisions should be made in the bark of the part of the cutting that will be underground in order to improve rooting. It takes About a month for axillary shoots to appear.

Pests and diseases

There does not appear to be any serious pests of the Indian coral tree. However when planted on pepper plantations, root damage by *Rhaphipodus* has been identified. The species is a host to the fruit-piercing moth *Othreis fullonia*, a serious pest in the Pacific islands. The tree itself is not particularly susceptible to diseases, but borers may infest weakened trees and some species of caterpillars can damage foliage. In Hawai'i, the leaves are susceptible to attack by powdery mildew (*Oidium* sp.), especially during the winter rainy season. In 2005, a serious new pest was identified in Hawai'i, the erythrina gall wasp (*Quadrastichus erythrinae*) (Heu et. al 2006). This pest has also been reported in American Samoa and Guam, as well as parts of Southeast Asia. The wasp larvae develop inside the young leaf petioles and stems, and cause galls to form Severe infestations have been reported throughout Hawai'i. These infestations can cause complete defoliation and death of trees. Treatments with certain pesticides have been effective at reducing infestations, although such treatments are impractical for most people. Until this problem is resolved, planting of coral tree in Hawai'i is not recommended.

Growth and Development

The tree is grown from cuttings or seed. Sapling growth is rapid, and a 1-year-old sapling can reach 3 m (10 ft) in height. Growth continues to be rapid during its young years. Trees as young as 3 or 4 years old can start flowering.

Growth rate

It typically reaches 3 m (10 ft) in height in a year, and 15–20 m (50–66 ft) in 20 to 25 years. On favorable sites, the stem can reach a diameter at breast height (dbh) of 50–60 cm (20–24 in) in 15 to 20 years.

Flowering and fruiting

Flowering and fruiting are seasonal. Flowering occurs when the tree is leafless in the summer, and fruiting soon follows. Its flowering time was used as a seasonal indicator in some places (e.g., in Samoa its flowering indicated that whales would soon be running in the adjacent ocean).

Yields

It is not usually used for fodder in the Pacific, but yields of 15–50 k

Genetic resources where collections exist

Seed collections are stored in Costa Rica (the Centre for Tropical Agricultural Research and Training [CATIE]), and the seeds or the plants are often obtainable at local nurseries.

Tribal Uses or Folkloric Uses [5] [6] [7] [12]

Seeds:

Seeds are used in folk remedies for cancer in Annam. Reported to have the same medicinal attributes as *Erythrina indica,* whose bark is used for fever, hepatosis, malaria, rheumatism, toothache, also for boils and fractures. Perry (1980) cites many more uses for *Erythrina indica*.

Bark:

The bark is used for poulticing fresh wounds in Malasia. Boiled roots are taken internally or externally for beri-beri. Grated wood used for hematuria.The tree yield a bark brown gum of little importance. The bark is used for tanning and dyeing; it yields a fiber suitable for cordage. The bark is antibilious and febrifuge, useful as a collyrium in ophthalmia. The inner side of the bark is smeared with ghee and held over the flame; the soot thus deposited is used in watery eye, tinea-tarse, and purulent conjunctivitis, being applied to the inner side and edges of the lower lid.

Wood:

The wood is light and soft, fairly durable. In India it is used for making light boxes, toys, sieve frames, trays, planking jars for house hold purposes. Rheumatic lumbar and leg pain - take 9 to 15 gms dried bark in decoction or in the form of alcohol (wine) infusion.

Root:

The root is used for rheumatism. Bark and leaves serve as a vermifuge. A decoction of root bark together with a dose of vasanta kusumaker rasa daily every morning in cases of diabetes is said to reduce the quantity of urine and sugar with in a short time. Young roots of the white flowered variety are pounded and given with cold milk as an aphrodisiac.

Leaves:

The tender leaves are eaten in curry. In the trichinopoly district the leaves are used as cattle fodder. In Indo-China they are used to wrap minced meat. Infantile convulsion, ascariasis: Take 2.5 to 3 gms pulverized leaves in the form of snuff. The fresh juice of the leaves taken in two ounce doses is a good vermifuge and cathartic, it is also injection in to the ear for the relief of ear-ache and as an anodyne for toothache. The leaves are externally applied to disperse venereal buboes and to relieve pain and inflammations in the joints. The trifoliate leaves are employed in the treatment of venereal buboes, inflammatory swellings of lymph nodes especially in the groins and armpits.

- In India and China, the bark and leaves are used in many traditional medicinal concoctions. Paribhadra, an Indian preparation, destroys parasites and relieves joint pains. Honeyed leaf juice is used for tapeworm and roundworm diseases. The juice also helps stimulate lactation and menstruation. A poultice of leaves is used for rheumatic joints.

Ayurvedic properties and actions [5] [13]:

Rasa : Tikta, Katu
Guna : Sara
Virya : Usna
Vipaka: Katu
Karma: Vatahara, Kaphahara, Medohara, Krmighna

Important Formulations

Nyagrodhadi churna, Abhaya Lavana, Narayana Taila.

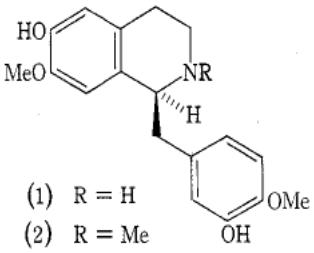
Uses In Ayurveda [5] [13]

The leaves and bark are the parts used. Paribhadraka enjoys a reputation as an antidote to strychinine. Its leaves are aperient; they also encourage the start of menstruation and of milk secretion. The bark helpful in gallstone colic and liverishness, and is an expectorant, febrifuge, and vermifuge.

Phytochemistry [14] [15] [16] [17] [18] [19]:

Erythrina indica contain several phenolic metabolites, such as pterocarpans, isoflavones, flavanones and chalcones, some of which displayed antiplasmodial activity, antimycobacterial
Activity (Khaomek et al., 2004) and cytotoxic activity against various cancer cell lines. It also contain alkaloids like N-norprotosinomenine (I), protosinomenine **(2),** erysodienone (3), /3-erythroidine, erysopine, erythraline, erythramine, erysodine, erysotrine, erythratine, N,N-dimethyltryptophan, hyparphorine and it also contains sterols like campesterol, β-sitosterol, β-amyrin. The isoflavones named as indicanines D and E together with 11 known compounds including 6 isoflavones like genistein, wighteone, alpinum isoflavones, dimethyl alpinum isofavone, 8-prenyl erythrinin 'C' and erysenegalensein E and one

Erythrinassinate B. Flavonoids include apigenin, genkwanin, iso-vitexin, swertisin, saponarin, 5-O-glucosylswertisin and 5-O-glucosylisoswertisin. Glucoside swertiamarin, a triterpene betulin have also been isolated. The alcohol insoluble portion of the unsaponifiable matter has yielded n-hexosamol, heptacosine, nonacosane. The non saponifiable matter of the petroleum ether extract has yielded myristic, stearic and oleic acids.



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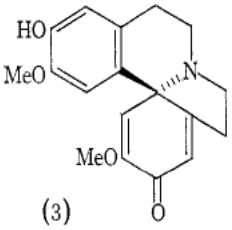

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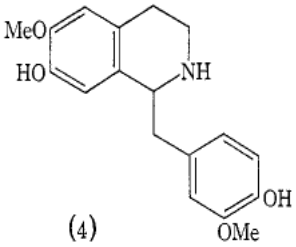
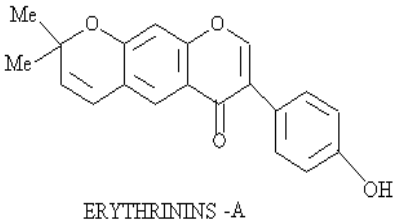
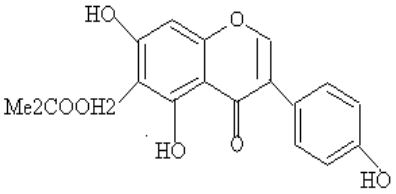


(4)

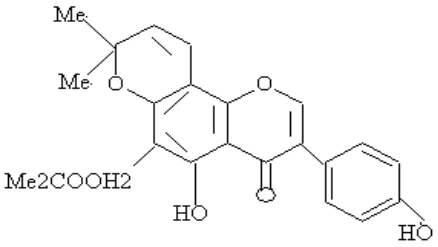
And also it contain erythrinins A, B, C.



ERYTHRININS -A



ERYTHRININS -B



ERYTHRININS - C

A new 3-phenylcoumarin, indicanine A (**1**), has been isolated from the root bark of the African medicinal plant *Erythrina indica*, together with three known compounds, robustic acid (**2**), daidzein, and 8-prenyldaidzein. The structure of the new compound was characterized, as 4-hydroxy-5-methoxy-3-(4‘-methoxyphenyl)-2‘‘-(1-methylethenyl)dihydrofurano[4‘ ‘,5‘ ‘:6,7] coumarin by means of extensive spectroscopic analyses. The compounds were found to be devoid of *in vitro* antibacterial activity. *E. indica* and *E. variegata* bark peelings are used as padding in certain storage bins. Ito (1999) isolated five oxy-erythrinan alkaloids with insecticidal properties, erythrinine, 11- hydroxyerysotrine, erysotramidine, erytharbine, crystamidine and a dibenz {d,f} azonine type alkaloid, erybidine, from *Erythrina* plants.

Pharmacological actions:

Anti-osteoporotic Effect [20]:

Study showed that E. indica (syn: E.variegata) could suppress the high rate of bone turnover induced by estrogen deficiency and improve the biomechanical properties of bone in the lab rats./ Journal of Ethnopharmacology / July 11 2006

Cytotoxicity [21]:

Study isolated five compounds from the methanol extract of stem bark of EV: epilupeol, 6-hydroxygenistein, 3ß, 28-dihydroxyolean-12-ene, epilupeol, and stigmasterol. Diiferent partitionates showed mild to moderate antimicrobial activity and varying degrees of cytotoxicity./ Journal of Phytochistry/August 01 2001.

Anthelmenthic activity [22]

The method described by Dash et al. was employed for evaluating anthelmintic activity. *Pheritima posthuma* (obtained from horticulture department, Madurai, Tamilnadu, India) of approximately equal size (15 Cm) was divided in to seven groups. Each group consists of six earth worms of same type and treated with any of the following. Fifty milliliter of test solution containing 50 and 100 mg /ml of test extracts (Ethanol, Chloroform and Ethyl acetate extract of leaves of *Erythrina indica*) and Piperazine citrate (10mg/kg). The Mean time of paralysis and death was recorded in minutes. The paralysis time was recorded when no movement of any sort could be observed except when the worms were shaken vigorously. Time for death of worms were recorded when worms were neither moved while shaken vigorously nor when dipped in warm water (50°C). /The Internet Journal of alternative Medicine ISSN: 1540-2584 / December 2009.

Anti ulcer activity [23]:

S Sakat Sachin et.al studied Antiulcer activity of methanol extract of *Erythrina indica* (family: Febaceae) leaves in pylorus ligated and indomethacin induced ulceration in the albino rats. The methanol extract of *E. indica* leaves possess significant antiulcer properties in a dose dependent manner. In conclusion the antiulcer properties of the extract may be attributed to the polyphenolic compounds that are present in it. / Pharmacognosy magazine / December 2009.

Diuretic Activity [24]:

The method of Lipschitz *et al* was employed for the evaluation of diuretic activity. The animals were divided in to five groups (six in each) deprived of food and water for 18h prior to the experiment. On the day of experiment, the Group I animals received normal saline (20 ml/kg. p.o.), the Group II animals received furosemide (20 mg/kg. i.p.), the Group III, IV and V animals received Ethanol, Chloroform and Ethyl acetate extracts (250 mg/kg) respectively. Immediately after the administration, the animals were kept in metallic cages (two per cage) specially designed to separate urine and feacal matter and kept at room temperature (20±0.5oC). The total volume of urine was collected at the end of 5h. During this period no water and food was made available to the animals. The parameters accounted for ascertaining the diuretic activity are total volume of urine and the urine concentration of Na+, K+ and Cl-.

The Na+ and K+ were measured by ß ame photometry and Cl- concentration was estimated by titration with silver nitrate solution (N/50) using 3 drops of potassium chromate as indicator. The student T. value was employed for statistical analysis. All the values expressed are Mean ± S.E.M. $P< 0.05$ (Compared to control) was considered significant./ International Journal Of Green Pharmacy / July 11 2008.

Analgesic activity [25]:

Haque et.al were studied, the peripheral analgesic activity of methanolic extract of leaf of *E. indica (syn: E.variegata)* was determined by the acetic acid induced writhing inhibition method. The inhibition of writhing in mice by the plant extract was compared against inhibition of writhing by a standard analgesic agent, aminopyrine given orally at a dose of 50 mg/kg body weight. The number of writhing was calculated for 10 min 5 minutes after the acetic acid injection. The percentage of pain protection was calculated. The analgesic activity was determined by radiant heat tail-flick model in mice.Morphine was used as the standard analgesic agent. Tail-flick latency was assessed by the analgesiometer (Inco, India). Tail-flick latency was measured 60 minutes after the drug administration. The methanolic extract of leaf of E.indica possesses significant analgesic activity. / Journal of Pharmaceutical Science.

Cardiovascular effects [26]:

G.K. Chatterjee et.al were studied, The intravenous administration of the aqueous extract at a dose, varying from 0.1-0.4mg/kg produced a sharp and short lived fall in B.P., both in cats and rats in acute experiments. The cats were sensitive as regards the hypotensive action than rats, since a moderate fall was noted with 0.12 mg/kg while in rats the hypotensive response noted only after 0.4 mg/kg. On the isolated frog hearts the extract has no action in smaller dose but at a dose of 5mg resulted a complete but reversible block of the heart. / Indian Journal of Pharmacology / March 20 1981

Effect on skeletal muscle [26]:

G.K. Chatterjee et.al were studied, The aqueous extract as such failed to produce any response in isolated frog rectus abdominis muscle and did not influence the acetyl choline induced contractions even with a dose upto 7.5 x 10^{-5}g/ml./ Indian Journal Of Pharmacology / March 20 1981

Effect on smooth muscle [26]:

G.K. Chatterjee et.al were studied, The aqueous extract produced a contraction of intestinal smooth muscle in isolated guineapig-ileum preparations at a dose of 1.3 x 10^{-5} g/ml; it is abolished by tretreating the ileum with dephenhydramine but not abolished by pretreatment with atropine./ Indian Journal Of Pharmacology / March 20 1981

Respiratory effects [26]:

G.K. Chatterjee et.al were studied, In smaller doses, the extract did not affect the respiration in urethane treated guinea-pigs but at higher doses the rate of respiration increased but there was no change in its amplitude. The effect generally persisted for 15.20 minutes. At a very high dose (4.6 mg/kg, iv) the respiration become shallow and in some cases even there was a short – lasting apnoea. / Indian Journal of Pharmacology / March 20 1981

CNS effects [26]:

G.K. Chatterjee et.al was reported to the extract was relatively non-toxic and the mice can tolerate a dose more than 500 mg/kg, ip of the extract. For CNS activity the extract was administrated at a dose of 80 mg/kg im. Pretreatment of mouse with the extract neither potentiated nor reduced the pentobarbitone dose induced sleeping time. Similarly the extract failed to protect the mouse significantly from pentylenetetrazol induced convulsions./ Indian Journal Of Pharmacology / March 20 1981

Antioxidant activity [27]:

Saraswathy A., et.al were investigated the ethanolic extract of the stem bark of Erythrina indica was screened for its invitro antioxidant activity by Ferric thiocyanate (FTC) and thiobarbituric acid (TBA) methods were employed and it was found that the ethanolic extract of the stem bark of erythrina indica possess significant antioxidant activity./ Indian drugs .

Toxicity [28] :

In a toxicity study, lorge dose of this plant extract administration causes liver and kidney disorders in rats and pigeons. No toxicity has been reported with the standard dose in humans.

Conclusion:

"Necessity is the mother of invention". This dictum fully applies to the rural or primitive societies, which have to discover solutions to almost all their needs and problems from the natural resources around them. There are over 400 different tribal and other ethnic groups in India. The tribal constitute about 7.5% of India's population. A part from the tribal groups many other forest dwellers and rural people also possess unique knowledge about the plant. In recent years, ethnomedicinal studies received much attention as this brings to light the numerous little known and unknown medicinal virtues especially of plant origin. They obviously deserve evaluation on modern scientific lines such as phytochemical analysis, Pharmacological screenings and clinical trials. In the present article, we have reviewed the relevant literatures to congregate the botanical, Ethno botanical, phytochemical and pharmacological information on *Erythrina indica*. A survey of literature revealed that the plant is having promising cytotoxic, antidiuretic, antioxidant, analgesic, antiulcer, anthelmenthic and osteoporotic activity. A critical analysis of the literatures also pin points the fact that although the number of diseases for which *E.indica* finds use as a medicine is fairly large, yet its therapeutic efficacy has been assessed only in few cases. In view of the wide range of medicinal uses of *E.indica* as mentioned in Ethno botanical surveys, Ayurveda, unani system and otherwise, it is imperative that more clinical and Pharmacological studies should be conducted to investigate unexploited potential of this plant.

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