



“*Erythrina variegata* L.” The Coral Tree: A Review

Authors

Preeti Kumari, Chandrawati Kumari

P.G. Department of Biotechnology, A.N. College, Magadh University, Patna

Email: preetikri32@gmail.com

ABSTRACT

Traditional Health System recommends use of plant extract which continues to provide health coverage to a large population especially in developing countries. In recent year, interest in formulating plant based medicine has grown rapidly. The global medicine markets have high demand of herbal plants extract and this demand is increasing day by day. Medicinal Plants are source of many noble drugs compounds. Secondary metabolites are a source of biological active natural products with high potential in various ailments. *Erythrina variegata* L. commonly called “Coral plant” show the presence of alkaloids, flavanoids, glycosides, steroids, phenols, tannins, saponins and resins in different solvent leaf extract. 50 numbers of Farmers/ Natives were interviewed with a structural questionnaire in order to understand the utilization of this plant in different areas. Most of the participants (85%) responded positively for the medicinal use of the coral plant, especially its leaves, roots and barks whereas some respondents are not clear. This plant is also utilized for general shade and shade tree (63%), Fence making (39%), food (22%), animal feed (28%) and burning wood (68%). Overall the tree is in general regarded as a beautiful, ornamental, green canopy, highly useful plant by Patnaites. The nutritive values of the leaves extract of *Erythrina variegata* was analysed and the leaf extract is moderate in nutrition and important constitute such as Protein, Fibre, Tannins, Ca, P, Mg, K, Na & S. However, its consumption by human is not in practice but the foliage of the plant is extensively consumed by animals. The result indicated presence of 278 g/Kg DM (Dry material), 79mg Ash, 175 mg Crude protein, 610 Nutrient detergent fibre, 340 Acid detergent fibre, Crude tannins, Calcium, Phosphorus, Magnesium, Potash, Sodium and Sulphur respectively. The leaf extract was found to be rich in potassium (K), moderate in Magnesium and poor in Sodium. The proximate analysis of standardization of *Erythrina* leaf was conducted, the result indicate the presence of Ash, Water- soluble ash, Acid-soluble ash, Ethanol soluble extractive, Water soluble extractive, Chloroform soluble extractive, Ethyl acetate soluble extractive and Loss on Drying percentage. This shows that the crude drugs assessing its genuineness and mitigating adulteration. The presence of inorganic ions in plants is necessary for vital activity. The qualitative inorganic ions analysis of *Erythrina variegata* revealed the presence of Iron, Magnesium, Potassium, Sodium, Calcium, Nitrate, Phosphorus and the absence of Sulphate and Chloride. This plant can be used as a better alternative against variety of degenerative diseases. The Coral plant “*Erythrina variegata* L.” is highly potential medicinal plant of multiple uses, commonly found all over in and around the city of Patna. However, the people are largely, unaware of its Nutritive, Medicinal and useful value, resulting in continuous decrease in its population by cutting and uprooting.

KEYWORDS: “*Erythrina variegata* L.”

INTRODUCTION

Medicinal Plants are nature’s gift to human society to make free from various ailments and gives a healthy life to people. Thousands, medicinal plants recognized by Ayurvedic medicinal practitioners and researcher in our

country. An effort to details a review survey of the literature by knowing the properties of “*Erythrina variegata* L.” the coral tree belonging to the family “Fabaceae”, and the major role in Ayurveda, Unani, Siddha and Homeopathy. This “Green medicine” is safer and more dependable

than costly synthetic drugs due to their adverse side effect. "*Erythrina variegata*" plant is often planted as a wind-break, beautification and also for medicinal use. It is valuable as shade tree. In India it is found throughout, often cultivated. Beside our country it is also common in Sri Lanka, Myanmar, Polynesia and Malaysia (Hort.ifas.ufl.edu. 2010).

DESCRIPTION

Erythrina species: All over the world in recent years, there is an upsurge and interest in the use of medicinal plants, crude extracts and active ingredients to treat various ailments. This is due to the need to discover new molecular structures as lead compounds from plant kingdom. Several medicinal plants which are grown in India, some are omnipresent, tough and easily grown; one such plant is *Erythrina variegata*, the coral plant. *Erythrina spp.* is universally recognized for their high biomass productivity and utilization almost always involve frequent pruning (Hegde, 1993).

The Taxonomy of *Erythrina spp.*: The coral tree *Erythrina* belongs to Kingdom: Plantae – Plants, Division: Magnoliophyta – Flowering plants, Class: Magnoliopsida – Dicotyledons, Family: Fabaceae (Legume family), Subfamily: Papilionoideae, Genus: *Erythrina* L. – Coral Tree, Species: *E. variegata* L. Scientific name of *Erythrina variegata* var. *orientalis*, Common name: Coral Tree/ Farhad. Family: Leguminosae. Origin: Oriental regions. Uses: shade tree, food and medicine.

Morphology of *Erythrina variegata* L.

Erythrina is a fast-growing, 50 feet tall and wide deciduous tree with green and yellow-variegated, six-inch-long leaves creates a broad canopy but has spiny branches (Photo 1 to 6). In spring, before the leaves appear, Coral Tree is decorated with showy red blossoms, each flower 2.5 inches long and arranged in dense, six-inch long racemes. These blooms are followed by 12-inch long, red/brown seedpods, which contain poisonous seeds. (Edward, F. *et.al.* 1993).

Height: 50 to 60 feet; spread: 40 to 50 feet
Crown; Uniformity: symmetrical canopy with a regular (or smooth) outline, and individuals have more or less identical crown forms; **Crown shape:** round, vase shape; **Crown density:** dense; **Growth rate:** fast.

Texture: Coarse Foliage; **Leaf arrangement:** alternate; **Leaf type:** odd pinnately compound, trifoliate; **Leaflet margin:** entire; **Leaflet shape:** deltoid, ovate; **Leaflet venation:** pinnate, reticulate; **Leaf type and persistence:** deciduous; **Leaflet blade length:** 2 to 4 inches; **Leaf colour:** green; **fall colour:** no fall colour; **fall characteristic:** not showy.

Seed: Placed in pod. Pod torulose, deep brown, stipulate; Seeds are Kidney-shaped or Bean-shaped 1-1.5 cm in length and they simply fall on the ground for their dispersion and regeneration (Cui L, *et.al* 2009).

Flower, Rachis and Blades: Beautiful Red colour Flower; characteristics: showy, spring flowering, beautiful long lasting. Flowers scarlet: 2.5 cm across in 5-15 cm long, dense racemes, Rachis is mostly 10–20 cm (4–8 in) long; Blades are ovate to rhomboid, 8–18 cm long, Lateral ones are smaller than the terminal one with vegetative parts finely pubescent. They are deciduous just before and during the flowering season (Kumar, A. *et.al.* 2010).

Fruit- Fruit covering: dry or hard; **Fruit colour:** brown; **Fruit characteristics:** does not attract wildlife, inconspicuous and not showy; no significant litter problem. Fruits are compressed.

Trunk and Branches- Trunk/bark/branches: bark is thin and easily damaged from mechanical impact, routinely grown with, or trainable to be grown with; multiple trunks; grow mostly upright and do not droop; showy trunk; thorns are present on the trunk or branches; **Pruning requirement:** requires pruning to develop strong structure; **Breakage:** resistant.

Calyx and Corolla: Calyx is top-shaped, deeply split along one side, 1–1.8cm long, on a pedicel 2–5mm long. Corolla is papilionaceous; standard

is short-clawed, ovate to sub elliptic, 3–4cm long, red-orange with longitudinal white lines.

Ovary: Ovary is superior, stamens 10, diadelphous, with 9 fused together at the base, enclosed within the keel. Keel is as long as the wings, greenish to pale red.

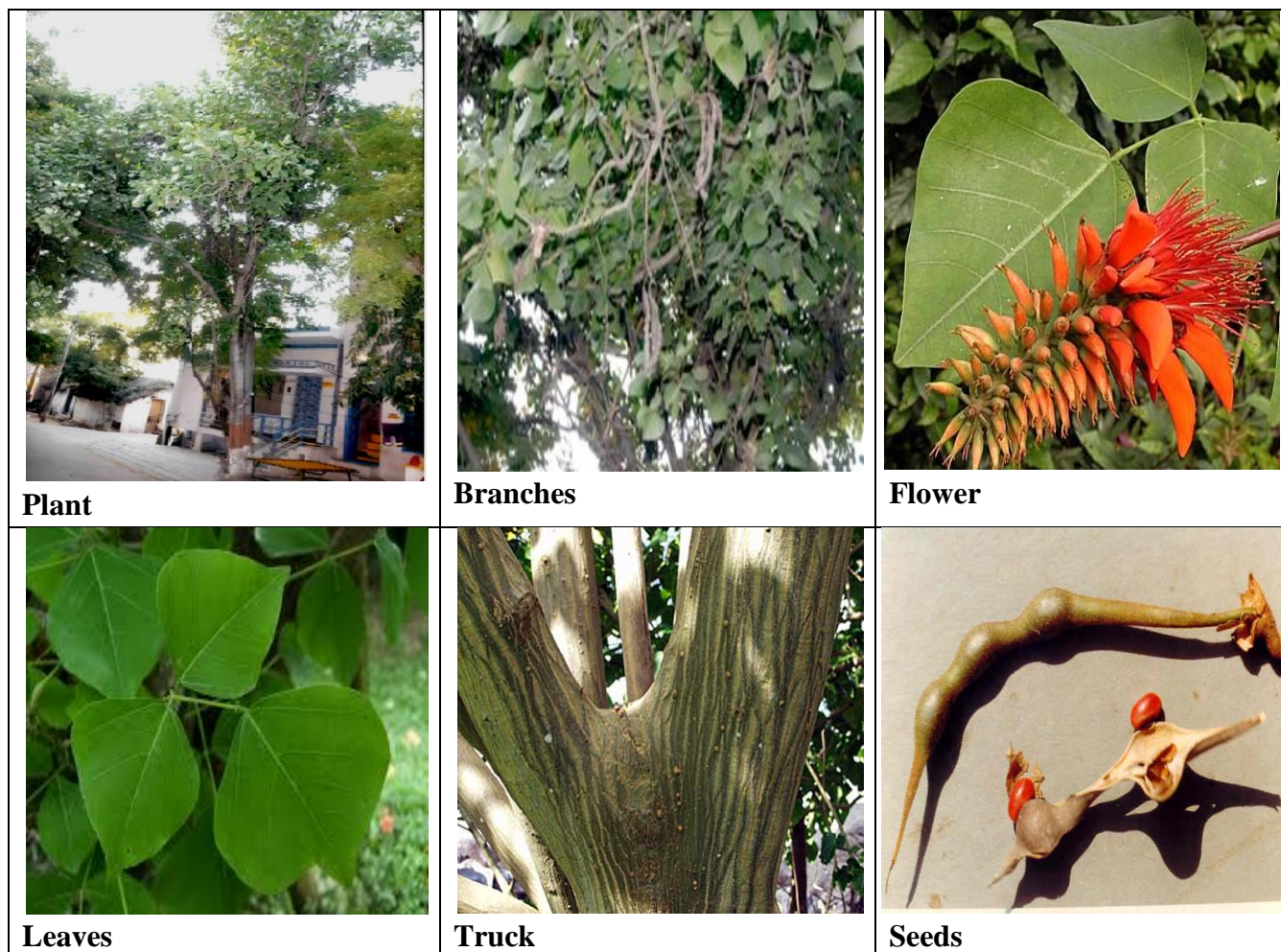
Twig color: brown, gray; Twig thickness: stout; thick.

Flowering Season: Its Flowers, come in March, Fruits appear in Apr. – July and sometime Flowering from July to November.

Cultural- Light requirement: tree grows in full sun ;Soil tolerances: clay, loam, sand, acidic,

alkaline and well-drained ; Drought tolerance: high aerosol salt tolerance, moderate; Roots: surface roots can lift sidewalks or interfere with mowing; Winter interest: tree has winter interest due to unusual form, nice persistent fruits, showy winter trunk, or winter flowers; tree: tree has outstanding ornamental features and could be planted more; Invasive potential: little, if any, potential at this time; Pest resistance: very sensitive to one or more pests or diseases which can affect tree health or aesthetics.

Photo 1: Erythrina plant and its Parts: (1) Whole Plant, (2) Branches, (3) Flowers, (4) Leaves, (5) Trunk and (6) Seeds



Use and management: The large size of Coral Tree makes it suited for planting in parks, golf courses and in other large-scale landscapes.

Multiple trunks ascend from the lower portion of the main trunk giving rise to a wide spreading canopy casting dense shade. Lower branches

droop to the ground if they are allowed to remain on the tree. Give this tree plenty of room to develop since the canopy is large and the tree looks wonderful with a symmetrical crown. Since the trunk often flares or buttresses at the base, plant it at least 10 feet from a sidewalk or driveway. Coral Tree should be grown in full sun on well drained soil. Trees are highly drought-tolerant and moderately salt-tolerant. Propagation is easily done by seeds, cuttings, or division.

Pests & Diseases: Stem and Leaves borers may infest weakened trees; Caterpillars eat significant amounts of foliage; No diseases are of major concern.

Medicinal Importance of *Erythrina spp.*: The coral plant is a multiuse plant for human as well as animals. It is used as Food: The new leaves are eaten in curries, as Fodder: Used as livestock fodder when lopped as it is rich in nitrogen (4% of dry weight), as Fiber: the bark is stringy and provides a strong fibre that is used in rope making, as Medicine: the bark and leaves is used in stomach disorders, anti-abortion treatment, malarial fever and liver problems, as Timber: The wood is light, soft, does not split and neither warps, making it suitable in applications where heavy wood is unsuitable such as in small curved articles and Tannin and Dyestuffs: A red dye is extracted from its flowers and many more. The pharmaceutical aspect of *Erythrina* species includes Antibacterial/ Dental care prevention, Antioxidant, Analgesic & Anti-inflammatory, Cardiovascular effects, Smooth muscle relaxant, Anti-osteoporotic Effect, Trypsin/ Proteinase inhibitors, Cyto-toxicity, Zinc & Cadmium removal from Pollution and Calcium Homeostasis (Preeti *et.al.*, 2017).

Biochemicals: Seeds- Erthyraline, Erysovine, Bark- Erythrinins; erysotine, erythratidine, epierythratidine etc; Bark has 0.05 % of alkaloids that are neuromuscular blocking, smooth muscle relaxant and CNS depressant. Flowers- Erthartine. Leaves- Ertybidine. Leaves contain many alkaloids with anti inflammatory activity. Erysovine, Erysovine, Erysonine,

Hypaphorine, 8 spiroamine alkaloids, flavones, Osajin, Erythrinins A,B,C, sterols in bark, Trunk contains alkaloids which are neuromuscular blocker, spasmolytic, CNS depressant, anti-convulsant. Plant contains many tetracyclik alkaloids and flavanoids mainly hexabarbitol, which has shown muscle relaxant activity (Kanwar *et.al.*, 2006, Patil and Bhaskar 2006, Kingston *et.al.*, 2007).

Erythrina Phytoconstituents:

Alkaloids, flavonoids, pterocarpan, triterpenes, steroids, alkyl trans-ferulates, proteins, and lecithin are found in the genus. The bark contains certain resins, stable oils, fatty acids and alkaloids like erisodin, erisonin, hypoforin and erisotrin. Leaves contain erisotrin, erisodin and erythrolin. Seeds contain hypoforin, erisopin and erisotin. Literature survey has revealed that finding about phytoconstituents are still to be reported in this plants (Rastogi, RP *et.al.*, 2006 and Rahman, MZ. *et.al.*, 2007). The two major Phytochemicals discussed here are alkaloids and flavonoids whereas others phytochemicals are also present in plants parts such as Leaf etc. The plant is a rich source of alkaloids (2.5%). The major alkaloids are erythraline, erysodine, stigmasterol, erycistagallin, erysovine, erysovine, epilupeol, 6-Hydroxygenistein, erythritol, isocolinine, 3 β , 28-Dihydroxyolean-12 ene, erystagallin isolated mainly from leaves. (Rastogi, RP. 2006, Ghosal, S. 2007 and Venkateswarlu, 2008). Flavonoids are chemical phenylbenzopyrones, which, usually conjugated with sugars, are present in all vascular plants. Isoflavonoids are reported to be the major phytoconstituents of *E. variegata*. It contains mainly erythrinins A, B, and C, Erythrabysin I, Orientanol, alpinium isoflavone, Dihydrofolinium and Octacosylferulate are found in plant and plants parts. (Sato, M. *et.al.*, 2003, Hirata, M. 2004).(Figure 1).

Nutritive value of “*Erythrina variegata*” Foliage

Kongmanila and Ledin (2009) reported that the differences in nutritive value of the foliage (leaves) among the three treatments (no fertiliser, cow manure and mineral fertiliser) were statistically significant (Table 2). As a mean over treatments, the stems were generally low in CP (59 g/kg DM) and had higher NDF (737 g/kg DM) compared with petioles (91 and 639 g/kg DM, respectively) or leaves (199 and 546 g/kg DM,

respectively), The CP content of leaves in the present study fell within the 193-213 g/kg DM range reported in previous studies (Aregheore and Perera 2004; Ngamsaeng *et.al.*, 2006). Factors such as differences in age of the trees or the shoots or stage of maturity of the leaves could be the reason for the differences between reported values. *E. variagata* can thus be promoted as a sole or supplementary feed for ruminants, especially in free-grazing systems with poor pasture.

Table 2: Nutritive value of *Erythrina variegata*

Chemical composition of <i>E. variegata</i> foliage with different treatment					
	Control	Cow manure	Mineral fertiliser	SEM	Prob.
Proportion, g DM/kg					
Leaves	592	588	599	27.1	0.955
Petioles	182	192	185	17.4	0.787
Stem	227	214	215	20.3	0.878
<i>In leaves</i>					
DM, g/kg	272	252	257	66.6	0.131
In g/kg DM:					
Ash	74	71	68	3.23	0.374
CP (Protein content)	198	201	197	7.29	0.878
NDF (Neutral Detergent Fiber)	540	560	537	20.4	0.673
ADF (Acid Detergent Fiber)	336	376	405	19.9	0.095
<i>In petioles</i>					
DM, g/kg	229	216	237	10.7	0.406
In g/kg DM:					
Ash	60	62	61	5.03	0.964
CP	90	92	90	3.33	0.878
NDF	632	655	629	23.9	0.673
ADF	454	507	546	26.9	0.095
<i>In stems</i>					
DM, g/kg	256	261	267	11.5	0.811
In g/kg DM:					
Ash	57	57	54	3.24	0.694
CP	59	60	59	2.19	0.878
NDF	730	756	725	27.6	0.673
ADF	488	551	597	31.9	0.095
<i>In leaves + petioles</i>					
In g/kg DM:					
CT ²	10.1	6.7	8.4	1.10	0.144
Ca	7.3	6.6	9.0	0.58	0.069
P	2.1	1.8	2.0	0.068	0.106
Mg	2.6	2.2	2.7	0.16	0.229
K	11.2	12.2	10.4	1.31	0.653
Na	0.1	0.2	<0.1	-	-
S	2.5	1.9	2.2	0.14	0.072

²Least squares means and standard error (SEM)²CT: Condensed tannins; DM= Dry material

The leaves of this tree are mainly the parts used in Ayurvedic medicine in the Indian subcontinent, with the juice from the leaves being put into ears

to stop earache. The paste made from the leaves are used for rheumatism and joint pains, applied to the affected areas, and it is also used for wounds

as it has antiseptic properties, and for inflammation, including for eye problems. A powder is made to aid digestion, as an aphrodisiac and for erectile dysfunctions. It is also used to get rid of intestinal worms, for blood purification, to regulate menstruation, for infections of the urinary tract such as cystitis, obesity, fevers and externally for skin problems. It is believed to support the liver and nerves functions and is anti-inflammatory, analgesic (pain-relieving), and to dilate the blood vessels (Ahmed, S. et.al., 2013). Secondary Metabolites or Phytochemicals present in this plants have eminent pharmacological activities such as anti- Oxidative, anti- allergic, antibiotic, hypoglycaemic and anticarcinogenic (Krishnamachari *et.al.*, 2017).

Phytochemical Screening of *Erythrina variegata* leaf:

The study has been made to investigate the phytochemical screening of the *Erythrina variegata* leaves. Such a qualitative analysis is thus a part of preliminary standardization. The carefully processed *Erythrina* leaves were subjected to Soxhlet apparatus using hexane, chloroform, dichloromethane, ethyl acetate, methanol, ethanol and aqueous on the basis of their polarity. Presence and absence of primary phytochemicals viz., alkaloids, flavanoids, glycosides, steroids, phenols, tannins, saponins and resins was confirmed in the laboratory tests. The preliminary phytochemical results of the selected solvent extracts of *E. variegata* are shown hereunder (Table 3).

Table 3 Phytochemical screening of selected solvent leaf extracts of *E. variegata*

S.N	Phyto-chemicals	n-Hexane	Chloro form	Dichloro methane	Ethyl acetate	Methanol	Ethanol	Aqueous
1.	Alkaloids	-	-	-	+	-	+	-
2.	Flavonoids	+	+	+	+	+	+	-
3.	Glycosides	+	+	+	-	+	-	+
4.	Steroids	-	-	-	-	-	-	-
5.	Phenols	-	+	+	+	+	+	+
6.	Tannins	-	+	+	+	+	+	+
7.	Saponins	+	-	-	-	-	-	-
8.	Resins	-	-	-	+	+	+	-

(+)= Present and (-)= Absent

Phytochemical screening of aqueous leaf extract of *E. variegata* contained Glycosides, phenols and tannins. Methanolic extract revealed the presence of flavonoids, glycosides, phenols, tannins and resins. The ethanolic extract showed the presence of alkaloids, flavonoids, phenols, tannins and resins. The qualitative phytochemical analysis indicates that hexane extract possess flavonoids, glycosides and saponins. From the phytochemical analysis it was noted that all the extracts of *E. variegata* leaf are rich in various secondary metabolites such as phenolics, alkaloids, flavonoids, tannins and saponins. Among the various solvents screened for phytochemicals, ethanolic extract is very effective followed by

methanol, chloroform, hexane and aqueous extracts. It has been mentioned that antioxidant activity of plants might be due to their phenolic compounds and tannins (Cook, N C. 1996).

Flavonoids are most commonly known for their antioxidant activity. They are modifiers which modify the body's reactions to allergens, viruses, and carcinogens. They show anti-allergic, anti-inflammatory, antimicrobial and anticancer activity. The presence of alkaloids explains its anti-bacterial activity, since this phytochemical is reported to have anti-bacterial activity. Tannins are reported to have various physiological effects like anti-irritant, antiseoretolytic, antiphlogistic, antimicrobial and antiparasitic effects.


Analysis of Standardization in the *Erythrina variegata* leaf:

Proximate analysis involving estimation of ash and extractive values of a crude drug is a means for the evaluation of crude drugs, establishment of genuineness, and ruling out all forms of adulteration. While extractive values provide a process of assay for drugs which are not readily estimated by other means, determination of ash values is useful for detecting low grade products, exhausted drugs and presence of sandy, earthy matter. Ash value figures indicate absence of

adulteration with sandy matter. Total ash value could be low, due to relatively low content of carbonates, phosphates, silicates and silica in the drugs. Low ash value is attributable to collection of plant material free of adherent earthy matter. Dried leaves of *Erythrina variegata* being taken, its LOD is lesser relative. Lower yield of water soluble extract of *Erythrina variegata*, and a higher relative proportion of chloroform and ethyl acetate soluble, indicates the predominance of polar constituents (Table 4).

Table 4: The analysis of Standardization in the *Erythrina variegata* leaf

S.no	Parameters	<i>Erythrina variegata</i> (%w/w)
1.	Total ash(% W/W)	3.22
2.	Water-soluble ash	0.635
3.	Acid-insoluble ash	1.52
4.	Ethanol-soluble extractive	1.18
5.	Water-soluble extractive	0.34
6.	Chloroform soluble extractive	1.47
7.	Ethylacetate soluble extractive	1.52
8.	LOD	4



Herbal extract contain different phytochemicals with biological activity that can be of valuable therapeutic index. In the present investigation, characteristics of pharmacognostical significance of *Erythrina variegata* leaves shows, total ash, acid insoluble ash, loss on drying, Alcohol soluble extractive value, water soluble extractive value, determined. The standardization values of *Erythrina variegata* is given in Table 4. Phytotherapeutically, tannin-containing plants are used to treat nonspecific diarrhoea, inflammations of mouth and throat and slightly injured skins. Leaf juice has been used for the treatment of asthma, cough, sexual disorders, diarrhoea, haematuria, ear-ache and toothache, migraine, eye troubles, gastic problems and scabies; leaf decoction has been used as an analgesic for toothache (Damanpreet Singh *et.al.*, 2009).

Inorganic ions Present in *Erythrina variegata* Leaf:


Inorganic ions in plants are ions necessary for vital cellular activity. The results of the qualitative inorganic ion analysis have been presented in Table 5. The ions such as magnesium, potassium, iron, calcium, sodium, nitrate, sulphate and chloride are present in *Erythrina variegata*. The reported mineral content is in agreement with the usage of the tender leaves of *Erythrina variegata* as an edible (Whistler and Elevitch 2006). Analysis of Physico- Chemical and Qualitative Inorganic Elements in the Selected Herbal Plants stated that the effectiveness of plant product promote the pharmaceutical use of herbs for health problems. The inorganic content in all the plant part ranked, next to the organic content. Analysis on qualitative different inorganic elements for acid radicals like sulphate, sulphide, chloride, nitrate & nitrite and basic radicals like iron, magnesium, calcium, sodium and potassium

recorded variations. This plants leaves could be used as better alternates against a variety of

degenerative diseases.

Table 5: Inorganic ions Present in *Erythrina variegata*

S.no	Ion	<i>E. variegata</i>
1.	Carbonate	-
2.	Iron	+
3.	Magnesium	+
4.	Potassium	+
5.	Sodium	+
6.	Calcium	+
7.	Nitrate	+
8.	Phosphate	+
9.	Sulphate	±
10.	Chloride	±



Note: (+) = present & (-) = absent

The inorganic ions present in herbal leaf extract of *Erythrina variegata* hold diverse phytochemicals with biological activity that can be of valuable therapeutic index. The protective effect of leaves has been qualified by phytochemicals, which are the non-nutrient plant compounds (Devi *et.al*, 2011). The result of the present study emphasised that the leaf extract of *Erythrina* is a high potential phytochemical compound suitable for formulation of curative plant based drugs.

CONCLUSION

In India, Rural peoples are well aware of the usage of Medicinal Plants. Apart from that Botanists and Ayurvedic Practisioners also possess a good Knowledge about the plants. In this studies, there was a much attention on this plant "*Erythrina variegata*" and their morphology, medicinal importance, Biochemical, Utilisation, Nutritive value of Foliage Phytochemical Screening of Leaf, Analysis of Standardization of Leaf and Inorganic ions presence in Leaf were studies so as to bring the Known and Unknown medicinal virtues especially of plant origin to Limelight. In the present review article, the Literature is to collect the Botanical, Phytochemical, Use and management and Pharmacological information of "*Erythrina variegata*". Each part of the Plant especially leaf is used to treat various diseases in India.

REFERENCES

- Hort.ifas.ufl.edu. University of Florida: Environmental Horticulture. (2008). updated on 2010 Jan 12. Available from: <http://hort.ufl.edu>.
- Hedge, NG., (1993). Cultivation and uses of *Erythrina variegata* in Western India. In: Westley SB, Powell MH, eds. *Erythrina in the New and Old Worlds*. Paia, Hawaii: NFTA, 77-84.
- Edward, F., Gilman, G. and Dennis, G., Watson (1993). *Tabebuia chrysotricha*: Golden Trumpet Tree. IFAS Assessment of the Status of NonNative Plants in Florida s Natural Areas. Cited from the Internet (Revise: November 3, 2006).
- Cui, L., Thuong, PT., Fomum, ZT., Oh, WK., (2009) A new erythrinan alkaloid from the seed of *Erythrina addisoniae*. Arch Pharm Res. 32:325–8.
- Kumar, A., Lingadurai, S., Jain, A., and Barman, N. R., (2010). *Erythrina variegata* Linn: A review on morphology, phytochemistry, and pharmacological aspects, 4(8): 147–152.
- Preeti Kumari, Subhankar K. Singh and Chandrawati Kumari., (2017). Phytochemical Screening and Antibacterial Activity of *Erythrina variegata* L. (Leaf Extract).

- Int.J.Curr.Microbiol.App.Sci.* 6(6): 2500-2505.
7. Kanwar Promila, Neetu Sharma & Anju Rekha (2006), Medicinal Plants used in Traditional health care system prevalent in western Himalaya's, *Indian Journal of Traditional Knowledge*, Vol. 5 (3): 300-309.
 8. Patil, H.M. and V. V. Bhaskar (2006), Medicinal knowledge system of tribals of Nandurbar district, Maharashtra, *Indian Journal of Traditional Knowledge*, Vol. 5 (3): 327-330.
 9. Kingston, C., Jeeva, GM., & Jeeva,S., (2007). Traditional treatment of skin diseases in South Travancore, Southern peninsular India, *Indian Journal of Traditional Knowledge.*, Vol 6(3): 498-501.
 10. Rastogi, RP., Mehrotra, BN., (2006) editors. *Compendium of Indian medicinal plants*. 2nd ed. Lucknow: Central Drug Research Institute and New Delhi, National Institute of Science Communication and Info Resources; Anonymous.
 11. Rahman, MZ., Sultana, SZ., Faruquee, CF., Ferdous, F., Rahman, MS., Islam, MS., (2007). Phytochemical and Biological investigation of *Erythrina variegata*. *Saudi Pharm J.*,15:140-5.
 12. Ghosal, S., Dutta, SK., Bhathacharya, SK., (2007) *Erythrina* - chemical and pharmacological evaluation II: Alkaloids of *Erythrina variegata* L. *J Pharm Sci.* ;61:1274-7.
 13. Venkateswarlul, P., Durga, GV., Babu, NC., Rao, MV., (2008). Biosorption of Zn(II) from an aqueous solution by *Erythrina variegata orientalis* leaf powder. *Int J Phys Sci.*;3:197-204.
 14. Sato, M., Tanaka, H., Fujiwara, S., Hirata, M., Yamaguchi, R., Etho, H., (2003). Antibacterial property of isoflavonoids isolated from *Erythrina variegata* against cariogenic oral bacteria. *Phytomedicine*. 2003; 10: 427-33.
 15. Hirata, M., Tanaka, H., Etoh, H., Sako, M., Sato, M., Murata, J., (2004). Six new constituents from the Roots of *Erythrina variegata*. *Chem Biodivers.* pp 1:1101-8.
 16. Deb, S., Arunachalamand, A. and Das, A.K. (2009). Indigenous knowledge of Nyishi tribes on traditional agroforestry systems. *Ind. J. of Traditional Knowledge* 8, 41-46.
 17. Whistler, W.A. and Elevitch, C.R. (2006). *Erythrina variegata* (coral tree). *Species Profiles for Pacific Island Agroforestry*. <http://www.traditionaltree.org>.
 18. Daovy, K., Preston, T.R. and Ledin, I. (2008). Survey on the utilization of local foliage species for goats in Xaythanee district, Vientiane City. *Livestock Research for Rural Development*. Vol 20, 987-1087.
 19. Phengsavanh, P. (2003). Goat production in smallholder farming systems in Lao PDR and the possibility of improving the diet quality by using *Stylosanthes guianensis* and *Andropogon gayanus*, MSc thesis in the programme "Tropical Livestock Systems and Biology", SLU, Dept. of Animal Nutrition and Management, Uppsala, Sweden
 20. Kongmanila, D. and Ledin, I. (2009). Chemical composition of some tropical foliage species and their intake and digestibility by goats. *Asia- Aust. J. of Animal Sciences* 22, 803-811.
 21. Aregheore, E.M. and Perera, D. (2004). Effects of *Erythrina variegata*, *Gliricidia sepium* and *Leucaena leucocephala* on dry matter intake and nutrient digestibility of maize stover, before and after spraying with molasses. *Animal Feed Sciences and Technology* 111, 191- 201.

22. Ngamsaeng, A., Wanapat, M. and Khampa, S. (2006). Evaluation of local tropical plants by *in vitro* rumen fermentation and their effects on fermentation end-products. *Pakistan Journal of Nutrition* 5, 414-418.
23. Ahmed Azad, S., (2013). Plants Used Against Gynaecological Diseases By The Gujjar, Bakerwal And Pahari Tribes Of District Rajouri (J&K). *Issn : 2250-0138 (Online). Indian J.Sci.Res.* 4(1): 135-136.
24. Krishnamachari, H., Nithyalakshmi, V., (2017). Phytochemical Analysis and Antioxidant Potential of *Cucumis Melo* Seeds. *Int. J. Life. Sci. Scienti. Res.*, 3(1): 863-867. <http://ijlssr.com>.
25. Cook, NC., Samman, S. (1996) Flavonoids- chemistry, metabolism, cardioprotective effects, and dietary sources. *Nutritional Biochemistry*, 7: 66-76.
26. Damanpreet Singh, Rajesh Kumar Goel, *Journal Of Ethnopharmacology*, (2009), 123(2), pg : 330-334.
27. Devi, RM., Manoharan, A., (2011). Characteristics of pharmacognostical significance of *Erythrina variegata* Var. and *Ficus racemosa* Linn. bark. *J Chem Pharm Res*, 3:707-714.