

# Phytoconstituents and Pharmacological Profile of *Erythrina variegata* Linn (var alba).

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**Abstract** - *Erythrina variegata* linn var.alba (E.V) is a genus of flowering plants of the Family fabaceae; it contains more than 200 species distributed worldwide. Traditionally plants of this genus have variety of uses such as in Tranquilizer, anti-inflammatory, in the treatment of cold, liver and alimentary problems. The properties of this plant bark are bitter acrid and have thermogenic, sedative, and diuretic useful in uropathy. E.V. is very rich in its phytoconstituents including alkaloids, flavonoids with its different classes, cinnamoylphenol, stilbenoids, 3-phenoxychromones, coumarins, 3-phenyl coumarin, lignans, cinnamateesters, triterpenes, sesquiterpenes, long-chain carboxylic acids and long-chain alcohols. This miracle plant has wide range of biological activities has been investigated including anti-microbile, anti-depressant, cytotoxic, muscle relaxant and many more. The drugs induced organs toxicity is referring to the generation of reactive oxygen species generation. The organ protective activities of E.V are reported to be due to antioxidants phytoconstituents present, such as flavonoids, phytosterols, polyphenols and liganas. This review mainly focus on the pharmacological role of E.V in the useful in the treatment of drug induced organs toxicity such as kidneys, liver and stomach. This article describes the phytoconstituents of E.V and its pharmacological activities.

**Index Terms** - *Erythrina variegata*, phytoconstituents, pharmacological activities.

## INTRODUCTION

Hepatotoxicity, nephrotoxicity and gastric ulcer generation is due to the longer use of certain class of drugs appearing to be the most common contributing factors. The many investigators have turned to simpler experimental models for studying drugs that protective and response of the organs like kidneys, liver and stomach cells by to potentially toxic agents. Conventional drugs used in the treatment of kidneys, liver and diseased conditions are sometimes

inadequate and can have serious side effects. Therefore, it is necessary to search for alternative drugs for the treatment of these organs in such toxic conditions. There is an ancient trend for use of traditional herbal drugs for the treatment of such organs caused drugs induced disorders. Several plant sources have been found as potential to these vital organs protective agents with diverse chemical structures.<sup>1</sup>

Drugs, diagnostic agents and chemicals are well known to be nephrotoxic, hepatotoxic and ulcer induced agents can produce damage either by directly reacting with cellular macromolecules and membrane components or from metabolism within the tubular cells to toxic products. These toxic metabolites mainly include free radicals.<sup>2</sup> Therefore; an affective formulation has to be developed, using indigenous medicinal plants, with proper pharmacological experiments and clinical trials.

The plant *E.V.* parts used bark and leaves. The properties of the bark are bitter acrid and thermogenic, anti-inflammatory, sedative, diuretic and useful in uropathy. The leaf paste is used by some tribes to treat fresh cuts and wounds. The bark of the plant is astringent, febrifuge, anti-bilious and anthelmintic. It is also useful in ophthalmic and skin diseases.<sup>3</sup> Different parts of *E. Variegata* have used in traditional medicine as nervine sedative, febrifuge, anti-asthmatic and antiepileptic. In some experiments, it has potential effects for treatment of some diseases like convulsion, fever, Inflammation, bacterial infection, insomnia, helminthiasis, cough, cuts and wounds.<sup>4</sup> *Erythrina* has been used in folk medicine for treatment of insomnia malaria fever, Venereal disease, asthma and toothache.<sup>5</sup>

## PHYTOCONSTITUENTS

Alkaloids, flavonoids, p-terocarpan, tri-terpenes, steroids, alkyl trans-ferulates, proteins, and lecithin are

found in the genus. Survey has revealed that a number of reports are available on *E.V.*

#### Alkaloids

The plant is a rich source of alkaloids (2.5%) 3-Demethoxyerythratidinone, erythraline, erythramine, erythrinine, erythratidinone, erysonine, erysotone, erysodine, erysovine, 11-hydroxy- *epi*-erythratidine, erythratidine, *epi*-erythratidine, erysodienone, erysotrine, erysopitine, 11- $\beta$ -hydroxyerysotrine (erythartine) are the tetracyclic alkaloids isolated from the various parts of plants.<sup>6</sup> and scoulerine, coreximine, l-reticuline, and erybidine isolated from leaves.<sup>7</sup> The ethanolic extract yielded chloroform-soluble and water-soluble bases, identified as erysovine and stachydrine.<sup>8</sup> Eight spiroamine alkaloids along with three carboxylated indole-3-alkylmamines–hypaphorine, its methyl ester and *N, N*-dimethyltryptophan isolated from various parts of plant.<sup>9</sup> Presences of isoquinoline (erythritol) and isococcolinine alkaloids are also reported in the study.<sup>10</sup>

#### Flavonoids

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.V.* It contains mainly erythrinins A, B, and C, osajin and alpinum isoflavone, in addition to the styrene oxyresveratrol and dihydrostilbene dihydroxyresveratrol. Linear pyranisoflavones, robustone and 4-*O*-methylalpinum isoflavone are also isolated from the plant.<sup>11,12</sup> The previous studies that reported erycricstagallin, orientanol B, erystagallin A,<sup>13</sup> stigmaterol, campesterol,<sup>8</sup> stigmoidins A, B, and C, phaseollin, 3- $\beta$ -acetoxo-B-norcholest-5-ene, docosanoic methyl ester, 29-norcycloartenol,  $\beta$ -sitosterol and its archidate, and capric acid<sup>6</sup> as main components refuted by recent well-documented and reliable investigations. Presence of flavonoid abyssinone V, erycricstagallin and 4-hydroxy-6, 3, 5-triprenylisoflavonone was confirmed in other studies.<sup>14</sup> In recent studies two new diphenylpropan-1, 2-diols, eryvarinols A and B, three new isoflavonoids, eryvarins M-O, two new 2-arylbenzofurans, eryvarins P and Q and a 3-aryl-2,3-dihydrobenzofuran, eryvarin R were isolated from the roots of *E.V.* and their

structures were elucidated on the basis of spectroscopic and chemical evidence.<sup>15,16</sup>

Bioassay-directed fractionation of the stem barks extract of *E.V.* has resulted in the isolation of three new misoflavones-5,4-dihydroxy-8-(3,3-dimethylallyl)-2-ethoxyisopropylfurano (4,5:6,7) isoflavone, (5,7,4) trihydroxy-6-(3,3-dimethylallyloxiranylmethyl), isoflavone, 5,4-dihydroxy-8-(3,3-dimethylallyl) -2-hydroxymethyl-2-methylpyranol (5,6:6,7), isoflavone and a new isoflavanone, 5,4-dihydroxy-2-methoxy-8, (3,3-dimethylallyl), 2,2-dimethylpyranol, (5,6:6,7), isoflavanone, together with seven known compounds, euchrenone, isoerysenegalensein E, wighteone, laburnetin, lupiwighteone, erythrodiol, and oleanolic acid.<sup>1</sup> Other newly reported isoflavonoids of *E.V.* are epilupeol, 6-hydroxygenistein, and 3 $\beta$ , 28-dihydroxyolean-12-ene.<sup>12</sup>

#### Miscellaneous phytoconstituents

Various other constituents, which have been reported from *E.V.* include erythrabyslin II, dihydrofolinin,<sup>18</sup> octacosylferulate, wax alcohol, wax acids, alkylferulates, and alkyl phenolates.<sup>8</sup> Seeds content moisture (3.8%), crude protein (31.2%), pentosan (11.9%), and water-soluble gum (1.6%). The amino acid composition of seed protein is as follows: alanine (7.2), arginine (3.4), aspartic acid (12.9), glutamic acid (13.4), glycine (7.6), histidine (3.9), isoleucine (3.6), leucine (7.1), lysine (5.1), methionine (0.5), phenylalanine (3.3), proline (4.7), serine (7.1), threonine (5.7), tyrosine (2.2), and valine (4.8) g/100g. The seeds also contain isolecitins (EVL I, EVL II and EVL III), the kuntz-type trypsin inhibitors (ETIa and ETIb) chymotrypsin inhibitor (ECI).<sup>19</sup>

#### PHARMACOLOGICAL ACTIVITY

The plant *E.V.* parts used are bark and leaves. The properties of the bark is bitter acrid and thermogenic, anti-inflammatory, sedative, diuretic and useful in uropathy the leaf paste is used by some tribes to treat fresh cuts and wounds.<sup>7</sup> The bark of the plant is astringent, febrifuge, anti-bilious and anthelmintic. It is also useful in ophthalmic and skin diseases. Different parts of *E.V.* have used in traditional medicine as nervine sedative, febrifuge, anti-asthmatic and antiepileptic.<sup>20</sup> In the some experiments, it has potential effects for treatment of some diseases like

convulsion, fever, Inflammation, bacterial infection, insomnia, helminthiasis, cough, cuts and wounds. *Erythrina* has been used in folk medicine for treatment of insomnia malaria fever, Venereal disease, asthma and toothache.

#### Anti-cancer activity:

*E.V.* is reported to be used in the treatment of cancer in traditional/folklore medicine which could be explored for their anticancer potential. The extracts with *E.V.* methanol (EVM) and chloroform (EVC) as solvents were screened for cytotoxicity by 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium assay on MDA-MB-231 and MCF-7 cell lines. The effective extract was further evaluated on MDA-MB-231 cells by nucleoprotein content estimation, and cell morphology was studied. High resolution liquid chromatography mass spectrometry (HRLCMS) of EVM was done to find the phytochemical composition. Among the two extracts, EVM was effective at an inhibitory concentration (IC<sub>50</sub>) value of 92 µg/ml and 143 µg/ml on MCF-7 and MDA-MB-231 cells, respectively. At the IC<sub>50</sub> value (143µg/ml) the nucleoprotein content of the cells was 58.2% and the apoptotic index was calculated to be 51.8%. EVM treated group showed significant morphological changes suggestive of apoptosis. HRLCMS revealed the presence of rutin, podocarpatriene, and cepharanthine which are known to be cytotoxic.<sup>21</sup>

#### Effects on Polycystic Ovarian Disease:

Ethanollic extract of *E.V.* in decreasing the major metabolic symptoms associated with Letrozole induced Polycystic Ovarian Disease (PCOD or PCOS) using female rat model. Female wistar albino rats were grouped into five groups with six animals each. All rats were daily administered with letrozole (1mg/kg b.t.w.) for 21 days except control, and during this period, changes in estrus cycle were observed. After letrozole treatment, group 2 was considered negative control, group 3 was considered standard, group 4 and 5 were treated orally with Ethanollic extract of *E.V.* 200 mg/kg b.wt. and 400 mg/kg b/wt, respectively, for 4 weeks (7 consecutive oestrus cycles). Various parameters such as estrus cycle, blood sugar level, lipid profile and weights of reproductive system were determined. The characteristic of ovary and uterus were evaluated by histopathological studies.<sup>22</sup>

#### Analgesic and anti-inflammatory activity:

The anti-inflammatory effect of ethanolic extract of *E.V.* was evaluated using acute inflammatory model like carrageenan induced paw edema and chronic inflammatory model like cotton pellet induced granuloma respectively. The ethanolic extract in different doses (200, and 400mg/kg, p.o) exhibited dose dependent and significant anti-inflammatory activity in acute and chronic model of inflammation.<sup>23</sup>

#### Antimicrobial activity:

The various extract of *E.V.* were analysed against bacterial pathogens such as *S. typhi*, *Pseudomonas putida*, *P. aeruginosa*, *E. coli*, *Klebsiella sp*, *Proteas sp*, *Serratia marcescens*, *Bacillus circulans*, *Staphylococcus aureas* and five fungal pathogens viz *Aspergillus niger*, *Aspergillus fumigates*, *Selerotium sp*, *Rhizopous sp*, *Candida sp*, all strains are more susceptible strains among all the solvents methanol showed promising antimicrobial activity these finally hence potential for use in the treatment of diseases caused by these tested organisms.<sup>24</sup>

#### Central nervous effects:

In the study alkaloid fraction from the bark showed several pharmacological effects, neuromuscular blocking, CNS depressant, and anticonvulsant effects which are consistent with the reported use of the plant extract in the indigenous system of medicine.<sup>9</sup> *E.V.* also causes passivity and decreases spontaneous activity with positive grip strength. this indicates CNS relaxant activity of this plant. The current therapeutic treatment of epilepsy with modern antiepileptic drugs (AEDs) is associated with side effects, dosage related teratogenic effects, and approximately 30% of the patients continue to have seizures with current AEDs therapy. Evidence for anticonvulsant activity of *E.V.* in the clonic seizure of pentylenetetrazole model has been tested in mice. As the protective effects of *E.V.* in clonic seizure, it suggests that it could be useful for treatment of absence seizure.<sup>25</sup>

#### Analysis of nutritive values:

The nutritive values of the leaves extract of *E.V.* 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 presence of inorganic ions in plants is necessary for vital activity. The qualitative inorganic ions analysis of *E.V.* 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.<sup>26</sup>

### CONCLUSION

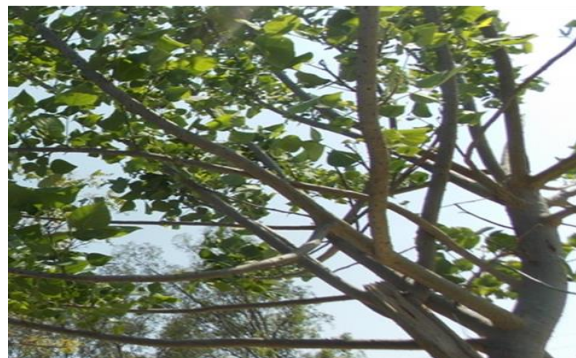
The plant *E.V.* is a very useful and valuable plant with tremendous therapeutic and biological potencies. The plant *E.V.* consists of various phytoconstituents that possess potent therapeutic effect. There are several claims that the plant is useful in treating various diseases, however there are no reports on the organsprotective activities. Further studies directed towards the detailed the mechanism of action and phytoconstituents responsible for organsprotective activities are need to explore. Hence the present review on this plant.

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