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REVIEW ON *ERYTHRINA VARIEGATA* LINN

Titil Datta Samanta and Subrata Laskar*

Natural Product Laboratory, Department of Chemistry, The University of Burdwan, Burdwan- 713104, West Bengal, India.

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***Corresponding Author**
Prof. Dr. Subrata Laskar
Natural Product Laboratory, Department of Chemistry, The University of Burdwan, Burdwan- 713104, West Bengal, India.

ABSTRACT

During last few decades plant sources have become an item of global importance in human civilization for several herbal medicines. One of such plants, *Erythrina variegata* Linn is an important member of family Fabaceae, different parts of which are widely used in folk medicines, Ayurveda and evidenced-based phyto-therapy. Different chemical constituents isolated from different parts of the plant have been compiled and presented in this review. Structures of the compounds along with their spectral data have also been included.

KEYWORDS: *Erythrina variegata* Linn.

INTRODUCTION

In India, increase in population is posing a great problem to the environmental system. First of all, such increase in population leads to increase in supply of food to people. Inadequate supply of food leads to inadequate nutrition to growing children, women and sick people. Malnutrition leads to many diseases, which in many cases even cause death. Many people in developing countries like India are lying below poverty line, and they suffer from shortage of food. In connection with this, it is well known that protein is very important for growing children, and for this purpose, search for low cost, easily available protein from natural sources is urgently in need. To fulfill this, we stepped into venturing our forestry to find out an answer. It is of no mention that plants store proteins, carbohydrates, fats, oils, steroids and various types of other chemical compounds in their seeds for their effective germination. Seeds containing considerable amount of protein can prove to be effective source of edible proteins. Plant protein products are gaining increased interest as non-traditional ingredients in food systems throughout many parts of the world. The final success of utilizing plant proteins as additives depend greatly upon the favorable characteristics that they impart to foods. For

plant proteins to be useful and successful in food application, they should ideally possess several desirable characteristics, referred to as functional properties, as well as providing essential amino acids.

In India, almost each of the plant kingdom has been found to posses many medicinal properties. Roots, barks, leaves, flowers, seeds of almost every species are used in many parts of India as folk medicines from very early dates. These medicines are actually chemical compounds which occur abundantly in plant materials including their seeds.

Biological macromolecules like protein are being paid much attention recently, because of their ability to bind certain metals selectively in presence of one another. This ability of protein molecules has lead to the idea of metal separation, accumulation or pre-concentration of different metal ions from solution.

Considering all the referred facts, a well known plant, *Erythrina variegata* Linn. (Palita Mandar) which is very common in Bengal and many parts of India, have been chosen for the present study and consequently a brief review on this plant has been done as follows:

***A Brief Review on Erythrina variegata* Linn:** The genus *Erythrina* belongs to the family *Fabaceae* (previously known as *Leguminosae*) and consists of 130 species. Most of the species are well known for their versatile uses as folk medicines and therapeutic properties. The genus consists of trees or shrubs, rarely herbs, usually armed with spines. The leaves are trifoliate, leaflets are membranous, glabrous, long and broad, truncate or broad, rhomboidal at base; the flowers are large, in dense racemes with coral red, yellow or may be white in colour; pods are torulose, containing 6 to 8 seeds; seeds are oblong, smooth, red, dark to purple or brown.[1]

Plant classification report of the Genus *Erythrina*

Up to the kingdom

Kingdom- Plantae

Division- Magnoliophyta

Class- Magnoliopsida

Order- Fabales

Family- Fabaceae

Subfamily- Faboideae

Tribe-Phaseoleae

Genus- Erythrina

Contains 130 species

Species *Erythrina variegata* L. var. *orientalis* (L.) Merr. syn *Erythrina indica* Lam.

***Erythrina variegata* Linn. (Palita mandar)**[2]

It is a showy, spreading tree legume having brilliant red blossoms and commonly as 'Indian coral tree' in Asia and 'tropical coral in the Pacific. The tree is highly valued as ornamental plant and is described as one of the gems of the floral world. The tree is also used as a sturdy component of wind break and proved to be valuable for fodder production. It modulates readily and prolifically in both acid and alkaline soils, hence it is useful for soil enrichment. In India, *E. variegata* is appreciated by farmers as fodder, light timber and recently, as pulp for paper industry.

Vernacular names[1,3]

Sanskrit: Mandar, parijata; Hindi: Dadap, mandara; Bengali: Palita mandar; Marathi: Mandar, Pangara; Gujrati: Bangaro, Panaraweo; Telegu: Badisa, Badita, Baridamu, Mmodugu; Tamil: Kaliyanamurukku; Kannada: Varjipe, Harivana; Malayalam: Kalayanamurukku, Mandaram; English: Indian coral tree; Nepalese: Phulado; Sinhalese: Erabaum; Japanese: Diego; German:Indischer Korallen Baum; Unani: Pangrah; Burmese: Kathit; French: Abre immorte; Tibetian: Pa-ri.

Ecology and distribution[1,2]

Erythrina variegata is adapted well to humid, semi-arid, tropics and sub-tropics. They occur in zones with annual rainfall of 800 to 1500 mm distributed over a five- to six-month rainy season. *Erythrina variegata* is very commonly found in warm coastal areas up to an elevation of 1500 m. The trees grow well in deep, well-drained, sandy loam, but they tolerate a wide range of soil conditions from sands to clays of pH 4.5 to 8.0. The trees can withstand water logging for up to two weeks and are fairly tolerant of fire. This species is bird pollinated, out crossed and sometimes genetically incompatible. *Erythrina variegata* is native to the coast of India and Malaysia. The species has been widely introduced in coastal areas of the Old World tropics, extending from East Africa and Madagascar through India, Indochina, Malaysia, northern Australia and Polynesia. It is found in the foot of Himalayas to Sri Lanka, Burma

and Malacca. It is very common in Bengal and many parts of India, and also in South India. It is often grown in gardens as support for black pepper vine and for providing shade to young cinchona plants. The seeds can float well on salt water for months, thus spreading the species.

Morphological description of *Erythrina variegata*[1,2]

Erythrina variegata is a medium to large tree, commonly reaching 15 to 20 m in height in 20 to 25 years with thin grey bark covered with minute conical black prickles. The tree has an erect, spreading form, typically with several vertically oriented branches emerging from the lower stem. The bark is smooth, streaked with vertical lines of green, buff, grey and white. The leaflets are commonly variegated, medium to light green, heart shaped, 7 to 12 cm wide and 12 to 18 cm long. The flowers are orange-red, emerging in dense, cofiioal inflorescences 5 to 7 cm long and 2 to 3 cm wide. The flowers are followed with lavish production of seeds. The pods are thick and black and are 1.5 to 2 cm wide and 15 to 20 cm long. Each mature pod contains 5 to 10 seeds. The seeds are glossy brown, red or purple and are 6 to 10 mm in diameter and 12 to 17 mm long.

Folk medicinal uses[1,2,4]

Different parts of *Erythrina variegata* plants are used as medicines in India, China and Southeast Asia. The bark and leaves are used to destroy pathogenic parasites and relieve joint pain. Juice from the leaves mixed with honey on ingestion kills tapeworm, roundworm and threadworm. This juice is given to women to stimulate lactation and menstruation. It is commonly mixed with castor oil to cure dysentery. A warm poultice of the leaves is applied externally to relieve rheumatic joints. The bark is used as laxative, diuretic and expectorant. Leaf juice can cure long standing dysmenorrheal, and also can remove sterility in fatty women by gradually reducing fat and producing natural menstrual flow. The juice increases secretion of milk during lactation.

Chemical constituents from *Erythrina variegata*

Phytochemical investigation of different parts of *Erythrina variegata* L. plant, viz., roots, bark, seeds, flowers etc., as carried out so far, has given more than 100 compounds with various structural patterns. Alkaloids form the major class of compounds present, together with flavonoids from different parts of the plant. Pterocarpinoids have also been found, together with some benzofurans, steroids, terpenoids etc. have also been isolated.

A. Flavonoids from *Erythrina variegata*

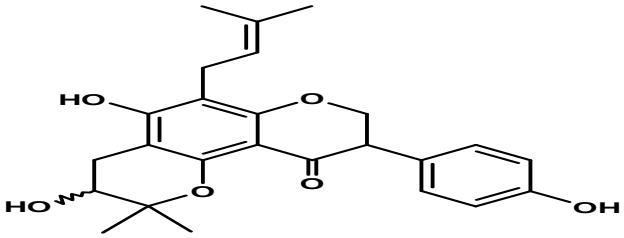
Flavonoids form a major class of compounds isolated from various parts of *Erythrina variegata* tree. Compounds are found from roots, root bark, stem bark, flowers etc., which include iso-flavone, iso-flav-ene, iso-flavanone, iso-flavan, etc. Nearly forty compounds of this class were isolated from this tree. The structures of the compounds are given below followed by the sources with references and the spectral data of most of the compounds. Some aryl-benzofurans are broadly named as flavonoid compounds, but a separate grouping has been done for those compounds here in this resume. The following flavonoids (Table 1) have been isolated from different parts of the plant, *Erythrina variegata.*

Table. 1: Flvonoids from *Erythrina variegata.*

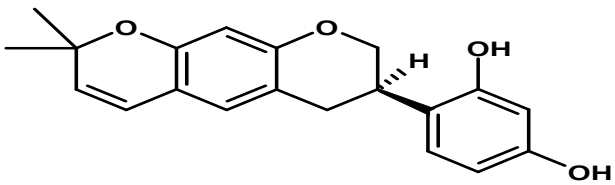
No	Compound name	Source (reference)
1	Eryvarin B	Wood [5]
2	Eryvarin C	Root [6]
3	Eryvarin H	Root [30]
4	Eryvarin I	Root [30]
5	Eryvarin M **[**2,3-Dihydro-7-hydroxy-3-(4-hydroxy-2,5-dimethoxyphenyl)-4H-1-benzopyran-4-one**]**	Root [11]
6	Eryvarin N **[**2,3-Dihydro-7-hydroxy-3-(4-hydroxy-2,5-dimethoxyphenyl)-8-(3-methylbut-2-en-1-yl)-4H-1-benzopyran-4-one**]**	Root [11]
7	Eryvarin O **[**7-Hydroxy-3-[4-hydroxy-2-methoxy-3-(3-methylbut-2-en-1-yl)phenyl]-2H-1-benzopyran-2-one**]**	Root [11]
8	Eryvarin S	Root [27]
9	Eryvarin T	Root [27]
10	Bidwillol A **[**3′-(γ,γ-Dimethylallyl)-7,4′-dihydroxy-2′-methoxyisoflav-3-ene**]**	Root bark [12], [35]
11	Bidwillon C **[**4′-Hydroxy-[6″,6″-dimethylpyrano(2″, 3″:7,8)]isoflavone**]**	Root bark [12]
12	Abyssinone V **[**4′-Hydroxy-3′, 5′-diprenylisoflavonone**]**	Bark [13]
13	4′-Hydroxy-6, 3′, 5′-triprenylisoflavonone	Bark [13]
14	Bidwillon B **[**2′,4′-Dihydroxy-8-γ,γ-dimethylallyl-2″,2″-dimethylpyrano[5″,6″:6,7]isoflavanone**]**	Root [14]
15	5,4′-Dihydroxy-8-(3,3-dimethylallyl)-2″-methoxyisopropylfurano[4,5:6,7]isoflavone	Stem bark [16]
16	5,7,4′-Trihydroxy-6-(3,3-dimethylallyloxiranylmethyl)isoflavone	Stem bark [16]
17	5,4′-Dihydroxy-8-(3,3-dimethylallyl)-2″-hydroxymethyl-2″-methylpyrano[5,6:6,7]isoflavone	Stem bark [16]
18	5,4′-Dihydroxy-2′-methoxy-8-(3,3-dimethylallyl)-2″,2″-dimethylpyrano[5,6:6,7]isoflavanone	Stem bark [16]

No	Compound name	Source (reference)
19	Eucherenone b_{10}	Stem bark [16], Bark [18]
20	Isoerysenegalensein E	Stem bark [16]
21	Wighteone	Stem bark [16]
22	Laburnetin	Stem bark [16]
23	Lupiwighteone	Stem bark [16]
24	Osajin	Bark [21]
25	Alpinium isoflavone	Stem Bark [21], [32]
26	Quercetin	Flower [22]
27	Quercetin-4-O-glucosyl-3-O-rhamnogucoside	Flower [22]
28	Warangalone (Scandenone)	Root [24]
29	5,7,4′-Trihydroxy-6,8-diprenylisoflavone	Root [24]
30	Isobavachin	Root [24]
31	Isorhamnetin-3-O-rhamnoglucoside	Flower [22]
32	Rutin	Flower [22]
33	Erythrivarone A	Stem bark [25]
34	Erythrivarone B **[**4′-Hydroxy-[6″,6″-dimethyldihydropyrano (2″,3″:5,6)]-[6‴,6‴-dimethyldihydropyrano (2‴,3‴:7,8)]isoflavone**]**	Stem bark [25]
35	Indicanine C	Root bark [31]
36	5,4′-Di-*O*-methylalpinumisoflavone	Root bark [31]
37	Cajanine	Root bark [31]
38	3 β, 28-Dihydroxyolean-12-ene	Stem bark [32]
39	Daidzein	Root bark [33]
40	5,7,4′-Trihydroxy-39-methoxy-8-C-prenylflavone7-*O*-β-D-glucopyranosyl-(1→3)-α-L-arabinopyranoside	Seeds [34]
41	6,8-Diprenyl-kaempferol	Stem bark [29]

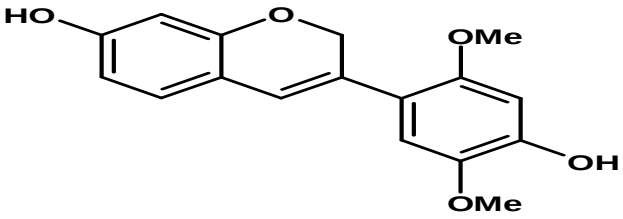
Structure of some of the isolated flavonoids of Table 1 with the Sl. No. indicated in the table are given below



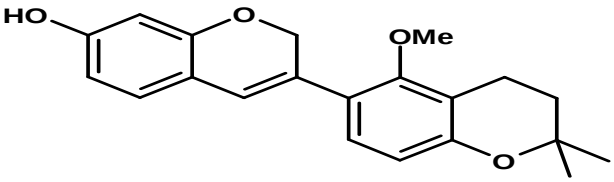
Eryvarin B (1)



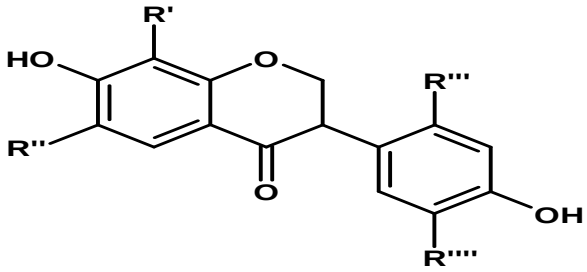
Eryvarin C (2)



Eryvarin H (3)



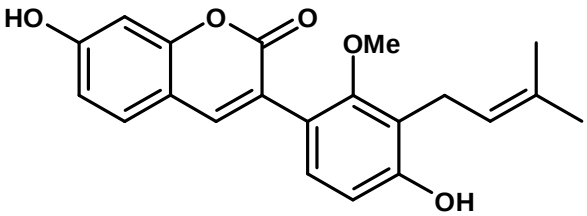
Eryvarin I (4)



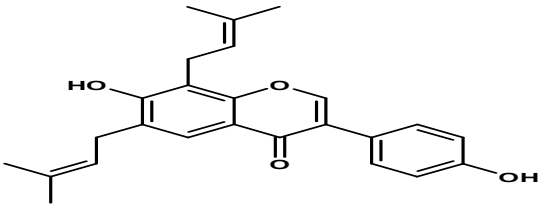
R'= R"=H, R'''=R''''=OMe, Eryvarin M (5)

R'=  **, R"=H, R'''=R''''=OMe, Eryvarin N (6)**

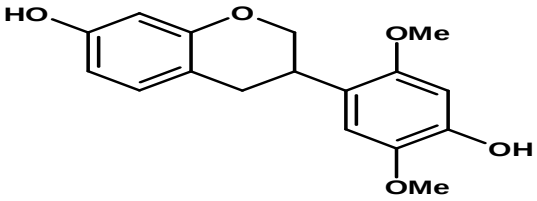
R'=R'''=R''''=H, R"=  **, Whitenone (21)**



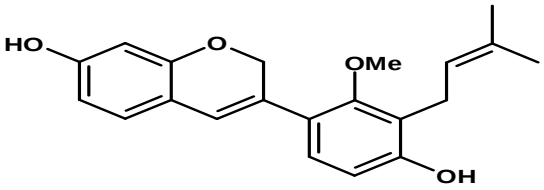
Eryvarin O (7)



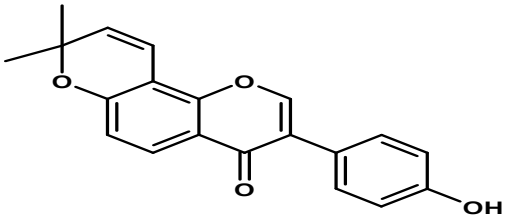
Eryvarin S (8)



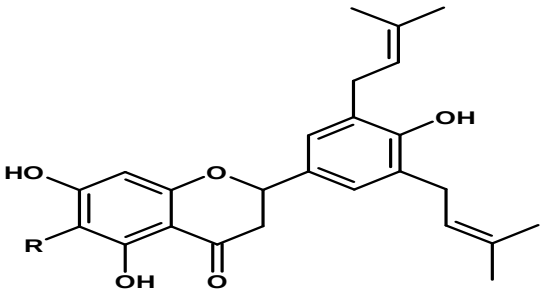
Eryvarin T (9)



Bidwillol A (10)

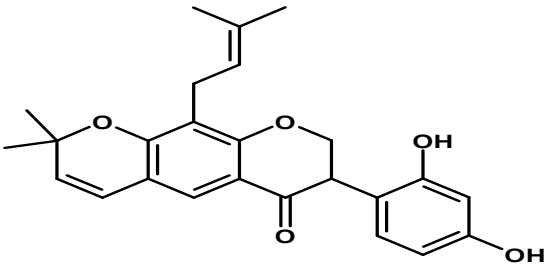


Bidwillon C (11)

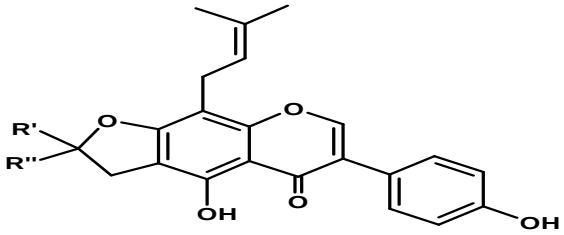


R=H, Abyssinone V (12)

R=  **, 4'-Hydroxy-6, 3', 5'-triprenylisoflavonone (13)**

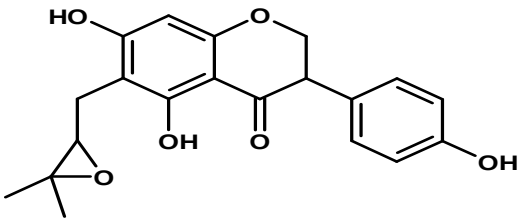


Bidwillon B (14)

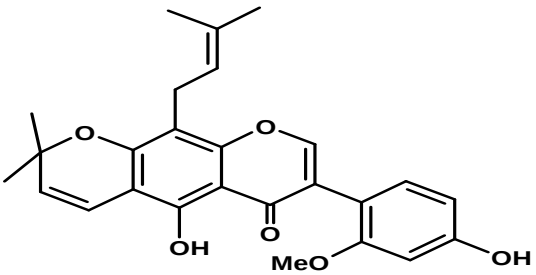


R'=  , R"=H, 5,4'-Dihydroxy-8-(3,3-dimethylallyl)-2"-methoxyisopropylfurano[4,5:6,7]isoflavone (15)

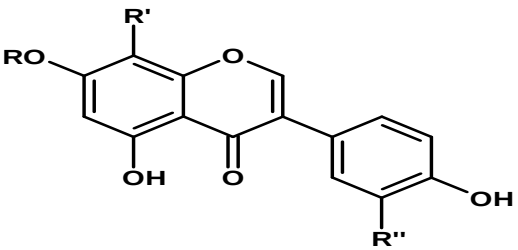
R'= -CH_2OH, R"=Me, 5,4'-Dihydroxy-8-(3,3-dimethylallyl)-2"-hydroxymethyl-2"-methylpyrano[5,6:6,7] isoflavone (17)



5,7,4'-Trihydroxy-6-(3,3-dimethylallyloxiranylmethyl)isoflavone (16)



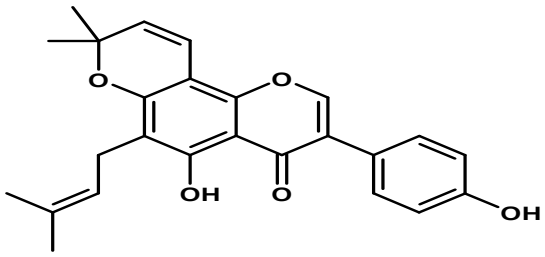
5,4'-Dihydroxy-2'-methoxy-8-(3,3-dimethylallyl)-2",2"-dimethylpyrano [5,6:6,7]isoflavanone (18)



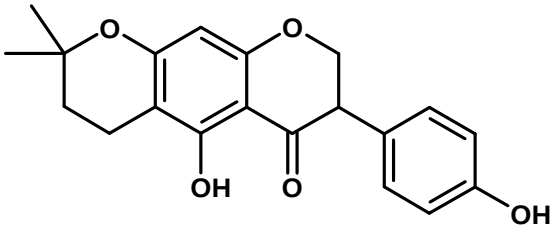
R'=  , R"=OH, R=H, Lupwhiteone (23)

R'=H, R"=OH, R= H, Quercetin (26)

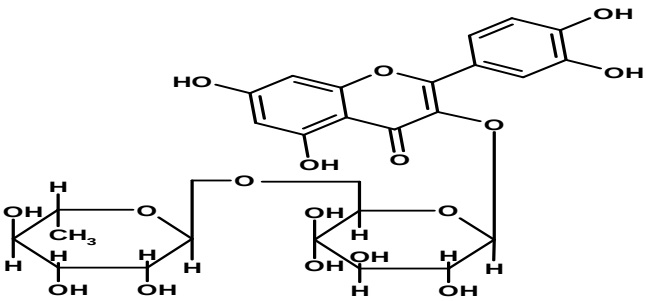
R'=  **, R"=OMe, R=D-glucosyl-(1→3)-L-arabinosyl;5,7,4′-Trihydroxy-39-methoxy-8-C-prenylflavone7-*O*-β-D-glucopyranosyl-(1→3)-α-L-arabinopyranoside (40)**



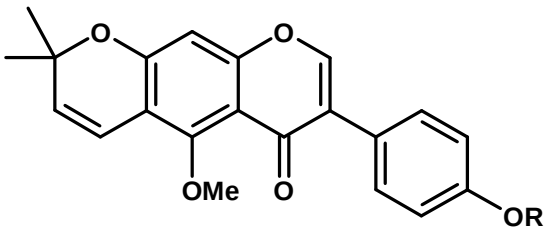
Osajin (24)



Aplinum isoflavone (25)

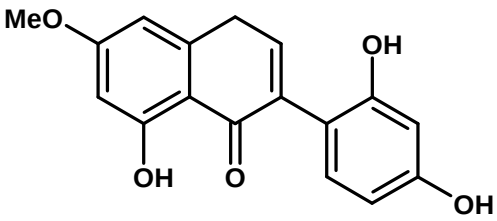


Rutin (32)

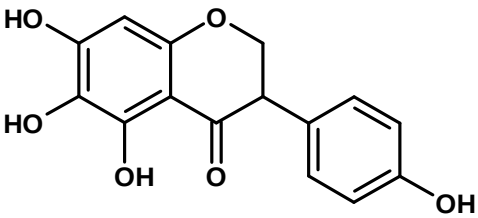


R=H, Indicanine C (35)

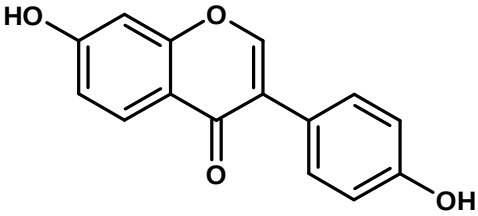
R=Me, 5,4'-Di-*O*-methylalpinumisoflavone (36)



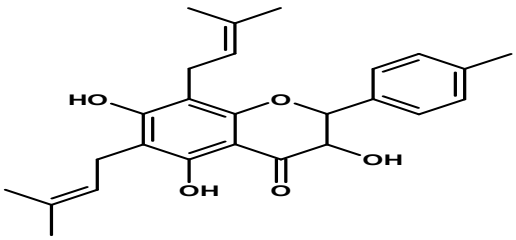
Cajanin (37)



3 β, 28-Dihydroxyolean-12-ene (38)



Daidzein (39)



6,8-Diprenyl-kaempferol (41)

Among the above flavonoids, many of them possess antimicrobial activities, e.g., Tanaka *et al* found out that Abyssinone V is phospholipase A_2 (PLA_2) inhibitor and also acts as antimicrobial agent.[13] 4′-Hydroxy-6, 3′, 5′-triprenylisoflavonone is also a phospholipase A_2 (PLA_2) inhibitor.[13] Indicanine B was found to be active against *Staphylococcus aureus* and *Mycobacterium smegmatis* according to Waffo *et al.*[30] Warangalone and 5,7,4′-Trihydroxy-6,8-diprenyhsoflavone, Isobavachin was found to be active against *S. aureus* and *M. smegmatis* according to Telikepalli *et al.*[24] Bidwillol A and Bidwillon C have antibacterial activity against oral bacteria[12]; Isobavachin, Warangalone and 5,7,4′-Trihydroxy-6,8-diprenyisoflavone possessed reproducible antimicrobial potency *in vitro* against

Staphylococcus aureus and *Mycobacterium smegmatis*.[24] Eryvarin S and Eryvarin T have antibacterial activities against thirteen strains of methicillin-resistant *Staphylococcus aureus* (MRSA).[27] Kobayashi *et al* found out that Eucherenone b_{10} inhibited Na^+/ H^+ exchange system of arterial smooth muscle cell.[18] Waffo *et al* found out that Indicanine C, 5,4′-Di-*O*-methylalpinumisoflavone and Cajanine has activity against Gram positive bacterium, *Staphylococus aureus* (209P) and *Mycobacterium smegmatis* (ATCC 607).[31] Sato *et al* found out that, Bidwillon B has antibacterial activities against twelve strains of methicillin-resistant *Staphylococcus aureus* (MRSA).[14] Spectral data of some flavonoids isolated from different parts of the plant, *Erythrina variegata* have been placed in Table 2.

Table. 2: Spectroscopic details, melting point, specific rotation etc of flavonoids from *Erythrina variegata.*

Compound Number /Name	Mol. Formula/ M.W/ UV / IR / Melting point / Specific rotation	Spectral data NMR (δ) / MS (m/z)	Ref
1/ Eryvarin B	$C_{25}H_{26}O_6$ M.W: 422 $[\alpha]_D^{23}$: 0°C (c=0.1, MeOH) U.V: λ_{max} (MeOH) (log ε): 204, 264 nm I.R: ν_{max} (KBr) 3420, 1640 cm^{-1}	^{1}H NMR: (150.80 MHz, acetone-d_6) δ_H: 1.28 (3H, *s*, 4″-Me), 1.40 (3H, *s*, 5″-Me), 1.66 (3H, s, 5‴-Me), 1.81 (3H, s, 4‴-Me), 2.64 (1H, *dd*, *J*=16.9, 7.3 Hz, H-1″), 3.00 (1H, *dd*, *J*=7.3, 5.1Hz, H-2″), 3.51 (2H, *d*, *J*=7.3 Hz, H-1‴), 3.78 (1H, *dd*, *J*=7.3 Hz, H-2″), 3.89 (1H, *br s*, 7-OH), 4.32 (1H, *br s*, 2″-OH), 5.21 (1H, *t*, *J*=7.3 Hz, H-2‴), 6.86 (2H, *d*, *J*=8.8 Hz, H-3′ and H-5′), 7.41 (2H, *d*, *J*=8.1 Hz, H-2′ and H-6′), 7.99 (1H, *s*, H-2), 8.37 (1H, *br s*, 4′-OH) ^{13}C NMR: (150.80 MHz, acetone-d_6) δ_C: 150.6 (C-2), 126.0 (C-3), 175.1 (C-4), 153.4 (C-5), 105.8 (C-6), 157.5 (C-7), 107.8 (C-8), 156.3 (C-9), 110.0 (C-10), 125.0 (C-1′), 131.3 (C-6′), 27.6 (C-1″), 69.0 (C-2″), 78.1 (C-3″), 20.5 (C-4″), 25.93 (C-5″), 22.5 (C-1‴), 123.3 (C-2‴), 132.2 (C-3‴), 18.0 (C-4‴), 25.87 (C-5‴), 56.3 (OMe) EIMS (*m/z*): 422 $[M]^+$, 403, 379, 351, 349, 336, 321, 307, 295, 279, 167	[5]
2/ Eryvarin C	$C_{20}H_{20}O_4$ M.W.: 324 $[\alpha]_D^{23}$: +35°.CD (c=0.1, MeOH) CD (MeOH; c 3.13 × 10^{-5}): Δε+2.11 (310), +1.56 (302), +2.50 (280), +1.23 (247), +4.04 (232), ±0 (218) U.V : λ_{max} (MeOH) (log ε): 204 (4.58), 222 (4.61), 277 (4.06), 311 (3.93) nm I.R: ν_{max} (KBr) 3400, 1620 cm^{-1}	^{1}H NMR ($CDCl_3$) δ_H: 1.41 (6H, *s*, H-4″, H-5″), 2.86 (1H, *ddd*, *J*= 15.6, 5.4, 1.5 Hz, H-4), 2.95 (1H, *dd*, *J*= 15.6, 10.7 Hz, H-4), 3.48 (1H, *m*, H-3), 4.02 (1H, *t*-like, *J*= 10.3 Hz, H-2), 4.31 (1H, *ddd*, *J*= 10.3, 3.4, 2.0 Hz, H-2), 4.73, 4.90 (2H, 2 × *s*, 2 × OH), 5.49 (1H, *d*, *J*= 9.8 Hz, H-2″), 6.25 (1H, *d*, *J*= 9.8 Hz, H-1″), 6.31 (H, *d*, *J*= 2.4 Hz, H-3′), 6.32 (1H, *s*, H-8), 6.38 (1H, *dd*, *J*=8.3, 2.4 Hz, H-5′), 6.69 (1H, *s*, H-5), 6.95 (1H, *d*, *J*=8.3 Hz, H-6′) ^{13}C NMR ($CDCl_3$) δ_C: 69.9 (C-2), 31.7 (C-3),	[6]

Compound Number /Name	Mol. Formula/ M.W/ UV / IR / Melting point / Specific rotation	Spectral data NMR (δ) / MS (m/z)	Ref
		30.3 (C-3), 126.9 (C-5), 114.9 (C-6), 152.3 (C-7), 104.2 (C-8), 154.9 (C-9), 114.4 (C-10), 119.9 (C-1′), 154.5 (C-2′), 103.1 (C-3′), 155.3 (C-4′), 107.9 (C-5′), 128.4 (C-6′), 121.9 (C-1″), 128.4 (C-2″), 76.1 (C-3″), 27.9 (C-4″), 27.9 (C-5″) MS *m/z* (rel.int.): 324 ([M^+], 28), 309 (100), 189 (7), 187 (13), 173 (18)	
3/ Eryvarin H	$C_{17}H_{16}O_5$ M.W: 300 U.V: λ_{max} (log ε): 206 (4.41), 235 (sh, 4.07), 288 (3.88), 326 (3.96) nm I.R: ν_{max} (KBr) 3420, 1620 cm^{-1}	^{1}H NMR (acetone-d_6) δ_H: 3.77 (3H, *s*, OMe-2′), 3.84 (3H, *s*, OMe-5′), 4.92 (2H, *s*, H-2), 6.33 (1H, *d*, *J*= 2.2 Hz, H-8), 6.41 (1H, *dd*, *J*= 8.1, 2.2, H-6), 6.56 (1H, *s*, H-4), 6.57 (1H, *s*, H-3′), 6.94 (1H, *d*, *J*= 8.1 Hz, H-5), 6.95 ((1H, *s*, H-6′), 7.81 (1H, *br s*, OH), 8.47 (1H, *br s*, OH) ^{13}C NMR (acetone-d_6) δ_C: 68.9 (C-2), 129.7 (C-3), 121.5 (C-4), 128.3 (C-5), 109.4 (C-6), 159.0 (C-7), 103.4 (C-8), 155.7 (C-9), 117.1 (C-10), 119.3 (C-1′), 153.1 (C-2′), 101.2 (C-3′), 148.3 (C-4′), 142.3 (C-5′), 113.3 (C-6′), 56.3 (OMe-2′), 57.1 (OMe-5′) EIMS *m/z* (rel.int.): 300 ([M^+], 100), 286 (38), 271 (19), 269 (23), 243 (8), 241 (8)	[30]
4/ Eryvarin I	$C_{21}H_{20}O_4$ M.W: 336.1371 U.V: λ_{max} (log ε): 205 (4.33), 241 (4.42), 284 (4.14), 322 (4.30) nm I.R: ν_{max} (Film) 3400, 1620 cm^{-1}	^{1}H NMR (acetone-d_6) δ_H: 1.42 (6H, *s*, H-5″, 6″), 3.70 (3H, *s*, OMe), 4.95 (2H, *s*, H-2), 5.79 (1H, *d*, *J*= 10.3 Hz, H-3″), 6.35 (1H, *d*, *J*= 2.2 Hz, H-8), 6.43 (1H, *dd*, *J*= 8.1, 2.2 Hz, H-6), 6.57 (1H, *d*, *J*= 8.8 Hz, H-5′), 6.63 (1H, *d*, *J*= 10.3 Hz, H-4″), 6.64 (1H, *s*, H-4), 6.98 (1H, *d*, *J*= 8.1 Hz, H-5), 7.13 (1H, *d*, *J*= 8.8 Hz, H-6′), 8.48 (1H, *br s*, OH) ^{13}C NMR (acetone-d_6) δ_C: 68.6 (C-2), 128.6 (C-3), 121.5 (C-4), 128.6 (C-5), 109.5 (C-6), 159.3 (C-7), 103.5 (C-8), 155.8 (C-9), 116.9 (C-10), 125.2 (C-1′), 154.7 (C-2′), 115.8 (C-3′), 154.9 (C-4′), 113.3 (C-5′), 129.5 (C-6′), 76.7 (C-2″), 131.7 (C-3″), 117.5 (C-4″), 28.0 (C-5″), 28.0 (C-6″), 61.9 (OMe-2′) EIMS *m/z* (rel.int.): 336 ([M^+], 81), 321 (100), 306 (19)	[30]
5/ Eryvarin M	$C_{17}H_{16}O_6$ M.W: 316 $[\alpha]_D$: ±0°.CD (c=3.19 × 10^{-5}, MeOH) U.V: λ_{max} (MeOH) (log ε): 211 (4.31), 233 (sh, 4.11), 278 (4.02), 317 (sh, 3.76) nm I.R: ν_{max} (film) 3400, 1650 cm^{-1}	^{1}H NMR: (600 MHz, $CDCl_3$) δ_H: 4.47 (1H, *dd*, *J*=10.7, 5.4 Hz, H-2), 4.55 (1H, *dd*, *J*=12.2, 10.7, H-2), 4.25 (1H, *dd*, *J*=12.2, 5.4 Hz, H-3), 7.89 (1H, *d*, *J*=8.8 Hz, H-5), 6.52 (1H, *dd*, *J*=8.8, 2.4 Hz, H-6), 6.39 (1H, *d*, *J*=2.4 Hz, H-8), 6.59 (1H, *s*, H-3′), 6.63 (1H, *s*, H-6′), 3.72 (3H, *s*, OMe-2′), 3.79 (3H, *s*, OMe-5′) ^{13}C NMR: (150.8 MHz, $CDCl_3$) δ_C: 71.2 (C-2), 47.7 (C-3), 191.9 (C-4), 129.9 (C-5), 110.4 (C-6), 162.5 (C-7), 103.1 (C-8), 163.8 (C-9), 115.6 (C-10), 114.0 (C-1′), 152.3 (C-2′), 99.9 (C-3′), 146.0	[11]

Compound Number /Name	Mol. Formula/ M.W/ UV / IR / Melting point / Specific rotation	Spectral data NMR (δ) / MS (m/z)	Ref
		(C-4′), 140.4 (C-5′), 113.3 (C-6′), 56.2 (C-2-OMe), 56.6 (C-5′-OMe) MS: $[M]^+$ 48(M^+), 180 (100), 165 (43), 149 (27), 137 (19), 91 (69)	
6/ Eryvarin N	$C_{22}H_{24}O_6$ M.W: 384 $[\alpha]_D$: ±0°.CD (c=2.63 × 10^{-5}, MeOH) U.V: λ_{max} (MeOH) (log ε): 208 (4.38), 219 (4.35), 236 (sh, 4.19), 287 (4.15) nm I.R: ν_{max} (film) 3400, 1660 cm^{-1}	^{1}H NMR: (600 MHz, $CDCl_3$) δ_H: 4.53 (1H, *dd*, *J*=11.0, 9.5 Hz, H-2), 4.55 (1H, *dd*, *J*=9.5, 7.3, H-2), 4.26 (1H, *dd*, *J*=11.0, 7.3 Hz, H-3), 7.81 (1H, *d*, *J*=8.8 Hz, H-5), 6.53 (1H, *d*, *J*=8.8 Hz, H-6), 6.59 (1H, *s*, H-3′), 6.63 (1H, *s*, H-6′), 3.41 (2H, *d*, *J*=7.3 Hz, CH_2-1″), 5.25 (1H, *t*, *J*=7.3 Hz, H-2″), 1.82 (1H, *s*, H-4″), 1.76 (1H, *s*, H-5″), 3.72 (3H, *s*, OMe-2′), 3.79 (3H, *s*, OMe-5′) ^{13}C NMR: (150.8 MHz, $CDCl_3$) δ_C: 71.3 (C-2), 47.4 (C-3), 192.2 (C-4), 127.1 (C-5), 110.4 (C-6), 160.9 (C-7), 114.3 (C-8), 161.0 (C-9), 115.7 (C-10), 114.2 (C-1’), 152.3 (C-2′), 99.9 (C-3′), 146.0 (C-4′), 140.4 (C-5′), 113.3 (C-6′), 22.1 (C-1″), 121.1 (C-2″), 135.3 (C-3″), 17.9 (C-4″), 25.8(C-5″), 56.2 (C-2′-OMe), 56.7 (C-5′-OMe) MS: $[M]^+$ 40 (M^+), 205 (24), 180 (100), 165 (30), 149 (34)	[11]
7/ Eryvarin O	$C_{21}H_{21}O_5$ M.W: 353 U.V: λ_{max} (MeOH) (log ε): 212 (4.51), 241 (4.03), 341 (4.24) nm I.R: ν_{max} (film) 3400, 1700, 1610 cm^{-1}	^{1}H NMR: (600 MHz, Acetone-d_6) δ_H: 7.84 (1H, *s*, H-4), 7.55 (1H, *d*, *J*=8.1Hz, H-5), 6.87 (1H, *dd*, *J*=8.1, 2.2 Hz, H-6), 6.79 (1H, *d*, *J*=2.2 Hz, H-8), 6.70 (1H, *d*, *J*=8.8 Hz, H-5′), 7.12 (1H, *d*, *J*=8.8 Hz, H-6′), 3.41 (2H, *d*, *J*=7.3 Hz, CH_2-1″), 5.29 (1H, *t*, *J*=7.3 Hz, H-2″), 1.78 (1H, *s*, H-4″), 1.67 (1H, *s*, H-5″), 3.52 (3H, *s*, OMe-2′) ^{13}C NMR: (150.8 MHz, Acetone-d_6) δ_C: 161.1(C-2), 122.5 (C-3), 142.4 (C-4), 130.3 (C-5), 113.8 (C-6), 161.6 (C-7), 102.9 (C-8), 156.4 (C-9), 113.5 (C-10), 121.2 (C-1′), 158.5 (C-2′), 122.4 (C-3′), 157.2 (C-4′), 111.3 (C-5′), 129.9 (C-6), 23.8 (C-1″), 124.4 (C-1″), 131.1 (C-1″), 17.8 (C-1″), 25.8(C-1″), 61.2 (C-2′-OMe) MS: $[M]^+$ 353 ($[M+H^+]$, 100), 297 (38)	[11]
8/ Eryvarin S	$C_{25}H_{26}O_4$ M.W. 390 U.V: λ_{max} (log ε): 205 (4.62), 255 (4.46), 309 (3.97) nm I.R: (film) ν_{max} 3380, 1620 cm^{-1}	^{1}H NMR: (600 MHz, $CDCl_3$) δ_H: 1.77 (3H, *s*, H-5‴), 1.80 (6H, *s*, H- 4″, 5″), 1.86 (3H, *s*, H-4‴), 3.45 (2H, *d*, *J*=7.3 Hz, H-1″), 3.61 (2H, *d*, *J*= 7.3 Hz, H-1‴), 5.27 (1H, *t*, *J*= 7.3 Hz, H-2‴), 5.33 (1H, *t*, *J*= 7.3 Hz, H-2″), 5.97 (1H, *br s*, OH), 6.18 (1H, *s*, OH), 6.84 (2H, *d*, *J*= 8.8 Hz, H-3′, 5′), 7.37 (2H, *d*, *J*= 8.8 Hz, H-2′, 6′), 7.96 (1H, *s*, H-5), 7.97 (1H, *s*, H-2) ^{13}C NMR: (600 MHz, $CDCl_3$) δ_C: 152.3 (C-2), 124.5 (C-3), 176.8 (C-4), 124.4 (C-5), 126.3 (C-6), 157.7 (C-7), 114.6 (C-8), 154.2 (C-9), 118.2 (C-10), 124.0 (C-1′), 130.3 (C-2′), 115.7 (C-3′),	[27]

Compound Number /Name	Mol. Formula/ M.W/ UV / IR / Melting point / Specific rotation	Spectral data NMR (δ) / MS (m/z)	Ref
		155.9 (C-4′), 115.7 (C-5′), 130.3 (C-6′), 29.8 (C-1″), 121.0 (C-2″), 135.8 (C-3″), 18.0 (C-4″), 25.9 (C-5″), 22.3 (C-1‴), 120.7 (C-2‴), 135.1 (C-3‴), 18.0 (C-4‴), 25.8 (C-5‴) EIMS *m/z* (rel. int.): 390 ([M^+], 100), 373 (24), 347 (16), 335 (47), 319 (72), 291 (21), 279 (29)	
9/ Eryvarin T	$C_{17}H_{18}O_5$ M.W. 302 $[\alpha]_D$: ±0°C CD (MeOH; c 2.32×10^{-5}) U.V: λ_{max} (log ε): 205 (4.66), 230 sh (4.11), 289 (3.87), 320 (3.43) nm I.R: (film) ν_{max} 3420 cm^{-1}	^{1}H NMR: (Acetone-d_6) δ_H: 2.77 (1H, *ddd*, *J*= 15.6, 5.4, 2.0 Hz, H-4b), 2.96 (1H, *dd*, *J*= 15.6, 11.2 Hz, H-4a), 3.47 (1H, *m*, H-3), 3.77 (3H, *s*, OMe-5′), 3.78 (3H, *s*, OMe-2′)	[27]
10/ Bidwillol A	$C_{21}H_{22}O_4$ M.W. 338 U.V: λ_{max} (MeOH) 218 , 242 sh, 301 sh, 322 nm	^{1}H NMR: (Acetone-d_6) δ_H: 1.66, 1.78 (3H each, *s*, Me), 3.37 (2H, *d*, *J*= 7 Hz, H-1″), 3.65 (3H, *s*, OMe), 4.94 (2H, *d*, *J*= 2 Hz, H-2), 5,26 (1H, *t*, J= 7 Hz, H-2″), 6.34 (1H, *d*, *J*=2 Hz, H-8), 6.42 (1H, *dd*, *J*= 8, 2 Hz, H-6), 6.58 (1H, *br s*, H-4), 6.68 (1H, *d*, *J*= 8 Hz, H-5′), 6.97 (1H, *d*, *J*= 8 Hz, H-5), 7.03 (1H, *d*, *J*= 8 Hz, H-6′), 8.44, 8.47 (1H each, *s*, OH) ^{13}C NMR: (acetone-d_6) δ_C: 68.7 (C-2), 124.4 (C-3), 127.6 (C-4),129.5 (C-5), 109.4 (C-6), 158.5 (C-7), 103.5 (C-8), 155.7 (C-9), 117.0 (C-10), 124.3 (C-1′), 157.0 (C-2′), 121.8 (C-3′), 159.1 (C-4′), 112.0 (C-5′), 128.5 (C-6′), 23.6 (C-1″), 122.8 (C-2″), 131.2 (C-3″), 18.0 (C-4″), 25.9 (C-5″), 61.0 (OMe) EIMS *m/z* (%): 338 [M^+] (100), 282 (51), 267 (49), 147 (26)	[12]
11/ Bidwillon C	$C_{20}H_{16}O_4$ M.W. 320	^{1}H NMR: (Acetone-d_6) δ_H: 1.46 (6H, s, Me × 2), 5.95 (1H, J= 10 Hz, H-5″), 6.80 (1H, *br d*, *J*= 10 Hz, H-4″), 6.81 (H, *d*, *J*= 9 Hz, H-3′, 5′), 6.93 (1H, *br d*, *J*= 9 Hz, H-6), 7.29 (2H, *d*, *J*= 9 Hz, H-2′, 6′), 7.89 (1H, *d*, *J*= 9 Hz, H-5), 8.37 (1H, *s*, H-2), 9.54 (1H, *br s*, OH) ^{13}C NMR: (acetone-d_6) δ_C: 152.1 (C-2), 122.7 (C-3), 175.2 (C-4), 126.5 (C-5), 115.4 (C-6), 157.7 (C-7), 109.4 (C-8), 153.3 (C-9), 118.3 (C-10), 124.1 (C-1′), 130.6 (C-2′, 6′), 115.5 (C-3′, 5′), 157.0 (C-4′), 114.6 (C-4″), 131.8 (C-5″), 78.3 (C-″6″), 28.1 (C-7″, 8) EIMS *m/z* (%): 320 [M^+] (22), 306 (21), 305 (100), 187 (15), 152 (16)	[12]
12/ Abyssinone V	$C_{25}H_{27}O_5$ M.W: 408 UV: λ_{max} (MeOH) 227, 291 nm (+ NaOH) 229, 248, 333 nm	^{1}H NMR ($CDCl_3$) δ_H: 1.60 (3H, *s*, CH_3), 1.75 (9H, *s*, 3 × CH_3), 2.75 (1H, *dd*, *J*) 14.5, 2.5 Hz, H-3), 3.10 (1H, *dd*, *J*= 14.5, 12.5 Hz, H-3), 3.35 (4H, *d*, *J*= 6 Hz, 2 × H_2-1″), 5.30 (3H, *m*, 2 × H-	[13]

Compound Number /Name	Mol. Formula/ M.W/ UV / IR / Melting point / Specific rotation	Spectral data NMR (δ) / MS (m/z)	Ref
	IR: ν_{max} 3430, 2915, 1640, 1605, 1475, 1375, 1340, 1270, 1165, 835 cm^{-1}	2″□ and OH-7), 6.00 (2H, *s*, H-6 and H-8), 7.05 (2H, *s*, H-2′□and H-6′), 12.06 (1H, *s*, OH-5) ^{13}C NMR ($CDCl_3$) δ_C: 17.9 (C-4″), 25.5 (C-5″), 29.7 (C- 1″), 43.1 (C-3), 79.5 (C-2), 95.5 (C-8), 96.6 (C-6), 103.2 (C-4a), 121.6 (C-2″), 126.1 (C-2′□ and C-6′), 127.6 (C-3′ □and C-5′), 129.7 (C-1′), 134.9 (C-3″), 153.4 (C-4′), 163.4 (C-8a), 164.3 (C-5), 164.5 (C-7), 196.4 (C-4) FABMS *m/z* [M + H]+ 409	
13/ 4′-Hydroxy-6, 3′, 5′-triprenylisoflavone	$C_{30}H_{37}O_5$ M.W: 477 UV: (MeOH) λ_{max} 232, 296 nm (+ NaOH) 249, 348 nm IR: (KBr) ν_{max} 3450, 3435, 3151, 2915, 1635, 1605, 1435, 1405, 1345, 1270, 1170, 1075 cm^{-1}	^1H NMR ($CDCl_3$) δ_H: 1.74 (6H, *s*, CH_3- 4‴), 1.80 (12H, *s*, CH_3-4″), 2.80 (1H, *dd*, *J*=14.5, 2.5 Hz, H-3), 3.06 (1H, *dd*, *J*= 14.5, 2.5 Hz, H-3), 3.30 (2H, *d*, *J*= 6 Hz, H-1‴), 3.38 (4H, *d*, *J*= 6.5 Hz, H-1″), 5.20 (1H, *t*, *J* = 6.5 Hz, H-2‴), 5.32 (3H, *m*, H-2, H-2″), 5.50 (1H, *s*, OH-4), 6.02 (1H, *s*, H-8), 6.05 (1H, *br s*, OH-7), 7.05 (2H, *s*, H-2′□ and H-6′), 12.02 (1H, *s*, OH-5) ^{13}C NMR ($CDCl_3$) δ_C: 17.9 (C-4″□and C-4‴), 21.8 (C-1‴), 25.8 (C-5″□and C-5‴), 29.7 (C-1″), 43.2 (C-3), 79.1 (C-2), 96.7 (C-8), 103.2 (C-8a), 106.0 (C-6), 121.5 (C-2″□ and C-2‴), 125.7 (C-2′□ and C-6′), 127.4 (C-3′□ and C-5′), 130.2 (C-1′), 134.8 (C-3″), 135.0 (C-3‴), 153.1 (C-4′), 159.9 (C-5), 162.3 (C-4a), 163.6 (C-7), 196.4 (C-4)	[13]
14/ Bidwillon B	$C_{25}H_{26}O_5$ M.W: 406 $[\alpha]_D$: ±0°.CD (c=0.1, MeOH) U.V: λ_{max} (MeOH) (log ε): 206, 220, 256, 337 nm I.R: ν_{max} (KBr) 3400, 1650 cm^{-1}	^1H NMR: (600 MHz, Acetone-d_6) δ_H: 1.45,1.46 (6H, 2 × *s*, H-5″ and -6″), 1.66, 1.79 (6H, 2 × *s*, H-4‴ and 5‴), 3.31 (2H, *d*, *J* = 7.3 Hz, H-1‴), 4.14 (1H, *dd*, *J* = 10.3, 5.1 Hz, H-3), 4.60 (1H, *dd*, *J* = 11.0, 5.1 Hz, H-2), 4.70 (1H, *dd*, *J* = 11.0, 11.3 Hz, H-2), 5.21 (1H, *t*, *J* = 7.3 Hz, H-2‴), 5.74 (1H, *t*, *J* = 9.5 Hz, H-3″), 6.32 (1H, *dd*, *J* = 8.8, 2.2 Hz, H-5′), 6.43 (1H, *d*, *J* = 2.2 Hz, H-3′), 6.44 (1H, *d*, *J* = 9.5, H-4″), 6.69 (1H, *d*, *J* = 8.8 Hz, H-6′), 7.46 (1H, *s*, H-5), 8.22 (1H, *br s*, OH), 8.53 (1H, *br s*, OH) EIMS: 406 [M^+], 391 (100), 373, 333, 289, 271, 255, 242, 227, 215	[14]
15/ 5,4′-Dihydroxy-8-(3,3-dimethylallyl)-2″-methoxyisopropylfurano[4,5:6,7]isoflavone	$C_{26}H_{26}O_6$ M.W: 434 M.pt. 101-102°C U.V: λ_{max} (MeOH) (log ε): 268 (4.75), 353 (3.49) nm I.R: ν_{max} (KBr) 3356, 2982, 2932, 1655, 1628, 1562, 1512, 1423, 1365, 1335, 1223, 1107, 1069, 988, 837 cm^{-1}	^1H NMR: (400 MHz, acetone-d_6) δ_H: 8.38 (1H, *s*, C-2), 7.50 (1H, *d*, *J*=8.6 Hz, C-2′), 6.39 (1H, *d*, *J*=8.6 Hz, H-3′), 6.93 (1H, *d*, *J*=8.6 Hz, H-5′), 7.50 (1H, *d*, *J*=8.6 Hz, H-6′), 3.88 (1H, *m*, H-2″), 1.33 (3H, *s*, H-4″), 1.39 (3H, *s*, H-5″), 3.11 (3H, *s*, OCH_3-4″), 13.72 (1H, *s*, OH-5) ^{13}C NMR: (100 MHz, acetone-d_6) δ_C: 155.2 (C-2), 123.0 (C-3), 183.8 (C-4), 154.3 (C-5), 113.8 (C-6), 158.2 (C-7), 104.6 (C-8), 151.9 (C-9), 107.4 (C-10), 123.1 (C-1′), 131.3 (C-2′), 116.0	[16]

Compound Number /Name	Mol. Formula/ M.W/ UV / IR / Melting point / Specific rotation	Spectral data NMR (δ) / MS (m/z)	Ref
		(C-3′), 158.5 (C-4′), 116.0 (C-5′), 131.3 (C-6′), 161.6 (C-2″), 102.0 (C-3″), 73.9 (C-4″), 25.5 (C-5″), 25.5 (C-6″), 22.7 (C-1‴), 122.0 (C-2‴), 133.3 (C-3‴), 17.9 (C-4‴), 25.9 (C-5‴), 51.1 (OCH_3-4″)	
16/ 5,7,4′-Trihydroxy-6-(3,3-dimethylallyloxiranylmethyl)isoflavone	$C_{20}H_{18}O_6$ M.W: 354 M.pt: 252-254°C $[\alpha]^{20}_D$: 10.8° (c=0.1, MeOH) U.V: λ_{max} (MeOH) (log ε): 212 (4.64), 265 (4.75), 300 (4.14), 339 (3.71) nm I.R: ν_{max} (KBr) 3441, 2932, 1655, 1616, 1578, 1516, 1462, 1369, 895, 837, 818 cm^{-1}	^{1}H NMR: (400 MHz, acetone-d_6) δ_H: 8.16 (1H, *s*, C-2), 6.36 (1H, *s*, C-8), 7.45 (1H, *d*, *J*=8.8 Hz, H-2′), 6.90 (1H, *d*, *J*=8.8 Hz, H-3′), 6.90 (1H, *d*, *J*=8.8 Hz, H-5′), 7.45 (1H, *d*, *J*=8.8 Hz, H-6′), 2.94 (1H, *m*, H-1″), 2.62 (1H, *dd*, *J*=17.0, 7.2 Hz, H-1″), 6.91 (1H, *s*, C-3″), 1.63 (3H, *s*, C-5″), 1.63 (3H, *s*, C-6″), 5.38 (1H, *tt*, *J*=7.5, 1.3 Hz, C-2‴), 1.89 (3H, *s*, C-4‴), 13.36 (1H, *s*, OH-5), 8.71 (1H, *s*, OH-4′) ^{13}C NMR: (100 MHz, acetone-d_6) δ_C: 154.4 (C-2), 123.8 (C-3), 181.8 (C-4), 160.8 (C-5), 105.1 (C-6), 160.6 (C-7), 95.1 (C-8), 156.8 (C-9), 105.7 (C-10), 123.1 (C-1′), 131.1 (C-2′), 116.0 (C-3′), 158.5 (C-4′), 116.0 (C-5′), 131.1 (C-6′), 26.1 (C-1″), 68.8 (C-2″), 79.8 (C-3″), 21.2 (C-4″), 25.8 (C-5″)	[16]
17/ 5,4′-Dihydroxy-8-(3,3-dimethylallyl)-2″-hydroxymethyl-2″-methylpyrano[5,6:6,7]isoflavone	$C_{25}H_{24}O_6$ M.W: 420 M.pt: 205-207°C $[\alpha]^{20}_D$: -7.8° (c-0.1, MeOH) U.V: λ_{max} (MeOH) (log ε): 289 (4.71), 226 (4.44) nm I.R: ν_{max} (KBr) 3456, 3283, 2909, 1659, 1616, 1570, 1516, 1435, 1230, 887, 837, 818 cm^{-1}	^{1}H NMR: (400 MHz, acetone-d_6) δ_H: 8.27 (1H, *s*, C-2), 7.47 (1H, *d*, *J*=8.8 Hz, C-2′), 6.91 (1H, *d*, *J*=8.8 Hz, H-3′), 6.91 (1H, *d*, *J*=8.8 Hz, H-5′), 7.47 (1H, *d*, *J*=8.8 Hz, H-6′), 5.76 (1H, *d*, *J*=10.1 Hz, H-3″), 6.78 (1H, *d*, *J*= 10.1 Hz, H-4″), 3.67 (2H, *s*, H-5″), 1.44 (3H, *s*, C-6″), 3.43 (2H, *m*, C-1‴), 5.23 (1H, *m*, C-2‴), 1.82 (3H, *br s*, C-4‴), 1.66 (3H, *br s*, C-5‴), 13.35 (1H, *s*, OH-5) ^{13}C NMR: (100 MHz, acetone-d_6) δ_C: 154.4 (C-2), 123.8 (C-3), 182.2 (C-4), 155.8 (C-5), 107.9 (C-6), 157.7 (C-7), 106.0 (C-8), 155.6 (C-9), 106.5 (C-10), 123.1 (C-1′), 131.1 (C-2′), 116.0 (C-3′), 158.5 (C-4′), 116.0 (C-5′), 131.2 (C-6′), 81.8 (C-2″), 126.3 (C-3″), 117.8 (C-4″), 68.7 (C-5″), 23.6 (C-6″), 21.9 (C-1‴), 123.0 (C-2‴), 132.1 (C-3‴), 18.0 (C-4‴), 25.9 (C-5‴)	[16]
18/ 5,4′-Dihydroxy-2′-methoxy-8-(3,3-dimethylally″l)-2″,2-dimethylpyrano[5,6:6,7]isoflavanone	$C_{25}H_{28}O_6$ M.W: 436 M.pt: 205-207°C $[\alpha]^{20}_D$: 7.6° (c=0.1, MeOH) U.V: λ_{max} (MeOH) (log ε): 269 (4.48), 275 (4.49), 312 (3.90), 360 (3.20) nm	^{1}H NMR: (400 MHz, $CDCl_3$) δ_H: 4.47 (2H, *m*, C-2), 4.28 (1H, *dd*, *J*=11.2, 5.6 Hz, C-3), 6.40 (1H, *br s*, H-3′), 6.34 (1H, *dd*, *J*=8.0, 2.0 Hz, H-5′), 6.92 (1H, *d*, *J*=8.0 Hz, H-6′), 5.49 (1H, *d*, *J*=10.0 Hz, H-3″), 6.64 (1H, *d*, *J*= 10.0 Hz, H-4″), 1.45 (3H, *s*, H-5″), 1.45 (3H, *s*, C-6″), 3.20 (2H, *d*, *J*=7.2 Hz, C-1‴), 5.16 (1H, *t*, *J*=7.2 Hz, C-2‴), 1.76 (3H, *s*, C-4‴), 1.68 (3H, *s*, C-5‴), 3.75 (3H, *s*, OCH_3-2′), 12.45 (1H, *s*, OH-5) ^{13}C NMR: (100 MHz, $CDCl_3$) δ_C: 70.4 (C-2), 46.7 (C-3), 198.1 (C-4), 157.0 (C-5), 102.8 (C-6),	[16]

Compound Number /Name	Mol. Formula/ M.W/ UV / IR / Melting point / Specific rotation	Spectral data NMR (δ) / MS (m/z)	Ref
		159.6 (C-7), 108.4 (C-8), 159.8 (C-9), 103.0 (C-10), 115.1 (C-1′), 158.6 (C-2′), 99.7 (C-3′), 156.8 (C-4′), 107.5 (C-5′), 130.9 (C-6′), 78.0 (C-2″), 125.9 (C-3″), 115.8 (C-4″), 28.4 (C-5″), 28.4 (C-6″), 21.3 (C-1‴), 122.6 (C-2‴), 131.1 (C-3‴), 17.8 (C-4‴), 25.8 (C-5‴), 55.5 (OCH_3-2′)	
23/ Lupiwighte-one	$C_{20}H_{18}O_5$ M.W: 338 M.pt. 133-134°C	^{1}H NMR (acetone-d_6) δ_H: 1.66 (*s*, 3H, H-4″), 1.81 (*s*, 3H, H-5″), 3.45 (*d*, 2H, J= 6.9 Hz, H-1″), 5.23 (*m*, 1H, *J*= 1.5, 6.9 Hz, H-2″), 6.37 (*s*, 1H, H-6), 6.90 (*d*, 2H, *J*= 9.0 Hz, H-3′, 5′), 7.47 (*d*, 2H, J= 9.0 Hz, H-2′, 6′), 8.25 (*s*, 1H, H-2), 8.47 (4′-OH), 8.60 (7-OH), 12.97 (5-OH) ^{13}C NMR (acetone-d_6, 75 MHz) δ_C: 17.37 (C-5″), 21.52 (C-1″), 25.32 (C-4″), 98.85 (C-6), 105.71 (C-4a), 106.66 (C-8), 115.41 (C-3′, 5′), 122.54 (C-2″), 122.66 (C-3), 123.16 (C-1′), 130.61 (2′, 6′), 131.54 (3″), 153.82 (C-8a), 155.73 (C-2), 157.80 (C-4′), 160.94 (C-5), 161.60 (C-7), 181.41 (C-4) EIMS *m/z* (%) 338 (M^+, 96), 323 (100), 283 (32), 270 (48), 118 (9)	[16]
25/ Alpinum isoflavone	$C_{20}H_{20}O_5$ M.W: 340	^{1}H NMR (400 MHz, $CDCl_3$): δ_H: 13.14 (1H, *s*, OH-5), 7.83 (1H, *s*, H-2), 7.27 (2H, *d*, *J* = 8.5 Hz, H-2′& H-6′), 6.90 (2H, *d*, *J* = 8.5 Hz, H-3′& H-5′), 6.60 (1H, *d*, *J* = 10.6 Hz, H-4″), 6.34 (1H, *s*, H-8), 5.63 (1H, *br s*, OH-4′) 5.53 (1H, *d*, *J* = 10.6 Hz, H-3″), 1.48 (6H, *s*, Me2-2″)	[21,32]
35/ Indicanine C	$C_{21}H_{18}O_5$ M.W: 350 UV: (MeOH) λ_{max} (log ε): 288 (4.78) nm IR: ν_{max} (KBr) 3325, 2981, 1654, 1646, 1602, 1272, 1235, 1067 cm^{-1}	^{1}H-NMR (300 MHz, $CDCl_3$) δ_H: 7.76 (1H, *s*, H-2), 7.26 (2H, *d*, *J* = 8.7 Hz, H-2′, H-6′), 7.19 (1H, *br*, exchangeable with D_2O, 4′-OH), 6.82 (2H, *d*, *J* = 8.7 Hz, H-3′ and H-5′), 6.72 (1H, *d*, *J* = 10 Hz, H-40), 6.60 (1H, *s*, H-8), 5.72 (1H, *d*, *J* = 10 Hz, H-30), 3.89 (3H, *s*, 5-OCH_3) and 1.47 (6H, *s*, $(CH_3)_2$ C) ^{13}C-NMR (75 MHz, $CDCl_3$) δ_C: 175.8 (*s*, C-4), 158.7 (*s*, C-7), 158.2 (*s*, C-5), 156.4 (*s*, C-4′), 155.7 (*s*, C-8a), 150.7 (*d*, C-2), 130.8 (*d*, C-30), 130.4 (*d*, C-2′ and C-6′), 125.9 (*s*, C-3), 123.4 (*s*, C-1′), 116.0 (*d*, C-4), 115.8 (*d*, C-3′ and C- 5′), 113.4 (*s*, C-6), 113.1 (*s*, C-4a), 100.7 (*d*, C-8), 77.8 (*s*, C-20), 62.9 (*q*, 5-OMe) and 28.3 (*q*, Me2-20) EIMS *m/z* (rel. int.) [M+] 350 (78), 335 (100), 306 (18), 217 (45), 202 (23), 168 (57), 118 (49)	
37/ Cajanine	$C_{16}H_{12}O_6$ M.W: 300	^{1}H-NMR (300 MHz, DMSO) δ_H: 12.98 (1H, *s*, exchangeable with D_2O, OH-5), 9.39 (1H, *s*, exchangeable with D_2O, 2′-OH), 9.31 (1H, *s*, exchangeable with D_2O, 4′-OH), 8.22 (1H, s, H-	

Compound Number /Name	Mol. Formula/ M.W/ UV / IR / Melting point / Specific rotation	Spectral data NMR (δ) / MS (m/z)	Ref
		2), 6.96 (1H, *d*, *J* = 8.3 Hz, H-6′), 6.63 (1H, *d*, *J* = 2.3 Hz, H-3′), 6.36 (1H, *dd*, *J* = 2.3 and 8.3 Hz, H-5′), 6.28 (1H, *d*, *J* = 2.2 Hz, H-6), 6.24 (1H, *d*, *J* = 2.2 Hz, H-8), 3.85 (3H, *s*, 7-OMe) ^{13}C-NMR (75 MHz, DMSO) δ_C: 180.6 (*s*, C-4), 165.1 (*s*, C-7), 161.6 (*s*, C-5), 158.6 (*s*, C-8a), 157.5 (*s*, C-4′), 156.4 (*s*, C-2′), 155.6 (*s*, C-2), 132.2 (*d*, C-6′), 120.6 (*s*, C-3), 108.4 (*s*, C-1′), 106.2 (*d*, C-5′), 105.4 (*s*, C-4a), 102.6 (*d*, C-3′), 97.9 (*d*, C-6), 92.3 (*d*, C-8), 56.1 (*q*, 7-OMe)	
38/ 3 β, 28-Dihydroxyolean-12-ene	$C_{15}H_{12}O_6$ M.W: 288	^{1}H NMR (400 MHz, $CDCl_3$) δ_H: 5.18 (1H, *br s*, H-12), 3.55 (1H, *d*, *J*=10.8, Ha-28′), 3.21 (2H, *br d*, *J*=10.8, H-3, Hb-28), 1.16 (3H, *s*, H-30), 0.99 (3H, *s*, H-27), 0.96 (3H, *s*, H-29), 0.94 (3H, *s*, H-26), 0.88 (3H, *s*, H-25), 0.87 (3H, *s*, H-23), 0.75 (3H, *s*, H-24) ^{13}C NMR (100 MHz, $CDCl_3$) δ_C: 38.6 (C-1), 27.2 (C-2), 79.0 (C-3), 38.8 (C-4), 55.2 (C-5), 18.4 (C-6), 32.6 (C-7), 39.8 (C-8), 47.6 (C-9), 36.9 (C-10), 23.6 (C-11), 122.3 (C-12), 144.2 (C-13), 41.7 (C-14), 25.6 (C-15), 22.0 (C-16), 36.9 (C-17), 42.3 (C-18), 46.5 (C-19), 31.0 (C-20), 34.1 (C-21), 31.0 (C-22), 28.0 (C-23), 15.5 (C-24), 15.5 (C-25), 16.7 (C-26), 25.9 (C-27), 69.7 (C-28), 33.2 (C-29), 23.6 (C-30)	[32]
41/ 6,8-Diprenyl-kaempferol	$C_{26}H_{29}O_5$ M.pt: 152-153□C IR: (KBr) 3351 (OH), 1641, 1503 cm^{-1} UV: (MeOH) □$_{max}$ (log□□): 276 (4.26), 336 (4.12) nm	^{1}H NMR (300 MHz, $CDCl_3$-CD_3OD) δ_H: □1.72 (3H, *s*, H-4″), 1.77 (3H, *s*, H-4‴), 1.83 (3H, *s*, H-5″), 1.95 (3H, *s*, H-5‴), 3.42 (2H, *t*, *J* = 7.2 Hz, H-1″), 3.69 (2H, *t*, *J* = 7.8 Hz, H-1‴), 5.40 (1H, *br t*, *J* = 7.2 Hz, H-2″), 5.45 (1H, *br t*, *J* = 7.8 Hz, H-2‴), 6.94 (2H, *d*, *J* = 8.1 Hz, H-3′□□, 5′), 7.64 □(2H, □□*d*, *J* = 8.1 Hz, H-2′, 6′), 12.32 (1H, *s*, 5-OH) ^{13}C NMR (75 MHz, $CDCl_3$-CD_3OD) δ_C: □153.61 (*d*, C-2), 153.08 (*s*, C-3), 179.55 (*s*, C-4), 158.66 (*s*, C-5), 112.35 (*s*, C-6), 160.02 (*s*, C-7), 104.76 (*s*, C-8), 155.07 (*s*, C-9), 102.34 (*s*, C-10), 113.20 (*s*, C-1′), 126.88 (2C, *d*, C-2′□□, 6′), 113.20 (2C, *d*, C-3′, 5′), 160.61 (*s*, C-4′), 27.53 (*t*, C-1″), 121.13 (*d*, C-2″), 133.70 (*s*, C-3″), 25.51 (2C, *q*, C-4″, 4‴), 26.48 (2C, *q*, C-5″, 5‴), 22.62 (*t*, C-1‴), 121.30 (*d*, C-2‴), 132.16 (*s*, C-3‴) EIMS *m/z* (rel. int. %): 422 [M]+ (52), 367 (27), 311 (32), 288 (12), 233 (22), 121 (100), 118 (23)	[29]

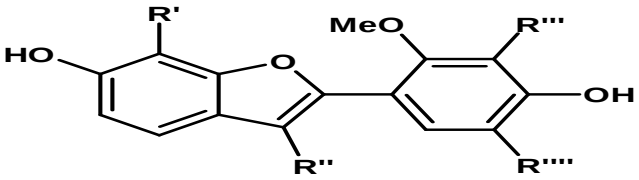
B. Benzofurans from *Erythrina variegata*

Some benzofurans were obtained from the roots of *Erythrina variegata*. Names and sources of the compounds have been cited in Table 3 as follows.

Table. 3: Benzofurans from *Erythrina variegata*.

No	Compound name	Source (reference)
1	Eryvarin P	Root [11]
2	Eryvarin Q	Root [11]
3	Eryvarin R	Root [11]
4	Eryvarin U	Root [27]
5	Eryvarin L	Root [30]
6	Bidwillol B **[**3′-(γ,γ-Dimethylallyl)-6,4′-dihydroxy-2′-methoxy-2-arylbenzofuran**]**	Root bark [12]

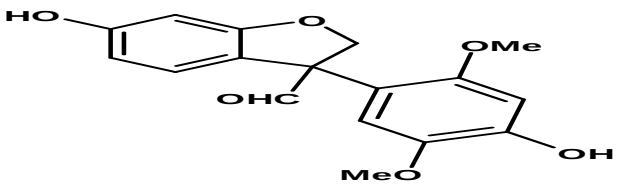
The structures of some of the above compounds are given below followed by the sources with references and the spectral data of the compounds.



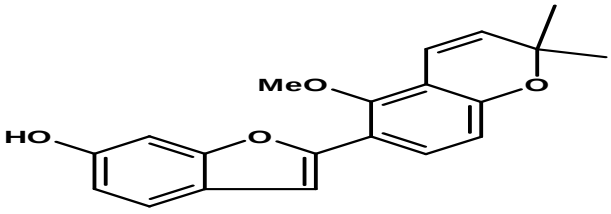
R'=R'''=H, R"=CHO, R''''=OMe, Eryvarin P (1)

R'= R''''=  **R"=CHO, R'''=H, Eryvarin Q (2)**

R'= R"=R''''=H, R'''=  **, Bidwillol B (6)**



Eryvarin R (3)



Eryvarin U (4)

Tanaka *et al* found that Eryvarin Q and Eryvarin U had a potent antibacterial activities against methicillin-resistant *Staphylococcus aureus* (MRSA).[11,27] Bidwillol B has antibacterial activity against oral bacteria.[12] Tanaka *et al* also found that, Eryvarin L exhibited weak anti-MRSA activity and it also inhibited growth of five strains of vancomycin-resistant enterococci.[30]

Spectral data of some benzofurans isolated from roots of the plant, *Erythrina variegata* have been placed in table 4.

Table. 4: Spectroscopic details, specific rotation etc of benzofurans from *Erythrina variegata.*

Compound Number/Name	Mol. Formula/ M.W/ UV / IR / Specific rotation	Spectral data NMR (δ) / MS (*m/z*)	Ref
1/Eryvarin P	$C_{17}H_{15}O_6$ M.W: 315 U.V: λ_{max} (MeOH) (log ε): 210 (4.37), 234 (sh, 4.16), 280 (3.94), 337 (sh, 3.66) nm I.R: ν_{max} (film) 3400, 1650, 1620 cm^{-1}	^{1}H NMR: (600 MHz, $CDCl_3$) δ_H: 8.06 (1H, *d*, *J*=8.4 Hz, H-4), 6.88 (1H, *dd*, *J*=8.4, 2.2 Hz, H-5), 7.01 (1H, *d*, *J*=2.2 Hz, H-7), 6.71 (1H, *s*, H-3′), 7.12 (1H, *s*, H-6′), 3.80 (3H, *s*, OMe-2′), 3.94 (3H, *s*, OMe-5′), 10.07 (1H, *s*, CHO) ^{13}C NMR: (150.8 MHz, $CDCl_3$) δ_C: 162.2 (C-2), 117.6 (C-3), 122.9 (C-4), 113.7 (C-5), 154.9 (C-6), 98.3 (C-7), 155.5 (C-8), 118.8 (C-9), 108.8 (C-1′), 153.0 (C-2′), 100.2 (C-3′), 149.5 (C-4′), 141.1 (C-5′), 113.6 (C-6′), 56.5 (C-2′-OMe), 56.9 (C-5″-OMe), 188.5 (CHO) MS: $[M]^+$ 315($[M+H^+]$, 100), 299 (50), 259 (50), 245 (38), 215 (50)	[11]
2/Eryvarin Q	$C_{25}H_{27}O_5$ M.W: 407 U.V: λ_{max} (MeOH) (log ε): 213 (4.48), 245 (4.26), 329 (4.05), 344 (4.10) nm I.R: ν_{max} (film) 3440, 1650 cm^{-1}	^{1}H NMR: (600 MHz, Acetone-d_6) δ_H: 7.77 (1H, *d*, *J*=8.3 Hz, H-4), 6.94 (1H, *d*, *J*=8.3 Hz, H-5), 6.68 (1H, *s*, H-3′), 7.38 (1H, *s*, H-6′), 3.61 (2H, *d*, *J*=7.3 Hz, CH_2-1″), 5.41 (1H, *t*, *J*=7.3 Hz, H-2″), 1.85 (1H, *s*, H-4″), 1.67 (1H, *s*, H-5″), 3.33 (1H, *d*, *J*=7.3 Hz, H-1‴) 5.39 (1H, *t*, *J*=7.3 Hz, H-2‴), 1.74 (1H, *s*, H-4‴), 1.74 (1H, *s*, H-5‴) 10.16 (1H, *s*, CHO) ^{13}C NMR: (150.8 MHz, $CDCl_3$) δ_C: 163.4 (C-2), 117.8 (C-3), 119.9 (C-4), 113.9 (C-5), 153.9 (C-6), 112.2 (C-7), 154.9 (C-8), 118.7 (C-9), 108.7 (C-1′), 155.6 (C-2′), 104.0 (C-3′), 159.2 (C-4′), 121.5 (C-5′), 132.6 (C-6′), 23.3 (C-1″), 122.8 (C-2″), 132.2 (C-3″), 17.8 (C-4″), 25.8 (C-5″), 28.1 (C-1‴), 123.6 (C-2‴), 132.7 (C-3‴), 18.0 (C-4‴), 25.9 (C-5‴), 188.1 (CHO) MS: $[M]^+$ 407 ($[M+H^+]$, 51), 389 (100)	[11]
3/Eryvarin R	$C_{17}H_{16}O_6$	^{1}H NMR: (600 MHz, $CDCl_3$) δ_H: 4.36 (1H, *d*,	[11]

Compound Number/Name	Mol. Formula/ M.W/ UV / IR / Specific rotation	Spectral data NMR (δ) / MS (*m/z*)	Ref
	M.W: 316 U.V: λ_{max} (MeOH) (log ε) 206 (4.47), 234 (sh, 4.00), 288 (3.83) nm I.R: ν_{max} (film) 3420, 1720, cm^{-1}	*J*=9.5 Hz, H-2), 5.48 (1H, *d*, *J*=9.5 Hz, H-2), 7.03 (1H, *d*, *J*=8.1 Hz, H-4), 6.45 (1H, *dd*, *J*=8.1, 2.2 Hz, H-5), 6.41 (1H, *d*, *J*=2.2 Hz, H-7), 6.60 (1H, *s*, H-3′), 6.64 (1H, *s*, H-6′), 3.71 (3H, *s*, OMe-2′), 3.71 (3H, *s*, OMe-2′), 9.60 (1H, *s*, CHO) ^{13}C NMR: (150.8 MHz, $CDCl_3$) δ_C: 79.0 (C-2), 62.8 (C-3), 126.8 (C-4), 108.2 (C-5), 158.1 (C-6), 98.6 (C-7), 162.5 (C-8), 116.1 (C-9), 119.4 (C-1′), 151.3 (C-2′), 99.6 (C-3′), 146.5 (C-4′), 140.4 (C-5′), 112.0 (C-6′), 56.0 (OCH_3-2′), 56.7 (OCH_3-5′), 195.4 (CHO) MS: $[M]^+$ 316 (3, M^+), 287 (83), 272 (8), 259 (7), 153 (11), 85 (65), 83 (100)	
4/Eryvarin U	$C_{20}H_{18}O_4$ M.W: 322 U.V: λ_{max} (log ε): 214 (sh, 4.02), 236 (4.17), 273 (4.15), 319 (4.19), 329 (4.31) nm I.R: (film) ν_{max} 3420, 1630 cm^{-1}	^{1}H NMR: ($CDCl_3$) δ_H: 1.46 (6H, *s*, H-5″, 6″), 3.78 (3H, *s*, OMe-2′), 5.70 (1H, *d*, *J*= 10.3 Hz, H-4″), 6.69 (1H, *d*, *J*= 8.8 Hz, H-5′), 6.76 (1H, *dd*, *J*= 8.1, 2.2 Hz, 6.99 (1H, *d*, *J*= 2.2 Hz, H-7), 7.10 91H, s, H-3), 7.40 (1H, *d*, *J*= 8.1 Hz, H-4), 7.71 (1H, *d*, *J*= 8.8 Hz, H-6′) ^{13}C NMR: (acetone-d_6) δ_C: 151.7 (C-2), 103.5 (C-3), 120.9 (C-4), 111.7 (C-5), 153.3 (C-6), 98.0 (C-7), 154.7 (C-8), 123.5 (C-9), 116.7 (C-1′), 153.1 (C-2′), 115.4 (C-3′), 154.1 (C-4′), 112.9 (C-5′), 127.1 (C-6′), 76.3 (C-2″), 130.8 (C-3″), 116.8 (C-4″), 27.9 (C-5″), 27.9 (C-6″), 61.1 (OMe-2′) EIMS *m/z* (%): 322 ([M^+], 62), 307 (100), 292 (66)	[27]
5/ Eryvarin L	$C_{16}H_{14}O_5$ M.W: 286 U.V: λ_{max} (log ε): 212 (4.37), 251 sh (3.81), 274 sh (3.98), 281 (4.01), 329 (4.42), 340 (4.38) nm I.R: (film) ν_{max} 3400, 1620 cm^{-1}	^{1}H NMR: ($CDCl_3$) δ_H: 3.91 (3H, *s*, OMe-2′), 3.96 (3H, *s*, OMe-5′), 5.10 (1H, *br s*, OH), 6.66 (1H, *s*, H-3′), 6.75 (1H, *dd*, *J*= 8.1, 2.2 Hz, H-5), 7.00 (1H, *d*, *J*=2.2 Hz, H-7), 7.14 (1H, *s*, H-3), 7.37 (1H, *d*, *J*=8.1, H-4), 7.50 (1H, *s*, H-6′) ^{13}C NMR: ($CDCl_3$) δ_C: 151.7 (C-2), 104.3 (C-3), 120.9 (C-4), 111.6 (C-5), 153.1(C-6), 97.9 (C-7), 154.4 (C-8), 123.7 (C-9), 111.1 (C-1′), 154.1 (C-2′), 99.5 (C-3′), 146.2 (C-4′), 140.5 (C-5′), 109.2 (C-6′), 56.0 (OMe-2′), 56.7 (OMe-5′) EIMS *m/z* (rel. int): 286 ([M^+], 100), 271 (49), 243 (19), 228 (14), 200 (4), 187 (5), 172 (6), 149 (7), 143 (10)	[30]
6/ Bidwillol B	$C_{20}H_{20}O_4$ M.W. 324 U.V: (MeOH) λ_{max} (log ε): 284 sh, 317, 331 nm	^{1}H NMR: (Acetone-d_6) δ_H: 1.67, 1.81 (3H each, *s*, Me), 3.44 (2H, *d*, *J*= 7 Hz, H-1′), 3.74 (3H, *s*, OMe), 5.30 (1H, *m*, H-2″), 6.79 (1H, *d*, *J*= 8 Hz, H-5′), 6.80 (1H, *dd*, *J*= 8, 2 Hz, H-	[12]

Compound Number/Name	Mol. Formula/ M.W/ UV / IR / Specific rotation	Spectral data NMR (δ) / MS (*m/z*)	Ref
		5), 6.97 (1H, *d*, *J*= 2 Hz, H-7), 7.11, (1H, *br s*, H-3), 7.40 (1H, *d*, *J*= 8 Hz, H-4), 7.62 (1H, *d*, *J*= 8 Hz, H-6′), 8.43, 8.69 (1H each, *s*, OH) ^{13}C NMR: (acetone-d_6) δ_C: 152.5 (C-2), 98.2 (C-3), 123.5 (C-4), 112.8 (C-5), 157.5 (C-6), 104.0 (C-7), 156.3 (C-8), 116.9 (C-9), 124.1 (C-1′), 155.8 (C-2′), 121.6 (C-3′), 157.4 (C-4′), 112.3 (C-5′), 125.8 (C-6′), 23.7 (C-1″), 123.3 (C-2″), 131.4 (C-3″), 18.0 (C-4″), 25.9 (C-5″), 60.6 (OMe) EIMS *m/z* (%): 324 [M^+] (100), 268 (42), 253 (53), 133 (15), 89 (29)	

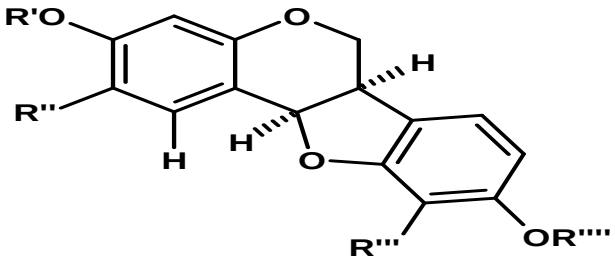
C. Pterocarpinoids from *Erythrina variegata*

Some pterocarpans and pterocarpenes were also isolated from the root and bark of *Eythrina variegata* whose names, sources are given in Table 5, under the name 'pterocarpinoids'.

Table. 5: Petrocarpinoids from *Erythrina variegata.*

No	Compound name	Source (reference)
1	Cristacarpin	Root [9]
2	Erystagallin A **[**3,9-Dihydroxy-2,10-diprenylpterocarp-6a-ene**]**	Root [10]
3	Erycristagallin **[**3,9-Dihydroxy-2,10-di(γ,γ-dimethylallyl)-6a, 11a-dehydropteocarpan**]**	Root [10], [12], Bark [13]
4	Orientanol B **[**9-Hydroxy-3-methoxy-2-γ,γ-dimethylallylpterocarpan**]**	Root [15], [35]
5	Erythrinin A	Bark [22]
6	Erythrinin B	Bark [18]
7	Erythrinin C	Bark [22]
8	Eryvarin A **[**6a-Hydroxy-3-methoxy(3′,4′-dihydro-3′-hydroxy)-2′,2′-dimethyl pyrano[5′,6′:9,10]pterocarpan**]**	Wood [5]
9	Eryvarin D	Root [6]
10	Eryvarin E	Root [6]
11	Erythrabyssin-II	Root [24], [35]
12	Phaseollin	Root [24]
13	Phaseollidin	Root [24]
14	Folitenol	Root [35]
15	Eryvarin J	Root [30]
16	Eryvarin K	Root [30]
17	Erysubin C	Root [41]

The structures of above the compounds are given below followed by the spectral data of the compounds.



R'=R"=H, R'''=  **, R''''=H, Cristacarpin (1)**

R'=H, R"=R'''=  **, R''''=Me, Erystagallin A (2)**

R'=H, R"=R'''=  **, R''''=H, Erycristagallin (3)**

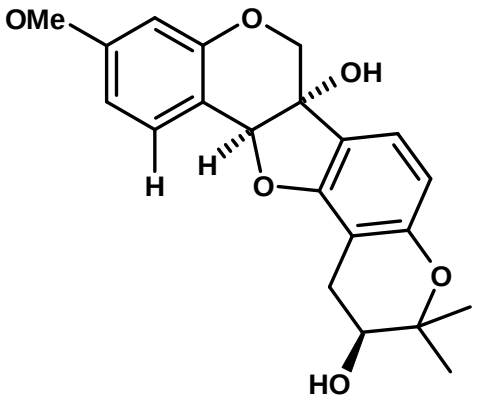
R'=Me, R"=  **, R'''=R''''=H, Orientanol B (4)**

R'=R"=H, R'''=  **, R''''=Me, Eryvarin D (9)**

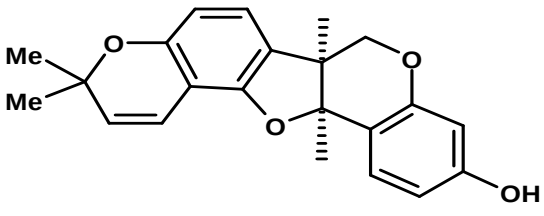
R'=H, R"=R'''=  **, R''''=Me, Eryvarin E (10)**

R'=H, R"=R'''=  **, R''''=H, Erythrabyssin II (11)**

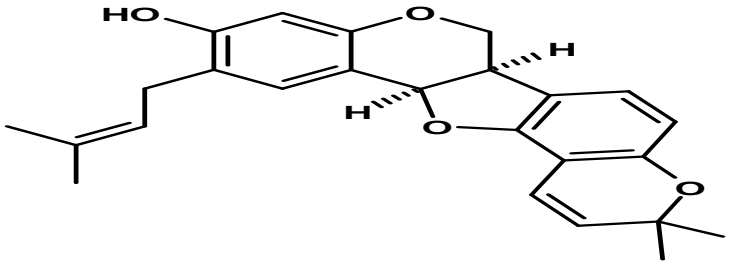
R'=Me, R"=CHO, R'''= R''''=H, Erysubin C (17)



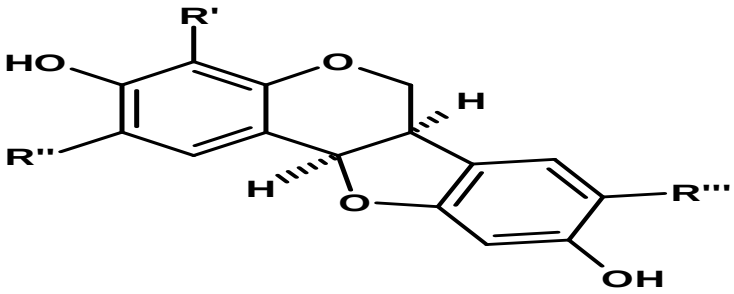
Eryvarin A (8)



Phaseollin (13)



Folitenol (14)



R'=R"=  **, R'''=H, Eryvarin J (15)**

R'=H, R"=  **, R'''=OMe, Eryvarin K (16)**

Tanaka *et al* found that Erycristagallin and Orientanol B had potent antibacterial activities against methicillin-resistant *Staphylococcus aureus* (MRSA)[11] and the later compound, Erycristagallin was also a phospholipase A_2 (PLA_2) inhibitor.[13] According to Tanaka *et al* Erycristagallin also had potent anti-microbial activity against *Sterptococcus mutans*, *Porphyromonas gingivalis* and *Actinobacillus actinomycetemcomitans.*[12] Tanaka *et al*, also showed that Orientanol B had potent antibacterial activity against methicillin-resistant *Staphylococcus aureus* (MRSA).[27] Sato *et al* found that Erycristagallin had highest antibacterial activity against mutans streptococci, other oral streptococci**,** *Actinomyces* and *Lactobacillus*, followed by Erystagallin A and Orientanol B.[15] Kobayashi *et al* found out Erythrinin B inhibited Na^+/ H^+ exchange system of arterial smooth muscle cell.[18] Rukachaisirikul *et al* found out that Erycristagallin exhibited the highest degree of activity against *Staphylococcus* strains, including drug-resistant strains (MRSA and VRSA). They also found out that Erythrabyssin II, Erystagallin A and Erycristagallin were more active against several strains of *Streptococcus* and *Staphylococcus* than the standard antibiotics vancomycin and oxacillin.[37] Erythrabyssin-II, Phaseollin, Phaseollidin, was found to be active against *S. aureus* and *M. smegmatis* according to Telikepalli *et al.*[24]

Spectral data of some of the isolated compounds from roots of the plant, *Erythrina variegata* have been placed in Table 6.

Table. 6: Spectroscopic details, melting point, specific rotation etc of petrocarpinoids from *Erythrina variegata*.

Compound Number/ Name	Mol. Formula/ M.W/ UV / IR / Melting point / Specific rotation	Spectral data NMR (δ) / MS (*m/z*)	Ref
1/ Crystacarpin	$C_{21}H_{22}O_5$ M.W: 354 $[\alpha]_D$: -187° (c=0.1, MeOH) U.V: λ_{max} 209. 280, 286 nm I.R: ν_{max} ($CHCl_3$) 3580, 1615, 1600 cm^{-1}	^1H NMR (270 and 400 MHz, $CDCl_3$) δ_H :7.39 (H-1, *d*, *J*=8.4 Hz), 6.55 (H-2, *dd*, *J*=8.4, 2.5), 6.38 (H-4, *d*, *J*=2.5 Hz), 4.00 (H-6, *d*, *J*=11.5 Hz), 4.21 (H-6, *d*, *J*=11.5 Hz), 7.14 (H-7, *d*, *J*=8.2 Hz), 6.49 (H-8, *d*, *J*=8.2 Hz), 5.26 (H-11a, *s*), 3.25 (H-1′, *d*, *J*=7.3 Hz), 5.19 (H-2′, *br t*, *J*=7.3 Hz), 1.64 (H-4′, *s*), 1.73 (H-5′, *s*), 3.80 (OMe, *s*), 4.96 (OH-6a, *br*, *s*), 2.73 (OH-11b *br s*) ^{13}C NMR: (67.5 MHz) δ_C: 159.8 (C-9), 158.5 (C-3), 156.9 (C-4a), 155.6 (C-10a), 132.4 (C-1), 131.8 (C-3′), 121.9 (C-2′), 120.7 (C-6b or C-7), 120.4 (C-7 or C-6b), 113.7 (C-10), 112.9 (C-11b), 110.2 (C-2), 103.9 (C-8 or C-4), 103.6 (C-4 or C-8), 84.2 (C-11a), 77.2 (C-6a), 69.5 (C-6), 56.0 (OMe), 25.8 (C-5′), 22.5 (C-1′), 17.7 (C-4′) MS: $[M]^+$ 345 (100), 339, 337, 336, 335, 326, 321, 311, 299, 298, 297, 295, 293, 283, 281, 271, 270, 269, 255, 217, 201	[9]
2/ Erycristagal-lin A	$C_{26}H_{30}O$ M.W: 422 $[\alpha]_D$: -182° (c=0.1, MeOH) U.V (MeOH/EtOH) λ_{max} 209, 283 nm I.R: ν_{max} ($CHCl_3$) 3600, 1620, 1600 cm^{-1}	^1H NMR (100 MHz, $CDCl_3$) δ_H : 7.19 (H-1, *s*), 6.33 (H-4, *s*), 3.99 (H-6, *d*, *J*=11.2 Hz), 4.11 (H-6, *d*, *J*=11.2 Hz), 7.16 (H-7, *d*, *J*=8.2 Hz), 5.24 (H-11a, *s*), 3.28 (H-1′, *d*, *J*=7.3 Hz), 5.35 (H-2′, *t*, *J*=7.3 Hz), 1.73 (H-4′, *s*), 1.72 (H-5′, *s*), 3.21 (H-1″, *d*, *J*=7.3 Hz), 5.16 (H-2″, *t*, *J*=7.3 Hz), 1.73 (H-5″, *s*), 3.80 (H-9 OMe, *s*), 2.85 (H-3 OH, *s*), 8.45 (H-9, OH, *s*) ^{13}C NMR: (25.2 MHz) δ_C: 132.5 (C-1), 123.0 (C-2), 156.9 (C-3), 103.4 (C-4), 154.9 (C-4a), 70.4 (C-6), 77.0 (C-6a), 123.1 (C-6b), 122.0 (C-7), 104.3 (C-8), 160.2 (C-9), 113.3 (C-10), 159.5 (C-10a), 85.8 (C-11a), 113.1 (C-11b), 28.5 (C-1′), 123.9 (C-2′), 132.3 (C-3′), 17.8 (C-4′), 25.9 (C-5′), 23.1 (C-1″), 123.2 (C-2″), 131.5 (C-3″), 17.8 (C-4″), 25.9 (C-5′), 56.3 (9-OMe) MS: $[M]^+$ 345 (100), 339, 337, 336, 335, 326, 321, 311, 299, 298, 297, 295, 293, 283, 281, 271, 270, 269, 255, 217, 201	[10]
3/ Erycristagallin	$C_{25}H_{24}O_4$ M.W: 336 UV: (MeOH) λ_{max} 214, 245, 252, 293, 339, 356 nm (+ NaOH) 212, 250, 287, 355, 367 nm IR: (KBr) ν_{max} 3430, 2970,	^1H NMR ($CDCl_3$) δ_H: 1.85 (9H, *s*, 3 × CH3), 1.92 (3H, *s*, CH_3), 3.32 (2H, *d*, *J*= 8 Hz, H-1″), 3.70 (2H, *d*, *J*= 8 Hz, H-1′), 5.18 (2H, *s*, H-6), 5.32 (1H, *t*, *J*= 8 Hz, H-2″), 5.39 (1H, *t*, *J*= 8 Hz, H-2′), 5.50 (2H, *s*, OH-3 and OH-9), 6.41 (1H, *s*, H-8), 6.78 (1H, *d*, *J* =10 Hz, H-4), 7.05 (1H, *d*, *J*= 10 Hz, H-5), 7.21 (1H, *s*, H-11) 13C NMR ($CDCl_3$) δ_C: 17.9 (C-4′), 18.0 (C-4″), 23.2 (C-	[10,12,13]

Compound Number/ Name	Mol. Formula/ M.W/ UV / IR / Melting point / Specific rotation	Spectral data NMR (δ) / MS (*m/z*)	Ref
	2915, 1650, 1615, 1505, 1445, 1375, 1250, 1165, 1035 cm-1	1″), 25.8 (C-4′), 25.8 (C-4″), 29.3 (C-1′), 65.5 (C-6), 104.3 (C-8), 106.3 (C-2), 109.9 (C-10), 111.1 (C-11a), 112.5 (C-4), 116.0 (C-5), 119.2 (C- 5a), 119.7 (C-5b), 121.0 (C-2′), 121.4 (C-2″), 121.9 (C-11), 135.1 (C-3″), 135.4 (C-3′), 147.1 (C-1a), 151.9 (C-11b), 153.5 (C-7a), 154.4 (C-9), 155.2 (C-3) PositiveFABMS *m/z* [M + H]+ 391.	
4/ Orientanol B	$C_{21}H_{22}0_4$ M.W: 338 [α]-237° (MeOH, c 0.1) UV: λ_{max} 208, 288 nm	^{1}HNMR ($CDCl_3$, 400, 600 MHz) δ_H: 7.24 (1H, *s*, H-1), 6.43 (1H, *s*, H-4), 3.60 (1H, *t*-like, *J*=11.0 Hz, H-6), 4.21 (1H, *dd*, *J*=11.0, 5.1 Hz, H-6), 3.48 (1H, *m*, H-6a), 7.06 (1H, *d*, *J*=8.1 Hz, H-7), 6.36 (1H, *dd*, *J*=8.1,2.2 Hz, H-8), 6.38 (1H, *d*, *J*= 2.2Hz, H-10), 5.48 (1H, *d*, *J*=6.6 Hz, H-11a), 3.25 (1H, *dd*, *J*=14.6, 7.3 Hz, H-1′□□□3.28 (1H, *dd*, *J*=14.6, 7.3 Hz, H- H-1′), 5.31 (1H, *t*, *J*=7.3 Hz, H-2′), 1.71 (3H, *s*, H-4′), 1.74 (3H, *s*, H-5′), 3.79 (3H, *s*, OMe), 5.49 (1H, *br s*, OH) ^{13}C NMR ($CDCl_3$, 67.5 MHz) δ_C: 130.9 (C-1), 124.2 (C-2), 158.7 (C-3), 99.3 (C-4), 154.8 (C-4a), 66.6 (C-6), 39.6 (C-6a), 119.3 (C-6b), 124.9 (C-7), 107.6 (C-8), 157.1 (C-9), 98.4 (C-10), 160.8 (C-10a), 78.9 (C-11a), 111.2 (C-11b), 27.9 (C-1′), 122.5 (C-2′), 132.4 (C-3′), 17.8 (C-4′), 25.9 (C-5′) MS *m/z*: 338 ([M]+, l00%), 323,283,269,229,205	[35]
8/ Eryvarin A	$C_{21}H_{23}O_6$ M.W: 370 M. pt. 208-210°C $[\alpha]_D^{23}$: -234°.CD (c=0.1, MeOH) U.V: λ_{max} (MeOH) 208, 285 nm I.R: ν_{max} (KBr) 3450, 1625, 1600 cm^{-1}	^{1}H NMR: (150.80 MHz, acetone-d_6) δ_H: 1.12 (3H, *s*, 5′-Me), 1.17 (3H, *s*, 4′-Me), 2.66 (1H, *dd*, *J*=13.2, 9.5 Hz, H-1′), 2.82 (1H, *dd*, *J*=13.2, 3.7 Hz, H-1′), 3.51 (1H, *dd*, *J*=9.5, 3.7 Hz, H-2′), 3.81 (3H, *s*, OMe), 4.06 (1H, *d*, *J*=11.7 Hz, H-6), 4.14 (1H, *d*, *J*=11.7 Hz, H-6), 4.97 (1H, *br s*, OH), 5.30 (1H, *s*, H-11a′), 6.31 (1H, *d*, *J*=2.2 Hz, H-4), 6.55 (1H, *dd*, *J*=8.8, 2.2 Hz, H-2), 6.57 (1H, *d*, *J*=8.1 Hz, H-8), 7.21 (1H, *d*, *J*=8.1 Hz, H-7), 7.33 (1H, *d*, *J*=8.1 Hz, H-8), 8.51 (1H, *br s*, OH) ^{13}C NMR: (150.80 MHz, acetone-d_6) δ_C: 133.1 (C-1), 110.7 (C-2), 159.6 (C-3), 103.7 (C-4), 157.0 (C-4a), 70.3 (C-6), 76.9 (C-6a), 122.8 (C-6b), 122.3 (C-7), 104.4 (C-8), 160.7 (C-9), 112.3 (C-10), 160.7 (C-9), 112.3 (C-10), 160.1 (C-10a), 85.7 (C-11a), 113.4 (C-11b), 27.0 (C-1′), 78.6 (C-2′), 72.9 (C-3′), 25.0 (C-4′), 26.1 (C-5′), 56.3 (OMe) FABMS (glycerol): 371 $[M + H]^+$, 353, 312, 299, 281, 277, 269, 209, 185, 163	[5]
9/ Eryvarin D	$C_{21}H_{20}O_4$ M.W: 336 U.V: (MeOH) λ_{max} (log ε): 211 (4.42), 233 (sh, 4.32), 286 (3.83), 334 (3.92), 353 (sh, 3.76) nm	^{1}HNMR ($CDCl_3$, 400, 600 MHz) δ_H: 1.69 (3H, *s*, H-5′), 1.88 (3H, *s*, H-4′), 3.62 (2H, *d*, *J*= 7.3 Hz, H-1′), 3.88 (3H, *s* OMe), 5.15 (1H, *br s*, OH), 5.35 (1H, *t*, *J*= 8.4 Hz, H-2′), 5.54 (2H, *s*, H-6), 6.43 (1H, *d*, *J*= 2.2 Hz, H-4), 6.45 (1H, *dd*, *J*= 8.1, 2.2 Hz, H-2), 6.85 (1H, *d*, *J*= 8.4 Hz, H-8), 7.09 (1H, *d*, *J*= 8.4 Hz, H-7), 7.37 (1H, *d*,	[6]

Compound Number/ Name	Mol. Formula/ M.W/ UV / IR / Melting point / Specific rotation	Spectral data NMR (δ) / MS (*m/z*)	Ref
	I.R: ν_{max} ($CHCl_3$) 3420, 1620 cm^{-1}	*J*= 8.1 Hz, H-1) ^{13}C NMR ($CDCl_3$, 150.8, 100.4 MHz) δ_C: 121.3 (C-1), 108.4 (C-2), 156.9 (C-3), 103.9 (C-4), 155.2 (C-4a), 65.7 (C-6), 105.8 (C-6a), 119.6 (C-6b), 115.3 (C-7), 107.9 (C-8), 154.9 (C-9), 114.4 (C-10), 154.7 (C-10a), 147. 3 (C-11a), 110.1 (C-11b), 22.9 (C-1′), 121.9 (C-2′), 132.0 (C-3′), 17.8 (C-4′), 25.8 (C-5′), 56.7 (OMe) MS *m/z* (rel. int.): 336 ([M^+], 100), 321 (4), 305 (4), 278 (15), 265 (4)	
10/ Eryvarin E	$C_{26}H_{28}O_4$ M.W: 404 U.V: (MeOH) λ_{max} (log ε): 204 (4.45), 253 (sh, 4.08), 287 (3.85), 340 (4.17), 356 (4.09) nm I.R: ν_{max} ($CHCl_3$) 3400, 1650, 1620 cm^{-1}	^{1}HNMR ($CDCl_3$, 400, 600 MHz) δ_H: 1.69 (3H, *s*, H-5″), 1.80 (6H, *s*, H-4′, 5′), 1.89 (3H, *s*, H-4″), 3.34 (2H, *d*, *J*=7.3 Hz, H-1′), 3.63 (2H, *d*, *J*= 7.3 Hz, H-1″), 3.89 (3H, *s*, OMe), 5.345 (1H, *t*, *J*= 7.3 Hz, H-2′), 5.35 (1H, *t*, *J*= 7.3 Hz, H-2″), 5.51 (2H, *s*, H-6), 6.42 (1H, *s*, H-4), 6.85 (1H, *d*, *J*= 8.3 Hz, H-8), 7.09 (1H, *d*, *J*= 8.3 Hz, H-7), 7.23 (1H, *s*, H-1) ^{13}C NMR ($CDCl_3$, 150.8, 100.4 MHz) δ_C: 121.4 (C-1), 119.8 (C-2), 155.3 (C-3), 104.2 (C-4), 153.6 (C-4a), 65.5 (C-6), 105.9 (C-6a), 119.7 (C-6b), 115.2 (C-7), 107.8 (C-8), 154.8 (C-9), 114.4 (C-10), 154.7 (C-10a), 147. 4 (C-11a), 109.9 (C-11b), 29.1 (C-1′), 122.0 (C-2′), 135.0 (C-3′), 17.8 (C-4′), 25.8 (C-5′), 22.9 (C-1″), 121.8 (C-2″), 131.9 (C-3″), 17.9 (C-4″), 25.8 (C-5″), 56.7 (OMe) MS *m/z* (rel. int.): 404 ([M^+], 100), 388 (25), 349 (34), 333 (8), 317 (7), 291 (6)	[6]
11/ Erythrabyssin II	$C_{25}H_{28}O_4$ M.W: 392 M.pt: 160-162°.C $[\alpha]_D$ -213° (MeOH, c 0.1) UV: λ_{max} 209, 289 nm	^{1}HNMR ($CDCl_3$, 400, 600 MHz) δ_H: 7.25 (1H, *s*, H-1) 6.41(1H, *s*, H-4), 3.59 (1H, *t*-like, *J*=11.0 Hz, H-6), 4.20 (1H, *dd*, *J*=11.0, 5.1 Hz, H-6), 3.49 (1H, *m*, H-6a), 6.95 (1H, *d*, *J*=8.1 Hz, H-7), 6.37 (1H, *d*, *J*=8.1 Hz, H-8), 5.44 (1H, *d*, *J*=7.3 Hz, H-11a), 3.34 (1H, *d*, *J*=7.3 Hz, H-1′), 5.29 (1H, *t*, *J*= 7.3 Hz, H-2′), 1.81 (3H, *s*, H-4′), 1.80 (3H, *s*, H-5′), 3.35 (1H, *dd*, *J*= 13.2, 7.3 Hz, H-1″), 3.40 (1H, *dd*, *J*= 13.2, 7.3 Hz, H-1″), 5.34 (1H, *t*, *J*=7.3 Hz, H-2″), 1.79 (3H, s, H-4″), 1.75 (3H, s, H-5″) ^{13}C NMR ($CDCl_3$, 67.5 MHz) δ_C: 132.0 (C-1), 121.1 (C-2), 155.0 (C-3), 103.9 (C-4), 155.7 (C-4a), 66.6 (C-6), 40.1 (C-6a), 118.8 (C-6b), 122.4 (C-7), 108.2 (C-8), 155.9 (C-9), 110.2 (C-10), 158.4 (C-10a), 78.2 (C-11a), 112.4 (C-11b), 29.2 (C-1′), 121.4 (C-2′), 134.8 (C-3′), 17.9 (C-4′), 25.8 (C-5′), 23.2 (C-1″), 121.9 (C-2″), 135.2 (C-3″), 17.9 (C-4″), 25.8 (C-5″) MS *m/z:* 392 ([Ml+, l00%), 336, 281	[35]
14/ Folitenol	$C_{25}H_{26}O_4$ M.W: 390 $[\alpha]_D$:-208° ($CHCl_3$, c 0.1) UV: λ_{max} (log ε) 208, 228,	^{1}HNMR ($CDCl_3$, 400, 600 MHz) δ_H: 7.26 (1H, *s*, H-1) 6.41(1H, *s*, H-4), 3.57 (1H, *t*-like, *J*=11.0 Hz, H-6), 4.20 (1H, *dd*, *J*=11.0, 5.1 Hz, H-6), 3.47 (1H, *m*, H-6a), 6.95 (1H, *d*, *J*=8.1 Hz, H-7), 6.34 (1H, *d*, *J*=8.1 Hz, H-8),	[35]

Compound Number/ Name	Mol. Formula/ M.W/ UV / IR / Melting point / Specific rotation	Spectral data NMR (δ) / MS (*m/z*)	Ref
	280, 313 nm	5.47 (1H, *d*, *J*=6.6 Hz, H-11a), 3.35 (1H, *d*, *J*=7.3 Hz, H-1′), 5.34 (1H, *t*, *J*= 7.3Hz, H-2′), 1.80 (3H, *s*, H-4′), 1.79 (3H, *s*, H-5′), 6.53 (1H, *d*, *J*= 9.5 Hz, H-1″), 5.58 (1H, *d*, *J*=9.5 Hz, H-2″), 1.40 (3H, *s*, H-4″), 1.43 (3H, *s*, H-5″), 5.25 (1H, *br s*, OH) ^{13}C NMR ($CDCl_3$, 67.5 MHz) δ_C: 132.0 (C-1), 121.0 (C-2), 155.4 (C-3), 104.0 (C-4), 155.1 (C-4a), 66.6 (C-6), 39.7 (C-6a), 119.2 (C-6b), 123.8 (C-7), 108.6 (C-8), 153.7 (C-9), 106.2 (C-10), 155.8 (C-10a), 78.9 (C-11a), 112.1 (C-11b), 29.3 (C-1′), 121.9 (C-2′), 134.9 (C-3′), 17.9 (C-4′), 25.9 (C-5′), 116.6 (C-1″), 129.6 (C-2″), 76.1 (C-3″), 27.8 (C-4″), 27.7 (C-5″) MS *m/z:* 390 ([Ml+, l00%), 375, 347, 335, 331, 319, 307, 291.	
15/ Eryvarin J	$C_{25}H_{28}O_4$ M.W: 392 $[\alpha]_D^{23}$: -137° (c=0.1, MeOH) U.V: λ_{max} (log ε): 209 (4.70), 235 (sh, 4.02), 287 (3.82) nm I.R: ν_{max} (KBr) 3440 cm^{-1}	^{1}H NMR ($CDCl_3$) δ_H: 1.71 (3H *s*, H-5″), 1.77 (6H, *s*, H-4′, 5′), 1.79 (3H, *s*, H-4″), 3.32 (2H, *d*, *J*= 7.3 Hz, H-1′), 3.38 (2H, *d*, *J*= 7.3 Hz, H-1″), 3.49 (1H, *m*, H-6a), 3.56 (1H, *t*-like, J= 11.0 Hz, H-6), 4.25 (1H, *dd*, *J*= 11.0 5.1 Hz, H-6), 4.89 (1H, *br s*, OH), 5.20 (1H, *t*, *J*= 7.3 Hz, H-2″), 5.32 (1H, *t*, *J*= 7.3 Hz, H-2′), 5.50 (1H, *d*, *J*= 7.3 Hz, H-11a), 5.57 (1H, s, OH), 6.35 (1H, *dd*, *J*= 8.1, 2.2 Hz, H-80, 6.36 (1H, *d*, *J*= 2.2 Hz, H-10), 7.07 (1H, *d*, *J*= 8.1 Hz, H-7), 7.13 (1H, *s*, H-1) ^{13}C NMR ($CDCl_3$) δ_C: 128.9 (C-1), 121.2 (C-2), 154.0 (C-3), 115.3 (C-4), 152.4 (C-4a), 66.8 (C-6), 39.5 (C-6a), 119.7 (C-6b), 124.9 (C-7), 107.4 (C-8), 156.8 (C-9), 98.3 (C-10), 160.8 (C-10a), 79.5 (C-11a), 111.7 (C-11b), 29.2 (C-1′), 122.2 (C-2′), 134.0 (C-3′), 17.8 (C-4′), 25.8 (C-5′), 22.5 (C-1″), 122.0 (C-2″), 134.2 (C-3″), 17.9 (C-4″), 25.8 (C-5′) EIMS *m/z* (rel.int.): 392 ([M^+], 100), 375 (7), 336 (10), 321 (30), 293 (10), 281 (22)	[30]
16/ Eryvarin K	$C_{21}H_{22}O_5$ M.W: 354 $[\alpha]_D^{23}$: -183° (c=0.1, MeOH) U.V: λ_{max} (log ε) 208 (4.67), 235 (sh, 4.04), 291 (3.92) nm I.R: ν_{max} (KBr) 3400 cm^{-1}	^{1}H NMR ($CDCl_3$) δ_H: 1.78 (3H, *s*, H-5′), 1.79 (3H, *s*, H-4′), 3.33 (2H, *d*, *J*= 7.3 Hz, H-1′), 3.48 (1H, *m*, H-6a), 3.61 (1H, *t*-like, *J*= 11.0 Hz, H-6), 3.87 (3H, *s*, OMe), 4.22 (1H, *dd*, *J*= 11.0, 5.1 Hz, H-6), 5.27 (1H, *br s*, OH), 5.32 (1H, *t*, *J*= 7.3 Hz, H-2′), 5.43 (1H, *d*, *J*=6.6 Hz, H-11a), 5.68 (1H, *s*, OH), 6.41 (1H, *s*, H-4), 6.52 (1H, *s*, H-10), 6.79 (1H, *s*, H-7), 7.24 (1H, *s*, H-1) ^{13}C NMR ($CDCl_3$) δ_C: 131.9 (C-1), 121.0 (C-2), 155.7 (C-3), 104.0 (C-4), 155.0 (C-4a), 66.5 (C-6), 40.3 (C-6a), 117.0 (C-6b), 107.7 (C-7), 141.1 (C-8), 146.6 (C-9), 98.1 (C-10), 153.9 (C-10a), 78.2 (C-11a), 112.3 (C-11b), 29.3 (C-1′), 121.8 (C-2′), 135.0 (C-3′), 17.9 (C-4′), 25.8 (C-5′) EIMS *m/z* (rel.int.): 354 ([M^+], 100), 299 (29), 232 (6), 194 (15)	[30]

Compound Number/ Name	Mol. Formula/ M.W/ UV / IR / Melting point / Specific rotation	Spectral data NMR (δ) / MS (*m/z*)	Ref
17/ Erysubin C	$C_{17}H_{14}O_5$ M.W: 298 $[\alpha]_D^{23}$: -250° (c=0.1, MeOH) U.V: λ_{max} (log ε) 206 (4.61), 277 (4.11), 316 (3.85) nm I.R: ν_{max} (KBr) 3430, 1650, 1620 cm^{-1}	^{1}H NMR (acetone-d_6) δ_H: 7.93 (1H, *s*, H-1), 6.62 (1H, *s*, H-4), 3.77 (1H, *t*-like, *J*=10.7 Hz, H-6), 4.41 (1H, *dd*, *J*=10.7, 4.8 Hz, H-6), 3.68 (1H, *m*, H-6a), 7.17 (1H, *d*, *J*=7.8 Hz, H-7), 6.40 (1H, *dd*, *J*=7.8, 2.2 Hz, H-8), 6.31 (1H, *d*, *J*=2.2 Hz, H-10), 5.59 (1H, *d*, *J*=7.3 Hz, H-11a), 3.96 (3H, *s*, OMe), 10.30 (1H, *s*, CHO), 8.38 (1H, *br s*, OH) ^{13}C NMR (acetone-d_6) δ_C: 132.7 (C-1), 120.8 (C-2), 164.0 (C-3), 101.0 (C-4), 163.0 (C-4a), 67.4 (C-6), 40.0 (C-6a), 118.5 (C-6b), 125.9 (C-7), 108.6 (C-8), 159.7 (C-9), 98.7 (C-10), 161.6 (C-10a), 78.3 (C-11a), 114.6 (C-11b), 56.5 OMe), 187.6 (CHO)	[41]

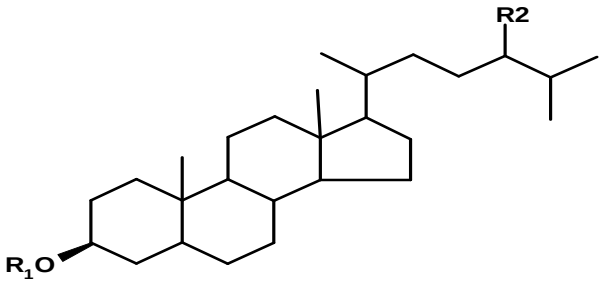
D. Steroids from *Erythrina variegata*

Some commonly occurring sterols were obtained from *Erythrina variegata* Linn. bark, stem bark and flower. Names and sources of the steroids are placed in Table 7.

Table. 7: Steroids from *Erythrina variegata.*

No	Compound name	Source (reference)
1	Erythrodiol	Stem bark [16]
2	Stigmasterol	Bark[17], stem bark[29], [32]
3	Sitosterol	Bark[17]
4	Campesterol	Bark[17], stem bark[29]
5	β-Sitosterol	Bark[19], stem bark[29]
6	γ-Sitosterol	Bark[19]
7	δ-Sitosterol	Bark[19]
8	Oxyresveratol	Bark[21]
9	Hydroxyresveratol	Bark[21]
10	Cycloartenol	Flower[26]
11	β-Sitosterol-3-*O*-β-*D*-glucopyranoside	Stem bark[29]
12	Epilupeol	Stem bark[32]

The structures of some of the compounds are given below followed by the sources with references and the spectral data of the compounds.



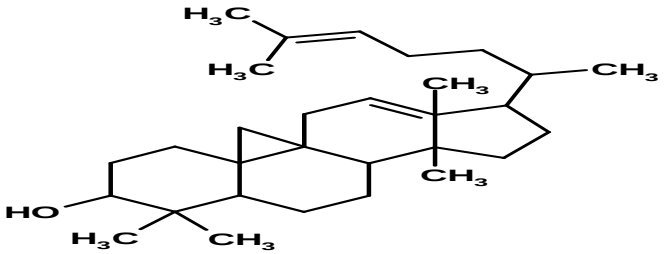
R_1=H, R_2=C_2H_5, $\Delta^{5,22}$, Stigmasterol (2)

R_1=H, R_2=CH_3, Campesterol (4)

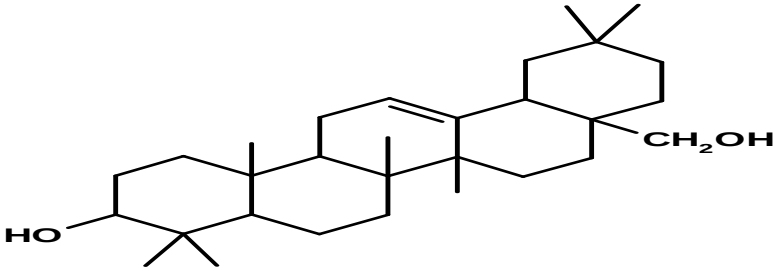
R_1=H, R_2=C_2H_5, β-Sitosterol (5)

γ-Sitosterol (6), differs from β-sitosterol with alternative arrangements at C-24

R_1=Glu,R_2=C_2H_5, β-Sitosterol-3-*O*-β-*D*-glucopyranoside (11)



Cycloartenol (10)



Epilupeol (12)

Spectral data, melting points, specific rotations of some of the compounds are given below (Table 8).

Table. 8: Spectroscopic details, melting point, specific rotation etc of steroids from *Erythrina variegata.*

Compound Number	Mol. Formula/ M.W/ UV / IR / Melting point / Specific rotation	Spectral data NMR (δ) / MS (*m/z*)	Ref
2/ Stigmasterol	$C_{29}H_{48}O$ M.W. 412 M.pt. 170°C $[\alpha]^{22}_D$: -51° (c=2, $CHCl_3$) I.R: ν_{max} (KBr) 3439 (OH), 1666 (C=C) cm^{-1}	^{1}H NMR (400 MHz, $CDCl_3$) δ_H: 5.35 (1H, *m*, H-6), 5.14 (1H, *dd*, *J* = 15.0, 6.5 Hz, H-22), 5.04 (1H, *dd*, *J* = 15.0, 9.0 Hz, H-23), 3.51 (1H, *m*, H-3), 1.00 (3H, s, H_3-19), 0.92 (3H, *d*, *J* = 6.0 Hz, H_3-21), 0.84 (3H, *d*, *J* = 6.0 Hz, H_3-26), 0.82 (3H, *t*, *J* = 6.5 Hz, H_3-29), 0.80 (3H, *d*, *J* = 6.0 Hz, H_3-27), 0.67 (3H, s, H_3-18).	[32]
4/ Campesterol	$C_{28}H_{48}O$ M.W; 400 M.pt. 157-158°C $[\alpha]^{23}_D$: -33° (22.5 mg in 5 mL $CHCl_3$) I.R: ν_{max} (KBr) 3439 (OH), 1666 (C=C) cm^{-1}	^{1}H NMR: (300 MHz, $CDCl_3$) δ_H : 0.68 (*s*, H-18), 1.00 (*s*, H-19), 3.52 (*m*, H-3α), 5.01 (*dd*, *J*=15.0, 8.4 Hz, H-22), 5.19 (*dd*, *J*=15.0, 8.4 Hz, H-23), 5.35 (*d*, *J*=5.1 Hz, H-6) EIMS *m/z* (rel. int. %): 414 (100), 412 (44), 400 (32)	[29]

Compound Number	Mol. Formula/ M.W/ UV / IR / Melting point / Specific rotation	Spectral data NMR (δ) / MS (*m/z*)	Ref
5/ β-Sitosterol	$C_{29}H_{50}O$ M.W. 414 M.pt. 140°C $[\alpha]^{22}_{D}$: -37° (c=2, $CHCl_3$) I.R: ν_{max} (KBr) 3439 (OH), 1666 (C=C) cm^{-1}	^{1}H NMR: (300 MHz, $CDCl_3$) δ_H : 0.68 (*s*, H-18), 1.00 (*s*, H-19), 3.52 (*m*, H-3α), 5.01 (*dd*, *J*=15.0, 8.4 Hz, H-22), 5.19 (*dd*, *J*=15.0, 8.4 Hz, H-23), 5.35 (*d*, *J*=5.1 Hz, H-6) EIMS *m/z* (rel. int. %): 414 (100), 412 (44), 400 (32)	[29]
6/ γ-Sitosterol	$C_{29}H_{50}O$ M.W. 414 I.R: ν_{max} (KBr) 3439 (OH), 1666 (C=C) cm^{-1}	^{1}H NMR: (300 MHz, $CDCl_3$) δ_H : 0.68 (*s*, H-18), 1.00 (*s*, H-19), 3.52 (*m*, H-3α), 5.01 (*dd*, *J*=15.0, 8.4 Hz, H-22), 5.19 (*dd*, *J*=15.0, 8.4 Hz, H-23), 5.35 (*d*, *J*=5.1 Hz, H-6) EIMS *m/z* (rel. int. %): 414 (100), 412 (44), 400 (32)	
12/ Epilupeol	$C_{30}H_{49}O_2$ M.W: 357	^{1}H NMR (400 MHz, $CDCl_3$) δ_H: 4.67 & 4.55 (each 1H, *br s*, H_2-29), 3.37 (1H, *t*, *J*=3.0 Hz, H-3β), 28 (1H, *m*, H-19), 1.67 (3H, s, H_3-30), 1.02 (3H, *s*, H_3-26), 0.95 (3H, *s*, H_3-23), 0.93 (3H, *s*, H_3-27), 0.84 (3H, *s*, H_3-25), 0.82 (3H, *s*, H_3-28), 0.78 (3H, *s*, H_3-24).	[32]

E. Alkaloids from *Erythrina variegata*

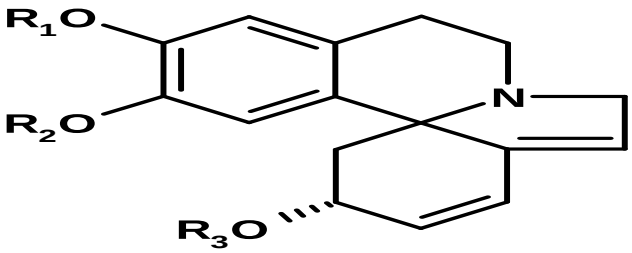
Alkaloids have been isolated from various parts of *Erythrina variegata* tree, especially from the seeds, some from bark, leaves, and flowers. All the alkaloids are tetracyclic type with different substitutions at different positions. Names of the alkaloids and sources with references are placed in Table 9.

Table 9: Alkaloids from *Erythrina variegata*

No	Compound name	Source (reference)
1	Erysovine	Bark[17,20], Seeds[21]
2	Stachydrine	Bark[17]
3	Erysotrine	[20], Bark[1]
4	Erythrartine (11β-Hydroxyerysotrine)	[20]
5	Erysodine	[20], Bark [1]
6	Erysonine	[20]
7	Erysopine	[20]
8	Erythraline	[20], Seeds [21]
9	Erythrinine	[20]
10	Erythratidine	[20]
11	Epierythratidine	[20]
12	11-Hydroxyepierythratidine	[20]
13	Erythratidinone	[20]
14	3-Demethoxyerythratidinone	[20]
15	Erythramine	[20]
16	Erythratine	Flowers [21,20]
17	Erysotine	[20]
18	Erysopitine	[20]

No	Compound name	Source (reference)
19	Erysodienone	[20]
20	Scoulerine	Leaves [21]
21	Coreximine	Leaves [21]
22	1-Reticuline	Leaves [21]
23	Erybidine	Leaves [21]
24	N-nororientaline	[23]
25	Hypaphorine	[21], Bark [1]
26	Methyl ester of Hypaphorine	[21]
27	Erythrosotidienone	Flower [26]
28	Erythromotidienone	Flower [26]
29	Eyrsotramidine	Flower [26]
30	Isococculinine	Stem bark [32]
31	Choline	Seeds, Flower[21], Bark[42]
32	Betaine	Bark[42]

More than thirty alkaloids were isolated from different parts of the plant, some structures are given below:



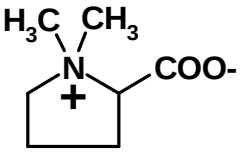
R_1 = R_3 = Me, R_2 = H, Erysovine (1)

R_1 = R_2 = R_3= Me, Erysotrine (3)

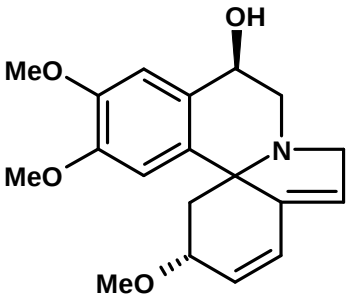
R_1 = H, R_2 = R_3 = Me, Erysodine (5)

R_1 = R_3 = H, R_2 = Me, Erysonine (6)

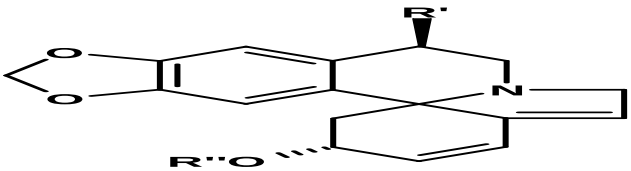
R_1 = R_2 = H, R_3 = Me, Erysopine (7)



Stachydrine (2)

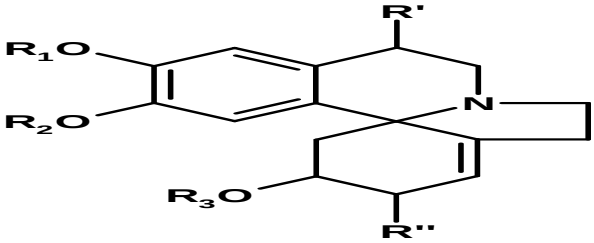


Erythrartine (4)



R″ = Me, R′ = H, Erythraline (8)

R″ = Me, R′ = OH, Erythrinine (9)



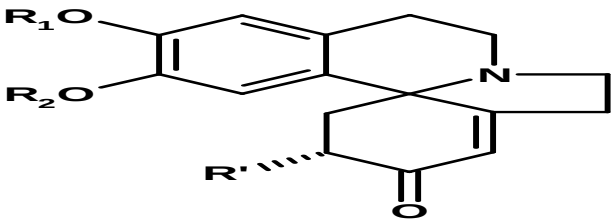
R_1 = R_2 = R_3= Me, R′ = R″ =H, Erythratidine (10)

R_1 = R_2 = R_3= Me, R′ = H, R″ = OH, Epierythratidine (11)

R_1 = R_2 = R_3= Me, R′ = R″ = OH, 11-Hydroxyepierythratidine (12)

R_1 = R′ = H, R_2 = R_3= Me, R″ = OH, Erysotine (17)

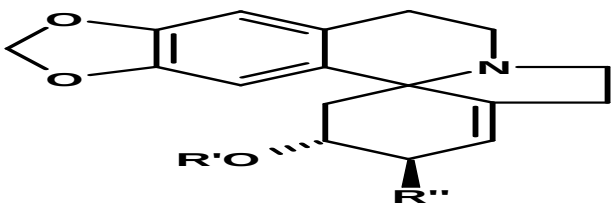
R_1 = R_2 = R′ = Me, R_3= Me, R″ = OH, Erysopitine (18)



R_1 = R_2 = Me, R′ = OMe, Erythratidinone (13)

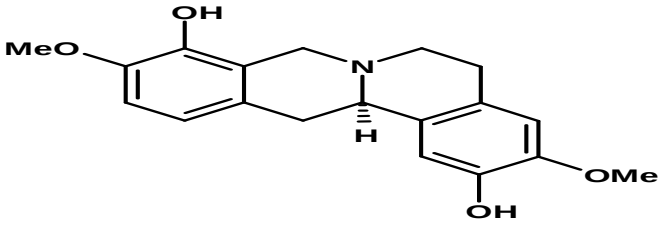
R_1 = R_2 = Me, R′ = H, 3-Demethoxyerythratidinone (14)

R_1 = H, R_2 = Me, R′ = OMe, Erysodienone (19)

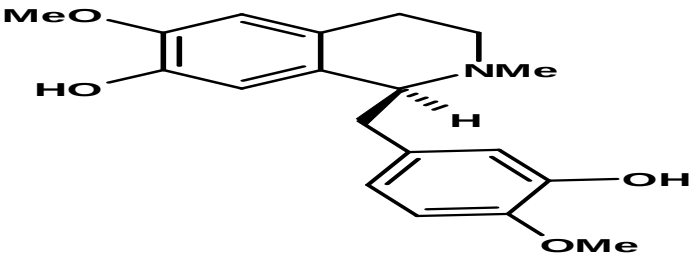


R′ = Me, R″ =H, Erythramine (15)

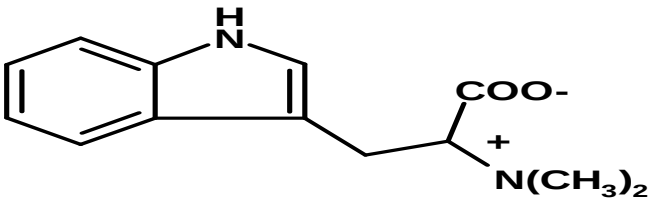
R′ = Me, R″ = OH, Erythratine (16)



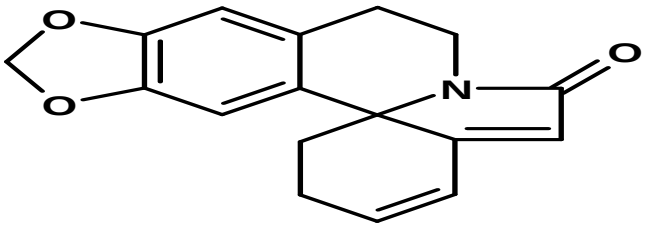
Scoulerine (20)



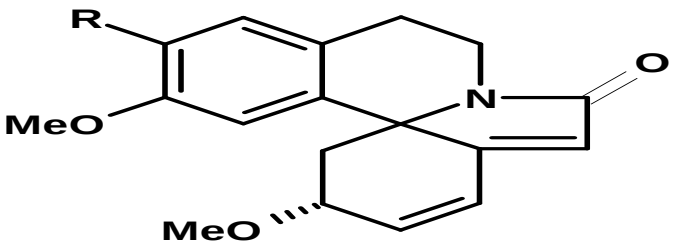
Reticuline (22)



Hyphaphorine (25)

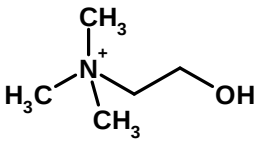


Erythrosotidienone (27)

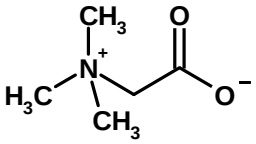


R=H, Erythromotidienone (28)

R=OMe, Erysotramidine (29)



Choline (31)



Betaine (32)

Ganguly *et al* found out that Erysotrine and Erysotamidine show potent CNS activities.[36]

Spectral data, melting points, specific rotations of most of the compounds are given below (Table 10).

Table. 10: Spectroscopic details, melting point, specific rotation etc of alkaloids from *Erythrina variegata.*

Compound Number/Name	Mol. Formula/ M.W/ UV / IR / Melting point / Specific rotation	Spectral data NMR (δ) / MS (*m/z*)	Ref
1/ Erysovine	$C_{18}H_{21}O_3N$ M.W: 299 M.pt. 167-169°C (Me_2CO / Petroleum ether) $[\alpha]_D$: +252° (c=0.123, EtOH) U.V: (MeOH/EtOH) (log ε): 228 (4.3), 283 (3.6) nm	^{1}H NMR: (60 MHz, $CDCl_3$) δ_H: 3.87 (3H, CH_3), 3.33 (3H, CH_3), 6.45 (1H, H-1), 6.00 (1H, H-2), 5.67 (1H, H-7), 6.84 (1H, H-17), 6.63 (1H, H-14) ^{13}C NMR: (90.6 MHz) δ_C: 125.6 (C-1), 132.0 (C-2), 55.7 (OMe), 76.4 (C-3), 41.1 (C-4), 66.8 (C-5), 142.4 (C-6), 122.4 (C-7), 56.6 (C-8), 44.0 (C-10), 24.2 (C-11), 111.0 (C-14), 131.5 (C-13), 125.2 (C-12), 143.9 (C-16), 145.6 (C-15), 112.5 (C-17), 55.7 (OMe) MS: $[M]^+$ 299 (39), 284 (41), 268 (100)	[20]
3/ Erysotrine	$C_{19}H_{23}O_3N$ M.W: 313 M.pt. 96-98°C (Me_2CO/ Petroleum ether) $[\alpha]_D^{25}$: +165° ($CHCl_3$) U.V: (MeOH/EtOH) (log ε): 230 (4.3), 280 (3.8) nm	^{1}H NMR (300 MHz, $CDCl_3$) δ_H : 6.38 (1H, *dd*, $J_{1,2}$=10.0, 2.5 Hz, H-1), 5.85 (1H, *d*, $J_{1,2}$=10.0 Hz, H-2), 3.96 (1H, *m*, *J*=12.0, 5.5 Hz, H-3), 2.48 (1H, *dd*, *J*=12.0, 5.5 Hz, H-4), 1.76 (1H, *t*, *J*=12.0, 5.5 Hz, H-4), 5.58 (1H, H-7), 3.74 (3H, CH_3), 3.64 (3H, CH_3), 6.48 1H, H-17), 6.71 (1H, H-14), 3.22 (3H, CH_3) ^{13}C NMR: (25.2 MHz) δ_C: 124.9 (C-1), 132.0 (C-2), 75.6 (C-3), 40.2 (C-4), 67.8 (C-5), 141.5 (C-6), 121.6 (C-7), 58.6 (C-8), 43.7 (C-10), 23.8 (C-11), 125.6 (C-12), 129.6 (C-13), 109.2 (C-14), 147.2 (C-15), 147.9 (C-16), 111.4 (C-17), 56.8 (OMe), 55.8 (OMe) , 55.8 (OMe) MS: $[M]^+$ 313 (84), 298 (81), 282 (100)	[20]
4/ Erythratine	$C_{19}H_{23}O_4N$ M.W: 329 M.pt. 166-168°C	^{1}H NMR: (100 MHz,$CDCl_3$) δ_H : 6.66 (1H, *dd*, *J*=10.0, 2.5 Hz, H-1), 8.09 (1H, *d*, *J*=10.0 Hz, H-2), 4.05 (1H, *m*, *J*=2.5, 10.5, 5.0 Hz, H-3),	[20]

Compound Number/Name	Mol. Formula/ M.W/ UV / IR / Melting point / Specific rotation	Spectral data NMR (δ) / MS (*m/z*)	Ref
	$[\alpha]_D$: +135° (c=0.5, $CHCl_3$), +256° (c=1.4, $CHCl_3$) U.V: (MeOH/EtOH) (log ε): 229 (4.16), 287 (3.51) nm I.R: 3600 cm^{-1}	1.87 (1H, *t*, *J*=5.0, 10.5 Hz, H-4), 3.33 (3H, CH_3), 2.45 (1H, *dd*, *J*=5.0, 10.5 Hz, H-4), 5.80 (1H, H-7), 3.93 (3H, CH_3), 3.81 (3H, CH_3), 6.91 (1H, H-17), 7.07 (1H, H-14), 4.79 (1H, *t*, *J*=4.5 Hz, H-11), 3.68 (1H, *dd*, *J*=14.0, 4.5 Hz, H-10), 3.14 (1H, *dd*, *J*=14.0, 4.5 Hz, H-10) ^{13}C NMR: (25.2 MHz) δ_C: 125.3 (C-1), 131.2 (C-2), 55.8 (OMe), 75.6 (C-3), 40.5 (C-4), 66.2 (C-5), 141.7 (C-6), 123.3 (C-7), 58.8 (C-8), 51.2 (C-10), 64.3 (C-11), 128.3 (C-12), 129.4 (C-13), 108.6 (C-14), 148.0 (C-15), 55.8 (OMe), 148.2 (C-16), 110.2 (C-17), 55.8 (OMe) MS: $[M]^+$ 329, 311, 296, 280, 278	
5/ Erysodine	$C_{18}H_{21}O_3N$ M.W: 299 M.pt: 204-206°C $[\alpha]_D^{27}$: +248° (EtOH) U.V: (MeOH) (log ε): 228 (4.3), 283 (3.7) nm I.R: (Nujol) 796, 870, 992, 1100, 1160, 1180, 1260, 1295, 1330, 1385, 1468, 1510, 1592, 2873, 2940, 3435 cm^{-1}	^1H NMR: (360 MHz, $CDCl_3$) δ_H: 6.58 (1H, *dd*, *J*=10.1, 2.3 Hz, H-1), 6.00 (1H, *dm*, *J*=10.1, 2.3, 1.1 Hz, H-2), 3.78 (3H, OMe), 4.04 (1H, *m*, *J*=2.3, 10.5 Hz, H-3), 1.84 (1H, *dd*, *J*=5.6, 11.5, 1.1 Hz, H-4), 2.53 (1H, *dd*, *J*=5.6, 11.5, 1.1 Hz, H-4), 5.47 (1H, *m*, H-7), 3.72 (1H, *dd*, *J*=3.0 Hz, H-8), 3.52 (1H, *dm*, *J*=3.0 Hz, H-8), 3.33 (3H, OMe), 3.48 (1H, *m*, H-10), 2.92 (1H, *m*, H-10), 2.92 (1H, *m*, H-11), 2.62 (1H, *m*, H-11), 6.80 (1H, H-14), 6.70 (1H, H-17) ^{13}C NMR: (90.6 MHz, DMSO-d_6) δ_C: 125.0 (C-1), 131.1 (C-2), 75.9 (C-3), 41.9 (C-4), 67.5 (C-5), 142.3 (C-6), 123.5 (C-7), 57.7 (C-8), 48.7 (C-10), 22.1 (C-11), 124.7 (C-12), 129.9 (C-13), 56.4 (OMe), 110.0 (C-14), 145.6 (C-15), 142.9 (C-16), 55.5 (OMe), 115.0 (C-17) MS: $[M]^+$ 299, 284, 268, 266, 241, 228, 215	[20]
6/ Erysonine	$C_{17}H_{19}O_3N$ M.W: 285 M.pt. 237-238°C $[\alpha]_D^{27}$: +285-288° (c=0.5, HCl)	MS: $[M]^+$ 285 (100), 268 (89), 266 (21), 254 (22)	[20]
7/ Erysopine	$C_{17}H_{19}O_3N$ M.W: 285 M.pt. 240-241°C (EtOH) $[\alpha]_D$: +263.4° (c=0.291, EtOH/Glycerine)	^{13}C NMR: (90.6 MHz, DMSO-d_6) δ_C: 124.7 (C-1), 131.1 (C-2), 75.8 (C-3), 55.4 (C-3, OMe), 41.6 (C-4), 66.0 (C-5), 142.3 (C-6), 122.3 (C-7), 56.3 (C-8), 43.4 (C-10), 23.1 (C-11), 124.8 (C-12), 130.0 (C-13), 112.8 (C-14), 143.7 (C-15), 143.0 (C-16), 115.4 (C-17) MS: TMSi derivative$[M]^+$ 429 (62), 414 (24),	[20]

Compound Number/Name	Mol. Formula/ M.W/ UV / IR / Melting point / Specific rotation	Spectral data NMR (δ) / MS (*m/z*)	Ref
		398 (100), 340 (12), 73 (45)	
8/ Erythraline	$C_{18}H_{19}O_3N$ M.W: 297 M.pt. 106-107°C (EtOH) $[\alpha]_D^{27}$: +211.8° (c=0.944, EtOH) U.V: (MeOH/EtOH) 232, 290 nm	^{1}H NMR: (360 MHz, $CDCl_3$) δ_H: 6.54 (1H, *dd*, *J*=10.1, 2.2 Hz, H-1), 5.96 (1H, *dm*, *J*=10.1 Hz, H-2), 3.96 (1H, *m*, *J*=2.2, 10.4, 5.5 Hz, H-3), 3.33 (3H, OMe), 1.86 (1H, *dd*, *J*=10.4, 11.6 Hz, H-4), 2.49 (1H, *dddd*, *J*=5.5, 11.6, 1.1 Hz, H-4), 5.73 (1H, *m*, H-7), 3.50 (1H, *m*, *J*=14.5, 2.8 Hz, H-8), 3.76 (1H, *dd*, *J*=14.5, 2.8 Hz, H-8), 2.90 (1H, *m*, H-10), 3.52 (1H, *m*, H-10), 2.90(1H, *m*, H-11), 2.70 (1H, *m*, H-11), 6.77 (1H, H-14), 6.63 (1H, H-17), 5.91 (1H, *d*, H-18), 5.88 (1H, *d*, H-18) ^{13}C NMR: (90.6 MHz,) δ_C: 55.9 (OMe), 125.2 (C-1), 131.5 (C-2), 76.1 (C-3), 41.6 (C-4), 67.4 (C-5), 142.2 (C-6), 122.8 (C-7), 57.6 (C-8), 44.5 (C-10), 25.2 (C-11), 127.9 (C-12), 132.4 (C-13), 106.1 (C-14), 146.1 (C-15), 145.6 (C-16), 108.6 (C-17), 100.6 (C-18) MS: $[M]^+$ 297, 282, 266 (100), 264, 239, 225, 212	[20]
9/ Erythrinine	$C_{18}H_{19}O_4N$ M.W: 313 M.pt. 197-200°C (MeOH) $[\alpha]_D^{20}$: +204° (c=0.1, $CHCl_3$) U.V: (MeOH/EtOH) (log ε): 209 (4.38), 230 (4.26), 289 (3.7) nm I.R: 3500 cm^{-1}	^{1}H NMR: (360 MHz, $CDCl_3$) δ_H: 6.56 (1H, *dd*, *J*=10.1, 2.2 Hz, H-1), 6.00 (1H, *dm*, *J*=10.1 Hz, H-2), 3.97 (1H, *m*, *J*=2.2, 10.6, 5.5 Hz, H-3), 3.33 (3H, OMe), 1.79 (1H, *dd*, *J*=10.6, 11.6 Hz, H-4), 2.38 (1H, *dddd*, *J*=5.5, 11.6, 1.1 Hz, H-4), 5.74 (1H, *m*, *J*=1.1 Hz, H-7), 3.87 (1H, *m*, H-8), 3.59 (1H, *dd*, *J*=4.6, 4.2 Hz, H-10), 3.02 (1H, *dd*, *J*=4.6, 4.2 Hz, H-10), 4.71 (1H, *dd*, *J*=4.6, 4.2 Hz, H-11), 6.31 (1H, H-14), 6.98 (1H, H-17), 5.95 (1H, *d*, *J*=1.4 Hz, H-18), 5.92 (1H, *d*, *J*=1.4 Hz, H-18) ^{13}C NMR: (22.6 MHz, DMSO-d_6) δ_C: 124.6 (C-1), 131.2 (C-2), 75.5 (C-3), 41.5 (C-4), 66.8 (C-5), 141.5 (C-6), 123.3 (C-7), 55.4 (C-8), 53.0 (C-10), 55.4 (OMe), 62.9 (C-11), 130.7 (C-12), 132.3 (C-13), 104.5 (C-14), 145.8 (C-15), 145.7 (C-16), 106.7 (C-17), 100.5 (C-18) MS: $[M]^+$ 313 (98), 298 (70), 295 (57), 283 (70), 282 (100), 280 (80), 264 (85), 262 (50), 224 (35), 211 (40)	[20]
10/ Erythratidine	$C_{19}H_{25}O_4N$ M.W: 331 M.pt:120-120.5°C (EtOAc /petroleum ether) $[\alpha]_D$:+273°(c=0.109, EtOH)	^{1}H NMR (360 MHz, $CDCl_3$) δ_H : 1.68-3.80 (10H), 5.81(1H, *m*, H-1), 3.30 (3H, OMe), 4.43 (1H, *m*, H-2), 3.80 (1H, *m*, H-3), 3.74 (3H, OMe), 6.46 (1H, H-14), 6.58 (1H, H-17), 3.80 (3H, OMe)	[20]

Compound Number/Name	Mol. Formula/ M.W/ UV / IR / Melting point / Specific rotation	Spectral data NMR (δ) / MS (*m/z*)	Ref
	U.V: (MeOH/EtOH) λ_{max} (log ε): 232 (3.76), 284 (3.41) nm I.R: 3387, 3509 cm^{-1}	^{13}C NMR: (90.6 MHz) δ_C: 120.6 (C-1), 76.5 (C-2), 64.6 (C-3), 40.5 (C-4), 63.4 (C-5), 145.4 (C-6), 27.4 (C-7), 36.3 (C-8), 46.3 (C-10), 21.7 (C-11), 125.9 (C-12), 128.5 (C-13), 110.9 (C-14), 148.3 (C-15), 146.8 (C-16), 112.5 (C-17), 55.9 (OMe), 55.9 (OMe), 56.3 (OMe) MS: $[M]^+$ 313, 300, 273, 257 (100), 244	
11/ Epierythratid-ine	$C_{19}H_{25}O_4N$ M.W: 331 M.pt.67-68°C (EtOAc/petroleum ether) $[\alpha]_D$: +142°(c= 0.148, $CHCl_3$) I.R: 3427, 3574 cm^{-1}	^1H NMR: (360 MHz, $CDCl_3$) δ_H : 1.67-3.97 (10H), 5.60 (1H, *m*, H-1), 4.50 (1H, *m*, H-2), 3.57 (1H, *m*, H-3), 3.30 (3H, OMe) , 4.97 (3H, OMe), 4.97 (3H, OMe), 6.60 (1H, H-14), 6.58 (1H, H-17) ^{13}C NMR: (90.6 MHz) δ_C: 121.3 (C-1), 56.0 (OMe), 81.0 (C-2), 72.7 (C-3), 40.1 (C-4), 64.5 (C-5), 143.8 (C-6), 26.7 (C-7), 38.3 (C-8), 45.3 (C-10), 21.4 (C-11), 124.9 (C-12), 127.8 (C-13), 111.1 (C-14), 147.9 (C-15), 146.6 (C-16), 111.8 (C-17), 55.7 (OMe), 55.7 (OMe) MS: $[M]^+$ 331, 300, 273, 257, 244	[20]
12/ 11-Hydroxyepierythratidine	$C_{19}H_{25}O_5N$ M.W: 347	MS: TMSi $[M]^+$ 451, 433 (75), 345 (100)	[20]
13/ Erythratidino-ne	$C_{19}H_{23}O_4N$ M.W: 329 M.pt:67-68°C (C_6H_6/petroleum ether) $[\alpha]_D$:+358°(c=1.121, $CHCl_3$) I.R: 1675 cm^{-1}	^1H NMR: (360 MHz, $CDCl_3$) δ_H : 2.28-3.32 (10H), 6.13 (1H, *m*, H-1), 4.05 (1H, *m*, H-2), 3.88 (3H, OMe), 6.57 (1H, H-14), 6.68 (1H, H-17), 3.78 (3H, OMe), 3.50 (3H, OMe), MS: $[M]^+$ 329, 301, 298, 286, 272, 271(100), 243, 242, 228, 215, 214, 197	[20]
14/ 3-Demethoxyerythratidinone	$C_{18}H_{15}O_3N$ M.W: 299 M.pt:111-112°C(C_6H_6/ petroleum ether) $[\alpha]_D$:+325°(c=0.249,$CHCl_3$) U.V: (MeOH/EtOH) λ_{max} (log ε): 284 (1.54) nm I.R: 1667 cm^{-1}	^1H NMR: (360 MHz, $CDCl_3$) δ_H: 2.28-3.32 (10H), 6.04 (1H, H-1), 3.68 (3H, OMe), 3.79 (3H, OMe), 6.51(1H, H-14), 6.57 (1H, H-17) MS: $[M]^+$ 329, 301, 298, 286, 272, 271(100), 243, 242, 228, 215, 214, 197	[20]
15/ Erythramine	$C_{18}H_{21}O_3N$ M.W: 299 M.pt:120-121°C(Et_2O) $[\alpha]_D$:+168°(c=0.33)	^1H NMR: (360 MHz, $CDCl_3$) δ_H : 5.55 (1H, *m*,H-1), 2.34 (1H, H-2), 3.73 (1H, *m*, *J*=11.5, 4.0 Hz, H-3), 2.28 (1H, *dd*, *J*=11.5, 4.0 Hz, H-4), 3.26 (3H, OMe), 1.57 (1H, *t*, *J*=11.5, 4.0 Hz, H-4), 6.60 (1H, H-17), 5.85 (2H, H-18) MS: $[M]^+$ 299 (20), 268 (15), 241 (74), 240 (100)	[20]
16/ Erythratine	$C_{18}H_{21}O_4N$ M.W: 315	^1H NMR: (360 MHz, $CDCl_3$) δ_H: 5.65 (1H, *m*, H-1), 4.36 (1H, *m*, *J*=7.4 Hz, H-2), 4.38 (*m*),	[20]

Compound Number/Name	Mol. Formula/ M.W/ UV / IR / Melting point / Specific rotation	Spectral data NMR (δ) / MS (*m/z*)	Ref
	M.pt.174-179°C $[\alpha]_D^{24}$:+140°(c=0.4, EtOH) U.V: (MeOH/EtOH) 238, 292 nm I.R: 3610 cm^{-1}	3.33 (3H, OMe), 3.63 (1H, *ddd*, *J*=12.5, 4.0 Hz, H-3), 2.33 (1H, *dd*, *J*=4.0, 11.7 Hz, H-4), 1.61 (1H, *dd*, *J*=12.5, 11.7 Hz, H-4), 2.46 (1H, *m*, H-7), 2.25 (1H, *m*, H-7), 3.02 (1H, *m*, H-8), 2.73, (1H, *m*, H-8), 3.56 (1H, *m*, *J*=6.6, 14.3 Hz, H-10), 3.18 (1H, *ddd*, *J*=1.4, 7.7, 14.3 Hz, H-10), 2.64 (1H, *dd*, *J*=1.4, 17.1 Hz, H-11), 3.02 (1H, *m*, *J*=7.7, 17.1 Hz, H-11*)*, 6.77 (1H, H-14), 5.93 (3H, OMe), 5.92 (3H, OMe), 6.60 (1H, H-17) MS: $[M]^+$ 315, 297, 284, 282, 266, 257, 241(100), 228	
17/ Erysotine	$C_{18}H_{23}O_4N$ M.W: 317 M.pt: 225-227°C (Et_2O)	^{1}H NMR: (60 MHz, $CDCl_3$) δ_H: 1.60-3.30(10H), 5.87 (1H, *m*, H-1), 4.45 (1H, *m*, H-2), 3.60 (1H, *m*, H-3), 3.80 (3H, OMe), 6.86 (1H, H-14), 3.36 (3H, OMe), 6.48 (1H, H-17) MS: $[M]^+$ 317 (8), 286 (14), 259 (93), 258 (23), 243 (100), 242 (26)	[20]
18/ Erysodienone	$C_{17}H_{21}O_4N$ M.W: 303 M.pt.168-171°C $[\alpha]_D^{24}$:+148°(c=0.52, EtOH) U.V: (MeOH/EtOH) λ_{max} (log ε): 285-287 (4.31) nm	MS: $[M]^+$ 303 (92), 288 (18), 271 (100), 245 (41)	[20]
19/ Erysodienone	$C_{18}H_{19}O_4N$ M.W: 313 M.pt: 222-225°C (EtOH) U.V: (MeOH/EtOH) λ_{max} (log ε): 240-242 (4.2), 285 (3.55) nm I.R: 1614, 1655, 1672, 3286, 3533	^{1}H NMR: (300 MHz, $CDCl_3$) δ_H: 2.10-3.65 (8H), 6.38 (1H, *t*, H-1), 6.38 (1H, *t*, H-1), 6.47 (1H, H-14), 6.64 (1H, H-17), 3.70 (3H, OMe) MS: $[M]^+$ 313 (62), 298 (17), 282 (100)	[20]
27/ Erythrosotidienone	$C_{17}H_{15}O_3N$ M.W: 281 I.R: ν_{max} 2930s, 2860s, 1740s, 1610s, 1460s, 1440s,1380s, 1280-60bs, 1160s, 1130s, 1075s, 1040s, 975s, 960s, 860-40bs, 730s, sh, 720s, 675s, 645s, 610s, 580s cm^{-1}	^{1}H NMR: (99.50 MHz, $CDCl_3$) δ_H: 3.63 (2H, *t*, *J*=1.5 and 4.5 Hz, C-10-H), 5.72 (1H, *m*, C-2-H), 5.94 (2H, *s*, O-CH_2-O), 7.32 (1H, *s* C-14-H), 7.23 (1H, *s*, C-17-H), 6.62 (1H, *s*, C-7-H), 6.02 (1H, *d*, *J*= 10.0 Hz, C-1-H), 1.87-3.27 (6H, *m*, methylene and methane protons) MS: $[M]^+$ (% relative abundance) 281 (5.0), 280 (22.5), 279 (100), 267 (7.5), 265 (7.5), 253 (17.5), 227 (2.5), 226, 199 (15.4), 174 (15.0), 167 (10.0), 133 (5.0), 81 (31.6), 120 (8.00, 77 (5.0), 76 (80.0), 56 (27.3), 55 (42.5) ^{13}C NMR: (99.50 MHz) δ_C: 184.0 (C=O), 152.0 (C-16), 152.4 (C-15), 132 (C-2), 131.0 (C-1), 129.6 (C-7), 128.3 (C-12), 128.1 (C-13), 114.0 (C-17), 110.0 (C-14), 104.0 (C-6), 102.8 (-O-CH_2-O), 68.1 (C-5), 40.3 (C-10), 32.0 (C-3), 30.4 (C-4), 23.2 (C-11)	[26]
28/	$C_{18}H_{19}O_3N$	^{1}H NMR: (99.50 MHz, $CDCl_3$) δ_H: 3.86 (3H, *s*,	[26]

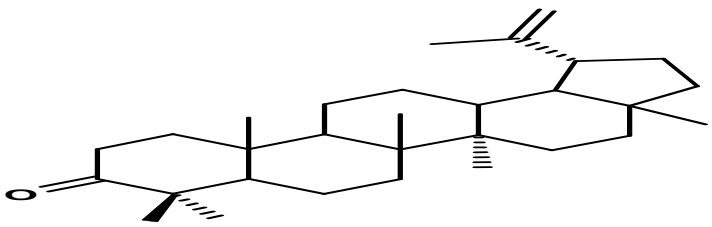
Compound Number/Name	Mol. Formula/ M.W/ UV / IR / Melting point / Specific rotation	Spectral data NMR (δ) / MS (*m/z*)	Ref
Erythromotidienone	M.W: 297 I.R: ν_{max} 2920s, 2880s, 1760s, 1600s, 1450s, 1380s, 1280-60bs, 1335s, 1280-60bs, 1250s, 1170s, 1110s,sh, 1075a, 1055s, 1025wb, 975s, 960s, 925s, 885w, sh, 835s, 800s, 765w,sh, 730s, 700s cm^{-1}	OCH_3), 3.36 (3H, *s*, OCH_3), 7.21 (1H, *d*, *J*= 2.7 Hz, C-14-H), 7.32 (1H, *dd*, *J*= 2.5 and 9.0 Hz, C-16 or C-15-H), 7.13 (1H, *d*, *J* =2.3 Hz, C-17-H), 6.62 (1H, *s*, C-7-H), 6.34 (1H, *d*, *J* =9.6 Hz, C-1-H), 6.02 (1H, *dd*, *J* =2.5 and 7.5 Hz, C-2-H), 1.92-3.76 (7H, *m*, methylene and methane protons) MS: $[M]^+$ (% relative abundance) 297 (5), 296 (8), 295 (11), 269 (19), 255 (30), 239 (8), 235 (10), 213 (16), 185 (16), 83 ($CHCl_2^+$), 81 (43)	
29/ Erysotramidine	$C_{19}H_{21}O_4N$ M.W: 327 I.R: ν_{max} 2930s, 2860s, 1760s, 1600s, 1475s, 1380s, 1310s, 1170s, 1030s, 980-70bs, 915s,sh, 885-60bs, 810s, sh, 740s, 720s, 695s, 610s cm^{-1}	^1H NMR: (99.50 MHz, $CDCl_3$) δ_H: 3.86, 3.62 and 3.36 (3H, *s*, each, 3 × OCH_3), 7.16 (1H, *s*, C-17-H), 6.97 (1H, *s*, C-14-H), 6.52 (1H, *s*, C-7-H), 6.34 (1H, *d*, *J* =5.5, C-1-H), 6.01 (*dd*, *J*= 3.5 and 9.5 Hz, C-2-H), 3.18-1.72 (7H, *m*, methylene and methane protons) MS: $[M]^+$ (% relative abundance) 327 (19), 299 (16), 269 (15), 268 (13), 265 (19), 264 (15), 243 (19), 159 (18), 82 (CCl_2), 81 (31)	[26]

F. Terpenoids from *Erythrina variegata:* A few triterpenes have been isolated from stem bark of the plant *Erythrina variegata*. Names and sources of the compounds with references are placed in Table 11, under the name 'terpenoids'.

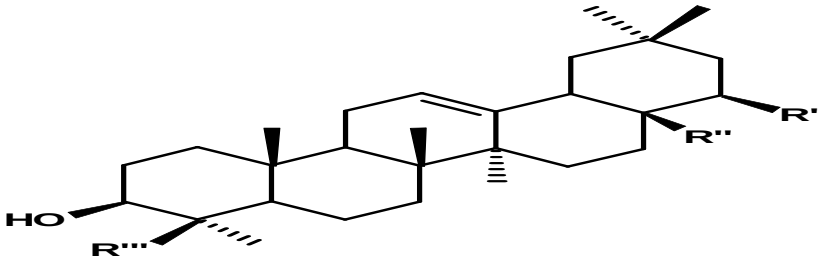
Table 11: Terpenoids from *Erythrina variegata.*

No	Compound name	Source (reference)
1	Lup-20(29)-en-3-one	Stem bark [29]
2	β-Amyrin	Stem bark [29]
3	Olean-12-en-3 β,22 β-diol	Stem bark [29]
4	Olean-12-en-3 β, 28-diol	Stem bark [29]
5	22 β,24-Dihydroxyolean-12-en-3-one	Stem bark [29]
6	Oleanonic acid	Stem bark [29]
7	Oleanolic acid	Stem bark [16,29]
8	Olean-12-ene-3 β,22 β,24-triol	Stem bark [29]

The structures of the triterpenes are given below followed by the spectral data of the compounds.



Lupe-20(29)-ene-3-one (1)



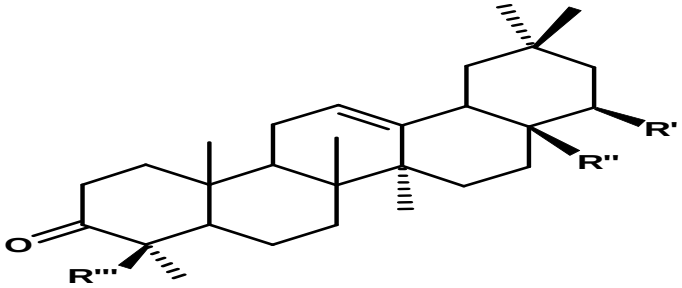
R′=H, R″=CH_3, R‴=CH_3, β-Amyrin (2)

R′=OH, R″=CH_3, R‴=CH_3, Olean-12-en-3 β,22 β-diol (3)

R′=H, R″=CH_2OH, R‴=CH_3, Olean-12-en-3 β, 28-diol (4)

R′=H, R″=COOH, R‴=CH_3, Oleanolic acid (7)

R′=OH, R″=CH_3, R‴=CH_2OH, Olean-12-ene-3 β,22 β,24-triol (8)



R′=OH, R″=CH_3, R‴=CH_2OH, 22 β, 24-Dihydroxyolean-12-en-3-one (5)

R′=H, R″=COOH, R‴=CH_3, Oleanonic acid (6)

Spectral data, melting points, specific rotations of few compounds are given below(Table 12).

Table. 12: Spectroscopic details, melting point, specific rotation etc of terpenoids compounds from *Erythrina variegata.*

Compound Number/ Name	Mol. Formula/ M.W/ UV / IR / Melting point / Specific rotation	Spectral data NMR (δ) / MS (*m/z*)	Ref
5/ 22 β, 24-Dihydroxyolean-12-en-3-one	$C_{30}H_{44}O_3$ M.W: 452 M.pt. 195-197 °C $[\alpha]_D$: +36.1° ($CHCl_3$, c 0.01) I.R: ν_{max} (KBr): 3467 (OH), 1705 (C=O), 1616 (C=C) cm^{-1}	^{1}H NMR: (300 MHz, $CDCl_3$) δ_H: 0.88 (3H, *s*, H-30), 0.90 (3H, *s*, H-29), 1.00 (3H, *s*, H-26), 1.01 (3H, *s*, H-25), 1.04 (3H, *s*, H-28), 1.12 (3H, *s*, H-27), 1.28 (3H, *s*, H-23), 3.45 (1H, *t*, *J*=3.2 Hz, H-22α), 3.49 (1H, *d*, *J*=11.3 Hz, H-24a), 3.99 (1H, *d*, *J*=11.3 Hz, H-24b), 5.28 (1H, *t*, *J*=3.4 Hz, H-12) ^{13}CNMR (75 MHz, $CDCl_3$) δ_c: 38.82 (*t*, C-1), 34.35 (*t*, C-2), 220.83 (*s*, C-3), 50.58 (*s*, C-4), 55.66 (*d*, C-5), 19.22 (*t*, C-6), 32.81 (*t*, C-7), 39.49 (*s*, C-8), 46.06 (*d*, C-9), 36.51 (*s*, C-10), 23.85 (*t*, C-11), 122.17 (*d*, C-12), 143.87 (*s*, C-13), 42.23 (*s*, C-14), 25.65 (*t*, C-15), 28.21 (*t*, C-16), 37.42 (*s*, C-17), 44.93 (*d*, C-18), 46.47 (*t*, C-19), 30.52 (*s*, C-20), 41.46 (*s*, C-21), 76.72 (*d*, C-22), 22.11 (*q*, C-23), 65.82 (*t*, C-24), 16.34 (*q*, C-	[29]

Compound Number/ Name	Mol. Formula/ M.W/ UV / IR / Melting point / Specific rotation	Spectral data NMR (δ) / MS (*m/z*)	Ref
		25), 16.68 (*q*, C-29), 25.15 (*q*, C-27), 28.03 (C-28), 32.48 (*q*, C-29), 22.01 (*q*, C-30) EIMS *m/z* (rel. Int. %): 456 (14), 234 (100), 221 (12), 219 (33), 216 (41), 176 (20)	
8/ Olean-12-ene-3 β,22 β,24-triol	$C_{29}H_{48}O_3$ M.W: 444 M.pt. 257-259 °C $[\alpha]_D$: + 40.3° ($CHCl_3$, c 0.01) I.R: ν_{max} (KBr) 3606 (OH), 1646 (C=C) cm^{-1}	^{1}H NMR: (300 MHz, $CDCl_3$) δ_H: 0.86 (3H, *s*, H-30) 0.89 (3H, *s*, H-25), 0.91 (3H, *s*, H-29), 0.94 (3H, *s*, H-26), 1.03 (3H, *s*, H-28), 1.10 (3H, *s*, H-27), 1.24 (3H, *s*, H-23), 3.36 (1H, *d*, *J* = 11.4 Hz, H-24a), 3.43 (1H, *t*, *J* = 3.6 Hz, H-22α), 3.45 (1H, *dd*, *J* = 12.0, 6.6 Hz, H-3α), 4.22 (1H, *d*, *J* = 11.4 Hz, H-24b), 5.24 (1H, *t*, *J* = 3.4 Hz, H-12) 13C-NMR (75 MHz, $CDCl_3$-CD_3OD) □ δ_C : 36.32 (*t*, C-1), 25.92 (*t*, C-2), 80.84 (*d*, C-3), 42.09 (*s*, C-4), 55.83 (*d*, C-5), 18.73 (*t*, C-6), 33.25 (*t*, C-7), 39.83 (*s*, C-8), 47.68 (*d*, C-9), 37.65 (*s*, C-10), 23.69 (*t*, C-11), 122.26 (*d*, C-12), 143.86 (*s*, C-13), 42.65 (*s*, C-14), 28.35 (*t*, C-15), 27.61 (*t*, C-16), 36.66 (*s*, C-17), 44.59 (*d*, C-18), 46.37 (*t*, C-19), 29.87 (*s*, C-20), 41.67 (*t*, C-21), 76.67 (*d*, C-22), 22.44 (*q*, C-23), 65.29 (*t*, C-24), 16.33 (*q*, C-25), 16.73 (*q*, C-26), 25.93 (*q*, C-27), 28.19 (*q*, C-28), 32.74 (*q*, C-29), 20.33 (*q*, C-30) EIMS *m/z* (rel. int. %): 458 [M]+ (9), 234 (100), 223 (23), 216 (13), 203 (67), 189 (26).	[29]

G. Miscellaneous compounds from *Erythrina variegata*

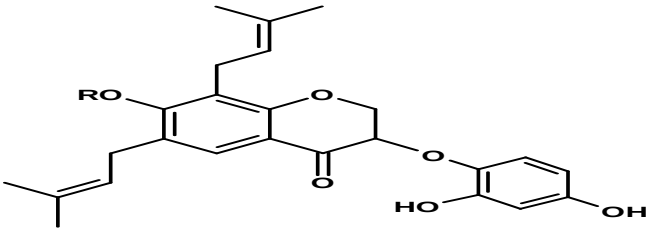
Compounds obtained from different parts of *Erythrina variegata* were grouped as flavonoids, alkaloids, benzofurans, pterocarpinoids, terpenoids and steroids. Apart from these, some compounds were placed separately as 'miscellaneous compounds', where many types of compounds were listed. These include 3-phenoxychromones (Eryvarin F and G), a few phenolic compounds, acids, indole derivatives, alkanes, alkenes etc. The names of the compounds are given with sources and references in Table 13.

Table. 13: Miscellaneous compounds from *Erythrina variegata.*

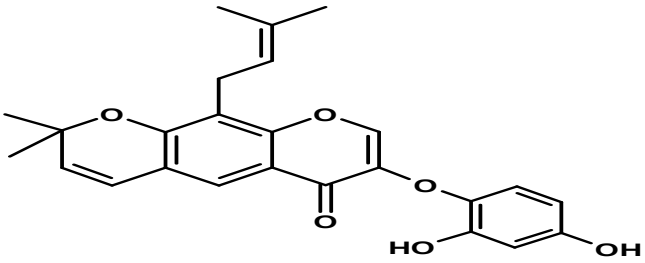
No	Compound name	Source (reference)
1	Eryvarin F	Root [7]
2	Eryvarin G	Root [7]
3	1,3,5-Trihydroxy-4(3-methylbut-2-enyl) xanthen-9-one	Bark [18]
4	Docosyl alcohol	Bark [19]
5	Sigmoidin K	Root bark [43]
6	Ferulic acid	Flower [22]
7	Caffeic acid	Flower [22]
8	Carboxylated indole-3-alkylamine	[21]
9	Eryvariestyrene	Root [24]

No	Compound name	Source (reference)
	[*E*-1-[2,4-Dihydroxy-5-(3-methylbut-2-enyl)]-2-phenylethylene**]**	
10	Eryvarinol A	Root [28]
11	Eryvarinol B	Root [28]
12	6-Hydroxygenistein	Stem bark [32]
13	Decarbomethoxyerymelanthine	Stem bark [32]
14	8-Prenyldaidzein	Root bark [33]
15	Indicanine A	Root bark [33]
16	Indicanine B	Root bark [31]
17	Robustic acid	Root bark [33]
18	Auriculatin	Root [8]
19	Warangalone	Stem bark [29]

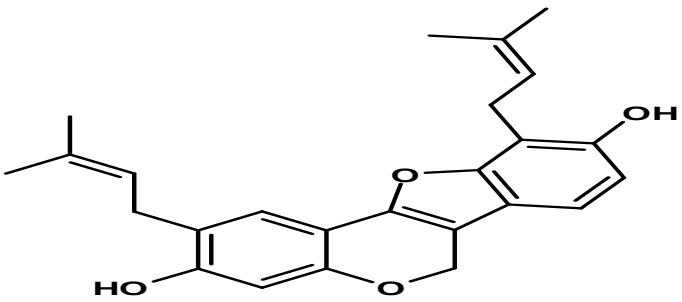
The structures of the some of the compounds are given below followed by the spectral data of the compounds.



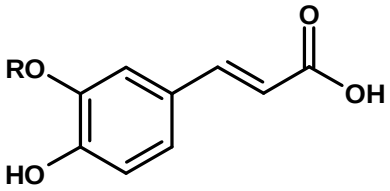
Eryvarin F (1)



Eryvarin G (2)

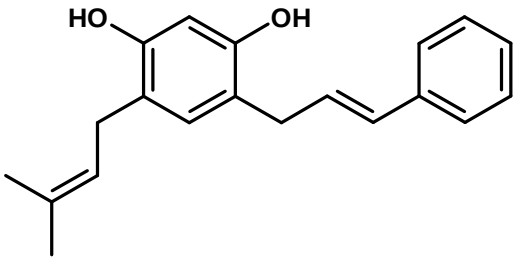


Sigmoidin K (5)

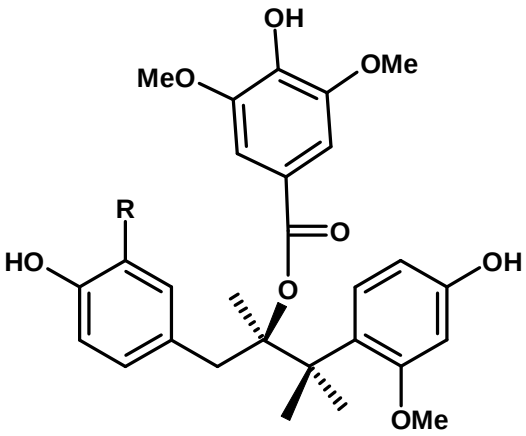


R= Me, Ferulic acid (6)

R= H, Caffeic acid (7)

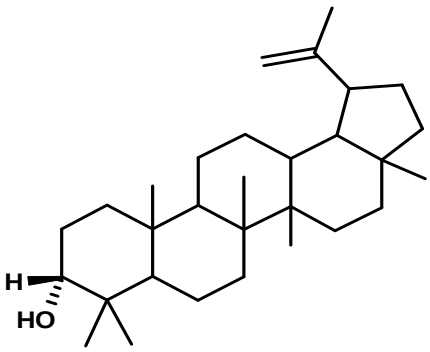


Eryvariestyrene (9)

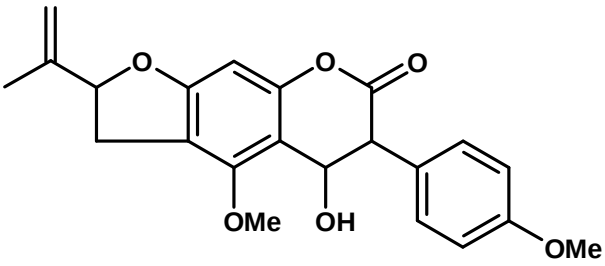


R= H, Eryvarinol A (10)

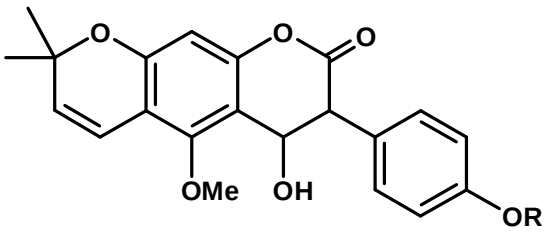
R=  **, Eryvarinol B (11)**



6-Hydroxygenistein (12)

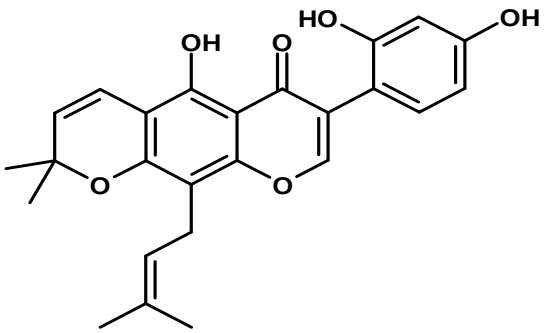


Indicanine A (15)

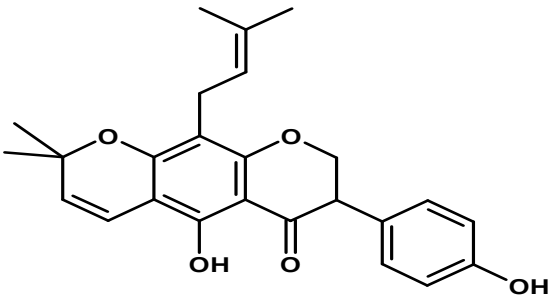


R= H, Indicanine B (16)

R=Me, Robustic acid (17)



Auriculatin (18)



Warangalone (19)

Kobayashi *et al* found out that 1,3,5-Trihydroxy-4(3-methylbut-2-enyl) xanthen-9-one inhibited Na^+/ H^+ exchange system of arterial smooth muscle cell.[18] Telikepalli *et al* reports that Auriculatin has toxicity against insects.[24] Whereas, Waffo *et al* found out that

Indicanine B has activity against Gram positive bacterium, *Staphylococus aureus* (209P) and *Mycobacterium smegmatis* (ATCC 607).[31] Spectral data, melting points, specific rotations of some compounds are given below (Table 14).

Table. 14: Spectroscopic details, melting point, specific rotation etc of other compounds from *Erythrina variegata*.

Compound Number/Name	Mol. Formula/ M.W/ UV / IR / Melting point / Specific rotation	Spectral data NMR (δ) / MS (*m/z*)	Ref
1/ Eryvarin F	$C_{25}H_{26}O_6$ M.W: 422 U.V: (MeOH/EtOH) (log ε): 203 (4.56), 246 sh (4.34), 288 sh (3.97) nm I.R: (KBr) ν_{max} 3400, 1630, 1600 cm^{-1}	^{1}H NMR: (400 & 600 MHz, $CDCl_3$) δ_H: 8.27 (H-2, *s*), 7.90 (H-5, *s*), 6.51 (H-3′, *d*, *J*=2.9 Hz), 6.28 (H-5′, *dd*, *J*=8.8, 2.9 Hz), 6.96 (H-6′, *d*, *J*=8.8 Hz), 3.41 (H-1″, *d*, *J*=7.3 Hz), 5.29 (H-2″, *t*, *J*=7.3 Hz), 1.77 (H-4″, *s*), 1.79 (H-5″, *s*), 3.59 (H-1‴, *d*, *J*=7.3 Hz), 5.21 (H-2‴, *t*, *J*=7.3 Hz), 1.85 (H-4‴, *s*), 1.75 (H-5⁗, *s*), 5.08 (OH, *br*, *s*), 6.29 (OH, *br*, *s*), 9.48 (OH, *br*, *s*) ^{13}C NMR: (100.4 & 150.8 MHz, $CDCl_3$) δ_C: 148.5 (C-2), 144.0 (C-3), 175.4 (C-4), 123.9 (C-5), 127.2 (C-6), 158.5 (C-7), 114.8 (C-8), 154.2 (C-9), 117.3 (C-10), 140.2 (C-1′), 150.3 (C-2′), 105.5 (C-3′), 154.0 (C-4′), 106.7 (C-5′), 121.7 (C-6′), 29.5 (C-1″), 120.2 (C-2″), 136.2 (C-3″), 17.9 (C-4″), 25.8 (C-5″), 22.3 (C-1‴), 120.4 (C-2‴), 135.6 (C-3‴), 18.0 (C-4‴), 25.8 (C-5‴) MS: $[M]^+$ 422 (100), 405 (9), 351 (8), 273 (15), 227 99), 217 (13), 173 (10), 161 (18), 150 (11)	[7]
2/Eryvarin G	$C_{25}H_{24}O_6$ M.W: 420 U.V: (MeOH/EtOH) (log ε): 204 (4.55), 268 (4.46), 331 (3.88), 346 sh (3.83) nm I.R: (film) ν_{max} 3500, 1630, 1600 cm^{-1}	^{1}H NMR: (400 & 600 MHz, $CDCl_3$) δ_H: 8.27 (H-2, *s*), 7.90 (H-5, *s*), 6.51 (H-3′, *d*, *J*=2.9 Hz), 6.28 (H-5′, *dd*, *J*=8.8, 2.9 Hz), 6.96 (H-6′, *d*, *J*=8.8 Hz), 3.41 (H-1″, *d*, *J*=7.3 Hz), 5.29 (H-2′, *t*, *J*=7.3 Hz), 1.77 (H-4″, *s*), 1.79 (H-5″, *s*), 3.59 (H-1‴, *d*, *J*=7.3 Hz), 5.21 (H-2‴, *t*, *J*=7.3 Hz), 1.85 (H-4‴, *s*), 1.75 (H-5‴, *s*), 5.08 (OH, *br*, *s*), 6.29 (OH, *br*, *s*), 9.48 (OH, *br*, *s*) ^{13}C NMR: (100.4 & 150.8 MHz, $CDCl_3$) δ_C: 148.5 (C-2), 144.0 (C-3), 175.4 (C-4), 123.9 (C-5), 127.2 (C-6), 158.5 (C-7), 114.8 (C-8), 154.2 (C-9), 117.3 (C-10), 140.2 (C-1′), 150.3 (C-2′), 105.5 (C-3′), 154.0 (C-4′), 106.7 (C-5′), 121.7 (C-6′), 29.5 (C-1″), 120.2 (C-2″), 136.2 (C-3″), 17.9 (C-4″), 25.8 (C-5″), 22.3 (C-1‴), 120.4 (C-2‴), 135.6 (C-3‴), 18.0 (C-4‴), 25.8 (C-5‴) MS: $[M]^+$ 420 (810), 405 (100), 349 (12), 281 (15), 255 (20), 187 (10)	[7]
9/Eryvariestyrene	$C_{20}H_{22}O_2$ M.W: 294 U.V: (MeOH/EtOH) (log ε) 252 (4.15), 285 (3.74), 293	^{1}H NMR: (500 MHz, $CDCl_3$) δ_H: 1.76 (3H, *br s* Me), 1.77 (3H, *br s*, Me), 3.27 (2H, *d*, *J*=7.18 Hz, H-1″,1″), 3.47 (2H, *br d*, *J*=6.5 Hz, H-1a,1a), 4.99 (1H, *m*, OH, D_2O exch.), 5.17 (1H, *m*, OH, D_2O exch.),	[24]

Compound Number/Name	Mol. Formula/ M.W/ UV / IR / Melting point / Specific rotation	Spectral data NMR (δ) / MS (*m/z*)	Ref
	(3.66) nm +NaOH 248 (4.20), 255 (4.20), 285 (3.66), 293 (3.71) nm +HCl 252 (4.12), 285 (3.71), 293 (3.63), MeOH + $AlCl_3$ + HCl 252 (412), 285 (3.71), 294 (3.61) nm I.R: ($CHCl_3$) ν_{max} 3595, 3460. 1620, 1600, 1495 cm^{-1}	5.29 (1H, *tt*, *J*=7.18, 1.3 Hz, H-2″), 6.34 (1H, *s*, H-3), 6.36 (1H, *dt*, *J*=15.9, 6.5 Hz, H-2a), 6.48 (1H, *d*, *J*=15.9 Hz, H-1′a) 6.84 (1H, *s*, H-6), 7.27 (5H, *m*, H-2′, 3′, 4′, 5′, 6′) ^{13}C NMR: (125.76 MHz, $CDCl_3$) δ_C: 17.84 (C-4″), 25.76 (C-5″), 29.26 (C-1″), 33.53 (C-1a), 103.79 (C-5), 117.50 (C-1 or 5), 119.0 (C-5 or 1), 122.28 (C-2″), 126.17 (C-2′,6′), 127.25 (C-4′), 128.50 (C-5′, 3′, 2a), 131.11 (C-1′a), 131.42 (C-6), 134.57 (C-3c), 137.13 (C-1′), 153.33 (C-2 or 4), 153.89 (C-4 or 2) MS: $[M]^+$ 3239 (65.3), 225 (13.5), 147 (19.9), 117 (48.8), 91 (100)	
10/Eryvarinol A	$C_{25}H_{25}O_9$ M.W: 469 $[\alpha]^{23}_D$: -74° (c=0.1, MeOH) U.V: (MeOH) λ_{max} (log ε): 206 (4.66), 228 (sh, 4.36), 279 (4.05) nm I.R: (KBr) ν_{max} 3400, 1700, 1620 cm^{-1}	^{1}H NMR: (600 MHz, acetone-d_6) δ_H: 5.19 (1H, *d*, *J*=4.4 Hz, H-1), 5.53 (1H, *t d*, *J*=5.9 and 4.4 Hz, H-2), 2.91 (2H, *d*, *J*=5.9 Hz, H-3), 6.45 (1H, *d*, *J*=2.2 Hz, H-3′), 6.45 (1H, *dd*, *J*=8.1 and 2.2 Hz, H-5′), 7.39 (1H, *d*, *J*=8.1 Hz, H-6′.), 7.03 (1H, *d*, *J*=8.8, Hz, H-2″), 6.67 (1H, *d*, H-3″), 6.67 (1H, *d*, *J*=8.8 Hz, H-5″), 7.03 (1H, *d*, *J*=8.8 Hz, H-6″) 7.20 (2H, *s*, H-2‴, 6″), 3.80 (3H, *s*, OMe-2′), 3.85 (6H, *s*, OMe-3‴, 5‴) ^{13}C NMR: (150.8 MHz, acetone-d_6) δ_C: 165.8 (COO), 158.8 (C-4′), 158.7 (C-2′), 156.6 (C-4″), 148.2 (C-3‴, 5‴), 141.3 (C-4‴), 131.3 (C-2″, 6″), 130.1 (C-1″), 129.9 (C-6′), 122.0 (C-1‴), 121.4 (C-1′), 78.6 (C-2), 69.5 (C-1), 56.7 (OMe-3″, 5‴), 55.8 (OMe-2′), 35.7 (C-3) FABMS (negative) *m/z* : 469 ($[M-H]^+$, 10), 367 (30), 275 (100)	[28]
11/Eryvainol B	$C_{30}H_{33}O_9$ M.W: 537 $[\alpha]^{23}_D$: -62° (c=0.1, MeOH) U.V: (MeOH) λ_{max} (log ε): 205 (4.69), 224 (sh, 4.42), 279 (4.07) nm I.R: (KBr) ν_{max} 3400, 1700, 1620 cm^{-1}	^{1}H NMR: (600 MHz, acetone-d_6) δ_H: 5.20 (1H, *d*, *J*=4.4 Hz, H-1), 5.52 (1H, *ddd*, *J*=8.1, 4.4 and 3.6 Hz, H-2), 2.88 (2H, *m*, H-3), 6.46 (1H, *d*, *J*=2.2 Hz, H-3′), 6.45 (1H, *dd*, *J*=8.8 and 2.2 Hz, H-5′), 7.39 (1H, *d*, *J*=8.8 Hz, H-6′), 6.90 (1H, *d*, *J*=2.2, Hz, H-2″, 6.66 (1H, *d*, *J*=8.1 Hz, H-5″), 6.85 (1H, *dd*, *J*=8.1 and 2.2 Hz, H-6″), 3.18(*d*, *J*=7.3 Hz, H-7″) 5.15 (*t*, *J*=7.3 Hz, H-8″), 1.60 (*s*, H-10″, 11″), 7.22 (6H, *s*, 2‴, 6‴), 3.81 (3H, *s*, OMe-2′), 3.85 (6H, *s*, OMe-3‴, 5‴) ^{13}C NMR: (150.8 MHz, acetone-d_6) δ_C: 165.7 (COO), 158.8 (C-4′), 158.7 (C-2′), 154.0 (C-4″), 148.2 (C-3‴, 5‴), 141.3 (C-4‴), 132.0 (C-9″), 131.5 (C-2″), 130.2 (C-1″), 129.9 (C-6′), 128.4 (C-6″), 128.1 (C-3″), 123.8 (C-8″), 122.0 (C-1‴), 121.4 (C-1′), 115.4 (C-5″, 108.0 (C-2‴,6‴), 107.7 (C-5′), 99.4 (C-3′), 78.6 (C-2), 69.5 (C-1), 56.7 (OMe-3‴, 5‴), 55.7 (OMe-2′), 35.8 (C-3), 29.0 (C-7″), 25.8 (C-11″), 17.7 (C-10″) FABMS (negative) *m/z* : 537 ($[M-H]^+$, 100), 446 (51), 444 (34), 313 (7), 297 (51), 295 (13)	[28]
12/6-	$C_{30}H_{50}O$	^{1}H NMR (400 MHz, $CDCl_3$) δ_H: 13.05	[32]

Compound Number/Name	Mol. Formula/ M.W/ UV / IR / Melting point / Specific rotation	Spectral data NMR (δ) / MS (*m/z*)	Ref
Hydroxygenistein	M.W: 426	(1H, *s*, OH-5), 7.83 (1H, *s*, H-2), 7.39 (1H, *d*, *J*= 8.5 Hz, H-2′, H-6′), 6.90 (1H, *d*, *J* = 8.5 Hz, H-3′, H- 5′), 6.36 (1H, *s*, H-8)	
15/Indicanine A	$C_{22}H_{20}O_6$, M.W: 380 M.pt. 175-177 °C, $[\alpha]_D$: -46° (*c* 1.99, MeOH) U.V: (MeOH) λ_{max} (log ε): 218 (4.54), 270 (3.48), 282 sh (3.86), 291 (4.23), 305 sh (4.17), 351 (4.63) nm I.R: ν_{max} (KBr) 3267, 1645, 1610, 1520, 1200, 1100 cm^{-1}	^{1}H NMR ($CDCl_3$, 300 MHz) δ_H: 7.42 (1H, *d*, *J*= 8.8 Hz, H-2′□and H-6′), 6.93 (2H, *d*, *J*= 8.8 Hz, H-3′ and H-5′), 6.58 (1H, *s*, H-8), 5.28 (1H, *t*, *J*= 8.8 Hz, H-2″), 5.0 (1H, *d*, *J*= 1.0 Hz, =CH), 4.95 (1H, *d*, *J*= 1.0 Hz, =CH), 4.08 (3H, *s*, 5-OMe), 3.80 (3H, *s*, 4′-OMe), 3.58 (1H, *dd*, *J*= 8.8 and 15.5 Hz, H-3″), 3.23 (1H, *dd*, *J* =7.6 and 15.8 Hz, H-3″), 1.77 (3H, *s*, CH_3-C=C) ^{13}C NMR (75 MHz) δ_C: 164.1 (*s*, C-4), 162.7 (*s*, C-2), 161.1 (*s*, C-5), 158 (*s*, C-7), 155.1 (s, C-4′), 152.4 (*s*, C-8a), 142.4 (*s*, C-2‴), 131.7 (*d*, C-2′□and C-6′), 123.6 (s, C-1′), 113.5 (*t*, C-1‴), 113.0 (*d*, C-3′□and C-5′), 111.0 (s, C-6), 100.0 (*s*, C-5a), 86.1 (*d*, C-2″), 60.5 (*q*, 5-OMe), 55.2 (*q*, 4′-OMe), 33.2 (*t*, C-3″), 17.1 (*q*, 3‴-Me) EIMS *m/z*: $[M]^+$ 380 (96), 365 (33), 337 (19), 233 (100), 217 (33), 190 (44), 175 (28), 148 (98), 135 (33), 120 (41), 91 (30), 69 (43), 41 (21), 39 (16) DCI/NH_3 [M+1]+ 381	[33]
16/Indicanine B	$C_{21}H_{18}O_6$ M.W: 366 U.V: (MeOH) λ_{max} (log ε): 234 (4.23), 258 (3.48), 339 (3.86) nm I.R: ν_{max} (KBr) 3400, 238, 1683, 1631, 1514, 1405, 1331, 1280, 1140, 1100 cm^{-1}	^{1}HNMR (DMSO, 300 MHz) δ_H: 10.0 (1H, *s*, exchangeable D_2O, 4-OH), 9.42 (1H, *s*, exchangeable D_2O, 4′-OH), 7.21 (2H, *d*, *J* = 8.8 Hz, H-2′ and H-6′), 6.78 (2H, *d*, *J* = 8.8 Hz, H-3′ and H-5′), 6.65 (1H, *s*, H-8), 6.63 (1H, *d*, *J* = 10.0 Hz, H-40), 5.91 (1H, *d*, *J* = 10.0 Hz, H-30), 3.88 (3H, *s*, OMe-5), 1.42 (6H, *s*, 20-Me_2) ^{13}C-NMR (75 MHz) δ_C: 161.5 (*s*, C-4), 160.3 (*s*, C-2), 156.4 (*s*, C-7), 156.3 (*s*, C-5), 153.4 (*s*, C-4’), 152.7 (*s*, C-8a), 132.0 (*d*, C-2′ and C-6′), 131.2 (*d*, C-30), 122.0 (*s*, C-1′), 115.1 (d, C-40), 114.5 (*d*, C-3′ and C-5′), 110.0 (*s*, C-6), 103.3 (*s*, C-3), 102.5 (*s*, C-4a), 100.2 (*d*, C-8), 77.5 (*s*, C-20), 64.2 (*q*, 5-OMe), 27.6 (*q*, 20-Me2) EIMS *m/z*: [M+] 366 (96), 351 (100), 217 (70), 188 (34), 134 (64)	[31]

From the above review and discussion, it is clear that investigations on the seed proteins of *Erythrina variegata* are not worth mention. Some scanty works[48,38-40,44,45] has been reported on this seed protein. This advantageous information encouraged author to undertake comprehensive work on the chemical nature of the seed proteins of *Erythrina variegata* Linn. and a study on functional properties of the total proteins isolated from the seeds. It was observed that nitrogen contents of the seeds and de-oiled seeds showed good protein contents.

Ultimately proteins were extracted from the seeds of *E. variegata* were done on the isolated seed proteins.[46] Amino acid analysis of the protein fractions identified 17 amino acids, most of which were essential,[46] The molecular weights of the total protein isolate were determined by SDS-PAG electrophoresis.[46] Functional properties of *Erythrina variegata* seed protein isolate were also studied.[47] Analysis of the seed oil and its fatty acid contents were also carried out by the Authors.[48]

REFERENCES

1. L. D. Kapoor, Handbook of Ayurvedic Medicinal Plants, New York: CRC Press, 2001; 177-178.
2. www.yahoo.com NFT Highlights, NFTA 94-02, January 1994.
3. Editorial Board, Council of Scientific and Industrial Research, The Wealth of India, A Dictionary of Indian Raw materials & Industrial Products, Vol.III: D-E, Publication and Information Directorate, CSIR, New Delhi, 1952; 195-199.
4. N. Hegde, Cultivation and uses of On Indian Medicinal Plantsf in Western India, In S. B. Westley and M. H. Powell, (Ed.), Erythrina in the New and Old Worlds. Paia, HI (USA): NFRA, 1993; 77-84.
5. H. Tanaka, H, Etoh, H. Shimizu, T. Makita and Y. Tateishi, Planta Medica, 2000; 66: 578-579.
6. H. Tanaka, M. Hirata, H, Etoh, N. Watanabe, H. Shimizu, M. Ahmad, Z. Khan and M. Anwar, Heterocycles, 2001; 55: 2341-2347.
7. H. Tanaka, M. Hirata, H, Etoh, H. Shimizu, M Sako, J. Murata, H. Murata, D. Darnaedi and T. Fukai, Phytochemistry, 2003; 62: 1243-1246.
8. M. Shabbir, A. Zaman, L. Crombie, B. Tuck and D.A. Whiting, Journal of the Chemical Society (C), 1968; 1899-1901.
9. H. Tanaka, T. Tanaka and H. Etoh, Phytochemistry, 1996; 42: 1473-1475.
10. H. Tanaka, T. Tanaka and H. Etoh, Phytochemistry, 1997; 45: 835-838.
11. H. Tanaka, M. Hirata, H, Etoh, M Sako, M. Sato, J. Murata, H. Murata, D. Darnaedi and T. Fukai, Chem Biodivers., 2004; 1(7): 1101-8.
12. M. Iinuma, Y. Okawa, T. Tanaka, Y. Koyabashi and K. Miyauchi, Heterocycles, 1994; 39: 687-692.
13. V.R. Hegde, P. Dai, M.G. Patel, M. S. Puar, P. Das, J. Pai, R. Bryant and P.A. Cox, Journal of Natural Products, 1997; 60(6): 537-539.

14. M. Sato, H. Tanaka, R. Yamaguchi, K. Kato and H. Etoh, International Journal of Antimicrobial Agents, 2004; 24: 43-48.
15. M. Sato, H. Tanaka, S. Fujiwara, M. Hirata, R. Yamaguchi, H. Etoh and C. Tokuda, Phytomedicine, 2003; 10(5): 427-433.
16. L. Xiaoli, W. Naili, W. M. Sau, A.S. Chen and Y. Xinsheng, Chemical & Pharmaceutical Bulletin, 2006; 54(4): 570-3.
17. H. Singh, A.S. Chawla, A.K. Jindal, A.H. Conner and J.W. Rowe, Lloydia, 1975; 38(2): 97-100.
18. M. Koyabashi, T. Mahmud, N. Yoshioka, H. Shibuya and I. Kitagawa, Chemical & Pharmaceutical Bulletin, 1997; 45(10): 1615-1619.
19. R. P. Rastogi, B. N. Mehrotra, Compendium of Indian Medcinal Plants, Vol. 1, 1960-1969, Central Drug Research Institute, Lucknow and Publication and Information Directorate, New Delhi, 1995; 177.
20. M. Shamma and A. J. Freyer, Journal of Natural Product, 1991; 54(2): 329-363.
21. R. P. Rastogi, B. N. Mehrotra, Compendium of Indian Medicinal Plants, Vol. 2, 1970-1979, Central Drug Research Institute, Lucknow and Publication and Information Directorate, New Delhi, 1993; 300-304.
22. R. P. Rastogi, B. N. Mehrotra, Compendium of Indian Medicinal Plants, Vol. 4, 1985-1989, Central Drug Research Institute, Lucknow and Publication and Information Directorate, New Delhi, 1995; 294-296.
23. A. Chatterjee and S. C. Pakrashi, The Treatise On Medicinal Plants, Vol. 2, Publication and Information Directorate, New Delhi, 1992; 92-94.
24. H. Telikepalli, S. R. Gollapudi, A. K.Shokri, L. Velazquez, R. A. Sandmann, E. A. Veliz, K. V. Jagannadha Rao, A. Siva and L. A. Mitscher, Phytochemistry, 1990; 29(6): 2005-2007.
25. K. F. Huang and Y. F. Yen, Journal of The Chinese Chemical Society, 1996; 43(6): 515-518.
26. S. K. Sharma and H. M. Chawla, Journal of The Indian Chemical society, 1998; 75(10-12): 833-837.
27. H. Tanaka, M. Sudo, M. Hirata, M. Sako, M. Sato, IS. Chen and T. Fukai, Heterocycles, 2005; 65(4): 871-877.
28. H. Tanaka, M. Hirata, H. Etoh, N. Watanabe, H. Shimizu, M. Ahmad, Y. Terada and T. Fukai, Journal of Natural Product, 2002; 65: 1933-1935.
29. K. F Huang and J. Y. Chiang, Chinese Pharmaceutical Journal, 2004: 56: 133-139.

30. H. Tanaka, M. Hirata, H, Etoh, M. Sako, M. Sato, J. Murata, H. Murata, D. Darnaedi and T. Fukai, Heterocycles, 2003; 60(12): 2767-2773.
31. A. K. Waffo, G. A. Azebaze, A. E. Nkengfack, Z. T. Fomum, M. Meyer, B. Bodo and F. R. van Heerden, Phytochemistry, 2000; 53: 981-985.
32. M. Z. Rahman, S. J. Sultana, C. F. Faruquee, F. Ferdous, M. S. Rahman, M. S. Islam and M. A. Rashid, Saudi Pharmaceutical Journal, 2007; 15(2): 140-145.
33. A. E. Nkengfack, A. K. Waffo, G. A. Azebaze, Z. T. Fomum, M. Meyer, B. Bodo and F. R. van Heerden, J. Nat. Prod, 2000; 63: 855-856.
34. R. N. Yadava and K. I. S. Reddy, Fitoterapia, 1999; 70: 357-360.
35. H. Tanaka, T. Tanaka and H. Etoh, Phytochemistry, 1998; 47(3): 475-477.
36. A. K. Ganguly, C. H. Wang, D. Biswas, J. Misiaszek and A. Micula, 2006; 47: 5539-5542.
37. T. Rukachaisirikul, P. Innok, N. Aroonrerk, W. Boonamnuaylap, S. Limrangsun, C. Boonyon, U. Woonjina and A. Suksamrarn, J. Ethnopharmacology, 2007; 110(1): 171-175.
38. L. Bhattacharyya, C. F. Brewer, Archives of Biochemistry and Biophysics, 1988; 262(2): 605-608.
39. C. L. Bhattacharyya, F. Brewer, Biochemical and Biophysical Research Communication, 1986; 141(3): 963-967.
40. L. Bhattacharyya, P. K. Das and A. Sen, Archives of Biochemistry and Biophysics, 1981; 211(1): 459-470.
41. H. Tanaka, H. Etoh, N. Watanabe, H. Shimizu, M. Ahmed and G. H. Rizwani, Phytochemistry, 2001; 56: 769-773.
42. Glossary of Indian Medicinal Plants, R. N. Chopra, S. L. Nayar, I. C. Chopra, Council of Scientific and Industrial Reasearch, New Delhi, 1956; 111.
43. A. E. Nkengfack, T. W. Vouffo, J. C. Vardamides and Z. T. Fomum, J. Nat. Product, 1994; 58(7): 1172-1177.
44. N. Yamasaki, M. Kimura, O. Yamaguchi and M. Araki, J. Chromatography A, 1992; 597(1-2): 207-211.
45. E. H. Konozy, R. Mulay, V. Faca, R. J. Ward, L. J. Greene, M. C. Roque-Barriera, S. Sabharwal and S. Bhide, Biochime, 2002; 84(10): 1035-1043.
46. T. D. Samanta and S. Laskar, Food Chemistry, 2009; 114: 212-6.
47. T.D. Samanta and S. Laskar, J. Applied Chem. Res., 2010; 15: 19-28.
48. T. D. Samanta and S.Laskar, Biosci. Biotech. Res. Asia, 2013; 10(1): 433-7.