

## Original Research Article

# Phytochemical Studies On *Ecbolium Viride* (Forsk.) Alston– An Ethno-Medicinal Plant.

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## Abstract

*Ecbolium viride* (Forsk.) Alston also known *Ecbolium linneanum* as commonly called as Blue Fox Tail. Plant is medicinally important and reported in treatment such as in jaundice, rheumatism and against tumour in ayurveda, siddha and unani system of medicine. Ethnobotanical and phytochemical studies were done for chemically active ingredient by various phytochemical and analytical methods in leaves stem and root parts of plant extracts for proximate analysis for both fresh and dry material has been recorded. It is also found that in different solvent system. The complete experimental results signifies that medicinal information from folk and ancient literature reveals the therapeutic efficiency of *Ecbolium viride* which need to further elaboration in future works to investigate active ingredient for disease specific.

**Keywords:** *Ecbolium*, Phytochemistry, Fourier Transform Infrared Spectrophotometer (FTIR), Secondary Metabolites and GC MS.

## Introduction

*Ecbolium viride* (Forsk.) Alston (Trimen, Handb. Fl. Ceylon 6 (Suppl.): 229 1931.) also known as *Ecbolium linnaeanum* is an erect glabrous herb member to the family Acanthaceae commonly referred to as Blue Fox Tail, locally it is known as Dhakata-adulsa, Ranboli etc. Branched shrubs. Branches terete, green, thickened above the nodes. Leaves entire, lanceolate, acuminate, base acute, villous beneath, 10-14 x 3.5-6 cm. Flowers bluish-green, in terminal spikes; bracts foliaceous, purple-tipped, villous, 4-rowed. Capsules compressed, stalked, acute, pubescent; seeds two, flat, tuberculate, notched, jaculated (Patil DA, 2003).

*Ecbolium viride* is significantly valued in the folklore medicine as different parts of the plant like roots, leaves, stem and whole plant which are used in the form of decoction medicine for several medicinal purposes like cancer, jaundice and rheumatism (Yusuf AM et al, 2009; Datta P. C. and Maiti R.K, 1968) and traditional medicines as all the parts of the plant are used for gout and dysuria (Vollesen K, 1989), decoction of leaves for stricture (Vasudevan et al, 1985, Khare CP, 2007). Root juice is used as an anti-helminthic and also premenstrual colic are treated.

The decoction made from its aerial parts of *Ecbolium viride* is used in infectious diarrhoea and dysentery and also the pulmonary problems are treated with bark root (Hermans N et al, 2007 and Tanveer et al, 2020). Crude extracts of plant shows a significant antimicrobial activity and in the treatment of some diseases as broad-spectrum antimicrobial agents. The plant was reported to have radical scavenging (Ashoka Babu V. L et al, 2011), hepatoprotective (Preethi Priyadharshni S.P et al, 2011) and antidiabetic (Ranjitsingh B R et al, 2013) properties.

The present study reveals the exploration of the phytochemical constituents of *Ecbolium viride* used in traditional medicine over a long period.

## Materials and Methods

**Field Work:** *Ecbolium viride* was collected after the end of rainy season from forest of Toranmal region of Shahada Tehsil of Nandurbar District (21.840213° N, 74.456583° E). Identification of plant sample was performed using flora of Dhule and Nandurbar District. The plant parts are shade dried and powdered for further extraction by Soxhlet extraction using various solvent systems. Proximate Analysis were tested for total moisture content, dry matter content and total ash content from plant has been tested as per modified methods given by Vidya et al., 2017, Patil and Khan 2017a, and Patil and Khan 2017b.

Phytochemical test for Alkaloids, Anthraquinones, Carbohydrates, Cardiac Glycosides, Coumarins, Flavonoids, Glycosides, Phenols, Phytosterols, protein and amino acid, Quinones, Saponins and Tannins were taken from extracted plant samples with specific phytochemical analysis methodology given by Auwal MS et al, 2014, Basumatary, 2016, Gul, 2017, Nanna, 2013, Njoku, 2009, Raaman, 2006, Sadasivam, 2005, Sheel, 2014, Silva GO et al, 2017, Singh V, Kumar R., 2017, Singh, 2017, Tiwari, 2011, Tyagi, 2017 and Uma, 2017.

UV Visible Spectral Analysis for *Ecbolium viride* leaves extract were carried out in methanol and chloroform solvent for UV range of 200 nm to 700 nm. Fourier Transform Infrared Spectrophotometer (FTIR) has been tested for identification of chemical bonds (functional groups), and their types present in leaves of *Ecbolium viride*. Chloroform and Petroleum Ether leaf extract were used in FTIR analysis with 100 mg KBr pellet as encapsulate in sample discs. The powdered plant part sample was loaded in FTIR spectroscope (Shimadzu 8400S), with the Scanning range from 400 to 4000 cm<sup>-1</sup> with a resolution of 4 cm<sup>-1</sup> (Yang, 2002; Martín, 2005; Duraes, 2008). Gas chromatography and mass spectrometry (GC MS) Studies were recorded for *Ecbolium viride* for their leaves extract and recorded results were identified with National Institute of Standards and Technology (NIST) and on Dr. Duke's Phytochemical and Ethnobotanical Databases by Dr. Jim Duke of the Agricultural Research Service or USDA (Antony et al., 2013 and Komalet al., 2011).

## Result and Discussions

**Ethnobotanical Information:** Information gathered from tribals, local Vaidus and doctors found that all plant parts are used in gout and dysuria related with pain. Roots are used in menorrhagia, rheumatism and pulmonary problems. Leaves and roots together pulverized and is used against tumours and root juice is used for the treatment of jaundice among the local native practitioners on tribals of Satpuda.

The plant is valuable traditional medicine used in gout and dysuria (Vollesen K, 1989), decoction of leaves for stricture (Khare C.P. 2007). In literature, the plant root juice is used as anti-helminthic and also for the treatment of premenstrual colic (Sharma R and Sharma H.K. 2010). The decoction from its aerial parts is used in diarrhoea and dysentery (Hermans N et al, 2007). The plant was reported to have radical scavenging (Ashoka Babu V. L et al. 2011), hepatoprotective (Preethi Priyadharshni S.P et al., 2011) antidiabetic (Ranjitsingh B R et al, 2013) properties. Bark root is used to get relief from pulmonary problems (Asolkar L V et al, 1922).

## Proximate Analysis:

*Ecbolium viride* shows the 57.16% of total moisture content from the collected samples were total dry content in plants 43.16% and ash content were recorded is 36.50% as in table 1.

**Table.1.** Result for Total Proximate Analysis

Total Proximate Analysis		
01	Moisture content	57.16%
02	Dry matter content	43.16%
03	Ash content	36.50%

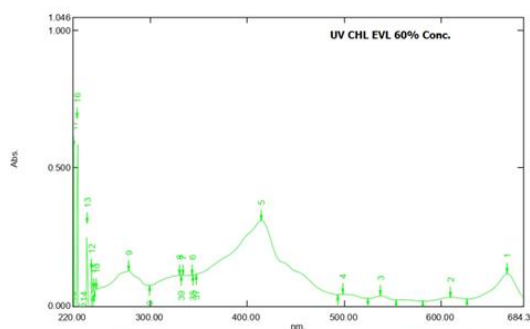
**Preliminary Phytochemistry:** Test for preliminary phytochemical results for root, stem and leaf with different solvent system are represented as in table 2.

**Table.2.** Result for Preliminary Phytochemistry

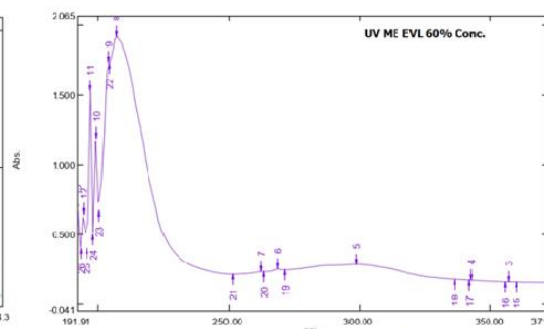
Sr. no.	Phytoconstituents	<i>Ecbolium viride</i> (Forssk.) Alston											
		Root				Stem				Leaf			
	Solvent Systems	Aq	Me	Ch	Pt	Aq	Me	Ch	Pt	Aq	Me	Ch	Pt
1.	Alkaloids	+	+	+	-	+	+	+	-	+	+	+	-
2.	Carbohydrates and Glycosides	+	+	+	-	+	-	-	-	+	+	-	-
3.	Cardiac glycosides	-	+	+	-	-	+	+	-	-	+	-	-
4.	Proteins and Amino acids	-	+	-	-	+	+	-	-	+	+	-	-
5.	Flavonoids	+	+	+	+	+	+	+	+	+	+	+	-
6.	Phenols	-	+	-	-	-	+	-	-	+	+	-	-
7.	Saponins	-	-	-	-	+	+	-	-	-	+	-	-
8.	Phytosterols	-	+	+	+	-	+	+	-	-	-	+	-
9.	Quinones	-	-	-	-	-	+	+	-	-	+	-	-
10.	Anthraquinones	-	+	-	-	-	+	+	-	-	-	-	-
11.	Coumarins	-	-	-	-	-	+	+	-	-	-	-	-
12.	Tannins	+	+	+	-	+	+	+	+	+	+	-	-

Aq= Aqueous, Me= Methanol, Ch= Chloroform, Pt= Petroleum Ether

**UV Visible Spectral Analysis:** In 60% Conc. chloroform extract of *Ecbolium viride*, sample from pure extract were used and shows remarkable peak in different absorptions at different wave length in leaves, stem and root. UV-VIS spectrophotometers show one peak in Leaves sample on 420 nm. In Stem extract recorded peak on 250 nm were no any significant result for root sample (Graph 1.). In same concentration (60%) of methanol extract of *Ecbolium viride*, UV-VIS spectrophotometers show one peak in Leaves sample on 220 nm. In Stem extract recorded peak range of 320-330 nm in screening. Two peaks were recorded at 280-290 nm range in root methanol extract (Graph 2.).

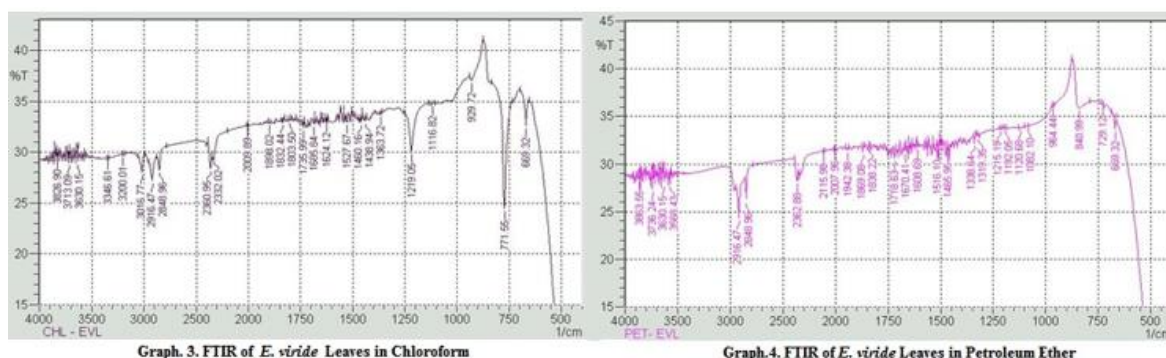


Graph. 1. UV spectra for *Ecbolium viride* (60% Conc. for Chloroform)



Graph. 2. UV spectra for *Ecbolium viride* (60% Conc. for Methanol)

**FTIR Spectral Analysis:** FTIR results for the *Ecbolium viride* leaves extract in chloroform extract solvent shows characteristic absorption bands at peak for Aromatic Rings (C-H) at  $3016.77\text{ cm}^{-1}$ , Carboxylic acids (O-H) at  $2916.47\text{ cm}^{-1}$ , Alcohols (C-O) at  $1219.05\text{ cm}^{-1}$  and Alkenes (C-H) at  $771.55\text{ cm}^{-1}$  like compounds in stretch between  $4000\text{ to }750\text{ cm}^{-1}$  in spectral search.

Graph. 3. FTIR of *E. viride* Leaves in ChloroformGraph. 4. FTIR of *E. viride* Leaves in Petroleum Ether

FTIR results for the *Ecbolium viride* leaves extract in petroleum ether extract solvent shows characteristic absorption bands at peak for Monomeric - Alcohols, Phenols (O-H) at  $3630.15\text{ cm}^{-1}$ , Hydrogen-bonded -Alcohols, Phenols (O-H) at  $3568.43\text{ cm}^{-1}$ , Carboxylic acids (C=C) at  $2916.47\text{ cm}^{-1}$ , Aldehydes (C=O) at  $1670.41\text{ cm}^{-1}$ , Amines (C-N) at  $1082.10\text{ cm}^{-1}$  and Phenyl Ring Substitution Bands (C-H) at  $840.99\text{ cm}^{-1}$  like compounds in stretch between  $4000\text{ to }500\text{ cm}^{-1}$  in spectral search.

**Table.3.** FTIR result for *Ecbolium viride* Chloroform Extract

Extracts prepared in	Peak values	IR Spectrum Frequency range ( $\text{cm}^{-1}$ )	Functional groups	Compound Type
Chloroform Extract of EVL	3016.77	$3500\text{-}3000\text{ cm}^{-1}$	C-H	Aromatic Rings (m)
	2916.47	$3000\text{-}2500\text{ cm}^{-1}$	O-H	Carboxylic acids (b) stretch
	1219.05	$1250\text{-}1000\text{ cm}^{-1}$	C-O	Alcohols, Ethers, Carboxylic acids, Esters
	771.55	$1000\text{-}750\text{ cm}^{-1}$	C-H	Alkenes

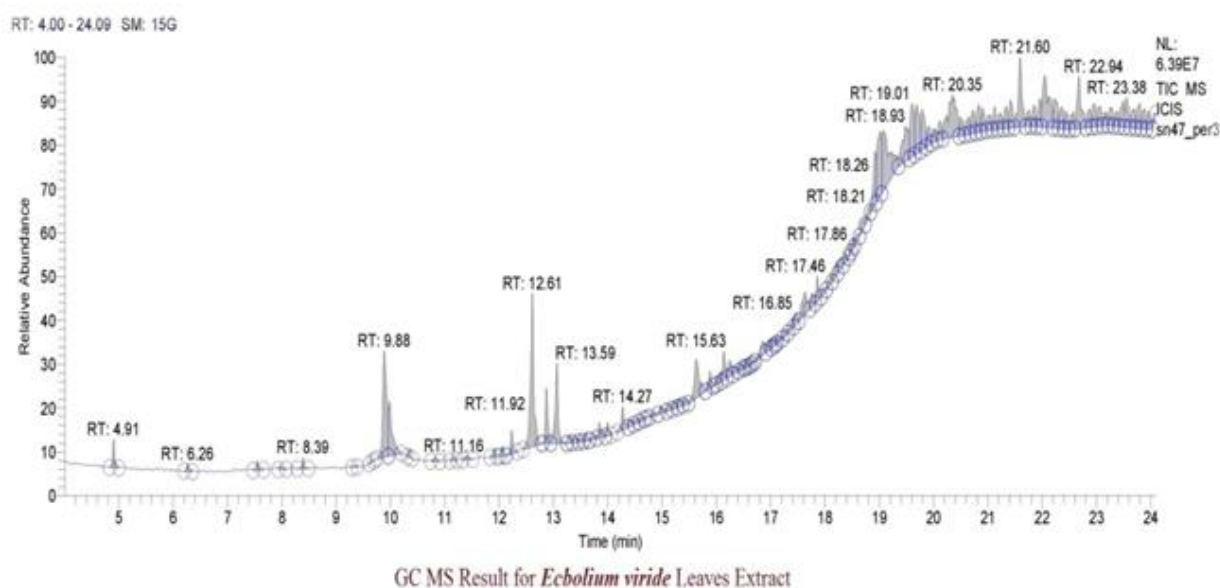
\*s - strong, #v - variable, m - medium, +w - weak, and b - broad.

FTIR results for the *Ecbolium viride* leaves extract in pet-ether extract solvent shows characteristic absorption bands at peak for Monomeric - Alcohols, Phenols (O-H) at  $3630.15\text{ cm}^{-1}$ , Hydrogen-bonded -Alcohols, Phenols (O-H) at  $3568.43\text{ cm}^{-1}$ , Carboxylic acids (C=C) at  $2916.47\text{ cm}^{-1}$ , Aldehydes (C=O) at  $1670.41\text{ cm}^{-1}$ , Amines (C-N) at  $1082.10\text{ cm}^{-1}$  and Phenyl Ring Substitution Bands (C-H) at  $840.99\text{ cm}^{-1}$  like compounds in starch between  $4000\text{ to }500\text{ cm}^{-1}$  in spectral search.

**Table.4.** FTIR result for *Ecbolium viride* Pet-Ether Extract

Extracts prepared in	Peak values	IR Spectrum Frequency range ( $\text{cm}^{-1}$ )	Functional groups	Compound Type
Pet-Ether Extract of EVL	3630.15	$4000\text{-}3500\text{ cm}^{-1}$	O-H	Monomeric - Alcohols, Phenols
	3568.43	$4000\text{-}3500\text{ cm}^{-1}$	O-H	Hydrogen-bonded -Alcohols, Phenols
	2916.47	$3000\text{-}2500\text{ cm}^{-1}$	C=C	Carboxylic acids (b)
	1670.41	$2000\text{-}1500\text{ cm}^{-1}$	C=O	Aldehydes, Ketones, Carboxylic acids, Esters
	1082.10	$1500\text{-}1000\text{ cm}^{-1}$	C-N	Amines (m)
	840.99	$1000\text{-}500\text{ cm}^{-1}$	C-H	Phenyl Ring Substitution Bands

\*s - strong, #v - variable, m - medium, +w - weak, and b - broad.

GC MS result for *Ecbolium viride* (Forssk.) Alston leaves:Graph.5.GC MS result for *Ecbolium viride*

In GC MS data interpretation the retention time (RT) value 9.88, 12.61 and 21.60 are shows the good peak value and hence far further tested for approximate compounds on the basis of GC MS library search data. It has been found that the compounds like Diethyl Phthalate, Phthalic acid, ethyl isopropyl ester, Phthalic acid, ethyl hex-3-yl ester, Phthalic acid, ethyl hex-2-yn-4-yl ester, Phthalic acid, ethyl 2-pentylester, 3,7,11,15-Tetramethyl-2-hexadecen-1-ol, Phytol, acetate, 3-Eicosyne, 9-Eicosyne, 9Octadecen1ol, (Z), Squalene, Trans-Geranylgeraniol, 2,6,10,14,18-Pentamethyl-2,6,10,14,18-eicosapentaene,1,6,10,14,18,22-Tetracosahexaen-3-ol, 2,6,10,15,19,23 hexamethyl and 2,2,4Trimethyl-3(3,8,12,16-tetramethyl-heptadeca 3,7,11,15-tetraenyl) cyclohexanol are present the plant sample (Graph 5 and Table 6.).

Table.5.Library Search Results for *Ecbolium viride* Leaves Extract

Sr. No	Compound Name	Formula	RT	Peak Area	Area %
01	Diethyl Phthalate	C <sub>12</sub> H <sub>14</sub> O <sub>4</sub>			
02	Phthalic acid, ethyl isopropyl ester	C <sub>13</sub> H <sub>16</sub> O <sub>4</sub>			
03	Phthalic acid, ethyl hex-3-yl ester	C <sub>16</sub> H <sub>22</sub> O <sub>4</sub>	9.88	79967549.36	4.87
04	Phthalic acid, ethyl hex-2-yn-4-yl ester	C <sub>16</sub> H <sub>18</sub> O <sub>4</sub>			
05	Phthalic acid, ethyl 2-pentylester	C <sub>15</sub> H <sub>20</sub> O <sub>4</sub>			
06	3,7,11,15-Tetramethyl-2-hexadecen-1-ol	C <sub>20</sub> H <sub>40</sub> O			
07	Phytol, acetate	C <sub>22</sub> H <sub>42</sub> O <sub>2</sub>			
08	3-Eicosyne	C <sub>20</sub> H <sub>38</sub>	12.61	96185014.09	5.86
09	9-Eicosyne	C <sub>20</sub> H <sub>38</sub>			
10	9Octadecen1ol, (Z)	C <sub>18</sub> H <sub>36</sub> O			
11	Squalene	C <sub>30</sub> H <sub>50</sub>			
12	Trans-Geranylgeraniol	C <sub>20</sub> H <sub>34</sub> O			
13	2,6,10,14,18-Pentamethyl-2,6,10,14,18-eicosapentaene	C <sub>25</sub> H <sub>42</sub>			
14	1,6,10,14,18,22-Tetracosahexaen-3-ol	C <sub>30</sub> H <sub>50</sub> O	21.60	49339340.35	3.00
15	2,6,10,15,19,23hexamethyl, 2,2,4Trimethyl-3(3,8,12,16-tetramethyl-heptadeca 3,7,11,15-tetraenyl) cyclohexanol	C <sub>30</sub> H <sub>52</sub> O			

## Conclusion

Phytochemical analysis *Ecbolium viride* for its different parts reveals the presence of important phyto constituent such as cardiac glycosides, phytosterols, tannins, alkaloids etc. in plant. The

complete experimental results reveals the therapeutic efficiency of *Ecbolium viride* and found the 15 major chemicals from the leaves extract in GC MS which need to further elaboration in future works to investigate active ingredient for disease specific *Ecbolium viride*.

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