

CHARACTERIZATION WITH HPTLC AND TLC OF CHLOROPHYTUM BORIVILIANUM AND ASPARAGUS RACEMOSUS LEAVES

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ABSTRACT

Background: This study had basically focused in revealing the existence of various active principles viz. steroids, triterpenoids, glycosides, alkaloids, etc. in the leaves of *Asparagus racemosus* by performing phytochemical evaluation of various types of extracts. Subsequently, explore the leaf extracts of *Chlorophytum borivilianum* for revealing the existence of several phytoconstituents. The extracts obtained by Soxhlet method were evaluated for pH, color, and percentage yield. Thus, in this research work, researchers evaluated the physicochemical, phytochemical evaluation and characterization by subjected to standard procedures. **Results:** This study claimed that the ethanolic and Aqueous extract of *Asparagus racemosus* and *Chlorophytum borivilianum* displayed overwhelming concentration of phytoconstituents viz., carbohydrates, terpenoid (saponins), steroids, flavonoids, proteins, free amino acids, glycosides, alkaloids, tannins, mucilages, etc. **Conclusions:** Thus, the ethanolic and aqueous extract of both plants has shown positive and effective reports. Therefore, these both extracts were subjected to standard procedure for the characterization by HPTLC and TLC. The present study includes the detailed exploration of phytochemical constituents found in the leaves of *Asparagus racemosus* and *Chlorophytum borivilianum*.

Keywords: Safed musli; Steroids; Triterpenoids; Saponins

INTRODUCTION

Currently in developing countries, medicinal plants are in high trend for different therapeutic application and for maintaining good health. *Chlorophytum borivilianum* is commonly known as safed musli or musli [1]. It is a herb belonging to a family "Asparagaceae" consist of lanceolate leaves. Its leaves are eaten as vegetable & roots are good health tonics. It is indigenous in thick forests of India. Since antiquity *Chlorophytum*

borivilianum have a great economic potential due to high medicinal properties. It consists of saponins, alkaloids, terpenoids, carbohydrates, phenols, resins, mucilage sugars etc. Chlorophytum borivilianum have approx 55-60 cm length with short, white flowers, long slender leaves (20-70 cm long & 2-3 cm wide) and thick, fleshy rhizome [2, 3].

The Latin word “herba” and French word “herbe” gives an English word “herb” [1, 2]. In recent studies “herb” means any part of the plant like roots, stem, leaves, fruits, flowers etc. and also non-woody plants but in old age “herb” means only non-woody plants [2, 3]. The herbal plants have various medicinal properties and used as food, perfume, medicine, ornamental plants, spiritual faith, etc. Since old ages, when the mankind itself started, human beings started depending on nature for their basic needs like shelter, clothing, food, medicine, fragrance, transportation, etc [1-3]. In developing countries many researchers are working on herbal plants as these are showing dominant effect from continuous long use in the health care system. In developed as well as developing countries herbal plants have dynamic part in developing new drug discovery [3]. Herbal plants have sole role in treating deadly diseases like heart attacks, cancer, hepatitis, AIDS, etc [4]. Globally, India is the vast biodiversity- rich country having traditional and medicinal importance of herbal plants in the field of homeopathy, Ayurveda, unani and siddha since ancient times.

Various phytochemical constituents like steroidal saponins, beta sitosterol, stigmasterol are found in Chlorophytum borivilianum but the key pharmacologic phytoconstituent is saponin having various therapeutic applications. Saponins have unique physical property i.e., “soap like formation”. If it is dissolved in liquid, then it will give foam like formation while agitation. It is miscible in both aqueous as well as in oily solution [7, 8]. The chemical structure of saponin includes the attachment of glycosides and sugars to another organic moiety i.e., steroid or triterpenoid. Thus, saponin is also known as triterpenoid saponins or steroidal saponins. Many researchers have done pharmacological studies on tubers of Chlorophytum borivilianum showing many beneficial therapeutic effects viz., hypocholesterolemic, hypolipidemic, anti-oxidant and various other activities [9].

Asparagus racemosus is commonly known as Satavar, Shatavari, etc. It is indigenous to the Himalayan region of north India. Its height is 2-3m with short, spiky stems having white flowers and blackish-purple, globular berries. Its roots are adventitious and tuberous going deep in gravelly, rocky soil. It belongs to a family “Asparagaceae”. Carbohydrates, glycosides, steroidal saponins, flavonoids, alkaloids and mucilage are the main active principles of Asparagus racemosus [10].

Chlorophytum borivilianum

Traditionally, Chlorophytum borivilianum plant is a rare ayurvedic herb having lanceolate leaves found in thick forest regions of India [11]. Now it is being cultivated because of strong economic potential and several usage properties viz. adaptogenic compounds, aphrodisiac, anti-inflammatory and used in arthritis, cancer, and diabetes. Chlorophytum borivilianum is commonly known as safed musli but due to the coloration of its root, referred as White gold [12]. The roots are rich in several active constituents like saponins and polysaccharides. There is various pharmacological activity of Chlorophytum borivilianum viz. anxiolytic, aphrodisiac, immunomodulatory activity, anthelmintic, antiulcer, antistress, anti-tumor, antioxidant, antidiabetic, antimicrobial, etc. Chlorophytum borivilianum is a peculiar gift of nature to mankind. Traditionally the leaves of Chlorophytum borivilianum are used for different activities like – aphrodisiac activity, culinary as well as vegetables [10-13].

Classification

Kingdom: Plantae Order: Asparagales Family: Asparagaceae Sub family: Agavoideae Genus: Chlorophytum
Species: borivilianum

Asparagus racemosus

Asparagus racemosus is a traditional plant found in India and regions of Himalayas used for treating dyspepsia, constipation, diarrhea, bronchitis, dementia, diabetes, etc. Asparagus racemosus is a species of Asparagus, commonly known as satavar, shatavari, etc and indigenous to tropical and subtropical region of India [14]. It is a woody climber grows 2-3m tall but roots go deep in soil. The demand of Asparagus racemosus is constantly high due to its various medicinal uses [15]. The whole plant of Asparagus racemosus including leaves and roots are especially useful in traditional Ayurvedic medicine [16]. Generally, Asparagus racemosus plants are found in India, some regions of Himalayas and all over the region of Sri Lanka, Asia, Australia, etc. It has many pharmacological effects namely: antitussive, antisecretory, gastrointestinal effects, antibacterial, antiprotozoal activity, apoptogenic activity, molluscicidal effect, antihepatotoxic activity, effect on uterus, etc. Generally, all the therapeutic uses of Asparagus racemosus are described in I.P. and B.P. and in Ayurveda, Siddha and Unani. Asparagus racemosus crop are generally resistant to pest and insects [17-21]. These are properly grown in hot climate and well- drained black soil [22].

Classification Kingdom: Plantae Order: Asparagales Family: Asparagaceae

Subfamily: Asparagoideae Genus: Asparagus Species: racemosus

MATERIALS AND METHODS

Selection of the plants on the basis of medicinal use and ethnobotanical survey .The leaves of Chlorophytum borivilianum and Asparagus racemosus are abundant in saponins, sterols, β -sitosterols, flavonoids, etc., according to different reports [23]. The test components would be the leaves of Chlorophytum borivilianum and Asparagus racemosus.

Collection, storage and authenticity of identification

Asparagus racemosus leaves have been collected from the campus of the Glocal University Saharanpur and Chlorophytum borivillianum leaves was collected from the Harbal Garden Of Glocal University . Plant authentication was performed by the Botanist, Department of Botany, Glocal school of Science . The leaves of these two plants were desiccated without drying.

Physicochemical Evaluation

The dried parts were subjected to the normal process of determining the different physicochemical parameters.

Successive Extraction of Plant material

Samples were broken and tested with 40 meshes. Dried shade into coarse powdered plant material (250 gms) i.e., dried leaves of Asparagus racemosus and Chlorophytum borivillianum were loaded into Soxhlet machines and extracted with petroleum ether (60-62°C), Chloroform, ethanol and water until complete extraction. After completing the extraction, the solvent was extracted by distillation. Dried the extracts using a rotator evaporator. The rest was then stored in a dessicator and a percentage yield was determined [12-14].

Phytochemical investigation

According to the standard procedures, the various leaves extracts of Asparagus racemosus and Chlorophytum borivillianum i.e., Pet. Ether extract, Chloroform extract, Ethanolic extract and Aqueous extract were obtained and after extraction they were subjected for phytochemical screening to determine the presence of various phytochemicals present in the extracts [11-13].

Various extracts obtained after extraction were subjected to phytochemical experiments to determine the existence of several phytochemicals present in extracts. Standard procedures were adopted to conduct the research [14, 15].

Characterization of extracts by TLC and HPTLC

The HPTLC instrument was used for the identification of respective chemical constituents present in the leaves of Chlorophytum borivillianum and Asparagus racemosus.

Development of thin layer chromatography

The TLC profile was determined for ethanolic and aqueous extract of ARL: Asparagus racemosus (Leaves) and CBL: Chlorophytum borivillianum

(Leaves) using following technique. Experimental technique [12] Preparation and activation of plate Liquid mud (1 part silica G gel and 3 parts pure water) was filtered out of the pestle glass and spread over glass plates (10cm by 20cm) by pouring and allowed to dry in air. The plates work an hour at 110-120 degrees and are

placed on desiccators to cool.

Preparation of sample solution

About 1% solution of methanolic extract was prepared and suspended impurities were filtered off.

Saturation of chamber

The solvent system was repaired and poured into the TLC chamber. A sheet of filter paper was inserted into it to provide quick filling and to prevent the bending effect. The room was closed by placing a glass plate at the mouth of the room with paraffin wax.

Application of spots

Spots of sample solutions are applied with the help of small capillaries on a plate, at a distance of about 1.5 cm from the ground and allowed to dry in the air. The distance between the two spots is kept at least 10 mm.

Development of chromatograms

After filling, the plates are placed in a chamber and the solvent is allowed to work until the solvent height of about 15 cm is reached at the point of view, removed and marked. It is then allowed to dry in air and sprayed with detecting reagent and stored in the oven for 5 minutes. Then the Rf values are calculated.

Development of HPTLC

Fingerprint of ethanolic and aqueous extracts of ARL: *Asparagus racemosus* (Leaves) and CBL: *Chlorophytum borivilianum* (Leaves) is made using the CAMAG HPTLC (Switzerland) system with the automatic Linomat IV additive. . The analysis was performed in an air-conditioned room maintained at 220°C. HPTLC is made of pre-assembled silica gel HPTLC aluminum plates 60 F254 (20cm 10cm / 10cm 10cm, 0.2mm thick, 5-6µm particle size, E. Merck, Germany). 5-10µl sample solution (1µg / ml) was identified as a 4mm or 5mm diameter band using automatic samples fitted with a 100 µl Hamilton syringe. Plates are developed using a solvent system prepared i.e. EA: M: H₂O; 7.5: 2: 4 for ethanolic and methanolic extraction respectively in the CAMAG double plate development room which was lined with filter paper and filled in front with a 30ml cell section. Enhanced plates are dried in the air and photographed. A spectrodensitometer (Scan 3, CAMAG) equipped with WINCATS software for planar chromatography controller was used for densitometry measurement and data processing. Absorbance / emission was a measurement mode with a scan speed of 20 mm / sec. Fragment dots are scanned from 200 to 800 nm to record their UV-VIS spectrum and detect high wavelength wavelengths. Densitogram was recorded at wavelength of high absorption of a different sample observed [13-14].

RESULT

In this research work different solvents were used to prepare various extracts and researchers evaluated the

percentage yield of different extracts of both the plants i.e. *Asparagus racemosus* and *Chlorophytum borivilianum*, shown below in Table 1 and Table-2.

Table 1: The percentage Yield of Various Extract of *Asparagus racemosus* and *Chlorophytum borivilianum* leaves

S/No.	Extract	Parameters			
		Nature of Extract	Color	pH	% Yield
1.	PEEARL	Semi Solid	Dark Brown	5.89	0.67
2.	CEARL	Semi solid	Creamish Brown	6.03	3.09
3.	EEARL	Semi Solid	Blackish Brown	6.09	8.11
4.	AEARL	Solid Powder	Light brown	6.05	15.09
5.	PEECBL	Semi Solid	Dark Green	6.09	0.86
6.	CECBL	Semi Solid	Green	6.09	2.98
7.	EECBL	Semi solid	Light Brown	7.87	7.77
8.	AECBL	Semi Solid	Dark brown	6.08	11.99

Abbreviations
 PEEARL=Petroleum Ether extract of *Asparagus racemosus* (Leaves) CEARL=Chloroform extract of *Asparagus racemosus* (Leaves)
 EEARL=Ethanollic extract of *Asparagus racemosus* (Leaves) AEARL=Aqueous extract of *Asparagus racemosus* (Leaves)
 PEECBL=Petroleum Ether extract of *Chlorophytum borivilianum* (Leaves) CECBL=Chloroform extract of *Chlorophytum borivilianum* (Leaves)
 EECBL=Ethanollic extract of *Chlorophytum borivilianum* (Leaves) AECBL=Aqueous extract of *Chlorophytum borivilianum* (Leaves)

Table 2: Preliminary Phytochemical Screening of *Asparagus racemosus* leaves

S/No.	Constituents	ARL			
		PEEARL	CEARL	EEARL	AEARL
1	Carbohydrates	√	√	X	√
2	Glycosides	X	X	√	√
3	Alkaloids	X	X	√	√
4	Protein & Amino acid	X	X	√	√
5	Tannins & Phenolic compounds	X	X	√	X
6	Flavonoids	X	√	√	X
7	Fixed oil and Fats	X	X	X	X
8	Steroids & Triterpenoids	√	√	√	√
9	Waxes	X	X	X	X
10	Mucilage & Gums	√	X	X	X

√ = Present X = Absent

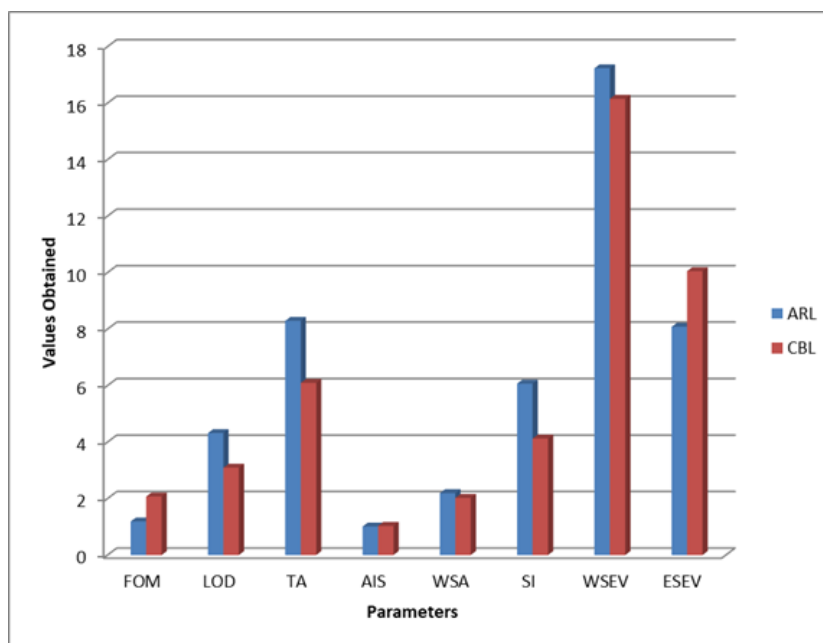
Physicochemical Evaluation

According to the standard procedures the dried plant parts of ARL: *Asparagus racemosus* (Leaves) and CBL: *Chlorophytum borivilianum* (Leaves) were used for the determination of various physicochemical parameters (Table 3-5). The results were presented in table 5.1 and Graph 1.

Table 3: Preliminary Phytochemical Screening of *Chlorophytum borivilianum* leaves

S/No.	Constituents	CBL			
		PEECBL	CEPCBL	EECBL	AECBL
1	Carbohydrates	X	√	√	√
2	Glycosides	X	√	√	√
3	Alkaloids	√	√	√	√
4	Protein & Amino acid	X	X	√	√
5	Tannins & Phenolic compounds	√	√	√	√
6	Flavonoids	X	X	X	X
7	Fixed oil and Fats	X	X	X	X
8	Steroids & Triterpenoids	√	√	√	√
9	Waxes	X	X	X	X
10	Mucilage & Gums	X	X	X	X

√ = Present; X = Absent



Graph 1: Physicochemical Evaluation of *Asparagus racemosus* leaves and *Chlorophytum borivilianum* leaves

Table 4: Development of TLC plates

S. No.	Solvent System	Inference
1.	Chloroform	Overlapping
2.	Ethyl acetate	Overlapping

3.	Methanol	Overlapping
4.	Ethyl acetate: hexane: methanol (9:90:1)	Overlapping
5.	Chloroform: benzene: methanol (20:2:1)	Tailing
6.	Ethyl acetate: hexane: chloroform (50:50:5)	Tailing
7.	Ethyl acetate: hexane: chloroform (50:60:3)	Poor
8.	Chloroform: Ethyl acetate: formic acid (2.5: 2: 0.5v/v)	Satisfactory
9.	Toluene: ethyl acetate (50:50)	Overlapping
10.	Toluene: ethyl acetate: Glacial acetic acid: formic acid (20: 45: 20:5)	Overlapping
11.	Toluene: ethyl acetate: formic acid (3: 2: 0.4v/v)	Satisfactory
12.	Ethyl Acetate:methanol:water (7.5: 2: 4)	Best
Adsorbent: Silica gel, Detecting reagent: Ferric chloride solution and in UV at 254 nm		

Table 5: TLC profile of ethanolic and aqueous extract of ARL: *Asparagus racemosus* (Leaves) and CBL: *Chlorophytum borivillianum* (Leaves)

S./No.	Name	No. of spots (Visible)	No. of spots	R _f values
			(At 254nm)	(in visible)
1	EAAARL	2	2	0.51, 0.68
2	AEARL	2	2	0.49, 0.70
3	EECBL	2	2	0.47, 0.72
4	AECBL	2	2	0.48, 0.71
Adsorbent: Silica gel G, Detecting reagent: Ferric chloride solution and in UV at 254 nm, Solvent System: Ethyl Acetate: methanol: water (7.5: 2: 4 v/v)				

Table 5.1: Physicochemical Evaluation of *Asparagus racemosus* leaves and *Chlorophytum borivillianum* leaves

S/No.	Parameters	ARL	CBL
1.	FOM	1.19±0.02	2.07±0.28
2.	LOD	4.32±0.15	3.09±0.12
3.	TA	8.29±0.08	6.09±0.12
4.	AIS	1.01±0.01	1.03±0.02
5.	WSA	2.19±0.12	2.02±0.03
6.	SI	6.07±0.13	4.12±0.11
7.	WSEV	17.23±1.08	16.15±1.12

8	ESEV	8.08±1.11	10.05±1.03
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Successive extraction of selected herbs

The shade dried coarsely powdered plant material of ARL: *Asparagus racemosus* leaves) and CBL: *Chlorophytum borivilianum* (Leaves) was extracted with petroleum ether, Chloroform, ethanol and water. The extraction was done by soxhlet method for dried plant material of ARL and CBL.

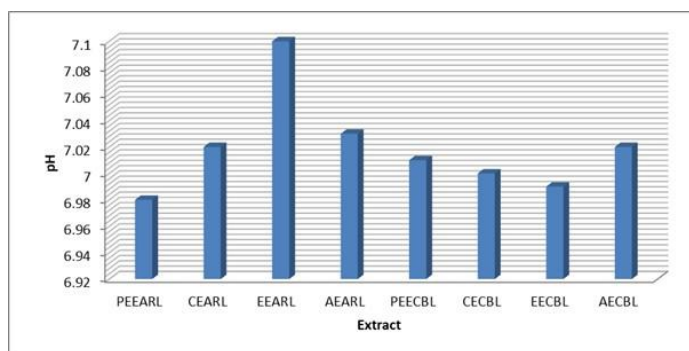
The extracts obtained were evaluated for pH, color and % yield. The results were presented in table 5.2, 5.3 and graph 2 & 3.

Table 5.2: Estimation of % Yield of Various Extract of *Asparagus racemosus* leaves

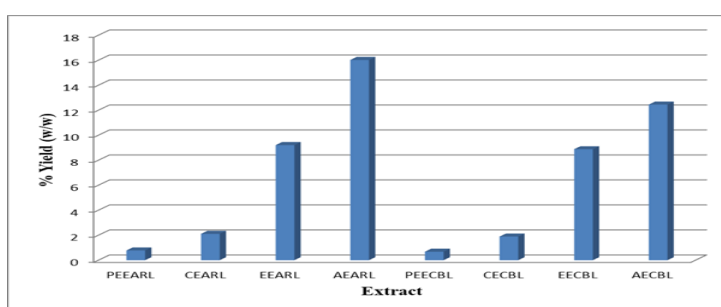
S/No.	Extract	Parameters			
		Nature of Extract	Color	pH	% Yield
1	PEEARL	Semi Solid	Creamish brown	6.98	0.78
2	CEARL	Semi solid	Brown	7.02	2.11
3	EEARL	Semi Solid	Light brown	7.1	9.21
4	AEARL	Solid Powder	Dark brown	7.03	16.02

Table 5.3: Estimation of % Yield of Various Extract of *Chlorophytum borivilianum* leaves

S/No.	Extract	Parameters			
		Nature of Extract	Color	pH	% Yield
1	PEECBL	Semi Solid	Green	7.01	0.68
2	CECBL	Semi Solid	Light green	7	1.89
3	EECBL	Semi solid	Brown	6.99	8.88
4	AECBL	Semi Solid	Blackish brown	7.02	12.45



Graph 2: pH of various extract of *Asparagus racemosus* and *Chlorophytum borivilianum* leaves



Graph 3: Percentage Yield of various extract of *Asparagus racemosus* and *Chlorophytum borivilianum* leaves

Preliminary phytochemical investigation of extracts

The various extract of ARL: *Asparagus racemosus* (Leaves) and CBL: *Chlorophytum borivilianum* (Leaves) obtained post-extraction were subjected to phytochemical experiments to determine the presence of existing phytochemical extracts. A standard procedure was adopted to conduct research.

The preliminary phytochemical screening revealed the presence of Carbohydrates, Alkaloids, Glycosides, Flavonoids, Tannins, Phenolic compounds, and Amino acid, Saponins, Steroids, Gums and Proteins.

The results for ARL are presented in table 5.4 and for CBL are presented in table 5.5.

Table 5.4: Preliminary Phytochemical Screening of *Asparagus racemosus* leaves

S/No.	Constituents	ARL			
		PEEARL	CEARL	EEARL	AEARL
1	Carbohydrates	+	+	-	+
2	Glycosides	-	-	+	+
3	Alkaloids	-	-	+	+
4	Protein & Amino acid	-	-	+	+
5	Tannins & Phenolic compounds	-	-	+	-

6	Flavonoids	-	+	+	+
7	Fixed oil and Fats	-	-	-	-
8	Steroids & Triterpenoids	+	+	+	+
9	Waxes	-	-	-	-
10	Mucilage & Gums	-	-	-	-
+ = Present; - = Absent					

Table 5.5: Preliminary Phytochemical Screening of Chlorophytum borivilianum leaves

S/No.	Constituents	CBL			
		PEECBL	CEPCBL	EECBL	AECBL
1	Carbohydrates	-	+	+	+
2	Glycosides	-	+	+	+
3	Alkaloids	+	+	+	+
4	Protein & Amino acid	-	-	+	+
5	Tannins & Phenolic compounds	+	+	+	+
6	Flavonoids	-	-	+	+
7	Fixed oil and Fats	-	-	-	-
8	Steroids & Triterpenoids	+	+	+	+
9	Waxes	-	-	-	-
10	Mucilage & Gums	-	-	-	-
+ = Present; - = Absent					

Characterization of extracts by TLC and HPTLC

The various extract of ARL: Asparagus racemosus (Leaves) and CBL: Chlorophytum borivilianum (Leaves) post-extraction were subjected to phytochemical experiments to determine the presence of various phytochemicals present in extracts. In ethanolic extract and aqueous extract the maximum phyto-constitunets were present in ARL and CBL. Therefore these two extracts of ARL: Asparagus racemosus (Leaves) and CBL: Chlorophytum borivilianum (Leaves) were subject to standard procedure for the characterization by TLC and HPTLC.

The TLC was performed for EEARL, AEARL, EECBL and AECBL. The findings were recorded in table 5.6 and table 5.7

Table 5.6: Development of TLC plates

S. No.	Solvent System	Inference
	Chloroform	Overlapping
	Ethyl acetate	Overlapping
	Methanol	Overlapping
	Ethyl acetate: hexane: methanol (9:90:1)	Overlapping
	Chloroform: benzene: methanol (20:2:1)	Tailing

	Ethyl acetate: hexane: chloroform (50:50:5)	Tailing
	Ethyl acetate: hexane: chloroform (50:60:3)	Poor
	Chloroform: Ethyl acetate: formic acid (2.5: 2: 0.5v/v)	Satisfactory
	Toluene: ethyl acetate (50:50)	Overlapping
0	Toluene: ethyl acetate: Glacial acetic acid: formic acid (20: 45: 20:5)	Overlapping
1	Toluene: ethyl acetate: formic acid (3: 2: 0.4v/v)	Satisfactory
2	Ethyl Acetate:methanol:water (7.5: 2: 4)	Best
Adsorbent: Silica gel, Detecting reagent: Ferric chloride solution and in UV at 254 nm		

Table 5.7: TLC profile of ethanolic and aqueous extract of ARL: *Asparagus racemosus* (Leaves) and CBL: *Chlorophytum borivilianum* (Leaves)

S./No.	Name	No. of spots (Visible)	No. of spots (At 254nm)	R _f values (in visible)
1	EAAARL	2	2	0.51, 0.68
2	AEARL	2	2	0.49, 0.70
3	EECBL	2	2	0.47, 0.72
4	AECBL	2	2	0.48, 0.71
Adsorbent: Silica gel G, Detecting reagent: Ferric chloride solution and in UV at 254 nm, Solvent System: Ethyl Acetate: methanol: water (7.5: 2: 4 v/v)				

EEARL, AEARL, EECBL and AECBL were subjected to HPTLC analysis by specific solvent systems i.e., EA: M: H₂O; 7.5: 2: 4 for respective extracts and detected under UV at 254 nm to identify the active phyto-constituents present in these extract. The results were presented in table 5.8. Figure 1 shows the number of reported peaks. HPTLC chromatograms were presented in Figure 2.

Table 5.8: HPTLC profile of the ethanolic and aqueous extracts of ARL and CBL at EA: M: H₂O (7.5: 2: 4) solvent system

Samples	R _f	Max Height	Max %	Area	Area %
EEARL	0.43	50.4	5.23	592.7	1.99
	0.11	102.6	10.65	1994.4	6.71
	0.68	28.8	2.99	389.4	1.31
AEARL	0.49	47.2	4.90	1625.4	5.47
	0.56	93.2	9.68	3170.0	10.66
	0.70	140.8	14.61	4151.7	13.97
	0.78	235.6	24.45	8067.7	27.1
	0.81	48.7	5.06	1454.7	4.89
	0.95	216.1	22.43	8278.3	27.85
EECBL	0.13	135.0	7.94	890.7	1.26

	0.21	183.9	10.82	6129.5	8.69
	0.29	37.6	2.21	382.6	0.54
	0.30	147.6	8.70	11804.5	16.73
	0.47	564.6	33.23	34856.8	49.41
	0.58	373.2	20.97	10930.1	15.40
	0.72	67.1	4.31	680.4	0.96
	0.84	104.17	6.20	2593.7	3.67
	0.91	83.7	4.93	2279.9	3.23
AECBL	0.19	618.4	50.21	48110.3	74.67
	0.41	78.8	6.53	1809.5	2.82
	0.48	68.9	5.71	2579.9	4.01
	0.69	66.1	5.48	2045.4	3.18
	0.71	67.8	5.61	1754.6	2.73
	0.75	61.1	5.06	2296.7	3.57
	0.84	62.9	5.21	2059.9	3.21

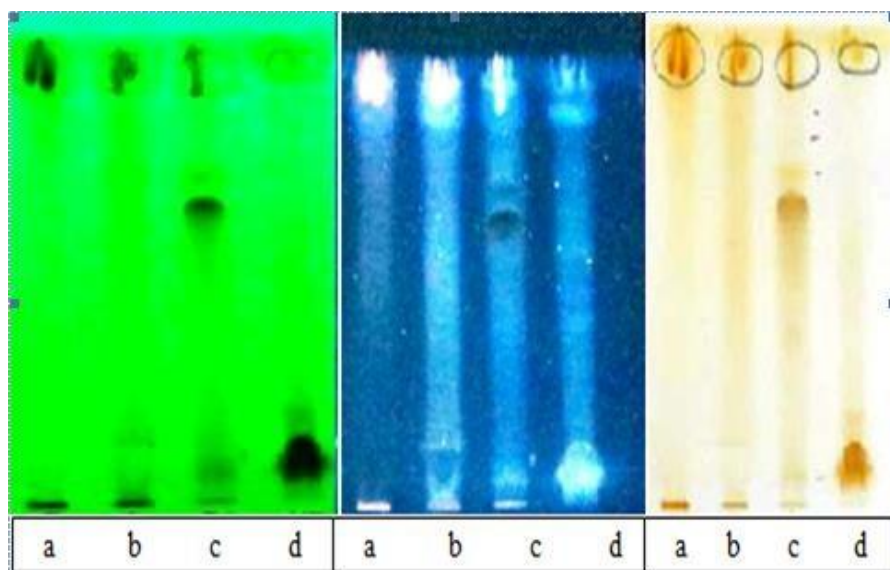


Figure 1: HPTLC fingerprint profile of ethanolic and aqueous extracts of ARL and CBL (EA: M: H₂O; 7.5: 2: 4) visualized under 254 nm UV M, 366 nm and after derivatization in iodine vapour

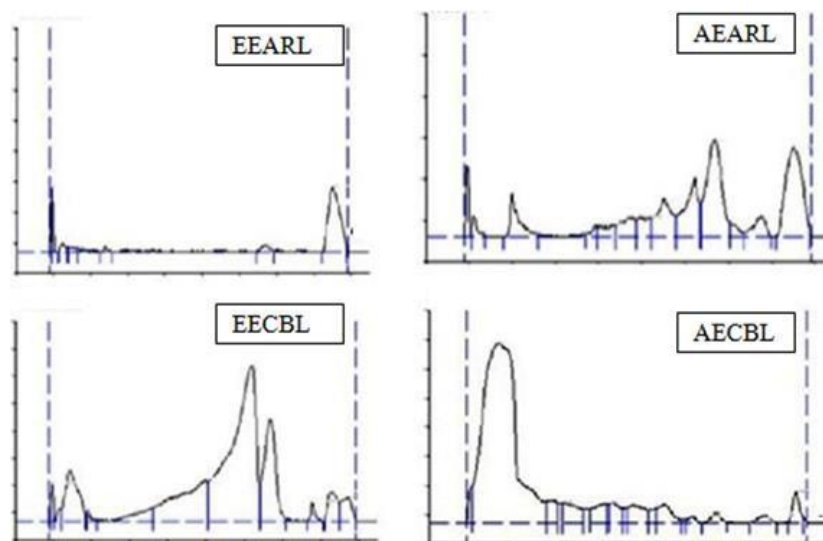


Figure 2: HPTLC chromatogram of ethanolic and aqueous extracts of ARL and CBL (EA: M: H₂O; 7.5: 2: 4) peak densitogram display

DISCUSSION

There are various chemical constituents in medicinal plants which enhances the properties of prevention and treatment from various diseases [76, 77]. These chemical constituents are secondary metabolites, present in one or many parts of the plants. These chemical constituents are secondary metabolites, present in one or many parts of the plants. These secondary metabolites may be categorized as glycosides, alkaloids, flavonoids, saponins, steroids etc. The knowledge is still incomplete and it should go more and more especially regarding biosynthetic pathway due to which these medicinal plants are highly valuable in today’s life [78, 79]. The developing countries, forest areas, rural places have traditional uses of these medicinal plants. Since, last few decades, there is a drastic elevation in exportation of medicinal plants, due to which all over the world, traditional health system is in high demand [80, 81, 82].

There are various medicinal plants are now in extinction due to over-exploitation. Since last few decades, medicinal plants are in high demand for its properties. The tribal communities use different types of plants for their treatments [82, 83, 84].

CONCLUSION

Asparagus racemosus and Chlorophytum borivilianum leaves were found to contain excessive amounts of steroids and triterpenoids, while Chlorophytum borivilianum leaves were found to contain excessive amounts of tannins and phenolic compounds. The results of this study also demonstrated that the percentage (%) yield of the aqueous extract of both plants—Asparagus racemosus and Chlorophytum borivilianum leaves—was higher than other prepared extracts.

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