INDO AMERICAN JOURNAL OF PHARMACEUTICAL RESEARCH

COMPARATIVE PHARMACOGNOSTICAL AND PHYSICO-CHEMICAL PROFILE OF ROOT OF *IXORA COCCINEA* LINN AND *IXORA ARBOREA* ROXB.

Riddhi D Kanakhara*, Dr. Harisha C. R., Dr. Shukla V. J.

Institute for Post Graduate Teaching and Research in Ayurved, Gujarat Ayurved University, Jamnagar, Gujarat, India.

ARTICLE INFO

Article history
Received 10/02/2017
Available online
28/02/2017

Keywords
Ayurveda,
Ixora Arborea,
Ixora Coccinea,
Pharmacognosy,
HPTLC.

ABSTRACT

Ixora arborea Roxb. and *Ixora coccinea* Linn are belonging to the same family Rubiaceae. Both the plants are medium sized perennial shrub from 6 to 8 feet in height; Large bunches terminal tricotomously cymes. *I. coccinea* with red colored flower whereas *I. arborea* white colored flowers. Root of both the plant used as astringent and antiseptic against scabies and other skin diseases. So, in the present study efforts are made in talking its pharmacognostical and physico-chemical aspects of both the species of *Ixora* and by using the above features, the plant can be easily identified and differentiated from each other. In *I.coccinea* cork with 5-6 layers, cortex 5-7 layers, where as *I.arborea* showed 2-3 layers of cork and 15-20 layers of cortex. Root powder showed similar characters i.e. Oil globules, Lignified fibers, tannin content, simple starch grains, pitted and border pitted vessels. Result obtained from physico-chemical study represented the similar pH value nearby 6.0 showed weak acidic in nature. Both the extractive value emphasized the presence of similar kind of hydrophilic and lipophilic chemical moiety in *Ixora coccinea* and *Ixora arborea* respectively. HPTLC shows similar Rf values of both the sample.

Corresponding author
Ms. Riddhi D Kanakhara
Ph.D. Scholar, Pharmacognosy Laboratory,
I.P.G.T. & R.A, Gujarat Ayurved University, Jamnagar, Gujarat, India.
kanakhararidhi@gmail.com

*Please cite this article in press as **Ms. Riddhi D Kanakhara** et al. Comparative Pharmacognostical and Physico-Chemical Profile of Root of Ixora Coccinea Linn and Ixora Arborea Roxb. Indo American Journal of Pharmaceutical Research.2017:7(02).*

INTRODUCTION

In India, drugs of herbal origin have been used in traditional systems of medicines such as *Unani* and *Ayurveda* since ancient times. The *Ayurveda* and *Unani* system of medicine uses about 700 species, *Siddha* 600, Amchi 600 and modern medicine around 30 species [1]. *Ixora coccinea* Linn and *Ixora arborea* Roxb. both are ornamental shrub or small tree cultivated in gardens. *Ixora coccinea* Linn is commonly known as "jungle of geranium" and "Red *Ixora*" have red scarlet flower whereas *Ixora arborea* Roxb. is known as "The torch tree" have white cluster of fragrant flowers [2, 3]. Root of *I. coccinea* used in loss of appetite, hiccup, diarrhoea and dysentery, and showed Stomachic, sedative; wound healing and anti-microbial activity. Fruits and roots of *I. arborea* are given to females when the urine is high colored [4, 5]. Hence the current study reveals the comparative Pharmacognostical and physico-chemical profile of the root of *Ixora coccinea* Linn and *Ixora arborea* Roxb.

MATERIALS AND METHODS

Collection and Authentication of Raw Drug

Ixora coccinea Linn. and *Ixora arborea* Roxb. were collected from natural habit which was free from pollution out skirts and botanical garden of Jamnagar in month of November-December 2014. Pharmacognostical identification and authentication was done in Pharmacognosy lab, IPGT & RA. Fresh samples were used for various Pharmacognostical evaluations. Herbarium sheet of the plant and sample specimen was deposited in Pharmacognosy lab, I.P.G.T. & R.A., Jamnagar for further reference. Root was separated dried in shed, powdered at 80 # for further powder microscopy and analytical studies.

Macroscopic Study

The collected samples were identified and authentified by studying their characters systematically as per the methods described in the textbooks of pharmacogosy [5, 6].

Organoleptic characters of the powder

Organoleptic characters i.e. color, odour, taste, size, shape and feel of drug to touch by sensory observations were noted done [5].

Microscopic Study

Fresh samples were taken for detailed microscopic study. Free hand sections were taken, cleared with chloral hydrate and then, the sections were stained with phloroglucinol and hydrochloric acid and observed for lignified elements like fibers, vessel etc. Microphotographs were taken by using Carl Zeiss Trinocular microscope attached with camera. Same procedure was followed for detailed powder microscopy [5, 6].

Histochemical evaluation

Thick sections of sample were subjected to histochemical tests to find starch, tannin, calcium etc. chemical constitute by treating various reagents and method were followed as per standard protocol [6].

Physico-chemical Evaluation

Physico-chemical Parameters like loss on drying, total ash, alcohol soluble extractive (90% methanol), water soluble extractive and pH values were determined as per the API guidelines for the powder sample [7, 8].

Preliminary Phytochemical Screening

Phytochemical analysis of methanol and water soluble extract of sample drugs was carried out for steroids, glycosides, tannins, proteins, flavonoids, alkaloids and saponins according to standard procedure.High performance thin layer chromatography was carried out for spectral comparison of both the samples [8, 9].

RESULTS AND DISCUSSION

Macroscopic Study

Both the plants were shrubs with simple opposite leaves with interpetiolar stipule. Inflorescences cymose clusters *I. coccinea* with red coloured flower whereas *I. arborea* with white coloured flowers. Fruits are simple Berry.

Microscopic Study

Transverse section of *Ixora coccinea* root

Diagrammatic T.S. of root was circular to irregular in outline. Outer cork is followed by cortex, endodermis, pericycle & vascular bundles. While, Detailed T.S. showed the outer most 5-6 layers are composed of barrel Shaped lignified cork cells filled with brown content and oil globules. (Plate no. I)

Cortex region is found to be reduced, loosely arranged & made up of 5-7 layers of simple parenchyma cells which are sacredly isolated with simple starch grains, oil globules and tannin content. Some of the isolated pericyclic fibres pockets were observed in the cortical region. Cortex ends with single layered of parenchymal endodermis. Vascular bundles are open and collateral type, radially arranged. Xylem consists of xylem parenchyma and fibres and xylem vessels were filled with tannin content. Xylem bundles were separated by medullary rays. Phloem is situated above the xylem with sieve elements and fibres. Medullary rays uni to bi-serrate and started from central region and extended up to inner layers of the pericyclic region loaded with simple and compound starch grains. (Plate no. I)

Transverse section of *Ixora arborea* root

Diagrammatic T.S. of root was circular in outline. Outer cork is followed by cortex, pericycle, endodermis & vascular bundles. Detailed T.S. shows the outer most 2-3 layers are composed of tangentially elongated lignified cork cells, some of the cells filled with brown content and oil globules. (Plate no. II)

Most part of the T.S. is occupied by the Cortex. Cortex is made up of 15-20 layers of loosely arranged simple parenchymatous cellswhich are loaded with simple and compound starch grains and oil globules.Isolated pericyclic fibres were discontinuously present in the corticle region and Some of these cells consists prismatic crystals of calcium oxalate. Cortex ends with single layered of parenchymatous endodermis. Vascular bundles are open and collateral type, radially arranged. Xylem consists of xylem parenchyma and fibres. xylem vessels were filled with oil globules. Xylem bundles were separated by medullary rays. Phloem is situated above the xylem with sieve elements and fibres. Medullary rays uni-serrate to bi-serrate and started from central region and extended up to inner layers of the cortex region filled with simple and compound starch grains and oil globules. (Plate no. II)

Comparative study on Powder microscopy

Regarding comparative similar and dissimilar organoleptic characters and powder microscopic characters like cork cells, starch grains, pitted vessels etc were commonly found in both the plants. (Table no.1&2) (Plate no. III & IV)

Table 1: Organoleptic Characters of Root powder

Characters	***I. coccinea***	***I. arborea***
Colour	Creamish yellow	Creamish brown
Odour	Oily fragrance	Oily fragrance
Taste	Astringent	Oily
Nature of powder	Coarse	Coarse

Table 2: Comparative Powder Microscopy of Root powder.

S. No.	**Characters**	***I. coccinea***	***I. arborea***
1	Fragments of lignified cork cells in surface view	+	+
2	Simple Starch grains	+	+
3	Compound Starch grains	–	+
4	Tannin content	+	+
5	Acicular crystals of Calcium oxalate	+	–
6	Prismatic crystals of Calcium oxalate	–	+
7	Pitted and Border Pitted vessels	+	+
8	Lignified fibres passing through medullary rays	+	+
9	Oil globules	+	+

Plate No. I - *Ixora coccinea*

Fig. (I.A.) Morphological measurement of *I.coccinea* Root

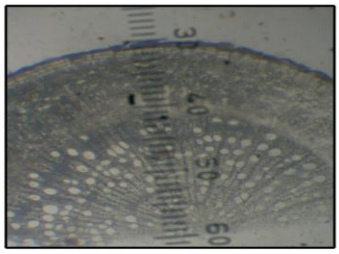


Fig. (I.B.) T.S. showed Cork, Cortex, Vascular Bundle and Pith

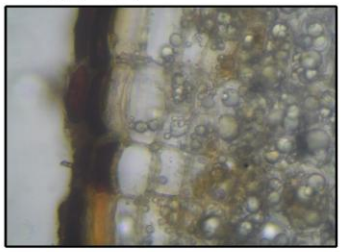


Fig. (I.C.) T. S. showed Cork, Cortex with oil globules and Starch grains

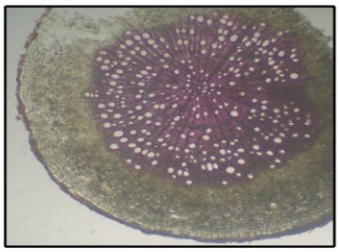
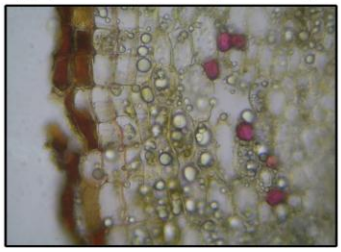


Fig.(I.D.) T.S. showed Lignified Stellar region



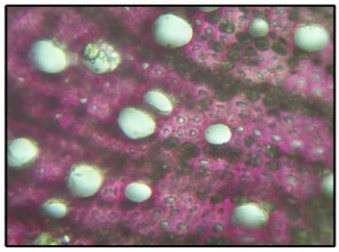


Plate No. II - *Ixora arborea*

Fig. (II.A.) Morphological measurement of *I. arborea* Root

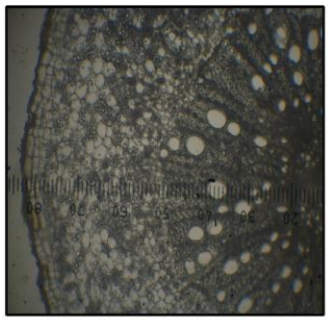


Fig. (II.B.) T.S. showed Cork, Cortex, Vascular Bundle and Central pith

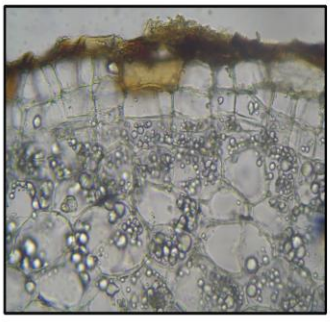


Fig. (II.C.) T.S. showed Cork, Cortex with oil globules and Starch grains

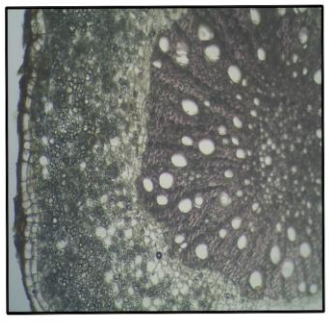


Fig. (II.D.) Cork, Cortex and Lignified stellar region

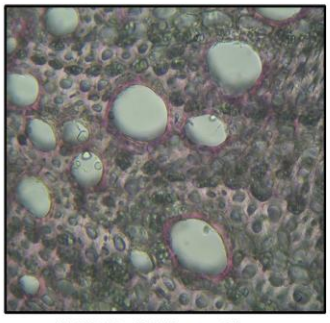


Fig. (II.E.) T.S. with Uni-biserrate medullary rays

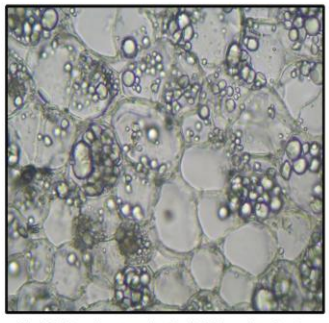


Fig. (II.F.) Parenchymatous cells with oil globules and starch grains

Plate No. III - *Ixora coccinea* root powder

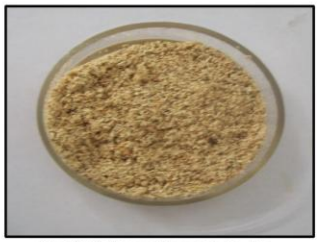


Fig. (III.A.) *I. coccinea* root powder

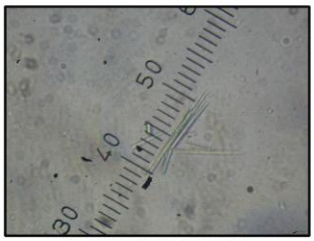


Fig. (III.B.) Acicular crystal

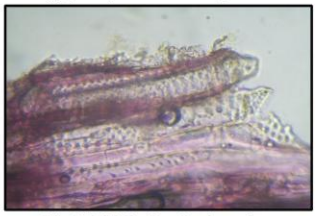


Fig. (III.C.) Border pitted vessels

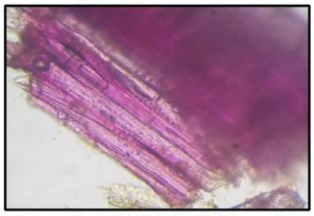


Fig. (III.D.) Lignified fibres

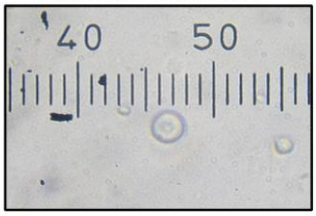


Fig. (III.E.) Starch grain

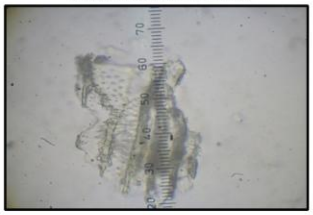


Fig. (III.F.) Pitted vessel

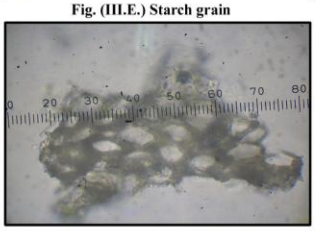


Fig. (III.G.) Cork in surface view

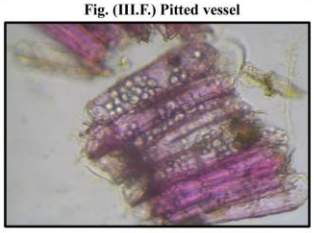


Fig. (III.H.) Sclereids with starch grains

Plate No. IV - *Ixora arborea* root powder

Fig. (IV.A.) *I. arborea* root powder

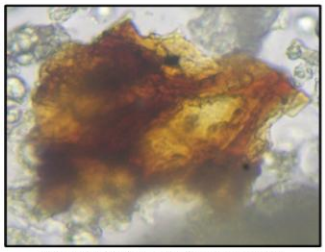


Fig. (IV.B.) Cork with tannin content

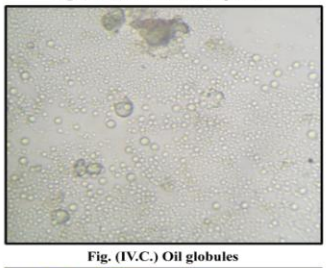


Fig. (IV.C.) Oil globules

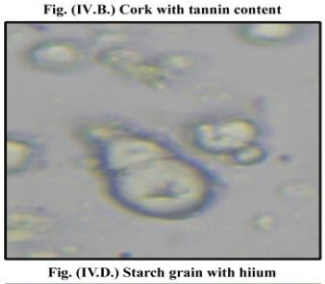


Fig. (IV.D.) Starch grain with hiium

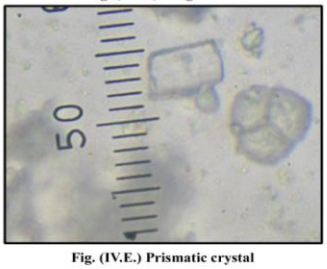


Fig. (IV.E.) Prismatic crystal

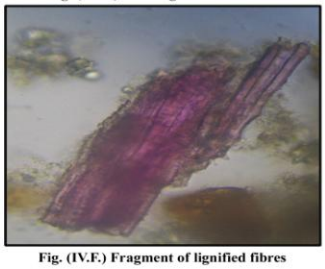


Fig. (IV.F.) Fragment of lignified fibres

Comparative Histochemical Evaluation

Histochemical tests showed lignified cells, starch, tannin, CaO – crystals, oil globules in both the samples by treating various reagents. (Table no. 3)

Table 3: Comparative Histochemical evaluation of Root powder.

S. No.	Reagent	Observation	Characteristics	Result	
				I.coccinea	*I.arborea*
1	Phloroglucinol + Conc. HCl	Red	Lignified cells	++	++
2	Iodine	Blue	Starch grains	++	++
3	Phloroglucinol + Conc. HCl	Dissolved	Calcium oxalate crystals	++	++
4	$FeCl_3$ solution	Dark blue	Tannin	++	++
5	Sudan III	Red	Oil globule	++	++

Comparative Physico-chemical parameters

Physico-chemical parameters like LOD showed 10.32% w/w in *I.coccinea* and 8.84% w/w in *I. arborea*, Ash value showed 12.16% w/w in *I.coccinea* and 5.04% w/w in *I.arborea*, Water soluble extractive (%w/w) showed 11.0%w/w in *I.coccinea* and 14.07% in *I. arborea*, Alcohol soluble extractive (%w/w) showed 27.50%w/w in *I.coccinea* and 16.47%w/w in *I. arborea*, pH value is 6 in both the sample. (Table no. 4)

Table 4: Comparative Physico-chemical parameters of Root powder.

S. No.	Name of the test	*I. coccinea*	*I. arborea*
1	Loss on drying (% w/w)	10.32	8.84
2	Ash value (% w/w)	12.16	5.04
3	Water soluble extractive (% w/w)	11.0	14.07
4	Alcohol soluble extractive (% w/w)	27.50	16.47
5	pH	6.0	6.0

Preliminary Phytochemical Screening

Phytochemical screening of methanol and water soluble extract of sample drugs showed carbohydrate, steroids, glycosides and saponins in both the plants powder. (Table no. 5)

Table 5: Preliminary Phytochemical Screening of Root powder.

S. No.	Name of the test	*I. coccinea*	*I. arborea*
1	Carbohydrates	++	++
2	Starch	++	++
3	Mucilage	–	–
4	Protein	–	–
5	Amino acid	–	–
6	Steroid	–	–
7	Saponin glycoside	++	++
8	Flavonoid	–	++
9	Tannin	++	++
10	Alkaloid	++	–

CHROMATOGRAPHIC ANALYSIS (HPTLC)

Chromatographic techniques were carried out as per the standard protocol. Solvent system which were designed for TLC i.e. Toluene: Ethyl acetate: Acetic acid (7: 2: 0.5) was used for HPTLC studies. The results are shown in the (Table no. 6) (Plate no. V).

Table 6: HPTLC Profiles of Methanolic extracts at 254 nm and 366 nm.

Sample	254 nm		366 nm	
	No. of spots	Rf value	No. of spots	Rf value
Track-1	9	0.06, 0.17, 0.33, 0.55, 0.62, 0.66, 0.81, 0.94, 0.98	5	0.06, 0.42, 0.55, 0.66, 0.96
Track-2	8	0.08, 0.31, 0.44, 0.53, 0.66, 0.81, 0.88, 0.98	7	0.08, 0.26, 0.31, 0.52, 0.66, 0.78, 0.86

- Track- 1: Root of *Ixora arborea* (1 mg/ml)
- Track- 2: Root of *Ixora coccinea* (1 mg/ml)

Plate No. V - HPTLC Profile

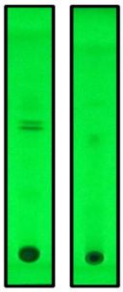


Fig. (V.A.) HPTLC plate at 254 nm

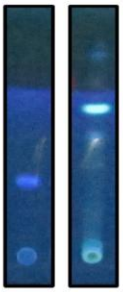


Fig. (V.B.) HPTLC plate at 366 nm

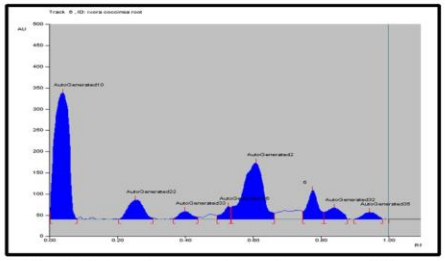


Fig. (V.C.) Densitogram of *I.coccinea* root at 254 nm

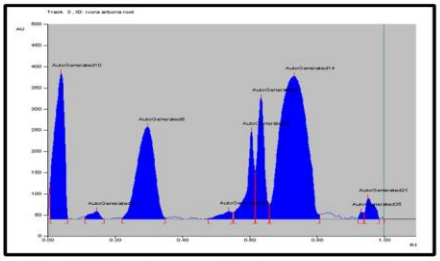


Fig. (V.D.) Densitogram of *I.arborea* root at 254 nm

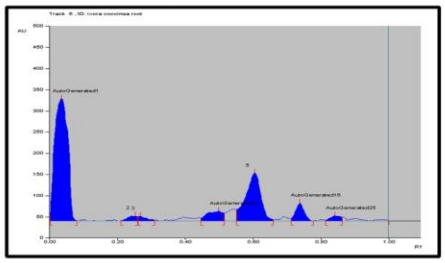


Fig. (V.E.) Densitogram of *I.coccinea* root at 366 nm

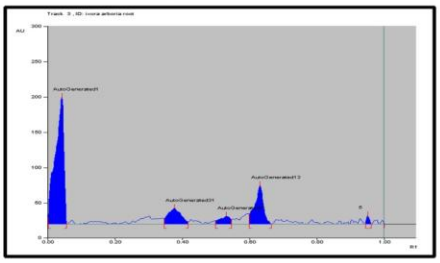


Fig. (V.F.) Densitogram of *I.arborea* root at 366 nm

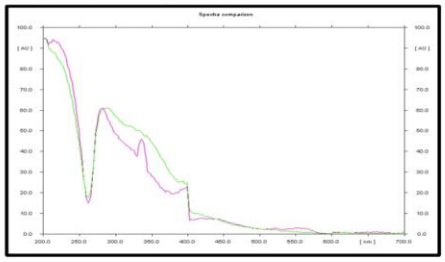


Fig. (V.G.) 3D graph of 0.51 Rf

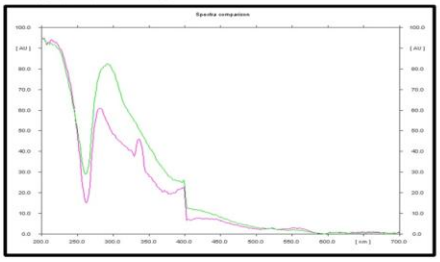


Fig. (V.H.) 3D graph of 0.53 Rf

DISCUSSION

Discussion is a process of re-examining ones views and forms a base for the conclusion. Hence, discussion is a very much crucial part of any scientific research. Taxonomically both the plants belong to the same family Rubiaceae, available all over India. Both the plants were shrubs or small tree, Inflorescences cymose clusters *I. coccinea* with red coloured flower whereas *I. arborea* with white coloured flowers. Transverse section of the Root in both of the species showed presence of oil globules. Medullary rays and pericyclic fiber were similar in structure. Results obtained from organoleptic study emphasized 90% similar in both the species. Root powder of both the species showed similar characters i.e Oil globules, Lignified fibres etc. except compound starch grain and Prismatic crystals of calcium oxalate present in *I.arborea* whereas absent in *I.coccinea.* Both the species showed similar results on subjected to histochemical tests liked lignified cork cell, starch grains, tannin contain etc.

Result obtained from physico-chemical study represented the similar pH value nearby 6.0 showed weak acidic in nature. L.O.D study revealed both the species contained more or less same amount of moisture contain, variation may be due to the environmental factors. Ash value study revealed both of the species contained more or less same amount of inorganic maters, the variation might be due to the influence of inorganic matrix. The water soluble chemical moieties contribute to the variation in Water soluble extractive value. Alcohol soluble extractive value varies may be due to the different alcohol soluble chemical moieties. Preliminary phytochemical screening showed that carbohydrate, alkaloids, starch, saponin and tannin etc. are present in both plants, Whereas mucilage, amino acids, protein are absent in both plants, except flavanoid present in *I.arborea* absent in *I.coccinea*, alkaloid present in *I.coccinea* and absent in *I.arborea* . HPTLC result showed that 3 common spots of Root at 254nm, and 1 common spot at 366nm. The spectral comparison of root shows 3 similar R_f values i.e. 0.66, 0.81, 0.98. This may show most common chemical moiety present in both the plants.

CONCLUSION

There is no scientific record on comparative pharmacognostical and physico-chemical work on root of *Ixora coccinea* Linn and *Ixora arborea* Roxb. So, the present work is undertaken to generate some pharmacognostical and analytical information in esteem of their identification, chemical constituents & physico-chemical characters which may be useful for standardization of herbal drugs. This result revealed 90% similarity between this two species and these data will be useful for further research work.

ABBREVIATIONS

L.O.D – Loss On Drying
HPTLC – High Performance Thin Layer Chromatography
T.S. – Transverse Section
TLC – Thin Layer Chromatography

ACKNOWLEDGEMENTS

The authors are thankful to the authorities of IPGT & RA and Gujarat Ayurveda University for providing facilities to carry out the research work.

CONFLICT OF INTERESTS

The author (s) confirm that this article content has no conflict of interest.

REFERENCES

1. Joy PP, Thomas J., Samuel Mathew, Baby P. Skaria.1998. Medicinal plants. Kerala agricultural university, Odakkali, Asamannoor, Ernakulam District, Kerala, India: Aromatic and Medicinal Plants Research Station.
2. Dontha *et al*. Phytochemical and Pharmacological Profile of *Ixora*: A Review. Int Jour Phar Sci Res, 2015; 6(2): 567-584.
3. Shah GL. Flora of Gujarat State, Part-1. Vallabh vidyanagar, Sardar Patel University,353-354.
4. Patel RI. Forest flora of Gujarat state. 1984, Baroda: Forest department Gujarat state: 182-183.
5. Trease and Evans. 1996, Pharmacognosy. London: W.B. Sunders Company Ltd. 16th ed. 569-570.
6. Wallis TE. 2002. Text book of Pharmacognosy, 5th Ed. New Delhi, India: CBS Publishers & Distributors 123- 132, 210-215.
7. Ravishankar S. 2001. Textbook of Pharmaceutical Analysis. Ootacamund: Rx Publication.
8. Anonymous. The Ayurvedic Pharmacopoeia of India, Part 5th, VoI.1. 1st ed. 2001. New Delhi: Government of India:111-143.
9. Baxi AJ, Shukla VJ, Bhat UB, 2001. Methods of qualitative testing of some Ayurvedic formulations. Gujarat Ayurvedic University, Jamnagar, India: 5-12.

5487847845**1170205**