ISSN No. 2394 - 7837

ARTICLE

Morphological Characterisation and Chemical Analysis of Ten Cultivars of *Ixora Coccinea* Linn.

Asha, R. Nair and Sumitha, V.R.[1]

Received 18/10/2014 Accepted 28/11/2014

Abstract

Ixoras are popular ornamental bushy shrub having medicinal properties, curing a number of diseases like dysentery, dysmenorrheal, leucorrhoea, haemoptysis, catarrhal bronchitis, opthalmopathy, sores and ulcers. Since a number of cultivars are available in the species, it is important to analyse the similarity or variability among the accessions. Diversity among accessions of a plant can be analysed using various marker techniques. Characterization of ten cultivars of *I. coccinea* carried out using morphological markers showed less variability among cultivars. Stomatal variability, chlorophyll analysis, fluorescence analysis of the extracts in various solvents and powder analysis has also been carried out in the ten cultivars. The study provides all the relevant information regarding the morphological characterisation and chemical analysis of 10 cultivars of *I.coccinea* linn.

Keywords: *Ixora coccinea*, quantitative characters, qualitative characters, stomata, pharmacognostic analysis, chlorophyll

Introduction

Ornamental plants are those which are showy and attractive, grown for display purposes, and the term largely corresponds to 'garden plants'.The Rubiaceae family is important in horticulture and genera, such as *Gardenia, Ixora, Pentas, Mussaenda* and *Sherardia*, are well known ornamentals (Robbrecht, 1996). It is the fourth largest family of flowering plants after the Asteraceae, Orchidaceae and Leguminosae including about 650 genera and 13,000 species. Among the family Rubiaceae the genus *Ixora* consists of about 400 species (Willis, 1966), of which 28 are cultivated (Huxley, 1992). *Ixora coccinea* Linn., (Rubiaceae) known as 'Jungle of Geranium or 'vetchi' in Ayurveda is a species of flowering plant. Measurement and characterization of genetic diversity had always been a primary concern in population and evolutionary genetic studies (Cheema et al., 2010). Morphological characterization is a conventional technique used for evaluating diversity among plant populations (Bayorbor et al., 2010). Morphological characters constitute basic information for plant systematic and are used to identify the similarities as well as dissimilarities between the species. Morphological characterization is done by classifying the morphological characters in to qualitative and quantitative characters. Eventhough the plant *I. coccinea* is rich in bio-active richness active constituents and potential therapeutic activities there is a lacuna in the pharmacognostical standardization on the leaves. The present study highlights the pharmacological analysis of *I. coc*cinea. This basic study helps in the botanical identification and sta dardization of the drug in the crude form and also to distinguish the drug from its adulterants. Thus the study provides all the relevant information regarding the morphological characterisation and chemical analysis of 10 cultivars of *I.coccinea* linn.

[1]Department of Botany, Mahatma Gandhi College, Thiruvananthapuram, Kerala, India
[1]Corresponding Author: email: Sumithapradeep@Gmail.Com

Materials and Methods

Morphological Characterisation

Ten cultivars of *Ixora coccinea* plants (table 1) were selected for the study based on their flower colour. Morphological analysis was carried out using 87 morphological characters which included 52 qualitative and 31 quantitative characters (table 2 and 3), selected according to the plant characteristics (Verdcourt, 1989). For each character 10 samples were analysed from each variety. The qualitative foliar characters were studied as per the classification of Hickey (1973) and the lamina colour was determined from Colour Chart by Wilson (1938; 1941). The data were recorded and tabulated for further analysis. The data obtained from quantitative characters alone were subjected to statistical analysis. The quantitative morphological characters collected from all the ten cultivars were pooled together, standardized and subjected to Hierarchical Cluster Analysis using the Average Linkage Study using SPSS (SPSS, 2010). A Proximity Matrix was prepared by calculating the Squared Euclidean Distances between pairs of plants and a Dendrogram was constructed illustrating the closeness of the relationship between the plants studied.

Analysis of Chlorophyll Content

About 2 gm of fresh leaves from each 10 cultivars of *I.coccinea* plants were selected for chlorophyll analysis. The fresh leaves were treated with 20% acetone and crushed using a motar and pestle, was sieved and centrifuged. The supernatant was selected, and about 1 ml was transferred in to test tube and 1ml of 20 % acetone was added to this. The optical density of the sample was taken at wave lengths 645 nm and 663 nm using a spectrophotometer.

Table 1. Cultivars of *Ixora coccinea* with code.

Sl. no.	Cultivar name	Cultivar Code
1	Light orange and red mix	LOR
2	Dark red colour	DRC
3	Magenta colour	MC
4	Yellow colour	YC
5	Orange colour	OC
6	Rose colour	RSC
7	Red colour	RC
8	Dark red small – colour	DRSC
9	Light red colour - hybrid	LRCH
10	Pink colour - hybrid	PCH

Analysis of Chlorophyll Content

About 2 gm of fresh leaves from each 10 cultivars of *I.coccinea* plants were selected for chlorophyll analysis. The fresh leaves were treated with 20% acetone and crushed using a motar and pestle, was sieved and centrifuged. The supernatant was selected, and about 1 ml was transferred in to test tube and 1ml of 20 % acetone was added to this. The optical density of the sample was taken at wave lengths 645 nm and 663 nm using a spectrophotometer.

Pharmacogonostic Study on Leaf Powder and Extracts in Daylight and UV Light

For the pharmacogonostic analysis, fluorescence test of dried leaf powder was done. The leaves of I.coccinea were dried for 2 weeks under shade and crushed in to. The drug leaf powder was treated with various chemicals and was observed under both day light and uv light. The chemicals

Table 2. List of qualitative characters selected for morphological characterisation

Sl. no.	Characters selected	Charc. code	Sl. no.	Characters selected	Charc. code
1	Stem surface	Sts	27	Calyx longevity	Cl
2	Stem nature	Stn	28	Calyx colour	Cc
3	Shape of stem	Ss	29	Aestivation - calyx	Asc
4	Colour of stem	Cs	30	Corolla shape	Csh
5	Presence of stipule	Pst	31	Corolla dorsal surface	Cds
6	Type of stipule	Tst	32	Corollaventral surface	Cvs
7	Shape of stipule	Sst	33	Corolla fusion	Cfu
8	Nature of petiole	Npt	34	Aestivation – corolla	Asco
9	Petiole surface	Pts	35	Corolla lobes free/not	Clf/n
10	Leaf colour	Lc	36	Uniformity in stamen length	Ustl
11	Leaf Shape	Ls	37	Arrangement of stamens	Ast
12	Leaf texture	Lt	38	Extrose/introrse	Ex/Ix
13	Leaf surface	Lsf	39	Inserted/Exerted	Is/Es
14	Leaf margin	Lfm	40	Anther colour	Ac
15	Equality of leaf base	Elb	41	Anther shape	As
16	Leaf origin	Lo	42	Dorsifixed/Basifixed	Ds/Bs
17	Phyllotaxy	Phl	43	Filament colour	Fc
18	Simple/ Compound leaves	S/Cl	44	Filament nature	Fn
19	Venation	Ve	45	Stigma type	Stm
20	Inflorescence type	If	46	Stigma free/not	Stf/N
21	Flower	Flw	47	Position of ovary	Pov
22	Peduncle surface	Pdns	48	Fruit Shape	Fs
23	Pedicel surface	Peds	49	Fruit colour	Frc
24	Shape of bract	Shb	50	Fruit Surface	Frs
25	Shape of calyx	Shc	51	Seed Shape	Ses
26	Calyx surface	Cs	52	Seed Colour	Sec

Table 3. List of quantitative characters selected for morphological characterisation of 10 cultivars of *Ixora coccinea* Linn.

Sl. no.	Characters selected	Character code	Sl. no.	Characters selected	Character code
1	Internode length	IL	16	Calyx length	Cal
2	Petiole length	PL	17	No of calyx lobes	Ncalo
3	Leaf length	LL	18	Length of calyx lobes	Lcalo
4	Leaf breadth	LB	19	Length of corolla	Lcor
5	Leaf area	LA	20	No of corolla lobes	Ncorl
6	Leaf perimeter	LP	21	Length of corolla lobes	Lcorl
7	No of secondary veins	NSV	22	Breadth of corolla lobes	Bcorl
8	Lateral vein pair number	SVP	23	Length of corolla tube	Lcort
9	No of stipules	NST	24	No of stamens	Nsta
10	Length of stipules	LST	25	Length of anther	Lant
11	No of flowers/peduncle	Nfpdn	26	Length of filament	Lfil
12	Length of peduncle	LPdn	27	Height of ovary	Hova
13	No of bracts	Nbr	28	Length of style	Lsty
14	Length of bracts	Lbr	29	No of stigma	Nsti
15	Pedicel length	PeL	30	No of ovule	Novu
			31	No of ovary	Nova

About 2 needed for the analysis of drug leaf powder include hydrocholoric acid, sulphuric acid, nitric acid, 1N sodium hydroxide, alcoholic sodium hydroxide, 1N potassium hydroxide, alcoholic potassium hydroxide, and ammonia. Fluorescence analysis of various extracts of leaf powder was also done using petroleum ether, choloroform, ethyl acetate, and methanol and colour change of leaf extracts were observed under both day light and uv light.

Results

Morphological Characterisation

Since the qualitative characters of all the 10 cultivars of *I.cocinea* were same except for some few characters such as leaf tip, leaf shape, corolla colour, statistical analysis was done for the qualitative characters alone. The quantitative morphological data collected from the 10 cultivars of I. coccinea were standardised and subjected to average linkage study. The proximity matrix was prepared by using the subsequent squared Euclidean Distance between pairs of plants (table 4.). In the present study a mean of 31 quantitative characters were considered to prepare the similarity matrix and subsequent dendrogram of the 10 cultivars. The morphological analysis based on the dendrogram and subsequent distance matrix revealed greater similarity among the cultivars.

The dendrogram was divided in to two clusters, cluster 1 and cluster 2, based on the similarities the cultivars shared. The 2 clusters were again divided in to subclusters. The data obtained revealed maximum similarity between cultivars MC and DRSC with a similarity value of 1.00(100 %). Subsequent similarity value of 99% was shown between MC and LOR cultivars and between DRSC and LOR cultivar. 98% similarity was shown between DRSC and YC cultivars followed by a value of 0.97. The LRCH and RC cultivars shows 94% of similarity in cluster analysis. 92 % of similarity is shown between DRC and OC cultivars. The least similarity value of 0.81 is between YC and RSC. In qualitative morphological analysis also they showed wide differences.

Agglomeration Schedule (table 5.) showed cultivars MC and DRSC showing closest pair with co-efficient 0.998, followed by LOR and MC with a co efficient value of 0.994. This is an accordance with the values obtained in proximity matrix and the subsequent dendrogram. The next closest value was obtained between DRC and RSC with a co efficient of 0.992. Least co efficient value of 0.661 was observed between the cultivars LOR and DRC. This goes well with the dendrogram data where two cultivars are placed distantly with a maximum rescaled distance of 25, and these two are placed in 2 different cluster.

Chlorophyll Study in Ten Cultivars of I. Coccinea Linn.

Chlorophyll analysis in 10 cultivars of *I.coccinea* indicate a wide range of varaition in optical density at 645 nm and 663 nm (table 6). Fig 2. shows graphical representation of optical density of chlorophyll in 10 cultivars of *I.coccinea*. The DRC have the highest wavelength at 645nm and it is 1.000 while it has the second largest wavelength at 663nm and it is 0.851.

Pharmacogonosical Analysis in Ten Cultivars of I. Coccinea Linn.

All the 10 cultivars of *I. coccinea* show a colour change in both day and uv light. This colour change indicates the prescence of specific compounds in leaf extracts and drug powder of leaves of *I.coccinea*.The flourescence colour is specific for each compound (table 7-26).

Table 4. Proximity matrix of 10 cultivars of *I. coccinea*

	LOR	DRC	MC	YC	OC	RSC	RC	DRSC	LRCH	PCH
LOR	1.00	0.71	0.99	0.96	0.91	0.73	0.79	0.99	0.79	0.79
DRC		1.00	0.72	0.79	0.92	0.99	0.35	0.71	0.25	0.18
MC			1.00	0.98	0.90	0.74	0.83	1.00	0.82	0.81
YC				1.00	0.91	0.81	0.83	0.98	0.78	0.73
OC					1.00	0.92	0.55	0.90	0.51	0.49
RSC						1.00	0.40	0.73	0.29	0.22
RC							1.00	0.83	0.94	0.90
DRSC								1.00	0.82	0.81
LRCH									1.00	0.97
PCH										1.00

Table 5. Agglomeration schedule similarity among 10 cultivars of *I. coccinea* Linn.

Stage	Cluster Combined		Coefficients	Stage Cluster First Appears		Next Stage
	Cluster 1	Cluster 2		Cluster 1	Cluster 2	
1	3	8	0.998	0	0	2
2	1	3	0.994	0	1	4
3	2	6	0.992	0	0	6
4	1	4	0.974	2	0	8
5	9	10	0.971	0	0	7
6	2	5	0.922	3	0	9
7	7	9	0.921	0	5	8
8	1	7	0.803	4	7	9
9	1	2	0.611	8	6	0

Table 6. Chlorophyll analysis in 10 cultivars of *Ixora coccinea* Linn.

Sl. no.	Cultivar name	Optical density (645nm)	Optical density (663nm)
1	LOR	0.594	0.405
2	DRC	0.958	0.851
3	MC	0.12	0.09
4	YC	0.045	0.021
5	OC	0.996	1.056
6	RSC	0.562	0.545
7	RC	0.393	0.189
8	DRSC	0.032	0.025
9	LRCH	0.415	0.405

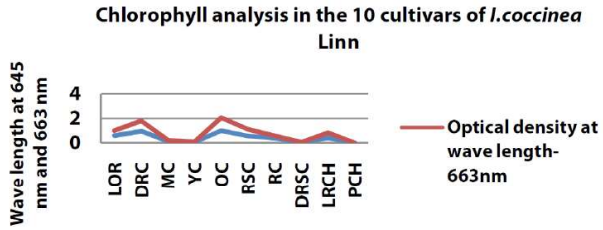

Figure 1. Graphical representation of optical density of chlorophyll in 10 cultivars of *I. coccinea*

Discussion

I. coccinea are woody in nature with smooth, round shaped, greenish to brown colour stem. The spiny pointed conical interpetiolar stipule is another important feature (De Block, 1998). Morphological characterisation of 10 cultivars of *Ixora coccinea* has been carried out using 52 qualitative and 31 quantitative characters. Morphological markers are a classical method to distinguish variation based on the observation of the external morphological differences such as the size and shape of the leaf and of the plant form, the length of the internodes, floral characters, characteristics of the fruit and seeds. They are used to evaluate distinctness, uniformity and stability and also to establish the description of genotype (Peterson et al., 1994). The qualitative characterisation of almost all the cultivars was same and hence was not subjected to statistical analysis. Slight variations were observed among cultivars with respect to such as such as leaf apex, leaf base, style colour, stigma colour. The colour of the corolla was the major difference. This results obtained from the present study was similar to that of Robbrecht, 2009 and Varier et al.,2012.

In the present study a mean of 31 qualitative characters were considered to prepare the similarity matrix and phylogenetic tree of the 10 cultivars of *I. coccinea*. In the proximity matrix maximum value generated showed very close relation among the cultivars. Cluster analysis decreases the number of individual variable units by classifying such variation into groups which are translated into a dendrogram using the coefficient of similarity (Sneath and Sokal, 1973; Tatineni et al., 1996). In the present study the dendrogram obtained is divided in to two clusters based on the similarities the cultivars shared. The 2 clusters again divided in to

Table 7. Fluorescence Analysis of Various Extracts of Leaves of 10 cultivars of *I. coccinea*

Plants	Extracts	Day light	UV light (366nm)
LOR	Petroleum ether	Light green	Green
	Choloroform	Light green	Light green
	Ethyl acetate	Light green	Red
	Methanol	Light green	Reddish green
DRC	Petroleum ether	Light green	Green & red
	Choloroform	Light green	Dark green
	Ethyl acetate	Light green	Dark green
	Methanol	Light green	Dark green
MC	Petroleum ether	Light green	Dark green
	Choloroform	Light green	Dark green
	Ethyl acetate	Light green	Dark green
	Methanol	Light green	Dark green
YC	Petroleum ether	Light green	Green
	Choloroform	Green	Green
	Ethyl acetate	Green	Dark green
	Methanol	Light green	Dark green
OC	Petroleum ether	Yellowish green	Dark green
	Choloroform	Light green	Dark green
	Ethyl acetate	Light green	Dark green
	Methanol	Yellowish green	Dark green
RSC	Petroleum ether	Green	Green
	Choloroform	Green	Green
	Ethyl acetate	Light green	Green
	Methanol	Green	Green
RC	Petroleum ether	Light green	Dark green
	Choloroform	Dark green	Dark green
	Ethyl acetate	Dark green	Dark green
	Methanol	Light green	Dark green
DRSC	Petroleum ether	Light green	Light green
	Choloroform	Light green	Dark green
	Ethyl acetate	Dark green	Dark green
	Methanol	Light green	Light brown
LRCH	Petroleum ether	Light green	Green
	Choloroform	Light green	Green
	Ethyl acetate	Light green	Light brown
	Methanol	Dark green	Light brown
PCH	Petroleum ether	Light green	Dark green
	Choloroform	Light green	Green
	Ethyl acetate	Light green	Green
	Methanol	Light green	Green

Table 8. Fluorescence Analysis of Drug Powder of Leaves of LOR

Treatment powder	Day light	UV light-366nm
Powder + water	Dark green	Light green
Powder+Conc Hcl	Dark green	Dark green
Powder+Conc HNO3	Yellowish green	Dark green
Powder+Conc H2so4	Dark red	Dark green
Powder+NAOH	Light red	Dark green
Powder+Alc. NAOH	Light green	Green
Powder+KOH	Light red	Green
Powder+Alc.KOH	Light green	Green
Powder+Ammonia	Green	Dark green

Table 9. Fluorescence Analysis of Drug Powder of Leaves of DRC

Treatment powder	Day light	UVlight-366nm
Powder + H2O	Light green	Dark green
Powder+Conc HCL	Light green	Dark green
Powder+Conc HNO3	Yellowish green	Dark green
Powder+Conc H2So4	Blackish green	Dark green
Powder+NAOH	Dark red	Dark green
Powder+Alc. NAOH	Light green	Dark green
Powder+KOH	Dark red	Dark green
Powder+Alc.KOH	Light green	Dark green
Powder+Ammonia	Dark red	Dark green

Table 10. Fluorescence Analysis of Drug Powder of Leaves of MC

Treatment powder	Day light	UV light-366nm
Powder + H2O	Light green	Dark green
Powder+Conc HCL	Light green	Dark green
Powder+ Conc HNO3	Yellowish green	Dark green
Powder+ Conc H2so4	Blackish green	Dark green
Powder+NAOH	Dark green	Dark green
Powder+Alc. NAOH	Light green	Dark green
Powder+KOH	Dark green	Dark green
Powder+Alc.KOH	Light green	Dark green
Powder+Ammonia	Dark green	Dark green

Table 11. Fluorescence Analysis of Drug Powder of Leaves of YC

Treatment powder	Day light	UV light-366nm
Powder + H2O	Light green	Dark green
Powder+Conc HCL	Light green	Dark green
Powder+Conc HNO3	Yellowish green	Dark green
Powder+Conc H2so4	Blackish green	Dark green
Powder+Naoh	Dark red	Dark green
Powder+Alc. NAOH	Light green	Dark green
Powder+KOH	Dark red	Dark green
Powder+Alc.KOH	Light green	Dark green
Powder+Ammonia	Light green	Dark green

Table 12. Fluorescence Analysis of Drug Powder of Leaves of OC

Treatment powder	Day light	UV light-366nm
Powder + H2O	Light green	Dark green
Powder+Conc HCL	Light green	Dark green
Powder+Conc HNO3	Yellowish green	Dark green
Powder+Conc H2so4	Blackish green	Dark green
Powder+NAOH	Light green	Light green
Powder+Alc. NAOH	Dark red	Dark green
Powder+KOH	Light green	Dark green
Powder+Alc.KOH	Dark red	Light green
Powder+Ammonia	Light green	Light green

Table 13. Fluorescence Analysis of Drug Powder of Leaves of RSC

Treatment powder	Day light	UVlight-366nm
Powder + H2O	Light green	Dark green
Powder+Conc HCL	Light green	Dark green
Powder+ Conc HNO3	Yellowish green	Dark green
Powder+ Conc H2so4	Blackish green	Dark green
Powder+NAOH	Dark green	Dark green
Powder+Alc. NAOH	Light green	Dark green
Powder+KOH	Dark green	Dark green
Powder+Alc.KOH	Light green	Dark green
Powder+Ammonia	Dark green	Dark green

Table 14. Fluorescence Analysis of Drug Powder of Leaves of RC

Treatment powder	Day light	UVlight-366nm
Powder + H2O	Light green	Dark green
Powder+ Conc Hcl	Light green	Dark green
Powder+ Conc HNO3	Yellowish green	Dark green
Powder+ Conc H2so4	Blackish green	Dark green
Powder+NAOH	Dark red	Dark green
Powder+Alc. NAOH	Light green	Dark green
Powder+KOH	Dark red	Dark green
Powder+Alc.KOH	Light green	Dark green
Powder+Ammonia	Dark green	Dark green

Table 15. Fluorescence Analysis of Drug Powder of Leaves of DRSC

Treatment powder	Day light	UVlight- 366nm
Powder + H2O	Light green	Dark brown
Powder+ Conc HCL	Dark green	Dark brown
Powder+ Conc HNO3	Yellowish green	Dark green
Powder+ Conc H2so4	Blackish green	Dark green
Powder+NAOH	Light brown	Dark green
Powder+Alc. NAOH	Light green	Dark green
Powder+KOH	Light brown	Dark green
Powder+Alc.KOH	Light brown	Dark green
Powder+Ammonia	Light brown	Dark green

Table 16. Fluorescence Analysis of Drug Powder of Leaves of LRCH

Treatment powder	Day light	UV light-366nm
Powder + H2O	Light green	Dark green
Powder+ Conc HCL	Light green	Green
Powder+ Conc HNO3	Red colour	Yellow
Powder + Conc H2so4	Dark green	Dark green
Powder+NAOH	Greenish brown	Dark green
Powder+Alc. NAOH	Light green	Dark green
Powder+KOH	Greenish brown	Dark green
Powder+Alc.KOH	Dark green	Dark green
Powder+Ammonia	Light green	Brown

Table 17. Fluorescence Analysis of Drug Powder of Leaves of PCH

Treatment powder	Day light	UV light-366nm
Powder + H2O	Light green	Dark green
Powder+ Conc HCL	Light green	Dark green
Powder+ Conc HNO3	Yellow	Dark green
Powder+ Conc H2so4	Dark red	Light green
Powder+NAOH	Light brown	Light green
Powder+Alc. NAOH	Light green	Dark green
Powder+KOH	Light brown	Dark green
Powder+Alc.KOH	Light green	Light green
Powder+Ammonia	Light brown	Light green

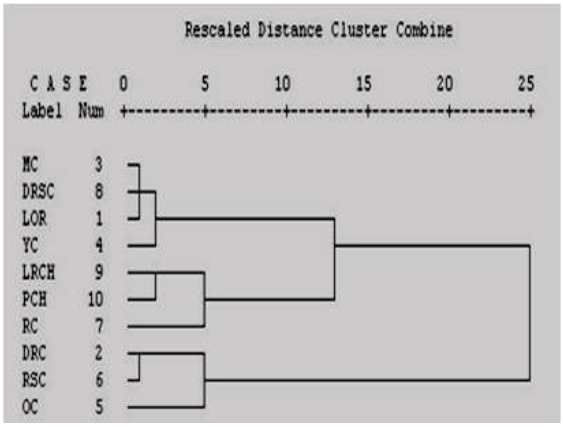

Figure 2.

two clusters based on the similarities the cultivars shared. The 2 clusters again divided in to so many sub clusters based on the characters the similarities they shared. Phylogeny and classification of the species-rich pantropical showy genus *Ixora* shows a close relationship between members (Arnaud et al., 2009).

In the present result the data obtained reveals that the hybrids such as LRCH and PCH exhibits some common characteristics so they share a common cluster. Interspecific hybridization is considered common among plants (Soltis et al., 1998). The DRC and RSC cultivars has a 99% similarities, thus they come under the main cluster. But the OC cultivar here remains as an outer lier, which shows similarity with the DRC cultivar. Thus OC and DRC remain as a sub cluster. The YC and RSC cultivars show the least similarity value between each other. So they again form a fourth level of sub cluster. This results were identical to the results observed in several varieties through the studies on germplasm characterization of plant morphological attributes for white clover Jahufer et al., 1997; Rosso and Pagano, 2001), wheat (Pecetti, 1992), white lupin (Rubio et al., 2004), apricot (Ruiz and Egea, 2008), water melon (Szamosi et al., 2009), sesame (Morris, 2009), safflower (Elfadl et al., 2010) and vineyard peach (Nikolić et al., 2010). Although, the morphological dendrogram generated from similarity or genetic distance matrices has provided an overall pattern of variation as well as the degree of relatedness among accessions, diverse results could be obtained in morphological grouping, when experiments are repeated owing to variations in environmental conditions such as soil types, and soil fertility levels (Steel, 1972); light, temperature and moisture regime (Morakinyo and Ajibade,1998).

The type of stomata in all the 10 cultivars of *I. coccinea* Linn. was anisocytic and the distribution of the stomata were even. The shape of the epidermal cells for all the 10 cultivars was hexagonal and was regular. This even distribution of stomata may be related to the process of transpiration. Three subsidiary cells were present for all the 10 cultivars. This result was identical to results obtained during the stomatal study and its implications in the plant (Ferry, 2008). Chlorophyll analyses in 10 cultivars of I.coccinea indicate a wide range of variation in optical density at 645 nm and 663nm. The DRC had the highest wavelength at 645nm with a value of 1.000 while it has the second largest wavelength at 663nm (0.851). OC has the longest wave length at 645nm (1.056) and second largest wavelength at 663nm (0.996). PHC has show the lowest value at the wavelength 645 and 663nm

In pharmacognostic analysis all the 10 cultivars showed almost same colours when the drug leaf powder extract was treated with various extracts on both day light and uv light. The fluorescence analysis of drug leaf powder extracts of 6 cultivars shows a peculiar light green colour to green colour when treated with chloroform, petroleum ether, methanol on day light and uv light. This result was identical to the results obtained during the fluorescent analysis of powdered vegetables (Chase et al., 1949). A non-fluorescent compound may fluoresce if mixed with impurities that are fluorescent. Hence, it is useful in detecting the adulterants and substituents. The present results obtained were identical to the results obtained during the pharmacognostical analysis of *Premna herbacea* (Thirumalai et al., 2013) and Rubus ellipticus Smith (Ringmichon et al., 2013). In the present study there was a narrow range of colour change in each cultivars when treated with the chemicals such as water, hydrochloric acid, concentrated sulphuric acid, concentrated nitric acid, sodium hydroxide, alcoholic sodium hydroxide, potassium hydroxide, alcoholic potassium hydroxide, ammonia. This colour change indicates the presence of compounds or impurities in the cultivars. Some cultivars showed same colour change, indicating that they possess some compounds which fluoresces only when a particular chemical is used. Many phytochemicals showed specific fluorescence characteristic of each compound when suitably illuminated.

Thus the present study provides all the relevant information regarding the morphological characterisation and chemical analysis of 10 cultivars of *I.coccinea* Linn. It is very much beneficial to understand the morphological differences and pharmacogonosical importance of I.coccinea cultivars.

Acknowledgement

The authors acknowledge Mahatma Gandhi College for the facilities provided.

References

1. Bayorbor, T. B., Dzomeku, I. K., Avornyo, V. K. and Opoku-Agyeman, M. O. 2010. Morphological variation in Kersting's groundnut (*Kerstigiella geocarpa* Harms) landraces from Northern Ghana. Agri. Biol. J. North Amer. Online. 2151-7525pp.
2. Chase, C. R. and Pratt, R. 1949. Fluorescence of Powdered Vegetable Drugs with Particular Reference to Development of a System of Identification. J. Amr. Pharma. Ass. (Sci.Ed.). 38: 324-33pp.
3. Cheema, N. M., Malik, M. A., Qadir, G. and Rabbani, M. A. 2010. Characterization of castor bean genotypes under various environments using SDS-PSAGE of total seed storage proteins. Pak. J. Bot. 42(3): 1797-1805pp.
4. De Block, P. 1998. The African species of Ixora (Rubiaceae - Pavetteae). Opera Bot. Belg. Vol.9:1-217pp.
5. Elfadl, E., Reinbrecht, C. and Claupein, W. 2010. Evaluation of phenotypic variation in a worldwide germplasm collection of safflower (*Carthamus tinctorius* L.) grown under organic farming conditions in Germany. Genet. Resour. Crop Evol. 57: 155–170pp.
6. Ferry, R. J. 2008 . Stomata, Subsidiary Cells, and Implications. The McAllen. Inter. Orc. Soc. J. 9(3) : 9-16pp.
7. Hickey, L. J. 1973. Classification of architecture of dicotyledonous leaves. Amer. J. Bot. 60(1): 17-33pp.
8. Hickey, L. J. 1973. Classification of arquitecture of dicotyledonous leaves. Amer. J. Bot. 60(1): 17-33pp.
9. Huxley, A. 1992. The new Royal Horticultural Society dictionary of gardening. Vol. 2 London: The Macmillan Press.
10. Jahufer, M. Z. Z., Cooper, M. and Harch, B. D. 1997. Pattern analysis of the diversity of morphological plant attributes and herbage yield in a world collection of white clover (*Trifolium repens* L.) germplasm characterized in a summer moisture stress environment of Australia. Genet. Resour. Crop Evol. 44: 289–300pp.
11. Morakinyo, J. A. and Ajibade, S. R. 1998. Characterization of the segregants of an improved cowpea line IT84K-124-6. Nig. J. Sci. 32:27-32pp.
12. Morris, J. B. 2009. Characterization of sesame (*Sesamum indicum* L.) germplasm regenerated in Georgia, USA. Genet Resour Crop Evol. 56: 925–936pp.
13. Nikolić, D., Rakonjac, V., Milatović, D. and Fotirić, M. 2010. Multivariate analysis of vineyard peach [*Prunus persica* (L.) Batsch.] germplasm collection. Euphytica. 171: 227– 234pp.
14. Pecetti, L., Annicchiarico, P. and Damania, A. B. 1992. Biodiversity in a germplasm collection of durum wheat. Euphytica. 60: 229–238pp.
15. Peterson, L., Ostergard, H. and Glese, H. 1994. Genetic diversity among wild and cultivated barley as revealed by RFLP. Theor. Appl. Gent. 89: 676-681pp.
16. Ringmichon, C. L., Bindu Gopalkrishnan and Dixit A. P. 2013. Ethnopharmacognostical Studies on Root Bark of *Rubus ellipticus* Smith. from Manipur J. pharm.phyto.chem. 2: 223pp.
17. Robbrecht, E. 2009. Rubiaceae Research at the National Botanic Garden of Belgium. National Botanic Garden of Belgium website. National Botanic Garden of Belgium.
18. Robbrecht, E. 1995. Advances in Rubiaceae Macrosystematics. Opera. Botn. Belg. 6. 50(2), 435 – 437pp.
19. Rosso, B. S. and Pagano, E. M. 2001. Collection and characterization of naturalized populations of white clover (*Trifolium repens* L.) in Argentina. Genet. Resour. Crop Evol. 48: 513–517pp.
20. Rubio, J., Cubero, J. I., Martin, L. M., Suso, M. J. and Flores, F. 2004. Biplot analysis of trait relations of white lupin in Spain. Euphytica. 135: 217–224pp.
21. Ruiz, D. and Egea, J. 2008. Phenotypic diversity and relationships of fruit quality traits in apricot (*Prunus armeniaca* L.) germplasm. Euphytica. 163: 143–158pp.
22. Sneath, P. H. A. and Sokal, R. R. (1973). Numerical Taxonomy. W. H. Freeman, San Francisco.
23. Steel, W. M. 1972. Cowpeas in Nigeria. Ph.D thesis, University of Reading. 241pp.
24. Szamosi, C., Solmaz, I., Sari, N. and Barsony, C. 2009. Morphological characterization of Hungarian and Turkish watermelon (*Citrullus lanatus* (Thunb.) Matsum. et Nakai) genetic resources. Genet. Resour. Crop Evol. 56. 2009. 1091– 1105pp.
25. Tatineni, V., Cantrell, R. G. and Davis, D. (1996). Genetic diversity in elite cotton germplasm determined by morphological characteristics and RAPD. Crop. Sci. 36: 136-196.
26. Thirumalai, D., Paridhavi, M. and Gowtham, M., 2013. Evaluation of physiochemical, pharmacognostical and phytochemical parameters of *Premna herbacea*. Asian. J. Pharm. Clin. Res. 6(1):173-181pp.
27. Varier, V. P. R. 2010. Indian Medicinal Plants,a compendium of 500 species. Vol 239.University press Pvt. Ltdpp.
28. Verdcourt, B. (1989). Rubiaceae. Flora Zambesiaca. FZ. volume:5 part:1.
29. Willis, J. C. 1966. A dictionary of the flowering plants and ferns. 7 edn,
30. Wilson, R. F. 1938 and 1941. Horticultural Colour Chart, I and II. British Colour Council.