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Research Article

PHARMACOGNOSTIC AND PHYTOCHEMICAL INVESTIGATION OF *CELOSIA ARGENTEA* LINN.

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ABSTRACT
Celosia argentea Linn belongs to family Amaranthaceae and is being used in the indigenous systems of medicine as a wound healing and immune stimulating agent for curing kidney stone. The drug part is usually used as the white tuberous roots, leaf and stem of this plant. The present study includes the macro and microscopic characters, histochemistry and phytochemistry. The phytochemical screening is also confirmed by HPTLC analysis for Quercetin.
Keywords: *Celosia argentea*, Pharmacognosy, phytochemical analysis, HPTLC.

INTRODUCTION

Celosia argentea Linn belongs to family Amaranthaceae. In India, it is found to be grown as a weed of bajra fields. It is an herbaceous, erect and branching plant[1]. The plant body is erect up to 1.5- 2ft height. Tuberous root are white in colour and cylindrical in shape. There are 17 species of *Celosia* recorded in India out of these 11 species of *Celosia* are found to be growing in Maharashtra[3]. For the present investigation *Celosia argentea* is selected as for their correct botanical identification and standardization of drug. The drug part used is the white roots, stem and leaf. The drug is used as a wound healing and immunostimulating agent for curing kidney stone, with potent antihepatotoxic effects[4-6]. Review of literature revealed that alcoholic extract of the seeds possesses aphrodisiac, antipyretic, antispasmodic, anticancer, diuretic and antibacterial activity.[7-11].

MATERIAL AND METHODS

Collection and Identification of Plant Materials

The plant materials were collected from in and around Pune district of Maharashtra, India in the month of September-October. Efforts were made to collect the plants in flowering and fruiting condition for the correct botanical identification. It was identified with help of Flora of The Presidency of Bombay[2].

Microscopic and Macroscopic evaluation

Thin (25µ) hand cut sections were taken from the fresh roots, leaf and stem, permanent double stained and finally mounted in Canada balsam as per the plant micro techniques method of Johansen[13]. The macroscopic evaluation was studied by the following method of Trease and Evans[14] and Wallis[15].

Histochemical study

The thin transverse sections of fresh root, leaf and stem were taken (about 25µ). It was treated with respective reagent for the detection and localization of chemicals in the tissues as per the method of Krishnamurthy[16].

Table 1:Histochemical analysis

Test	Reagent	Stem	Leaf	Root
Starch	I_2KI			
Protein	Pottasium Ferrocyanide + water + acetic acid + 60% alcohol + $FeCl_3$	Epi, Cort, Xy.	Epi, Cort, Xy.	Cork, Sec.cort
Tannin	Acidic $FeCl_3$	Epi, Cort, Xy.	Epi, Cort, Xy.	Cork, Sec.cort
Saponin	Conc. H2SO4	Epi, Cort, Xy Phlo.	Epi, Cort, Xy.	Cork, Sec.cort, Xy.
Fat	Sudan III	Epi, Cort, Xy.	Epi, Cort, Xy.	Cork, Sec.cort
Sugar	20% aq. NaOH	Epi, Cort, Xy Phlo.	Epi, Cort, Xy.	Cork, Sec.cort, Xy.
Glycosides	Guignard's Test	Epi, Cort, Xy Phlo.	Epi, Cort, Xy.	Cork, Sec.cort, Xy.
Alkaloids	Mayer's Reagent	Epi, Cort, Xy Phlo.	Epi, Cort, Xy.	Cork, Sec.cort, Xy.
	Wagner's Reagent	Epi, Cort, Xy Phlo.	Epi, Cort, Xy.	Cork, Sec.cort, Xy.
	Dragendorff's Reagent	Epi, Cort, Xy Phlo.	Epi, Cort, Xy.	Cork, Sec.cort, Xy.
	Hager's Reagent	Epi, Cort, Xy Phlo.	Epi, Cort, Xy.	Cork, Sec.cort, Xy.
Tannic acid	10% $Fecl_3$	Epi, Cort, Xy Phlo.	Epi, Cort, Xy.	Cork, Sec.cort, Xy.

Abbreviations: I_2KI: Potassium iodide, $FeCl_3$: Ferric chloride, Conc. H_2SO_4: Concentrated sulphuric acid, NaOH: Sodium hydroxide.
Epi: Epidermis, Endo: Endodermis, Peri: Pericycle, Cort: Cortex, Xy: Xylem, Phlo: Phloem
Sign indicates the addition of Potassium Ferrocyanide in water, then acetic acid, 60% alcohol and lastly $FeCl_3$

Table 2: **Ash and Acid Insoluble ash of *Celosia argentea* Linn**

Parameter	Results % dry wt.		
	Stem	Leaf	Root
Total Ash	16%	12.6%	16.2%
Acid Insoluble Ash	6.5%	5.6%	6.3%

Table 3: Percentage extractives of *Celosia argentea* Linn

Solvent used	Stem	Leaf	Root
Distilled water	3.4%	3.1%	2.8%
Absolute alcohol	4%	4.3%	4.4%
Petroleum ether	2%	2.5%	2.6%
Benzene	10%	10.2%	10.4%
Chloroform	4%	4.1%	4.3%
Acetone	18%	18.3%	18.6%

Table 4: Fluorescence Analysis of *Celosia argentea* Linn

Treatments	Stem	Leaf	Root
Powder as such.	Creamy yellow	Creamy green	Whitish brown
Powder as such in UV-light.	Greenish yellow	Greenish brown	Greenish black
Powder + Nitrocellulose	Grayish black	Grayish black	Grayish black
Powder + 1N NaOH in Methanol.	Pale green	Pale green	Pale green with reddish tinge.
Powder + 1N NaOH in Methanol dry for 30min. + Nitrocellulose.	Greenish yellow	Greenish yellow	Greenish yellow with brown tinge.

Table 5: Phytochemical test of *Celosia argentea* Linn

Test	Stem	Leaf	Root
Water extract.			
Starch	+ve	+ve	+ve
Protein	+ve	+ve	+ve
Tannin	+ve	+ve	+ve
Saponin	+ve	+ve	+ve
Fat	+ve	+ve	+ve
Sugar	+ve	+ve	+ve
Alcohal extract.			
Mayer's reagent	+ve	+ve	+ve
Wagner's reagent	+ve	+ve	+ve
Dragendorffs Reagent	+ve	+ve	+ve
Tannic acid	+ve	+ve	+ve

Table 6: Quantitative estimation of *Celosia argentea* Linn

Quantitative estimation	(mg /g dry weight)		
	Stem	Root	Leaf
Protein	0.88025	1.308	1.63275
Reducing Sugar	0.74312	0.74312	0.74312
Non - Reducing Sugar	0.01947	0.01947	0.01947
Starch	0.28716	0.28716	0.28716
Flavonoid	0.059	0.0647	0.0290

Table 7: Showing the value of peak for Quercetin in the root of *Celosia argentea* Linn

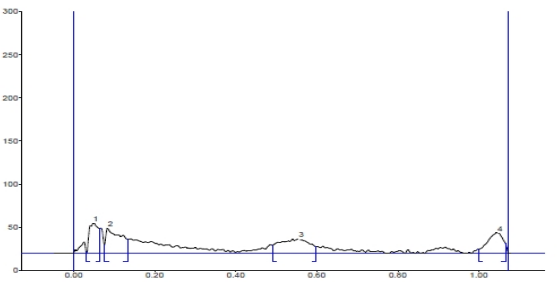
Peak	Start R_f	Start Height	Max R_f	Max Height	Max%	End Rf	End Height	Area	Area%
1	0.03	1.9	0.05	35.4	33.47	0.06	28.7	582.7	19.88
2	0.08	9.7	0.08	29.5	27.92	0.13	16.5	789.6	26.94
3	0.49	9.5	0.56	16.8	15.94	0.60	7.8	900.7	30.73
4	1.00	4.9	1.05	23.9	22.66	1.07	11.8	658.3	22.46

Table 8: Showing the value of peak for Quercetin in the leaf of *Celosia argentea* Linn

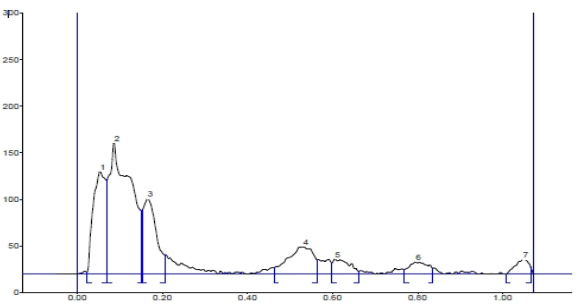
Peak	Start R_f	Start Height	Max R_f	Max Height	Max%	End R_f	End Height	Area	Area%
1	0.02	1.6	0.05	110.5	27.16	0.07	100.8	2362.8	19.87
2	0.07	102.0	0.09	140.6	34.56	0.15	68.0	5197.8	43.71
3	0.15	68.9	0.17	81.1	19.93	0.21	20.7	1829.7	15.39
4	0.46	6.9	0.53	29.5	7.24	0.56	15.3	1263.3	10.62
5	0.60	12.0	0.61	16.4	4.03	0.66	2.9	455.7	3.83
6	0.77	5.1	0.80	13.0	3.21	0.84	6.3	422.0	3.55
7	1.01	0.2	1.05	15.8	3.87	1.07	8.1	361.4	3.04

Table 9: Showing the value of peak for Quercetin in the stem of *Celosia argentea* Linn

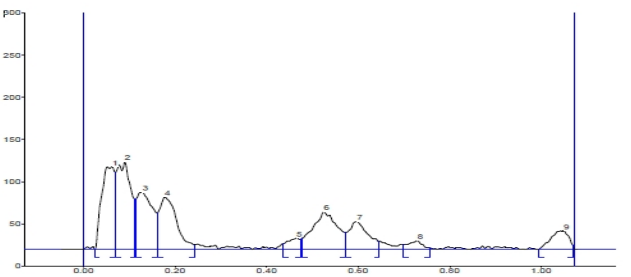
Peak	Start R_f	Start Height	Max R_f	Max Height	Max%	End R_f	End Height	Area	Area%
1	0.02	0.1	0.06	98.1	21.54	0.07	91.3	2010.3	17.33
2	0.07	91.7	0.09	104.0	22.82	0.11	59.5	2332.2	20.10
3	0.11	59.6	0.13	67.7	14.85	0.16	43.1	1732.8	14.94
4	0.16	43.9	0.18	61.9	13.59	0.24	5.6	1686.0	14.53
5	0.44	6.7	0.47	13.5	2.97	0.47	11.9	259.1	2.23
6	0.48	13.3	0.53	44.7	9.81	0.57	20.2	1720.9	14.83
7	0.57	20.1	0.60	33.1	7.26	0.65	9.6	1000.1	8.62
8	0.70	5.8	0.73	10.6	2.32	0.76	1.7	233.8	2.02
9	1.00	0.1	1.05	22.0	4.84	1.07	5.0	626.4	5.40



Graph 1: Qualitative analysis of Quercetin in the root of *Celosia argentea* Linn



Graph 2: Qualitative analysis of Quercetin in the leaf of *Celosia argentea* Linn



Graph 3: Qualitative analysis of Quercetin in the stem of *Celosia argentea* Linn

Figure 1: Habit of *Celosia argentea*

Figure 2: Root of *Celosia argentea* Linn

Figure 3: Stem of *Celosia argentea*

Figure 4: Leaf of *Celosia argentea* Linn

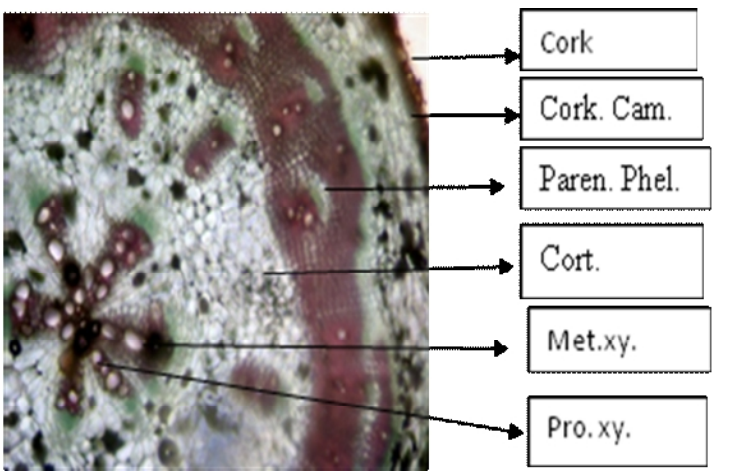


Figure 5: *Celosia argentea* Linn. (Root)

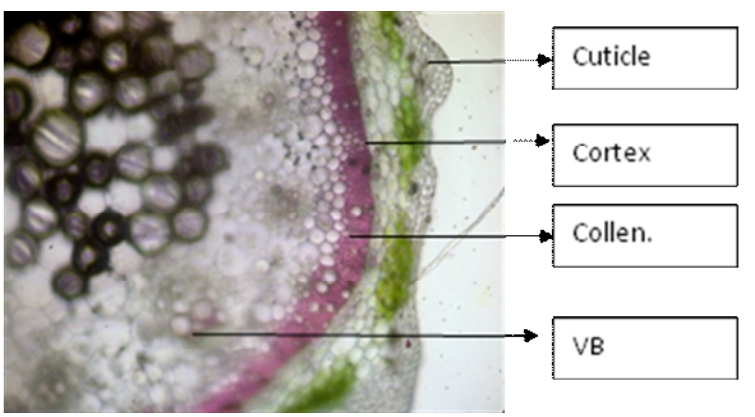


Figure 6: *Celosia argentea* Linn. (Stem)

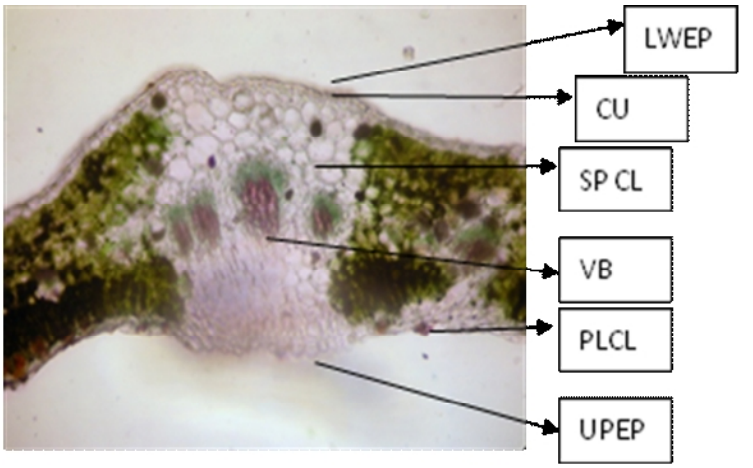
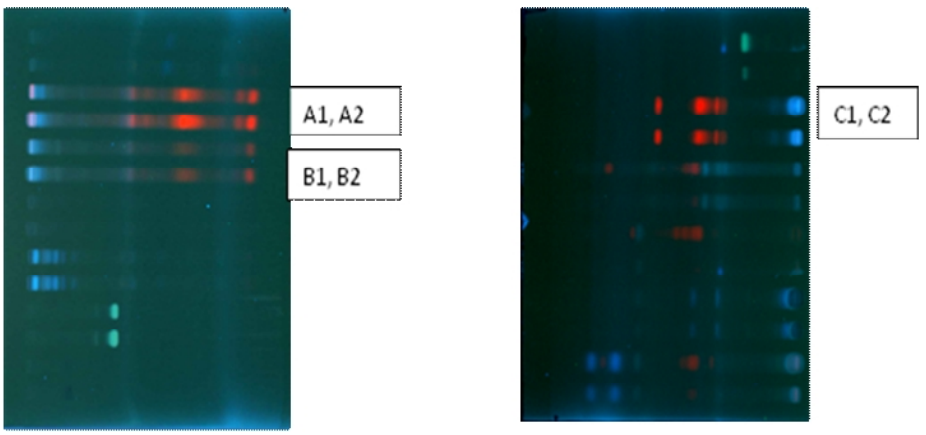


Figure 7: *Celosia argentea* Linn. (Leaf)
CORK. CAM- Cork Cambium; PAREN. PHEL- Parenchymatous phelloderm; CORT.- cortex; MET.XY. – Metaxylem; PRO.XY.- Protoxylem; COLLEN.- Collenchyma; VB- Vascular bundle; LWEP- Lower Epidermis; CU- Cuticle; SP CL- Spongy cell; PLCL-Palisade cell; UPEP- Upper Epidermis.



A1, A2- *C. argentea* Stem; C1, C2- *C. argentea* Leaf; B1, B2- *C. argentea* Root

Figure 8: Detection of Quercetin by HPTLC techniques at 366nm

Phytochemical evaluation

Some materials were dried under the shade so as to avoid the decomposition of chemical constituents, powdered in blender and finally stored in dry air tied containers for phytochemical screening. Ash and percentage extractives were accomplished by following standard pharmacopoeal techniques[17]. Fluorescence analysis was carried out as per Chase and Pratt[18]. Qualitative phytochemical test were carried out by standard methods of Harborne[19] and Trease and Evans[14]. Quantitative phytochemical analysis was determined for proteins, carbohydrates and flavonoid by the methods of Lowry *et al*.[20]; Nelson[21] and Boham and Kochipai[22] respectively. The phytochemical screening was also detected by the High Performance- Thin Layer Chromatography (HPTLC). HPTLC study was carried out on instrument comprising of Linomat 5 for application using Densitometer-TLC Scanner 3 with "WINCATS" software (Camag, Switzerland). These studies were carried out on pre-coated aluminum fluorescent plates (E. Merck). For HPTLC studies, an extract of methanol (25% GR) solvent system was used and after development, plate was scanned at 254 and 366nm[23,24.]

RESULTS AND DISCUSSIONS

Macroscopic evaluation

Herb: 1.5-2ft. in height.

Roots: Roots are white, have bitter taste and characteristic odour. The root is cylindrical in shape. Their length ranges from 12-15cm in length and 2-3cm in breadth. The roots are rounded in cross-section with slight ridges running lengthwise.

Leaves: Leaves are green, have bitter taste and bitter odour. The leaf is linear - lanceolate in shape. Their length ranges from 8-10cm in length and 2-4cm in breadth.

Flower: They are having perianth of variously colored, typically whitish red in this variety, penta-merous, corolla absent & Stamens 5.

Fruit: Fruit is Pyxides. (Figure 1 and 2)

Microscopic characters

T.S of Leaf

The transverse section of the leaf shows prominent below and has a narrow ridge above; the palisade is discontinuous which shows in transverse section 4-5 vascular bundles arranged in the form of a circle. Underneath the upper epidermis of the midrib lie 5-6 rows of collenchymatic tissue which forms a very narrow band of 2-3 rows on the lower epidermis. The

upper epidermis consists of polygonal, tabular cells and those of lower epidermis have strongly wavy anticlinal walls; measuring 11-15cm in length and 15-27cm in width. The cuticle is moderately thick, stomata of anisocytic type are observed occasionally it was interrupted by tetracytic stomata. The Mesophyll is dorsiventrally with 2-3 rows of palisade cells but distinctly isobilateral at the margin and occasionally undifferentiated at the other regions of the lamina. Most of the cells of Mesophyll contain droplets of oil.

T.S of Root

The transverse section of the root is circular in outline, exhibiting peripheral cork. At the centre there is 25 primary xylem bundles arranged at right angles to each other, with the Protoxylem groups directed outwards. The outer part of the root is composed of 3-4 rows of suberised cork cells followed by 10-12 rows of parenchymatous phelloderm containing simple and compound starch grains (Figure 3).

T.S. of Stem

The transverse section of the stem shows circular in outline. The outermost epidermis consists mostly of tabular, rectangular, thin-walled cells with strongly developed cuticle especially on the ridges and the wings. The cells are in distinctly beaded and contain occasional stomata, the size and shape of which are identical to that of the leaf .The cortex is narrow, parenchymatic, with the groups of collenchymatic tissue. In a young stem, the endodermis is well marked, consisting of rather large cells with obvious casparian strips which become rather indistinct in the older stem. The parenchymatous pericycle has isolated or small groups of fibres at the intervals, vascular system exhibit anomalous secondary thickening. Xylem vessels are 200-450 11m long, 16.1-60.0 11m broad, with pitted, spiral to sclariform thickening. All the parenchyma, contain starch grains which are rounded, simple to compound and measure from 3.8-7.6pm in size. The pith is wide parenchymatous.

Histochemical Screening

Histochemical screening showed the presence of starch, protein, fat, saponin, tannin, sugars and alkaloids (Table 1).

Phytochemical Study

The total ash content in root, stem and leaf of *Celosia argentea* is 16.2%, 16%, and 12.6% while acid insoluble ash content is 6.3%, 6.5% and 5.6% (Table 2). The value of percentage extractives was higher in root by using solvent acetone and lower in stem by using solvent petroleum ether (Table 3). Fluorescence analysis was carried out to check the purity of the drug. The powdered drug was observed in visible light as whitish brown, Creamy yellow and Creamy green in root, stem and leaf respectively. The powder was then observed in ultraviolet light. It was treated with reagent like nitrocellulose, 1N sodium hydroxide, 1N sodium hydroxide in nitrocellulose and dry for 30minutes and then it was observed under ultraviolet light and it emits the color as shown in (Table 4). Qualitative analysis of the root drug indicated the presence of proteins, reducing and non-reducing sugars, saponin, fats, tannin, glycoside and alkaloids in the plant (Table 5). The quantity of proteins is higher in leaf of *Celosia argentea* than root and stem, carbohydrate is more in root than leaf and stem and flavonoid is more in leaf than root and stem (Table 6). In HPTLC study the methanolic extract is ultrasonic for 15minutes and filtered. The filtrate is used as an application for saponin and stegmasteroids. For each application 5µl and 10µl extracts were used and loaded on instrument comprising of Linomat 5 for application using Densitometer- TLC Scanner 3 with "WINCATS" software (Camag, Switzerland). These studies were carried out on pre-coated aluminum fluorescent plates (E. Merck). The plates were scanned at 254 and at 366nm23,24.

Analytical studies (Quercetin)

The HPTLC analysis showed that, the Quercetin from the *Celosia argentea* samples gave light yellow bands in visible light and blue bands after derivatization in fluorescence light. The plates were scanned at 254 and 366nm. When images were compared with the graph and table values; it shows maximum area 22.99 % at 366nm after derivatization. The table also indicates the starting R_f values and end R_f values (Figure 4; Graph 1; Table 7). .

CONCLUSION

The plant *Celosia argentea* showed the correct taxonomy. The morphological characters and histochemical study with double staining of the root stem and leaf, percentage extractives, fluorescence and ash analysis and the phytochemical screening of the plant is helpful for the standardization of drug. As in case of Quercetin, the peaks are denoted by the R_f values. Finding the overall results of the study of *Celosia argentea*, these investigations will be useful for the correct botanical identification and authentication of the drug.

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REFERENCES

1. Hara H. The Flora of Eastern Himalaya. Tokyo University Press, Japan; 1966. p. 407
2. Cooke T. Flora of Presidency of Bombay. B.S.I. Calcutta 1958; 3: 280-289.
3. The Wealth of India- A dictionary of Indian raw materials and industrial products, Revised Edn. Publication and Information Directorate, CSIR. Dr RS Krishnan Marg, New Delhi 1992; 3(Ca-Ci): 482-483.
4. Nadkarni AK, KM Nadkarni. Indian Materia Medica. Popular Book Depot., Lamington Road, Bombay, 3rded; 1927. 1. p. 208-209
5. Chopra RN, Nayer SL, Chopra IC. Glossary of Indian medicinal Plants CSIR. New Delhi; 1956. p. 218
6. Marais W, Reilly J. *Chlorophytum* and its related Genera (Liliaceae). Kew Bulletin 1978; 32(3): 653-663. http://dx.doi.org/10.2307/4109671
7. Govindarajan R, Vijayakumar M, Pushpangadan P. Antioxidant approach to disease management and the role of Rasayana herbs of Ayurveda. Journal of Ethnopharmacology 2005; 99: 165-178. http://dx.doi.org/10.1016/j.jep.2005.02.035 PMid:15894123
8. Anonymous. Medicinal Plants more on Safed Musali. Agriculture and Industry Survey; 2001. p. 38-39
9. Dhuley JN. Effect of some Indian herbs on macrophase functions in Ochratoxin A treated mice. Jour. of Ethnopharmacology 1997; 58: 15-20. http://dx.doi.org/10.1016/S0378-8741(97)00072-X
10. Nergard CS, Diallo D, Michaelsen TE, Malterud KE, Kiyohara H, Matsumoto T, *et al.* Isolation, Partial characterization and immunostimulation activity of polysaccharides from *Verninia kotschyana* Sch. Bip. Ex. Walp. Journal of Ethnopharmacology 2004; 91: 141-152.http://dx.doi.org/10.1016/j.jep.2003.12.007 PMid:15036481
11. Kirtikar KR, Basu BD. Liliaceae: *Chlorophytum*. In: Kirtikar KR, Basu BD (Eds.) Indian Medicinal Plants. LM Basu Publishers. Allahabad, India 1975; 2508-2509.

12. Sreevidya N, Kumar V, Kumar S, Sikarwar RLS. Utilization, depletion and conservation of Safed Musali (*Chlorophytum spp.)*. Journal of non-Timber Forest Products 2003; 10: 155-157.
13. Johansen DA. Plant Microtechnique, McGraw-Hill Book Co. Inc. New York; 1940. p. 151-154, 182-203
14. Trease GE, Evans WC. Trease and Evans Pharmacognosy, 15th ed. WB Saunders Edinburgh London, New York, Philadelphia St. Louis Sydney Toronto; 2002. p. 3-4, 528-533, 538-547
15. Wallis TE. A Text Book of Pharmacognosy, reprinted edition, Churchill, Living stone. London; 1967. p. 578-617
16. Krishnamurthy KV. Methods in the Plant Histochemistry, Viswanadhan Pvt. Limited, Madras; 1988. p. 1-77
17. Anonymous. Pharmacopoeia of India, Government of India, Ministry of Health Manager, Publications Delhi, 1st ed; 1955. p. 370 & 864
18. Chase CR, Pratt R. Fluorescence of powdered vegetable drugs with particular reference to development of a system of identification. Jour. Of Amer. Phar. Asso. (Sci. ed.) 1949; 38: 324-330.
19. Harborne JB. Phytochemical Methods, Chapman and Hall International Edition, London. 2nd ed; 1973. p. 5-8
20. Lowry OH, Rosebrough NJ, Farr AL, Randall RJ. Protein measurement with the Folin-Phenol reagent. Jour. of Biol. Chem 1951; 193: 265-275.
21. Nelson N. A photometric adaptation of the Somogyi method for the determination of Glucose. Jour. of Biol. Chem 1944; 153: 375-380.
22. Boham AB, Kocipai AC. Flavonoid and condensed tannins from Leaves of *Hawaiian vaccininum, vaticulum* and *vicalycinium*. Pacific Sci 1994; 48:458-463.
23. Wagner H, Baldt S. Plant Drug Analysis: A Thin Layer Chromatography Atlas. Springer-Verlag, Berlin; 1996. p. 129, 144, 155, 157, 176, 178, 206 http://dx.doi.org/10.1007/978-3-642-00574-9
24. Reich E, Schibii A. High Performance- Thin Layer Chromatography for the analysis of medicinal plants, Thieme medical publishers. Inc; 2007. p. 129-160, 206-210, 224-240

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