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Pharmacognostical and phytochemical investigation of *Madanga* (*Viscum Articulatum* Burm f.) Haustoria

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Abstract
Haustoria are the union between the plant and the host plant is a root like structure or structure that grows in and around another water and nutrient-absorbing structure. *Viscum articulatum* Burm f. belongs to family Santalaceae, an extra pharmacopeia drug of Ayurveda known as Madanga parasite on *Diospyros melanoxylon* Roxb. Belongs to family Ebenaceae. For proper scientific evaluation of the plant for its authentication, macroscopy, microscopy physicochemical parameters, phytochemical screening, qualitative and quantitative of *V. articulatum* has been carried out as per standard protocol. The haustoria morphology showed cylindrical, branched, long 4 to 12 mm in diameter, variable in length, surface faintly longitudinally striated, at places shows few. Fracture is short, fractured surface brown, externally brown in colour, odour aromatic, taste is bitter. Microscopically T.S. showed the Haustoria host plant with outer epidermis followed by 2 -3 layer palisade cells. Ground tissue nearly 6 to 7 pairs of vascular bundles, pericyclic fibres 6 to 7 layers, Xylem 4-5 celled pericyclic fibre is present in cortical zone and extended up to xylem tissue. The haustoria zone mainly consists of parenchyma cells with calcium oxalate crystals, stone cells and scleroids. Ample amount of starch grains, brown content and isolated oil globules are observed in *V. articulatum* can be helpful in identifying the plant in powder from and useful for the proper scientific understating of the future analysis.

Keywords: haustoria, madang, viscum, articulatum

Introduction
Haustoria are the union between the plant and the host plant is a root like structure or structure that grows in and around another water and nutrient-absorbing structure. In botany, this can be the cotyledon or the root of a parasite plant, which penetrates the tissue of the host and draws nutrients from it (such as broom rape or mucous membrane). Throughout mycology it means the annex or section of a parasite fungus that performs a similar function (the hyphal tip). The cell wall of the host plant and the siphonic nutrients enter the microscopic haustorium between the cell wall and the plasma membrane but are not penetrated by the membrane.

Viscum articulatum Burm f. belongs to family Santalaceae is one of the most prominent plants used in folklore India. The species is natively, found in India, China, Australia stem widely used in preparation as various formulation for the various treatment of and management of rheumatoid arthritis, analgesic, anti-thrombotic, blood purifier, and wound healing activity [1, 2]. Due to its diverse global presence and ability to combat multiple health complications, this plant can be exploited for developing multiple modern drug forms after proper scientific validation and value addition. In this connection, this study aimed to proper scientific authentication and validation of *V. articulatum.*

It consists of various phytochemical compounds various glycosides these species also contain of various Visartiside A to F and various glycosidal, phenolic and flavonoid compounds [3].

These research works consist of the macroscopic, microscopic transverse section and powder microscopic study, physicochemical parameters, phytochemical screening, qualitative and quantitative of *V. articulatum.* Due to the therapeutic significance, trade demand of these species. Hence the study is being designed and develops the standard protocol for authentication and standardization of the correct plant material of *V. articulatum.*

Material and Method
Collection of plant material
V. articulatum was parasite on *Diospyros melanoxylon* Roxb. collected as growing naturally at the Gandhamardana hill Ranges, Balangir district of Odisha (20°52′26″N82°50′34″E) during the month of November 2018 as per standard procedure [4] and authentication of drug (Specimen no. IPGTRA/BP/01-18-19) from Central National Herbarium, BSI, Kolkata.

Morphology
Morphological character of whole plant of *V. articulatum* were studied as per observation & visual perception

following standard procedure of taxonomy and verified with existing floras for authentication [5].

Microscopic evaluation

Then the sample were kept on slide and studied under microscope using distilled water. Upon staining with the phloroglucinol HCL and iodine solution with different type of stains, the specimen was tested, and then specific structures and cell contents were measured [6].

Physico-chemical parameters

Physico-chemical parameters like moisture content (loss on drying at 105°C), methanol soluble extractive value, water soluble extractive value, total ash value and acid insoluble ash value were done [7, 8].

Phytochemical screening and quantitively estimation of phyto-chemical parameters

Preliminary phytochemical analysis was performed in methanol extract and water extract for the confirmation of present/ absent of phytochemical such as Alkaloids, Carbohydrates, Fats and fixed oils, Flavonoid, glycoside, terpenoids, tannin, protein, amino acids, starch and mucilage present in *V. articulatum.* In quantitive phyto-chemical analysis 1 mg/ml stock solution is being taken. Total Carbohydrate [9], Protein [10], Total Phenol Content [11], Total flavonoid content [12], Tannin [13] and Terpenoid [14] are being quantified using specified standards for the studies are being performed.

Result

Morphological study

Parasite showed cylindrical, branched, long 4 to 12 mm in diameter, variable in length, surface faintly longitudinally striated, at places shows few. Fracture is short, fractured surface brown, externally brown in colour, odour aromatic, taste is bitter root-like structures found growing along the surface of the host plant, to which they become attached at intervals by absorbing organs – haustoria. In transverse and longitudinal sections, these structures were found to contain tracheids but no sieve tubes. The haustoria tissues become very intimately connected with the vessels of the host, from which water is directly absorbed. From these short haustoria arise and serve as direct connections to the xylem of the host. The parasite induces considerable modification and hypertrophy of the host tissues, whilst the base of the parasite itself often becomes enlarged. According to McLuekie (1923) the haustoria penetrate the host partly by mechanical pressure and partly by enzyme action, the disorganized host tissues provides some of the nourishment for the parasite before the latter becomes firmly established. [Fig 1 a-d]

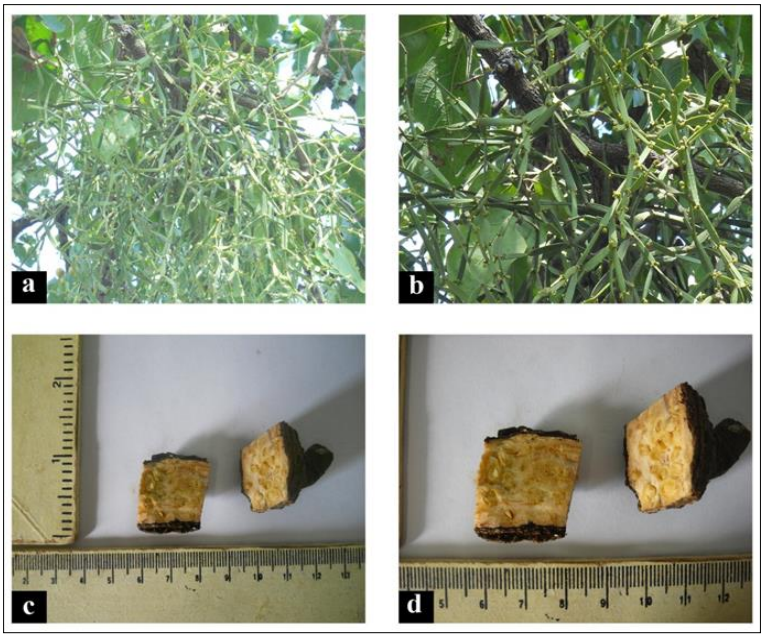

Fig 1: (a) Fresh *V. articulatum* attached to the host plant. (b) Enlarged view of haustoria attachment to Host plant (c) Haustoria of *V. articulatum* (d) Enlarged view of haustoria *V. articulatum*

Microscopically study

The haustoria located inside the host plant, Diagrammatic T.S. of haustoria hostorial plant with outer epidermis followed by 2-3 layer palisade cells followed by ground tissue made up of other cells are rounded to squarish or angular the central ground tissue cells are elongated compressed parenchyma cells. Ground tissue nearly 6 to 7 pairs of vascular bundles or arranged oppositely each vascular bundle consist upper pericyclic fibres 6 to 7 layers cap like structure followed by phloem. Xylem 4-5 celled pericyclic fibre is present. T.S. through the haustoria shows the haustoria tissues are strongly embedded in the corticle zone and extended up to Phloem and xylem tissue. The Haustoria zone mainly consists of parenchyma cells with calcium oxalate crystals, stone cells and scleroids. Ample amount of starch grains, brown content and isolated oil globules are observed. Vascular bundle made up of very week elements of phloem and xylem. The exact position of the host plant conducting tissue is occupied by the hautorial tissue and absorbs the food and nutrition. [Figure 2 a-g]

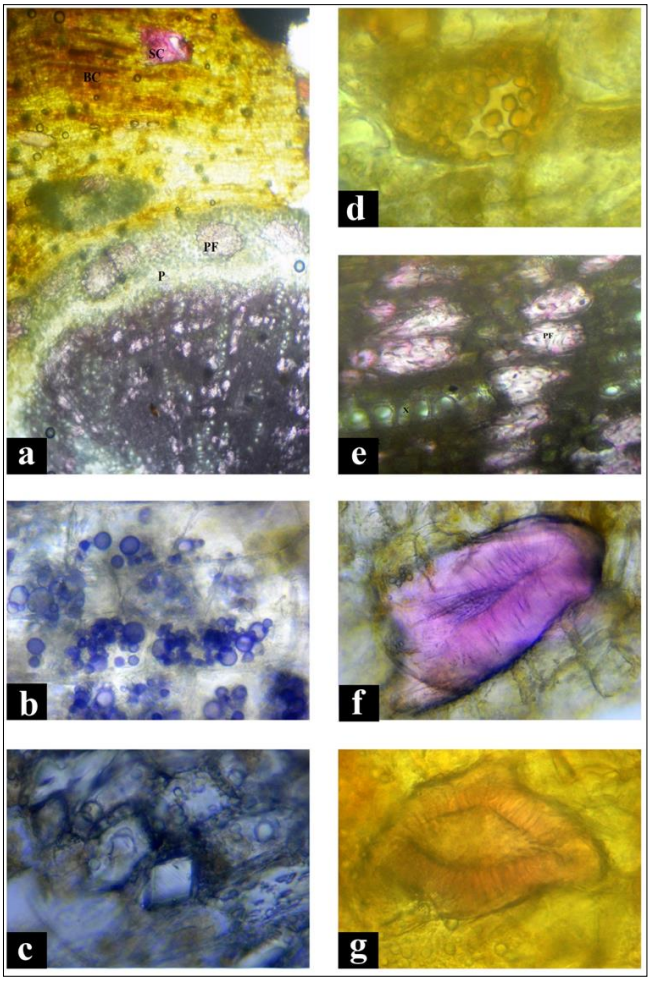

Fig 2: (a) T.S. of Haustoria of *V. articulatum*. SC: Stone cell, BC: Brownish content PF: Pericyclic fibre P: Phloem (b) Lignified starch grains (c) Rhomboidal crystal (d) Haustoria zone (e) Section containing X: xylem, PF: pericyclic fibre and MR: Medullary rays (f) Lignified stone cells and sclroids (g) Lumen

Organoleptic character

The organoleptic character of *V. articulatum* haustoria were performed and the results are depicted. [Table 1]

Table 1: Organoleptic character of *V. articulatum* haustoria

Parameters	Description
Colour	Greenish
Odour	Aromatic
Taste	Bitter
Fracture	Short
Size	4-4.5 cm
Shape	Cylindrical to round

Physico-chemical analysis

The physico-chemical parameters of *V. articulatum* haustoria powder were performed and the results are depicted. [Table 2]

Table 2: Physico-chemical analysis of *V. articulatum* haustoria

Powder parameters	Results
PH (Aqueous 5 %)	5.5 ± 0.55
Loss on drying (%w/w)	4.46 ± 0.07
Ash value (%w/w)	1.60 ±0.01
Acid insoluble ash (%w/w)	0.06 ± 0.01
Alcohol soluble extractive (%w/w)	32.44 ± 0.10
Water soluble extractive (%w/w)	46.11 ± 0.94

Mean±SD (n=3)

Preliminary phyto-chemical qualitative and quantitative analysis

The qualitative and quantitive phyto-chemical analysis were performed in both water and methanol extract of *V. articulatum* haustoria powder are depicted. [Table 3] and [Table 4]

Table 3: Qualitative phyto-chemical analysis of *V. articulatum* haustoria

Phyto-constituents	Tests	Water extract	Methanol extract
Alkaloids	Mayer's Reagent	--	--
	Wagner's test	--	--
	Dragen dorff's test	--	--
Carbohydrates	Molisch test	++	++
	Fehling's Test	++	++
Fats and fixed oils	Filter paper test	--	--
Flavonoid	Shinoda's Test	++	++
Cardiac glycoside	Keller-killiani test	++	++
Saponin glycoside	Foam test	++	++
Anthraquinone	Borntragers test	++	++
Steroids & Terpenoids	Salkowski test	++	++
Tannins & Phenolic compounds	5% $FeCl_3$	++	++
Proteins	Biuret test	--	--
	$K_3Fe(CN)_6$	--	--
Amino acids	Ninhydrin test	--	--
Starch	I2-KI	++	--
Mucilage	Ruthenium red	++	++

Present ++ Absent --

Table 4: Quantitative phyto-chemical analysis of *V. articulatum* haustoria

Name of the test	Quantitative extract (in µg/ml)
Total Carbohydrates content	1752.48±150.94
Total Protein content	532.66±71.95
Total Flavonoid content	253.82±52.11
Total Tannin content	275.30±67.06
Total Terpenoid content	19.10±6.23
Total Phenolic content	339.66±10.13

Mean±SD (n=3)

Discussion

Plants are one of the main sources of dietetic supplements that contribute to healthy maintenance. Past metabolic screening data showed that the plant's capacity was largely caused by bioactive compounds [15]. The *V. articulatum* haustoria particularly from topical and sub-topical region, root like structure grow also along the surface of the host plant, which they become attached at interval by absorbing-organs termed haustoria. These structure which contain tracheid but no sieve tubes, become very intimately connected with the vessels of the host from which nutriment is directly absorbed [16], However quantitative data revelled the higher amount of carbohydrates followed by protein, phenol, flavonoid, tannin and terpenoid was being used for knowing the phytoconstituents are qualitatively and quantitative present in the plant. All results show genuine samples and are free of adulteration. The use of *V. articulatum* haustoria an ingredient may serve to develop a new medicinal in the future.

Conclusion

Botanically *Madanga* plant is identified as *Viscum articulatum* Burm f. This study is very useful in identifying, authentication and assessing the quality of *V. articulatum* haustoria by using the means of both pharmacognostically and phytochemical. It will be useful as a reference tool to properly verify the correct plant material and to track quality for finished formulation with the use of *V. articulatum* part for the therapeutic purpose.

References

1. Bachhav SS, Bhutada MS, Patil SD, Baser B, Chaudhari KB. Effect of Viscum articulatum Burm. (Loranthaceae) in Nω-nitro-L-arginine methyl ester induced hypertension and renal dysfunction. Journal of ethnopharmacology. 2012; 142(2):467-73.
2. Biswajit P, Deenabandhu S, Malaya KM. Ethnomedicobotanical studies of Mohana area of Gajapati district, Odisha, India. Int J Herb Med. 2014; 1(2):40-5.
3. Li Y, Zhao YL, Huang N, Zheng YT, Yang YP, Li XL. *et al*. Two new phenolic glycosides from Viscum articulatum. Molecules. 2008; 13(10):2500-2508.
4. Harnischfeger G. Proposed guidelines for commercial collection of medicinal plant material. Journal of herbs, spices & medicinal plants. 2000 7(1): 43-50.
5. Evans WC, Trease and Evans, Pharmacognosy, 15th ed., (Saunders, London), 2003, 545-547.
6. Paliwal P, Pancholi SS, Patel RK. Pharmacognostic parameters for evaluation of the rhizomes of Curcuma caesia. Journal of advanced pharmaceutical technology & research. 2011; 2(1):56.
7. Tripathi M, Sikarwar RL, Tiwari A, Dwivedi N. Pharmacognostical identification of ingredients in Laghulai curna: An Ayurvedic compound formulation. Indian J Traditional Knowledge. 2015; 1(4):531-536.
8. Anonymous. The Ayurvedic Pharmacopoeia of India. Part 1, Vol. 1, chap. Appendix. (Government of India Ministry of AYUSH, New Delhi), 2001, 161.
9. Krishnaveni S, Theymoli B, Sadasivam S. Phenol Sulphuric acid method. Food chem. 1984; 5(15):229.
10. Lowry OH, Rosebrough NJ, Farr AL, Randall RJ. Protein measurement with the Folin phenol reagent. Journal of Biological chemistry. 1951; 5(1):265-75.
11. Malik CP, Singh MB. Extraction and estimation of total phenols, Plant enzymology and histoenzymology (Kalyani Publishers, New Delhi, India), 1980, 286.
12. Khatiwora E, Adsul VB, Kulkarni MM, Deshpande NR, Kashalkar RV. Spectroscopic determination of total phenol and flavonoid contents of Ipomoea carnea. International Journal of Chem Tech Research. 2010; 2(3):1698-701.
13. Graham HD. Stabilization of the Prussian blue color in the determination of polyphenols. Journal of agricultural and food chemistry. 1992; 40(5):801-5.
14. Ghorai N, Chakraborty S, Gucchait S, Saha SK, Biswas S. Estimation of total Terpenoids concentration in plant tissues using a monoterpene, Linalool as standard reagent, Protocol Exchange. 2012; (5):256-262.
15. Kuo YJ, Yang YC, Zhang LJ, Wu MD, Kuo LM, Kuo YC. *et al*. Flavanone and diphenylpropane glycosides and glycosidic acyl esters from Viscum articulatum, Journal of natural products. 2010; 73(2):109-14.
16. Ross JA, Kasum CM. Dietary flavonoids: bioavailability, metabolic effects, and safety, Annual review of nutrition. 2002; 22(1):19-34.