Research Article

J. Ayu. Herb. Med.
2015; 1(1): 13-16
July- August

www. ayurvedjournal.com

Physicochemical evaluation of *Satva* extracted from male and female plants of *Guduchi* (*Tinospora cordifolia* (Willd.) Miers)

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ABSTRACT

Introduction: Guduchi (*Tinospora cordifolia* (Willd.) Miers) is a commonly used Ayurvedic herb, with wide range of therapeutic applications. The plant is dioecious, however, this factor is not given proper consideration while collecting the plant material for medicinal purposes. Minimal studies are available on male and female varieties of *Guduchi*. *Guduchi Satva*, the aqueous extracted starchy material of *Guduchi* stem is a widely used and highly potent single drug formulation. Factors such as type of species and stem size could affect the final yield and physicochemical profile of Guduchi Satva. However, no published information on such variations is available so far. **Aims and Objectives:** The present study is planned to evaluate quantitative variation and physicochemical profile in Satva extracted from male and female varieties of *Guduchi*. **Materials and Methods:** Total ten batches (5 batches from each group) of *Guduchi Satva* were prepared to get an average data and findings were systematically recorded. The obtained Satva was further subjected to relevant physicochemical parameters, qualitative tests for various functional groups and total alkaloid contents. **Results:** The study results revealed that average yield of dried *Satva* was more in female (3.18%) than male variety (2.25%). Variations in Organoleptic characters were insignificant. All functional groups were found to be same in each sample. Extractive values (water soluble extractive and methanol soluble extractive) and total alkaloid contents were found bit higher in *Satva* from female variety. The obtained data can be considered as standard for future studies.

Keywords: *Guduchi*, Dioecious, Physicochemical analysis, *Satva*, *Tinospora cordifolia*. .

INTRODUCTION

T*inospora cordifolia* (Willd.) Miers. (Family: Menispermaceae), commonly known as '*Guduchi*' or '*Giloe*', is a large, glabrous, deciduous, climbing vine. The stem is fibrous and the transverse section radially arranged wedge shaped wood bundles[1]. The stem is bitter, stomachic, cholagogue, diuretic, tonic, allays fever and thirst, cleanses blood, hepato-protective, cures jaundice, burning sensation, urinary and upper respiratory tract infections[2]. *Guduchi* has been subjected to numerous chemicals, pharmacological, pre-clinical and clinical investigations, and several compilations are available on the same[3-5]. The phenomenon of dioecy in plants is rarer and presently twenty five traditionally used plant species are identified as dioecious. Different genders are reported to exhibit few differences such as in growth rates, morphological and microscopical characters, and phytoconstituents levels[6-8]. *Guduchi* also show dioecism, however harvesters harvest both male and female varieties of *Guduchi* stem without knowing that which gender is more suitable for drug production.

Guduchi Satva (a whitish, aqueous extractable starchy substance from *Tinospora cordifolia*)[9] is indicated in *Daha* (burning sensation) and *Pittaja roga* (*Pitta* predominant disorders)[10] Owing to its effectiveness in febrile conditions, it is often referred as 'Indian Quinine'[10].

During preparation of *Guduchi Satva,* quantitative variations are observed in final yield. Rao (1969) reported yield of 0.48 % *Satva* with fresh stem and 1.20% with dried stem[11]. Salunke P (1997) reported extraction of 0.15 % of *Satva* with fresh stem[12]. Sharma R (2012) obtained maximum yield of *Satva* (2.7 %) from medium size (1.6-2.0 cm) fresh stems;[13] another scholar reported maximum yield from 1.0cm-1.5cm diameter fresh stems,[14] while later a scholar found maximum extraction from 16–18 mm diameter dry stems[15]. Factors such as differences in the species, size of stem, time of collection, maturity of plant and geographical variations may be responsible for such variations.

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Furthermore, Standard Manufacturing Procedure of *Guduchi Satva* and physico-chemical profiles are also well-documented in previous studies[16],[17]. Few differences in physicochemical profiles of male and female *Guduchi* are observed in earlier attempts[18]. However, no reports are available so far to find out comparative quantitative and physicochemical variations in *Satva* extracted from male and female varieties of *Guduchi*. Taking this in view, the present study has been undertaken.

MATERIALS AND METHODS

Procurement and identification of *Guduchi* stem

Fresh male and female varieties of *Guduchi*, spreading over *Nimba* (*Azadirachta indica*) tree (figure 1) were collected from the non-polluted, wild areas near the campus of Abhilashi Ayurvedic college and research institute, Abhilashi University, district Mandi, Himachal Pradesh, in between date 05/02/2015 to 06/02/2015. Identification was carried out on the basis of morphological data provided by earlier study[18]. The plants were authenticated in the Pharmacognosy laboratory of the same institute. For identification and authentication help was taken from various available official Databases and floras[19-22].

Male *Guduchi* Female *Guduchi*

Figure 1: Male and female *Guduchi* collected from their natural habitat with *Neem* tree

Mature fresh stems of 1.6-2.0 cm diameter were selected (figure 2), cleaned to remove the physical impurities and washed thoroughly with water. Two separate groups of male and female varieties were made. Total 10 batches (5 batches from each group) of *Guduchi Satva* were prepared to get an average data.

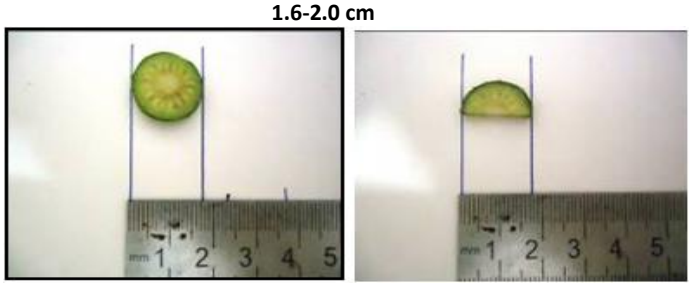
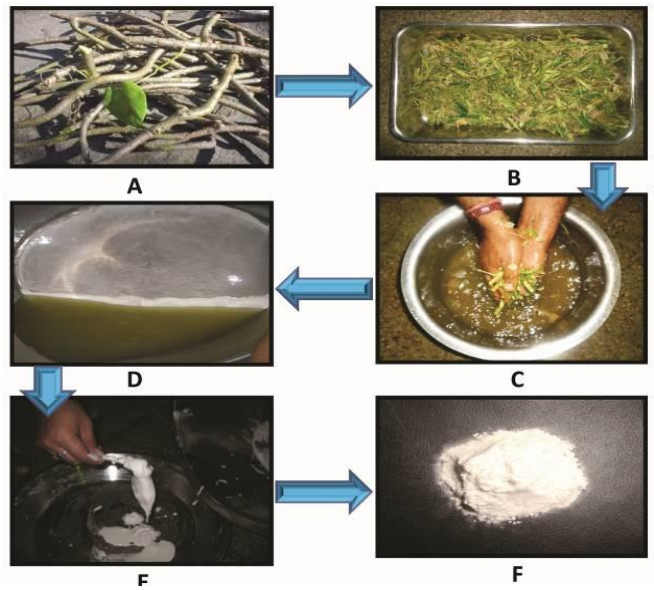


Figure 2: Stem diameter selected for pharmaceutical preparation

Method of preparation

1 kg fresh *Guduchi* stems were collected and washed thoroughly with potable water. Stems were chopped into pieces of 1.5-2 inches, pounded thoroughly into coarse slimy mass and and soaked in 6 times water for overnight. The material was macerated thoroughly on next day for about 1 hour and strained through four folded cotton cloth. The filtered liquid was kept undisturbed for 4 hrs for sedimentation, the supernatant liquid was decanted carefully and the starchy sediment settled at the bottom was scrapped into a tray. Later, it was air dried under running fan which took 2 hours and stored as *Guduchi Satva* in airtight glass jars. *Satva* was *Shankhabha* (clear white) in colour. The pharmaceutical process is illustrated in figure 3. Similar procedure was followed for remaining batches to maintain batch uniformity.



A- *Guduchi* stem, **B-** pounded coarse slimmy mass, **C-** maceration, **D-** removal of supernatant liquid, **E-** scrapping of white sediment, **F-** dried *Guduchi Satva*.

Figure 3: Unit operating procedure of preparation of Guduchi Satva

Analytical Study

Fresh *Satva* of both male and female *Guduchi* were analysed by employing various analytical parameters. Organoleptic characteristics (colour, odour, taste, touch, appearence) and physicochemical data like pH value, loss on drying at 110°C, ash value, water soluble extractive and methanol soluble extractive were recorded[23]. Qualitative analysis for various functional groups[24,25] and quantitative estimations of total alkaloids was also carried out[26]. Average value for 5 batches from each group was calculated and compiled in tables. (Table 2- 5)

RESULTS AND DISCUSSION

Fresh *Guduchi* was chosen for the study as classics instruct to use it always in fresh state[27]. *Guduchi*, which grows encircling *Neem* trees is said to be superior for therapeutic purposes, therefore *Neem Guduchi* was collected from the natural habitat[28]. The pharmaceutical process was carried out by adopting the classical guidelines[29].

Male and female varieties of *Guduchi* were collected and quantitative variation in *Satva* extraction was evaluated, as no any classical texts or contemporary study have mentioned that which gender of *Guduchi* is better for *Satva* extraction. Therefore *Guduchi Satva* was extracted from both varieties to distinguish the best gender for achieving more yield. The average values of pharmaceutical preparation of *Guduchi Satva* from male and female varieties of *Guduchi* are detailed in table 1. It is evident from present study that the yield of *Satva* from male and female stem was 2.25 % and 3.18 % respectively. The organoleptic results of present study reveal that the colour of obtained *Satva* was clear white in both varieties, which is consistent with classics where "*Shankhanibha*" colour of *Satva* is mentioned[30],[31]. Classical texts mentioned the taste of *Guduchi Satva* as *swadu* (sweet),[32] but few experts of current scenario explain *Guduchi Satva* as slight bitter[33]. In present study *Satva* was found the tasteless, thus validated the classical statements (table 2). The organoleptic characters showed insignificant difference between *Satva* samples of both varieties. Therefore the present study suggests that female variety should be opted to obtain more *Satva*. An earlier study reported relatively higher

starch and mucilage contents in female variety, suggesting that more yield of *Satva* can be expected from the female variety;[18] and the present study validates and supports the same.

Observations of physicochemical data (detailed in tables 3-4) revealed no difference in pH values. The findings of loss on drying and ash value also showed insignificant differences. Relatively higher extractive values (water soluble extractive and methanol soluble extractive) and total alkaloid contents in female variety. These findings are in concordance with recent reports which suggest that female plant is best for its therapeutic phyto-constituents as it is having a higher concentration of metabolites than that of the male variety[34].

Qualitative tests were carried out to detect the functional groups (table 4). Alkaloids, carbohydrates and starch was present, while glycosides, tannins, saponins, flavanoids, phenols, proteins and sterols were found absent in both *Satva* samples. Though qualitative study didn't revealed any difference in both genders, future comparative studies are requisite in this direction for quantitative estimation of levels of present phytoconstituents in these plants.

Table 1: Average values of 10 batches (5 batches from each group) of *Guduchi Satva*

Parameters	Male *Guduchi*	Female *Guduchi*
Fresh *Guduchi* stem (kg)	1	1
Diameter of stem (cm)	1.6-2.0	1.6-2.0
Size of stem pieces (inch)	1.5-2.0	1.5-2.0
Total quantity of potable water (L)	4	4
Duration for soaking (h)	12	12
Total time taken for maceration* (min.)	30	30
Total time taken for sedimentation (h)	4	4
Total time for drying (h)	2	2
Total yield (g)	22.5	31.8
% yield	2.25	3.18

*maceration was carried out with potable water at room temperature.

Table 2: Organoleptic characters of *Satva* of male and female *Guduchi*

S. No.	Parameter	Results	
		Satva* of Male *Guduchi	***Satva* of Female *Guduchi***
1	*Rupa* (colour)	Clear white	Clear white
2	*Rasa* (taste)	Tasteless	Tasteless
3	*Gandha* (smell)	Not specific	Not specific
4	*Sparsa* (touch)	Smooth	Smooth
5	Appearance	Amorphous powder	Amorphous powder

Table 3: Results of physico-chemical parameters of *Satva* of male and female *Guduchi*

S. No.	Parameter	***Satva* of Male *Guduchi***	***Satva* of Female *Guduchi***
1	pH value	5.06	5.06
2	Loss on drying at 110^{o}C (% w/w)	6.13	6.18
3	Ash value (% w/w)	0.65	0.64
4	Water soluble extract (% w/w)	22.48	24.09
5	Alcohol soluble extract (% w/w)	14.0	16.86

Table 4: Qualitative analysis of *Satva* of male and female *Guduchi*

S. No.	Functional group	***Satva* of Male *Guduchi***	***Satva* of Female *Guduchi***
1	Glycosides	-ve	-ve
2	Alkaloids	+ve	+ve
3	Tannin	-ve	-ve
4	Saponin	-ve	-ve
5	Flavanoids	-ve	-ve
6	Phenols	-ve	-ve
7	Proteins	-ve	-ve
8	Carbohydrates	+ve	+ve
9	Starch	+ve	+ve
10	Steroid	-ve	-ve

+ve =present, -ve =absent

Table 5: Percentage of total alkaloid contents in *Satva* of male and female *Guduchi*

S. No.	Sample	Total alkaloid content (%)
1	*Satva* of Male *Guduchi*	0.27
2	*Satva* of Female *Guduchi*	0.34

CONCLUSION

Yield of the *Guduchi Satva* largely depends on the size, environment, geographical region and variety of plant. Present study concluded that the yield of *Satva* from male and female stem was 2.25 % and 3.18 % respectively. Thus the female variety is suggested to be opted to obtain more *Satva*. The Organoleptic characters and functional groups were found to be same in both samples. Extractive values (water soluble extractive and methanol soluble extractive) and total alkaloid contents were found bit higher in *Satva* from female variety. The obtained data can be considered as standard for future studies.

Acknowledgement

The authors are grateful to Dr R.K. Abhilashi, Chancellor, Er L.K. Abhilashi, Pro-Chancellor, Prof H.S. Banyal, Vice-Chancellor, and Dr L. Raju, Dean Pharmacy, Abhilashi University, for their constant support and encouragement provided during the study.

FINANCIAL SUPPORT AND SPONSORSHIP

Abhilashi University, Chail Chowk, Mandi, Himachal Pradesh.

CONFLICTS OF INTEREST

None declared.

REFERENCES

1. BV Shetty, V Singh. Flora of Rajasthan. 1st ed. Merrut: Merrut publishers and Distributors; Vol 1: 756-100.
2. Vedavathy S, Rao KN. Antipyretic activity of six indigenous medicinal plants of Tirumala Hills. Andhra Pradesh, India. Journal of Ethnopharmacology 1991;33:193-6.
3. Sharma R, Amin H, Galib R, Prajapati PK. Therapeutic vistas of *Guduchi* (*Tinospora cordifolia* (willd.) Miers): a medico-historical memoir. J Res Educ Indian Med, 2014;XX(2):121-135.
4. Sharma R, Amin H, Galib R, Prajapati PK. Antidiabetic claims of *Tinospora cordifolia* (Willd.) Miers: critical appraisal and role in therapy. Asian Pac J Trop Dis 2015; 5(1): 670-680.
5. Sharma R, Amin H, Galib R, Prajapati PK. Antidiabetic appraisal of *Guduchi* (*Tinospora cordifolia* (Willd.) Miers): Insightful exposition of Ayurvedic claims. Rasamruta 2014;6(16):1-14.
6. Renner SS, Ricklefs RE. Dioecy and its correlates in the flowering plants. American Journal of Botany 1995;82:596–606.
7. Retuerto R, Lema BF, Roiloa SR, Obeso JR. Gender, light and water effects in carbon isotope discrimination, and growth rates in the dioecious tree Ilex aquifolium. Functional Ecology 2000;14(5):529–537.
8. Kleps RA, Myers TC, Lipdus RN, Henderson TO. A sex-specific metabolite identified in a marine invertebrate utilizing phosphorus-31 nuclear magnetic resonance. PLoS ONE 2007;2(8):e780.
9. Anonymous. The Ayurvedic Formulary of India, Ministry of Health and Family Welfare, Govt. of India, New Delhi, Second edition: 2003; Part-1, p560.
10. Mishra B, Vaishya R. Bhavprakasha Nighantu of Bhavamishra, 10th ed. Part 1. Varanasi: Chaukhambha Sanskrit Sansthan; 2002. p. 271.
11. Rao EV, Rao MV. Studies on the polysaccharide preparation (*Guduchi Satwa*) derived from *Tinospora cordifolia*. Indian J Pharm Sci 1981; 43:103-6.
12. Salunke P, Pimpalgaonkar PB A comparative study of *Guduchi Satva* and *Guduchi Ghana*. MD dissertation, R.A Podar Ayurveda college, Mumbai, 1997.
13. Sharma R, Harisha CR, Galib R, Patgiri BJ, Prajapati PK. Quantitative estimation of satva extracted from different stem sizes of *Guduchi* (*Tinospora cordifolia* (Willd.) Miers. J Pharm Sci Innov 2012;1:1:38-40.
14. Patil S, Choudhary AK. Pharmaceutical standardization of *Guduchi Satva*. International Journal of Pharmaceutical and Biological Archives 2013; 4(1): 109-113.
15. Pradhan D, Pandey AK. Estimation of starch extracted from different diameter thickness stem of *Giloe* (*Tinospora cordifolia* Willd Miers). Journal of Pharmacognosy and Phytochemistry 2013;2(4):162-163.
16. Sharma R, Amin H, G, Prajapati PK. Validation of standard manufacturing procedure of *Guduchi Satva* (aqueous extract of *Tinospora cordifolia* (Willd.) Miers) and its tablets. Ancient Sci Life 2013;33:27-34.
17. Sharma R, Amin H, Galib R, Prajapati PK. Seasonal variations in physicochemical profiles of *Guduchi Satva* (starchy substance from Tinospora cordifolia [Willd.] Miers). J Ayurveda Integr Med 2013;4:193-7.
18. Sharma R, Amin H, Prajapati PK. Physicochemical evaluation of male and female plants of *Guduchi* (*Tinospora cordifolia* (Willd.) Miers). The Journal of Phytopharmacology 2015; 4(2): 116-120.
19. Anonymous. Quality Standards of Indian Medicinal Plants. Vol. 1, New Delhi: ICMR; 2003. p. 212.
20. Anonymous. Database of Medicinal Plants used in Ayurveda. Vol. 3, reprint ed. New Delhi: CCRAS, Government of India, Ministry of Health and Family Welfare; 2005. p. 256.
21. Anonymous. Pharmacognosy of Indigenous drugs. Vol. 1, reprint ed. New Delhi: CCRAS, Government of India, Ministry of Health and Family Welfare; 1999. p. 324.
22. Anonymous. The wealth of India. Vol. 10, reprint ed. New Delhi: NISCAIR, Council of Scientific and Industrial Research, Govt. of India, Ministry of Health and Family Welfare; 2003. p. 252.
23. Anonymous. The Ayurvedic Pharmacopoeia of India. 1st ed., vol. 1. Part 1 Appendix 2.2.3-2.2.9. New Delhi: Govt. of India, Ministry of Health and Family Welfare; 1999. p. 213-36.
24. Baxi AJ, Shukla VJ, Bhatt UB. Methods of qualitative testing of some Ayurvedic formulations. 1st ed. Jamnagar: Gujarat Ayurved University; 2001. p. 5-12.
25. Khandelwal KR. Practical pharmacognosy techniques and experiments. 16th ed. Pune: Nirali Prakashan; 2006. p. 149-56.
26. Stephen K. Medicinal plant alkaloids: An introduction for pharmacy students. 2nd ed. Canada: University of Toronto press; 1965. p. 44.
27. Shastri P. Sharangadhara Samhita of Sharangadhara, Prathama Khanda, with the commentary of Adhamalla's Dipika and Kasiram's Gudhartha Dipika. 6th ed. 1/45. Varanasi: Chaukhamba Orientalia; 2005. p. 11.
28. Anonymous. Quality standards of Indian Medicinal Plants. Indian Council of Medical Research; New Delhi: 2003, Vol. 1, p 212.
29. Acharya YT. Siddha Yoga Sangraha. Rajyakshma Urahkshatadhikar. 13 th ed., Ch. 14. Nagpur: Shri Baidhnath Ayurved Bhavan Ltd.; 2008. p. 83‑4.
30. Shastri B. Commentary Vidhyotani of Shastri L on Yogaratnakara of Anonymous. 7th ed. Varanasi: Choukhamba Sanskrit Sansthan; 2002. p. 118.
31. Sharma H. Rasa Yoga Sagara. Reprint ed. Varanasi: Chaukhamba Krishnadas Academy; 2004. p. 378.
32. Navare K, editor. Nighantu Ratnakar of Panshikar VL and Soman KV, Part 1, 1st ed. Delhi: Choukhambha Sanskrit Sansthan; 2011. p. 75.
33. Hiremath SG. A Text Book Bhaishajya Kalpana. 2nd revised ed. Part 1, Satva Kalpana, Chapter 19, Varanasi: Chaukhamba Orientalia; 2005. p. 220.
34. Choudhary N, Singh S, Siddiqui MB, Khatoon S. Impact of Seasons and Dioecy on therapeutic phytoconstituents of *Tinospora cordifolia*, a Rasayana Drug. BioMed Research International, Volume 2014, Article ID 902138, 11 pages. http://dx.doi.org/10.1155/2014/902138.

HOW TO CITE THIS ARTICLE

Sharma R, Amin H, Prajapati PK. Physicochemical evaluation of *Satva* extracted from male and female plants of *Guduchi* (*Tinospora cordifolia* (Willd.) Miers). J Ayu Herb Med 2015;1(1):13-16.