Sennoside variations due to environmental changes in Sonamukhi: An Indian herb

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ABSTRACT

Sonamukhi, Senna, (Cassia angustifolia) used in traditional formulations for the treatment of various disease conditions. The physicochemical properties fluctuate with the season and in response to stress. The present study aim to evaluate the physiochemical fluctuations in the leaves of Sonamukhi and sennoside, an alkaloidal constituent in these leaves. Plant leaves were collected in every month of a year at different time and places. The leaves were evaluated for proximate phytochemical analysis, extractive values in petroleum ether, chloroform, ethyl acetate, ethanol, water, and determination of the concentration of component sennoside. Phytochemical composition was same in all season; however the levels of extractive values fluctuated in response to seasonal variations. To get herbal medicine with good effectiveness it is important to collect it from source at appropriate conditions. Ethanolic plant concentrate gives sennoside proportion in high range at spring, at highest altitude place and at early day.

Keywords: Effectiveness, environmental condition, sennoside, seena, traditional medicine

INTRODUCTION

Sonamukhi, Senna (*Cassia angustifolia*) is a popular herbal medicine due to presence of active compounds in it. Senna is rich in a constituent sennoside that helps to lower the constipation. Different symptoms of constipation involve gastrointestinal tract related disorders such as bowel movement, hardness of stools and feeling of uneasiness. Currently available medication has limitations to cure the disease due to its multifactorial causes of constipation and treatment in single range (Gallagher and Mahony, 2009). Senna is among the most well-known laxative ingredients in teas that contains glycosides that imparts laxative action by stimulating bowel movement of stomach. To cure of GIT disorders, Senna act as a popular safe and effective due to its laxative action in stomach and so used commonly (Satish *et al.*, 2021).

Collection of genuine raw materials is one of the necessary steps during preparation of a quality product. Season has impact on active principles in medicinal plants. In ancient ayurvedic texts, Charaka and Susrutha mentioned time and seasons for collection of medicinal plant parts used for the medicine preparation. In Ashtangahridaya, the factors affecting quality of the herbs have been stated as (i) period of harvesting, (ii) age, (iii) soil, (iv)

altitude, (v) post-harvest conditions. There is no general rule for the harvesting time for better yield of specific secondary metabolites. The seasonal variation is associated with the vegetative and reproductive stages of the plant, it has direct influence with the variation in chemical constituents of the plants (Jayanthy, 2013). Appropriate period of collection of plant part was mentioned in Charaka samhita (Kalpam), where it was mentioned that the roots (Ashwagandha, Ginger) should be collected only after the completion of seed shedding and in the case of fruits (Pepper, Ficus), time should be near the ripening period i.e., full grown but unripe (Sharma, 2007). Phytochemical changes due to various seasons were reported by Palshikar and Shanmugapandiyan (2023). The purpose of the study is to evaluate specific season, time and place (altitude) for collection of particular herbal raw material like sonamukhi, senna, *(Cassia angustifolia)* so that the active component like sennoside content will be in higher proportion and the effect it will create is to improve potency of pharmaceutical product.

MATERIALS AND METHODS

The plant material was collected from places nearby Pune city, Maharashtra, India in every month of the year 2023-24, i.e., in the rainy season (June, July, August, September), winter (October, November, December, January) and summer (February, March, April, May), from places of different altitude i.e. low (560 meters-Pune city), medium (920 meters-Atkarwadi villege) and high (1,412 meters-Sinhgad fort) at morning 6 am. Authentication was done by Taxonomist of the Botanical Survey of India, Pune. A voucher specimen (No.BSI/WRC/100-1/Tech./2023/07) was deposited in the Herbarium of Botanical Survey of India, Pune. Experimentation and evaluation was performed at laboratory of Genba Sopanrao Moze College of Pharmacy, Wagholi, Pune.

Phytochemical screening: The method was followed as detailed by Mahire and Patel (2020). 1000 gm coarse powder of Sonamukhi leaves was taken and extracted by continuous hot extraction method using soxhlet apparatus (Borosil, India) with different solvents of increasing polarity such Petroleum ether, Chloroform, Ethyl acetate (Reachem laboratory chemicals Pvt. Ltd., India), Ethanol (95 %) (Jiang Su Huaxi International Trade Co. Ltd., China) respectively. Each time before extracting with the next solvent, the material was dried. All the extracts were concentrated by distilling the solvent and the extracts were dried on water bath. Then consistency, color, appearance of the extracts and their percentage yield were noted. The extracts obtained from successive solvent extraction were then subjected to various qualitative chemical tests to determine the presence of various phytoconstituents like alkaloids, glycosides, carbohydrates, phenolics and tannins, proteins and amino acids, saponins and phytosterols using reported methods.

HPTLC Analysis: HPTLC of Ethanol extracts (high yield) was performed for sennoside. Weighed accurately 20 mg of each extracts individually into volumetric flask and to it add 10 ml methanol. Dissolved and filtered it with whatman filter paper no. 1 and used for HPTLC analysis.

Standard preparation: Weighed accurately 10 mg of each standard individually into volumetric flask and to it add 10 ml methanol. Dissolved and filtered it with whatman filter paper no. 1 and used.

Procedure: The procedure adopted as per method detailed by Nicoletti (2011). Development of HPTLC plates was performed by using the automatic and reproducibly developing chamber, saturated with the mobile phase for 20 minute at 25^0 C. The developing solvents were carefully studied before the analysis. The length of the chromatogram run was 70 mm from the point of application. The developed layers were allowed to dry at 100^0 C for 5 min and then derivatised with a selected solution. The

plate is heated at 100^0 C for 2- 3 min and then dipped into anisaldehyde sulphuric acid. Finally, the plates are dried for 5 min at 120^0 C before inspection. All treated plates were then inspected under a UV light at 254 nm under reflectance at a CAMAG TLC visualizer, before and after derivatisation with standard AUC 2650 and using Pet. ether: Ethyl acetate (6:4) mobile phase. Win CATS software 1.4.4 was used for the documentation of derivatised plates.

RESULTS AND DISCUSSION

Analysis of sonamukhi leaves ethanolic extract in various seasons of the year *i.e.*, from January to December in low, medium and high altitude places, Sennoside alkaloidal content vary and its percentage obtained as 6.36 % w/w in April (Summer), 6.12 % w/w in December (Winter) and 6.75% w/w in August (Rainy) season (Table 1). It shows that, alkaloidal content percentage is significantly variable in rainy season *i.e.*, in August, at high altitude place as compared to medium and low altitude place.

HPTLC analytical method was used to confirm the availability of sennoside in ethanolic plant extract with its yield obtained as 3.44 mg/gm in April (summer), 4.36 mg/gm in August (rainy) and 3.32 mg/gm in December (winter) in high altitude. It shows more yield of active compound sennoside in August month *i.e.*, rainy season of the year (Table 2).

It was reported that analysis of Sonamukhi leaves extracts shows presence of alkaloids, sennoside, oils, lipids, glycosides etc. (Junaid, 2020). Results stated that, HPTLC analytical pattern gets vary according to external environmental conditions (Palshikar *et. al.*, 2023) Sennoside content is significantly variable in rainy season i.e. in August, at morning time and high altitude (Fig. 1, 2). Current research work can be useful for selection of month, place and time of harvesting crude drugs. Tavhare *et al.* (2016) proved the effect of seasonal variations on the phytoconstituents of *Asvagandha* in relation to lunar cycles. Environmental factors like climate, altitude, rainfall etc. may affect growth as well as quality of bioactive constituents present in it even when it is produced in the same region (Kokate *et al.,* 2004 and Geetha, 2014). Seasonal changes shows variation in yield depends on which seasons receive water additional or less. Increases in spring precipitation led to growth reductions, where as increases in summer precipitation led to increases in growth (Santos *et al.,* 2012).

CONCLUSION

From the Current research work it was observed that, chemical components present in plant material get vary according to external conditions related with the season, time and place of collection of the plant. In month of August sennoside content found to be more at morning and at 638-meter-high altitude.

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CONFLICT OF INTEREST STATEMENT

The author declare that he has no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Table 1: Monthly Variation in sennoside alkaloids with altitude n= 3 P< 0.05.

A.	Month											
	1	2	3	4	5	6	7	8	9	10	11	12
L.	5.45 ±0.57	6.10 ±1.00	6.25 ±1.00	6.50 ±1.00	6.60 ±1.00	6.05 ±1.00	6.33 ±1.52	6.37 ±1.52	6.32 ±1.15	6.50 ±1.00	5.27 ±1.15	5.78 ±1.15
M.	5.74 ±0.57	6.23 ±1.00	6.15 ±1.00	6.23 ±1.00	6.13 ±1.00	6.06 ±1.00	6.03 ±1.52	6.33 ±1.52	6.46 ±1.15	6.04 ±1.00	5.72 ±1.15	5.35 ±1.15
H.	5.46 ±0.57	6.14 ±0.57	6.24 ±0.57	6.36 ±0.57	6.39 ±0.57	6.34 ±0.57	6.07 ±1.15	6.75 ±1.15	6.73 ±0.57	6.39 ±0.57	6.05 ±1.00	6.12 ±1.00

A= Altitude, L= Low, M= Medium, H= High

Table 2: Monthly Variation in Sennoside alkaloidal HPTLC Yield mg/g with altitude n= 3 P< 0.05.

A.	Month											
	1	2	3	4	5	6	7	8	9	10	11	12
L.	2.10 ±0.20	2.12 ±0.26	2.23 ±0.55	2.43 ±0.11	2.82 ±0.05	3.10 ±0.05	3.27 ±0.05	3.34 ±0.05	3.23 ±0.11	2.42 ±0.05	2.25 ±0.10	2.62 ±0.60
M.	2.52 ±0.20	2.58 ±0.32	2.84 ±0.65	3.03 ±0.10	3.46 ±0.11	3.78 ±0.05	3.84 ±0.05	3.93 ±0.05	3.82 ±0.15	2.97 ±0.10	2.72 ±0.10	3.15 ±0.60
H.	3.24 ±0.58	2.85 ±0.05	3.25 ±0.60	3.44 ±0.11	3.83 ±0.05	4.17 ±0.05	4.22 ±0.05	4.36 ±0.05	4.24 ±0.11	3.49 ±0.05	3.23 ±0.10	3.32 ±0.05

A= Altitude, L= Low, M= Medium, H= High

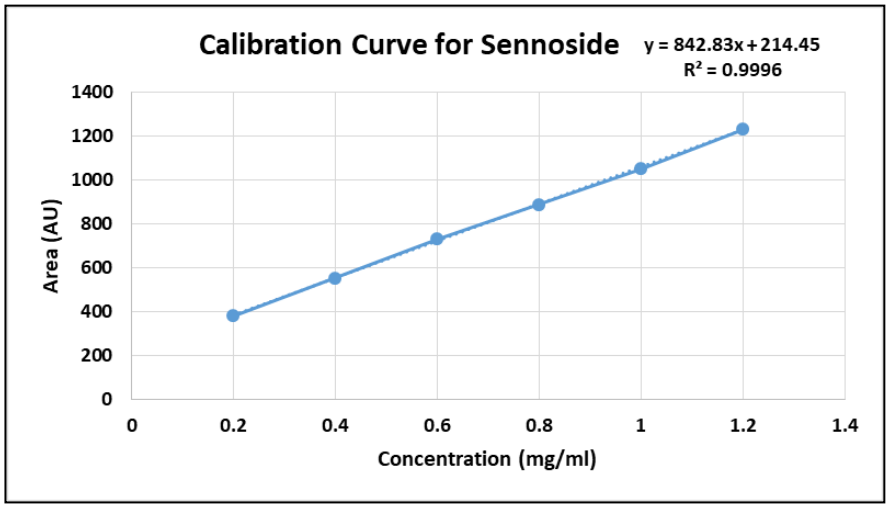
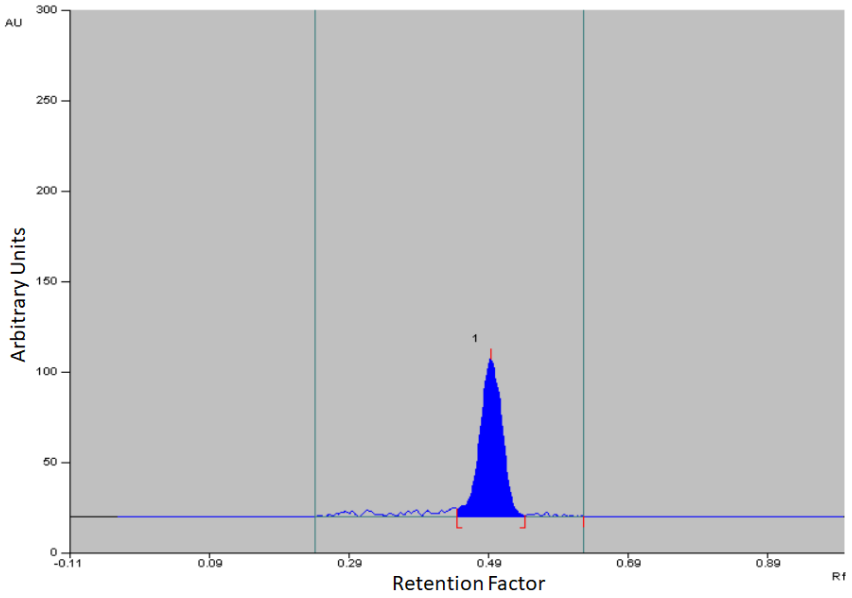
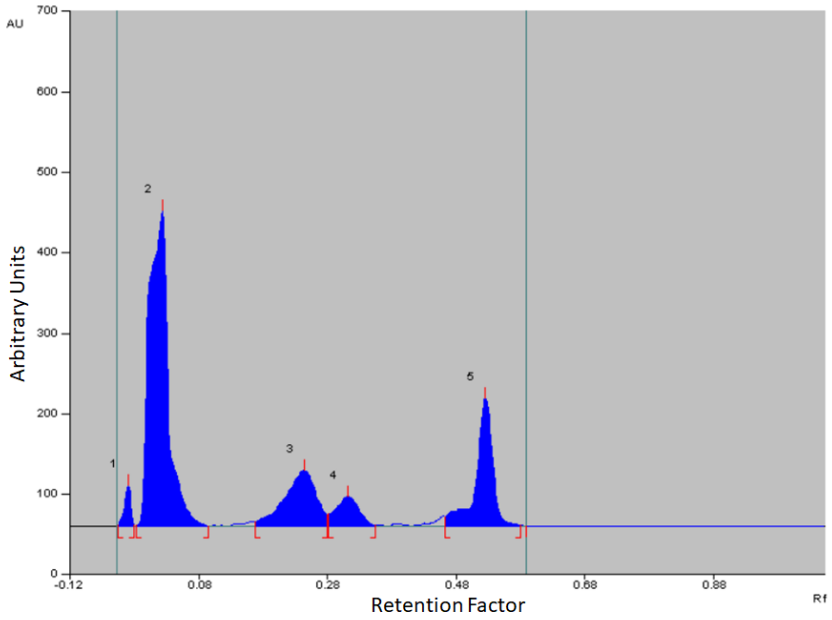


Figure: 1 Calibration curve of Sennoside

Standard Sennoside



Ethanolic extract (April)



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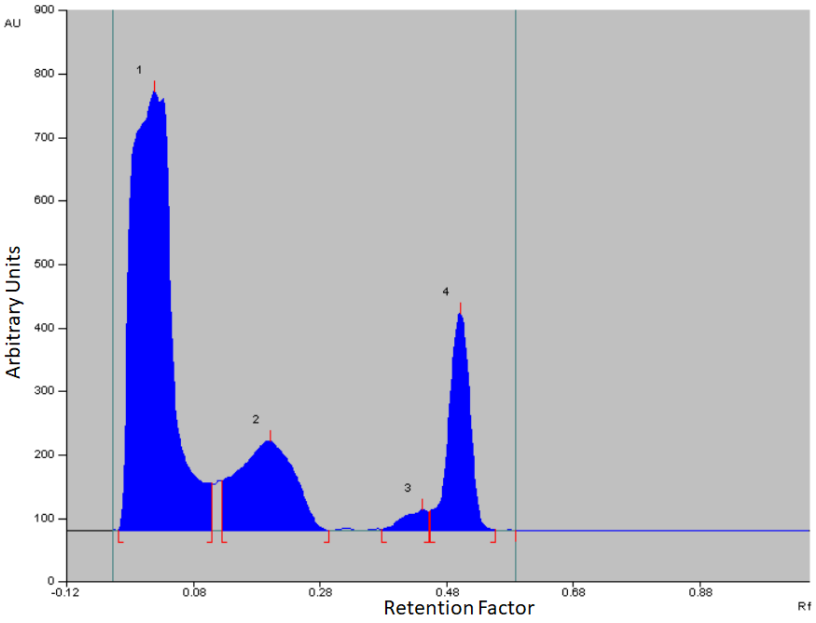

Ethanolic extract (December)

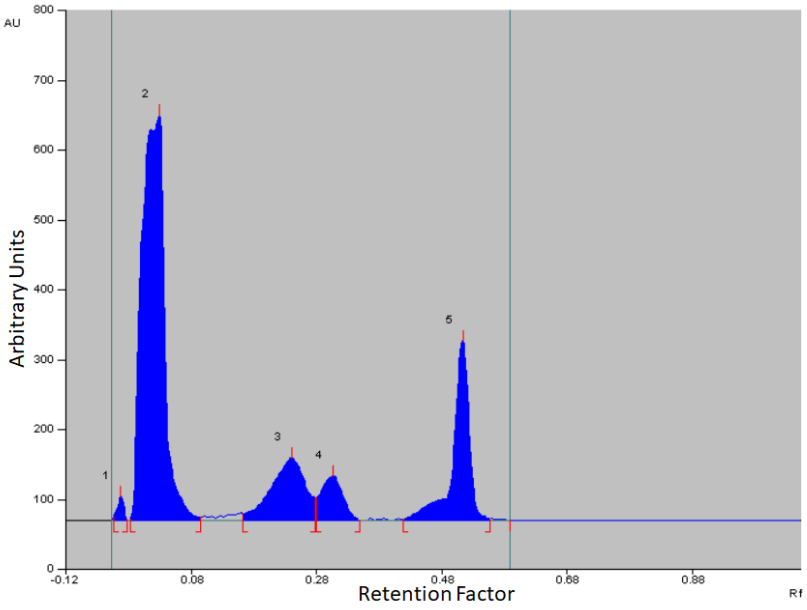

Figure: 2 Chromatogram of Sennoside