

Rasanirdharana (Assessment Of Taste) Of An Extra- Pharmacopeial Drug Fragaria X Ananassa Duch. [Strawberry]

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Abstract

Ayurvedic literature describes numerous drugs in terms of their nomenclature, properties, and therapeutic applications. However, many medicinal substances with significant therapeutic potential and widespread acceptance among various ethnic communities remain undocumented in the classical texts. These are not described in Ayurvedic Pharmacopoeia and hence extra-pharmacopeial in Ayurvedic field. Such drugs are collectively referred to as Anukta Dravya. The pharmacological action of an Anukta Dravya can be understood through its Rasapanchaka, namely Rasa (taste), Guna (quality), Veerya (potency), Vipaka (post-digestive transformation), and Prabhava (specific action)⁽¹⁾. Among these attributes, Rasa(taste) perceived through the gustatory receptors⁽²⁾ of the tongue so Rasa is the only attribute that can be directly assessed through perception⁽³⁾.

Fragaria x ananassa Duch. is an extra-pharmacopeial drug with several ethnomedicinal claims. However, no scientific attempts have been made to explore its pharmacological properties or to evaluate its Rasapanchaka according to Ayurvedic pharmacological principles.

As per the Aptavachan (word of an authoritative person) जगत्त्येवमनौषधम् न किञ्चिद्विद्यते द्रव्यं ||⁽⁴⁾ There is no substance in the world which cannot be used as a Medicine. So it is needed to be assess the pharmacological properties of anukta dravyas .Therefore, to assess the properties of the drug, Rasa analysis was conducted using the “taste perception method” by administering one well-ripened strawberry fruit to 30 volunteers⁽⁵⁾ The questionnaire was prepared for the analysis where volunteers noted their responses. Final Data were collected using a structured questionnaire prepared based on Ayurvedic literature.

The majority of respondents identified Madhur Rasa (sweet taste) as the predominant Rasa (75.53%), while Amla Rasa (sour taste) was perceived as the Anurasa (after taste) (48.86%). Hence, it was concluded that Fragaria x ananassa Duch. possesses Madhur Rasa with Amla Anurasa. Its seeds contribute by Kashaya and Tikta Anurasa.

Key Words – Strawberry, Dravyaguna, Rasanirdharan, Taste perception, Fragaria x ananassa Duch.

Introduction

Ayurveda explains human physiology, and drug pharmacology based on its fundamental principles such as Tridosha and Panchamahabhuta⁽⁶⁾. The concepts of pharmacodynamics and pharmacokinetics⁽⁷⁾ are also interpreted through unique Ayurvedic principles collectively described under the Saptapadartha, namely Dravya (substance/drug), Rasa (taste), Guna (quality), Veerya (potency), Vipaka (post-digestive transformation), Prabhava (specific action), and Karma (pharmacological action). Among these attributes, Rasa is considered the foremost parameter for assessing the pharmacological behaviour of a Dravya.

Using these principles, Ayurvedic classics have documented numerous medicinal substances along with their nomenclature, properties, and therapeutic applications. However, several drugs possessing significant medicinal value and widely used among different ethnic communities remain undocumented in the classical texts. Such substances are generally referred to as Anukta Dravya.

The analysis of Rasapanchaka is considered essential for the inclusion of Anukta Dravyas in the Ayurvedic Pharmacopoeia of India. According to Ayurveda, six types of Rasa are recognized, namely Madhura (sweet), Amla (sour), Lavana (salty), Tikta (bitter), Katu (pungent), and Kashaya (astringent)⁽⁸⁾. In contrast, modern science recognizes five basic tastes: sweet, sour, salty, bitter, and umami. Rasa, meaning taste, is identified through its characteristic sensory perception. Assessment of Rasa can be carried out by two methods: the taste perception method and the taste threshold method.

Fragaria x ananassa Duch., commonly known as strawberry, belongs to the family Rosaceae and is one of the most widely cultivated berry fruits in the world. The plant is a perennial herb growing to 0.3 m (1ft) characterized by trifoliate leaves, white

flowers, creeping runners, and bright red fleshy fruits. Botanically, the edible portion of the strawberry is considered an accessory fruit, while the small seed-like structures present on the outer surface are the true fruits known as achenes⁽⁹⁾. The many botanists have studied about the strawberries like "Strawberries" by James F. Hancock: Part of the Crop Production Science in Horticulture series (2nd Edition), this book details strawberry breeding, cultivation, botany, and global production. "Strawberries: Production, Postharvest Management and Protection" by R. M. Sharma Focuses heavily on crop management, disease prevention, and fruit handling. Strawberry is a source of vitamin C, folate, phenolics, anthocyanins, and other bioactive compounds, and its taste is mainly shaped by the balance of sugars, organic acids, and aroma components⁽¹⁰⁾. But in Ayurveda literature we unable to find the reference regarding its pharmacological properties, morphology & and its medicinal properties.

Methodology

Study Design –

This single-center, exploratory, questionnaire-based taste perception study was conducted at Bharati Vidyapeeth College of Ayurveda and Research Centre, Pune, Maharashtra, India. involving healthy volunteers. The study protocol was developed based on the methodology described in a previously published preliminary Rasa Nirdhāraṇa study on *Leonotis nepetifolia*, with necessary modifications implemented to address the specific objectives of the current study.^{(5),(11)}

Institutional Ethics Committee approval was obtained [Approval number BVDUCOA/EC/258/2026-27], and written informed consent was secured from all participants in accordance with the ICMR National Ethical Guidelines for Biomedical and Health Research Involving Human Participants.

Methodology –

Rasa analysis of *Fragaria x ananas* Duch. was done by using 'The taste perception method' following the guidelines of Prof. S.C. Dhyani⁽¹²⁾. It was done by administering well ripened strawberry fruit to 30 healthy volunteers and analysis of the perceived data.

Plant material & sample preparation –

The fruits were purchased from the local market of Wai, Maharashtra which was sourced from the Mahabaleshwar. It was a cultivated sample. Mahabaleshwar is high altitude place which is suitable for cultivation of strawberry. The material was identified and confirmed at "Bharati Vidyapeeth College of Ayurveda and Research Centre, Dept of RSBK". The fruits were cleaned initially by using salt water to remove physical and chemical impurities over it and again washed it by pure water and dried in shade.

Questionnaire Development:

A structured questionnaire was designed based on the characteristic features of each Rasa described in classical Ayurvedic text as per Ashtanga Hrudaya- Sutrasthana chapter 9(13). The questionnaire included parameters to assess sensory reactions experienced in the tongue, buccal cavity, throat, and palate, eyes, nose, during drug testing. A total of 17 questions were incorporated for evaluation. The table 1 shows the Questionnaire chart. Direct response in terms of Rasa and Anurasa were also recorded.

Table-1. Questionnaire for Rasanishchiti of Strawberry fruit

Sr.No.	Question regarding characteristics/ attribute	Responses of the volunteer (Yes/No/Ans)	Corresponding rasa (Rasa / Anurasa)
1	Vaktram anulimpati ⁽¹⁴⁾ (Do you have a stickiness/ coated sensation in your mouth)?		
2	Dehasya Aswadyamanam ⁽¹⁴⁾ (Do you experience a pleasant or soothing feeling)		
3	Dehasya Lhadana /Alhadan ⁽¹⁴⁾ (Do you experience refreshment after eating the strawberry fruit?)		

4	Akshi- Bhruva Nikoch ⁽¹⁵⁾ (Do you experience instant closing eyes and eyebrows after eating the strawberry fruit?)		
5	Dantanam harshayati ⁽¹⁵⁾ (Do you feel the tingling /Sensitivity sensation in your tooth ?)		
6	Romaharshanyati ⁽¹⁵⁾ (Do you experience goosebumps of body?)		
7	Kshalayati mukham ⁽¹⁵⁾ (Does you feel cleansing orsensation inside of your mouth and buccal cavity?)		
8	Syandayati Aasyam ⁽¹⁶⁾ (Do you experience watering inside the mouth ?)		
9	Kapol-Gala dahakaroti ⁽¹⁶⁾ (Do you experience burning sensation in buccal cavity and throat after eating the strawberry fruit)		
10	Jivhgra udvega ⁽¹⁷⁾ (Do you feel instant Agitation at tip of the tongue ?)		
11	Jivha Chimchimayanam karoti ⁽¹⁷⁾ (Do you feel irritation in your throat and buccal cavity?)		
12	Sravati nasa ⁽¹⁷⁾ (Do you experience nasal secretion after you eat the fruit?)		
13	Sravati Akshi ⁽¹⁷⁾ (Does your eyes start watering after you eat the fruit?)		
14	Kantham Vibandhayati ⁽¹⁸⁾ (Do you experience the obstruction in your throat after eating the fruit ?)		
15	Jivha jadyatwa ⁽¹⁸⁾ (Do you feel the stiffness of/ heaviness of the tongue after eating the fruit ?)		
16	Rasanam Pratihanti ⁽¹⁹⁾ (Do you feel the tastelessness after eating the fruit ?)		
17	Vishadayati aasyam ⁽¹⁹⁾ (Do you experience the clear &cleansing inside the mouth after eating the fruit ?)		

Selection of Volunteers and Pre-Experimental Instructions (B.I.d experiment guidelines)

A total of 30 healthy volunteers aged above 18 years, including both male and female participants, were selected for the study. All The methods of the study, its rationale and their role as a participant were explained in detail to each volunteer. Written informed consent was obtained from all volunteers prior to the commencement of the experiment. Before initiation of the procedure, detailed guidelines regarding the experiment were explained to all volunteers. The volunteers were instructed to consume only light food at least two hours prior to the experiment, and no food intake was permitted thereafter until completion of the study procedure. The study will be conducted at 10:00 a.m. considering the exclusion of Kapha Kala. All participants will be provided with comfortable seating arrangements in a hall maintained at a room temperature of 26–28°C. Before the experiment, all participants were provided with lukewarm water for rinsing the mouth to maintain uniform oral conditions. A brief training session was conducted on the previous day to familiarize the volunteers with the experimental procedure, observations to be made, and the method of documenting their responses in the provided proforma.

B.1.d. Experiment⁽²⁰⁾

On the day of the experiment, all volunteers were instructed to assemble in the hall at 10:00 a.m. Upon arrival, each volunteer was provided with lukewarm water for mouth rinsing to ensure uniform oral conditions before the test. The volunteers were then asked to sit comfortably and relax for five minutes. After the resting period, one strawberry fruit was distributed simultaneously to all participants. The volunteers were instructed to administer the fruit orally and retain it on the tongue for 30

seconds before swallowing, to allow uniform exposure of the taste buds to the test sample. Following the tasting procedure, each volunteer was instructed to carefully observe the taste sensation and record their responses in the provided questionnaire proforma.

Results

Statistical analysis: The responses obtained for each characteristic, along with the perceived Rasa and Anurasa assessed by each volunteer, were tabulated using the manual tally method. The collected data were subsequently analysed using descriptive statistical methods, including calculation of means and proportions.

Among the 30 volunteers who participated in the study, 75.53% of the respondents perceived Madhura Rasa, while 48.86% experienced Amla Rasa (Table 3).

Table-1. Symptoms Experienced by the Respondents

Sr.No	Question regarding characteristics/ sensory perception	Lakshan type	Corresponding Rasa	Number reported (n=30)		%
				Yes	No	
1	Vaktram anulimpati (Do you have a stickiness/ coated sensation in your mouth) ?	Individual	Madhur	15	15	50
2	Dehasya Aswadyamanam (Do you experience pleasant or soothing feeling)	Individual	Madhur	27	3	90
3	Dehasya Lhadana /Alhadan (Do you experience refreshment after eating the strawberry fruit?)	Individual	Madhur	26	4	86.6
4	Akshi- Bhruva Nikoch (Do you experience instant closing eyes and eyebrows after eating the strawberry fruit?)	Individual	Amla	7	23	23.33
5	(Dantanam harshayati) (Do you feel the tingling /Sensitivity sensation in your tooth ?)	Individual	Amla	14	16	46.6
6	(Romaharshanyati) (Do you experience goosebumps of body?)	Individual	Amla	1	29	3.33
7	Kshalayati mukham (Does you feel cleansing sensation inside of your mouth and buccal cavity?)	Individual	Amla	22	8	73.33
8	Syandayati Aasyam (Do you experience watering inside the mouth ?)	Individual	Lavan /Amla	23	7	76.66

9	Kapol-Gala dahakaroti (Do you experience burning sensation in buccal cavity and throat after eating the strawberry fruit)	Individual	Lavan	0	30	0
10	Jivhgra udvega (Do you feel instant Agitation at tip of the tongue ?)	Individual	Katu	2	28	6.66
11	Jivha Chimchimayanam karoti (Do you feel irritation in your throat and buccal cavity?)	Individual	Katu	2	28	6.66
12	Sravati nasa (Do you experience nasal secretion after you eat the fruit?)	Individual	Katu	0	30	0
13	Sravati Akshi (Does your eyes start watering after you eat the fruit?)	Individual	Katu	0	30	0
14	Kantham Vibandhayati (Do you experience the obstruction in your throat after eating the fruit ?)	Individual	Kashay	0	30	0
15	Jivha jadyatwa (Do you feel the stiffness of/ heaviness of the tongue after eating the fruit ?)	Individual	Kashay	6	24	20
16	Rasanam Pratihanti (Do you feel the tastelessness after eating the fruit?)	Individual	Tikta	3	27	10
17	Vishadayati aasyam (Do you experience the clear &cleansing inside the mouth after eating the fruit ?)	Individual	Tikta	23	7	76.66

Table-3. Average response % by volunteers according to six Rasa

Rasa	Madhur	Amla	Lavan	Katu	Tikta	Kashay
Average response %	75.53	48.86	0	3.33	43.33	10

Discussion

In Ayurveda, the pharmacological action of a substance is understood through a holistic framework known as Dravyaguṇa. It is assessed using five key principles—rasa (taste), guṇa (qualities), vīrya (potency), vipāka (post-digestive effect), and prabhāva (specific action)—which together explain its physiological and therapeutic effects. These principles are considered manifestations of the five mahābhūtas, reflecting both the structure and activity of the substance. So, the rasa of the *Fragaria x ananassa* Duch. was evaluated using a structured questionnaire. Data analysis indicated that the drug predominantly possesses

Madhur rasa (75.53%) with Amla (48.86%) as its prime anurasa, along with Tikta (43.33 %) and Kashaya (10 %). Conversely, the lowest experiential values were recorded for Katu (3.33%) and Lavan (0%), indicating a significant variance in the sensory outcomes of the study. Rasa(taste) of the substance is the foremost tool in Ayurveda to assess and determine the pharmacological properties and actions of the substance.

Modern food chemistry supports this, explaining that the familiar sweet-sour balance of ripe strawberries is created by the combination of sugars, organic acids, and volatile aromas.⁽²¹⁾

As per Astang Hruday Sutrasthan chapter 9, Vagbhat explained that Madhura rasa and Amla rasa are predominantly associated with the Prithvi-Jala and Prithvi-Agni Mahabhutas, respectively, and are therefore considered to possess kapha vruddikar & Vata-Pitta shamaka properties. Madhura rasa, being dominant in qualities such as guru, snigdha, and picchila, exhibits therapeutic actions including brimhana, balya, sandhankara, vayahsthapana, and kanthya effects. Whereas Amla rasa is characterized by qualities such as snigdha, ushna, and laghu, which may aggravate Pitta and Kapha doshas. It is known for its pharmacological actions such as hridya (cardioprotective), agnideepana, amapachana, ruchya, preenana, and kledana. Additionally the tikta [bitter] and Kashaya [astringent] aftertastes were due to the seeds [achenes] over the surface of strawberry. Botanically, a strawberry is not a true fruit or a berry; it is classified as an "aggregate accessory fruit." The red, fleshy part we eat is actually the swollen flower stem. The tiny "seeds" dotting the outside are actually individual dry fruits, known as achenes. Although strawberry achenes constitute only a small portion of the fruit, they make a significant contribution to the fruit's overall antioxidant content and capacity, indicating their potential as a valuable health-promoting by-product.⁽²²⁾

Strawberry is one of the most widely consumed and commercially demanded fruits worldwide due to its attractive flavour, nutritional value, and versatility in food products. Over 300 volatile compounds contribute to a strawberry's distinct fragrance. It is considered a heat-promoting fruit and is traditionally valued for its refreshing, digestive, and rejuvenating properties⁽²³⁾. Strawberries possess medicinal potential owing to the presence of active principles such as anthocyanins, ellagic acid, flavonoids, vitamin C, and phenolic compounds, which contribute to their antioxidant⁽²³⁾, anticancer⁽²⁴⁾ and anti-inflammatory activities. These bioactive constituents support cardiovascular health, immunity, and overall metabolic well-being.

According to the Ayurvedic classics, the properties and therapeutic actions attributed to fruits possessing Madhura and Amla rasa in classical texts are in concordance with the observed properties and pharmacological activities of Strawberry described above. The predominance of these rasas may account for its nourishing, digestive, refreshing, and health-promoting effects. Due to dominance of Madhura and Amla taste and its actions, this Dravya is Rasa Pradhan. Due to the juicy nature, the popular recipes of strawberry include squash, syrup and jam, which is comparable to dietary dosage form Raga Shadav in Ayurved.

Dry powdered form or boiled form of other woody/ dry herbs is also used for rasa nirdharana, however as strawberry is pulpy fruit and its perishable, its powder was not prepared. It was used in fresh and unprocessed form.

In the taste perception, watering inside the mouth (syandayati asyam) is common response due to amla and lavan rasa. As per the classics of Ayurveda, watering of mouth is attributed towards lavan rasa, however even amla rasa shows similar attribute.

Conclusion

The study reveals that, Mahabaleshwar Strawberry predominantly exhibits Madhura rasa with Amla anurasa. Its seeds over the surface contribute by slight Kashaya -astringent and tikta-bitter taste. The perception of Madhura rasa by most volunteers indicates the paradhanata of madhur rasa which possesses nourishing, brimhana (nourishing), and balya (strengthening) properties, while the presence of amla anurasa supports its hridya[cardioprotective], and agnideepana (appetizing action) actions. These findings are in accordance with the Ayurvedic principles of Dravyaguna. The rasa profile of strawberry may therefore contribute to its rejuvenating, health-promoting, and therapeutic potential. The findings support the usefulness of rasa nirdharaṇa as an initial Ayurvedic method for evaluating extra-pharmacopeial substances.

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