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Standard Protocol for Quality Assessment of Raw Medicinal Plants Material on The basis of Rasa

DEPARTMENT OF DRAVYAGUNA

ALL INDIA INSTITUTE OF AYURVEDA, NEW DELHI

NATIONAL INSTITUTE OF AYURVEDA, JAIPUR

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PROCEEDINGS OF THE SERIES OF WORKSHOPS HELD AT AIIA, NEW DELHI & NIA, JAIPUR

STANDARD PROTOCOL FOR QUALITY ASSESSMENT OF RAW MEDICINAL PLANTS MATERIAL ON THE BASIS OF RASA

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FOREWORD

It gives me immense pleasure to present here this protocol which is the outcome of brain storming workshops over three years. Although Ayurveda is an age old tradition to maintain the health, totreat various ailments and is successful for all the human beings there are certain limitations while validating the basic concepts in a robust manner.

The tradition of *Tadvidyasambhashain Ayurveda* also dates back to thousands of years which shows conversations of many Rishis who were well versed with the fundamental principles of Ayurveda and allied Shastras. This has led to the development of this science. The present document may be considered as the outcome of such effort in modern times where experts have given their inputs for its development.

Dravyaguna is the important part of Ayurveda Shastra to understand the mode of action of drugs and food in Ayurveda. Although it is not considered under the eight branches of Ashtanga Ayurveda but Dravya has been given utmost importance as far asDinacharya,Ritucharya treatment etc.are concerned. Hence the basic concepts of Dravyaguna i.e. Rasa, Guna, Virya, Vipaka and Prabhava are also of very much important which need to be understood.

There are certain studies which were carried out in the past to validate these concepts but those were scattered at various places. The present attempt may be a pathway to establish one of the concept i.e. Rasa in an organized way. In this various experts all over the country have given their contribution to prepare this protocol. This protocol is also open for expert comments from all over the country so that it can be updated and amended accordingly.

National Medicinal Plant Board is always behind such efforts, however it must be admitted that this is outcome of tireless and combined efforts of IEC section, NMPB; Dravyaguna Departments from All India Institute of Ayurveda, New Delhi and National Institute of Ayurveda, Jaipur who have tried to get together many experts from all over the country.

I am very thankful to all the experts who have contributed to this effort and look forward for the preparation of such protocols for other basic points in Dravyaguna like Guna, Virya etc.

J.L.N.S 08/01/20

(Dr. J.L.N Sastry)

if the wisdom is herbal,
many ailments are curable
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PREFACE

Every stream of knowledge needs continuous research to remain relevant and utilitarian. Such research needs to be done both in the fundamental and applied spectrum of the science. Such a holistic research vision shall ensure the revalidation of the principles and offer innovations in applications of the principles. Applied research in Ayurveda has gained significant momentum in the recent past, particularly in the sphere of clinical medicine with good success. But fundamental research which aims at the understanding of the theoretical framework enunciated in ancient medicine has lagged behind. Ayurveda is a rational and structured knowledge system. The concepts of Panchamahabhuta, Tridosha, Rasa, Guna etc. need contemporary understanding in view of the changing scientific knowledge.

The use of medicinal substances for improvement of health, both in healthy and diseased, is based strictly on logic (*yukti vyapashraya).* The physician needs to know an array of information pertaining to the patient, disease, medicine, etc. to establish this yukti. The pharmacological basis of drug action in Ayurveda is well developed wherein it is explained in terms of Rasa, Guna, Veerya and Vipaka. These attributes are the manifestation of various unique arrangements of the Panchamahabhutas which is the material basis of each and every medicinal substance. Therapeutic attempt evolves around the interplay between Rasa vs. Dosha and Dravya vs. disease. Therefore, a physician must have knowledge of Rasa, Guna, Virya, Vipaka and Prabhava of the medicinal substances. Ayurveda has advised specific methods to determine these attributes in a dravya. Rasa (taste) can be evaluated by direct contact with tongue, evaluation of Vipaka by the ultimate effect on the body (Doshas, Dhatus and Malas), Veerya; the dynamic properties of a substance judged by Nipata (contact with the body) and Adhivas (duration of stay in the body) and Prabhava; the specific action of the substance.

But the texts have not elaborated the operational details of such evaluation experiments and further these evaluations are smeared with huge subjective observations leading to variations in final results. Therefore, it becomes difficult to arrive at unanimity both at the method and results of the evaluation. This has resulted in almost no addition of new drugs to official Ayurveda materia medica. Further, there has been significant advancements in contemporary science which needs to be incorporated in Ayurvedic efforts. The technological advancements must be aligned with Ayurvedic principles and methods in evaluation of Rasa and other attributes of a medicinal substance. Many works had been done

in this direction but sporadically and without peer involvement resulting in lacklustre unanimity and universal acceptance.

It is thus incumbent on the present generation to design, develop, validate and standardize a protocol for evaluation of Rasa, Guna, Virya, etc. by involving experts from Dravyaguna, Basic Principles of Ayurveda, other relevant subjects like Pharmacology, Chemistry, Physics and so on. Such a collaborative effort will pave the way for designing robust, holistic, peer reviewed protocol that could be acceptable to all experts including the official agencies.

Enrichment of our pharmacopeia was the primary objective of this endeavour. New dravyas are being introduced into Ayurveda practice but owing to the lack of information about their Rasa, Guna, etc. the same can not be declared officially as an Ayurveda drug. Therefore, it was a dire need before the Dravyaguna clan to develop a protocol to determine the Rasa Panchaka of the newly introduced medicinal substances.

Keeping this fact in mind it was planned to bring all relevant experts to one platform and conduct series of workshops to design and develop standard protocols for evaluation of Rasa, Guna, etc. The first workshop in this series was held at National Institute of Ayurveda, Jaipur on 30th & 31st January 2018 in which preliminary brainstorming was done to carve out a feasible path with time milestones to develop such protocols. It was unanimously resolved that instead of attempting to develops protocols for Rasa, Guna, Virya, Vipaka simultaneously it will be more prudent to attempt at “designing and standardising Protocol for Evaluation of Rasa” because it is the foremost attribute in a Dravya for prediciting and explaining its pharmacological behaviour. Further, other attributes like Guna, Virya and Vipaka are derived through Rasa of the substances and consequently confirmed by the actions of the Dravya.

Subsequent to this recommendation, 2 such workshops were conducted at AIIA, New Delhi on 25-26th February 2019 and 4-5th February 2020 to brainstorm, design, develop and review to finalise “Protocol for Determination of Rasa of Dravya”. All the workshops were attended actively by luminaries of Dravyaguna and other relevant subjects across the premier institutions in India. Representation was ensured for all the generations of experts starting from the stalwarts, middle generation, young generation and even the student generation.

After persistent front end deliberations of 3 years, 3 workshops, 6 days backed with continuous back end work, the entire fraternity takes immense pride and pleasure to present a “Standard Protocol for Determination of Rasa (Taste) of Dravya (Medicinal Substances)”.

This protocol will be validated and standardized first by using well established Ukta Dravyas followed by Anukta Dravyas. The protocol has incorporated both classical Ayurevdic principles, techniques along with contemporary techniques like E-tongue, FTIR, NMR, etc. wherever required. The protocol has also incorporated all the Pramanas – Aptopadesha, Pratyaksha, Anumana and Yukti.

The experts recommend development of Rasa Reference Standards (RRSs) for each of the six Rasa by using this protocol. These RRSs can be utilized as references while determining Rasa of Anukta Dravyas. A list of probable RRSs have also been appended with this document.

The document has also included relevant information and references about Rasa (Taste) for ready reference for the readers. Despite our best efforts there may be some commissions and omissions in this document, which we will be obliged if pointed out for rectification. We solicit constructive criticism for improvement of the document and protocol from one and all.

We take this opportunity to bow in respect to more than 50 experts of yore from all over the country whose knowledge we used freely while preparing the document and protocol. We also thank all the experts who contributed significantly in framing this document.

The expert team of editors have given valuable time and commitment. We also thank NIA and AIIA team for initiating this important task and NMPB for all the financial support.

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THEORETICAL FRAMEWORK OF

CONCEPT OF RASA (TASTE) IN AYURVEDA

INTRODUCTION

Every system of knowledge evolves around its own theoretical framework. More robust this framework, more acceptable and sustainable the science becomes. Ayurveda contrary to the contemporary misbelieve is a highly structured and logic based health system having its own unique theoretical underpinnings. The autoratative texts of Ayurveda has uniequivically stressed that the principles described within ambit of Ayruevda will have the contextual relevance of Desha (place) and Kala (time) during actual application. This paves the way for continuous updating of the application of principles with time.

The basic aim of Ayurveda is to improve the health of the humanity. The health is addressed by two main domains – Dravya (food and medicines) and Kriya (life style). It is postulated that there is complete similarity between the dravya and the body both at structural (Pancha Mahabhuta) and functional (guna) level. Various substances effectuate increase or decrease in the constitutents of the body on basis of their similarity or dissimilarity (Samanya-Vieshesha) respectively. These similarities or dissimlaities can be ascertained by the principles present within substances namely Rasa (taste), Guna(properties), Virya (potency) and Vipaka (post digestive taste). These are elaborative concepts portraying lots of underlying information and not to be confused with the limited meanings associated with their rough English equivalent terms. These attributes are used to draw plans of logical use of substances in order to ensure a predictable outcome because Ayurveda firmly believes therapeutics can not be conducted with chance theory.

Rasa is the primary and the most important tool for assessment of guna (properties) and karma (action) of any substance. Ayurveda utilizes pramanas like Aptopadesh (textual knowledge), Pratyaksha (direct sensory knowledge), Anuman (inference) and Yukti (rational inference) as tools of knowledge. Pratyaksha is considered as the most important tool for acquiring knowledge when there is insufficient textual knowledge is available. Rasa(taste) is one of the five Pratyaksha pramanas and thus it has been used as the first tool for assessing the properties and actions of any substance. In most of the cases the other attributes i.e. Guna, Vipaka and Virya can be prospectively predicted on basis of Rasa. In some exceptions there might be some alterations in these attributes which can be now retrospectively determined by analysing the actions of the substance. Thus determination of Rasa is the most fundamental step in determination of the pharmacological behaviour of any substance.

Rasa is used in Indian literature carries different meaning in different contexts, among those four who are related with Ayurveda are mentioned below with their etymological meanings:

Rasa (special sense of taste)

This aspect is related with Dravya-guna-śastra which is something experienced by an individual through gustatory sense organ (rasana)[1], these are Six in number i.e. madhura (sweet), amla (sour), lavaṇa (salt), kaṭu (pungent), tikta (bitter) and kaṣāya (astringent), and are inherently situated in dravya.

Characteristics of Rasa

Rasa is the object of gustatory sense organ (tongue) as such the perception through tongue after contact of the dravya. The experience of tastings is common in all dravyas because of Prthivī and Ap as primary components though they have their own specificity due to permutation of mahābhūtas. Based on this fact Nāgārjuna has stated that Rasa is manifested by tasting as its characteristies.

Number of Rasas

According to Caraka rasas are six in numbers i.e.: Madhura (sweet), Amla (sour), Lavana (Salty), Kaṭu (pungent), Tikta (bitter) and Kaṣāya (astringent)[2] which are in general practice called as Mīṭhā, Khattā, Namakīna, Kaduā, Tītā and Kasaila respectively. Examples related to these are:

Madhura	:	Guda (jaggery), Sharkara, ghrita, drakṣa etc.
Amla	:	Amlika, nimbuka, cangeri etc.
Lavana	:	Saindhava, sāmudra etc.
Katu	:	Marica, lankā, Pippali etc.
Tikta	:	Nimba, Cirāyatā, Karavellaka etc.
Kasaya	:	Haritakī, Babūla, Dhataki etc.

Since Ayurveda has a very logical way of concluding things there was a long discussion regarding number of Rasas also. While determinig the number of Rasas various experts of ancient era had opined differently with justification about number of Rasa and in a symposium were very strict and ultimately after thorough discussion, finalised their number

neither more nor less than six, as has been mentioned in Charaka Sutrasthana 26.8 (Atreya Bhadrakāpīya Adhyāya), chaired by Punarvasu Atreya, where various views regarding the number of rasas were presented[3].

Based on the logics after hearing the views proposed by Rşis, Acarya Punarvasu Atreya in his concluding statement confirmed the numbers of rasas as six, i.e. Madhura, amla, lavana, kaṭu, tikta and kaşāya. Other predecessars also accepted the conclusion stated by Atreya Punarvasu.

Modern view regarding modern physiology and psychology basically four tastes are mentioned: Madhura (sweet), amla (sour), lavana (salt) and tikta (bitter), while kaşāya (astringent) and katu (pungent) are the combined form of taste and sensitivity to touch not as a free rasa but in pharmacology kaşaya and katu (astringents and pungents) are elaborated separately[4]. Practically pharmacology too indicates six rasas.

Modern Pañcabhautika Composition of Rasa:

Like dravyas rasas are also pāñcabhautika. In origin of rasa, ap and prthivī are prakrtibhūta kārana or ādhāra kārana (material cause) while other three akāśa, vāyuand agni (three) bhutas serve as the instrumental cause in their specific variations general manitestation as stated by Chakrapani. However, Yogendra Nath interpretes Pratyayas as Karanas (causes). In this way all the five mahābhūtas are concurrently associated with rasa[5].

Dravya and rasa both are pañcabhautika in nature, dravyas are of various rasas but due to graded variations in bhautika composition as utkarşa and apakarşa one shows manifestation while other remains unmanifested (pradhana and apradhana respe Dectively) which is the basis of the concept of rasa and anurasa proposed by Acharyas[6].

Rasa and Anurasa

The chief manifestation expressed immediately after contact of dravya and received by gustatory sense organ (tongue) is called rasa and opposite to it, 1s anurasa. They have following characteristics:

1. Rasa is manifested completely[7]. It is observed clearly and directly as madhura, amla etc. i.e. Pippalī and harītakī are pungent and astringent respectively.

2. It is observed immediately in dry state of drug[89]. Sometimes the rasa of wet dravya does not stay upto the dry. That's why this temporary or momentary expression of rasa does not

come under the category of rasa. In this way the rasa is that which stays in dry state and perceived and manifested as pradhana rasa, for example in drākṣā madhura rasa is observed in both dryand wet conditions, while in pippal madhura rasa is perceived in wet state and katu rasa in dry, resulting katu as rasa and madhura as anurasa.

3. The first rasa experienced just after the contact of dravya with gustatorysense organ is called rasa, i.e. Amla rasa in kanji and takra etc. Contrary to this the rasa experienced in wet state and manifested slightly or faintly in the end is called anurasa. Thus rasa and anurasa can be differentiated by manifestations whereas anurasa is known only by low perceving and experienced commonly in the end.

As Such anurasa has the following features

1) unmanifested or slightly manifested, i.e. Madhura rasa in harītakī.

2) It does not stay upto the dry state of dravya as madhura rasa of pippalī in wet state does not appear in dry.

3) Anurasa is perceived only in the end after the manifestation of chief (pradhana) rasa i.e. Kaṣāya and madhura rasa in haritaki called as rasa and anurasa respectively, likewise in kāñjī amla as rasa and tikta as anurasa.

However Chakrapani interpreting the topic rasa and anurasa says that the taste which is quite manifested in states of fresh as well as dry and from beginining to the end (four stages) is rasa and which is unmanifested in all these four stages is called anurasa[10].

PANCHABHAUTIKA CONSTITUTION OF RASA

Distinctive features of Rasas

Generally rasas are pañcabhautika yet their specific accomplishment as madhura, amla etc. is due to specifically and proportionate configuration of pañcamahābhūtas as it is found responsible for the special colours and shapes of the living beings as they too are pañcabhautika[11]. Drugs (medicinal plants) get their nourishment for development by water which itself is unmanifested (Antarisksodaka or Divyodaka) or devoid of any taste but gradually reaching towards earth (prthivi) after association with other mahabhutas in specific proportions give rise to six rasas that endowed the dravyas of sthawara and jagama origin with six rasas, as[1213].

1. Madhura: Jala + Prthivī

2. Amla:Prthivi + Agni (Caraka, Vāgbhata)

Jala + Agni (Suśruta)

3. Lavana: Jala + Agni (Caraka, Vāgbhaṭa)

Prthivi + Agni (Suśruta)

Agni + Jala (Nāgārjuna)

4. Katu: Vayu + Agni

5.Tikta: Vayu + Akāśa

6. Kaṣaya:Vayu + Prthivi[14]

Vagbhata takes kaṭu after tikta

Svabhāva of Rasas is responsible for theorigin of limited (fixed) numbers and their specific combinations and configurations. Secondly there exist specific natural characteristics amongmahabhutas to contact with a particular mahabhuta only resulting in origin of a certain rasa and not with any other, that's why only these specifically fixed dual combinations of mahābhūtas result into origin of six rasas only[1516].

Predominanceand subdueness (utkarsa and apakarşa) of mahābhūtas take place according to seasons resultinginto origin of rasas in certain seasons. Since the number of seasons are six so the number of rasas too is accepted six. Following table gives the detailed description regarding this[17].

S. No.	Season	Utkarşa of mahabhūtas	Origin of rasa
1	Sisira	Vāyu + Akāśa	Tikta
2	Vasanta	Vāyu + Prthivī	Kaşāya
3	Grīşma	Vayu + Agni	Kaṭu
4	Varşa	Prthivi + Agni	Amla
5	Sarat	Jala + Agni	Lavana
6	Hemanta	Prthivi+Jala	Madhura

Above mentioned table indicates that predominance (utkarşa) of certain mahabhūtas in a particular season gives rise to a certain rasa. But sometimes some variations may also be seen. Interpreting upon this Indu states that predominance (utkarsha) of Mahabhutas may be seen in other seasons also beside specified seasons resulting in origin of rasas[18].

Among all the rasas, madhura rasa has got top priority. It pacifies vata-paittika disorder due to unctuous, heavy and cold properties. Coldness of madhura rasa is autsargika (inherent), somewhere madhura ushna is also seen[19].

Guna does not reside in guna,so the existence of properties like snigdha (unctuousness) etc. reside in dravya. It is said metaphorically the property of rasa. Thus a guna can not be justified to be in rasa wnicn itself is a guna as has been stated. In such cases gunasshoul be taken to be residing not in guna but in its substratum (sahacharya) rasa in dravyas and as auch they are understood ny the presence of particular rasa. Here sāhacarya means Concommit nitance or uer. The significance behind this is that the naturally related properties can also be understood without mentioning them as in madhura rasa dravya there is no need to repeat that this dravya is snigdha (unctuous) as Well because it is understood from the above statement of concomitance (Sahacarya). If somewhere it is mentioned it doubles the objective. Again, like madhura rasa amla rasa too shows hotness generally, based on this fact the coldness of āmalaka does not get opposed or obsuructed. In the same way the coldness of saindhava lavana (rocksalt) does not become rude though lavana rasa being hot in property. In this way the gunas (propertles) mentioned in cases of rasas should be understood (accepted) barring exceptions.

Sivadäsasena here raises a query that amla rasa is derived from predominances of jala + agni mahābhütas. In such condition the amla rasa will be cold due to jala mahabhūta or hot due to agni mahābhūta? Such situation is also seen with the origin of lavana rasa. Answer

Suśruta in this regard states both amla and lavana rasa are igneous in nature. Logics behind this statement, in context of predominances of two mutually opposite properties bearing mahabhutas resulting in origin of igneous nature, is because the properties of parabhuta (agni) dominates over properties of pūrvabhüta (jala) resulting into origin of hot property bearing amlarasa. It is directly observed in hot water too, in case of lightness among rasas where there is preponderance of agni mahābhüta that overcomes the coldness of water due to hotness, but it does not happen in cases of gold, silver and iron where their heaviness is not defeated. So, in heaviness of amla etc. rasas there is dominance of pürvabhüta (first bhūta).

Thus predominance exerting bhüta represents its own properties specifically and this is decided as a criteria regarding the bhautika composition of rasas. The relative position of bhütas in each rasa should be fixed accordingly so that one canknow the participation of bhūtas as well as their relative preponderance. Owing to this some change has been made i.e. Amla and lavaṇa rasas are agneya (igneous) by nature, the latter being first regarding usna that's why Agni has been given first place in its bhautika composition. In case of lavaṇa rasa which has been mentioned heavier(gurutara) in comparision to Amla rasa, so its bhautika composition should be Prthivi and latter Jala, because Prthivi is heavier than the Jala. Similarily, Tiktā rasa is lighter than Katū rasa because of Akāsa as the first component in Tikta rasa. Actually speaking it is the nature of the mahābhūtas that at the time of mutual combinations originating into a particular rasa, only one property is seen not all which is merely due to the unseen factor nothing but nature.

Various commentators have expressed their views regarding above facts. The statement of Chakrapānī states that heaviness or lightness can not be decided on the basis of bhautika composition, is not acceptable. As the theory of Pañcamahābhūta is the basic concept of Ayurveda and there can be no other criteria than this to decide the properties. So, it can be stated that bhautika composition is responsible for the properties existing in rasas and based on which the heaviness or lightness is decided. Thus Prthivī is heaviest and there exists relative (comparative) lightness among Ap etc. while Akasa the lightest. Besides these the order of bhautika composition among rasas should also be decided in accordance with their relative properties; for example: The bhautika composition of lavana rasa should be mentioned as Agni + Prthivī inspite of Prthivi + Agni because, lavana rasa is superior in hot and inferior in heavy property. In the same way in Tikta rasa's bhautika composition should be Akāśa and Vāyu. By this pañcabhautika gradation their relative properties shall be easily observed.

Ascertainment of bhautika composition

The bhautika composition of rasas is to be known by inference[20]. On the basis of gunas and karmas (properties and actions) the proportionate arrangement of bhūtas can be inferred. After using rasas (dravyas) there is increase in similar properties bearing doṣas and dhatus and decrease in dissimilar one that give ideas about related mahābhūtas by inference i.e. Madhura rasa increases watery kapha and decreases igneous pitta to ascertain its bhautika composition by Prthivī + Jala[2122]. In the sameway because of increasing kapha and pitta, amla rasa is suposed to be composed of Prthivī + Agni (Pārthivagneya), Lavana rasa being kanh egravating is composed of Ap + Agni (Apyagneya), Kaṭu rasa being Vata-pitta aggravating is vāyavyāgneya (Vāyu + Agni), tikta rasa by Vata aggravating and Kapha pacifying is Vāyavyākāsiya like Vayu + Akasa, kasaya rasa being vata-aggravating and pitta pacifying is accepted to be vayavyaparthiva (vāyu+prthvi)[23].

Some of the commentators accept it as authoritative statement because of the complexity of the matter which is beyond the imagination of a general human being. Actually speaking one can acknowledge the bhautika composition of rasas by authoritative statements but their confirmation may be done by inference[24].

1. Sraddheyārtha: By following the elder's sayings.

2. Anumeyartha:Perceived through inference.

3. Pratyakşartha: Perceived through direct means.

Here second and third are confirmed by direct perception and inference i.e. Eye is concerned with the knowledge of vision while first one is totally authoritative and is accepted solely due to faith which can not be shown experimentally or inferred: for example 'there are fairies in the heaven'. Being a directly observating science Ayurveda is related with second and third only[25].

Bhautika compositions of rasas are also inferred by purifying actions besides pacificating actions, for examples Vomiting represents the agneyavayavya compositions because agni by nature proceeds upwards and vayu leaps up due to lightness. In these conditions both the mahābhūtas unitely eliminate the body impurities. In the same way rasas composed of Jala + Prthivī are purgative (Recana Adhobhagahara) where by nature Jala flows down and Prthivī too due to heaviness (Gurutva) proceeds downwards. These infere that recana rasas (dravyas)a composed of Jala + Prthivi bhutas and mixing of both indicates

the properties eliminate the impurities both upwards and downwards (Ubhayatobhagahara-Emetic-purgative). Like these, the bhütas of dipana (stomachic) etc. can also be inferred[26,27].

Acquaintance of Rasa: **Rasopalabdhi**

There are various means that ascertain the thorough knowledge of acquaintance of rasas. In Indian philosophy three sources have been mentioned in this context i.e. Pratyaksa (direct perceptions), Anumana (by inference) and Aptopadeśa (authoritative statement)[28]. Among these direct perception aspect is mostly applied.

Rasa is perceived through the contact of dravya with the gustatory sense organ and is called gustatory perception[29]. This is the best way to know about rasa of a dravya. Inference (Anumāna) and Aptopadeśa also play an important role in ascertaining the rasas of some dravyas like astringent and sweet taste of suvarma (gold) by authoritative statements and by seeing the actions on the body. The knowledge regarding non-manifested and imperceptible (Anurasa and Avyaktarasa) is achieved by authoritative statement and is proved by inference (Anumäna). Some of the scholars state that these three sources of rasopalabdhi (acquaintance of rasa) deal with general, specific and experimental knowledge respectively[30].

General sense of taste:By direct perception

Specific sense of taste:By inference

Experimental knowledge of taste: By Authoritative statement

Transformation of Rasas

General perception of sense of taste of dravya is transformed into other due to certain causes mentioned below

1. Sthithi (Condition or Status): Keeping a dravya for sometime its rasa is denatured for eg cooked rice is sweet in taste after keeping sometimes become acidic

2. Patra (Pot or Vessel): The rasa of dravya is changed or will change with the use of certain pots or vessels that curd becomes pungent after keeping in a pot made of bronze.

3. Sanyoga (Combination): In combination of Specific dravyas, there may be origin of a separate rasa as tamarind (tamarindus indicus Linn) lime water changes into Madhura rasa.

4. Paka (Cooking) : After cooking on fire some of the substances change their rasas, i.e. Cooked fruits of Tamarind and Jamboobecome sweet.

5. Atapa (Sunlight) : Some of the dravyas after drying in sunlight change their rasa for example, Fruit of Tumburu (Xanthoxylum alatum Roxb.) which is astringent in taste after drying in sunlight changes to sweet.

6. Bhavanā (Soaking): Few dravyas being soaked, change their natural taste i.e. Tila (Sesamum indicum Linn.) being astringent, bitter and sweet in taste changes its natural tastes into sweet after soaking in decoction of Yastimadhu (Glycyrrhiza glabra Linn.).

7. Desha (Place or Habitate): Place or habitate may be a factor responsible for change in taste of certain dravyas i.e. Fruits ol Amalaka growing in certain place contain sweet taste.

8. Kala (Time): With regard to time rasa or dravyas get changed i.e. The astringent taste of fruit of Banana (Musa paradisiaca Linn.), converts into sweet after ripening at maturity and also Mango (Mangifera indica Linn.) in tender stage is astringent, at maturity becomes sour and at the time of ripening becomes sweet.

9. Parinama (Change in natural form):Rasa of a dravya can also be transformed from its natural (prior) form i.e. Milk being transformed into Curd gets changed from sweet taste to acidic one".

10. Upasarga (Contamination): When dravyas are contaminated or infected or eaten by certain worms or insects their natural taste is lost or denatured, for example in Ikşu (Saccharum officinarum Linn.) being contaminated or eaten by some insects changes its natural sweet taste to bitter or acidic.

11. Vikriya (Specilic measures): There are few specific measures o which are responsible for a change in natural taste of dravya, for example After beng cooked in fire Tālaphala (Borassus flabelifer Linn.) becomes bitter and fruit of Lakuca (Artocarpus integrifolia Linn.) changes amla rasa after rubbing with hands[31].

The above mentioned factors or effects regarding transformation of rasas are very much beneficial in pharmaceutical preparations where tastes of dravyas are considered as an important factor.

MODE OF KNOWING ACTIONOF DRAVYA ON THE BASIS OF RASA

Classification of Rasas

Regarding the essential role played by Agni and Soma in the creation and maintenance or Universe, rasas too are classified into two groups

1. Agneya: Kaṭu, Amla, Lavana

2. Saumya: Madhura, Tikta, Kaşāya

Agneya (1gneous) rasas are hot and are responsible for syncope (fainting) and burning sensation that's why these are called Vidahi (Causing burning sensation) and opposite to these Saumya (having the properties of moon) rasas are cold and alleviate fainting and burning sensation that's why they are called Avidähi (those which do not cause burning)[3233].

S.No.	Class	Rasas	Properties	Actions
1.	Saumya	Madhura, tikta, kasaya	Cold	Pitta and fainting alleviating and avidahi
2.	Agneya	Katu, amla, lavana	Hot	Pitta aggravating , causes faintness and burning sensation

In the sameway there may be two groups as Vayavya and Avayavya (relating tovayu and without vāyu) also which are vāta-aggravating and vāta-pacifying respectively. First group is consisted of katu, tikta, kasaya whereas second is madhura, amla and lavaṇa.

Characterstics of Rasas

Rasa is known from the perception after contact of dravya with the gustatory senseorgan: the tongue, it is self experienced and Can not be explained in words i.e. "This sweet is very Sweet" can not be explained because its sweetness cannot be analysed so, like rasas of literature, this rasa is also mere perceptive and self experienced but scientifically it is not enough and to be directly observable should follow some fixed rules. In this way the changes (physically or reflexly) observed in mouth or body after taking, give guideline in ascertaining the characterstics of rasas in detail as

1. Madhura rasa: It is uncting, satiating, pleasing, Softening, Sliminess of in mouth producing, kapha increasing and liked by ants and flies as in diabetics ants are attracted towards urine and flies towards body

2. Amla rasa: It causes excessive sensitiveness in teeth, promotes oozing, diaphoretic, cleansing and refreshing of mouth, relishing (promoting desire for food), blinking and contraction of eyes, burning in throat and mouth, thrilling and is wholesome to the heart.

3. Lavana rasa: It is moistening (as it absorbs water to be dissolved therein) softening, relishing and produces burning sensation in oral cavity and throat

4.Katu rasa: Merely on contact it is tongue irritating and painful, promotes discharges (watering) from mouth, nose and eyes with burning sensation and causes headache

5. Tikta rasa: With the contact on tongue it diminishes the perception ot other rasas, beside being unpleasant it promotes desire for food and relishing. it causes non-sliminess and dryness of mouth, purification of throat, feeling of coldness and satiating.

6. Kaṣaya rasa: It causes non-sliminess, stiffening and stiffness in tongue and throat. 1t is mouth cleansing and refreshing, causes cardiac pain, pacifies kapha and causes heaviness in body[34,35,36,37].

Rasas are divided into three groups according to their effect on salivation

1. Discharge promoting rasas-Kaṭu, Amla

2. Discharge checking rasas-Tikta, Kaşāya

3. Concentration (solidity) changing rasas- Madhura, Lavana

Above facts may be decided by animal experiments.

Properties of Rasas

Guna does not exist in guna and as such samyoga can not be justified to be in rasa which itself is a guna. In such cases gunas of rasas should be taken to be residing not in rasas but in its dravya (substratum) which unfailingly company (concommitantly related or living together) rasas in dravyas and as such they are understood by the presence of a particular rasa. In otherwords we can say that rasa and guna are not mutually related as substratum and dependent but these are the naturally existing properties in dravyas so, these are inherently or concomitantly related. Based on this fact gunas are mentioned in these metaphorically forexample: After burning with heated ghee it is generally said burnt with ghee or ghrit-dagdha whereas burn is due to heat located in ghee[3839]. The properties which are present in rasa can be tabulated as follows:

Rasa	Properties
Madhura	Unctuous, cold, heavy
Amla	Unctuous, hot, light
Lavana	Unctuous, hot, heavy
Katu	Rough, hot, light
Tikta	Rough, cold , light
Kashaya	Rough, cold, heavy

Regarding above mentioned properties rasas are grouped into six catagonies comprising each with three rasas as follows:

1. Snigdha (unctuous): Madhura, amla, lava,

2. Ruksa (rough): Kaṣāya, kaṭu, tikta

3. Sita (cold):Kasaya, madhura, tikta

4. Ushna (hot):Lavana, amla, kaṭu

5. Guru (heavy): Madhura, kaṣāya, lavana

6. Laghu (light): Tikta, kaṭu, amla

This classification may also be established into three categories in accordance with the gradation (degree) in activities related properties of rasas as mentioned below[4041]:

S.No.	Guna	Uttam (superior)	Madhyama (medium)	Avara (inferior)
1.	Ruksha	kasaya	Katu	Tikta
2.	Snigdha	Madhura	Amla	Lavana
3.	Usna	Lavana	Amla	Katu
4.	Sita	Madhura	Kasaya	Tikta
5.	Guru	Madhura	Kasaya	Lavana
6.	Laghu	Tikta	Katu	Amla

This gradation of properties has been advocated by Caraka and Vāgbhaṭa. However, some of the Acharyas accept lightness as inferior property in lavana rasa. Exceptionally there are some dravyas that do not follow this general rule as

1. Though Audaka and anupa mamsa are sweet in rasa yet they are hot by nature.

2. Amalaka, though being amla rasa, is cold.

3. Saindhava being lavana is not hot.

4. Pippalī and rasona though both are Kaṭu or pungent in rasa, yet they are unctuous and heavy.

5. Arka, aguru and gudūcī all being tikta (bitter) in rasa, are hot by nature.

6. Harītakī is hot (usna) though it is Kasaya (astringent) in rasaand is kaṣāya (astringent) in rasa brhatpañcamūla is hot though it is Kasaya, tikta in rasa[4243].

Actions of Rasas

A) Systemic actions: On various systems of body the actions of rasas are as follows

1. Madhura Rasa-

Nervous System: Pleasing (gladdening), promotes normal functioning of sensory organs including manas, Intellect promoting and is satiating.

Digestive System: Pushes impurities into its natural cause and is thirst alleviating Blood Vascular System: Wholesome for promoting union and heart.

Respiratory System: Beneficial for throat.

Urinary System: Diuretic.

Reproductive System: Semen promoting (aphrodisiac), foetus stabilizing and lactatingSkin: Decreases burning sensation, benencial for skin, hair and promotes complexion".

2. Amla Rasa

Nervous system: Causes clarity and happiness of mind, produces stability in organs.

Digestive System: Salivation promoting, relishing, stomachic digestive and pushes impurities into natural course.

Blood Vascular System: Wholesome for the heart and rakta-pitta aggravating.

Urinary System: Diuretic.

Reproductive System: Causing loss of semen.

3. Lavana Rasa

Digestive System: Moistening, stomachic, digestant, faecal mass and abdominal lump breaking and desire for food and relish promoting.

Blood Vascular System: Blood vitiating

Respiratory System: Expectoration by excising and desaturating and channel cleansing, so, eliminates the thick sputum.

Urinary System: Diuretic.

Reproductíve System: Causing loss of Semen

4. Katu Rasa

Nervous System: Sense organs stimulating, resuscitating.

Digestive System: Mouth cleansing and refreshing, stomachic, digestant, anthelmintic, promotes desire for food and relishing, functions of grahani promoting.

Blood Vascular System: Cardiac stimulant, increases blood oozing.

Respiratory System: Kapha eliminating.

Urinary System: Antidiuretic.

Reproductive System: Non-aphrodisiac.

Skin: Anti leprotic and Antipruritic

5. Tikta Rasa

Digestive System: desire for food and relish promoting, anthelminthic, thirst-alleviating, stomachics, digestant, antidiahhroeal by checking frequency and liquidity of stool.

Blood Vascular System: blood purifying, unwholesome for the heart.

Respiratory System: Kapha eliminating.

Urinary System: Anti-diuretic.

Reproductive System: Non-aphrodisiac, galacto-depurant.

Skin: anti-diaphorating, anti-pruritic, anti-leprotic ,alleviating burning sensation and stability promotor

6. Kashaya Rasa

Digestive system: checking or holding

blood vascular system: wholesome for promotion of union and unwholesome for the heart.

Respiratory system: kapha-eliminating

Urinary system: anti-diuretic

Reproductive system: non-aphrodisiac

Skin: Pressing, wound healing and restoring normal pigmentation[44].

B) Action on Dhatus: Rasas exert their actions upon different dhatus of body in different ways

1. Madhura Rasa: It promotes all the dhatus of the body by increasing the essence of all the dhatus (ojas) it is strength promoting, vitaliser and is longevity providing. It also promotes lactation (galactogogue) strength promotion and is aphrodisiac and vitaliser.

2. Amla Rasa: Nāgārjuna has said amla rasa is beneficial for body and strength promotion and is aphrodisiac and vitaliser. Caraka accepts it as body and strength promoting but causes loss of semen.

3. Lavana Rasa: It destroys dhätus and body strength so, causes slackness.

4. Katu Rasa: It is dhâtus destroying, slimming (body weight reducing) and non-aphrodisiac.

5.Tikta Rasa: It is slimming (scarificating), non aphrodisiac and specially causing consumption of fat (anti-obesity), bone-marrow and lymph. So all these are absorbed (reduced) by tikta rasa.

6. Kaşaya Rasa: It causes consumption of all the dhätus and is slimming[45].

Rasa	**Actions upon dhatus**
Madhura	Promotes all the dhatus, strength promoting, vitaliser, longevity providing and galactogogue.
Amla	Body promoting, strength promoting, and causes loss of semen.
Lavana	Dhatus destroying, debilitating, non-aphrodisiac and slacking.
Katu	debilitating, slimming, non-aphrodisiac
Tikta	Debilitating, non-aphrodisiac, causing consumption of fat, bone-marrow and lymph.
Kasaya	Consumes all the dhatus and slimming.

C)Actions upon Malas (impurities): Rasas are grouped into two according to their actions upon Särīra malas (body impurities).

1. Snigdha (unctuous): Consisting of madhura, amla and lavana rasas.

2. Rüksha (non-unctuous): Consisted of kaṭu, tikta and kaşāya rasas.

Snigdha rasas due to unctuousness push impurities to its natural course and support the excretion of urine and faeces so, can be said as diuretic, purgative and vata pacifying.

Opposite to this rūkşa rasas due to non-unctuousness (roughness) aggravate vāta so reduce urine and feaces. In unctuous group madhura rasa is superior and lavana rasa is inferior while in non-unctuous group kasāya rasa is superior- and tikta rasa is inferior as has been mentioned earlier[46].

S.No.	Rasa	Actions on malas
1.	Madhura, Amla, Lavana	Diuretic, purgative and carminative
2.	Katu, Tikta, Kasaya	Constipative, anti-diuretic and vata-binding

D) Actions of Rasas on Doşas: The actions of rasas on doşas follow according to law of sāmānya and viśeşa (similar and dissimilar properties). So rasas at the time of combination with doshas in maha-srotas (channels) increase the similar ones and decrease doshas having dissimilar properties[474849].

1. Madhura Rasa: It is derived from prthivī and jala-mahabhuta and kapha doşa too is from the same. Both are alike regarding composition and properties i.e. sweetness, uncting, heaviness, coldness, softness and sliminess. In this way madhura rasa is Kapha aggravating and excluding coldness it is opposite to vata (rukşa, laghu, viśada and khara) resultantly pacifies vāta. In the same way it has properties contrary to pitta (katu, usna, tīksna and rukşa (partially unctuous) so pacifies pita too

2. Amla Rasa: Having been composed of pruthvi and agni mahabhuta it is unctuous, hot and heavy in properties due to similar properties like kapha (unctuous and heavy)it aggravates kapha and being opposite in properties to vata (ruksha, laghu, sita) it pacifies vata and due to hot and sharp properties it aggracates pitta

3. Lavana Rasa: Having been derived from jala and agni bhutas it is unctuous, hot and heavy in properties, therefore like amla rasa it is kapha and pitta aggravating and vata pacifying.

4. Kaṭu Rasa: It is pāñcabhautically derived from vayu and agni having also non-unctuous, hot and light properties along with sharp and non-sliminess. Due to these properties it

increases pitta (having similar properties), and pacifies kapha (having dissimilar properties) and also due to rukşa, laghu and kaṭu properties similar to that of vata it aggravates vāta

5. Tikta Rasa: It is composed of vāyu and akasa mahabhutas and possesses properties i.e. rūksa, Sīta and laghu. Beside this, softness and non-slimminess are also found. Regarding these properties and being Similar to vata, it increases vāta and being opposite to pitta and kapha in properties it decreases them.

6. Kashaya Rasa: Having been derived from vāyu and prthivī mahābhütas it has properties like: rüksa, Sita and laghu along with non-slimminess and flatulant (wind forming). These properties are similar to vata so it increases vāta' and opposite to those of pitta and kapha, it decreases them[50].

Rasa	**Vata**	**Pitta**	**Kapha**
Madhura	Pacifying	Pacifying	Aggravating
Amla	Pacifying	Aggravating	Aggravating
Lavana	Pacifying	Aggravating	Aggravating
katu	Aggravating	Aggravating	Pacifying
Tikta	Aggravating	Pacifying	Pacifying
Kasaya	Aggravating	Pacifying	Pacifying

The description mentioned above regarding aggravation or pacification of doshas should be treated as a general rule but it nas some exceptions too as follows

- Madhura Rasa: it is kapha aggravating but honey, Jungala māmsa, yava, wheat, old rice and mudga do not do so
- Amla Rasa: It aggravates pitta excluding dadima and amalak
- Lavana Rasa: It is pitta aggravating and harmful to eyes excluding saindhava lavana (rock salt).
- KatuRasa: It is vāta aggravating and causes loss of semen excluding shunthi, pippali and rasona.
- TiktaRasa: it is vata aggravating and causes loss of semen excluding vetagra, guduchi and patola patra.
- kasaya Rasa: It is Sīta (cold) and stambnana (Checking, holding) excluding harītakī[51].

Order of Rasa's use as Aushadha (drug)

The order of rasas used as a auṣadha (drug) in different disorders caused by doshas should be done in a well planned manner as mentioned below

1. In Kaphaja disorders: kapha Ausadha (drug) should be used in order of kaṭu, tikta and kaṣāya rasa because the first use of katu rasa subsides the sliminess and heaviness of kapha, after this the use of tikta rasa reduces the sweetness of mouth and absorbs kapha. At last with the use of kasāya rasa the unctuousness or Kapha is removed resulting in alleviation of disorders related to kapha doṣa and the expectoration of cough stopped.

2. In Paittika disorders: Ausadha (drug) should be used in order of tikta, madhura and kaṣāya because, the use of tikta rasa in the beginning digests ama-pitta. After this the administration of madhura rasa pacifies the digested pitta by its coldness, heaviness, unctuousness and sweetness and it lasts with the use of Kashaya rasa aushadh. The liquidity of pitta is alleviated due to its roughness and absorbing properties.

3. In Vätaja disorders: The ausadha (drug) containing lavana, amla and madhura rasa should be used because in the beginning the use of lavana rasa overcomes the obstruction of vāyu, coldness and lightness of vāta due to its moistening, hotness and heaviness properties. After this the use of amla rasa (ausadha) due to sharpness clears the channels (Srotasas) and carminates the derranged vāta because of unctuous and hot properties. And in the end the use of madhur rasa drug pacifies the laghu, viśada and ruksa properties of vāta due to its heavy, slimy and unctuous gunas respectively[52].

Doshas (disorders)	Adi (beginning)	Madhya (mid)	Anta (last)
Kapha	Katu	Tikta	kasaya
Pitta	Tikta	Madhura	Kasaya
Vata	Lavana	Amla	Madhura

This general rule may be changed according to predominance of certain qualities of doṣas in different disorders such as, if roughness of vāyu prevails madhura the foremost among snigdhas, will have to be applied and so on[53].

Order of Rasa's use in Ahāra (diet)

In āhāra (diet) there should be the use of madhura rasa dravya in the beginning amla and lavana rasa dravya in the middle and at last kaṭu, tikta, kaṣaya rasa dravyas. The

scientific reason behind this is that because, before taking meals stomach remains empty resultantly vata is profusely present there which is specified by the diet containing madhura rasa taken in the beginning causes moistening of diet due to increase in kapha. The use of amla and lavaṇa rasa dravya after this pacifies the remaining vata and due to igneous nature they promote digestive fire to start digestion. At last the use of katu tikta kasaya dravyas stimulate the digestive fire and also controls the increased kapha produced just after meal[54].

In specific conditions there may be some change in above mentioned pattern as has been advocated by bhavmishra-the use of ginger and salt before taking meal increases diminished digestive fire, is relishing and cleanses tongue and throat[55]. Where katu rasa pacifies the kapha and lavana rasa moistens the food and also pacifies the vata.

Further, bhavmishra has coineda specific priniciple to use madhura rasa dravyas at the end of diet subside burning sensation caused by lavana, amla, katu ahara dravya. Which may occur due to nature (prakru), desire (ruci) Circumstances (paristhiti), so that pitta may not increase[56]. In this way the ahar (diet) taken systematically should be full of all the rasas (Sadrasa) to maintain the equilibrium among doṣas.

COMBINATIONS AND PERMUTATIONS OF RASAS

The permutation of rasas is nothing but detailed study of rasas regarding their type and incarnated arrangement, rasas are used in treatment or personal hygiene according to variation of doṣas. In otherwords Knowledge of 'rasaand doṣa-vikalpa' (variations or permutations or rasas and doṣas) is very much essential because, maintaining equilibrium among doshas is the only aim of Ayurveda. Doṣas are permutated into sixty three types that become innumerable with combinations of dhatus and malas, in same way rasas too are divided into sixty- three types regarding consideration of rasa and anurasa they are also innumerable[57]. Thus both the permutations (rasabheda and doṣabheda) are totally parallel providing a guideline to maintain equilibrium between doṣas and dhatus by using the appropriate rasa in context to doṣa concerned as has been mentioned by Susruta in Uttaratantra chapter 63 and 66 (Rasabheda-vikalpadhyāya and Doṣabheda-vikalpādhyāya) respectively in detail. Caraka has also mentioned such type of description[58]. Vāgbhata has stated that rasas should be used according doṣas. In vataja disorder amla rasa, in paittika-vataja amla, tikta rasa and kaphaja-vātaja disorders amla, kaṭu rasas should be used. In the same way purgative containing single rasa is non-cordial so, a combination of two or three rasas should be used.

The permutation (variation) of rasas (sixty three) occur due to impact of dravya, deśa, kala and due to variation in pañcabhautika composition of dravyas and rasas too are derived accordingly. Impact of dravya as madhura rasa due topredominance or Soma guna, due to impact of deśa such as grapes, pomegranate grown in Himalayan region are sweet and at other places sour, and impact of kāla such as mango in tender age is kaṣāya, in middle age sour and at maturity sweet. ln the same way in hemant ritu, drugs are sweet and sour in rainy season (varṣa rtu)[59].

The sixty three (63) variation of rasas regarding their combinations are as follows:

Ekarasa – 06

Dvikarasa - 15

Trika rasa – 20

Catuska rasa - 15

Pañcaka rasa – 06

Satka rasa - 01

Thus these sixty three[60] permutations of rasas described by expert scholars should be used by wise according to sixty three combinations of doṣas. In this way owing to the large number of permutations of rasas, it is almost impossible regarding presence of a dravya containing single rasa. As has been stated earlier that due to pañcabhautika composition dravyas are sarvarasātmaka (having all the six rasas) and among them only predominants are manifested; resultantly dravyas are denoted accordingly while weaker rasas being non-manifested are termed as anurasa[61]. In this context when we mention a dravya related to madhura rasa, it indicates not only madhura rasa but also madhura vipaka and madhura prabhav so this should be treated as a general rule for others also[62].

Effect of Dravyas Containing various Rasas

The Knowledge regarding effects of permutated rasas (dravyas)and doshas (aisorders) is based on two laws as follows.

1. If the combination between rasas and doṣas is prakrtisam-samvaya (similar) then the effects of dravyas and disorders should be decided according to their separate effect.
2. If the combination between rasas and doṣas is Vikrtivisama-samvaya, then due to change in properties on account of specific Pharmaceutical preparation and

combination, the decision becomes difficult. In these conditions, there effects should be ascertained after after round and sound knowledge of dravyas and disorders[63].

Importance of Rasa

Rasa has got important position in dravyaguna shastra that's why it is described in details in separate chapter by acaryas. In true sense, gustatory sense organs (tongue) was specific laboratory through which by direct observation of rasas, panchbhautika composition of dravyas, their properties like vipaka, veerya, guna can be inferred and proved experimentally in laboratory with needed corrections. For example, in tikta rasa dravya the imagination regarding its bhautika composition by vayu+akash with ruksha guna, katu vipaka and sita veerya appear after use if it aggravates pitta then the presence of ushna veerya is ascertained.

Methods described by Dr Shiva Charan Dhyani for taste threshold[64]

Take 5 gms. of drug powder. Put it in 100 ml and stir it for 30 minutes. Then filter it with the filter paper. Take 1 ml. of that filtered solution and dilute it withwater gradually. Taste a few drops of this solution between different dilutions. The point at which the taste is last perceived is the Taste threshold of that taste in that drug. Any further dilution of the solution would reveal no taste. According to this method, Karpasamula has 2240 ml. Taste-threshold; Yastimadhu has 1320 ml. Taste threshold. Bala has got 1160 ml. Taste threshold etc.

When the volunteers different on the taste of a drug orwhen a drug has two tastes of equal intensity; the Rasa havinghigher threshold values in that drug wil1 be considered as itsPradhana Rasa and the other as Anurasa. For example; Ashwagandha has been enumerated in Madhuravarga by Charaka but Rajanighantu has described it as katu. We gave the powder ofthis drug to fifty volunteers blind method). Twentysevenvolunteers opined that it was Madhura while twenty three opinedthat it was Tikta. All the volunteers could detect both the Rasasbut the above difference arose when they fixed up Pradhana Rasaand Anurasa. Then, the Taste threshold was determined by theabove described method and it was found that Tikta Rasa in thatdrug had higher threshold than Madhura Rasa. It was, therefore,decided that Ashwagandha has Tikta as its Pradhana Rasa andMadhura as Anurasa.

Classification of the intensity of taste

Take the Taste-threshold of 50 famous Madhura Dravyas, Record the lowest and the highest threshold values. Note the actualfluctuation. Devide the figure by three and thus fix up the degreesof Madhura, Madhuratara and Madhuratama.

We have tried it in 25 Madhura Rasa Dravya. It was found that one of these drugs showed the lowest threshold of 80 ml. while another drug showed the highest threshold of 2240 ml. The actual fluctuation, therefore, was 2160 ml (2240-80=2160). This figure of 2160 is to be divided by 3. (21 60÷3=720 ml). Therefore Madhura Rasa Dravyas having the threshold of 720 or below will be classified as Madhura; those having thethreshold between 721 to 1440 ml. will be clascified as Madhuratara and those having the taste threshold between 1440 to 2240 ml. will be classified as Madhuratama, Similarly thedrugs of all the Rasas can be classified.

Let us admit that the same drug collected from differentplaces in different reasons may show variable thresholds of taste.It is, therefore, desirable to conduct these experiments

repeatedly over a period of five years on drugs collected from different parts of the country before final conclusions are reached at.

Practical works done

While working for their postgraduate degree from the GujaratAyurveda University, Janmagar, Shri D. Krishna Murthy (1974)and Shri P. U. Vaishnav (1977) and the writer of this bookdetermined the taste threshold of 150 drugs of different Rasas.These drugs were collected, indentified, powdered and tested for their taste-threshold. Let us have some of the examples.

The taste threshold values of drugs were determined by manymethods and ways

(1) **In cold water**: The method is described earlier.

(2) **In hot water**: Some drugs contain some volatile oils that subscribe to the taste of drugs. Some fractions are dissolved onboiling the drug in water. Therefore, the threshold values were determined in hot water also. If the threshold values are higher incold water, the drug should be administered with cold water. Ifthe threshold values are higher in hot water, the drugs should be administered with hot water. This is the clinical significance ofthis experiment.

Take 5 gms, of drug powder; dissolve it in 100 ml. of water;boil it till it is reduced to 50 ml, Stir it during boiling. Filter it, Take 1 ml, of this filtered solution or decoction and taste it. Goon diluting it with cold distilled water till the taste is perceived,Record it for the Taste threshold.

(3) **Threshold value 6 hours after boiling**:

Adopt method 2 as given above with the modification that the solution, after reducing it to 50 ml., be allowed 6 hours gap againbefore proceeding the test further. Certain fractions may again precipitate when the solution is cooled down and the effect may be seen in the threshold

(4) **Threshold value in 1% Saline Solution**:

It is said by Charaka that Lavana suppresses other tastes[65]. This experiment was mecant to assess the effect of Lavana on thethreshold of tastes of drugs.The method is the same as that of cold water except that1%saline solution was used instead of cold water, i.e., 5

gmsof drug powder was dissolved in 100 ml. of 1% saline solution,rest of the procedure is the same.

(5) **Threshold in 1% glucose solution**:

This experiment was meant to find out whether the addition of any other Rasa suppresses the original Rasa of the drug. The method is the same as is described in (4). Take 1% glucose solution instead of Saline solution.

MODERN TECHNIQUES WHICH MAY BE HELPFUL IN DETERMINING RASA

1. Nuclear Magnetic Resonance (NMR)

According to the Ayurvedic classics, Rasais an outcome of interaction of all the Panchamahabhutas, originating from earth (Pruthvi) as a source. The origination is initiated by the water (Ambu), and close combination of principle elements like fire (Agni), air (Pavana) and sky (Akasha)[66]. The association of these five elements results in the formation of *Dravya* and is pharmacological attributes. In the process of formation of any Dravya, these basic elements take part in such a way that their specific proportion depicts particular pharmacological attributes. So, it proves that the intimate combination of the basic elements is the main cause of formation of specifically determined properties of the Dravya

Study of metabolomics aims at the study of chemical processes involving metabolites, the small molecule substrates, intermediates and products of metabolism[67].Metabolomics is the large-scale study of small molecules, commonly known as metabolites, within cells, biofluids, tissues or organisms. Collectively, these small molecules and their interactions within a biological system are known as the metabolome. The metabolomics have great importance n predicting and explaining complex phenotypes in diverse biological systems. As every Dravyahave specific Panchabhautikconfiguration; which can be correlated to the metabolomics of the drug, may prove beneficial in defining chemosensory parameters for specific *Rasa.*

Nuclear magnetic resonance (NMR) is a spectroscopic technique well suited to determining the structure of molecules ranging from a few atoms to large proteins. The strength of NMR lies in its ability to distinguish and identify atoms on the basis of their chemical environment, and in determining the chemical bond and spatial relationship of those atoms. Thus, NMR is a powerful tool for the identification of molecules, especially those of an organic nature. In addition, NMR has quantitative applications valuable to pharmaceutical analysis.

Nuclear magnetic resonance (NMR)-based metabolomics has many applications in plant science. Metabolomics can be used in functional genomics and to differentiate plants from different origin, or after different treatments. In this protocol, the following steps of plant metabolomics using NMR spectroscopy are described[68]:

1.**Sample preparation** (freeze drying followed by extraction by ultrasonication with 1:1 CD3OD:KH2PO4 buffer in D2O)

2.**NMR analysis** (standard 1C, J-resolved, 1H–1H correlation spectroscopy (COSY) and heteronuclear multiple bond correlation (HMBC))

3.**Chemometric methods**

The main advantage of NMR metabolomic analysis is the possibility of identifying metabolites by comparing NMR data with references or by structure elucidation using two-dimensional NMR. This protocol is particularly suited for the analysis of secondary metabolites such as phenolic compounds (usually abundant in plants), and for primary metabolites (e.g., sugars and amino acids). This procedure is rapid; it takes not more than 30 min for sample preparation (multiple parallel) and a further 10 min for NMR spectrum acquisition[69].

Nuclear magnetic resonance (NMR) is a spectroscopic technique well suited to determining the structure of molecules ranging from a few atoms to large proteins. The strength of NMR lies in its ability to distinguish and identify atoms on the basis of their chemical environment, and in determining the chemical bond and spatial relationship of those atoms. Thus, NMR is a powerful tool for the identification of molecules, especially those of an organic nature. In addition, NMR has quantitative applications valuable to pharmaceutical analysis.

2. E-tongue: An Analytical tool for assessment of *Rasa* (taste) of medicinal plants

Introduction:

"Rasonipatedravyanam" is the basic examination of Rasa (taste) told by the ancient seers of Ayurveda i.e. the taste of any substance is primarily known by tasting himself through Rasanaendriya (tongue)[70]. But it is very dangerous in cases of toxic material or plants. Food and Drug Administration (FDA)-unapproved molecule testing. Therefore, analytical taste-sensing multichannel sensory system called as electronic tongue (e-tongue or artificial tongue) which can assess taste have been replacing the sensory panellists. Thus, e-tongue includes benefits like reducing dependence on human panel.[71]

Rasa (taste) is an important pharmacodynamic attributes in Ayurvedic pharmacology among five (Rasa, Guna, Veerya, Vipaka). Thus, it is essential to use these analytical tools in medicinal plants or Ayurveda for quality assurance as well as for standardization[72].

Electronic tongue is an instrument defined as an array of non-specific chemical sensors with partial sensitivity (cross-sensitivity) to different components, able to analyze complex liquids[73]. These are used mainly for qualitative assessment. Sufficient amount of aqueous solubility of test compound is necessary for application on the electronic tongue. To increase the solubility co-solvents like ethanol can be used.

These devices have three principal components-

I. Sensory array
II. Equipment of emitting and receiving signals
III. Pattern recognition

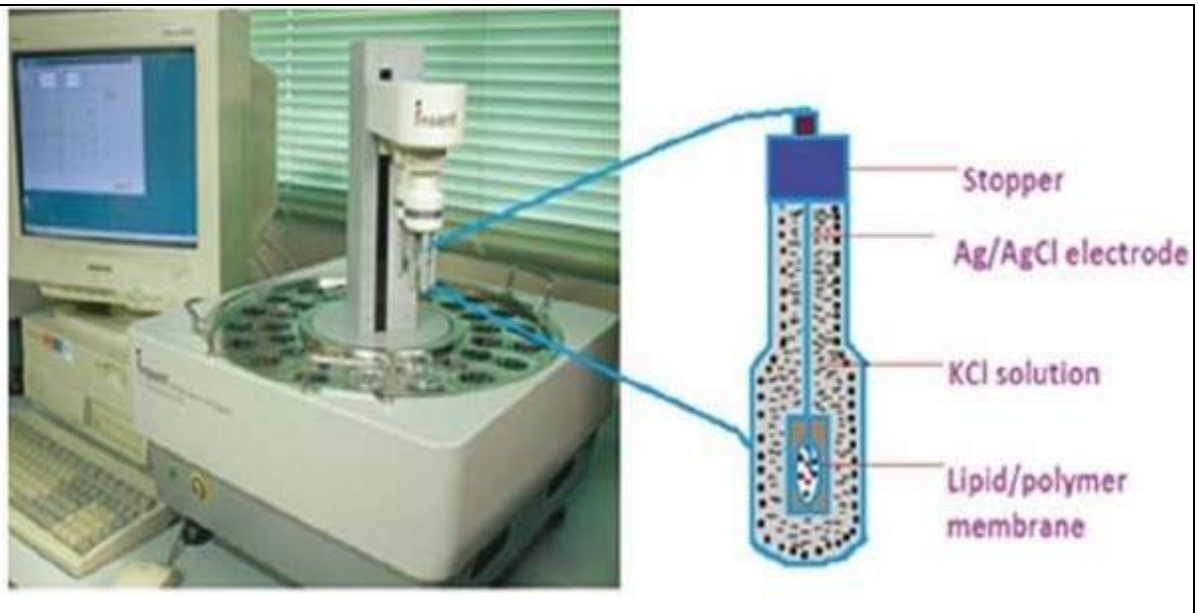
In recent years, three types of electronic tongues/taste sensors had been developed, based on potential, impedance spectroscopy, and voltammetry.

I. The gustatory sensors based on potential by Iiyama *et al*. which is composed of several kinds of lipids/polyvinylchloride(PVC) membranes for transforming the taste quality information like saltiness, bitterness, etc., into electrical signals.
II. The electronic tongue based on impedance spectroscopy described by Riul and coworkers, in which the sensors were built by supramolecular thin films of conducting polymers with lipid-like material and were analysed with impedance spectroscopy.

III. The third based on the principle of voltammeter designed by Winquist *et al*. which was consists of several metallic electrodes (platinum, gold, palladium, iridium, rhenium, and rhodium) and it work as working electrode (Ag/AgCl reference electrode and stainless steel electrode as counter electrode for standard three-electrode systems).

Basic Principle:

It consists of different types of sensors which are attached to the arm, a sample table, an amplifier and a computer for data recording. Thus, it is based on electrochemical taste-sensing system principle. It has the same process of human tongue buds behave with interact of a molecule. The taste buds are represented by sensors which interact with these test molecules. The response of these signals are compared with physiological action potentials which are recorded by computer which correspond to the neural network at the physiological level. The obtained data can be evaluated further on the basis of already existing matrix of sensor responses which can be compared with human memory or association to already existing taste patterns. The most applied principle is potentiometry.



SA402B (Insent Inc., Atsugi-chi, Japan) Electronic tongue

Jayasundar R et al. adopted a method in which a potentiometric difference was measured between 7 sensors and the reference electrode. Three of them tuned each to sour (S1), salty (S3) and umami (S4) tastes. The other four sensors gave an integrated response. The electrochemical signals from the sensors were stored as data matrix and used for multivariate analysis. The response of each sensor was assessed on a relative intensity scale

of 1–10, from the least to the most intense taste perception. Each sensor has a specific organic membrane with interacts with ionic, neutral and chemical compounds present in the liquid sample in a specific manner. Any interaction at the membrane interface is detected by the sensor and converted into electronic signal. It can be adopted as a reference method for other studies.

Different taste sensors have different composition[74] which is mentioned in table 1.

Table 1: Components of taste sensor

Taste sensor	**Lipid**	**Plasticizer**
Saltiness	Tetradodecylammonium bromide, n-Tetradecyl alcohol	Dioctyl phenylphosphonate
Sourness	Phosphoric acid di(2-ethylhexyl) ester, Oleic acid, Trioctylmethylammonium chloride	Dioctyl phenylphosphonate
Umami	Phosphoric acid di(2-ethylhexyl) ester, Trioctylmethylammonium chloride	Dioctyl phenylphosphonate
Acidic bitterness	Phosphoric acid di-n-decyl ester	Bis(1-butylpentyl) adipate Tributyl O-acetylcitrate
Basic bitterness	Tetradodecylammonium bromide	Dioctyl phenylphosphonate
Astringency	Tetradodecylammonium bromide	2-Nitrophenyl octyl ether
Sweetness	Tetradodecylammonium bromide, Trimeritic acid	Dioctyl phenylphosphonate

Significance:

As earlier mentioned a study was conducted by (Jayasundar R et al. 2016) for determination of *Rasa* through E tongue analytical tool of some medicinal plants likewise it can be applied on other plants also.

Others-

1. Quantify taste-masking efficiency of pharmaceuticals.
2. Analyze stability of medicines regarding taste.
3. Identify toxic substances.
4. Search for drugs, explosive.
5. Monitor Herbal medicine.
6. Identify unpleasant taste of pharmaceuticals.
7. Quantify taste and foodstuff recognition.[3]

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GUIDELINES FOR THE STANDARD PROTOCOL FOR EVALUATION / DETERMINATION OF RASA (TASTE)

A. PASSPORT DATA OF THE SAMPLE

(This data is confidential and should not be shared with any person who is to blinded as part of the investigation till the procedures requires so.)

1. **Test sample name/ code –** Write down the botanical name / local name of test sample and the test sample code for blinding purpose.
2. **Source of sample –** Write the source of sample, if it is **self -collected** (by any team member of investigating team) or **procured from the market** or **collected from the third party.** If it is provided by the third party and primary source is not known, then the third party will be considered as source. Write **"Not Specified",** if the sample is procured from the market and its source is not known.
3. **Collector's name –** Write down the name of collector (any member of investigating team).
4. **Date of collection –** Mention the date (DD-MM-YYYY) of collection
5. **Season of collection –**Specify the season of collection as stated.
    a. Shishir/ Vasant/ Grishma/ Varsha/ Sharad/ Hemant
    b. Spring/ Autumn/ summer/ winter
6. **Collected Part –**Mentionclearly the part used of the plant source.
7. **Authentication number/ Authenticating body-** Provide drug accession number or drug identification certificate number provided by the competent authority working in the field of identification of plants well equipped with taxonomist, botanist and chemist. Attach a copy of the same.
8. **Weight of sample received –** weigh the test sample with digital weighing scale having accuracy of 0.01gm. Minimum amount of the test sample needed should be calculated according to the number of participants. It should not be less than 5gm for each volunteer.
9. **Powder Fineness (in case of powdered drug) –**The sample should not be of more than 80 mesh sieve.

10. **Quality assessment tests** –Pharmacognosticstudy of the test sample(crude drug and powder) covering macroscopic and microscopic study. It should cover the description of organoleptic characters, microscopic characters, phytochemical study, physicochemical parameters like foreign matter, loss on drying, total ashvalue, acid insoluble ash, water extractive value, alcohol extractive value, preliminary phytochemical analysis as per the standard protocol in the book entitled Quality Standards of ASU drugs provided by Pharmacopeal Laboratory of Indian Medicine , New Delhi. The investigators may add more quality tests besides these.
11. **Safety and toxicity study-YES / NO.** Assessment of Rasa can only be done when credible and unequivocal safety data is available for the oral use of the sample. The investigators must attach the summary safety data along with their references in the records.

B. TRIAL FOR EVALUATION / DETERMINATION OF RASA (TASTE)

The evaluation will comprise of two parts. The first part of evaluation will be done by involving human subjects and the second part will be laboratory based. The result obtained through human subject evaluation will be final and binding whereas the results of the second part will be utilized to establish the correlation. The laboratory based evaluation will be conducted where such facilities are available and are not mandatory if the human trial is able to establish the Rasa of the substance without any doubt. In case of any confusion in determining the Rasa, laboratory based investigations needs to be done for resolving the confusion.

B.1. GUIDELINES FOR EVALUATION INVOLVING HUMAN SUBJECTS

B.1.a. General

1. Apparently healthy volunteers can take part in this evaluation process. Special care should be taken to ensure that the volunteer is not having any clinical condition which may interfere in perceiving taste sensation.
2. People who have studied or studying Ayurveda (BAMS) can only be volunteers for this evaluation.
3. This is a trial involving human subjects. Therefore ethical clearance from the competent authority should be obtained before starting the evaluation.
4. The study should be preferably double-blind or at least single blind.

5. The volunteers must be given a demo / training about the entire process of evaluation.

B.1.b. Trial Drug

1. The evaluation should be done as early as possible from the time of collection and within the designated shelf life period.
2. The investigators must ensure the authenticity and quality of the sample before proceeding the evaluation of Rasa.
3. Taste will be evaluated of the Powder (fine, passed through 80 size sieve) and / or fresh Juice (sieved through a fine cloth).
4. The dose for evaluation will be as per the documented human dose or as calculated from the safe dose for animals. In any case the dose should not be more than 5 gms for powder sample and 5 ml for fresh juice. The dose will be administered orally.

B.1.c. Volunteers

1. Age – More than 18 years.
2. Gender – Either Gender / Any gender.
3. Minimum Sample Size for one sample – 10.
4. Written Consent to be obtained from all volunteers.
5. A brief training / orientation session should be conducted to explain to make the volunteers aware about the procedure and what needs to be observed and documented.

B.1.d. Experiment

1. The experiment should be conducted in a SadharanaRitu i.e. normal climatic condition. The room temperature should not be more than 25^0C .
2. The experiment should be conducted between after 9 am. (Kapha Kala exclusion)
3. The volunteers should be provided comfortable sitting arrangement.
4. The volunteers will be asked to have light food at least 2 hours before the experiment.
5. The volunteers will be given standard mouth cleanser and distilled water for rinsing the mouth.
6. The test drug will be administered per oral and volunteers to will be asked to retain it for thirty seconds over the tonguebefore swallowing for uniform contact of taste buds of the tongue.
7. Each volunteer will then be asked to fill in the Proforma / CRF.

B.1.f. Proforma

1. The Proforma contains 2 Parts (Part A & Part B). Part A involves indirect assessment of Rasa whereas Part B involves direct assessment of Rasa.
2. Each volunteer has to fill in both the parts. Part B has to be filled in by the volunteer after filling the Part A.

B.1.e. Data Interpretation

1. The responsesof the volunteers to questions of Part A will be appropriately awarded scores to their associated Rasa. For example, Highest Degree of Coating in the mouth = Madhura – 3(M3); Medium degree of dispersion in Mouth = Lavana – 2 (L2), so on.
2. These scores will be tested for their statistical significance and consequently to derive the Rasa.
3. The response to Question no. 5 in Part B will be tested for its statistical significance and primarily determine the Rasa of the substance and its degree. For example, if the statistically significant response of all the volunteers comes to Madhura – 2, then primarily it will be assumed as the main rasa of the substance.
4. This finding of Q.5 will be validated with the collective response of Part A (Q.1 to 4).
5. In case of any significant discrepancy, the test will be conducted on a bigger sample size to resolve it. Ideally findings of Part A and Part B should validate each other.
6. In case of persisting discrepancy even with a bigger sample size and multicentric evaluation, the findings may also be compared with the rasa suggested by modern laboratory based investigations.
7. The responses of Questions 5 & 6 will be tested for statistical significance and will be termed as Anurasa of the substance.

B.2. GUIDELINES FOR EVALUATION OF RASA (TASTE) THROUGH TLC

Material:

1. Pre-coated TLC plates with good uniformity (Merck)
2. Reagents: Sulphuric acid, Marcous reagent , Vanillin, HPTLC setup, Benzene (AR grade)
3. Silica gel GF 254
4. Supporting software(R/SPSS/.)

Methodology:

1. As per API protocol, extraction will be carried out.
2. 1mg/ml Stock solution will be prepared.
3. Plating/ spotting in triplicates in volume 5 µl
4. The Rf value will be documented in day light with Post-chromatographic derivatization
5. Data will then be subjected to analysis.

B.3. GUIDELINES FOR EVALUATION OF RASA (TASTE) THROUGH E TONGUE

B.3.a. Aim: To explore the use of structuro-functional information deduced from spectroscopic techniques (Nuclear Magnetic Resonance (NMR), Fourier Transform InfraRed (FTIR) and Laser Induced Breakdown Spectroscopy (LIBS) and Electronic tongue to study the unidentified Rasaof medicinal plants.

B.3.b. Principle: Taste has both subjective and objective components. While the former relates to sensory perception, the latter relates to chemical sense of taste, i.e. chemical constituents of the sample. For example, sucrose, fructose or glucose contribute to sweet taste, and acids to sour taste. Sensorial (taste) and phytochemical descriptors of selected medicinal plants can be comprehensively evaluated. The latter can be studied using (Nuclear Magnetic Resonance (NMR), Fourier Transform InfraRed (FTIR) and Laser Induced Breakdown Spectroscopy (LIBS), and the sensorial parameters of taste using Etongue. The novelty of this study is assessment of both the objective (chemical) and subjective (sensorial) aspects of the chemosensory property of taste using analytical techniques and more importantly, on whole extracts rather than single molecules or fractionated extracts of plants.

B.3.c. Materials and methods:

B.3.c.i.Plant materials: Both the test drug (drug with unknown Rasa) and reference standard drug (drug with known Rasa) should be prepared for the study after proper identification and authentication by the subjective expert.The dry and powdered form of the each samples can be taken and 50 ml of distilled water can be added to 5 gm of each sample, placed in a 40^0C water bath for 1 hour, gently stirred every 10 min and then macerated. All the prepared solutions should be filtered to remove any suspended particles, left at room temperature for 1 hour and used for analysis. The following may be the experimental conditions: sample volume e 20 ml; acquisition time e 120 s; time per analysis e 180 s; four replicates per sample.

B.3.c.ii. E-tongue based evaluation of taste: Taste can be evaluated with the potentiometry based a-Astree Electronic tongue (Alpha MOS, France) using Sensor Array #5 and a reference electrode. The array of the each sensor tuned to known tastes. The electrochemical signals from the sensors should be stored as data matrix and used for multivariate analysis. The response of each sensor should be assessed on a relative intensity scale of 1e10, from the least to the most intense taste perception.

B.3.c.ii. Spectroscopic studies:

1. **Nuclear Magnetic Resonance:**The plants from the similar taste category are clustering in closer, indicating similarity between their spectra.
2. **Fourier transform infrared spectroscopy:**Spectral similarities of different *rasa* is observed along with differences categorical region.
3. **Laser-induced breakdown spectroscopy:**Elemental spectral range in obtained as per different category of Rasa.

B.3.d. Results: E-tongue data can be analysed and the differential response of the sensors is presented as a radar graph with intensity grading. NMR data on the other hand, can be first processed using standard procedures (Fourier transformation, baseline and phase corrections) and then subjected to multivariate Principal Component Analysis (PCA). Data obtained from the study can be compared with reference standard drug to interpret the probable rasa of the test drug.

Standard Protocol for Determination of Rasa (Taste) Involving Human Subjects

Name of the Volunteer:

Age:

Date:

PART - A

√(tick one or more option)

1. **What did you feel in the oral cavity after tasting the sample? (tick one or more option)**

SI No	Question	Uttam (Highest degree) Score - 3	Madhyam (Medium Degree) Score - 2	Avara (Lowest Degree) Score - 1
1.	Coating of the oral cavity			
2.	Unctuous/Slimy feeling			
3.	Softness of the mouth			
4.	Cleansing of mouth			
5.	Burning sensation in mouth, throat, chest - After sometime			
6.	Softness of the mouth			
7.	Disperse quickly			
8.	Burning sensation in mouth, forehead			
9.	Burning sensation in mouth, forehead, whole body –immediate			
10.	pricking sensation on tongue			
11.	Cleansing of mouth			
12.	Feeling of temporary loss of taste perception			
13.	Not pleasant to Tongue			
14.	Cleansing of mouth			
15.	Dryness of mouth			

16.	Stiffness of the tongue			

2. What did you feel in mind / brain after tasting the sample?

SI No	Question	Uttam (Highest degree) Score - 3	Madhyam (Medium Degree) Score - 2	Avara (Lowest Degree) Score - 1
1.	Sense of satisfaction			
2.	Pleasant feeling			
3.	Developed likingness in food			
4.	Mental Agitation			

3. Which kind of effect you are experiencing?

SI No	Question	Uttam (Highest degree) Score - 3	Madhyam (Medium Degree) Score - 2	Avara (Lowest Degree) Score - 1
1.	Perspiration / Sweating			
2.	Discharge from Nose			
3.	Lacrimation / Tears in eyes			
4.	Stiffness of Head			
5.	Choking feeling in throat / chest region			

4. What reflective effect you observed?

SI No	Question	Uttam (Highest degree) Score - 3	Madhyam (Medium Degree) Score - 2	Avara (Lowest Degree) Score - 1
1.	Increased Salivation			
2.	Tingling sensation in teeth			
3.	Eye and eyebrow constriction			
4.	Feeling of Goosebumps			

PART - B

5. What is the Predominant taste of drug/ which taste you felt the most after immediate contact? (Tick only one)

Sl No	Option	Uttam (Highest degree) Score - 3	Madhyam (Medium Degree) Score - 2	Avara (Lowest Degree) Score - 1
1.	Madhura			
2.	Amla			
3.	Lavana			
4.	Katu			
5.	Tikta			
6.	Kashaya			

6. What is the secondary taste of drug/ which taste you felt after some time of contact? (Tick only one)

a. *Madhura*– Sweet
b. *Amla* – Sour
c. *Lavana*- Salt
d. *Katu* - Pungent
e. *Tikta* - Bitter
f. *Kashaya*- Astringent
g. None.

7. Any other taste(s) felt besides the above two? (Tick all applicable options)

a. *Madhura*– Sweet
b. *Amla* – Sour
c. *Lavana*- Salt
d. *Katu* - Pungent
e. *Tikta* - Bitter
f. *Kashaya*- Astringent
g. None.

KEY TO STANDARD PROTOCOL FOR DETERMINATION OF RASA (TASTE) OF MEDICINAL SUBSTANCES.

PART - A

1. What did you feel in the oral cavity after tasting the sample? (tick one or more option)

Sl No	Question	Reference	Associated Rasa
1.	Coating of the oral cavity	(*Anulimpativa*) Ch./ *Mukha Upalepa Su.*	Madhura
2.	Unctuous/Slimy feeling	(*Snehana*) Ch.	Madhura
3.	Softness of the mouth	(*Mardava)* Ch.	Madhura
4.	Cleansing of mouth	(*Mukhabodhana*) Ch./ *Kshalana* A.H.	Amla
5.	Burning sensation in mouth, throat, chest - After sometime	(*Vidahascha aasyakanthasya)* CH. / *Urahkantham vidahati* (A.S.)	Amla
6.	Softness of the mouth	(*maardavam kurute mukhe*) Ch.	Lavana
7.	Disperse quickly	(*Praleeyana*) Ch.	Lavana
8.	Burning sensation in mouth, forehead	(*vidahanmukhasya cha*)Ch./(*kapolagala dahakrit*)A.H./(*kanthakapolavidahati*)A.S.	Lavana
9.	Burning sensation in mouth, forehead, whole body –immediate	(*vidahan mukha* Ch. or *vidahati deham* A.S.) (*Kapolo dahateeva cha*) A.H.	Katu
10.	pricking sensation on tongue	*nipate tudateev cha*) Ch.	Katu
11.	Cleansing of mouth	*Mukha Vaishadya (Charak)*	Tikta
12.	Feeling of temporary loss of taste perception	(*pratihanti nipate*)*Ch./ Pratihanti Rasanam* (A.S.)	Tikta
13.	Not pleasant to Tongue	Swadate Na cha - Ch	Tikta
14.	Cleansing of mouth	*Vaishadya (Charak)*	Kashaya
15.	Dryness of mouth	Vaktram Parishoshayati (Su)	Kashaya
16.	Stiffness of the tongue	Jihvanstambhayati (Su)	Kashaya

2. What did you feel in mind / brain after tasting the sample?

Sl No	Question	Reference	Associated Rasa
1.	Sense of satisfaction	*Paritosham utpadayati Su*	Madhura
2.	Pleasant feeling	*Ahlad Ch. / Prahlad Su.*	Madhura
3.	Developed likingness in food	*Shraddam utpadyati Su. /*	Amla

		Bhaktaruchim Ch./ Bhaktaruchim chapadayati	
4.	Mental Agitation	*???*	Katu

3. Which kind of effect you are experiencing?

Sl No	Question	Reference	Associated Rasa
1.	Perspiration / Sweating	*Swedana Ch.*	Amla
2.	Discharge from Nose	*Nasasravi Ch*	Katu
3.	Lacrimation / Tears in eyes	*Akshisansravi*) Ch	Katu
4.	Stiffness of Head	*shiro grahaniite*) Su.	Katu
5.	Choking feeling in throat / chest region	*Badhnativa ch yah kantham Ch. / Hridayam karshayati peedayati (Su)*	Kashaya

4. What reflective effect you observed?

Sl No	Question	Reference	Associated Rasa
1.	Increased Salivation	*shleshma abhivardhyati* (M) Su./ *Mukhasravam janayati* (A) Ch. / Excess Salivation, *kapha prasekam janayati Su.* (L)	Madhura / Amla / Lavana
2.	Tingling sensation in teeth	*Danta harsha Ch.*	Amla
3.	Eye and eyebrow constriction	*Akshibhruvam sankochayati A.S.*	Amla
4.	Feeling of Goosebumps	*Harshayati romani (A.S) / Harsha (Su)*	Amla / Tikta

ANNEXURES

NATIONAL INSTITUTE OF AYURVEDA

(An Autonomous Body under Ministry of AYUSH, Govt. of India)
Jorawar Singh Gate, Amer Road, Jaipur.

P.G. DEPARTMENT OF DRAVYAGUNA

1st Workshop on
"Designing of Standard Protocol for Determination of Rasa Panchak of Anukta Dravyas"

Date - 30th and 31st January 2018 **Venue - NIA, Jaipur**

SUMMARY REPORT AND FUTURE SUGGESTIONS

- A 2 Day workshop on "Designing of Standard Protocol for Determination of Ras Panchak of Anukta Dravyas" was organised on 30 & 31st January 2018, at NIA, Jaipur.
- 24 senior experts (16 from outside NIA and 8 from NIA) representing fields of Dravyaguna, Maulik Siddhant, Botany, Physics, Pharmacology, Pharmacognosy actively participated and deliberated upon the above topic. 44 junior experts (13 from outside NIA and 31 from NIA),who are pursuing their MD and Ph D studies in Dravyaguna also participated in this workshop.
- All the participants were grouped into 6 groups namely Rasa, Guna, Veerya, Vipaka, Karma and modern aspects of Raspanchaka. (List of groups and there members are annexed)
- Each group was given a mandate to compile and analyze the references and relevant information to design a suitable provisional protocol to assess the component of raspanchak assigned to them.
- In the next one and a half days, each group did extensive analysis and discussion on this pre-gathered information regarding the topics allotted to them.
- The groups finally came up with provisional protocols for accessment of Rasa , Guna, Veerya, Vipaka of Anukta Dravya.
- All the experts in the common final session subjected these provisional protocols to a critical review and rigorous scrutiny. Many interesting and path-lighting interactions took place during the course of this open house discussion.
- After two days of brain storming all the experts were of the following unanimous future suggestion.
- Determination of raspanchak of anukta dravyas is an essential need of the ours considering the prevelance of use of many ethenic and exotic drugs.
- Rasa is the beginning point of determination of rasapanchak. Once rasa is determined than vipaaka, guna and veerya should be logically estimated and subjected to confirmation.
- All the provisional protocols for assessment of rasa, guna, veerya, vipaaka were inprinciple accepted and recommended for subsequent enrichment.
- The provisional protocol formulated for rasa was considered to be extensive and appropriate. The assembly is of the opinion that "*raso nipaate dravyaanam" should* be the underlying principal principle for the determination of rasa.Therefore, rasa should be ascertained by placing the sample on tongue of volunteers by using the methodology suggested in provisional

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protocol. But, any such experimentation should be preceded by oral toxicity studies or by the availability of such safety data without any doubt whatsoever.The experts were of the opinion , the use of other techniques and tools like e-tongue should be used only when there is significant confusion in determining the rasa of substance by human tongue or when the substance is toxic.The assembly was of the view that any protocol for determination of rasa should be reasonably reliable, reproducible and feasible on the part of most of the investigators. It was opined that use of sophisticated tools and complicated procedures will dissuade investigator to undertake determination of rasa experiments.

- All the experts,thus suggested that this simple provisional protocol for determination of rasa should be subjected to practical use and subsequent validation by using standard and test samples.
- As envisaged it was agreed that development of standard protocol for determination of rasapanchak will require series of workshops. It was also stressed that this series of workshop should be conducted within a reasonable timeframe to keep the intensity intact and deliver purposeful outcomes.
- All India Institute of Ayurveda, represented by its Director, Prof. Tanuja Nesari, volunteered to organise the next workshop on this topic, which was thankfully agreed by one and all.
- All the experts were of the view that keeping all the provisional protocols for review and enhancement in the agenda of one workshop is practically not feasible. Therefore, in the subsequent workshop the agenda should be focused and feasible to conclude.
- Keeping in view of this important recommendation, this first workshop suggests that the agenda of next workshop should be "Development of standard protocols for assessment of 8 important gunas namely Guru, Laghu, Shita, Ushna, Mridu, Tikshna, Snigdha and Ruksha."
- The remaining gunas, veerya, vipaak can be dealt in the future workshops. Meanwhile,the provisional protocols for these will remain available in the public domain for constructive feedback from all the stakeholders.

The organisers of the workshop express there sincere thanks to all the experts, the Director of NIA, Ministry of AYUSH for there kind cooperation to make this workshop successful.

Prof. Mita Kotecha
(Chairman, Organising Committee)

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P.G. DEPARTMENT OF DRAVYAGUNA

1st Workshop on
"Designing of Standard Protocol for Determination of Rasa Panchak of Anukta Dravyas"

Date - 30th and 31st January 2018 **Venue - NIA, Jaipur**

List of Experts Participated

1. Prof. Mahesh Chandra Sharma, Ex Director, NIA, Jaipur.
2. Prof. S.D. Dubey, Retd. Professor of Dravyaguna, BHU, Varanasi.
3. Prof. R.D. Dwivedi, Retd. Professor of Basic Principles, IPGTRA, Jamnagar.
4. Prof. Tanuja Nesari, Professor & HOD, Dept. of Dravyaguna,AIIA, New Delhi.
5. Prof. K N Dwivedi, Professor & HOD, Dept. of Dravyaguna, BHU, Varanasi.
6. Prof. D.Nag, Retd. Professor of Botany, Paprola, Himachal Pradesh.
7. Dr. Mohan Shankar Dashora, Asso. Professor (Retd.), Botany, NIA, Jaipur.
8. Prof. Rama Jayasundar, Professor of Physics, AIIMS, New Delhi.
9. Prof. K Nishteswar Rao, Retd. Professor of Dravyaguna, IPGTRA, Jamnagar.
10. Prof. Manasi Deshpandey, Professor of Dravyaguna, Bharti Vidyapeeth, Pune, India
11. Dr. Bhupesh Patel, Asso. Professor of Dravyaguna, IPGTRA, Jamnagar.
12. Prof. Lalitha B, Professor & HOD, Dept. of Dravyaguna, GAMC, Bangalore.
13. Dr. Navneet Sharma, Reader in Dravyaguna, RGPGAC, Paprola.
14. Dr. Subhash Rana, Reader in Dravyaguna, RGPGAC, Paprola.
15. Dr. Yagnesh Vyas, Surat.
16. Dr. T S Bairry, Udupi.
17. Prof. Mita Kotecha, Professor & HOD, Dept. of Dravyaguna, NIA, Jaipur.
18. Prof. M L Jaiswal, Professor, Dept. of Dravyaguna, NIA, Jaipur.
19. Prof. A Ramamurthy, Professor, Dept. of Dravyaguna, NIA, Jaipur.
20. Dr. Sudipta Kumar Rath, Asst. Professor, Dravyaguna, NIA, Jaipur.
21. Dr. Sumit Nathani, Asst. Professor, Dravyaguna, NIA, Jaipur.
22. Dr. Krutika Joshi, Lecturer, Dravyaguna, NIA, Jaipur.
23. Mr. Gaurav Sharma, Pharmacologist, NIA, Jaipur.
24. Mr. Navin Garg, Pharmacognosist, NIA, Jaipur.

Report of Rasa 1ST Workshop held at AIIA, New Delhi

25th& 26th February, 2019

All India Institute of Ayurveda organized a **National Level workshop & Brain Storming Session on Development of Standard Protocol for quality Assessment of Raw Medicinal plants materials on the basis of Rasa & an exhibition on Medicinal Plant Research** from 25th to 26th February 2019 which was supported by NMPB.
Inaugural function of the workshop took place on 25th February 2019.

The ceremony was started with the lamp lighting and welcome address of the Director, AIIA, Prof. Tanuja Nesari. Madam also highlighted the salient features of the workshop and the aim and objectives for the organisation of this specific workshop and exhibition. It was followed by the address of Dy. CEO NMPB, Mrs. Padamapriya Balakrishna, emphasising the role and responsibilities of NMPB. The chief guest of the ceremony was Prof Abhimanyu Kumar,VC of Uttarakhand Ayurveda University and guest of Honour Prof S.D Dubey, former Head, Department of Dravuaguna, IMS BHU. The chief guest and guest of honour appreciated the efforts taken and showered their blessings for success of the workshop. Then the learned subject experts gathered from entire nation gave their introduction.

After the inaugural the first plenary session was chaired by Prof Unnikrishnan Pillai and co-chaired by Prof Manasi Deshpande. The first talk was delivered by Dr Ramesh Bhutya. He highlighted the importance of classification of Dravyas as per Guna which may be useful for the specific treatment of Diseases. The second deliberation of the session was by Prof Rabinarayan Acharya who highlighted the importance of Rasapanchaka Nirdharana w.s.r. to Anukta Dravya and presented various research papers and work for the validation of Rasapanchaka and emphasized that the first need is to collect all the existing information and its critical analysis for thinking further and planning for preparation of protocol which may be accepted widely.

In the post lunch session the experts worked at their work stations and prepared the relevant protocol/ questionnaire relevant to their assigned topics.

Day 2: The workshop started by a short visit of AIIA Hospital, Acedemic Block and Vanaushadhi Vatika. It was followed by the presentation of the work done during Day one by one member of each team. Every presentation was followed by open discussion and inclusion of relevant suggestionsfrom the experts. The expert remarks were given by Prof V.K Joshi, Prof Emeritus BHU and by Dr JLN Shastri from Dabur India Limited. The entire matter was collected for the preparation of final protocol.

In the afternoon, the inaugural of the poster exhibition was conducted by the auspicious hands of Joint Secretary, Shri Roshan Jaggi. About 40 posters from AIIA and various parts of the nation prepared by pg scholars were displayed in the exhibition.

The stalls of NMPB were also arranged during the event. Joint secretory and the experts from across the nation appreciated the efforts done by the scholars.

During two days of Brain storming session the galaxy of the experts pave the path for further work to be done for the validation and formation of parameters for Rasa Panchaka Nirdharana i.e.pharmacodynamic attributes of the drugs.

Valedictory session was graced by the presence of Joint Secretary Roshan Jaggi.This is the brief report of the 2 days National workshop.

Lamp Lighting by Chief Guest Respected Prof. (Dr.) Abhimanyu Kumar & Prof. (Dr.)Tanuja Nesari (Director, AIIA)

Welcome Address by Prof. (Dr.) Tanuja Nesari (Director, AIIA & CEO, NMPB)

Address by Dr. (Prof.) Abhimanyu Kumar (VC, Uttarakhand Ayurveda University)

Introductory Session of Learned Experts

Deliberation being delivered by Dr. Sharayu Kore

Learned Experts visiting Hospital Block, AIIA

Learned Experts visiting Academic Block, AIIA

Learned Experts visiting Vanaushadhi Vatika, AIIA

Internal Discussion in Groups and Preparation of Protocol Questionnaire on "KARMA"

Internal Discussion in Groups and Preparation of Protocol Questionnaire on "VIRYA"

Internal Discussion in Groups and Preparation of Protocol Questionnaire on "RASA"

Internal Discussion in Groups and Preparation of Protocol Questionnaire on "GUNA"

Internal Discussion in Groups and Preparation of Protocol Questionnaire on "VIPAKA"

Posters Exhibition displayed by PG Scholars

Posters being examined by Respected Joint Secretary Shri Roshan Jaggi and Director, AIIA

Valedictory Function

Learned Experts and Dignitaries following the conclusion of 2 days workshop

Experts for second Meeting held on 24th -25th Feb 2019 at All India Institute of Ayurveda, New Delhi

Prof. Tanuja Manoj Nesari
Head, Department of Dravyaguna,
Director, AIIA

Prof. (Dr.) Mita Kotecha
Professor and Head,
Department of Dravyaguna
NIA Jaipur

Prof. M.C.Sharma,
Former Director, NIA

Prof. S.D. Dubey,
Ex. Head of the Department
Department of Dravyaguna
Varanasi

Prof Rambabu Dwivedi,
Ex. Head of Department
Department of Samhita & Siddhanta,
IPGTRA, Jamnagar

Prof Apurva Sangoram
Professor, Department of Dravyaguna
Tilak Ayurved Mahavidyalaya, Pune

Prof. (Dr.) A.R. Murthy,
Professor
Department of Dravyaguna,
NIA, Jaipur

Prof. Bulushu Sitaram,
Department of Dravyaguna
Tirupati

Dr. Bupesh Patel,
Asso. Professor,
IPGTRA, Jamnagar

Prof. Unnikrishnan Pillai,
Department Of Rasa Shashtra,
Amrita College Of Ayurveda,
Kerala

Dr. Asit Panja,
Associate Professor
Department of Maulik Siddhanta,

Prof. Sarayu Kore,
Pune

Dr. Sudipta Kumar Rath,
Assistant Professor
Department of Drvayaguna
NIA Jaipur

Prof. Ravi Narayan Archarya
Professor &Head
IPGT &RA

Prof. VK Joshi
Prof Emeritus, Department of Dravyaguna
B.H.U Varanasi

Prof Manasi Deshpande,
HOD, Department of Dravyaguna
Bharti Vidhya Peetha College, Pune

Prof. Lalitha, BR, Bangalore
Head, Department of Drvyaguna
Govt, Ayurveda College
Bangalore

Dr. Sumit Nathani,
Assistant Professor
Department of Drvayaguna
NIA Jaipur

Dr. JLN Sastry, CEO, NAMP
New Delhi

Prof. Anil Sharma,
Prof & Head Dept Of Drvyaguna
Shrikrishna Govt Ayurvedic College,
Karukshetra

Dr Shivani Ghildiyal,
Assistant Professor Department of
Dravyaguna
AIIA

Report of Rasa 2nd Workshop held at AIIA, New Delhi

04th & 05th February, 2020

All India Institute of Ayurveda (AIIA), New Delhi organized a "National level workshop and brain storming session on development of standard protocol for quality assessment of raw medicinal plants material on the basis of Rasa" on 04th & 05th February, 2020 in collaboration with National Medicinal Plant Board (NMPB). The inaugural ceremony was graced by Vaidya Jayant Deopujari, President, CCIM & Vaidya J.L.N. Shastri, CEO, NMPB.

Ten esteemed experts from prestigious institutes of Pan India namely IPGTRA, Jamnagar; NIA, Jaipur; BHU, Varanasi; Bharati Vidyapeeth, Pune; Tilak Ayurveda college, Pune etc. designed a protocol for determination of Rasa which will be applicable all over India as Standard reference in future studies. During workshop, consular of India in Britain also visited and had discussion with the experts and emphasized about need of such type of workshops for global acceptance of Ayurveda.

The workshop started on 4-2-2020 at 11.00 am with the Lighting of the lamp and recitation of Lord Dhanvantari prayer. President, CCIM Respected Jayant Deopujari chaired the session. Vaidya J.L.N. Shastri, CEO, NMPB, Prof. Tanuja Manoj Neasri, Director AIIA, Prof. V.K. Joshi, Prof. (Dr.) Mita Kotecha, Professor & Head, Department of Dravyaguna, NIA, Jaipur and other faculty members of AIIA, Scholars and experts of all over India became part of the Inaugural Session. The welcome address was given by Prof. (Dr.) Tanuja Manoj Neasri and all guests were felicitated by AIIA faculty with a symbol of green wealth.

After that Dr J. LN Shastri, Chief Executive Officer, National Medicinal Plants Board, Ministry of AYUSH gave deliberation about Rasa and modern tools & techniques which can be beneficial in the field of Ayurveda. He also talked about how the Rasa assessment can be done. After that Vd. Jayant Deopujari, President CCIM talked about Ayurveda and the curriculum of Ayurveda. He also emphasised on the need of research in the field of Ayurveda. The session was over with the felicitation of Guest of Honour and Chief Guest.

After that Rasa group and others along with their PPT presented their work done in previous workshop and the next step of protocol development. Dr. Apoorva Sangoram, Associate Professor, Tilak Ayurved Mahavidyalaya presented the work done on Rasa assessment in previous workshop. After that the session was over with presentation of framework for the development of Rasa protocol.

On day two (5-2-2020) The workshop again started with the presentation of Rasa. The work was presented by Dr Kalpesh Panara, Assistant Professor, Department of Dravyaguna, IPGT &RA, Jamnagar. The modification was done in the protocol by a long discussion with experts and the reviews of Prof. V. K. Joshi.

After the group discussion the final protocol was developed by Prof. V. K. Joshi and Dr. Anagha Ranade, Research Officer, Regional Ayurveda Institute for Fundamental Research, Pune finalize the standard protocol of Rasa which was the mandate of the workshop.

On day two the valedictory ceremony also started by invoking the blessings of lord Dhanvantari and by lightning the lamp with Respected Director Madam, and dignitaries. All the experts were facilitated by the Director mam. The session was concluded with enriching guidance for the future endeavours by for development of rasa protocol respected director mam and votes of thanks by Dr. Shivani Ghildiyal and Dr. Bhargav Bhide.

Inagural Ceremony and Welcome of Guest


Review of Rasa protocol by Prof. V.K. Joshi


Discussion on Rasa


Rasa group presentation of previous work


Finalization of Rasa protocol

Valedictory Ceremony

In the first session of day one, various points were discussed in detail by the experts which are enlisted below.

1. Dr Kalpesh Panara

    a. Both fresh and dry drugs should be taken into consideration while preparing the protocol.

2. Dr Rasika Kolhe
    a. Criteria for selection of volunteers should be fixed.
    b. Addiction in what sense may be specified.
3. Dr Sudeept Rath
    a. Standards for test should be specified
    b. Process of making powder in detail and particle size
    c. Selection process of volunteers should be standardized.
    d. May start with classical drugs instead of Anukta Dravya.
    e. Protocol should be kept in public domain for 6 months for suggestions from experts all over the country.
4. Dr. Vinay Verma
    a. Formulation of the drug- Swaras Kalpana can be preferred.
    b. Localization of the taste is not possible.
    c. Likert scale cannot be considered.
5. Dr. Anagha Ranade
    a. Assessment may be done clinically.
    b. In vivo models for gut receptors to be designed so as to assess the effect on the whole body.
6. Dr. Vinay J. Shukla
    a. Thrustonian panel of 7 participants can be made.
    b. They must be given the sensory training and evaluation will be done afterwards by means of duo/trio discriminative test.
    c. Models on the basis of training data set generation with algorithm.
    d. Large data set must be considered to increase the accuracy.

e. Zone of Rasa and its stability.

f. Analysis may be done by PCA software.

7. Prof. V. K. Joshi

a. Line of assessment must be same as that of Ayurvedic classics.

b. All the 5 kashay-kalpana should be considered.

c. Study design can be double blind trial

d. Experience verses evidence.

e. The groups may be divided as 21-30 years, 31-40 years, 41-50 years instead of 10 to 40 years age group.

f. Three groups can be made according to the dosha prominence.

g. Rasa Reference Standard (RRS) should be prepared.

h. Swastha criteria must be defined.

i. Experienced persons must be considered and same drug must be administered for seven consecutive days.

j. Comparison of Alcoholic hydro-alcoholic and aqueous extracts with the panchavidha kashay Kalpana.

k. The view of industries must be considered.

8. Prof. Meeta Kotecha

a. Easy techniques to assess Rasa manual, can be done with the help of instruments.

b. 2 phases can be done of this workshop.

9. Prof. V.K. Joshi

a. Rasa Reference Standard (RRS)- drugs available in all the five zones must be given the priority.

b. Calendar has to be prepared for the reference standard.

c. After that, exclusively grown drugs in the particular region can be taken into consideration.

d. BSI standard can be taken into consideration.

In Session 2, detail discussion took place as to which plant drugs should be considered for validation of protocol. A list was prepared initially which included following drugs. It was decided that to avoid confusion drugs having single Rasa should only be considered to validate the protocol. The compilation of botanical name, family, useful part and time of collection of all these plants was done by MD scholars of Department of Dravyaguna, AIIA, New Delhi. The initial list of drugs was as follows.

INITIAL LIST OF DRAVYAS ON THE BASIS OF RASA

NAME	BOTANICAL NAME	FAMILY	PART USED	TIME OF COLLECTION
Madhura Rasa Dravya				
Gambhari	*Gmelina arborea*	Verbenaceae	Root, fruit	Root- Grishma, shishir Fruit- Grishma
Bala	*Sida cordifolia*	Malvaceae	Root, seed	Root- Grishma, Shishir Seed- Oct to jan
Atibala	*Abutilon indicum*	Malvaceae	Root, seed	Root- Grishma, Shishir Seed- Oct to jan
Shaliparni	*Desmodium gangeticum*	Fabaceae	Root, Panchang	Root- Grishma, shishir Panchang- Sharad
Prushniparni	*Uraria picta*	Fabaceae	Root	Root- Grishma, shishir
Gokshur	*Tribulus terrestris*	Zygophyllaceae	Root, fruit	Root- Grishma, shishir Fruit- After sharad
Jeevanti	*Leptadenia reticulata*	Asclepiadaceae	Root	Root - Shishir
Mrudvika	*Vitis vinifera*	Vitaceae	Dried fruit	Fruit- Yatharitu
Kharjur	*Phoenix sylvestris*	Arecaceae	Fruit	Fruit- Late Grishma
Shrungatak	*Trapa bicornis*	Trapaceae	Fruitcarp, seed	Fruit- Sheetakal

Amla Rasa Dravya				
Dadim	*Punica granatum*	Punicaceae	Fruit	July- september
Amlika	*Tamarindus indica*	Caesalpiniaceae	Fruit	July-August
Matulunga	*Citrus medica*	Rutaceae	Fruit	Yatharitu
Amratak	*Spondias pinnata*	Anacardiaceae	Fruit	Yatharitu
Karamrda	*Crissa carandas*	Apocynaceae	Fruit	Chaitra- Jyestha
Vrukshamla	*Garcinia indica*	Clusiaceae	Fruit, root	Fruit- April
Nimbuk	*Citurs acida*	Rutaceae	Fruit	
Changeri	*Oxalis corniculata*	Oxalidaceae	Panchang	Throughout year
Lavana Rasa Dravya				
Saindhav				
Panchalavan				
Katu Rasa Dravya				
Pippali	*Piper longum*	Piperaceae	Fruit, root	Root- Grishma, shishir Fruit- Grishma
Chitrak	*Plumbago zeylanica*	Plumbaginaceae	Root	Root- shishir
Marich	*Piper nigrum*	Piperaceae	Fruit	Dec to Mar
Ajmoda	*Apium graveolens*	Apiaceae	Fruit	April
Adrak	*Zingiber officinale*	Zingiberaceae	Rhizome	Shard ritu
Tejovati	*Zanthoxylum armatum*	Rutaceae	Fruit, bark	Sharad
Hinguniryas	*Ferula narthex*	Apiaceae	Exudate	Vasant
Vidanga	*Embelia ribes*	Myrsinaceae	Fruit	Yatharitu
Sarshap	*Brassica nigra*	Brassicaceae	Seed	Yatharitu
Kushtha	*Saussurea costus*	Asteraceae	Root	Sharad
Tikta Rasa Dravya				
Nimba	*Azadirachta indica*	Meliaceae	Leaves, bark, seed	Seed- Late summer Leaves- Late Vasant
Kutaki	*Picrorhiza kurroa*	Scrophulariaceae	Rhizome	Grishma, shishir
Indrayav	*Holarrhena pubescens*	Apocynaceae	Seed	Winter
Karawellak	*Momordica charantia*	Cucurbitaceae	Panchang, Phalatwak	Yatharitu
Patol	*Trichosanthes dioica*	Cucurbitaceae	Leaves	Varsha, vasant
Guduchi	*Tinospora cordifolia*	Menispermaceae	Stem	Yatharitu
Mandukparni	*Centella asiatica*	Apiaceae	Panchang	Sharad
Saptaparna	*Alstonia scholaris*	Apocynaceae	Bark	Sharad
Tagar	*Valeriana jatamansi*	Valerianaceae	Root	Grishma, shishir
Ushir	*Vetiveria zizanioides*	Poaceae	Root	Grishma, shishir
Patha	*Cissampelos pareira*	Menispermaceae	Root, stem	Root- Grishma, shishir
Musta	*Cyperus rotundus*	Cyperaceae	Rhizome	Grishma, shishir
Karanj	*Pongamia pinnata*	Fabaceae	Bark, leaves,	Leaves- Varsha,

			seed	vasant Seed- Dec to Jan
Haridra	*Curcuma longa*	Zingiberaceae	Rhizome	Grishma, shishir
Daruharidra	*Berberis aristata*	Berberidaceae	Root, Stem, Fruit	Root- Grishma, shishir Fruit-late Grishma
Kashaya Rasa Dravya				
Lodhra	*Symplocos racemosa*	Symplocaceae	Bark	Sharad
Mocharas	*Bombax ceiba*	Bombacaceae	Exudate	Sharad
Dhataki	*Woodfordia fruticosa*	Lytheraceae	Flower	Feb to Mar
Kanchanar	*Bauhinia purpurea*	Caesalpiniaceae	Bark, flowers	Flowers- Feb to Mar
Jambu	*Syzygium cuminia*	Myrtaceae	Fruit, Seed, Bark, Leaves	Fruit- June-July Leaves- Varsha, vasant
Arjun	*Terminalia arjuna*	Combretaceae	Bark	Sharad
Amrasthi	*Mangifera indica*	Anacardiaceae	Seed	March- May
Kadamb	*Neomarckia kadamba*	Rubiaceae	Bark, fruit	Yatharitu
Shirish	*Albizia lebbeck*	Mimisaceae	Bark, Seed, Leaves, flower	Flower- April To June Fruit- Cold season
Khadir	*Acacia catechu*	Mimosaceae	Bark, *Sar*	Sar- Hemant
Bibhitak	*Terminalia bellerica*	Combretaceae	Fruit	Jan-Feb
Sarjaras	*Shorea robusta*	Dipterocarpaceae	Bark, exudate	Yatharitu

It was also decided that Basic material will be collected by National Medicinal Plant Board (NMPB)

Other factors regarding volunteers for validating the proforma were discussed and finalized as follows:

Sex – either sex

Volunteers will be divided into three groups according to the age, as 18-28 yrs, 35-50yrs and 55-65 years.

Volunteers must be devoid of any ENT related pathology.

Rasalakshanas (Characteristics of rasa) may be explained in Sanskrit, Hindi and English languages.

Books for understanding modern aspect of Rasa determination stated by Dr. V. J. Shukla can be referred. They are mentioned below.

1. Sensory discrimination taste analysis (Page 561): Taste descriptive analysis; concept formation, alignment and appropriateness.

2. Sensory evaluation of food: Discrimination testing pg.79 – 4.2.11 to 4.2.5

On day two (5-2-2020) The workshop again started with the presentation of Rasa. The work was presented by Dr Kalpesh Panara, Assistant Professor, Department of Dravyaguna, IPGT & RA, Jamnagar.

After this it was decided that Dr. Kalpesh Panara and Dr. Rasika Kolhe would prepare the proforma for the taste perception. It was divided in three parts.

1. Direct perception of taste.
2. Perception of Lakshanas of the taste.
3. Questionnaire form (Gradation in necessary)

The proforma was accepted by incorporating some corrections and suggestion.

By the discussion among the experts and with the final deliberation by Prof. V.K. Joshi, Prof. Tanuja Manoj Nesari and Prof. Mita Kotecha, a method having following points was developed to establish a "Universal Rasa Protocol" for coded (Ukta) and uncoded (Anukta) drugs used in Ayurvedic practices or in Ethnobotanical practices.

a. Collection of the drug (Seasonal collection)
b. Panchavidha Kashaya Kalpana preparation (SOPs and Dosage form)
c. Double blinding between participants and researcher.
d. Experiences vs Evidences
e. Multicentric (5 zones are selected accordingly East, West, North, South and Center)
f. Number of Samples =Minimum 3 samples x from 5 different places = Total 15 samples of a drug
g. Age = 3 age groups (18-30 yrs, 31-50 yrs, 51-70 yrs)
h. Duration of the study
i. Rasa Reference Standard (RRS) should be prepared;
j. Inclusion and Exclusion criteria
k. Compilation of all thesis works on *Rasa*
l. Questionnaire form (Dr. Nistheswar's Standardized Question format)
m. Volunteers (UG and PG students from 5 institutes already chosen)
n. If new questionnaire to be developed, that must be validated.

Summary of the 2 day's discussion was presented by Dr. Apoorva Sangoram. The following points were stated.

1. Compilation of thesis on Rasa in specified manner.

2. Drug list of fresh and dry drugs must be prepared in the form of a table.
3. Standardization of formulations according to the Sharangdhara.
4. Volunteers will be divided into 3 groups (18-21, 35-45, 55-65 years)
5. Basic materials will be collected by NMPB or CCRAS and distributed to all the centres.
6. Selection of volunteers- healthy volunteers, devoid of any ENT disorders.
7. Non-poisonous drugs will be used.
8. Preparation of questionnaire will be done.

A deliberation on QCA (Qualitative comparative analysis) was delivered by Dr. V.J. Shukla. The modification was done in the protocol by discussion among the experts and the reviews of Prof. V. K. Joshi.

After the group discussion the final protocol was developed by Prof. V. K. Joshi and Dr. Anagha Ranade, Research Officer, Regional Ayurveda Institute for Fundamental Research, Pune finalize the standard protocol of Rasa which was the mandate of the workshop.

The valedictory ceremony also started by invoking the blessings of lord Dhanvantari and by lightning the lamp with Director, AIIA, and dignitaries. All the experts were facilitated by the Director. The session was concluded with enriching guidance for the future endeavours by for development of rasa protocol Director and vote of thanks by Dr. Shivani Ghildiyal and Dr. Bhargav Bhide.

Experts for second Meeting held on 4th -5th Feb 2020 at All India Institute of Ayurveda

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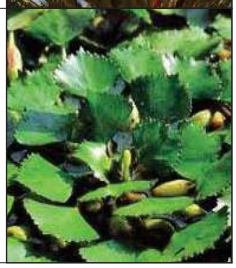
List of Plants to be used for Rasa Reference Standard (RRS) Determination

Madhura rasa

S. No.	Plant Name	Common name/English name	Family	Rasa	Part used	Picture
1.	Bala (*Sida cordifolia* L.)	Bariyara/Country mallow	Malvaceae	**Madhura**	Root	
2.	Atibala (*Abutilon indicum* L.)	Kanghi/ Country mallow	Malvaceae	**Madhura**	Root	
3.	Jeevanti (*Leptadenia reticulata* (Retz.) Wight & Arn)	Dodi shaaka/ Cork Swallow	Asclepiadaceae	**Madhura**	Root	
4.	Mrudvika(*Vitis vinifera* Linn)	Dhaaka	Vitaceae	**Madhura**	Dried fruit	
5.	Kharjura(*Phoenix dactylifera* Linn.)	Kajura/Date	Palmae	**Madhura**	Fruit	
6.	Shringataka (*Trapanatum bispinosa.* (Roxb). Makino)	Singhada/ Calotrops, Water chestnut	Trapaceae	**Madhura**	Fruit	

Amla rasa

S. No.	Plant Name	Common name/English name	Family	Rasa	Part used	Picture
1.	Changeri (*Oxalis corniculata* Linn.)	Tinpatiya/ Indian sorrel	Oxallidaceae	**Amla**	Leaf	
2.	Dadima (*Punica granatam* Linn)	Anara/ Pomegranate	Punicaceae	**Amla**	Seed	
3.	Amalaki (*Phyllanthus emblica*Linn.)	Aamla/ Emblic myrobalan	Euphorbiaceae	**Amla**	Fruit	
4.	Amlika (*Tamarindus indica* Linn.)	Imli/ Tamarind tree	Asclepiadaceae	**Amla**	Fruit	
5.	**Karmarda (*Carissa carandas* Linn)**	Christ thorn	Apocynaceae	**Amla**	Fruit	
6.	**Vrikshamla (***Garcinia indica* Choisy)	Vrikshamla/ Kokum butter tree	Guttiferae	**Amla**	Fruit	

Katu rasa

S. No.	Plant Name	Common name/English name	Family	Rasa	Part used	Picture
1.	**Pippali (***Piper longum* Linn.)	Pippal/ Ling pepper	Piperacea	**Katu**	Fruit	
2.	**Maricha (***Piper nigrum* Linn)	Black pepper/ Kali mircha	Piperaceae	**Katu**	Fruit	
3.	Ajmoda(*Trachyspermum ammi*(L.) Sprague ex Turrill)	Ajmod/ celery	Umbelliferae	**Katu**	Seed	
4.	Aadraka(*Zingiber officinale*Roscoe)	Adrakh/ Zinger	Zingiberaceae	**Katu**	Rhizome	
5.	Tumbaru(*Zanthoxylum alatum* Roxb.)	Tumbru phala/ Tootache tree	Rutaceae	**Katu**	Bark, Fruit, Root	
6.	Sarshapa (*Brassica campestris* Linn)	Mustard	Cruciferae	**Katu**	Seed	

Tikta rasa

S. No.	Plant Name	Common name/English name	Family	Rasa	Part used	Picture
1.	Nimba (*Azadirachta indica* A.Juss)	Margosa	Meliaceae	**Tikta**	Bark	
2.	Kutaki (*Picrorhiza kurrooa* Royle ex.)	Picrorhiza	Scrophulariaceae	**Tikta**	Rhizomes & Roots	
3.	Karvellaka (*Momordica Charantia* Linn)	Bitter gourd	Cucurbitaceae	**Tikta**	Fruit	
4.	Ushira (*Vetiveria zizanioides* (Linn) Nash)	Khaskhas grass	Graminae	**Tikta**	Root	
5.	Saptaparna (*Alstonia scholaris* R. Br.)	Dita	Apocynacreae	**Tikta**	Bark	
6.	Guduchi (*Tinospora cordifolia* Wall. ex Seringe.)	Heart-leaved moonseed	Menispermaceae	**Tikta**	Stem	

Kashaya rasa

S.No.	Plant Name	Common name/English name	Family	Rasa	Part used	Picture
1.	Lodhra (*Symplocos racemose* Roxb)	Symplocus tree	Symplocaceae	**Kashaya**	Bark	
2.	Kanchanar (*Bauhinia variegate* Linn.)	Mountain ebony	Fabaceae	**Kashaya**	Bark	
3.	Arjuna (*Terminalia arjuna*(Roxb.) Wight & Arn.)	Arjuna	Combretaceae	**Kashaya**	Bark	
4.	Amrasthi (*Mangifera indica* Linn)	Mango Seed	Anacardiaceae	**Kashaya**	Amarasthi [seed]	
5.	Khadira (*Acacia catechu* (L. f.) Willd.)	Cutch tree	Fabaceae	**Kashaya**	Heart Wood, Bark.	
6.	Bibhitaka (*Terminalia bellirica*)	Belliric Myrobalan	Combretaceae	**Kashaya**	Fruit	

References of Rasa

Rasa utpatti

रसनार्थो रसस्तस्य द्रव्यमापः क्षितिस्तथा|

निर्वृत्तौ च विशेषे च प्रत्ययाः खादयस्त्रयः ||६४||

Different views on number of Rasa from and discussion C.S.26

एक एव रस इत्युवाच भद्रकाप्यः, यं पञ्चानामिन्द्रियार्थानामन्यतमं जिह्वावैषयिकं भावमाचक्षते कुशलाः, स पुनरुदकादनन्य इति | द्वौ रसाविति शाकुन्तेयो ब्राह्मणः, छेदनीय उपशमनीयश्चेति| त्रयो रसा इति पूर्णाक्षो मौद्गल्यः, छेदनीयोपशमनीय साधारणा इति| चत्वारो रसा इति हिरण्याक्षः कौशिकः, स्वादुर्हितश्चस्वादुरहितश्चास्वादुर्हितश्चास्वादुरहितश्चेति | पञ्चरसा इति कुमारशिरा भरद्वाजः, भौमौदकाग्नेयवायव्यान्तरिक्षाः | षड्रसा इति वार्योविदो राजर्षिः, गुरुलघुशीतोष्णस्निग्धरूक्षाः | सप्तरसा इति निमिर्वैदेहः, मधुराम्ललवणकटुतिक्तकषायक्षाराः | अष्टौ रसा इति बडिशो धामार्गवः, मधुराम्ललवणकटुतिक्तकषायक्षाराव्यक्ताः | अपरिसङ्ख्येयारसा इति काङ्कायनो बाह्लीकभिषक्, आश्रयगुणकर्मसंस्वादविशेषाणामपरिसङ्ख्येयत्वात् ||८||

षडेव रसा इत्युवाच भगवानात्रेयः पुनर्वसुः, मधुराम्ललवणकटुतिक्तकषायाः | तेषां षण्णां रसानां योनिरुदकं, छेदनोपशमने द्वे कर्मणी, तयोर्मिश्रीभावात्साधारणत्वं, स्वाद्वस्वादुता भक्तिः, हिताहितौ प्रभावौ, पञ्चमहाभूतविकारास्त्वाश्रयाः प्रकृतिविकृतिविचारदेशकालवशाः, तेष्वाश्रयेषु द्रव्यसञ्ज्ञकेषु गुणा गुरुलघुशीतोष्णस्निग्धरूक्षाद्याः; क्षरणात्क्षारः, नासौ रसः द्रव्यं तदनेकरससमुत्पन्नमनेकरसं कटुकलवणभूयिष्ठमनेकेन्द्रियार्थसमन्वितं करणाभिनिर्वृत्तम्; अव्यक्तीभावस्तु खलु रसानां प्रकृतौ भवत्यनुरसेऽनुरससमन्विते वा द्रव्ये; अपरिसङ्ख्येयत्वं पुनस्तेषामाश्रयादीनां भावानां विशेषापरिसङ्ख्येयत्वान्न युक्तम्, एकैकोऽपि ह्येषामाश्रयादीनां भावानां विशेषानाश्रयते विशेषापरिसङ्ख्येयत्वात्, न च तस्मादन्यत्वमुपपद्यते; परस्परसंसृष्टभूयिष्ठत्वान्न चैषामभिनिर्वृत्तेर्गुणप्रकृतीनामपरिसङ्ख्येयत्वं भवति; तस्मान्न संसृष्टानां रसानां कर्मोपदिशन्ति बुद्धिमन्तः | तच्चैव कारणमपेक्षमाणाः षण्णां रसानां परस्परेणासंसृष्टानां लक्षणपृथक्त्वमुपदेक्ष्यामः ||९|| Ch.Su.26

स्वादुरम्लोऽथलवणः कटुकस्तिक्त एव च | कषायश्चेतिषट्कोऽयं रसानां सङ्ग्रहः स्मृतः||६५|| Ch.Su.1

Combinations of Rasa

भेदश्चैषां त्रिषष्टिविधविकल्पो द्रव्यदेशकालप्रभावाद्भवति, तमुपदेक्ष्यामः||१४||

पृथगम्लादियुक्तस्य योगः शेषैः पृथग्भवेत् | मधुरस्य तथाऽम्लस्य लवणस्य कटोस्तथा ||१६||

त्रिरसानि यथासङ्ख्यं द्रव्याण्युक्तानि विंशतिः | वक्ष्यन्ते तु चतुष्केण द्रव्याणि दशपञ्च च||१७||

स्वाद्वम्लौ सहितौ योगं लवणाद्यैः पृथग्गतौ | योगं शेषैः पृथग्यातश्चतुष्करससङ्ख्यया ||१८||

सहितौ स्वादुलवणौ तद्वत्कट्वादिभिः पृथक् | युक्तौ शेषैः पृथग्योगं यातः स्वादूषणौ तथा ||१९||

कट्वाद्यैरम्ललवणौ संयुक्तौ सहितौ पृथक् | यातः शेषैः पृथग्योगं शेषैरम्लकटू तथा||२०||

युज्यते तु कषायेण सतिक्तौ लवणोषणौ | षट्तु पञ्चरसान्याहुरेकैकस्यापवर्जनात् ||२१||

षट्चैवैकरसानिस्युरेकंषड्रसमेवतु | इति त्रिषष्टिर्द्रव्याणां निर्दिष्टा रससङ्ख्यया ||२२||

त्रिषष्टिः स्यात्त्वसङ्ख्येया रसानुरसकल्पनात् | रसास्तरतमाभ्यां तां सङ्ख्यामतिपतन्ति हि ||२३||

संयोगाः सप्तपञ्चाशत्कल्पना तु त्रिषष्टिधा | रसानां तत्र योग्यत्वात् कल्पिता रसचिन्तकैः ||२४||

क्वचिदेको रसः कल्प्यः संयुक्ताश्चरसाः क्वचित् | दोषौषधादीन्सञ्चिन्त्य भिषजा सिद्धिमिच्छता ||२५||

द्रव्याणि द्विरसादीनि संयुक्तांश्च रसान्बुधाः | रसानेकैकशो वाऽपि कल्पयन्ति गदान्प्रति ||२६||

यः स्याद्रसविकल्पज्ञः स्याच्च दोषविकल्पवित् | न स मुह्येद्विकाराणां हेतुलिङ्गोपशान्तिषु ||२७|| Ch.Su.26

तत्रैतेषां रसानां संयोगास्त्रिषष्टिर्भवन्ति | तद्यथा- पञ्चदशद्विकाः, विंशतिस्त्रिकाः, पञ्चदशचतुष्काः, षट्पञ्चकाः, एकशः षड्रसाः, एकःषट्क इति ||१२|| Su.Su.42

Rasa and Anurasa

व्यक्तः शुष्कस्य चादौ च रसो द्रव्यस्य लक्ष्यते|

विपर्ययेणानुरसो रसो नास्ति हि सप्तमः ||२८||

गुणागुणाश्रया नोक्तास्तस्माद्रसगुणान्भिषक् |

विद्याद्द्रव्यगुणान् कर्तुरभिप्रायाः पृथग्विधाः ||३६||

Rasa and Mahabhuta

तेषां षण्णां रसानां सोमगुणातिरेकान्मधुरो रसः, पृथिव्यग्निभूयिष्ठत्वादम्लः, सलिलाग्निभूयिष्ठत्वाल्लवणः, वाय्वग्निभूयिष्ठत्वात्कटुकः, वाय्वाकाशातिरिक्तत्वात्तिक्तः, पवनपृथिवीव्यतिरेकात्कषाय इति|

एवमेषां रसानां षट्त्वमुपपन्नं न्यूनातिरेकविशेषान्महाभूतानां भूतानामिव स्थावरजङ्गमानां नानावर्णाकृतिविशेषाः; षड्ऋतुकत्वाच्च कालस्योपपन्नो महाभूतानां न्यूनातिरेकविशेषः ||४०|| C.Su.26

आकाशपवनदहनतोयभूमिषु यथासङ्ख्यमेकोत्तरपरिवृद्धाः शब्दस्पर्शरूपरसगन्धाः, तस्मादाप्योरसः | परस्परसंसर्गात्परस्परानुग्रहात्परस्परानुप्रवेशाच्च सर्वेषु सर्वेषां सान्निध्यमस्ति, उत्कर्षापकर्षात्तु ग्रहणम् | स खल्वाप्यो रसः शेषभूतसंसर्गाद्विदग्धः षोढाविभज्यते; तद्यथा- मधुरोऽम्लोलवणः कटुकस्तिक्तः कषाय इति | ते च भूयः परस्परसंसर्गात्त्रिषष्टिधा भिद्यन्ते | तत्र, भूम्यम्बुगुणबाहुल्यान्मधुरः, भूम्यग्निगुणबाहुल्यादम्लः, तोयाग्निगुणबाहुल्याल्लवणः, वाय्वग्निगुणबाहुल्यात्कटुकः, वाय्वाकाशगुणबाहुल्यात्तिक्तः, पृथिव्यनिलगुणबाहुल्यात्कषाय इति ||३|| Su.Su.42

Actions of Rasa and effects of its excessive use

तत्राग्निमारुतात्मका रसाः प्रायेणोर्ध्वभाजः, लाघवादुत्प्लवनत्वाच्च वायोरूर्ध्वज्वलनत्वाच्चवह्नेः; सलिलपृथिव्यात्मकास्तु प्रायेणाधोभाजः, पृथिव्यागुरुत्वान्निम्नगत्वाच्चोदकस्य; व्यामिश्रात्मकाः पुनरुभयतोभाजः ||४१|| Ch.Su.26

Madhura Rasa

तत्र, मधुरोरसः शरीरसात्म्याद्रसरुधिरमांसमेदोस्थिमज्जौजःशुक्राभिवर्धन आयुष्यः षडिन्द्रियप्रसादनो बलवर्णकरः पित्तविषमारुतघ्नस्तृष्णादाहप्रशमनस्त्वच्यः केश्यः कण्ठ्यो बल्यः प्रीणनो जीवनस्तर्पणो बृंहणः स्थैर्यकरः क्षीणक्षतसन्धानकरो घ्राणमुखकण्ठौष्ठजिह्वाप्रह्लादनो दाहमूर्च्छाप्रशमनः षट्पदपिपीलिकानामिष्टतमः स्निग्धः शीतोगुरुश्च | सएवङ्गुणोऽप्येकएवात्यर्थमुपयुज्यमानः स्थौल्यंमार्दवमालस्यमतिस्वप्नं गौरवमनन्नाभिलाष-मग्नेर्दौर्बल्यमास्यकण्ठयोर्मांसाभिवृद्धिं श्वासकासप्रतिश्यायालसकशीतज्वरानाहास्यमाधुर्यवमथुसञ्ज्ञास्वरप्रणाश-गलगण्डगण्डमालाश्लीपदगलशोफबस्तिधमनीगलोपलेपाक्ष्यामयाभिष्यन्दानित्येवम्प्रभृतीन्कफजान्विकारानुपजनय ति (१)|४३| Ch.Su.26

रसगुणानत ऊर्ध्वंवक्ष्यामः- तत्र, मधुरोरसो रसरक्तमांसमेदोऽस्थिमज्जौजःशुक्रस्तन्यवर्धनश्चक्षुष्यः केश्योवर्ण्योबलकृत्सन्धानः शोणितरसप्रसादनो बालवृद्धक्षतक्षीणहितः षट्पदपिपीलिकानामिष्टतम-स्तृष्णामूर्च्छादाहप्रशमनः षडिन्द्रियप्रसादनः कृमिकफकरश्चेति; स एवङ्गुणोऽप्येकएवात्यर्थमासेव्यमानः कासश्वासालसकवमथुवदनमाधुर्यस्वरोपघातकृमिगलगण्डानापादयति तथाऽर्बुदश्लीपदबस्तिगुदोपलेपाभिष्यन्द प्रभृतीञ्जनयति (१) |१०| Su.su.42

Amla Rasa

अम्लोरसो भक्तंरोचयति, अग्निं दीपयति, देहं बृंहयति ऊर्जयति, मनोबोधयति, इन्द्रियाणि दृढीकरोति, बलं वर्धयति, वातमनुलोमयति, हृदयं तर्पयति, आस्यमास्रावयति, भुक्तमपकर्षयति क्लेदयतिजरयति, प्रीणयति, लघुरुष्णः स्निग्धश्च | स एवङ्गुणोऽप्येक एवात्यर्थमुपयुज्यमानो दन्तान्हर्षयति, तर्षयति, सम्मीलयत्यक्षिणी, संवेजयति लोमानि, कफं विलापयति, पित्तमभिवर्धयति, रक्तं दूषयति, मांसं विदहति, कायं शिथिलीकरोति, क्षीणक्षतकृशदुर्बलानां श्वयथुमापादयति, अपि च क्षताभिहतदष्टदग्धभग्नशूनप्रच्युतावमूत्रितपरिसर्पितमर्दितच्छिन्नभिन्नविश्लिष्टो-द्विद्धोत्पिष्टादीनि पाचयत्याग्नेयस्वभावात्, परिदहति कण्ठमुरो हृदयं च (२)|४३| Ch.Su.26

अम्लो जरणः पाचनो दीपनः पवननिग्रहणोऽनुलोमनः कोष्ठविदाही बहिःशीतः क्लेदनः प्रायशो ह्यद्यश्चेति; स एवङ्गुणोऽप्येक एवात्यर्थमुपसेव्यमानो दन्तहर्षनयनसम्मीलनरोमसंवेजनकफविलयनशरीरशैथिल्यान्यापादयति, तथा क्षताभिहतदग्धदष्टभग्नरुग्णशूनप्रच्युतावमूत्रितविसर्पितच्छिन्नभिन्नविद्धोत्पिष्टादीनि पाचयत्याग्नेय-स्वभावात्परिदहति कण्ठमुरो हृदयंचेति (२) |१०| Su.Su.42

Lavana Rasa

लवणो रसः पाचनः क्लेदनो दीपनश्च्यावनश्छेदनो भेदनस्तीक्ष्णः सरोविकास्यधः स्रंस्यवकाशकरो वातहरः स्तम्भबन्धसङ्घातविधमनः सर्वरसप्रत्यनीकभूतः, आस्यमास्रावयति, कफं विष्यन्दयति, मार्गान्विशोधयति, सर्वशरीरावयवान्मृदूकरोति, रोचयत्याहारम्, आहारयोगी, नात्यर्थं गुरुः स्निग्ध उष्णश्च|

स एवङ्गुणोऽप्येकएवात्यर्थमुपयुज्यमानः पित्तंकोपयति, रक्तंवर्धयति, तर्षयति, मूर्च्छयति, तापयति, दारयति, कुष्णातिमांसानि, प्रगालयतिकुष्ठानि, विषंवर्धयति, शोफान्स्फोटयति, दन्तांश्च्यावयति, पुंस्त्वमुपहन्ति, इन्द्रियाण्युपरुणद्धि, वलिपलितखालित्यमापादयति, अपि च लोहितपित्ताम्लपित्तविसर्प-वातरक्तविचर्चिकेन्द्रलुप्तप्रभृतीन्विकारानुपजनयति (३)|४३| Ch.Su.26

लवणः संशोधनः पाचनो विश्लेषणः क्लेदनः शैथिल्यकृदुष्णः सर्वरसप्रत्यनीको मार्गविशोधनः सर्वशरीरावयवमार्दवकरश्चेति; स एवङ्गुणोऽप्येक एवात्यर्थमासेव्यमानो गात्रकण्डूकोठशोफवैवर्ण्य-पुंस्त्वोपघातेन्द्रियोपतापमुखाक्षिपाकरक्तपित्तवातशोणिताम्लीकाप्रभृतीनापादयति (३) |१०| Su.Su.42

Katu Rasa

कटुकोरसो वक्त्रंशोधयति, अग्निंदीपयति, भुक्तंशोषयति, घ्राणमास्रावयति, चक्षुर्विरेचयति, स्फुटीकरोतीन्द्रियाणि, अलसकश्वयथूपचयोदर्दाभिष्यन्दस्नेहस्वेदक्लेदमलानुपहन्ति, रोचयत्यशनं, कण्डूर्विनाशयति, व्रणानवसादयति, क्रिमीन्हिनस्ति, मांसंविलिखति, शोणितसङ्घातंभिनत्ति, बन्धांश्छिनत्ति, मार्गान्विवृणोति, श्लेष्माणंशमयति, लघुरुष्णोरूक्षश्च |

स एवङ्गुणोऽप्येक एवात्यर्थमुपयुज्यमानो विपाकप्रभावात्पुंस्त्वमुपहन्ति, रसवीर्यप्रभावान्मोहयन्ति, ग्लापयति, सादयति, कर्शयति, मूर्च्छयति, नमयति, तमयति, भ्रमयति, कण्ठंपरिदहति, शरीरतापमुपजनयति, बलंक्षिणोति, तृष्णांजनयति; अपि च वाय्वग्निगुणबाहुल्याद्भ्रमदवथुकम्पतोदभेदैश्चरणभुजपार्श्वपृष्ठप्रभृतिषु मारुतजान्विकारानुपजनयति (४); Ch.Su.26

कटुको दीपनः पाचनो रोचनः शोधनः स्थौल्यालस्यकफकृमिविषकुष्ठकण्डूप्रशमनः सन्धिबन्धविच्छेदनोऽवसादनः स्तन्यशुक्रमेदसामुपहन्ता चेति; स एवङ्गुणोऽप्येक एवात्यर्थमुपसेव्यमानो भ्रममदगलताल्वोष्ठशोषदाहसन्ताप-बलविघातकम्पतोदभेदकृत्करचरणपार्श्वपृष्ठप्रभृतिषु च वातशूलानापादयति (४) |१०| Su.su.42

Tikta Rasa

तिक्तो रसः स्वयमरोचिष्णुरप्यरोचकघ्नो विषघ्नः क्रिमिघ्नो मूर्च्छादाहकण्डूकुष्ठतृष्णाप्रशमनस्त्वङ्मांसयोः स्थिरीकरणो ज्वरघ्नो दीपनः पाचनः स्तन्यशोधनो लेखनः क्लेदमेदोवसामज्जलसीकापूयस्वेदमूत्रपुरीषपित्तश्लेष्मोपशोषणो रूक्षः शीतो लघुश्च | स एवङ्गुणोऽप्येक एवात्यर्थमुपयुज्यमानो रौक्ष्यात्खरविषदस्वभावाच्च रसरुधिरमांस-मेदोस्थिमज्जशुक्राण्युच्छोषयति, स्रोतसां खरत्वमुपपादयति, बलमादत्ते, कर्शयति, ग्लपयति, मोहयति, भ्रमयति, वदनमुपशोषयति, अपरांश्च वातविकारानुपजनयति (५); Ch.Su.26

तिक्तश्छेदनो रोचनो दीपनः शोधनः कण्डूकोठतृष्णामूर्च्छाज्वरप्रशमनः स्तन्यशोधनो विण्मूत्रक्लेदमेदोवसापूयोपशोषणश्चेति; स एव ङ्गुणोऽप्येक एवात्यर्थमुपसेव्यमानो गात्रमन्यास्तम्भाक्षेपका-र्दितशिरःशूलभ्रमतोदभेदच्छेदास्यवैरस्यान्यापादयति(५) |१०| Su.su.42

Kashaya Rasa

कषायो रसः संशमनः सङ्ग्राहीसन्धानकरः पीडनोरोपणः शोषणः स्तम्भनः श्लेष्मरक्तपित्तप्रशमनः शरीरक्लेदस्योपयोक्ता रूक्षः शीतोऽलघुश्च | स एवङ्गुणोऽप्येकएवात्यर्थमुपयुज्यमान आस्यं शोषयति, हृदयं

पीडयति, उदरमाध्मापयति, वाचं निगृह्णाति, स्रोतांस्यवबध्नाति, श्यावत्वमापादयति, पुंस्त्वमुपहन्ति, विष्टभ्य जरां गच्छति, वातमूत्रपुरीषरेतांस्यवगृह्णाति, कर्शयति, ग्लपयति, तर्षयति, स्तम्भयति, खरविशदरूक्षत्वात्पक्षवध-ग्रहापतानकार्दितप्रभृतींश्चवातविकारानुपजनयति ||४३|| Ch.Su.26

कषायः सङ्ग्राहकोरोपणः स्तम्भनः शोधनो लेखनः शोषणः पीडनः क्लेदोपशोषणश्चेति; स एवङ्गुणोऽप्येक एवात्यर्थमुपसेव्यमानो हृत्पीडास्यशोषोदराध्मानवाक्यग्रहमन्यास्तम्भ- गात्रस्फुरणचुमुचुमायनाकुञ्चना-क्षेपणप्रभृतीञ्जनयति [८] ||१०|| Su.su.42

Virya according to Rasa

शीतं वीर्येण यद्द्रव्यं मधुरं रसपाकयोः | तयोरम्लं यदुष्णं च यद्द्रव्यं कटुकं तयोः ||४५|| Ch.Su.26

Saumya and Agneya Rasa

केचिदाहुः- अग्नीषोमीयत्वाज्जगतो रसा द्विविधाः- सौम्या आग्नेयाश्च | मधुरतिक्तकषायाःसौम्याः; कट्वम्ललवणाआग्नेयाः | तत्र मधुराम्ललवणाः स्निग्धागुरवश्च, कटुतिक्तकषायारूक्षालघवश्च; सौम्याः शीताः, आग्नेया उष्णाः ||७|| Su.Su.42

Actions dependent on Rasa

तेषां रसोपदेशेन निर्देश्यो गुणसङ्ग्रहः | वीर्यतोऽविपरीतानां पाकतश्चोपदेक्ष्यते||४६||

यथा पयो यथा सर्पिर्यथा वा चव्यचित्रकौ | एवमादीनि चान्यानि निर्दिशेद्रसतो भिषक्||४७||

Exceptions to the actions according to Rasa

मधुरं किञ्चिदुष्णं स्यात्कषायं तिक्तमेव च | यथा महत्पञ्चमूलं यथाऽब्जानूपमामिषम् ||४८||

लवणं सैन्धवं नोष्णमम्लमामलकं तथा | अर्कागुरुगुडूचीनां तिक्तानामुष्णमुच्यते ||४९||

किञ्चिदम्लं हि सङ्ग्राहि किञ्चिदम्लं भिनत्ति च | यथा कपित्थं सङ्ग्राहि भेदिचामलकं तथा ||५०||

पिप्पली नागरं वृष्यं कटु चावृष्यमुच्यते | कषायः स्तम्भनः शीतः सोऽभयायामतोऽन्यथा ||५१||

तस्माद्रसोपदेशेन न सर्वं द्रव्यामादिशेत् | दृष्टं तुल्यरसेऽप्येवं द्रव्ये द्रव्ये गुणान्तरम् ||५२||

Rasa Taratamya according to Guna

रौक्ष्यात्कषायो रूक्षाणामुत्तमो मध्यमः कटुः | तिक्तोऽवरस्तथोष्णानामुष्णत्वाल्लवणः परः ||५३||

मध्योऽम्लः कटुकश्चान्त्यः स्निग्धानां मधुरः परः | मध्योऽम्लोलवणश्चान्त्यो रसः स्नेहान्निरुच्यते ||५४||

मध्योत्कृष्टावराः शैत्यात्कषायस्वादुतिक्तकाः | स्वादुर्गुरुत्वादधिकः कषायाल्लवणोऽवरः ||५५||

अम्लात्कटुस्ततस्तिक्तो लघुत्वादुत्तमोत्तमः | केचिल्लघूनामवरमिच्छन्ति लवणं रसम्||५६||

गौरवे लाघवेचैव सोऽवरस्तूभयोरपि ||५७||

Vipaka according to Rasa

कटुतिक्तकषायाणां विपाकः प्रायशः कटुः | अम्लोऽम्लं पच्यते स्वादुर्मधुरं लवणस्तथा ||५८||

Actions of Rasa on Shukra and Mala

मधुरो लवणाम्लौ च स्निग्धभावात्त्रयो रसाः | वातमूत्रपुरीषाणां प्रायो मोक्षे सुखा मताः ||५९||

कटुतिक्तकषायास्तु रूक्षभावात्त्रयोरसाः | दुःखाय मोक्षे दृश्यन्ते वातविण्मूत्ररेतसाम् ||६०||

Actions of Rasa on Dosha (Ch.Vi.1)

स्वाद्वम्ललवणावायुं, कषायस्वादुतिक्तकाः | जयन्तिपित्तं, श्लेष्माणं कषायकटुतिक्तकाः ||६६||

(कट्वम्ललवणाः पित्तं, स्वाद्वम्ललवणाः कफम् | कटुतिक्तकषायाश्च कोपयन्ति समीरणम् ||१||)| Ch.Su.1

तत्रदोषमेकैकं त्रयस्त्रयो रसाजनयन्ति, त्रयस्त्रयश्चोपशमयन्ति | तद्यथा- कटुतिक्तकषाया वातं जनयन्ति, मधुराम्ललवणास्त्वेनं शमयन्ति; कट्वम्ललवणाः पित्तं जनयन्ति, मधुरतिक्तकषायास्त्वेनच्छमयन्ति; मधुराम्ललवणाः श्लेष्माणं जनयन्ति, कटुतिक्तकषायास्त्वेनं शमयन्ति ||६|| Ch.Su.26

तत्र, मधुराम्ललवणा वातघ्नाः, मधुरतिक्तकषायाः पित्तघ्नाः, कटुतिक्तकषायाः श्लेष्मघ्नाः ||४|| तत्रवायोरात्मैवात्मा, पित्तमाग्नेयं, श्लेष्मासौम्यइति ||५|| त एते रसाः स्वयोनिवर्धना, अन्ययोनिप्रशमनाश्च ||६|| Su.Su.42

तत्रशैत्यरौक्ष्यलाघववैशद्यवैष्टम्भ्यगुणलक्षणो वायुः, तस्य समानयोनिः कषायो रसः; सोऽस्यशैत्याच्छैत्यंवर्धयति, रौक्ष्याद्रौक्ष्यं, लाघवाल्लाघवं, वैशद्याद्वैशद्यं, वैष्टम्भ्याद्वैष्टम्भ्यमिति; (१) |८| औष्ण्यतैक्ष्ण्यरौक्ष्यलाघववैशद्यगुणलक्षणं पित्तं, तस्य समानयोनिः कटुको रसः; सोऽस्य औष्ण्यादौष्ण्यंवर्धयति, तैक्ष्ण्यात्तैक्ष्ण्यं, रौक्ष्याद्रौक्ष्यं, लाघवाल्लाघवं, वैशद्याद्वैशद्यमिति (२) |८| माधुर्यस्नेहगौरवशैत्यपैच्छिल्यगुणलक्षणः श्लेष्मा; तस्य समानयोनिर्मधुरोरसः, सोऽस्यमाधुर्यान्माधुर्यं वर्धयति, स्नेहात्स्नेहं, गौरवाद्गौरवं, शैत्याच्छैत्यं, पैच्छिल्यात्पैच्छिल्यमिति (३) ||८|| तस्य पुनरन्ययोनिः कटुको रसः; स श्लेष्मणःप्रत्यनीकत्वात्कटुकत्वान्माधुर्यमभिभवति, रौक्ष्यात्स्नेहं, लाघवाद्गौरवम्, औष्ण्याच्छैत्यं, वैशद्यात्पैच्छिल्यमिति | तदेतन्निदर्शनमात्रमुक्तं भवति (४) |८||Su.Su.42

Rasopalabdhi

रसोनिपातेद्रव्याणां |

Immediate effects of Rasa

स्नेहनप्रीणनाह्लादमार्दवैरुपलभ्यते | मुखस्थो मधुरश्चास्यं व्याप्नुवँल्लिम्पतीव च ||७४||

दन्तहर्षान्मुखास्रावात्स्वेदनान्मुखबोधनात् | विदाहाच्चास्यकण्ठस्यप्रा श्यैवाम्लं रसं वदेत् ||७५||

प्रलीयन्क्लेदविष्यन्दमार्दवं कुरुते मुखे | यः शीघ्रं लवणो ज्ञेयः स विदाहान्मुखस्य च||७६||

संवेजयेद्यो रसानां निपाते तुदतीव च | विदहन्मुखनासाक्षिसंस्रावी स कटुः स्मृतः ||७७||

प्रतिहन्ति निपाते यो रसनं स्वदते न च | स तिक्तो मुखवैशद्यशोषप्रह्लादकारकः [८६] ||७८||

वैशद्यस्तम्भजाड्यैर्यो रसनं योजयेद्रसः | बध्नातीव च यः कण्ठं कषायः सविकास्यपि ||७९|| Ch.Su.26

रसलक्षणमतऊर्ध्वं वक्ष्यामः- तत्र, यः परितोषमुत्पादयति प्रह्लादयति तर्पयति जीवयति मुखोपलेपं जनयति श्लेष्माणं चाभिवर्धयति स मधुरः; यो दन्तहर्षमुत्पादयति मुखास्रावं जनयति श्रद्धां चोत्पादयति सोऽम्लः; यो भक्तरुचिमुत्पादयति कफप्रसेकं जनयति मार्दवं चापादयति स लवणः; यो जिह्वाग्रं बाधते उद्वेगं जनयति शिरोगृह्णीते नासिकां स्रावयति स कटुकः; यो गले चोषमुत्पादयति मुखवैशद्यं जनयति भक्तरुचिं चापादयति हर्षं च स तिक्तः; यो वक्त्रं परिशोषयति जिह्वां स्तम्भयति कण्ठं बध्नाति हृदयं कर्षति पीडयति च स कषाय इति ||९|| Su.Su.42

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