

## PROBABLE RASANIRDHARNA MODEL (DILUTION METHOD) IN AYURVEDA FOR CRUDE DRUGS – A PRELIMINARY STUDY

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### Abstract

The Acharyas of Ayurveda like Charaka have described the method of perceiving rasa (taste). Pradhana rasa (Main taste) is considered as one which is perceived shortly after the material comes in contact with tongue and the rasa which is felt later is called anurasa. Prof. S.C. Dhayni suggested the threshold method for Tara, Tamatva. This threshold was further discriminated with better understating by mathematical calculations. It was found that the ratio of dilution for perception is getting decreased. The compound drug preparation can be analyzed easily by 'Taste with the tongue' method. Sensory evaluation of Food Principles and Practices by Harry T. Lawless and Hildegard Heymann, 2<sup>nd</sup> edition published by Springer and Applied mathematics for odor testing by Michal AMcGinely et.al was referred for the measurement of taste threshold as well as for calculation of equations. As per the scholars knowledge this is the first attempt tried on taste threshold for its discriminative aspect as well as mathematical calculation of taste threshold on any Ayurvedic drug.

**Key words:** Taste threshold, Rasanirdharana, Parnidwaya.

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## INTRODUCTION

In Ayurvedic science Rasa is considered as the first and foremost parameter to identify the drug action. With the various permutations and combinations of Panchamahabhuta (five elements) the six rasas are formed. Doshas are also made of Panchamahabhuta and for increase condition of the dosha the equilibrium was followed by giving the drugs with the sense of mitigation and vice versa. Thus for Anukta Dravya (The drugs are not mentioned anywhere) as well as for poisonous drugs after purification, to know the range of the actions of Dravya, the knowledge of rasa is important.<sup>[1]</sup>

‘Rasonipate dravyanam’ i.e. ‘Taste with the tongue’ The Acharyas of Ayurveda like Charaka have described the method of perceiving rasa. Pradhana rasa is considered as one which is perceived shortly after the material comes in contact with tongue and the rasa which is felt later is called anurasa. Ayurvedic science believes in reorganization of six rasas i.e. Madhura (Sweet), Amla (Sour), Lavana (Salty), Katu (Pungent), Tikta (Bitter) and Kashaya (Astringent).<sup>[2]</sup> One can also determine the intensity of Rasa in a drug and it is named as ‘Taste threshold’ of a drug. These intensities have referred to Rasa as Madhura, Madhuratara, Madhuratama etc. By evaluating them the different taste intensities of drug may be employed to correct the Doshic vitiation of different degrees.<sup>[3]</sup>

As per the authors knowledge the serially dilution was first evaluated with double blind method as well as rasa of Anukta Dravya of compound preparation was determined in three categories of each rasa.

## MATERIAL AND METHODS

### Trial Drugs

Ansumatidwaya (Parnidwaya)<sup>[4]</sup> i.e. The mixture of equal quantity of Shalparni (*Desmodium gangeticum* DC.) root and Prishniparni (*Uraria picta* Desv.) root churna were taken for the study.

### Taste by tongue

Rasanirdharana (perception of taste) of the drugs were followed with the guidelines of Prof. S.C. Dhyani mentioned in the book Rasapanchaka (Ayurvedic principals of drug action).<sup>[1]</sup>

### Drug preparation

Each drug was converted into fine powder form by sieving through mesh no. 80. The powder was served to 30 healthy volunteers (PG and Ph.D. scholars) from I.P.G.T & R.A.GAU, Jamnagar. Single blind method was adopted. The sample was served simultaneously and the volunteers were requested to write the taste which they felt in separate proforma. The proforma were collected from volunteers. The results and observation were discussed by charts etc. separately.

### Types of Thresholds

The threshold can be classified into four, they are<sup>[5]</sup>

1. Detection (Absolute) – Point at which the substance is differentiated from the background.
2. Recognition threshold – Point at which the substance is correctly named.
3. Terminal threshold – Point at which no further intensity increase is found with increasing concentration or dilution.

4. Consumer rejection threshold – Point at which a consumer preference occurs for a sample not containing the substance.

### **General procedure for Threshold test**

Preliminary tasks before threshold testing are

- Obtain the authentic Ayurvedic herbal sample. (Drug as whole Churna etc.)
- Choose the solvent system (As the Jala is having Avyakta rasa, the same is taken as a solvent system)
- Set concentration/dilution steps.e.g.1/3,1/9 etc.
- Dilutions of the sample were done.
- The numbering of Dilution was given from the start dilution no.1 etc.
- The sample size was taken as 30
- As the Ayurvedic drugs are used as whole without the separation of compound, the taste threshold was done. Randomization of dilutions was not made. The serially assessment of the dilution was taken into consideration.
- Instructions were given to the panellists as well as they were coached for understanding word to word meaning.

### **Rasanirdharana of the Trial drugs**

As the standards for the methods of thresholds as well as substitution were not yet set for Ayurvedic drugs. It was unanimously decided that the drug as well as its substitute should be assessed on the basis of sensory parameters. For this, a detailed proforma was made on the basis of Ayurvedokta rasanirdharana as well as with the help of various measures of the Sensory evaluation carried out for food. Principles and Practices by Harry T.Lawless and Hildegard Heymann, 2<sup>nd</sup> edition published by Springer was taken for reference.<sup>[5]</sup> A Double blind methodology was followed to measure the threshold of the Drug. The changes were made in case sheet and calculations as per the need of the research.

Further for calculations of threshold the 'Applied mathematics for odor testing by Michael A. McGinley et.al was referred.<sup>[6]</sup>

The solution for the threshold was prepared by adding 10 g of the drug in 90 ml of distilled water. The solution was stirred well and kept for 12 h. This solution was used to pursue threshold of the drug. The procedure was carried out in the Pharmaceutical department, I.P.G.T. & R.A., Jamnagar. The avyaktata (Inapprehensive or implicit) of the rasa will be perceived normally by cold water only and to avoid any interference of reaction with the drug it was avoided mixing with hot water. After 12 h the solution was decanted properly and from this solution 10 ml of the solution was taken separately. Then it was added with 20 ml of water and the formed solution was considered as 1<sup>st</sup> dilution. Like this dilutions were made serially with increased intensity of dilution. Each volunteer individually took the dilution serially and noted their perception of tastes. A double blind method was followed for taste threshold determination.

The ascending concentration series followed during testing of taste is a geometric progression (each dilution level thrice the previous level). Since the each dilution ratio is 1/3<sup>rd</sup> of the previous presentation (thrice the amount of taste), the scale does not have an equal spread between values. Applying a logarithm base 10 transformation forces the presentation scale to have an equal spread between dilution level and in other words, equal variance along the logarithm scale (Dravnieks 1986.) Ref. Applied mathematics for odor testing by Michal AMcGinely et.al.

(Note- The equation was made with the help of statistical calculator and with log table. The usage of software wasn't taken. Only the mathematical theme is adopted here.)

## RESULTS

Fourteen volunteers considered that the madhura rasa is first rasa perceived and two volunteers each for secondly and thirdly perceived rasa. Thirteen volunteers felt that the Tikta rasa is firstly perceived, nine volunteers as secondly perceived rasa and thirdly one. Two volunteers consider that they perceived Lavana rasa as first perceived rasa. The Kashaya rasa was perceived as firstly perceived rasa by one volunteer and five each for secondly and thirdly perceived. (Table 1)

(Graph 1) Five volunteers considered that they perceived Tikta as anurasa, three volunteers considered that they perceived madhura anurasa and two perceived Kashaya anurasa. (Table 2) (Graph 2) Thus we can consider that Parnidwya is having Madhura, tikta and kashaya rasa as by the opinion of volunteers and the anurasa as tikta.

The Absolute, reorganization, terminal and Consumer rejection of Parnidwya was found at 2352, 645, 25 and 4 ml respectively. (Table 3) (Graph 3)

**Table 1: Rasa perceived of Parnidwya churna by volunteers**

Rasa perceived	Madhura			Amla			Lavana			Katu			Tikta			Kashaya		
	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>
No. of Volunteers	14	2	2	0	0	0	2	1	0	0	0	2	13	9	1	1	5	5

**Table 2: Anurasa of Parnidwya perceived by volunteers**

Anurasa perceived	Madhura	Amla	Lavana	Katu	Tikta	Kashaya
No. of Volunteers	3	0	0	0	5	2

**Table 3: Taste threshold of Parnidwya**

Type of threshold	A	R	T	C
Parnidwya g/ml	2352.8812019	645.3569627	25.69804	4.3211565

**Table 5: Final result of Parnidwya**

Threshold	A	R	T	C
Avg. Log Value	6.3716	5.8098	4.4099	3.6356
Threshold	2352881.2019	645356.9627	25698.04	4321.1565

## DISCUSSION AND CONCLUSION

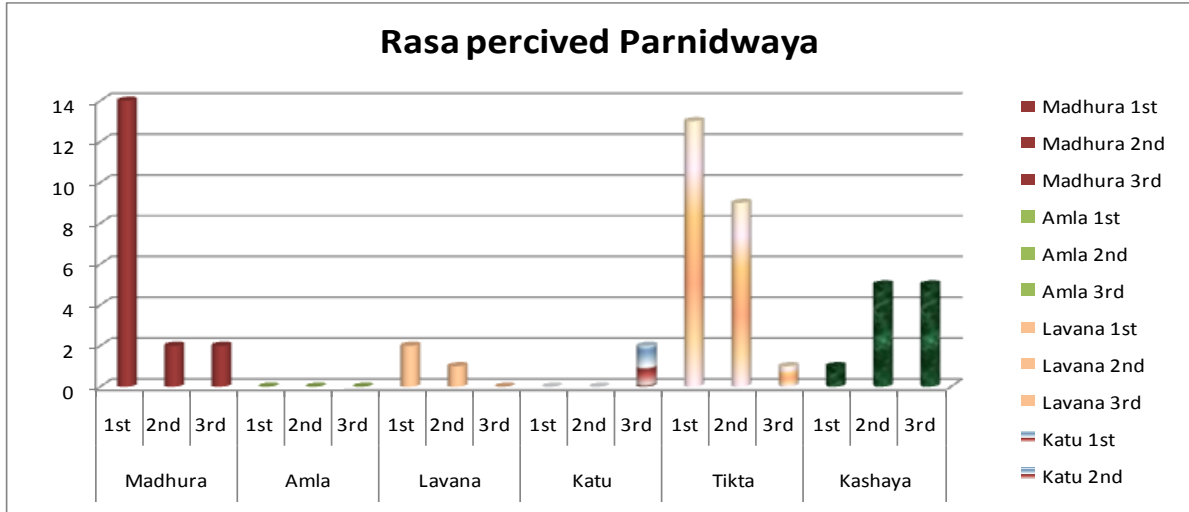
Rasa nirdhrana of unknown drugs was done by direct taste method. The action of the compound preparation can be assessed by its

rasa as it posses madhura rasa, tikta and kashaya rasa which is Vata, Pitta and Kaphashamaka respectively thus tridoshaghna action can be expressed by rasa nirdharana wholly.

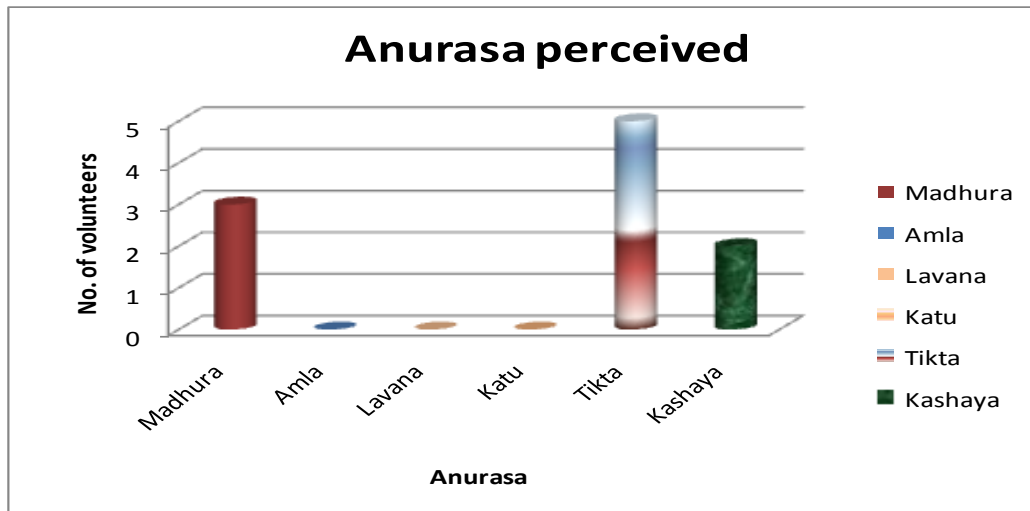
**Table 4: Taste threshold chart for Parnidvyaya**

Dilution level	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Thresholds				
Sample volume mg/lml	111111.11	37037.037	12345.667	4115.2	1371.73	457.23	152.41	50.88	16.93	5.64	1.88	0.62	0.206	0.068	0.023	0.0076	0.0025	0.00083	0.00027	0.000009	A-Absolute threshold	R- Recognition threshold.	T-Terminal threshold.	C-Consumer rejection threshold.	
Total volume	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000				
Dilution ratio	3486784401	1162261464	387420489	129140163	43046721	14348907	4782969	1594323	531441	177147	59049	19683	6561	2187	729	243	81	27	9	3					
Geometric mean	3313853.72	1593431.26	766184.45	368411.63	177010.89	85048.50	40894.66	19663.76	9440.61	4539.42	2182.73	1047.13	504.66	242.66	116.68	56.10	26.97	12.97	6.24	2.77					
Log (Geo.Mean)	6.520	6.202	5.884	5.566	5.248	4.929	4.611	4.293	3.975	3.657	3.339	3.02	2.703	2.385	2.067	1.749	1.431	1.113	0.795	0.473					
Assessor/Round.																					Log A	Log R	Log T	Log C	
1.	A	A	A	R	R	R	T	T	T	T					C	T	T	T		C	6.520	6.520	6.520	4.929	
2.	A	A	A	R	R	R	T	T	C	C						T	T	C			6.520	6.520	5.884	4.929	
3.	A	A	A	R	R	T	T	C	C	C						C		C			6.520	6.520	5.248	4.929	
4.	A	A	R	R	R	T	T	C	C	C								C			6.520	6.202	5.248	4.611	
5.	A	A	R	R	T	T	T	C	C												6.520	6.202	5.248	4.611	
6.	A	A	R	R	T	T	C		C												6.520	6.202	5.248	4.611	
7.	A	A	R	R	T	T	C														6.520	6.202	5.248	4.611	
8.	A	A	R		T	T	C														6.520	6.202	5.248	4.611	
9.	A	R	R		T	C	C														6.520	6.202	5.248	4.611	
10.	A	R	T		T	C	C														6.520	6.202	5.248	4.611	
11.	A	R			T	C	C														6.520	6.202	4.929	4.611	
12.	A	R			T		C														6.520	5.884	4.929	4.293	
13.	A	R					C														6.520	5.884	4.929	4.293	
14.	A	R																			6.520	5.884	4.929	4.293	
15.	A	R																			6.520	5.884	4.929	3.975	
16.	A	R																			6.520	5.884	4.929	3.975	
17.	A																				6.520	5.884	4.611	3.975	
18.	A																				6.520	5.566	4.611	3.975	
19.	A																				6.520	5.566	4.611	3.975	
20.	R																				6.202	5.566	4.611	3.657	
21.	R																				6.202	5.566	4.611	3.657	
22.	R																				6.202	5.566	4.293	3.657	
23.	T																				6.202	5.566	4.293	3.02	
24.																					6.202	5.566	3.975	3.02	
25.																					6.202	5.248	3.657	2.067	
26.																					6.202	5.248	3.02	1.749	
27.																					6.202	5.248	1.749	1.113	
28.																					5.884	5.248	1.749	1.113	
29.																					5.884	4.929	1.431	1.113	
30.																					5.884	4.929	1.113	0.473	

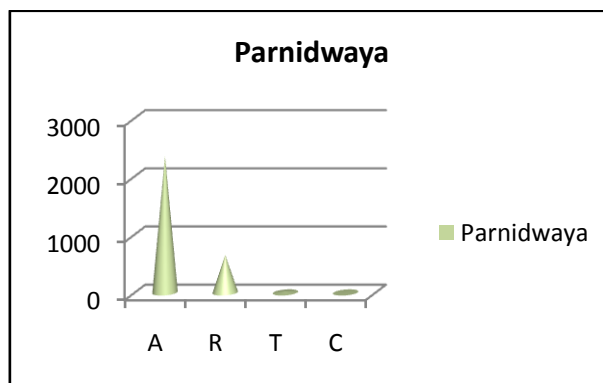
**Graph 1: Rasa perceived for Parnidwaya churna**



**Graph 2: Anurasa perceived for Parnidwaya churna.**



**Graph 3: Absolute, reorganization, terminal and consumer rejection threshold of Parnidwaya**



In this experiment it was made as an assumption for rasa as firstly perceived, secondly perceived and thirdly perceived for all the six rasas and the anurasa perceived separately as madhura, amla etc. Volunteers also gave a positive response as if they perceived rasa firstly, secondly etc. which is indicative that if we want to perceive the senses in deeper way the rasa can be enumerated in various aspects with the level of minute fractionalization. Further it can be determine on statistical basis which will give the correct analysing in between tara, tamta of rasa as a whole. (Table 4)

Permutation and combinations of rasa forms various numbers of rasas. This permutations and combination wise, if we separate rasas as only one, two etc. predominant rasa containing drug will demarcate the action of the drug. Probably this may be the concept of Charaka behind the permutation and combination of the rasa.

Generally the Taste thresholds of the drugs were assessed by increasing concentration, as the molecules are already separated in other science of medicine. But as we are using drug as whole and the dilution of the sample less in quantity as reversely in case of odour perception, it indicates that the ratio of dilution for perception gets decreased. Further the chart prepared to measure taste threshold is

self explanatory. The differentiation in between the avastas of Tara, Tamata of the rasa is possible with this experiment.

This is just our humble efforts in taste thresholds determination which can be expressed on Ayurvedic parameter. Further research is need of the hour.

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