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EXPERIMENTAL STUDY OF *BODHAKA KAPHA* WITH SPECIAL REFERENCE TO TASTE PERCEPTION

Mahendra Bansilal Toshniwal,[1*] Ravindra Sahebrao Kharat [2]

1. *Assistant Professor, Dept of Sharirkriya, CSMSS Ayurved Mahavidyalaya, Kanchanwadi, Aurangabad. Email: tdr.mahendra@yahoo.com, Mobile :+91 9850229994.

2. Associate Professor, Dept. of Dravyaguna Vigyan, CSMSS Ayurved Mahavidyalaya, Kanchanwadi, Aurangabad. Email:ravikharat2@gmail.com, Mobile :+91 9822281494

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***Corresponding Author**

Mahendra Bansilal Toshniwal
Assistant Professor,
Dept of Sharirkriya, CSMSS Ayurved Mahavidyalaya,
Kanchanwadi, Aurangabad,
Mobile: +91 9850229994.
Email:tdr.mahendra@yahoo.com

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ABSTRACT:

According to the modern science, saliva dissolves substances and it is responsible for taste as well as digestion of carbohydrates. *Ayurveda* has mentioned six different types of taste that are called as *Rasa. Bodhak Kapha* is located at the base of tongue and pharynx. It is responsible for the perception of taste. The present article aims to find out, the content of saliva which is responsible for taste perception and to study the similarities among salivary content and *Bodhak Kapha* according to modern and ancient aspect. The present study concluded that *Bodhak Kapha* is physiologically and functionally similar to salivary content mucin.

Key Words: *Bodhak Kapha, Rasa, Mucin,* Taste Perception, Saliva.

INTRODUCTION:

According to *Ayurveda*, there are three basic *Doshas* i.e. *Vata*, *Pitta* and *Kapha*. [1] *Kapha Dosha* is one of the functional unit of the body. *Kapha Dosha* is classified into five types that are *Avalambaka Kapha, Kledak Kapha, Tarpak Kapha, Sleshaka Kapha* and *Bodhak Kapha*. [2]
Bodhak Kapha is located at the base of tongue and pharynx. It is responsible for the perception of taste [3] *Kapha* that remains at the tongue and attributable to its water content it is capable for perception of taste [4] Breakdown of food under the influence of *Tejas* element of saliva is not highlighted by *Bruhatrayee*. Reference to the function of *Tejas* element to the saliva is mentioned in *Ayurved sutra* by *Yogananda's Natha* commentary. [5] According to the modern science, saliva dissolves substances and it is responsible for taste as well as digestion of carbohydrates. [6]
Ayurveda has mentioned six different types of tastes that are called as *Rasa.* [7] These *Rasas* are *Madhura, Amla, Lavan, Katu, Tikta* and *Kashaya*. [8] *Jala* (water) is *Yoni* of *Rasa.* [9] *Rasa* (taste) is perceived by *Jivha* (tounge). [10] Hence six *Rasa Dravyas* in powder form are preferred for present study.

On the basis of above facts *Bodahka Kapha* studied comparatively, literature wise and experimentally. The present article aims to find out the content of saliva which is responsible for taste of perception and to study the similarities among salivary content and *Bodhak Kapha* according to modern and ancient aspect. The aim of present study is to explore the *Ayurvedic* concepts of *Bodhak Kapha* by modern science.

AIMS AND OBJECTS:

1. To study the *Bodhak Kapha* literature wise through modern and *Ayurvedic* texts.
2. To study the similarities among salivary contents and *Bodhak Kapha*, according to modern and *Ayurvedic* aspects.
3. To study *Bodhak Kapha* experimentally with reference to taste perception.

MATERIALS AND METHODOLOGY:

Study Design: Observational and Experimental Study.

Materials

1. For present study 30 volunteers were selected.
3. Fine Powders of six different *Ayurvedic* drugs were selected.
4. Aqueous solutions of six different *Ayurvedic* drugs were selected.
5. Digital Stop watch
6. *Rasa* (taste) of these drugs is well known to *Ayurveda*.

Inclusion Criteria

1. 30 healthy volunteers were included.
2. Age group of 20 to 40 years was included
3. Both males and females are selected
4. Volunteers were randomly selected irrespective of their socio-economic status and religion.

Exclusion Criteria

1. Tobacco chewers were excluded
2. Smokers were excluded

3. Persons having teeth, gums and oral cavity disorders were excluded
4. Individuals suffering from Diabetes Mellitus, Cancer, Neurological disorders were excluded
5. Volunteers of *Jivha Samatva* (Coated tongue) were excluded.

Table 1 Drugs Selected for Current Study

Sr No	Drug	Botanical names	Part used	*Rasa*
1	*Yashtimadhu*	*Glycarriza glabra*	Stolon	*Madhur*
2	*Amra* (dried)	*mangifera indica*	Fruit	*Amla*
3	*Samudra Lavan*(salt)	*NaCl*	-	*Lavan*
4	*Maricha*	*Piper nigrum*	Fruit	*Katu*
5	*Nimba*	*Azadiracta indica*	Bark	*Tikta*
6	*Jambu*	*Eugenia jamboolena*	bark	*Kashaya*

Method Used: Taste Threshold Method [11]

As per texts *Bodhak Kapha* is responsible for perception of taste. [3] *Ayurveda* has described six different tastes(*Rasas*). [8] *Jala* is *Yoni* of *Rasas* [9] i.e. rasa percepts when it dissolves in water or saliva. On the basis of above hypothesis Powdered *Dravya* slowly dissolves in saliva and aqueous solutions of *Dravya* dissolves rapidly in saliva. Hence 30 healthy volunteers were subjected to taste each *Dravya*, in fine powdered and aqueous solutions form. The study was conducted for 12 days. The sample was given in the morning. The subject was nil by mouth till the sample was given to him. The volunteer was asked to keep his eyes closed. In first six days each group was given fine powder of each *Dravya* for taste. In next six days each group was given aqueous solutions of each *Dravya* for taste. Observations of taste and time taken for perception of taste were made. Taste was assessed by Taste Threshold Method. [11] Time is calculated with the help of Digital stop watch. Stop watch was given to volunteer when he percept the taste the switch is paused and the time was observed.

OBSERVATIONS AND RESULTS:

Relative study of Different taste perceptions was done. It was observed that taste perception of powdered drug was slightly delayed; taste perception of aqueous solution was quick as compared with powdered drug, except salt taste. In aqueous solution taste perception of *Amla* and *Katu Rasa Dravyas* was rapid as compared to powdered drug. In case of *Katu, Amla* and *Lavan Rasa* salivary secretions were more. The exact observations of time taken for perception of taste in powdered drug and aqueous solution of drug are tabulated in table 2 and table 3 respectively.

Table 2 Time taken for Perception of Taste of Fine powders

Sr No	Time taken to percept taste (minutes:seconds)					
	Madhur	*Amla*	*Lavan*	*Katu*	*Tikta*	*Kashaya*
1	00:10:66	00:07:78	00:03:50	00:11:47	00:04:59	00:12:31
2	00:22:19	00:09:13	00:02:16	00:09:72	00:04:22	00:11:87
3	00:10:43	00:05:50	00:03:28	00:12:60	00:06:00	00:10:85
4	00:08:53	00:05:88	00:03:13	00:15:06	00:04:41	00:11:85
5	00:10:68	00:06:40	00:04:06	00:10:65	00:04:98	00:12:05
6	00:17:15	00:05:68	00:02:28	00:10:48	00:04:67	00:11:08
7	00:11:08	00:06:00	00:03:18	00:09:82	00:06:03	00:12:31
8	00:10:11	00:06:53	00:03:20	00:11:69	00:05:58	00:12:07
9	00:10:82	00:08:00	00:03:35	00:13:06	00:06:15	00:12:44
10	00:14:07	00:09:13	00:03:55	00:14:10	00:07:00	00:11:50
11	00:12:63	00:07:17	00:03:14	00:13:58	00:06:58	00:10:47
12	00:08:87	00:08:20	00:02:22	00:10:54	00:05:10	00:10:63
13	00:09:14	00:06:40	00:01:55	00:09:65	00:05:25	00:11:97
14	00:09:20	00:09:10	00:02:10	00:09:70	00:04:68	00:12:00
15	00:10:05	00:08:00	00:02:25	00:10:65	00:05:60	00:11:05
16	00:10:44	00:05:18	00:03:00	00:11:40	00:04:90	00:10:98
17	00:11:25	00:06:10	00:02:15	00:10:55	00:04:48	00:10:60
18	00:10:37	00:07:00	00:03:05	00:09:10	00:04:98	00:11:66
19	00:11:04	00:06:56	00:03:10	00:11:47	00:05:15	00:11:95
20	00:11:52	00:05:50	00:03:28	00:11:15	00:06:00	00:12:60
21	00:10:66	00:05:98	00:02:30	00:11:25	00:06:20	00:12:85
22	00:10:43	00:06:45	00:03:10	00:11:41	00:05:98	00:11:07
23	00:10:55	00:05:37	00:02:18	00:09:55	00:06:03	00:10:63
24	00:10:15	00:07:78	00:03:38	00:10:02	00:04:98	00:10:65
25	00:09:53	00:08:00	00:02:58	00:10:10	00:05:25	00:09:72
26	00:08:58	00:09:19	00:02:45	00:09:58	00:05:48	00:11:47
27	00:08:53	00:09:13	00:02:25	00:09:40	00:05:98	00:11:69
28	00:10:85	00:06:53	00:02:10	00:09:80	00:04:62	00:10:48
29	00:09:14	00:08:20	00:02:18	00:12:00	00:04:50	00:11:85
30	00:10:17	00:07:17	00:03:01	00:15:06	00:04:47	00:10:65

Table 3 Time taken for Perception of Taste of Aqueous solutions

Sr No.	Time taken to percept taste (minutes:seconds)					
	Madhur	*Amla*	*Lavan*	*Katu*	*Tikta*	*Kashaya*
1	00:05:41	00:04:50	00:00:94	00:05:06	00:02:93	00:02:53
2	00:04:10	00:04:44	00:01:00	00:06:25	00:02:13	00:02:57
3	00:05:35	00:04:34	00:01:10	00:04:50	00:03:73	00:03:10
4	00:05:37	00:05:07	00:02:13	00:04:03	00:02:63	00:02:46
5	00:05:13	00:03:62	00:00:97	00:05:06	00:02:20	00:02:14
6	00:05:48	00:04:58	00:01:05	00:04:48	00:03:10	00:02:58
7	00:04:18	00:04:94	00:00:98	00:05:26	00:03:05	00:02:45
8	00:05:25	00:05:03	00:01:10	00:06:00	00:02:16	00:02:10
9	00:05:35	00:05:00	00:01:18	00:05:50	00:02:78	00:02:48
10	00:04:47	00:04:62	00:01:05	00:04:10	00:01:96	00:02:18
11	00:05:25	00:03:82	00:01:15	00:04:28	00:02:05	00:02:43
12	00:04:41	00:03:98	00:00:97	00:06:15	00:03:13	00:02:47
13	00:04:60	00:04:54	00:00:92	00:05:10	00:02:18	00:02:90
14	00:05:02	00:04:38	00:00:95	00:05:16	00:02:68	00:02:56
15	00:04:98	00:03:92	00:00:98	00:04:18	00:02:25	00:02:24
16	00:05:10	00:04:18	00:01:03	00:04:03	00:02:08	00:02:15
17	00:04:48	00:04:10	00:01:00	00:05:10	00:01:99	00:02:68
18	00:05:10	00:04:22	00:01:15	00:05:06	00:02:45	00:02:98
19	00:04:70	00:03:88	00:01:05	00:05:15	00:02:59	00:02:80
20	00:04:98	00:04:09	00:01:93	00:04:45	00:02:90	00:02:88
21	00:04:84	00:04:05	00:00:98	00:04:90	00:02:68	00:02:75
22	00:05:64	00:03:92	00:00:97	00:05:00	00:02:82	00:02:68
23	00:05:00	00:04:02	00:00:65	00:04:60	00:03:00	00:02:60
24	00:05:03	00:04:05	00:00:68	00:05:08	00:02:70	00:03:00
25	00:04:64	00:04:10	00:00:80	00:04:48	00:03:15	00:02:87
26	00:04:95	00:05:00	00:00:98	00:05:03	00:02:48	00:02:48
27	00:04:78	00:04:68	00:00:99	00:04:98	00:02:28	00:02:15
28	00:05:48	00:03:78	00:01:00	00:05:05	00:02:70	00:02:46
29	00:05:51	00:04:09	00:01:90	00:04:63	00:02:82	00:02:58
30	00:05:25	00:04:18	00:01:18	00:04:23	00:02:68	00:02:48

Table 4: Comparative Statistical analysis of six rasas in powder and aqueous solution form

Rasa	Mean		SD		SE		Confidence interval	t value	p value
	Powdered	Solution	Powdered	Solution	Powdered	Solution			
Madhur	10.9607	4.9943	2.7253	0.4045	0.4976	0.0738	5.9663	11.8611	> 0.0001
Amla	7.1007	4.3040	1.2826	0.4112	0.2342	0.0751	2.7967	11.3727	> 0.0001
Lavan	2.7687	1.0920	0.5972	0.3279	0.1090	0.0599	1.6767	13.4799	> 0.0001
Katu	11.1537	4.8960	1.6466	0.5826	0.3006	0.1064	6.2577	19.6229	> 0.0001
Tikta	5.3280	2.6093	0.7299	0.4237	0.1333	0.0774	2.7187	17.6434	> 0.0001
Kashya	11.4433	2.5577	0.7695	0.2722	0.1405	0.0497	8.8857	59.6256	> 0.0001

Statistical Analysis:

- Sample size was 30
- The Data was in Quantitative form – Time taken for taste perception in Seconds and Milliseconds
- The data was Unpaired – As the observations were made on the same 30 individuals but at different times by the same methodology
- Unpaired t test was applied.

DISCUSSION:

Literary review of Bodhak kapha and saliva concludes that function of saliva and Bodhak Kapha for taste perception is almost same. According to modern science the constituents of saliva are similar to plasma. Ptyalin a chief constituent of saliva is responsible for digestion of carbohydrates although Mucin have protective function on oral cavity and it also helps in deglutition. [12]

Ayurveda describes that *Utpatti* of *Bodhak Kapha* is from *Rasadhatu*. [13] Symptoms of *Raskshaya* and *Kaphakshaya* are same e.g.in *Talushosha* quantity of *Lalastrava* is decreased, and it nomalises after intake of *Jaliya Dhatu*(fluids).the symptoms of *Rasadhatuvruddhi* and *Kaphavruddhi* are same e.g. in *Praseka Lalastrava* is increased. It is observed according to *Samanya* and *Vishesh Siddhanta*. [14]

According to modern science in the process of taste perception, taste bud and sensory nerve carries sensation to brain. [15] According to *Ayurveda* the function of carrying sensation is a function of *Vata Dosha*. [16] Hence this function cannot be included in the functions of *Bodhaka Kapha*.

For taste perception it is mandatory that the substance dissolves in saliva, *Ayurveda* is also of same opinion that *Jala* is the *Yoni* of all *Rasa*, on the basis of these facts the experiment was carried out. Time for perception varies in some volunteers that can be attributable to physiological range or physiological variation.

Relative study of Different taste perceptions was done. It was observed that taste perception of powdered form of the 6 drugs was slightly delayed as compared to the time taken for the taste perception of aqueous solutions of the same 6 drugs (**p value** > 0.0001). In aqueous solution taste perception of *Amla* and *Katu Rasa Dravyas* was rapid (**p value** > 0.0001) as compared to powdered drug. In case of *Katu,Amla* and *Lavan Rasa* it was observed that the salivary secretions were more.

According to *Mahbhuta* predominance, time for perception differed. It is observed that *Rasa* with *Prithvi Mahabhoot* predominance shows delayed perception than *Rasa* with *Jala Mahabhoot* predominance. This can be associated with molecular binding of substance with taste bud and saliva.

Kapha Dosha is Jalamahabhoot predominant. Hence time taken for perception of *Lavan Rasa* is rapid as *Lavan Rasa* is also *Jala Mahabhoot* predominant.

Finally it may be concluded that *Bodhak Kapha* is physiologically and functionally similar to salivary content mucin. The predominance of *Mahabhoota* in substance is helpful in taste perception.

CONCLUSION:

The Taste perception of aqueous solution of a drug is quick as compared to the powdered form of the same drug in case of all *rasas* i.e. *Madhura, Amla, Lavana, Katu, Tikta* and *Kashaya Rasa.*

It can be concluded that for taste perception of any substance water content plays an important role. *Mucin* is a liquid substance present in saliva which is responsible for taste perception. *Bodhak kapha* is also having *jalamahabhoot* predominance is responsible for taste perception.

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#401/8-A, 4th Floor, Shiv Shrishti Apt.
Nardas Nagar, TP Rd., Bhandup (W), Mumbai – 400078
E:mail-editorijaam@gmail.com, Web- www.ijaam.org