Volume 8, Issue 5 Sep-Oct 2023, pp: 579-585 www.ijprajournal.com ISSN: 2249-7781

# Classical Approach To Understand The Concept of Consuming Order of Shad Rasa – A Review

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Submitted: 20-09-2023 Accepted: 30-09-2023

ABSTRACT: Aahar is consumed as fuel for the biological activities continuously carried in the human body. People have always relied on rasa to find nutritious items in nature and stay away from toxins. Consuming aahar having all six rasa helps in formation of aaharrasa that nourishes all dhatu. It is said that sarvarasabhyasam promotes aarogya. According to Ayurveda, a person's digestive and metabolic processes (vipaka) are highly influenced by their sense of rasa. Six rasa show different digestive and metabolic properties. So rasa which are heavy to digest require more energy to process, while rasa which easily digest require less energy. So consumption of heavy to digest rasa like madhur in first order helps to digest easily and later rasa which is easy to digestbecause digestive energy at the start of the meal is higher. In order to facilitate the digestion of the food in koshta certain specific patterns of intake based on rasa are suggested in ayurveda. So in this article we discussed the order of rasa consumption mentioned in ayurveda text.

**KEYWORDS**: Aahar, Consumption, Digestive, Order, Rasa

## I. INTRODUCTION:

Ayurveda has recognised the significance of diet and nutrition in health and disease, and it has been stated that both the human body and diseases are the result of nutrition. [1] The healthy bodies as well as the diseases are nothing but the outcome of aahar. [2] For total positive health, ayurveda has given three sub pillars- aahar, nidra and brahmacharya, which comes under the concept of Swasthavritta. Here Aahar, has been explained first, which shows its importance. [3]

Sushrut says that the strength, complexion, immunity, etc., of a living system is under the control of aahar which is range under control of the six rasa. [4]

In Ayurvedic classics "Rasa" is the basic concept which mean by the taste experienced by the person. Acharya Chakrapani has described the

of definition concept "Rasa" "RasyateAswadyateiti rasa". [5] The word rasa refers to rasa and that which is perceived through the tongue. According classical text mentioned rasa are six in number: madhur rasa (sweet), amla rasa (sour), lavana rasa (salty), katu rasa (pungent), tikta rasa (bitter), and kashaya rasa (astringent). [6, 7] The sense of rasa, in accordance with Ayurveda, serves as a natural road map to a balanced diet. The sense of taste is commonly referred to as the 'gatekeeper' of food intake. [8] Our taste buds are much more than just senses of flavour; they also unlock the nutritional potential of food and act as the catalyst for the entire digestive process.<sup>[9]</sup>

These six rasas are linked to the balance of elements like Aakash, vayu, agni, jala and pruthvimahabhutas. These rasa are not a coincidence; they are a direct representation of the food's biochemical properties, showing its pharmacological potential. Our sense of rasa allows us to evaluate the nutritive value of foods prior to ingesting them. In terms of modern nutrition, the six rasas satisfy all the major dietary building components. For example, madhuraaharis rich in fats, proteins, carbohydrates, and water, whereas tikta and kashayarasatmakaahar are high in vitamins and minerals.

Aacharya Charaka recommends taking Madhur, amla, lavana, katu, tikta and kashayarasatmakaahar in the above-mentioned order, saying that the former rasa is stronger than the later one. Meanwhile AacharyaVagbhat says that the order is indicated as the former rasa is more strength presenting to human than the later one. [7]

Healthy diet is vital for a healthy body and a healthy mind. InAyurveda, an ideal diet incorporates the sixrasas prescribed in the classics. Good or poor, acceptable, or disagreeable, it is the rasa that determines whether we want to continue swallowing/eating that food. Therefore the rule for

Volume 8, Issue 5 Sep-Oct 2023, pp: 579-585 www.ijprajournal.com ISSN: 2249-7781

following the order of rasa is useful for a healthy lifestyle.

## **AIM &OBJECTIVES:**

- To study the concept of importance of order for consuming aahar rasa.
- To study the impact of rasas on digestion process.

### II. MATERIAL & METHOD:

Materials related to aahar, shadrasa, order of rasa of food in ayurveda and other related topics have been collected from various ayurvedic classical texts such as Charaka Samhita, Sushruta Samhita, Ashtang Sangrah, Kashyap Samhita etc. The references were compiled, analysed, and discussed for a thorough and in-depthunderstanding of the concept of order of shadarasatmakaahar consumption.

## III. DISCUSSION:

#### Rasa

In ayurveda, "rasa" is a simple phrase for rasa, but it also refers to a deeper principle. Rasa is defined as a "knowledge perceived through rasanaindriya (roughly gustatory sensation) located at jihva (tongue)." [5] Rasa basically identifies by mahabhuta, which is structurally predominant in eaten food. [5]

### **Evolution of rasa:**

Commentator Chakrapani states that jalamahabhuta and pruthvimahabhuta are essential components for expression of rasa. These two mahabhutas come together to give origin to rasa. Though jalamahabhuta is accountable for the progress of all rasa, six rasa are formed by the combination and supremacy of two mahabhutas. Hence all five mahabhutas play an important role in the growth and development of the human body which is made up of panchmahabhutas, it is also called panchbhautik sharira.

Table No.1:Rasa and MahabhutaRelation [12,13,14,15]

Sr. No	Rasa	Mahabhuta	Sr. No	Rasa	Mahabhuta
1	Madhur	Prithvi + Jala	4	Katu	Agni + Vayu
2	Amla	Agni + Prithvi	5	Tikta	Vayu+ Akasha
3	Lavana	Agni + Jala	6	Kashaya	Vayu + Prithvi

## Relation between six seasons and rasa:

The predominance of specific mahabhuta in the environment is the principal reason for six types of rasa. These predominant mahabhutas make these rasa strong as those are chief structural

components of these rasa. Due to this predominance, the environment is divided into six seasons. In ayurveda six seasons are explained and the environment of six seasons is predominant of one or two mahabhuta. [15]

Table No. 2: Relation between six seasons and rasa<sup>[15]</sup>

Sr. No	Rasa	Season
1	Madhur	Hemant
2	Amla	Varsha
3	Lavana	Sharad
4	Katu	Grishm
5	Tikta	Shishir
6	Kashaya	Vasant

# Relation between rasa and dosha $^{[16,10,17]}$ :

Rasa have a remarkable direct influence on dosha, three rasa pacify, and the other three aggravate each of them. The similarity and dissimilarity of rasa with dosha is explained on the basis of associated gunas of rasa. Explanation on the basis ofyoni(origin) bhutasis found more conspicuous. The relation between rasa-dosha is given in the following table.



Volume 8, Issue 5 Sep-Oct 2023, pp: 579-585 www.ijprajournal.com ISSN: 2249-7781

Table No. 3: Relation between rasa and dosha

Dosha	Vardhaka ↑	Shamak ↓
Vata	Katu, tikta, kashaya	Madhur, amla, lavana
Pitta	Amla, lavana, katu	Tikta, kashaya, madhur
Kapha	Madhur, amla, lavana	Katu, tikta, kashaya

# Order of consuming aaharrasasin healthy condition:

If we follow the order of rasa in food we can prevent the disease and not only the disease but also it keeps our body as well as mind in healthy condition scientifically according to ayurveda.

Ayurveda instructs anything which is of madhurrasa should be eaten first as they are dominated by pruthvi and jalamahabhuta which are heavy by nature and due to it they are heavy to digest, At starting of meal digestive strength is maximum which helps to digest madhurrasatmakaahar easily. Then lavana and amla rasa should be consumed to stimulate digestion and enhance the flavors. Katu rasa and kashayarasa are advised to take at the end of the meal, as they trigger absorption and clear the palate. [19]

Sushrut advocated 3 phases for using the rasa's in aahar. [18]

पूर्वं मधुरमश्लीयान्मध्येऽम्ललवणौ रसौ || पश्लाच्छेषान रसान वैद्यो भोजनेष्ववचारयेत | स.स४६/४६०

Table No. 4: Order of rasa

Prathama avastha (first phase)	Madhur Rasa
Madhyama avastha (middle)	Amla&Lavana Rasa
Antima avastha(last)	Tikta, Katu, Kashaya Rasa

Now we will see the reason of above rules one by one :-

- 1. **Madhur rasa** Before a meal or dinner our stomach remains empty. Due to emptiness of the stomach, there will be aggravation of laghu and ruksha qualities of vata dosha and ushna qualities of pitta dosha. So, to maintain the vata and pitta dosha in normal condition or to avoid aggravation of vata and pittadosha. We have to consume aahar having opposite qualities of laghu, rukshaand ushnai.e. guru, snigdha and sheet. Madhur rasa is taken first as it is having the panchabhautik constitution of prithvi and jalamahabhuta<sup>[12]</sup> and opposite qualities that are guru, snigdha and sheet 15, 20]. So due to madhur rasa we can maintain the vata and pittadosha at normal condition. [15, <sup>20]</sup>Due to madhurrasa, we can keep the food material moist (kledan) to dissolve it properly in body fluids. Madhur rasa provides trupti<sup>[21]</sup> of aahar so it is helpful to avoid over consumption of aahar. Madhur rasa also has the property of mukhaupalepa<sup>[21]</sup>(coating) which is also not good for oral health if eaten
- Amla and lavanarasa- These two rasa possess the quality of snigdha and ushna which causes

- the food items to be moist<sup>[21]</sup> and digestible by maintaining the acid level normal in stomach and duodenum. And, these qualities help to maintain the vatadosha in normal condition by reducing its ruksha and sheet quality.<sup>[15,20]</sup> Also, these both increase the flavour of food. The panchabhautik constitution of amla rasa is prithvi and tejamahabhuta<sup>[12]</sup> and that of lavanarasa is jala and tejamahabhuta,<sup>[12]</sup> thus it is helpful to maintain the digestive agni.
- 3. **Katu, tikta and kashaya rasa-** After intake of food there is necessity of proper digestion of it up to its absorption from gut, so the qualities of all these three rasa helps in doing the same process. These qualities of rasa helpful such as ushnaguna of katu rasa for digestion purpose, vishada and sheet guna of tikta rasa to avoid excessive snigdhaguna at intestine level and maintains pitta dosha at normal condition respectively, laghu and rukshaguna of kashaya rasa to absorb the digested material from gut wall. [15,20]

DOI: 10.35629/7781-0805579585 | Impact Factor value 7.429 | ISO 9001: 2008 Certified Journal Page 581

Volume 8, Issue 5 Sep-Oct 2023, pp: 579-585 www.ijprajournal.com ISSN: 2249-7781

# Order of consuming anharrasa in diseased condition:

In the samprapti of disease, due to improper food ingestion, it causes vitiation of doshas i.e. kapha dosha in amashaya, pitta dosha in pachyamanashaya (gastrointestinal) vata dosha in

pakvashaya. The dosha vitiation takes place after ingestion of apathyaaahar (incompatible foods). This order of rasa changes as per pathology or diseased condition.

Table No. 5 : Order of rasa in Disease<sup>[22,23,24]</sup>

Sr. No	DoshajVyadhi	Order of rasa		Relation between Rasa&Guna
1.	KaphajVyadhi	Katu → Ti Kashaya	Tikta →	Katu rasa - Guru &Pichchila ↓ Tikta rasa - Vishodhana, Pichchila ↓ Kashaya rasa - Snigdha ↓
2.	PittajVyadhi	Tikta → M Kashaya	Iadhur →	Tikta rasa – Ama pachana Madhur rasa – Laghu, Ushna ↓ Kashaya rasa – Pichchila ↓
3.	VatajVyadhi	Lavana → A Madhur	Amla →	Lavana Rasa – Vibhandatwa, Sheet & Laghu ↓ Amla Rasa – Srotovishodhana, Laghu, Vishada & Ruksha ↓ Madhur Rasa – Laghu & Vishada & Ruksha ↓

## Importance of order of rasa:

Rasa is the main factor from rasapanchak of food material which comes in contact withdoshas present in gastrointestinal tract after its administration. So firstly there will be changes in the quality of doshas and due to vitiation of dosha the dhatus and malas get vitiates. Change in their qualities of rasa directly affects dosha imbalance which is the root cause of disease formation. [25] So proper aaharrasa administration is important for

maintenance of health. Ayurvedic dietary prescription calls for a proper proportion of every rasa in preparations of food for getting a healthy and balanced diet.

## Modern point of view on rasa:-

If carefully evaluated the ancient concept will match the present scientific views. Foods with specific chemical constituents are found to exhibit rasa as below<sup>[26]</sup>

Table No. 6: Rasa& its chemical constituent

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Rasa	chemical constituent	
Madhura (Sweet)	Sugar, Fat, And Amino Acid	
Amla (Sour)	Acids	
Lavana (Salty)	Salts	
Katu ( Pungent)	Essential Oils, Phenols Etc	
Tikta (Bitter)	Certain Alkaloids &Glycosides	
Kashaya (Astringent)	Tannins	



Volume 8, Issue 5 Sep-Oct 2023, pp: 579-585 www.ijprajournal.com ISSN: 2249-7781

Food consumption, chewing and enzymatic digestion of the food starts in the saliva, leading to the formation of various chemical compounds. [27] The chemical activation of the taste receptors triggers a stimulation of the neuronal fibers connected to receptor cells, sending the signal to the brain for processing into a sensory experience in terms of taste quality, intensity, and hedonics. [28] When the brain recognises one of the previously mentioned six rasa, it signals the gut or digestive system to secrete the appropriate enzymes required for proper digestion.

Saliva in the mouth contains enzymes that aid in the breakdown of food into carbohydrates before we swallow it. Eating sweets at the start of a meal helps the body to stimulate taste buds and saliva, it helps the body to release digestive hormones and improve digestion. While eating sweet after meal can slow down digestion process. Consumption of sweet-tasting products induces "sensory-specific satiety," a general decrease in the attractiveness of all sweet products. Bruno laeng stated that the liking for sweetness may change during a meal, sweetness preferences are reportedly higher before a meal than after a meal.

Salt helps to increase digestive activity and stimulates salivation, enhances the flavour of food<sup>[32]</sup> and aids the digestion, absorption and elimination.<sup>[33]</sup>

Sour taste in moderation, sour foods are refreshing. They stimulate the appetite, improve the digestion, It is salivation promoting, relishing. [33]

Pungent taste breaks up hard masses of food present in the intestines. In addition to this it improves digestion, absorption and elimination of food. Spices having mainly pungent taste stimulate the liver to secrete more bile enriched in bile acids, and it also stimulate the enzyme activities that participate in digestion, both of pancreatic and intestinal origin. Such stimulation of bile secretion and of the activities of digestive enzymes leads to an increasing digestive process, resulting in a significant decreases in the duration of passage of food through the gastrointestinal tract, which is helpful in digestion of overall food. [34]

Bitter taste helps to clean the mouth, destroys taste perception. It promotes the flavour of all tastes. [33] Absorption of nutrients and product of digestion is increased by bitter taste. [35] Bitter foods have potent effects to secrete gastrointestinal hormones and slow gastric emptying. Slowing the process of gastric emptying enhances the feeling of

fullness after a meal, which is useful in stopping excessive intake of food. So these gut functions play important roles in the regulation of both acute energy intake and postprandial glycaemia. [36]

Astringent taste dries up moisture and fat, Its qualities are cooling, drying and heavy. [33] Astringency mainly comes from tannins and other polyphenolic compounds and causes the drying, roughening and puckering of the mouth epithelia attributed to the interaction between tannins and salivary proteins. [37]

## IV. CONCLUSION:

Rasa is the true essence of life and it affects each aspect of our being, from structure and physiology to our overall state of mind and consciousness. According to Ayurveda, the eating order of aahar should be according to rasa, which is madhur, amla, lavana, katu, tiktaandkashaya. So data about the order of rasa administration is helpful for individuals to maintain their healthy life. Consumption of Madhur rasa firstly during meal releases digestive hormone and improves digestion vs after meal it slows down digestive process. Amla and lavana rasa increase the salivation and digestive hormones which is helpful for the digestion process. Katu&tiktarasa increases digestion process and slows down the gastric emptying time which is helpful in nutrient absorption. Kashaya rasa slows down salivary secretion in the mouth which is helpful in cleaning the mouth after a meal. Understanding the concept of shadrasa and how they relate to our individual constitution can help us make better choices to promote health and to prevent diseases.

## **REFERENCE:**

- [1]. JadavjiTrikamji, Charaka Samhita of Agnivesh with Ayurved-Dipika Commentary of Chakrapanidatta, Chaukhamba Orientalia Varanasi, 2021 Edition Vol. 1 Sutrastan Adhyaya 28/45:553.
- [2]. JadavjiTrikamji, Charaka Samhita of Agnivesh with Ayurved-Dipika Commentary of Chakrapanidatta, Chaukhamba Orientalia Varanasi, 2021 Edition Vol. 1 Sutrastan Adhyaya 28/7: 178.
- [3]. JadavjiTrikamji, Charaka Samhita of Agnivesh with Ayurved-Dipika Commentary of Chakrapanidatta, Chaukhamba Orientalia Varanasi, 2021

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## **International Journal of Pharmaceutical Research and Applications**

Volume 8, Issue 5 Sep-Oct 2023, pp: 579-585 www.ijprajournal.com ISSN: 2249-7781

- Edition Vol. 1 Sutrastan Adhyaya 11/35: 74.
- [4]. JadavjiTrikamji, Susruta Samhita of Susruta with Nibandhasngraha Commentary, Chaukhamba Orientalia Varanasi, 2021 Edition Vol. 1 Sutrastan Adhyaya 1/28:7.
- [5]. JadavjiTrikamji, Charaka Samhita of Agnivesh with Ayurved-Dipika Commentary of Chakrapanidatta, Chaukhamba Orientalia Varanasi, 2021 Edition Vol. 1 Sutrastan Adhyaya 1/64: 18
- [6]. JadavjiTrikamji, Charaka Samhita of Agnivesh with Ayurved-Dipika Commentary of Chakrapanidatta, Chaukhamba Orientalia Varanasi, 2021 Edition Vol. 1 Sutrastan Adhyaya 1/65: 18.
- [7]. Dr. Bramhanand Tripathi, AstangaHrdayam of Shrimadvagbhata with Nirmala Hindi Commentary, Chaukhamba Sanskrit Pratishthan Delhi, 2022 Edition Vol.1. Sutra sthan Adhyaya 1/14-15: 12
- [8]. Feeney, E.; O'Brien, S.; Scannell, A.; Markey, A.; Gibney, E.R. Genetic variation in taste perception: Does it have a role in healthy eating? Proc. Nutr. Soc. 2011, 70, 135–143.
- [9]. Depoortere I. Taste receptors of the gut: emerging roles in health and diseaseGut 2014;63:179-190
- [10]. JadavjiTrikamji , Susruta Samhita of Susruta with Nibandhasngraha Commentary, Chaukhamba Orientalia Varanasi, 2021 Edition Vol. 1 Sutrastan Adhyaya 42/3: 183-184
- [11]. Rath SK, Panja AK, Nagar L, Shinde A. The scientific basis of rasa (taste) of a substance as a tool to explore its pharmacological behavior. Anc Sci Life. 2014;33(4):198-202.
- [12]. JadavjiTrikamji, Charaka Samhita of Agnivesh with Ayurved-Dipika Commentary of Chakrapanidatta, Chaukhamba Orientalia Varanasi, 2021 Edition Vol. 1 Sutrastan Adhyaya 26/40: 143
- [13]. JadavjiTrikamji , Susruta Samhita of Susruta with Nibandhasngraha Commentary, Chaukhamba Orientalia Varanasi, 2021 Edition Vol. 1 Sutrastan Adhyaya 42/3: 184-185

- [14]. Dr. Bramhanand Tripathi, AstangaHrdayam of Shrimadvagbhata with Nirmala Hindi Commentary, Chaukhamba Sanskrit Pratishthan Delhi, 2022 Edition Vol.1. Sutra sthan Adhyaya 10 /1:152.
- [15]. Kaviraj Atrideva Gupta, AstangaSamgraha of Shrimadvagbhata with Hindi Commentary, Chaukhamba Krishnadas Academy Varanasi, 2019 Edition Vol.1. Sutra sthan Adhyaya 18/3-4 : 147.
- [16]. JadavjiTrikamji, Charaka Samhita of Agnivesh with Ayurved-Dipika Commentary of Chakrapanidatta, Chaukhamba Orientalia Varanasi, 2021 Edition Vol. 1 Vimansthan Adhyaya 1/6: 2
- [17]. Dr. Bramhanand Tripathi, AstangaHrdayam of Shrimadvagbhata with Nirmala Hindi Commentary, Chaukhamba Sanskrit Pratishthan Delhi, 2022 Edition Vol.1. Sutra sthan Adhyaya 1/15: 13
- [18]. JadavjiTrikamji , Susruta Samhita of Susruta with Nibandhasngraha Commentary, Chaukhamba Orientalia Varanasi, 2021 Edition Vol. 1 Sutrastan Adhyaya 46/460: 247
- [19]. Dr. Bramhanand Tripathi, AstangaHrdayam of Shrimadvagbhata with Nirmala Hindi Commentary, Chaukhamba Sanskrit Pratishthan Delhi, 2022 Edition Vol.1. Sutra sthan Adhyaya 1/14:12.
- [20]. JadavjiTrikamji, Charaka Samhita of Agnivesh with Ayurved-Dipika Commentary of Chakrapanidatta, Chaukhamba Orientalia Varanasi, 2021 Edition Vol. 1 Vimansthan Adhyaya 26/42-43: 144-145
- [21]. JadavjiTrikamji, Charaka Samhita of Agnivesh with Ayurved-Dipika Commentary of Chakrapanidatta, Chaukhamba Orientalia Varanasi, 2021 Edition Vol. 1 Sutra sthan Adhyaya 26/76:149
- [22]. Hemraja Sarma, Kasyapa Samhita of Vriddhajivaka revised by vatsya with Vidyotini Hindi commentary, Chaukhamba Sanskrit Sansthan Varanasi, 1974 Edition 2 Khilsthan Adhyaya 6/24-26: 263
- [23]. Hemraja Sarma, Kasyapa Samhita of Vriddhajivaka revised by vatsya with



Volume 8, Issue 5 Sep-Oct 2023, pp: 579-585 www.ijprajournal.com ISSN: 2249-7781

- Vidyotini Hindi commentary, Chaukhamba Sanskrit Sansthan Varanasi, 1974 Edition 2 Khilsthan Adhyaya 6/27-29: 264
- [24]. Hemraja Sarma, Kasyapa Samhita of Vriddhajivaka revised by vatsya with Vidyotini Hindi commentary, Chaukhamba Sanskrit Sansthan Varanasi, 1974 Edition 2 Khilsthan Adhyaya 6/30-34:264
- [25]. varghesejibithankachan et al: ahara rasa unveiled transformation to the finest. International ayurvedic medical journal {online} 2021.
- [26]. Liem DG and Russell CG (2019) The Influence of Taste Liking on the Consumption of Nutrient Rich and Nutrient Poor Foods. Front. Nutr. 6:174.
- [27]. M. Witt, K. Reutter Anatomy of the tongue and taste buds Handbook of Olfaction and Gustation, Taylor & Francis (2015), pp. 637-664.
- [28]. A.Hichami, A.S. Khan, N.A. Khan Cellular and molecular mechanisms of fat taste perception Handb Exp Pharm, 275 (2022), pp. 247-270
- [29]. Patricia JJ, Dhamoon AS. Physiology,
  Digestion.In: StatPearls [Internet].
  Treasure Island (FL): StatPearls
  Publishing; 2023 Jan
- [30]. Laeng B, Berridge KC, Butter CM. Pleasantness of a sweet taste during hunger and satiety: effects of gender and "sweet tooth". Appetite. 1993;21(3):247–254
- [31]. Hetherington M, Rolls BJ, Burley VJ. The time course of sensory-specific satiety. Appetite. 1989;12:57–68.
- [32]. Henney JE, Taylor CL, Boon CS, editors. Strategies to Reduce Sodium Intake in the United States. Washington (DC): National Academies Press (US); 2010. 3
- [33]. Ayurvedic Concept of Diet & Nutrition Editors Dr. Sunanda Ranade Prof. Dr. R. R. Deshpande Dr. Arti Firke , International Academy of Ayurved B. A. M. S. Graduates Association, 2011, 53-56
- [34]. Platel, Kalpana & Srinivasan, Krishnapura. (2004). Digestive stimulant action of spices: A myth or reality?. The Indian journal of medical research. 119(5). 167-79

- [35]. Walker JM. The Bitter Remedy. The European Journal of Herbal Medicine 6(2):28-33.
- [36]. Rezaie P, Bitarafan V, Horowitz M, Feinle-Bisset C. Effects of Bitter Substances on GI Function, Energy Intake and Glycaemia-Do Preclinical Findings Translate to Outcomes in Humans? Nutrients. 2021; 13(4):1317.
- [37]. He M, Tian H, Luo X, Qi X, Chen X. Molecular progress in research on fruit astringency. Molecules. 2015;20(1):1434-1451. Published 2015 Jan 15.