E-ISSN:2456-3110

Review Article

Lifestyle Disorders

Check for updates

Journal of Ayurveda and Integrated Medical Sciences

2025 Volume 10 Number 8 August

Publisher

Maharshi Charaka Ayurveda

www.maharshicharaka.in

Role of Tikta Rasa in the sustained intervention of Lifestyle Disorders - A Review article

Motwani A[1*], Giri C[2]

DOI:10.21760/jaims.10.8.37

[1*] Anushka Motwani, Post Graduate Scholar, Department of Dravyaguna, DY Patil School of Ayurveda, Nerul, Navi Mumbai, Maharashtra, India.

[2] Charushila Giri, HOD, Department of Dravyaguna, DY Patil School of Ayurveda, Nerul, Navi Mumbai, Maharashtra, India.

The WHO classifies Lifestyle Disorders as Non-communicable diseases which include Diabetes mellitus, Obesity, Cardiovascular disease, Hypertension, Alzheimer's and Cancer. 74% of fatalities worldwide are attributed to NCDs each year. In Charak Samhita Sutrasthan Chapter 25, described Agrya Dravyas in which the usage of Ek Rasa Abyasa is deemed Daurbalyakar. This means consumption of one particular taste/food group has been responsible to create laxness in the body. The exponential rise in NCDs might be due to overconsumption of Ek Rasa (eg: Madhur Rasa i.e., Guru Bhojhana), Agni Mandya, Sedentary lifestyle, Smoking, Alcohol consumption. They're called Santarpanjanya disorders in Ayurveda. These disorders have presence of Ama as a contributing factor, which makes the etiology difficult to cure. Tikta Rasa is one such Rasa out of 6 essential Rasas which has the potential to manage lifestyle disorders both on the level of Curative as its a Apatarpanjanya Rasa, by doing Deepana of Agni, Pachana of Ama in the minute Srotases. Preventive by using its beneficial phytonutrients and antioxidant property by including in our Aahar and Dinacharya. This study shows various Tikta Rasa Aahar Varga like Kushmandi, Alabu, Patola, Kunduru, Koshataki, Bimbi, Chichind etc. They're a potent source of phytonutrients like Vit A, Vit C, Vit B complex and phytochemicals like flavonoids, tannins, saponins which prevent right from Diabetes, Dyslipdemias, Metabolic syndromes upto Cancer. A NCD epidemic is approaching and inevitable hence there's a need for a sustained intervention to manage these in the long term. The main objective of this study is to bring awareness and inculcate ways in which we can include this most beneficial nutrition quotient back in our diet and lifestyle.

Keywords: Non-communicable diseases (NCDs), Lifestyle disorders, Santarpanjanya disorders, Agni Mandya, Ama, Tikta Rasa

Corresponding Author

Anushka Motwani, Post Graduate Scholar, Department of Dravyaguna, DY Patil School of Ayurveda, Nerul, Navi Mumbai, Maharashtra, India.
Email: anushkamotwani29@gmail.com

How to Cite this Article

Motwani A, Giri C, Role of Tikta Rasa in the sustained intervention of Lifestyle Disorders - A Review article. J Ayu Int Med Sci. 2025;10(8):222-230.
Available From
https://jaims.in/jaims/article/view/5047/

To Browse

Manuscript Received	Review Round 1	Review Round 2	Review Round 3	Accepted
2025-06-15	2025-06-28	2025-07-08	2025-07-18	2025-07-28

Conflict of Interest	Funding	Ethical Approval	Plagiarism X-checker	Note
None	Nil	Not required	12.36	

Introduction

Lifestyle disorders are the Non communicable disorders due faulty diet and lifestyle. *Ek Rasaabhyasa* is deemed *Daurbalyakar.* For example: Excess *Madhur Rasa Sevana* leads to *Prameha*, similarly excess *Madhur*, *Amla Sevana* leads to *Kushtha*. Lifestyle disorders vis-a-vis *Santarpanjanya Vyadhis* due to common causative factors, symptoms, condition. *Santarpanjanya* disorders have presence of *Agnimandhya* and thereby formation of *Ama*. They are formed due to inactivity, sedentary lifestyle, over nourishment leading to vitiation of *Kapha Dosha*. *Tikta Rasa* has been neglected in our diet over the years. This might relate with the exponential high numbers of lifestyle disorders as *Tikta Rasa* isn't adequately used to compensate the excess *Madhur* in *Shadras Yukta Aahar. Tikta Rasa* can be included in *Aahar Dravyas* as a preventive and curative measure. This paper describes some beneficial *Tikta Aahar Dravyas* that can be consumed to manage Lifestyle disorders.

Aim and Objectives

1. To conceptualise the effectiveness of *Tikta Rasa Aahar Dravyas* in management of Lifestyle disorders.
2. To check the utility of *Tikta Rasa Aahar Dravyas* as preventivee., by including in *Aahara Sevana.*
3. To check the utility of *Tikta Rasa Aahar Dravyas* as curative i.e., in *Pathyapathya* and *Chikitsa.*

Materials and Methods

This study is a review article on *Tikta Aahar Dravyas* mentioned in the classics. *Bhavprakasha Nighantu (Shaka Varga), Shodal nighantu, Shaligram Nighantu* was found to be the suitable reference for this research article. Along with that different Research articles, Modern texts, different Research databases like PubMed, Authorea etc. There are so many known *Tikta Shaka Dravyas* that we know and consume, but here some lesser known *Tikta Shaka* varieties have also been mentioned that should be included in our diet.

Tikta Rasa Aahar Dravyas

Name	Rasa Panchak	Family	Phytonutrients and Compounds	Pharmacological Actions
1. Kushmandi (Kumhadi/ karkaru) Field Pumpkin  Fig. 1.1 Source: Scientific Figure on ResearchGate. Available from: https://www.researchgate.net/figure/Young-fruits-of-Cucurbita-pepo-one-from-each-edible-fruited-cultivargroup-Left-to_fig7_304456365 [accessed 1 Jun 2025]	**Tikta**, Shita, Guru Kapha Vataghna	Cucurbitaceae, Cucurbita pepo Linn.	Proteins, fats, Iron, VIT C, Carotenoids, tocopherols, alkaloids, glycosides, flavonoids, terpenoids	Anti-inflammatory, Antioxidant, Anti-hypertensive, Anti diabetic [1], Anti-viral
2. Kushmandi Bheda (Lal kumhada) Red gourd/ Squash  Fig. 1.2 Source: https://www.monaconatureencyclopedia.com/cucurbita-maxima/?lang=en	**Tikta** Krumighna, Mutrala	Cucurbitaceae, C. Maxima Duchesne.	Phenols, flavonoids, alkaloids, tannin, saponin, terpenoids, steroids	Hepatoprotective, Anti diabetic, anti-hypertensive, anti-atherosclerotic [2], anti hypercholesterolemic, anti-inflammatory, antibacterial

Name	Rasa Panchak	Family	Phytonutrients and Compounds	Pharmacological Actions
3. Katu Tumbi Bottle gourd / Calabash  Fig. 1.3 Source: https://www.easyayurveda.com/wp-content/uploads/2016/08/Lagenaria-siceraria1.jpg https://plantwiseplusknowledgebank.org/cms/10.1079/pwkb.species.30556/asset/bede05e8-999a-4ddb-ad0f-d1a2c1030170/assets/graphic/30556_02.jpg	**Tikta**, Shita, Katu Vipaka, Pittavataghna, Hridya, Vishaghna	Cucurbitaceae, Lagenaria vulgaris Ser.	Saponins, flavonoids, terpenoids, vit b complex, vit c, b-carotene, pyrogallol, avenasterol, palmitic & stearic acids	Antioxidant, immunomodulatory, immunosuppression[3], antidiabetic, anticancer antimicrobial
4. Chichind (Chachenda) Snake gourd  Fig. 1.4 Source: https://upload.wikimedia.org/wikipedia/commons/d/df/Trichosanthes_cucumerina_var._anguina_-_Snake_Gourd_in_a_market_in_North_India.jpg	Guna Like Patola	Cucurbitaceae, Trichosanthes anguina Linn.	Vit C, proteins, vit B1, vit B2, Niacin, flavonoids, carotenoids, phenolic acids, tannins, lycopene, cardiac glycoside	Anti-bacterial, Anti-Fungal, Anti helminthic, Anti diabetic [4], Anti-inflammatory, Anti arthritic, hepatoprotective, cytoprotective
5. Karvellak Bitter gourd  Fig. 1.5 Source: https://fruitboxco.com/cdn/shop/products/BitterGourd.jpg?v=1592407929	Tikta, Shita, Laghu, Pittakaphaghna, Mala Bhedan	Cucurbitaceae, Momordica charantia Linn.	Carotenes, Glycosides, Saponins, momoridicine, vit A, C, E, thiamine, riboflavin, folate, niacin, fatty acids	Anti-cancer [5], anti-cholesterol, anti-dementia, antibacterial, anti-inflammatory
6. Raja Koshataki (Koshataki/ dharmagav) Sponge gourd  Fig. 1.6 Source: https://www.nparks.gov.sg//media/ffw/migrated/round2/flora/4988/7f0406ec214a4574a017052dee4056b7.jpg	Tikta, Madhur, Shita, Deepan, Pittaghna	Cucurbitaceae, Luffa acutangula Roxb.	Flavonoids, anthraquinones, saponin, volatile oils	Anti-Ulcer, Anti-hypertensive, Anti-cancer, anti-hyperlipidemic [6], anti-diabetic, analgesic, immunomodulatory

Name	Rasa Panchak	Family	Phytonutrients and Compounds	Pharmacological Actions
7. Patola (Padval) Pointed gourd  Fig. 1.7 Source: https://www.planetayurveda.com/pa-wp-images/pointed-gourd.jpg	Tikta, Ushna, Deeepan, Pachan, Kaphaghna, Vrishya	Cucurbitaceae, Trichosanthes dioica Roxb.	Saponins, Vit A, C, tannins, alkaloids, triterpenes	Anti-diabetic [7], Hepatoprotective, cholesterol lowering, antioxidant, anti hypertensive
8. Bimbi (Kunduru, Bimbi, Kanduri) Ivy gourd  Fig. 1.8 Source: https://5.imimg.com/data5/DL/YC/MY-33719223/coccinia-indica-extract-500x500.jpg	Madhur, Tikta, Shita, Guru, Stambhan, Lekhan, Ruchikar	Cucurbitaceae, Coccinia indica	Saponins, flavonoids, sterols, alkaloids, triterpenoid, carotenes	Hypo lipidemic [8], Anti mulategenic, anti-glycemic, anti-inflammatory
9. Shigru (Sahijan) Drum stick plant  Fig 1.9 Source: https://plantsguru.com/cdn/shop/files/pg-drumstick-plant.jpg?v=1735618452	Katu, Tikta, Laghu, Ushna, Kapha Vata Shamak	Moringaceae, Moringa oleifera	Alkaloids, flavonoids, anthraquinones, vitamins, glycosides, and terpenes	Anti diabetic [9], hepatoprotective, cardioprotective, and anti-inflammatory
10. Pothki (Bathua) Lambs quarters  Fig. 1.10 Source: https://biokic3.rc.asu.edu/imglib/h_seinet/seinet/Chenopodiaceae/photos/Chenopodium-album-FL-web-.jpg	Madhur, Tikta, Laghu, Deepana, Pachana, Balaprada	Chenopodiaceae, Chenopodium album	Carotene, vit c, flavonoid, isoflavonoid, polyphenol, saponins, amino acids	Anti-oxidant, anti-inflammatory, analgesic, gastroprotective, hepatoprotective, anticancer[10]
11. Tanduliya (Chaulai/ Jala Chaulai) Prickly amaranth  Fig 1.11 Source: https://newfs.s3.amazonaws.com/taxon-images-1000s1000/Amaranthaceae/amaranthus-spinosus-le-kstarr2-a.jpg	Tikta, Shita, Laghu, Vata Shamak	Amaranthaceae, Amaranthus spinosus	Alkaloids, flavonoids, glycosides, phenolic acids, steroids, amino acids, terpenoids, lipids, saponin, b-sitosterol, linoleic acid, rutin and carotenoids.	Antidiabetic [11], antitumor, analgesic, antimicrobial, anti-inflammatory

Name	Rasa Panchak	Family	Phytonutrients and Compounds	Pharmacological Actions
12. Pattashak (Nadik)  Fig. 1.12 Source: https://indiabiodiversity.org/files api/api/get/raw/img//Corchorus%20capsularis/Corchorus_capsularis_1.jpg	Tikta, Madhur, Reduces Krumi, Kushtha. Raktapitta	Tiliaceae, Corchorus capsularis	Protein, lipid, calcium, iron, carotene, vitamins, folic acid	Anti inflammatory, cardioprotective[12]
13. Grunjan (Gajar) Carrot  Fig. 1.13 Source: https://seed2plant.in/cdn/shop/products/carrotseeds.jpg?v=1604032858	Madhur, Tikta, Ushna, Tikshna, Deepana, Laghu, Grahi	Umbelliferae, Daucus carota	Carotenes, vit C, Vit A, Phenols, polyacetylenes	Antioxidant, anti-inflammatory, plasma lipid modification, and anti-tumour properties[13]
14. Vruntak Phala (Bhanta/baingan) Brinjal  Fig. 1.14 Source: https://organicmandya.com/cdn/shop/files/Brinjal.jpg?v=1721370805&width=1000	Madhur, Tikta,	Solanum melongema, Solanaceae	Flavonoids, alkaloids, glycosides, saponins, tannins, sterols	Anti-inflammatory, anti-diabetic, anti-cancer, anti-rheumatic, anti-cholesterol
15. Varahi Kanda (Genthi)  Fig. 1.15 Source: https://m.media-amazon.com/images/I/61-yZ1Y8YML._AC_UF1000,1000_QL80_.jpg	Katu, Tikta, Rasayan, Balya, Deepana	Dioscoriaceae, Dioscoria bulbifera	catechin, kaempferol, catechuic acid, cortisones, bafoudiosbulbins, diosbulbins, xanthins, dioscin and dioscrine	Antioxidant, anti-inflammatory, antihyperlipidemic, antihelminthic and antileprosy
16. KEMUKA (Kemua, Kebuk)  Fig 1.16 Source: https://toptropicals.com/pics/garden/m2/2020/10/IMG_20201018_124328857_Cheilocostus_speciosus_TA.jpg	Tikta, Katu, Shita, Grahi, Deepana, Pachana, Hridya, Laghu	Zingiberaceae, Costus speciosus	flavones, flavonols, isoflavones, anthocyanins, flavanols, proanthocyanidins and other plant phenolics	Antioxidant, anti-inflammatory, Anti lipid, and anti-cancer

Phytocompounds found in *Tikta Aahar Dravyas*

- **Tannins:** They accelerate blood clotting, reduce blood pressure, decrease the serum lipid level, and modulate immune responses.
- **Glycosides:** It is known to help reduce inflammation, improve digestion, and boost the immune system. It can also help to reduce cholesterol levels, improve blood sugar levels, and reduce the risk of certain types of cancer.
- **Saponins:** Saponins decrease blood lipids, lower cancer risks, and lower blood glucose response.
- **Flavonoids:** They show anti-cancer, antioxidant, anti-inflammatory and anti-viral properties
- **Terpenoids:** They have anticancer, antioxidant, antiviral, and anti-atherosclerotic activities.
- **Carotenoids:** A very good antioxidant, anti-inflammatory, anti-cancer, provides good vision, strong immunity, mucous membrane
- **Vitamins & Minerals:** Vit B complex, Vit A, Vit C, Fe, Cu, S, K, Ca, Mg, P, Na, Cl & much more.

Bitter taste receptor theory as per Modern texts

Taste perception starts right from the tongue. Tongue has approximately 2000-10,000 taste buds. Among them, Bitter taste receptors, also known as type 2 taste receptors (TAS2Rs or T2Rs), are G protein-coupled receptors (GPCRs) that detect bitter, potentially harmful substances. They are also found in places apart from the tongue. They are also found in several extra-oral systems including the intestine, airways, urinary tract, vascular smooth muscle, nervous system, thyroid gland and airway smooth muscle.**[14]**

1) Respiratory tract: Bitter compounds increase the cilia beat frequency in airway epithelium which prevents the pathogen colonisation by increasing the mucociliary clearance. It also relaxes the pre-contracted smooth muscle airway.**[15]**

2) Gastrointestinal tract: Bitter compounds have been known to modulate gastrointestinal motility by delaying gastric emptying and increase satiety.**[16]**

3) Cardiovascular system: It has been shown to modulate cardiac contractibility and vascular tone. It also shows potential in sensing danger signals.**[17]**

4) Others: They are also involved in various parts of brain, bladder, reproductive system

Bitter taste in disease prevention

1) Type 2 DM: The aetiopathology of type 2 diabetes mellitus (T2DM) is characterized by insulin resistance and initial hyperinsulinemia, followed by a gradual decline in ability of pancreatic beta cells to produce insulin. In addition, incretin dysregulation, lipolysis, hyperinsulinemia, increased renal glucose reabsorption and central appetite regulation play a central role in pathophysiology of Type 2 DM. Incretin secretion is released after ingestion and regulates glucose homeostasis. Mammalian TAS2R and sensitizing molecules are expressed in intestinal mucosa and mobilize intestinal TAS2R to stimulate secretion of GLP-1 and even gut hormones by intestinal endocrine cells. GLP-1 is an important candidate for development of anti-diabetic drugs that regulate blood glucose levels by various mechanisms, including modulation of insulin production. GLP-1 and its receptor in beta and delta cells of pancreas (GLP-1R) interact to stimulate biosynthesis and release of insulin and somatostatin, respectively, thereby lowering blood glucose levels.**[18]**

2) Obesity: Obesity, which now affects around 1/3 of the world's population, is gradually being recognised as a global health problem. It is thought to be associated with altered gene expression in the taste buds. TAS2R in gastrointestinal endocrine cells controls appetite secretion and regulates gut hormones that affect hunger and food intake. It has shown to have inhibitory effect on Ghrelin secretion, regulate gastrointestinal motility, induces delayed gastric emptying, inducing satiety. The presence of bitter taste receptors in the gastrointestinal tract may facilitate weight control in obese patients and may serve as novel receptors that alter hunger signaling in humans.

3) Hyperlipidemia: Bitter compounds reduced the proliferation and differentiation of preadipocytes, while both overexpression and knockdown of TAS2R reduced up to accumulation in adipocytes and decreased the expression of adipogenic genes. This shows potential role of bitter compounds in regulating lipid levels.

4) Cancer: Bitter compounds counteracts most typical capabilities of cancerous cells during cancer development and progression.

By regulating growth suppression, deregulating cellular energetics and apoptosis as well as promoting invading and metastatic capabilities.**[19]**

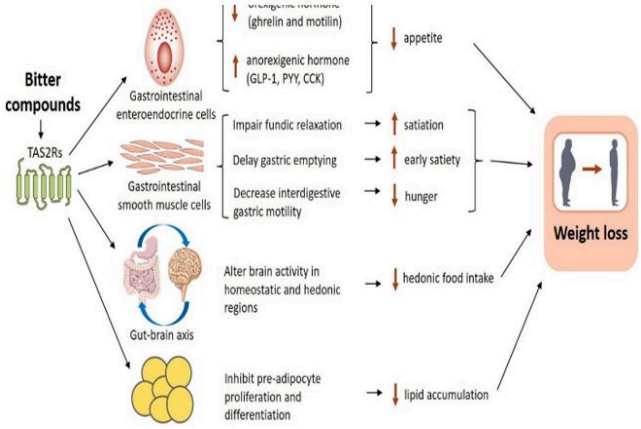

Figure 2: Action of Bitter Compounds

Figure 3: Bitter compounds in Cancer

Discussion

Tikta Aahar Dravyas contain many phytochemicals such as allkaloids, saponins, phenols, glycosides, flavonoids which have been proven to have Anti-diabetic, Anti-cancer, Anti-dyslipidemic, Anti inflammatory effects. These effects would prove to be beneficial in patients with lifestyle disorders as a curative measure. Proper medications followed with exercise and diet comprising of *Tikta* Shaka Varga vegetables may help in loosing weight sustainably, managing sugar, cholesterol levels naturally. *Tikta* shaka varga vegetables must be consumed in adequate quantity and never consumed raw.

They must be cooked and dressed with hingu, saindhav and maricha in order to reap maximum benefits and to pertain to all types of Prakriti patients. *Tikta Aahar Dravyas* also have many essential phytonutrients like Vit B complex, Vit A, Vit C, Fe, Cu, S, K, Ca, Mg, P, Na, Cl etc. They're a rich vegetarian source of all beneficial Vitamins and Minerals. *Tikta Ahar Dravyas* can also be consumed as a prevention, to be disease free in the longer run.

Out of all six *Rasas Tikta Rasa* is considered best for *Agni Deepana*. It does *Pachana* of *Ama*. It has the potential to digest metabolic wastes which have been accumulated for years (*Visha Roopa*) by its *Vishaghna* quality. It does *Lekhana*, *Rukshana* and removes excess *Kleda* which is beneficial in *Sthaulya, Kaphaj Vyadhis, Prameha* etc.

It does *Shodhana* of *Doshas* inside the body. It is *Rasa-Rakta Prasadak.* In *Santarpanjanya Vyadhis, Rasavaha* and *Annavaha Srotas* are involved first; *Tikta Rasa* works on both. *Tikta Shaaka Dravyas* holds potential to prevent and cure lifestyle disorders when used properly in our diet.

Diabetes	Kushmandi, Kushmandi Bheda, Katu Tumbi, Chichind, Karvellak, Raja Koshataki, Patola, Bimbi, Shigru, Tanduliya, Vruntak Phala
Dyslipidemia	Kushmandi Bheda, Karvellak, Raja Koshataki, Patola, Bimbi, Grunjan, Vruntak Pala, Varahikanda, Kemuka
Cancer	Katu Tumbi, Karvellak, Raja Koshataki, Tanduliya, Grunjan, Vruntak Phala, Kemuka
Cardiac Disorders	Kushmandi Bheda, Shigru, Pattashak
Hypertension	Kushmandi, Kushmandi Bheda, Patola, Raja Koshataki
Alzeihmers/Dementia	Karvellak

Conclusion

Considering various activities of *Tikta Rasa* viz. *Deepana*, *Pachana*, *Rukshana*, *Lekhana*, *Vishaghna*, *Krumighna* it is observed that it is highly beneficial as preventive as well as curative in Lifestyle disorders. Evidence based scientific researches have also proven its efficacy and effectiveness in Diabetes, Obesity, Hyper Cholesterolremia, Cardiac diseases, Cancers etc. As *Tikta Rasa Aahar Dravyas* are being neglected in our diet nowadays, if we include it in our daily diet with delicious recipes as described in our classical scriptures, it can successfully be used as a sustained intervention of lifestyle disorders.

References

1. Batool M, Ranjha MMAN, Roobab U, Manzoor MF, Farooq U, Nadeem HR, et al. Nutritional value, phytochemical potential, and therapeutic benefits of pumpkin (Cucurbita sp.). Plants (Basel). *2022 May 24;11(11):1394. doi: 10.3390/plants11111394. PMID: 35684166; PMCID: PMC9182978 [Crossref] [PubMed][Google Scholar]*

2. Sharma D, Sharma A, Chand T, Khardiya M. Antidiabetic and antihyperlipidemic activity of Cucurbita maxima Duchense (pumpkin) seeds on streptozotocin-induced diabetic rats. J Pharmacogn Phytochem. 2013;1:108–16. *[Crossref][PubMed] [Google Scholar]*

3. Prajapati RP, Kalariya M, Parmar SK, Sheth NR. Phytochemical and pharmacological review of Lagenaria siceraria. J Ayurveda Integr Med. 2010 Oct;1(4):266–72. *doi: 10.4103/0975-9476.74431. PMID: 21731373; PMCID: PMC3117318 [Crossref] [PubMed][Google Scholar]*

4. Kirana H, Srinivasan BP. Trichosanthes cucumerina Linn. improves glucose tolerance and tissue glycogen in non-insulin dependent diabetes mellitus induced rats. Indian J Pharmacol. *2008 Jun;40(3):103–6. doi: 10.4103/0253-7613.42301. PMID: 20040935; PMCID: PMC2792599 [Crossref] [PubMed][Google Scholar]*

5. Bortolotti M, Mercatelli D, Polito L. Momordica charantia, a nutraceutical approach for inflammatory related diseases. Front Pharmacol. 2019 May 8;10:486. *doi: 10.3389/fphar.2019.00486. PMID: 31139079; PMCID: PMC6517695 [Crossref][PubMed][Google Scholar]*

6. Shendge PN, Belemkar S. Therapeutic potential of Luffa acutangula: A review on its traditional uses, phytochemistry, pharmacology and toxicological aspects. Front Pharmacol. 2018 Oct 22;9:1177. *doi: 10.3389/fphar.2018.01177. PMID: 30459601; PMCID: PMC6232903 [Crossref][PubMed][Google Scholar]*

7. Kumar N, Singh S, Manvi, Gupta R. Trichosanthes dioica Roxb. : An overview. Pharmacogn Rev. *2012 Jan;6(11):61–7. doi: 10.4103/0973-7847.95886. PMID: 22654406; PMCID: PMC3358970 [Crossref] [PubMed][Google Scholar]*

8. Singh M, Alok DS, Jain S, Verma A, Mahor A. Morphology, pharmacological activity, pharmaceutical preparation, doses and side effects of Coccinia indica (Wight & Arn): An overview. Asian Pac J Trop Dis. 2013;1:10. *12980/JCLM.1.20133D55 [Crossref][PubMed][Google Scholar]*

9. Pareek A, Pant M, Gupta MM, Kashania P, Ratan Y, Jain V, et al. Moringa oleifera: An updated comprehensive review of its pharmacological activities, ethnomedicinal, phytopharmaceutical formulation, clinical, phytochemical, and toxicological aspects. Int J Mol Sci. 2023 Jan 20;24(3):2098. *doi: 10.3390/ijms24032098. PMID: 36768420; PMCID: PMC9916933 [Crossref] [PubMed][Google Scholar]*

10. Al-Snafi AE. The chemical constituents and pharmacological effects of Chenopodium album – an overview. Int J Pharmacol Screen Methods. 2015;5:10–7. *[Crossref][PubMed][Google Scholar]*

11. Pal V, Singh O, Singh B, Ahmad A. Pharmacognostical studies of Amaranthus spinosus Linn. UK J Pharm Biosci. 2013;1:32. *doi: 10.20510/ukjpb/1/i1/91112 [Crossref][PubMed] [Google Scholar]*

12. Ahmad T, Cawood M, Iqbal Q, Ariño A, Batool A, Tariq RMS, et al. Phytochemicals in Daucus carota and their health benefits – review article. Foods. 2019 Sep 19;8(9):424. *doi: 10.3390/foods8090424. PMID: 31546950; PMCID: PMC6770766 [Crossref][PubMed][Google Scholar]*

13. Kartika E, et al. Phytochemical and pharmacological review of carrot (Daucus carota L.). Int J Pharm Sci Med. *2021 Jan;6(1):75–82 [Crossref][PubMed][Google Scholar]*

14. Lu P, Zhang CH, Lifshitz LM, ZhuGe R. Extraoral bitter taste receptors in health and disease. J Gen Physiol. 2017 Feb;149(2):181–97. *doi: 10.1085/jgp.201611637. PMID: 28053191; PMCID: PMC5299619 [Crossref][PubMed][Google Scholar]*

15. Deshpande DA, Wang WC, McIlmoyle EL, Robinett KS, Schillinger RM, An SS, et al. Bitter taste receptors on airway smooth muscle bronchodilate by localized calcium signaling and reverse obstruction. Nat Med. 2010 Nov;16(11):1299–304. *[Crossref][PubMed][Google Scholar]*

16. Avau B, Rotondo A, Thijs T, Andrews CN, Janssen P, Tack J, et al. Targeting extra-oral bitter taste receptors modulates gastrointestinal motility with effects on satiation. Sci Rep. 2015 Nov 6;5:15985. *doi: 10.1038/srep15985. PMID: 26541810; PMCID: PMC4635351 [Crossref] [PubMed][Google Scholar]*

17. Bloxham CJ, Foster SR, Thomas WG. A bitter taste in your heart. Front Physiol. 2020 May 8;11:431. *doi: 10.3389/fphys.2020.00431. PMID: 32457649; PMCID: PMC7225360 [Crossref] [PubMed][Google Scholar]*

18. Yu X, Zhen Y, Fang T, Zhang J, Xu Y, Wu F, et al. Advances in the study of the role of extraoral bitter taste receptors. Authorea Preprints. 2023. *doi: 10.22541/au.168431413.33194743/v1 [Crossref] [PubMed][Google Scholar]*

19. Zehentner S, Reiner AT, Grimm C, Somoza V. The role of bitter taste receptors in cancer: A systematic review. Cancers (Basel). 2021 Nov 23;13(23):5891. *doi: 10.3390/cancers13235891. PMID: 34885005; PMCID: PMC8656863 [Crossref] [PubMed][Google Scholar]*