

REVIEW ARTICLE

A Review on Aging Population and Their Problems and How Traditional Approaches Can Give Support to Overcome These Problems

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ABSTRACT

Ayurveda has served humanity since ancient times through natural therapeutic approaches. With increasing health awareness, there is a growing preference for naturally derived products over synthetic compounds, which may produce harmful side effects. In this context, plant-based *Ayurvedic* preparations have gained importance as safer and biodegradable alternatives for the prevention and treatment of various human and plant diseases. Medicinal plants have long been valued for their diverse bioactive constituents and therapeutic potential. Naturally occurring phytochemicals are widely used in the traditional Indian medicinal system of *Ayurveda* for the treatment of a variety of diseases. Some of the plant products have shown remarkable anti-tumor properties against various human cancers. However, the detailed mechanisms of action of these phytochemicals at the cellular and molecular level have not been fully elucidated. *Triphala* is a traditional *Ayurvedic* herbal formulation composed of the fruits of *Terminalia chebula*, *Embolica officinalis*, and *Terminalia bellirica* mixed in equal proportions. It is an important medicine of the “*Rasayana*” group and is believed to promote health, immunity, and longevity. This formulation, rich in antioxidants, is a frequently used *Ayurvedic* medicine to treat many diseases, such as anemia, jaundice, constipation, asthma, fever, and chronic ulcers. Most people practicing *Ayurvedic* medicine consume *Triphala* as a “health tonic.” Recent studies have reported anti-clastogenic and anti-tumor properties of *E. officinalis* and the anti-proliferative effect of *T. chebula*. *Triphala Rasayana* is an *Ayurvedic* formulation described in *Charaka Samhita* and is known for its *Rasayana* (rejuvenative) effects. Four types of *Triphala Rasayana* are mentioned in the text. Similar descriptions of *Triphala Rasayana* are also found in *Vagbhat* and *Bhavaprakasha*. In the present study, *Triphala churna* was subjected to phytochemical investigation using high-resolution mass spectrometry (HRMS) following *Soxhlet* extraction with a water–ethanol solvent system. The obtained HRMS data were analyzed to identify the major phytoconstituents present in the extract. Subsequently, the identified compounds were screened and validated using the Indian Medicinal Plants, Phytochemistry and Therapeutics Database database (<https://cb.imsc.res.in/imppat/>) to confirm their phytochemical occurrence and therapeutic relevance. Based on the identified bioactive constituents, an *in silico* study was designed to evaluate their potential anticancer activity against cancer-associated molecular targets.

1. INTRODUCTION

In India, the population of older persons in the past 50 years of the 20th century increased from 19.6 million to 77.6 million in 2000. In

the next 50 years, the population of older persons is expected to go up to 324 million. *Rasayana* rejuvenation therapy is very useful for maintenance of positive health and prevention of diseases.^[1] As this therapy invigorates *Ojasca*, a healthy person, *Rasayana* therapy delays the process of decaying biological factors enumerated decades-wise, by improving the health of individuals.^[2] Scientists are evincing great interest in screening classical *Rasayana* drugs for their antioxidant activity, and a good number of plants show significant

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evidence. *Triphala* has been found to be an excellent scavenger of hydroxyl radicals and nitric oxide radicals, and *gallic acid*, which shows *anticancerous* properties, *fumaric acid*, *chebulic acid*, *chebulenilic acid*, *chebulagic acid*, or ascorbic acid. And ascorbic acid, whose excessive formation is implicated in oxidative stress.^[3]

1.1. Aims and Objectives

- To evaluate and validate the *Ayurvedic* principle of *Triphala Rasayana* with rational evidence based on biochemical and biophysical parameters
- Analytical study of different samples in extract forms and its constituents present in all four types of *Triphala Rasayana*
- To study the literature review regarding the therapeutic effect of constituents present in all 4 types of *Triphala Rasayana*.

2. MATERIALS AND METHODS

- The fruits of *Triphala* (mixture of three herbs in suitable proportion) and its constituent plants, namely, *Amalaki* (*Emblica officinalis*), *Bibhitaki* (*Terminalia bellerica*) and *Haritaki* (*Terminalia chebula*) will be taken and crushed to get their powder form
- The powdered *Triphala* and its constituents will be dissolved in different solvents, namely, distilled water and alcohol, to get their aqueous extracts and alcoholic extracts, respectively, using the Soxhlet method
- The aqueous extracts and alcoholic extracts will be analyzed through high-resolution mass spectrometry (HRMS), Infrared spectroscopy, and other analytical methods to confirm the presence of value-added chemical ingredients.

3. CLINICAL VIEWS

3.1. Concept of Rasayana

The word *Rasayana* (*rasa* + *ayana*) refers to nutrition and its transportation in the body. The *rasayana* therapy enhances the qualities of *rasa*, enriches it with nutrients so one can attain longevity, memory, intelligence, freedom from disorder, youthfulness, excellence of luster, complexion and voice, optimum development of physique and sense organs, mastery over phonetics and brilliance. Taking *Rasayana* is helpful to increase the immunity of the person to keep him away from disease. The concept of *Rasayana* interested us as the claims for this form of therapy are far-reaching. In the words of *Charaka*, “one obtains longevity, regains youth, gets a sharp memory and intellect and freedom from diseases, gets a lustrous complexion and strength of a horse.”^[4]

3.2. Triphala Rasayana- Views of Caraka Samhita

Caraka Samhita, the most authoritative textbook of *Ayurveda*, in different contexts described *Triphala* as a remedy of good number of diseases, more particularly in the context of *Rasayana*. *Caraka Samhita* has described *Triphala* and its variable combinations having *Rasayana* effect, and it more clearly discusses three combinations of *Triphala* as follows in the chapter dealing with *Rasayana* as *Triphala Rasayana*.^[5]

3.3. Triphala Rasayana^[5]

One *haritaki* after digestion, two *bibhitaki* before a meal, and four *amalaki* after a meal should be taken with honey and ghee for a year. This *triphalā rasayana* helps a person live for 100 years free from senility and disease.

3.4. Triphala Rasayana: 2^[6]

A new iron plate should be pasted with the paste of *triphalā*. After 24 h, this paste should be collected and dissolved in honey water and consumed. After the medicine is digested, one should take a meal with plenty of fat. By observing this procedure for a year, one lives 100 years free from senility and illness.

3.5. Triphala Rasayana: 3^[7]

Triphala mixed with *madhuka*, *tugaksheeri*, *pippali* along with honey and ghee, or *triphalā* with sugar is an effective *Rasayana*.

3.6. Triphala Rasayana: 4^[8]

Triphala, along with all six metals, including gold, *vacha* or with *vidanga*, and *pippali* or with *lavana*, taken with honey and ghee for a year, promotes intellect, memory and strength, longevity and excellence, and relieves senility and diseases.

Indian people are saying that “Don’t have a mother to take care of you? As long as you take *Triphala* everyday, don’t worry, everything will be fine.”

4. MATERIALS AND METHODS

The basic aim of the study is to only correlate the significance of principles of *Samhitās* and to study its efficacy over certain generalized conditions which can be studied and observed with the help of modern scientific parameters. As per planning after review of literature, experiments have been designed and proposed to be carried out.

4.1. Method of Preparation of Triphalā Rasāyana as Described in Caraka Samhitā

The three myrobalans (which were powdered and collected earlier) each weighed 33.3 g by weighing machine and were mixed thoroughly in *Kharala* till homogeneous powder not prepared. Hence, now 100 g *Triphalā* powder is prepared right now. This *Triphalā* powder is sieved through clothes in a special manner as mentioned in *Āyurvedic* classics to prepare fine powder. The process of sieving is called as *Kapadacchana*.

5. OBSERVATION AND RESULTS

5.1. HRMS Study of Triphala Extracts

The data collected from this analytical study were systematically organized and analyzed using appropriate methods. The results are presented in both tabular and graphical formats presents below. The phytochemical profiling of *Triphala* extract was carried out through an extensive review of previously published literature. 1–5 *Triphala* is a well-known polyherbal *Ayurvedic* formulation composed of the dried fruits of *T. chebula*, *Terminalia bellirica*, and *E. officinalis* in equal proportions.^[9-12] Literature reports, observation, and results revealed the presence of numerous bioactive phytoconstituents belonging to different chemical classes, such as tannins, flavonoids, phenolic acids, glycosides, triterpenoids, and alkaloids. These phytochemicals are responsible for the diverse pharmacological properties of *Triphala*, including antioxidant, anti-inflammatory, anticancer, antimicrobial, immunomodulatory, and anti-aging activities [Table 1].^[12-19]

HRMS study of the sample shows a large number of metabolites availability. Apply scientific tools above selective metabolites or phytoconstituents present above, a comprehensive list of major

phytochemicals present in *Triphala* extract was prepared. Subsequently, these identified compounds were screened in the Indian Medicinal Plants, Phytochemistry and Therapeutics Database for retrieval of their structural and pharmacological information. The compounds possessing suitable molecular structures, biological relevance, and docking compatibility were selected for molecular docking studies against the target protein [Figures 3-10].

The selected phytoconstituents were subsequently utilized for molecular docking studies to evaluate their binding affinity and molecular interactions with the selected target protein. The docking-based screening approach helped in identifying potential lead compounds from *Triphala* that may contribute to its pharmacological and therapeutic activities.

The phytochemicals identified through liquid chromatography–mass spectrometry (LC-MS) analysis were subsequently subjected to molecular docking studies against the crystal structure of the BRCA1-associated RING domain protein to evaluate their potential anticancer activity against breast cancer. The selected receptor protein plays a crucial role in DNA repair mechanisms, cell cycle regulation, and breast cancer progression.^[20] Molecular docking analysis was performed to investigate the binding affinity and interaction pattern of the identified phytoconstituents within the active site of the receptor protein.

The docking results demonstrated that the screened phytochemicals exhibited varying degrees of binding affinity toward the target protein.^[2] The detailed molecular docking outcomes, including docking scores and important intermolecular interactions, such as hydrogen bonding, π – π stacking, and salt bridge formation, are summarized in Table 2.

Among all the screened compounds, 11,12-dihydroxy arachidic acid exhibited the strongest binding affinity toward the BRCA1-associated RING domain protein with the most favorable docking score. Detailed interaction analysis revealed that amino acid residues, including PHE, GLU, LYS, and GLY actively participated in hydrogen bond interactions with the ligand. In addition, the LYS residue was involved in the formation of a stabilizing salt bridge interaction, which significantly contributed to enhanced ligand–protein stability within the active binding pocket. The presence of multiple hydrogen bonding interactions together with electrostatic stabilization suggested a strong and stable receptor–ligand complex.

Furthermore, compounds, such as 4-methoxycinnamic acid, hydrocinnamic acid, and gallic acid also demonstrated considerable binding affinities against the breast cancer receptor, with docking scores of –4.679, –4.644, and –4.319 kcal/mol, respectively. Interaction profiling of these complexes indicated the participation of several crucial amino acid residues, including ASN, LYS, GLY, HIS, and SER in hydrogen bond formation. In addition, LYS residues contributed to stabilizing salt bridge interactions in these ligand–protein complexes. These findings indicate favorable ligand accommodation and stable molecular interactions within the receptor active site.

The observed intermolecular interactions suggest that the identified phytoconstituents possess significant binding potential toward the BRCA1-associated receptor protein, which may contribute to their possible anticancer activity. Hydrogen bonding interactions play an important role in maintaining ligand orientation and specificity within the active site, while hydrophobic interactions and salt bridge formation further enhance the structural stability of the docked complexes. The presence of aromatic and hydroxyl functional groups in the phytochemicals may also facilitate stronger molecular recognition

and receptor binding. Figure 11 illustrates the two-dimensional (2D) interaction profiles of the ligand–protein complexes, highlighting the major amino acid residues involved in hydrogen bonding, hydrophobic interactions, and salt bridge formation. These interaction maps provide detailed insight into the molecular recognition pattern between the phytochemicals and the receptor protein.

In addition, Figure 12 presents the three-dimensional (3D) conformations of the top four docked ligand–protein complexes, demonstrating the orientation and accommodation of ligands within the active binding cavity of the receptor. The 3D interaction models further depict the spatial arrangement of the interacting amino acid residues and confirm the stability of the docked conformations.

Overall, the molecular docking analysis revealed that several LC-MS identified phytoconstituents of *Triphala* exhibited promising binding affinity against the BRCA1-associated RING domain protein (3FA2). Among them, 11,12-dihydroxy arachidic acid emerged as the most potent compound based on docking score and interaction stability. These findings suggest that *Triphala*-derived phytochemicals may serve as potential therapeutic candidates for cancer.

6. DISCUSSION

HRMS analysis of *Triphala Rasayana* clearly shows that it contains a good amount of lauh (iron), which is essential for *Praśasta rakta dhātu*. The method to follow the regimen of this preparation is very scientific.

It contains Ascorbic acid (vitamin C) in good quantity, which is essential and helpful in iron absorption and acts as an antioxidant.

American Dietetic Association study found that caste iron cookware can leach a significant amount of dietary iron into food. The amount of iron absorbed greatly depending on the food, its acidity, its water content, how long it was cooked, and how old the cookware was.

The study shows that *Triphalā* has an acidic pH, which enhances the leaching property.

Hence, we can say *Triphalā Rasāyana* has more potential than simple *Triphalā* to show the *Rasayana* property.

The researcher had performed the experiment for total phenol content by spectrophotometry and found that *Triphala Rasayana* has more amounts of phenolic compounds, gallic acid chebulic acid, ellagic acid, etc., and as we know that the phenolic compounds shows antioxidant properties. For detection of different compounds in *Triphala Rasayana*, researcher had accomplished the HPLC analysis for qualitative and quantitative study of phenolic compounds.^[21]

Gallic acid is a common phytoconstituent present in all three herbs used in *Triphalā* and is reported to possess hepato-protective and antioxidant activity.

Researcher has found in his experiments that *Triphala Rasayana* contains a large amount of phenolic compounds, which act as antioxidants. On the basis of this we can say that *Triphala Rasayana* through antioxidant activity prevents many serious diseases, aging process, age related disease.^[22]

How these *Rasayana* alleviate the disease, on this basis, it may be said that these promotive drugs, because of bringing back the equilibrium of *dhātus*, pacify the disorders. These *Rasayana* drugs balance the vitiated *dosa*, so by this action it may alleviate the disease.

In this study, it is found that *Triphalā Rasāyana* has antioxidant and anticancer properties, which may be correlated with the *roghanuta* property of *Rasayana*. *Triphalā Rasāyana* contains phenolic compounds, and these phenolic compounds have antioxidant properties; hence, this indicates its *Rasāyana* property.

7. CONCLUSION

In this section, after going through all the literature and observations made, the following conclusion may be drawn; in present scenario, concept of *Rasayana* requires more discussion and researches. After scanning the literature, we have found that the principles of *Rasāyana* are equally applicable for prevention of diseases and their cure, as well as promotion of total health of the individual. As per *Sārīngadhar* and *Madanpāla nighantu*, one *Haritaki*, two *Vibhītakī*, and four *Āmalakī* (parts by weight) are called *Triphala*, while as per *Bhāvaprakāśa* and P.V. Sharma, all three ingredients taken in equal amounts by weight (only dried pericarp of the myrobalans) will be called as *Triphalā*. As per the *Ayurvedic* formulary of India, it is prepared by combining a 1:1:1 mixing of ground dry fruits, called as myrobalans.

The measurement here is to be understood by enumeration. This is because standard myrobalans (ripened and just dried ones) have a difference in weight; that is, one chebulic myrobalan (*Harītakī*) weighs equally with two beleric myrobalans (*Vibhītakī*), and this is equal to the weight of four emblic myrobalans (*Āmalakī*). This also means that they have to be taken in equal quantities by weight, which is not contrary to the above statement.

Rasayana therapy of the Indian system of medicine is a very comprehensive discipline based on an in-depth philosophy and sound scientific footings, which is more suited to the modern society of today and the medical needs of the time, which is confronted with the newer challenges of disease caused by stress, strain and premature ageing. *Triphalā Rasāyana* is a very important preparation among the treasure of *Ayurveda*.

Analytic study shows it contains gallic acid, and ascorbic acid, which helps in iron absorption. The preparation is advised to be taken with honey (as *Anupāna*), which acts as a vehicle to incorporate it into the body.

Triphalā Rasāyana also contains many other essential minerals which are very beneficial for the maintenance of cellular health. *Triphalā* itself has *Rasayana* property, but when the complete *Triphala Rasayana* regimen is followed accurately as described in classics, its efficacy as *Rasayana* boosts up. The above all steps help in iron metabolism, which is a positive step in the attainment of *prasasta rakta dhātu*. Ultimately, this study fulfils the definition of *Rasayana* as we know “LĀBHOPĀYO HI SASTĀNĀM RASĀDINĀM RASĀYANAM.”

As per *Ayurvedic* principles, *Triphalā* has *tridoṣa śāmaka guṇa*, and it has five rasas out of six. It only lacks lavaṇa rasa. *Triphalā* has been used in *Ayurveda* since time immemorial, and this is being called as *Mahaphalā*. One of its contents is *Āmalakī*, which has been told as the best among *VAYAHSTHAPANA DRAVYA*. *Harītakī*, which is also a part of *Triphalā*, has *śodhan* property in spite of its *Rasāyana* guṇa. *Sodhana* karma is necessary before shifting to the main *Rasayana* course, which potentiates its action. *Harītakī* is also being used in many religious rituals, which show its utility at a broader level. *Vibhītakī* has *rogaghna guṇa* as described in the text. Hence, we may draw conclusion that all the three contents of *Triphalā* collectively are having positive synergistic effect which is a great gift of *Ayurveda* to society.

During the HRMS study, it was found that the phytochemical constituents of *Triphala* extract were successfully identified through LC–MS analysis and subsequently evaluated through molecular docking studies against the BRCA1-associated RING domain protein, an important molecular target associated with breast cancer progression and development. The phytochemical profiling revealed the presence of several biologically active compounds belonging to diverse chemical classes, such as phenolic acids, flavonoids, tannins, and fatty acid derivatives. These compounds are known for their significant pharmacological properties, particularly antioxidant, anti-inflammatory, and anticancer activities.

The molecular docking investigation demonstrated that several identified phytochemicals exhibited favorable binding interactions with the active site residues of the receptor protein. Among the screened compounds, 11,12-dihydroxy arachidic acid showed the strongest binding affinity, indicating its potential as a promising lead molecule against the breast cancer-associated target. Important intermolecular interactions, including hydrogen bonding and salt bridge formation, contributed significantly to ligand stabilization within the receptor binding pocket. Other phytochemicals, such as 4-methoxycinnamic acid, hydrocinnamic acid, and gallic acid, also exhibited considerable docking affinity and stable interaction profiles with key amino acid residues.

The overall findings of this study suggest that *Triphala*-derived phytoconstituents possess promising inhibitory potential against breast cancer-related molecular targets. The integration of LC-MS-based phytochemical identification with computational molecular docking provided a scientific approach for screening potential bioactive compounds from traditional *Ayurvedic* formulations. Thus, the study supports the therapeutic relevance of *Triphala* as a valuable natural source of anticancer phytomolecules and highlights its potential role in the development of plant-based therapeutic agents for breast cancer management.

The antioxidant property of Ascorbic acid and Gallic acid is well established by most of the research works. Its presence in sample drugs confirms their antioxidant property. Hence, the antioxidant property of this preparation is also well established and substantiated as *ūrjaskara, praśasta dhātu prāpti*.

Triphalā and *Triphala Rasayana* both contain phenolic group of compounds, which are definitely considered as having antioxidant properties. Hence, we conclude that the concepts, principles and methods described in *Samhitā* have sound footing, reasoning and logic as proved with experimental evidence.

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All authors gave equal contribution to the preparation of this manuscript.

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11. ETHICAL STATEMENT

Ethical approval was not required for this study as it is a review article.

12. CONFLICT OF INTERESTS

The authors declare no conflicts of interest regarding the publication of this paper.

13. DATA AVAILABILITY STATEMENT

The data analyzed in this review were obtained from publicly available sources, including peer-reviewed articles, observational studies, and surveys accessible through databases.

14. DISCLAIMER/VIEW AND OPINIONS

The opinions expressed in this article are solely those of the authors and do not reflect the views of the International Research Journal of Ayurveda and Yoga or its editorial board.

15. AI-USE DECLARATION

The authors declare that no generative AI tools were used to create scientific content, interpret data, or draft any sections of this manuscript. AI-based tools were used solely for minor language and grammar refinements to improve clarity and readability. All scientific content, analysis, and conclusions remain the sole responsibility of the author.

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REFERENCES

- Khan S, Balick MJ. Therapeutic plants of ayurveda: A review of selected clinical and other studies for 166 species. *J Altern Complement Med.* 2001;7:405-515.
- Sandhya T, Lathika KM, Pandey BN, Mishra KP. Potential of traditional ayurvedic formulation, Triphala, as a novel anticancer drug. *Cancer Lett.* 2006;231(2):206-14.
- Rege NN, Thatte UM, Dahanukar SA. Adaptogenic properties of six rasayana herbs used in ayurvedic medicine. *Phytother Res.* 1999;13:275-91.
- Datta C. Charaka samhita, revised by charaka and dridhabala. Sutra sthana, adhyaya 30, verse 28. Varanasi: Chaukhambha Surbharati Prakashan; 2019. p. 212-3.
- Datta C. Charaka samhita, revised by charaka and dridhabala. Sutra sthana, adhyaya 30, verse 24. Varanasi: Chaukhambha Surbharati Prakashan; 2019. p. 212-3.
- Datta C. Charaka samhita, revised by charaka and dridhabala. Sutra sthana, adhyaya 16, verse 27-28. Varanasi: Chaukhambha Surbharati Prakashan; 2019. p. 125-9.
- Datta C. Charaka samhita, revised by charaka and dridhabala. Sharir sthana, adhyaya 1/58. Varanasi: Chaukhambha Surbharati Prakashan; 2019. p. 412-3.
- Datta C. Charaka samhita, revised by charaka and dridhabala. Chikitsa sthana, adhyaya 1-1/81. Varanasi: Chaukhambha Surbharati Prakashan; 2019. p. 324-6.
- Akter R, Khan SS, Kabir MT, Halder S. GC-MS-employed phytochemical characterization, synergistic antioxidant, and cytotoxic potential of Triphala methanol extract at non-equivalent ratios of its constituents. *Saudi J Biol Sci.* 2022;29(6):103287.
- Chulet R, Pradhan P. A review on rasayana. *Pharmacogn Rev.* 2009;3:229-34.
- Shekhar C, Reddy KR, Bansal K. Triphala described as an antidiabetic agent in Ayurveda treatises: A review. *Asian J Pharm.* 2017;11(4):S685.
- Vani T, Rajani M, Sarkar S, Shishoo CJ. Antioxidant properties of the ayurvedic formulation Triphala and its constituents. *Int J Pharmacogn.* 1997;35(5):313-7.
- Gupta R, Gupta A, Singh RL. Hepatoprotective activities of Triphala and its constituents. *Int J Pharma Res Rev.* 2015;4:34-55.
- Ingilela R, Patan A, Penabaka V, Yadala PC. A review on Triphala churna health benefits. *Int J Pharm Nat Med.* 2025;13(2):77-83.
- Bairwa VK, Kashyap AK, Meena P, Jain BP. Triphala's characteristics and potential therapeutic uses in modern health. *Int J Physiol Pathophysiol Pharmacol.* 2025;17(2):19-36.
- Peterson CT, Denniston K, Chopra D. Therapeutic uses of Triphala in ayurvedic medicine. *J Altern Complement Med.* 2017;23(8):607-14.
- Kumar NS, Nair AS, Nair AM, Murali M. Pharmacological and therapeutic effects of triphala-a literature review. *J Pharmacogn Phytochem.* 2016;5(3):23-7.
- Vigneshwaran S, Naveen C, Premkumar H, Aswini R, Priyanka M, Muthuvinayagam M, Rameshkumar P, Pillai MV, Hirad AH, Arunachalam S. Investigation of structural and electrochemical properties of triphala-ZnO nanocomposite synthesized via green methodology for supercapacitor applications. *Ionics* 2025;31(2):2123-35.
- Jagtap CY, Mishra AK, Nariya M, Shukla VJ, Prajapati PK. Product development and characterization of the ayurvedic herbo-mineral-metallic compound-Hridayarnava Rasa. *J Ayurveda Integr Med.* 2024;15(3):100886.
- Chandran U, Mehendale N, Tillu G, Patwardhan B. Network pharmacology of ayurveda formulation Triphala with special reference to anti-cancer property. *Comb Chem High Throughput Screen.* 2015;18(9):846-54.
- Sandhya T, Mishra KP. Cytotoxic response of breast cancer cell lines, MCF 7 and T 47 D to Triphala and its modification by antioxidants. *Cancer Lett.* 2006;238(2):304-13.
- Zhao Y, Wang M, Tsering J, Li H, Li S, Li Y, Liu Y, Hu X. An integrated study on the antitumor effect and mechanism of Triphala against gynecological cancers based on network pharmacological prediction and *in vitro* experimental validation. *Integr Cancer Ther.* 2018;17(3):894-901.

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Table 1: Phytoconstituents of *Triphala* extract identified through screening and presents after HRMS study below

Compound name	RT	Molecular formula	Molecular weight	Activity/structure
16-Hydroxyhexadecanoic acid	22.228	C ₁₆ H ₃₂ O ₃	271.2272	Pg No. 192 and 1771
1,6-Bis-O-(3,4,5-trihydroxybenzoyl) hexopyranose	1.269	C ₂₀ H ₂₀ O ₁₄	484.0841	167
2,5-Furandicarboxylic acid	9.154	C ₆ H ₄ O ₅	156.0052	140/144
2-Furoic acid	10.001	C ₅ H ₄ O ₃	112.0156	91
Chebulic acid	0.899	C ₁₄ H ₁₂ O ₁₁	356.0378	16/53
Ellagic acid	11.655	C ₁₄ H ₆ O ₈	302.0056	14/166
Gallic acid	1.121	C ₇ H ₆ O ₅	170.0213	6/44
Digallate/methyl gallate, Ethyl gallate	1.314	C ₁₄ H ₁₀ O ₉	322.0319	102
5-Hydroxymethyl-2-furaldehyde	10.03	C ₆ H ₆ O ₃	126.0313	4,123
D-(+)-Proline	0.96	C ₅ H ₉ NO ₂	115.063	64
2-Decene-4,6-dienoic acid, methyl ester, (E)-	18.303	C ₁₁ H ₁₂ O ₂	176.083	761
2- (1,3-Benzodioxol-5-yl) -5-hydroxy 6,8-dimethoxy-4H-1-benzopyran-4-one	16.31	C ₁₈ H ₁₄ O ₇	342.07308	149
Methyl [3-(2-methyl-1,3-dioxolan-2-yl) 4-oxo-2-azetidyl] acetate	1.07	C ₁₀ H ₁₅ NO ₅	229.09	178
9,10,13-trihydroxy-Octadecanoic acid	18.262	C ₁₈ H ₃₆ O ₅	332.2555	1554, 1900, 926
1,2-dihydroxyheptadec-16-yn-4-yl acetate	18.02	C ₁₉ H ₃₄ O ₄	326.2443	1135, 1985
9(Z),11(E),13(E)-Octadecatrienoic Acid methyl ester	25.257	C ₁₉ H ₃₂ O ₂	292.2391	1657, 1733
4-(4-Fluoro-2-methylphenyl)-8-methoxy-2,3-dihydro-1,5-benzothiazepine-2-carboxylic acid	14.705	C ₁₈ H ₁₆ FN ₂ O ₃ S	345.0842	1873, 1617
1-Aminocyclohexanecarboxylic acid	1.002	C ₇ H ₁₃ NO ₂	143.0941	645, 139
cis-12-Octadecenoic acid methyl ester	24.138	C ₁₉ H ₃₆ O ₂	296.2705	1610, 1671
(1S,4aR,6aS,6bR,10R,11R,12aR)-1,10,11-trihydroxy-9,9-bis (hydroxymethyl)-2,2,6a,6b, 12a-pentamethyl-1,2,3,4,4a, 5,6,6a, 6b, 7,8,8a, 9,10,11,12,12a, 12b, 13,14b-icosahydronicene-4a-carboxylic acid	15.222	C ₃₀ H ₄₈ O ₇	520.3378	1698, 1175, 948
7- {[3-Fluoro-5-(4-methoxytetrahydro-2H-pyran-4-yl)-4-methylphenyl] sulfanyl} -4-methyl-2H-1,4-benzoxazin-3 (4H)-one	15.566	C ₂₂ H ₂₄ FN ₂ O ₄ S	417.1417	1703
(1S,2R,5S)-5-(2,6-Diamino-9H-purin-9-yl)-4-fluoro-3-(hydroxymethyl)-3-cyclopentene-1,2-diol	17.941	C ₁₁ H ₁₃ FN ₆ O ₃	296.1041	1871, 1579
Linolenic acid ethyl ester	26.201	C ₂₀ H ₃₄ O ₂	306.2545	376, 1291, 1116, 74
Palmitoleic acid	23.709	C ₁₆ H ₃₀ O ₂	254.2236	1479
N-[1-(2-Furylmethyl)-2,4,6-trioxo-5-(trifluoromethyl)-2,3,4,5,6,7-hexahydro-1H-pyrrolo[2,3-d] pyrimidin-5-yl] acetamide	7.444	C ₁₄ H ₁₁ F ₃ N ₄ O ₅	372.0679	80, 1255
(1S,2R,5S)-5-(2,6-Diamino-9H-purin-9-yl)-4-fluoro-3-(hydroxymethyl)-3-cyclopentene-1,2-diol	17.941	C ₁₁ H ₁₃ FN ₆ O ₃	296.1041	1871, 1579
(1S_4S)-4-Hydroxy-3-oxocyclohexane-1-carboxylate	10.254	C ₇ H ₁₀ O ₄	158.0575	1023, 390, 345, 248
9-(5-O-Phosphonopentofuranosyl)-1,7,8,9-tetrahydro-6H-purin-6-one				437
2-Propenoic acid, 2-phenoxyethyl ester	15.75	C ₁₁ H ₁₂ O ₃	192.0783	1022
(1R,2S)-2-[(4-Fluoro-5,6-dimethoxy-1-benzothiophen-2-yl) carbonyl] cyclopropanecarboxylic acid	324.0469	C ₁₅ H ₁₃ FO ₃ S	324.0469	308
(2S,3S,4R)-3,4-Dihydroxy-N-(3 pentanyl)-5-[6-(3-pentanylamino)-9H purin-9-yl] tetrahydro-2 furancarboxamide	22.05	C ₂₀ H ₃₂ N ₆ O ₄	420.2503	1503
(2R)-5-hydroxy-7-methoxy-2-phenyl-3, 4-dihydro-2H-1-benzopyran-4- one	17.31	C ₁₆ H ₁₄ O ₄	270.08812	1574
N-[1-(4-Methoxy-2-oxo-2H-pyran-6-yl) 2-methylpropyl] acetamide 0.97 239.1147	0.97	C ₁₂ H ₁₇ NO ₄	239.1147	354
9-chloro-10-hydroxy-octadecanoic acid	23.34	C ₁₈ H ₃₅ ClO ₃	334.2266	1962
(5R)-5-{3-[3-(6-Methoxy-1,2 benzoxazol-3-yl)-2-oxo-6 (trifluoromethyl)-2,3-dihydro-1H benzimidazol-1-yl] phenyl}-5-methyl-1, 3-oxazolidine-2,4-dione	16.69	C ₂₆ H ₁₇ F ₃ N ₄ O ₆	538.11018	1655
16-Hydroxyhexadecanoic acid 4	22.23	C ₁₆ H ₃₂ O ₃		1771
5(Z),8(Z),11(Z)-Eicosatrienoic acid methyl ester	26.50	C ₂₁ H ₃₆ O ₂	320.27021	1865
cis-12-Octadecenoic acid methyl ester	24.14	C ₁₉ H ₃₆ O ₂	296.274	1610

(Contd...)

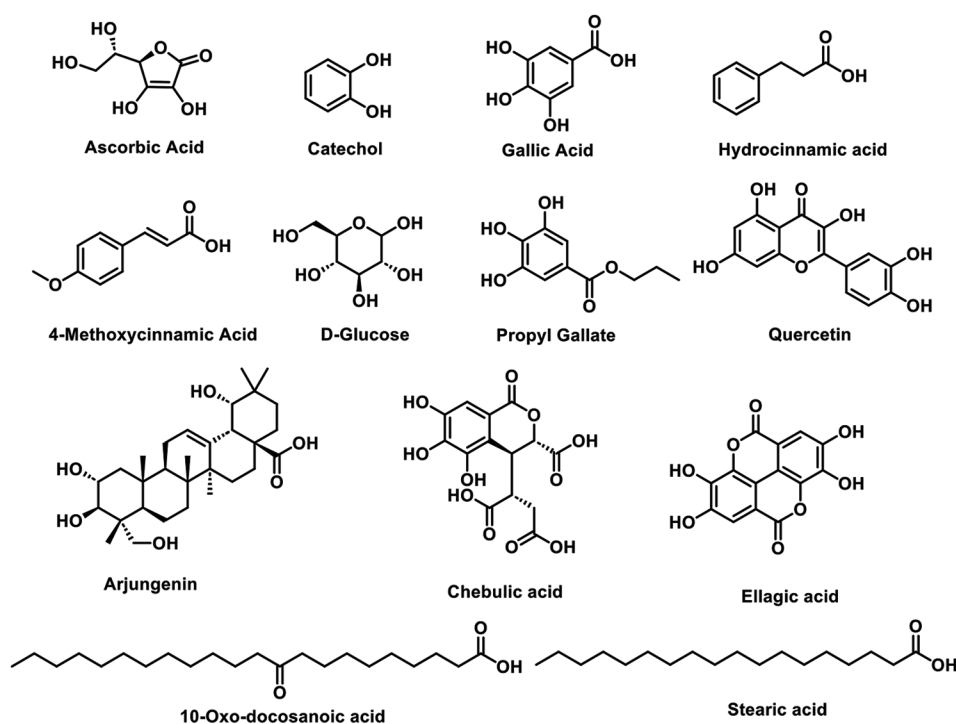
Table 1: (Continued)

Compound name	RT	Molecular formula	Molecular weight	Activity/structure
1-O-(1,3,23,24,25-Pentahydroxy-28 oxo-9,19-cyclolanostan-28 yl) hexopyranose	18.01	C ₃₆ H ₆₀ O ₁₂	684.40	1706
[8,9-Dihydroxy-4-(methoxycarbonyl) 2,6-dioxo-2,6-dihydro-4H-pyrano[3,4,5 de] chromen-3-yl] acetic acid	14.35	C ₁₅ H ₁₀ O ₁₀	350.025	372
Tetrahydrofurfuryl acrylate	16.15	C ₈ H ₁₂ O ₃	156.07794	1430

HRMS: High-resolution mass spectrometry

Table 2: Protein–Ligand docking score with interaction residues

Protein	Compound	PubChem CID	Docking score	Interaction residues		
				H-bond	π - π stacking	Salt-bridge
3FA2	11,12-Dihydroxy arachidic acid	5282932	−5.438	PHE-600, GLU-599, LYS-693, and GLY-576	-	LYS-619
	4-Methoxycinnamic Acid	699414	−4.679	ASN-690, LYS-619, and GLY-576	-	LYS-619
	Hydrocinnamic acid	107	−4.644	GLY-576	-	LYS-619
	Gallic Acid	370	−4.319	HIS-686 and SER-760	-	-
	Catechol	289	−3.757	HIE-685	-	-
	Ascorbic Acid	54670067	−3.264	CYS-743 and GLU-740	-	-
	10-Oxo-docosanoic acid	5312927	−2.750	LEU-618	-	-

**Figure 1:** Preparation of *Triphala* powder**Figure 2:** 2D structure of phytoconstituents of *triphala* utilized for molecular docking

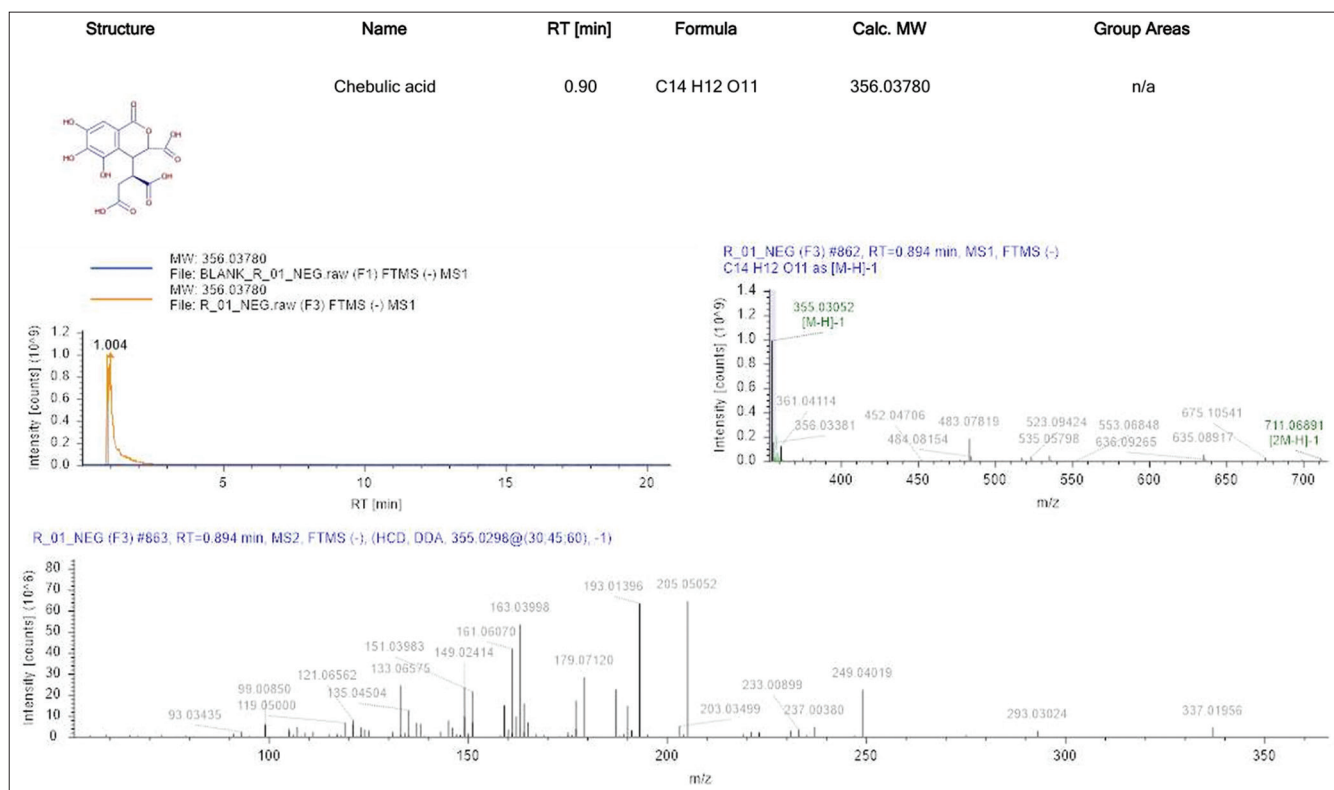


Figure 3: High-resolution mass spectrometry data of chebularic acid

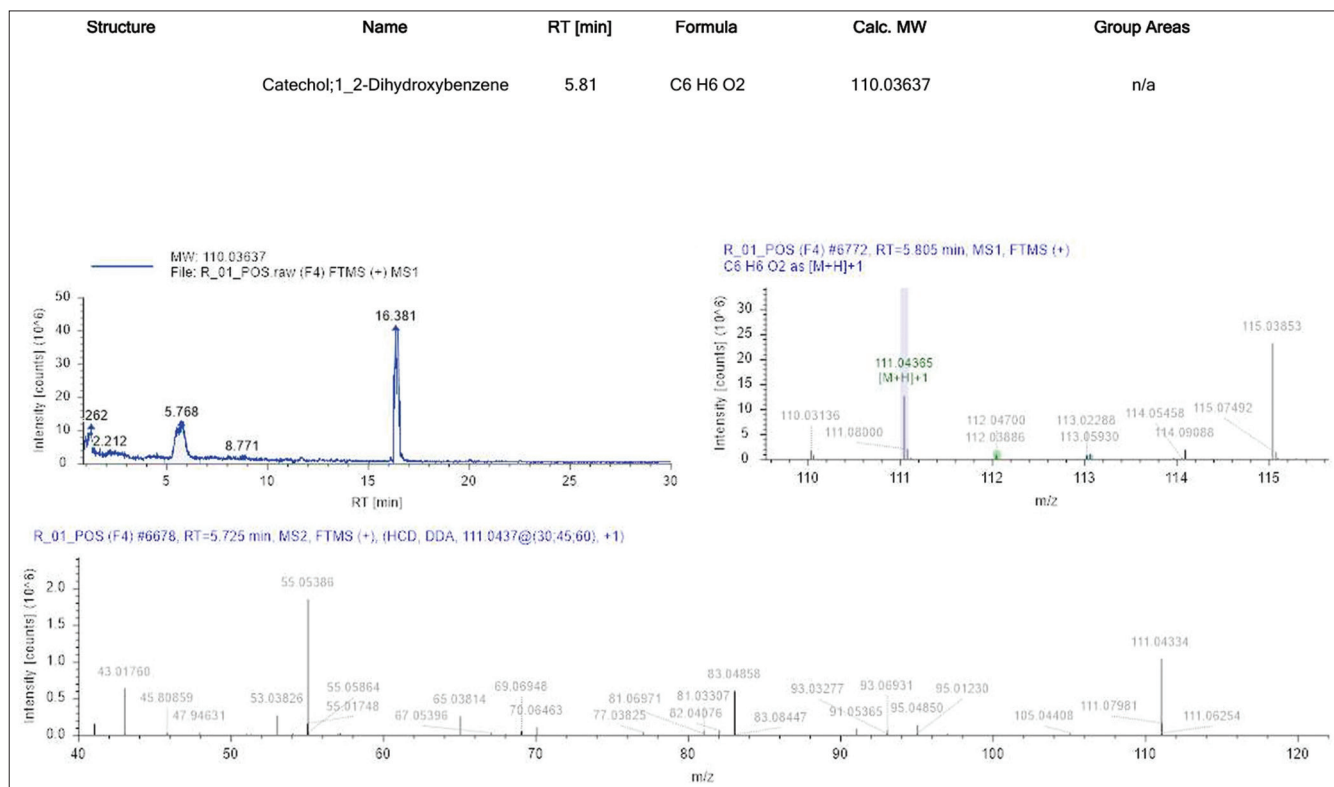


Figure 4: High-resolution mass spectrometry data of catechol

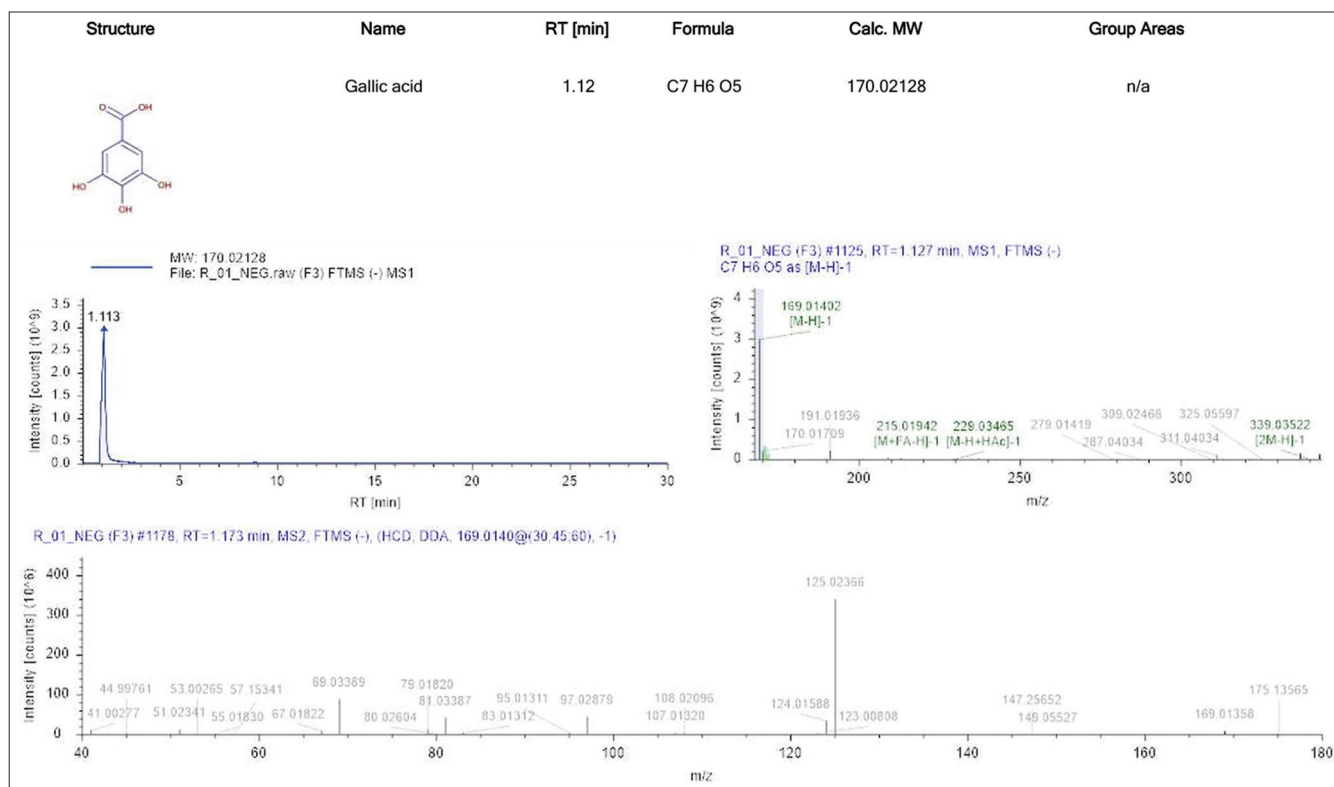


Figure 5: High-resolution mass spectrometry data of gallic acid

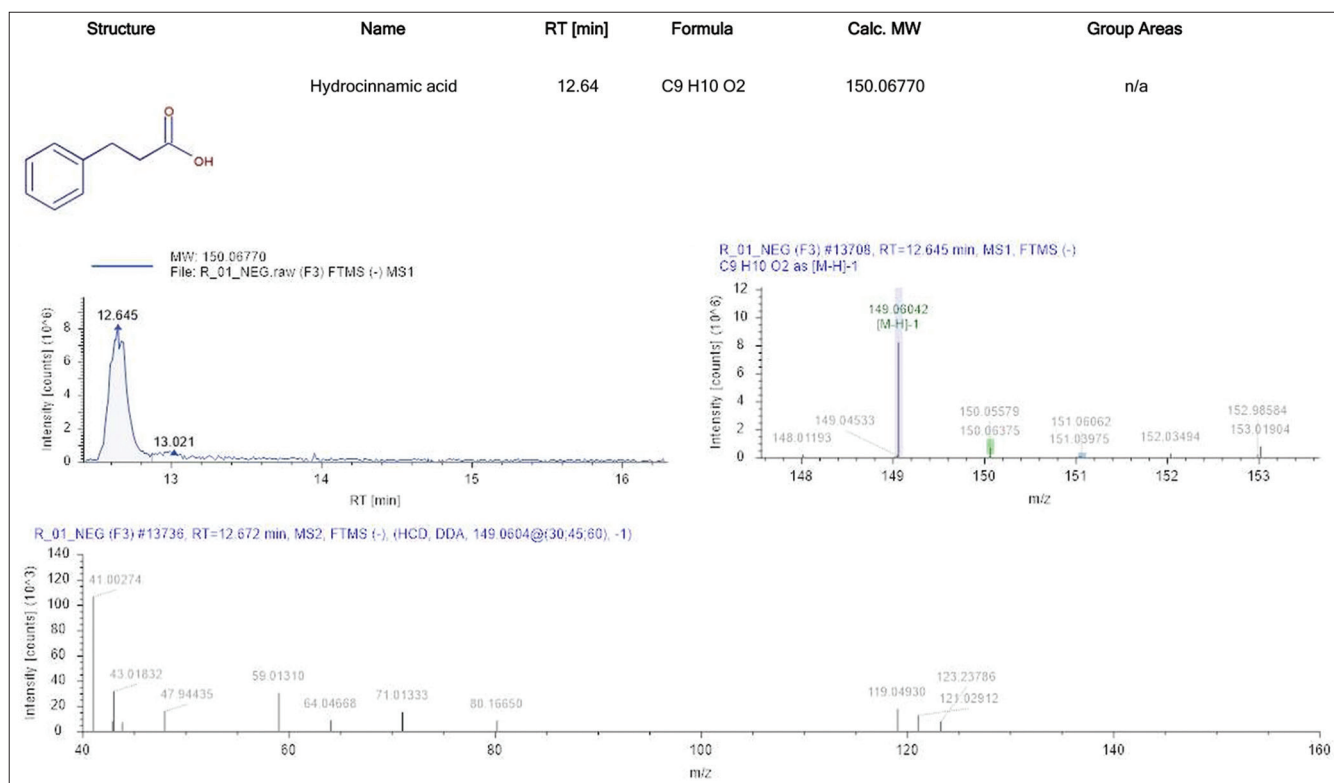


Figure 6: High-resolution mass spectrometry data of hydrocinnamic acid

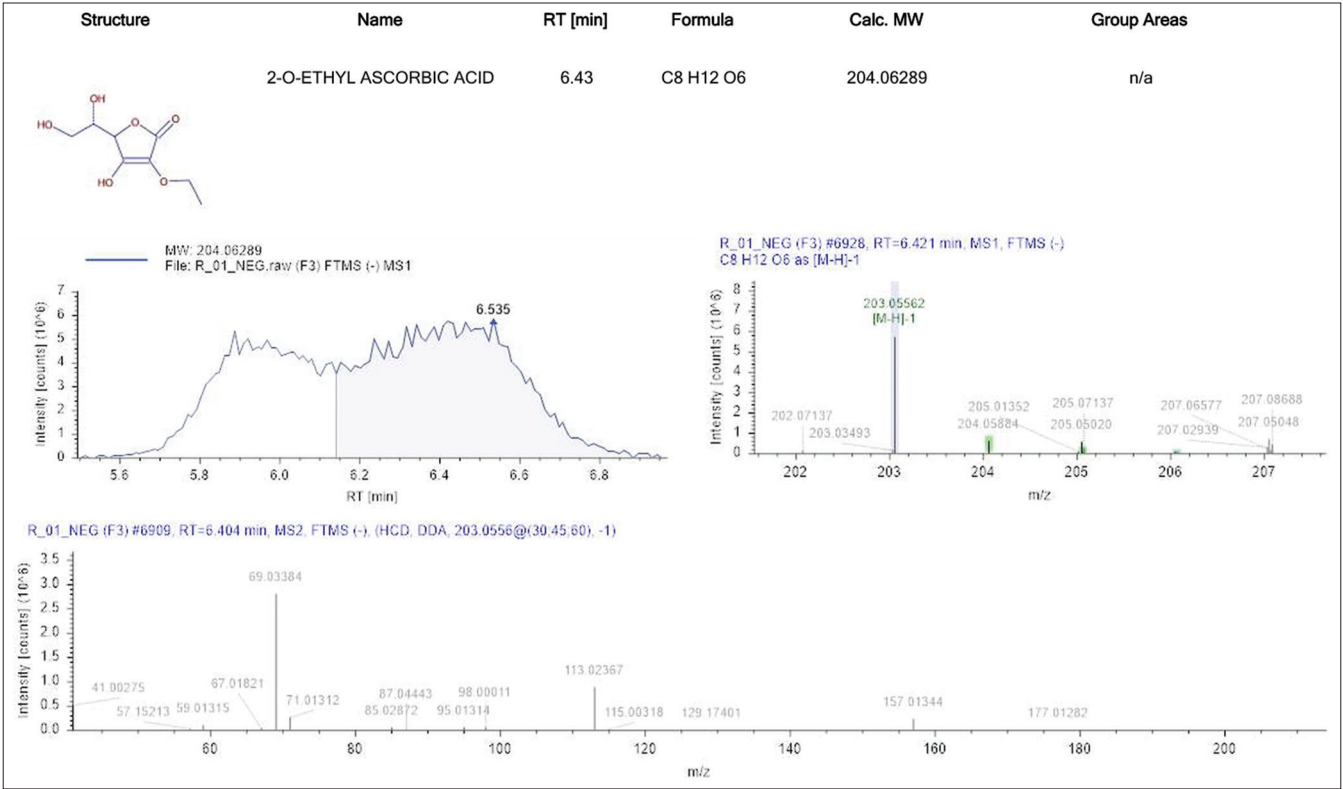


Figure 7: High-resolution mass spectrometry data of ascorbic acid derivative

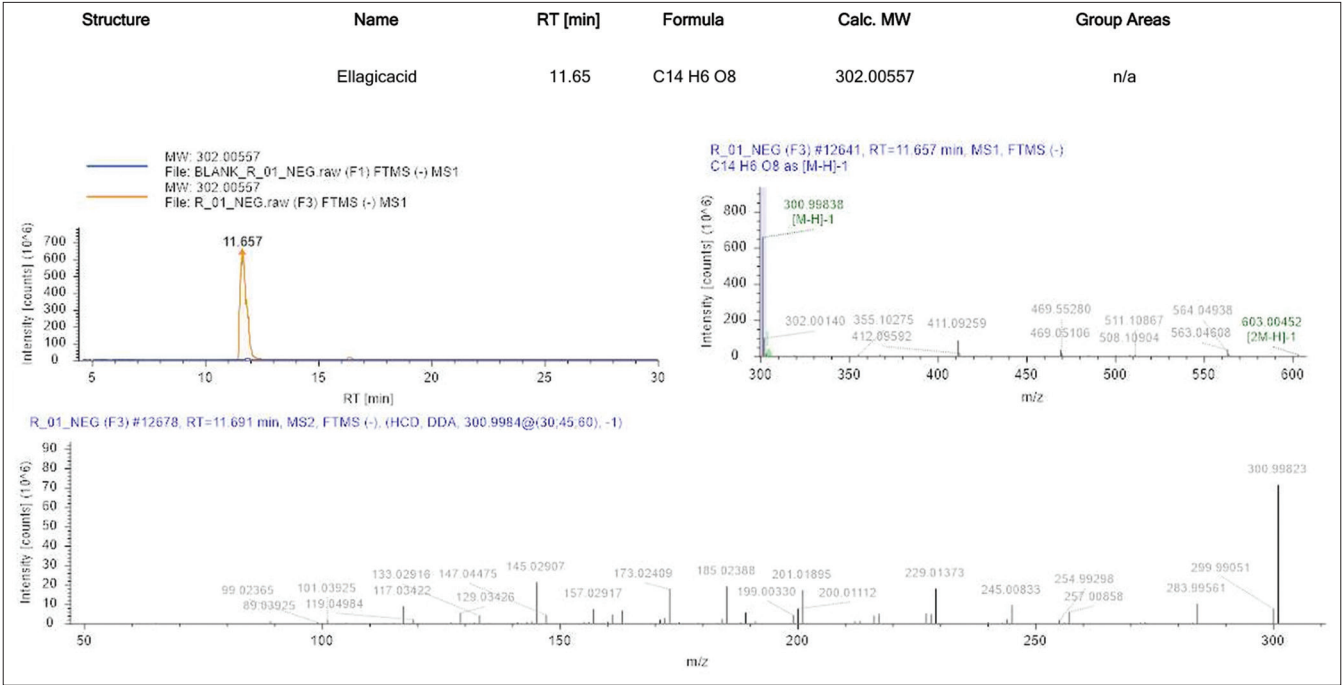


Figure 8: High-resolution mass spectrometry data of ellagic acid

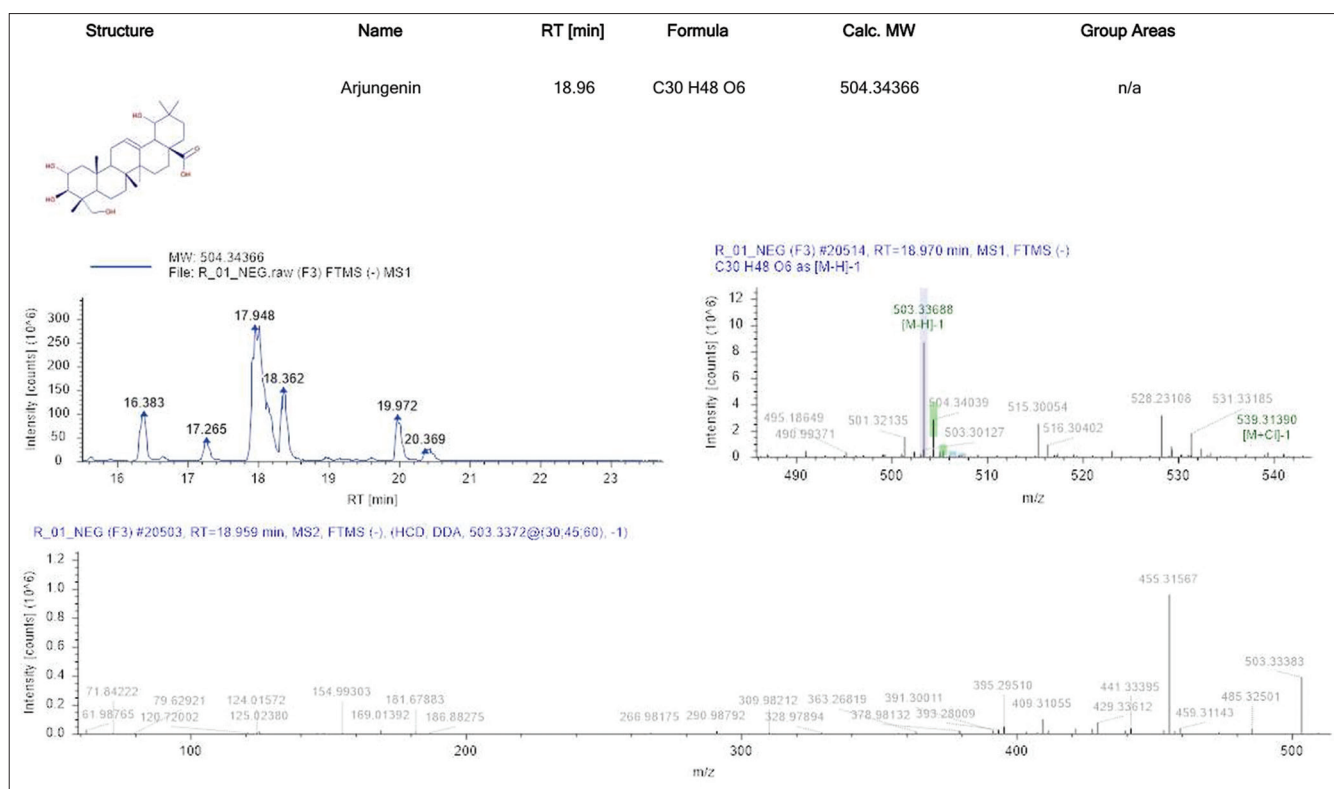


Figure 9: High-resolution mass spectrometry data of arjungenin

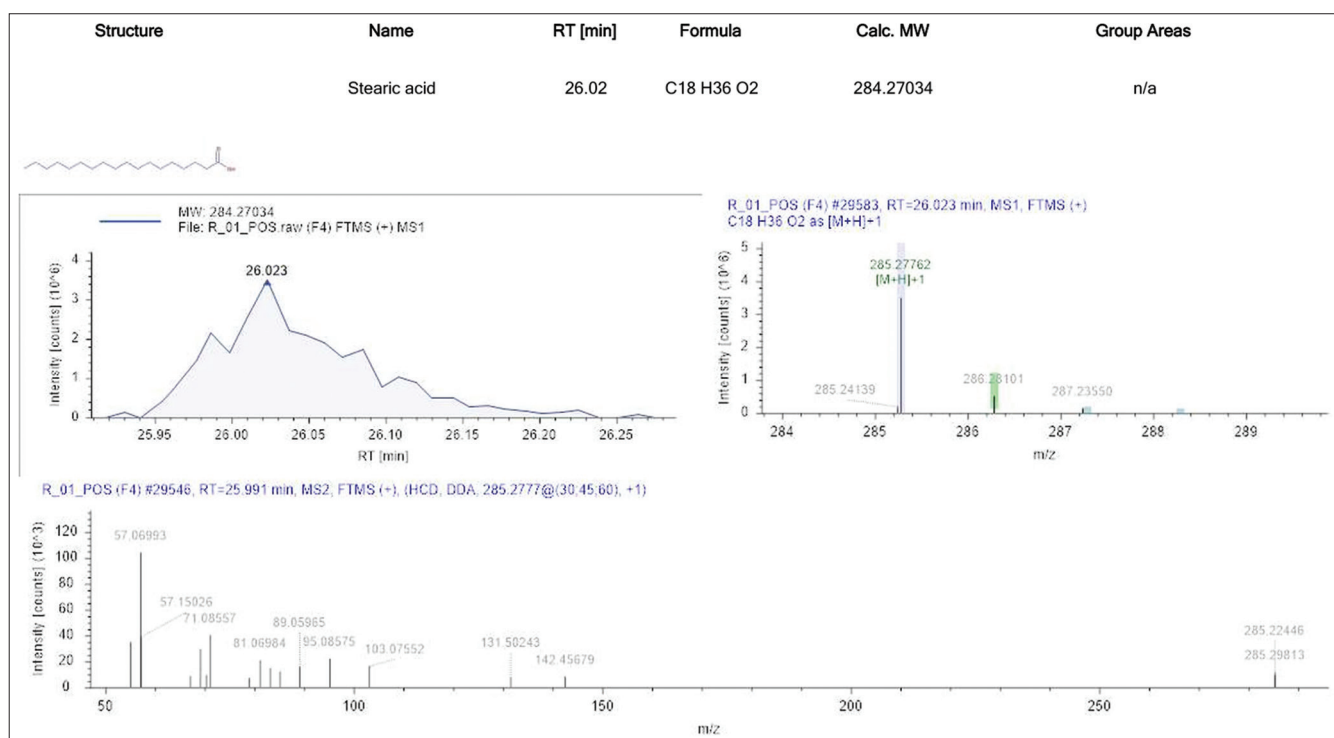


Figure 10: High-resolution mass spectrometry data of stearic acid

