



# Formulation And Evaluation Of Herbal Effervescent Powder For The Treatment Of Constipation

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## Abstract :

The formulation and evaluation of herbal effervescent powders for constipation were conducted to develop a natural, effective, and patient-friendly treatment option. Four formulations were prepared using triphala, trikatu, chitrak, fennel, sendhav, citric acid, tartaric acid, sodium bicarbonate, and other excipients. Effervescent powders were designed to produce solutions that release carbon dioxide simultaneously. The main advantages of effervescent powder are quick production of solution. Thus, it is faster and better to absorb. This powder was evaluated for various parameters like angle of repose, dissolution studies, and effervescent cessation time. The formulated effervescent powder exhibited excellent flow properties which showed good angle of repose, Carr's index, Hausner's ratio, bulk density and tapped density.

**Keywords :** Effervescent Powder, Constipation, triphala, trikatu, chitrak, fennel, sendhav, Carr's index, Hausner's ratio, bulk density and tapped density.

## I. Introduction

Constipation is a common digestive problem that affects people of all ages, from newborns to elderly people, and it affects a wide range of people irrespective of their gender, race, or socioeconomic background. It is more than just a symptom and presents as irregular and usually difficult bowel movements. Patients of all ages might have constipation, which is a common and typical functioning digestive tract issue. Unsatisfactory stools, infrequent stools, hard stools when walking, or both, together with pain and stiffness, might be symptoms of constipation. If left untreated, constipation can have a serious negative impact on a person's health and result in a number of issues. It has a significant effect on healthcare use everywhere, even in the US. There are several varieties of the illness, each with its own etiology and clinical features, including secondary constipation, chronic idiopathic constipation, and functional constipation. It is essential to comprehend how constipated individuals are clinically assessed. This conversation examines the complex nature of constipation, including its causes, signs, and frequency while highlighting how crucial efficient treatment is for general health. It also emphasizes how important interdisciplinary teams are to hospitalized patients' constipation management. Constipation frequently causes lumpy, crusty feces that can be abnormally big or little. Each person experiences it to a different degree. Constipation may only be a temporary problem for some people, but for others, it can develop into a chronic problem that causes significant pain, discomfort, and a lower quality of life. A severe case of acute constipation may result in

intestinal blockage, which may require surgery. Because bowel motions can be difficult, people may find themselves spending a lot of time on the toilet. Some people may get a blockage sensation and feel as though they haven't completely emptied their bowels. Stool that has solidified too much can put more strain on the muscles in the rectum. Hard stool passage is a defining feature of chronic constipation, a complicated condition that affects older people. Older people are much more likely than younger people to experience constipation. Numerous factors are linked to common causes of constipation in older adults, such as aging or lack of regular bowel movements, poor dietary choices, low-fiber food consumption, dehydration, a sedentary lifestyle, infections, or medication use. The overall frequency of constipation was estimated to be around 16% worldwide, with a higher prevalence of 33.5% among individuals aged 60 to 95. Individuals differ from one another in the degree of constipation they experience. According to the World Health Organization, traditional or herbal medicine is a collection of abilities, know-how, and methods derived from the philosophies and beliefs of different cultures with the goal of preserving health in balance with nature—a prime example of fundamental symbiotic relationships. Natural compounds made from plants, animals, and minerals have long been used as essential therapeutic agents for human illnesses. As early as the 18th century, saline cathartic effervescent powders were available, and they were later listed as compounded effervescent powders in official compendia. Over time, these combinations became rather popular because they offered the public a unique and interesting recipe to make in addition to its therapeutic advantages. Moreover, their carbonation imparted a pleasant taste, masking the disagreeable flavors of medications. The selection of ingredients for effervescent granules depends on production requirements, typically involving at least one acid and one base to facilitate the release of carbon dioxide through acid-base reactions. Commonly utilized acids include citric and tartaric acids, as using either acid alone can present challenges. Effervescent salts typically contain “sodium bicarbonate, citric acid, and tartaric acid”, which, upon dissolution in water, undergo reactions between acids and bases, liberating carbon dioxide and resulting in effervescence. (Sahil D. et.al. 2024)

Due to their affordability, medicinal plants are particularly useful in treating constipation in developing nations. Drugs from plants have long been a good option. Numerous cultures have a well-documented history of using medicinal plants for therapeutic purposes. Many plants were utilized as dietary supplements and to cure various illnesses without anyone being aware of their proper uses or components. Original medications were used to cure constipation from the time of Charaka and Sushruta, but a safe and effective treatment paradigm has not yet been established in India, despite the development of numerous synthetic treatments. (Dr. Gautam Ray, 2016) According to the FDA and its modifications, effervescent powders are powders that dissolve or scatter in water prior to administration. They usually contain a combination of carbonates or bicarbonates (such as sodium, potassium, or other acceptable alkali compound metal carbonates/bicarbonates) and acids (such as "citric, tartaric, malic, or other suitable acids or acid anhydrides") in addition to the active ingredient. These powders release carbon dioxide (CO<sub>2</sub>) when mixed with water. In some cases, the main ingredient serves as an acidic or crucial metal compound that is necessary for the bubbling reaction. These powders usually don't have coatings and react quickly with water to release CO<sub>2</sub>, therefore they need to be dissolved or diluted in water before being applied. They are frequently given for drugs that may irritate the stomach or that are sensitive to the pH of the stomach, particularly when taken in large amounts. Furthermore, effervescent powders are simpler to swallow than conventional powders or capsules, which could be problematic for some people, because they are liquid when swallowed. Usually, three to four ounces of water are used to dissolve one powder. By pre-dissolving in a buffer solution, effervescent products avoid direct contact with the gastrointestinal tract, reducing stomach and intestinal irritation. The powder is dissolved in a glass of water prior to intake, and the resulting medicinal solution or dispersion should be used right away. Because tartaric and citric acids react with alkali metal carbonates or bicarbonates in water, the powder breaks down quickly and releases CO<sub>2</sub> gas, which increases the solubility of the active pharmaceutical ingredient (API) and masks its flavor. Compared to other oral dosage forms, effervescent powders provide a number of benefits, such as improved taste for the

developer, less effect on the patient's stomach, and marketing concerns. (Patel HK,2012) Powders without coating that are effervescent are composed of carbonates or bicarbonates (such as sodium or potassium) and acids or acid salts (such as "citric, tartaric, malic, or other applicable acids or acid anhydrides"). They include carbonate or bicarbonate, an appropriate alkali metal, which quickly combines with water to liberate carbon dioxide, causing CO<sub>2</sub> gas to be released. This reaction both conceals the taste of the active pharmaceutical ingredient (API) and increases its water solubility. (Patel HK,2012) Over 2000 milligrams of water-soluble active substances can be contained in one (one portion) of a typical effervescent powder with a particular diameter of one inch and a total weight of five grams. When a higher dose is needed, a sachet (powder form) is a frequent dosing tool. Using Alka Seltzer technology, things were extremely important in the 1930s. Due to their attractive dose forms and therapeutic benefits, these substances have gained a moderate amount of popularity throughout time. Improving the drug's rate of absorption into the body (bioavailability) is the main objective of this research project. By doing this, they can prevent the first round effect and ensure that powders have superior bioavailability than other dosage forms with patient agreement. A highly humid control environment is necessary to increase the stability of effervescent powders. In the middle, when temperature and humidity are not controlled, effervescent powders cannot be made. (Patel HK,2012)

## II.Reason For Choosing An Effervescent Powder

**Fast onset of action:** The main benefit of effervescent powders is that the medicine is already dissolved and absorbed; as a result, absorption is easier and more effective than with traditional powders. Faster absorption is indicated by a quicker onset to activity. Effervescent medications are administered to the stomach at the optimal pH for absorption. When taken with food or other prescriptions, many pharmaceuticals take longer to pass through the digestive tract. Vaishnav Y,et.al.2021

The powder does not need to be swallowed. People who have trouble swallowing powder or who dislike eating powders and capsules can be served by administering effervescent medications in liquid form rather than powder or capsules. Usually, only one dose of effervescent medication is required. Only three or four ounces of water are needed. Vaishnav Y,et.al.2021

Good intestinal and stomach tolerance is indicated by the effervescent granules completely dissolving in the buffer solution. Additionally, buffering frequently keeps stomach acids from producing pharmaceutical interactions, which can be a major cause of adverse effects. Reducing localized contact in the upper gastrointestinal tract also improves tolerability and lessens discomfort.(Patel SG,et.al.2018)

## Drug And Excipient Profile

### III.Triphala

Because of its diverse pharmacological properties, triphala is a medication that is frequently used to treat a variety of illnesses. One of the most widely used Ayurvedic remedies, triphala is made up of the three myrobalans: Terminalia chebula Retz. (Haritaki), Terminalia bellerica Roxb. (Bibhitaki), and Emblica officinalis Gaertn. (Amalaki). The pericarps of these myrobalans are often present in equal amounts in the formulation. According to the ancient Ayurvedic scripture, triphala is a Tridoshic Rasayana, a medicinal substance that balances and revitalizes the three humours, or constitutional elements, of Ayurveda: vata, pitta, and kapha. Emblica officinalis Gaertn. is chilly, whilst Terminalia chebula Retz and Terminalia bellerica Roxb are warm. Since triphala combines all three, it is balanced and can be used as a recipe for internal cleansing and detoxification. In Ayurvedic medicine, it is considered a good purgative and an essential Rasayana. The Charaka and Susruta Samhita, two ancient Indian scriptures, include the recipe for this traditional herbal supplement. The following lists the many characteristics and attributes of the drug's ingredients: (Patel SG,et.al.2018)

## 1. Haritaki(Patel SG,et.al.2018)

Latin name - Terminalia chebula Linn.

Family - Combretaceae

Classical name - Haritaki

Sanskrit synonyms - Haritaki, Pathya, Abhaya, Avyatha, Vayastha, Haimavati, Shiva

Hindi name - Harre, Harad

English name - Chebulic Myrobalan

Swaroop (Habit) - A moderate sized / large deciduous tree

Habitat - Found in MP, W. Bengal, Karnataka and Maharashtra in India, Burma and Ceylon

Types - Seven types namely Vijaya, Rohini, Putana, Amrita, Abhaya, Jivanti and Chetaki

Ayurvedic Pharmacodynamics

Rasa - Pancharasa (Kashaya predominance, Lava rahita)

Guna - Laghu, Ruksha

Virya - Ushna

Vipaka - Madhura

Prabhava - Tridosahara

Dosha karma - Mainly kapha pitta samaka.

Parts used - Fruits

Chemical Composition : Fruit contains tannin up to 30 %, chebulic acid and gallic acid and some purgative constituents of the nature of Anthraquinone.

Therapeutic Uses:

The fruit is a well-known herbal remedy that is frequently added to several formulations and is used extensively in the Indian medical system. Asthma, sore throat, thirst, vomiting, eye conditions, heart and bladder disorders, biliousness, inflammation, bleeding piles, typhoid, constipation, anemia, elephantiasis, delirium, and strangury are among the conditions for which it is helpful. Ripe fruit is carminative, tonic, and purgative; it also fortifies the gums, eyes, and brain. The astringent unripe fruit can help with diarrhea and dysentery.( Patel SG,et.al.2018)

## 2. Vibhitaki (Patel SG,et.al.2018)

Latin name - Terminalia bellerica Roxb.

Family - Combretaceae

Classical name - Vibhitaka

Sanskrit synonyms - Aksha, Kaliphala, Bhutavasa, Kalidruma, Karnaphala

Hindi name - Bahera, Baherha

English name - Belleric Myrobalan

Swaroop (Habit) - A large deciduous tree

Habitat - Throughout the deciduous forests of India and Burma

Pharmacodynamics

Rasa - Kashaya

Guna - Laghu, Ruksha

Virya - Ushna

Vipaka - Madhura

Prabhava - Tridoshagna

Dosha karma - Kapha hara

Parts used - Fruit

Chemical Composition :

Fruit contains 17 % tannin and gallo-tannic acid (colouring matter) and resin. Seeds contain greenish yellow oil.

Therapeutic Uses:

The bark helps those with leucoderma and asthma. The fruit is used to treat bronchitis, sore throats, biliousness, inflammation, and conditions affecting the eyes, nose, heart, and bladder. It is also digestible, laxative, and antihelminthic. Applying the oil to the hair works well. The fine powder is applied as an astringent and styptics agent to fresh cuts and wounds in order to stop the bleeding. The fruit of the Beleric myrobalan is a component of the Triphala, a significant group of three myrobalans that include embelic, Beleric, and Chebulic myrobalans. (Patel SG,et.al.2018)

### 3. Amalaki (Patel SG,et.al.2018)

Latin name - *Emblica officinalis* Gartn.

Family - Euphorbiaceae

Classical name - Amalaki, Dhatri

Hindi name - Awala, Amla, Aonla

Sanskrit synonymns - Amalaki, Dhatri, Vyastha

English name - Indian gooseberry

Swaroop (Habit) - A medium sized tree

Habitat - Found throughout India; often planted in gardens and cultivated also in small and large scale

Ayurvedic Pharmacodynamics

Rasa - Pancharasa (Amla predominance and

Lavanarahita)

Guna - Laghu, Ruksha, Sita

Virya - Sita

Vipaka - Madhura

Prabhava - Rasayan

Dosha karma - Tridoshara, Pittasamaka (mainly)

Parts used – Fruits

Chemical Composition

Fruit is a well known rich source of Vitamin C. Seeds contains fixed oil, phosphatides and an essential oil. Fruits, barks and leaves are rich in tannins.

Applications in Medicine :

The most beneficial portion of the plant is its fruits, which are used medicinally to treat a variety of illnesses in a variety of ways. Vitamin C and other nutrients are supplemented with fruits. It is among the most well-known, widely used, and well-regarded medications in the traditional medical system. Anemia, peptic ulcer, dyspepsia, anorexia, diarrhea, dysentery, hemorrhage, eye inflammations, bladder irritability, leucorrhea, spermatorrhea, epistaxis, menorrhagia, jaundice, weak memory, nervous debility, oedema, and liver conditions are among the conditions for which it is used. Fresh fruit juice is used as a laxative, diuretic, antiscorbutic, tonic, and anti-bilious treatment. (Patel SG,et.al.2018)

#### IV. Trikatu

The Trikatu As the name suggests, Trikatu means "tri," which in Sanskrit means "three," and "katu," which means "acrids." When mixed in equal amounts, the three caustic herbs—Maricha (black pepper), Peepali (long pepper), and Sunthi (ginger)—form the magical concoction known as Trikatu. An Ayurvedic compound called Trikatu is used to treat a variety of illnesses. (Kaushik R,et.al.2018)

Trikatu chemistry: The three herbs *P. longum*, *P. nigrum*, and *Z. officinale* are found in trikatu. Piperine is the primary chemical and biological marker found in the component plants *P. longum* and *P. nigrum*, with smaller amounts of additional ingredients. Among the chemical components found in *Z. officinale* are gingerols, gingerene, and shalols. (Kaushik R,et.al.2018)

The chemical makeup of *P. longum* (pipali)

The main and active ingredient in long pepper is piperine. On a dry weight basis, *P. longum* contains 3–5% piperine. The most prevalent alkaloids and related compounds found in *P. longum* fruit are piperine, methyl piperine, iperonaline, piperettine, pellitorine, piperlongumine, piperlonguminine, asarinine, piperundecalidine, refractomide A, pipericide, piperderidine, longamide and tetrahydropiperine, tetrahydro piperlongumine, dehydropiperonaline piperidine, trimethoxy cinnamoylpiperidine. Lignans The fruit of *P. longum* has also yielded the isolated compounds fargesin, pulvuatilol, and sesamin. (Kaushik R,et.al.2018)

Chemical Make-Up of Kali Miri (*P. nigrum*)

Along with about 3.5% volatile oil, *P. nigrum* also contains lignans, alkaloids, flavonoids, amides, and other fragrant chemicals. Sabinene, pinene, linalool, limonene, and phellandrene are some of the constituents of essential oil. *P. nigrum* is identified chemically by piperine, an alkaloid. There is also chavicine, an isomer of piperine. The aroma of black pepper is not caused by piperine or chavicine. The black pepper's pungency is caused by piperine. (Kaushik R,et.al.2018)

## Chemical Composition of *Z. officinalis* ( ginger )

Ginger has around 450 components, according to a thorough chemical examination. Carbohydrates (50–70%), lipids (3–8%), terpenes, phenolic compounds, amino acids, raw fiber, ash, protein, phytosterols, vitamins, and minerals make up the majority of ginger rhizomes.  $\beta$ -bisabolene,  $\alpha$ -farnesene,  $\alpha$ -curcumene,  $\beta$ -sesquiphellandrene, and zingiberene are among the volatile terpenoidal elements of *Z. officinale*. Paradols, shogaol, and gingerol are examples of phenolic chemicals. Ginger's pungency is caused by gingerols and shagols. Higher concentrations of up to 20–25% are detected in these gingerols and shogaols. Ginger rhizome has also been found to contain other chemicals (1–10%) linked to gingerol or shogaol, such as 6-paradol, 1-dehydrogingerdione, 6-gingerdione, and 10-gingerdione. Gingerdiol derivatives include 4-, 6-, 8-, and 10-gingerdiol as well as diarylheptanoids.

Therapeutic Indication Trikatu Churna is helpful in following health conditions. (Kaushik R,et.al.2018)

- Constipation with mucous or sticky stool
- Loss of appetite.
- Indigestion.
- Gas or flatulence.
- Bloating.
- Abdominal distension.
- Irritable bowel syndrome.
- Common cold (acute phase during running nose).
- Cough with thin white phlegm.
- Asthma (chest congestion due to phlegm).
- Weight loss (obesity).
- Body aches with feeling of heaviness in the body.
- High cholesterol levels. • Atherosclerosis.
- High blood pressure due to hypercholesterolemia.
- Gout.

## V.Chitrak

One of the most significant sources of medicine is plants; many medications are made from them, and chiraka has been identified botanically. *Plumbago zeylanica* Linn. is a member of the Plumbaginaceae family. One of the common plants used in Indian traditional medicine is this perennial, sub-scandant shrub and herb. There are 10 genera and 280 species in the Plumbaginaceae family. Because of its various medicinal applications, *P. zeylanica* is widely grown in horticulture. (Mulke VG,et.al,2020)

### Classification

Kingdom: Plantae

Order: Caryophyllales

Family: Plumbaginaceae

Genus: Plumbago Species: zeylanica

Benefits and Actions: ● Stomach Health: Chitrak is highly effective in curing gastrointestinal issues such as duodenal ulcers and other stomach-related diseases.

● Fire Ignition (Agni Deepana): Known as "Agni Deepana," Chitrak helps in kindling the digestive fire, thus maintaining overall health and well-being.

● Protective Nature: Regular use of Chitrak ensures proper health maintenance and protection against various ailments. It is renowned for its ability to preserve life by strengthening bodily functions and immunity. (Deshmukh AR., 2024)

## VI.FENNEL

Fennel has long been utilized in medicine and cooking. The entire plant has therapeutic use; its larger base is used as a vegetable; its leaves are used in cooking; and its seeds are used to extract essential oils and as a spice. Additionally, yellow and brown dyes are made from the leaves and flowers. The most powerful form of fennel is pollen, but it costs a fortune. (Malhotra SK, 2012)

Fennel's functional qualities:

Rich in dietary fiber (28.7%), Indian fennel has been shown to have a positive physiological impact on the digestive tract (Srinivasan, 2005). Due to its many applications in traditional medicine, including its recommendation as an anti-anorexigenic, the identification and isolation of fennel's various active components is of significant therapeutic interest. Its nutritional profile suggests that it has both culinary and therapeutic benefits as a preventive food for managing a range of illnesses. In addition to numerous other pharmacopoeias from other nations, fennel is officially recognized in the United States and the United Kingdom. Table 14.4 lists the main formulations that use fennel for medical purposes. Since fennel's leaves, bulb, seed, essential oil, and water all have several useful qualities, it has been used for a long time in herbal remedies such as teas, tinctures, and extractives. Because of its toning and purifying qualities, fennel is utilized in aromatherapy and has a strong anise-like scent. According to contemporary herbal medical sciences, fennel has a vast variety of therapeutic benefits, some of which are detailed in the sections that follow. These benefits include treating mouth sores, cellulite, bruising, halitosis, gum disease, flatulence, and more. (Malhotra SK, 2012)

Stimulant, carminative and expectorant :

Fennel is believed to promote a healthy appetite and digestion; Patel and Srinivasan (2001) found that adding fennel and other major dietary spices to the diet significantly shortened the time it took for food to transit. In the composition of fennel, there are large amounts of anethole found throughout the plant, although mostly concentrated in the seeds. This compound is responsible for fennel's digestive and carminative properties, and its flavorful aroma and unique flavor make it a tasty vegetable that may be added to food. With a long history of use, vegetable charcoal is well-known for its capacity to quickly absorb gasses and liquids from the intestines while also fostering beneficial intestinal bacteria that aid in proper digestion. Fennel-infused vegetable-based charcoal is sold commercially in encapsulated form. Herbal mixes and cough syrups gain a delightful flavor and aromatic boost with the addition of fennel. Anethole and fenchone, the main components of fennel's essential oil, have been demonstrated to have a secretolytic impact on the respiratory tract. Fennel can also aid in the expulsion of wind from the alimentary canal, relieving the respiratory system and providing a relaxing effect on coughs and bronchitis. (Malhotra SK, 2012)

## VII. Jeera

According to estimates from the World Health Organization (WHO), 4 billion people, or 80% of the global population, currently receive primary healthcare through herbal medicine (1). Antimicrobial, antioxidant, anticancer, hypolipidemic, cardiovascular, central nervous, respiratory, immunological, anti-inflammatory, analgesic, antipyretic, and many other pharmacological actions were among the various pharmacological activity that the plant demonstrated (2–70). *Cuminum cyminum* included alkaloids, coumarins, anthraquinones, flavonoids, glycosides, proteins, resins, saponins, tannins, and steroids, according to phytochemical study. *Cuminum cyminum* exerted antimicrobial, insecticidal, anti-inflammatory, analgesic, antioxidant, anticancer, antidiabetic, antiplatelet aggregation, hypotensive, bronchodilatory, immunological, contraceptive, anti-amyloidogenic, anti-osteoporotic, aldose reductase, alpha-glucosidase, and tyrosinase inhibitory effects, as well as protective and central nervous effects, according to earlier pharmacological studies. The chemical components and pharmacological effects of *Cuminum cyminum* are highlighted in this review. (Al-Snafi AE,2012)

Synonyms: *Cuminia cyminum* J. F. Gmel., *Cuminum aegyptiacum* Mérat ex DC., *Cuminum hispanicum* Mérat ex DC., *Cuminum odorum* Salisb., *Cuminum sativum* J. Sm., *Cyminon longeinvolutum* St.-Lag

Taxonomic classification:

Kingdom: Plantae;

Subkingdom: Viridiplantae;

Infrakingdom: Streptophyta;

Superdivision: Embryophyta;

Division: Tracheophyta;

Subdivision: Spermatophytina;

Class: Magnoliopsida;

Superorder: Asteranae;

Order: Apiales;

Family: Apiaceae;

Genus: *Cuminum*;

Species: *Cuminum cyminum*

### GASTROINTESTINAL EFFECT:

Rats treated with aqueous extracts of dried cumin fruit leaves showed antiulcer effectiveness against diclofenac sodium-induced stomach ulceration when compared to omeprazole. To varying degrees, cumin extract sped up the healing process. It was discovered that the aqueous extracts of piper betel and cumin together have greater therapeutic properties than the aqueous extracts of piper betel and cumin alone. Additionally, aqueous extract promotes the regeneration and protection of gastric mucin. (Al-Snafi AE,2012).

## VIII.Kala Namak

Kala Namak, another name for black salt, has drawn notice for its exceptional nutritional profile and possible health benefits above store-bought table salts (Sahil D. et.al. 2024). In South Asia, this artificial salt is referred to by a number of names due to its distinct sulfurous and strong odor. There is one type of black Himalayan rock salt that is also black in color, but it lacks the medicinal ingredients of traditional manufactured black salt. Although sodium chloride makes up the majority of kala namak, the other trace components it includes give it its distinct color and scent. The sulfur component of the salt, which is found in the forms of sodium sulfate ( $\text{Na}_2\text{SO}_4$ ), sodium sulfide ( $\text{Na}_2\text{S}$ ), sodium bisulfate ( $\text{NaHSO}_4$ ), sodium bisulfite ( $\text{NaHSO}_3$ ), and iron sulfide ( $\text{FeS}$ ), is notably responsible for its unique scent. Greigite, an Iron (II, III) sulfide mineral, provides the salt its variety of colors, ranging from purple to pink when ground into a powder and from brownish pink to dark violet when crystallized. In addition to its culinary applications, kala namak is prized in Ayurveda for its therapeutic qualities (Bali S, et.al.)

Black salt's composition includes a range of trace elements and compounds, including iron sulfide, sodium sulfate, sodium bisulfate, and sodium bisulfite, which collectively give it its distinct qualities. While a variety of sulfur compounds, most notably hydrogen sulfide, give the salt a distinctive savory scent and a slightly sour flavor, iron sulfide gives Kala Namak its dark violet hue. Kala Namak has a sodium level that is comparable to ordinary table salt, ranging from 36.8% to 38.79%. Furthermore, antioxidants such as tannins, phenols, and alkaloids have been found by phytochemical screens, indicating that black salt may have health advantages, especially with reference to oxidative stress and aging. (Bali S, et.al.)

Health advantages of black salt : Triphala is added to the formulation of black salt to enhance its flavor profile and increase its health advantages, making it a useful ingredient in a variety of dishes and medicinal applications.

maintains appropriate hemostasis, supports mucosal defense, and encourages mucosal healing. (Bali S, et.al.)

## IX.Materials And Methods

The powder of triphala , trikatu , chitrak , fennel , kala namak , citric acid , tartaric acid and sodium bicarbonate were collected and purchased from the local market form pune (Shop Name- gopal Govind lokhande, address: 764, Bagade Rd, opposite The Cosmos Co-op. Bank Ltd., Phadke Haud, Budhwar Peth, Pune, Maharashtra 411002)

The methods will be used in this study are:-

1. Measuring Ingredients: • Calculate each ingredient's therapeutic dosage while taking safety and effectiveness into account.  
• For the planned therapy, determine a balanced ratio of sodium bicarbonate, citric acid, tartaric acid, fennel, kala namak, triphala, trikatu, and chitrak.
2. Powder Blending: Using a mortar and pestle, weigh and thoroughly combine triphala trikatu chitrak kala namak fennel and jeera to get a uniform mixture.
3. Alkalinizing Agent Addition: To increase the herbal blend's effervescence, add sodium bicarbonate.  
• For extra effervescence, you can optionally add citric acid.
4. Flavoring and Sweetening (Optional): To enhance flavor and make the powder more palatable, add sucrose sweeteners.

Table 1: Ingredients with their properties

Ingredients	Properties
Triphala	Natural laxative
Trikatu	Improve metabolism
Chitrak	Appetite stimulant
Fennel	Source of fiber
Jeera	Antiulcer
Kala namak	Natural Digestive agent
Sugar	Sweetening agent
Citric acid	Effervescent Agent
Tartaric acid	Effervescent Agent
Sodium bicarbonate	Effervescent Agent

Table 2: Formulation table of herbal effervescent powder for constipation

Ingredients	F1 (in mg)	F2 (in mg)	F3 (in mg)	F4 (in mg)	F5 (in mg)
Triphala	0.48	0.48	0.48	0.48	0.48
Trikatu	0.48	0.24	0.32	0.32	0.32
Chitrak	0.48	0.24	0.24	0.48	0.48
Fennel	0.48	0.48	0.48	0.48	0.48
Jeera	-	-	0.08	0.16	0.16
Kala namak	0.48	0.48	0.56	0.64	0.72
Sugar	-	-	-	-	0.96
Citric acid	0.28	0.28	0.28	0.28	0.28
Tartaric acid	0.31	0.31	0.31	0.31	0.31s
Sodium bicarbonate	0.60	0.60	0.60	0.60	0.60



Fig.1. Formulation F1



Fig.2. Formulation F2



Fig.3. Formulation F3



Fig.4. Formulation F4

## X. Evaluation Of Formulated Herbal Effervescent Powder

1. **Angle of Repose:** The angle of repose was measured using the fixed funnel method. The tip of a funnel was fastened above graph paper on a level horizontal surface at a specified height (h). The mixture was gradually pushed through the funnel until the conical pile's peak barely touched the funnel's tip. The conical pile's base's radius was measured. The following formula was used to determine the angle of repose ( $\theta$ ):  $\tan \theta = h/r$  where r is the cone base's radius, h is the cone's height, and  $\theta$  is the angle of repose. Angles of repose  $> 40^\circ$  indicate a poorly flowing material, while values  $< 30^\circ$  often indicate a free flowing material. Excellent flow qualities are displayed in 25–30, acceptable flow properties in 31–35, fair flow properties in 36–40, and passable flow properties in 41–45.
2. **Density of Bulk Without compacting,** a 15 g powder mixture is added to a dry 100 ml cylinder. The unsettled apparent volume,  $V_o$ , was measured after the powder was gently leveled without compacting. The following formula was used to determine the bulk density.  $\rho_b = M / V_o$  where M is the sample weight, V is the apparent volume of powder, and  $\rho_b$  is the apparent bulk density.
3. **Density Tapped** Following the steps outlined for measuring bulk density, the cylinder holding the sample was tapped 500 times at first, then 750 times more until the difference between subsequent measurements was less than 2%. The tapped volume, or  $V_f$ , was then measured to the closest graduated unit. The following formula was used to determine the tapped density, expressed as grams per ml.  $\rho_{tap} = M / V_f$  where M is the sample weight,  $V_f$  is the powder's tapped volume, and  $\rho_{tap}$  is the taped density.
4. **The Carr's index** The ability of a powder to be compressed is gauged by the Compressibility Index, often known as Carr's index. Both the tapped and bulk densities are used to calculate it. A material is said to be more flowable if it is less compressible. The relative significance of interparticulate interactions is therefore measured. These interactions tend to be less important in a free-flowing powder, since the tapped and bulk densities will be closer in value. There are often more inter-particle interactions in poorer moving materials, which will result in a larger gap between the bulk and tapped densities. The following formulas are used to calculate the Carr's Index, which reflects these differences: The compressibility index is equal to  $[(\rho_{tap} - \rho_b) / \rho_{tap}] \times 100$ . With  $\rho_b$  standing for bulk density and  $\rho_{tap}$  for taped density

5. The Hausner Ratio An indirect measure of powder flow easiness is Hausner's ratio. This formula is used to calculate it. Tapped density ( $\rho_t$ ) divided by bulk density ( $\rho_b$ ) is Hausner's ratio. where  $\rho_b$  is the bulk density and  $\rho_t$  is the tapped density. Better flow properties are shown by a lower Hausner's ratio ( $<1.25$ ), moderate flow properties are shown by a ratio between 1.25 and 1.5, and poor flow is indicated by a ratio greater than 1.5.
6. Effervescence Time: One dose of effervescent granules was added to a 250 ml beaker containing 100 ml of distilled water. The effervescent production and cessation times were recorded.



Fig. 5. Angle of repose



Fig.6. Tapped density



Fig.7. Effervescence Time

## XI. Results

Since all age groups may readily administer this specific composition, a herbal effervescent powder was created. The granules are dark in color and have a distinct smell. The granules' angle of repose was 15.75. The tapped density ( $\rho_{tap}$ ) was 1.28 while the bulk density ( $\rho_b$ ) was 0.52. Its outstanding flow properties are demonstrated by the Hausner ratio of 0.77 and the compressibility index (Carr's index) of 28.57. And after two to three minutes, the effervescence period shows an excellent outcome. Every outcome is displayed in the table.

Table.no.3. Evaluation parameter

Sr no	Parameters	Results
1	Angle of repose	15.75
2	Bulk density	72.0
3	tapped density	1.28
4	Carr's index	28.57
5	Hausner ratio	0.77
6	Effervescent Cessation Time	2-3 min
7	Color	Brown color
8	Odor	Characteristic odor
9	Apperance	Amorphous

## Conclusion

With advantages like a quicker onset of action, better flavor, and increased gastrointestinal tolerance, effervescent powder offers a viable solution for constipation. The development and testing of a herbal effervescent powder for constipation is a step in the direction of offering practical and affordable treatment choices. using organic ingredients such as fennel, jeera, chitrak, triphala, trikatu, etc. Compared to conventional dose forms, effervescent powder has a number of benefits, such as quicker absorption, better patient compliance, and adjustable dosage. However, it's important to recognize the constraints, limitations, and challenges associated with creating effervescent powder preparations, such as issues with stability, cost-effectiveness, and taste masking. To get over these challenges and improve the effectiveness and accessibility of herbal effervescent powder for the treatment of constipation, more research and development is required.

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