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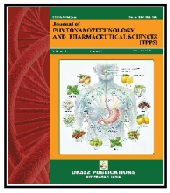

Review Article : Open Access

Natural antiemetic agents: A review of herbal therapeutics

Md. Kaif Siddique, Ali Athar, Mohammad Irfan Khan, Badruddeen, Juber Akhtar, Mohammad Ahmad, Muhammad Arif, Akash Srivastava, Asad Ahmad and Anas Islam

Faculty of Pharmacy, Integral University, Kursi Road, Dasauli, Lucknow-226026, Uttar Pradesh, India

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Abstract

Nausea and vomiting are common symptoms encountered in both physiological and pathological conditions, including pregnancy, motion sickness, gastrointestinal disorders, postoperative recovery, and cancer treatment. These responses are mediated through interconnected gut-brain signalling pathways involving the gastrointestinal tract, vestibular system, a toxin-sensitive brain region, and higher cortical centres. Although, conventional antiemetic medications effectively alleviate these symptoms, they may be associated with adverse effects such as drowsiness, movement disorders, reduced neural signalling, or inadequate symptom control in certain individuals. Consequently, increasing attention has been directed toward plant-based remedies as potentially safer alternatives or complementary therapies. Despite the complex mechanisms underlying emesis, several medicinal plants have demonstrated promising antiemetic potential. Ginger, peppermint, chamomile, fennel, clove, lemon, cardamom, basil, amla, and cinnamon have shown beneficial effects in preliminary studies. Rather than acting through a single mechanism, these herbs are believed to exert their antiemetic activity through multiple pathways, including 5-HT3 receptor antagonism, enhancement of gastric motility, soothing of gastrointestinal tissues, smooth muscle relaxation, antioxidant activity, and anxiety reduction through aromatic properties. Among these, ginger has consistently demonstrated the strongest evidence across human studies. However, broader clinical application requires further rigorous investigation, standardised formulations, and comprehensive safety evaluations.

1. Introduction

Feeling sick and throwing up rank high on the list of troubling health issues seen by doctors, showing up during pregnancy or car rides, also appearing with stomach problems, operations, even cancer care (Stern *et al.,* 2021; Zhao *et al.,* 2022). When vomiting would not stop, it risks fluid loss, mineral disruption, lack of proper nourishment, worse daily functioning, plus skipping needed medical plans (Chen *et al.,* 2024; Rojas and Slusher, 2012). Today's nausea medicines work in different ways, some block serotonin signals, others interfere with dopamine, histamine, acetylcholine, or substance P through NK-1 pathways, all aimed at distinct points in the body's urge to vomit (Rojas and Slusher, 2012; StatPearls Publishing, 2024). Though useful, manufactured antiemetics come with notable drawbacks (Ekor, 2014; StatPearls Publishing, 2024). Instead of solving every problem, dopamine blockers can trigger movement-related side effects. Sedation and dry mouth appear frequently with antihistamines or anticholinergic agents. Even when combined, multiple drugs sometimes fail to manage nausea and vomiting that follow chemotherapy (Rojas and Slusher, 2012; StatPearls Publishing, 2024). Because of these gaps, researchers are looking again at plants traditionally used for stomach issues and queasiness (Haniadka *et al.,* 2012; World Health Organization, 2013). Unlike strict pharmaceutical models, herbal remedies might work on several levels at once. Acceptance among patients tends to be higher. Cost is generally less, particularly where resources are limited (Ekor, 2014; Haniadka *et al.,* 2012).

Corresponding author: Dr. Mohammad Irfan Khan

Professor, Faculty of Pharmacy, Integral University, Lucknow-226026, Uttar Pradesh, India

E-mail: irfan9896@gmail.com

Tel.: +91-7897124030

2. Physiology of emesis

Throwing up is a well-organised bodily reaction designed to remove irritating or dangerous materials from the stomach and upper gut (Stern *et al.,* 2021). Far from happening on its own, this process depends heavily on signals from the digestive system combining with brain activity and autonomic nervous responses, followed by precise muscle actions (Rojas and Slusher, 2012; Stern *et al.,* 2021). Included within this overall response are feelings of queasiness, repeated heaving without expulsion, then ultimately the forceful ejection of contents (Stern *et al.,* 2021).

Deep inside the brainstem, a key cluster handling nausea sits within the medulla oblongata, this hub ties together the nucleus tractus solitarius, nearby reticular zones, and linked autonomic centers (Rojas and Slusher, 2012; Stern *et al.,* 2021). Functioning as one unit, these areas gather incoming data from multiple bodily routes (Stern *et al.,* 2021). Signals stream in: gut-based messages travel *via* vagal and sympathetic nerves, balance-related cues arrive through histamine and acetylcholine networks, bloodborne triggers spark activity in the chemoreceptor zone, while thoughts and feelings filter in from upper brain layers (Rojas and Slusher, 2012; Stern *et al.,* 2021). Triggered, the system unleashes a coordinated wave of nerve-driven muscle actions leading to vomiting (Stern *et al.,* 2021).

Inside the brain, near the base of the fourth ventricle, sits a small region known as the area postrema, this spot plays a key role in triggering nausea. Not shielded by the usual protective layer around the brain, it picks up signals from substances moving through the bloodstream. Chemical messengers like serotonin, dopamine, histamine, acetylcholine, and substance P bind to specific sites here, setting off responses linked to vomiting. Once activated, these sites send messages into deeper parts of the brainstem that coordinate the physical act of being sick. Seen often during cancer treatment, pain therapy with strong medications, or shifts in body chemistry, this response follows a consistent biological path.

Signals from the digestive system play an essential role (Stern *et al.,* 2021). When irritation, inflammation, infection, bloating, blockage, or movement issues occur, they trigger sensory nerves linked to the brain's vomiting centre *via* the vagus nerve (Rojas and Slusher, 2012; Stern *et al.,* 2021). Serotonin, produced by specialised cells lining the intestine, helps carry out this function (Rojas and Slusher, 2012). Following chemo, radiation, or harmful substances in the gut, this chemical attaches to 5-HT_3 receptors on nerve endings, sparking fast signals to vomit (Rojas and Slusher, 2012; StatPearls Publishing, 2024). Because of this connection between gut and brain, drugs blocking 5-HT_3 receptors work well against sudden nausea caused by cancer treatment or surgery (Rojas and Slusher, 2012; StatPearls Publishing, 2024).

Sometimes vomiting begins in the gut. Irritation there, along with blockages or poor movement, sparks a reaction carried by nerve signals from internal organs. This kind is often called reflexive. Elsewhere, certain substances floating in blood can activate a brain region near the fourth ventricle, leading to another form - driven not by physical disruption but by chemical triggers. Motion-related nausea emerges when inner ear signals clash with what eyes see, relying heavily on histamine and acetylcholine activity. Emotional states like dread or remembered discomfort also provoke vomiting, linking higher brain areas involved in feeling and memory to core brainstem circuits. Each route feeds into a shared control centre deep within the lower brain. Pathways differ, yet outcomes resemble one another closely.

Following nausea, the body may enter retching, though vomiting does not always occur. Nausea involves feeling the need to throw up, along with paleness, increased saliva, sweat, fast heartbeat, and irregular stomach activity. Instead of smooth movement, the gut shows chaotic rhythms during this early stage. Retching happens when belly and breathing muscles spasm while the vocal cords stay shut, blocking any release. Despite strong effort, nothing leaves the stomach at this point. Eventually, if pressure builds enough, the lower esophagus opens as the diaphragm pushes down and the abdomen tightens. This moment marks the sudden exit of stomach contents. Each step reveals how deeply sensation and automatic motion are linked in vomiting. Though separate, these stages often blur into one continuous process. Awareness of discomfort comes first and then physical reactions take over.

Among brain chemicals tied to vomiting, serotonin stands out when tissue damage or nerve signals spark immediate symptoms. Following irritation of gut linings, 5-HT_3 receptor pathways turn active, key during early stages. In a brain area that senses toxins, dopamine links to D_2 sites, shaping responses. Elsewhere, motion-related queasiness involves histamine at H_1 receptors along with acetylcholine via M1 channels. When sickness appears later after cancer drugs, a molecule called substance P engages NK1 zones, driving prolonged effects. Though rooted in tradition, herbal remedies ease nausea by quietly targeting gut movement, muscle spasms, inflammation, anxiety, or scent-based triggers, each herb working its own way (Haniadka *et al.,* 2012; Zhao *et al.,* 2022).

3. Herbal medicines that reduce nausea

3.1 Ginger (*Zingiber officinale* Roscoe)

Though often linked to digestive relief, ginger stands out due to broad research backing its role against nausea. Bioactives like gingerols and shogaols likely influence gut function by adjusting serotonin activity while calming intestinal contractions. Instead of just masking symptoms, these compounds also seem to ease underlying inflammation, possibly speeding stomach emptying. Studies focusing on pregnant individuals show reduced nausea severity when ginger is part of care. Even in tough settings, such as after surgery or during cancer treatment, it shows measurable benefit alongside conventional drugs. Rather than replacing pharmaceuticals, newer data place it best used alongside them. Evidence strength grows clearer with each review pointing toward consistent but modest gains. While not universal, results across trials highlight usefulness within specific clinical contexts.

3.2 Peppermint (*Mentha piperita* L.)

Peppermint often helps ease digestion problems, including gas and queasiness (Grigoleit and Grigoleit, 2005; McKay and Blumberg, 2006). Because its essential oil contains high levels of menthol, it can calm intestinal muscles, leading to relief from spasms and trapped wind (Grigoleit and Grigoleit, 2005). While proof for stopping nausea is not as strong as with ginger, this herb might work well when an upset stomach comes with indigestion or ongoing gut irritation (Cash *et al.,* 2016; McKay and Blumberg, 2006).

3.3 Chamomile (*Matricaria chamomilla* L.)

Though best known for calm, chamomile works partly through compounds like apigenin and certain terpenes (Srivastava *et al.,* 2010). Because of these elements, it eases inflammation and relaxes muscle spasms, while also reducing low-grade anxiety (Srivastava *et al.,* 2010). When nausea stems from digestive upset, nervous tension, or disrupted body rhythms, its role becomes more apparent (Hajková and Ševèíková, 2019; Srivastava *et al.,* 2010). Not strong enough alone against intense vomiting, still, it supports recovery gently when used alongside other care (Srivastava *et al.,* 2010).

3.4 Fennel (*Foeniculum vulgare* Mill.)

Fennel contains anethole along with similar volatile compounds, contributing to its ability to ease intestinal spasms and expel gas (Badgujar *et al.,* 2014; Rather *et al.,* 2016). Because of these properties, it has long supported relief from bloating, flatulence, and general stomach upset (Rather *et al.,* 2016; Badgujar *et al.,* 2014). Nausea linked to gut cramps or trapped wind might also lessen with its use (Badgujar *et al.,* 2014; Rather *et al.,* 2016). Given this pattern, its role in reducing vomiting stems largely from calming digestion (Badgujar *et al.,* 2014).

3.5 Clove (*Syzygium aromaticum* (L.) Merr. & L.M. Perry)

Eugenol, found in clove, acts as a phenolic agent showing traits like calming inflammation, fighting oxidative stress, easing pain, along with slight muscle relaxation (Chaieb *et al.,* 2007). Because of such actions, upset in the stomach lining or deep abdominal unease might ease, lowering triggers linked to feeling sick (Chaieb *et al.,* 2007). Rather than working like precise receptor-targeting medicines meant to block vomiting, clove fits better as a background aid for digestion and quieting swelling (Chaieb *et al.,* 2007).

3.6 Lemon (*Citrus limon* (L.) Osbeck)

Lemon often appears in aroma-based methods to ease nausea, particularly during pregnancy or due to light stress (Kiecolt-Glaser *et al.,* 2008; Lehrner *et al.,* 2005). Because its scent molecules travel through smell-related brain routes, shifts in emotion, bodily regulation, and how queasiness feels can occur (Kiecolt-Glaser *et al.,* 2008; Lehrner *et al.,* 2005). Unlike plant remedies aimed at digestion, this route matters more when feelings or surroundings spark discomfort (Lehrner *et al.,* 2005).

3.7 Cardamom (*Elettaria cardamomum* (L.) Maton)

Though cardamom is traditionally seen as aiding digestion and easing gas, science still lacks strong proof it stops vomiting. Essential oils inside might boost gut fluids while calming stomach discomfort, giving reason to trust old uses for nausea. Research by Dutta and Ray in 2016 notes such effects sound possible but remain poorly tested in people.

3.8 Basil (*Ocimum tenuiflorum* L.)

Basil (specifically Tulsi) is highly regarded in traditional medicine for its adaptogenic, anti-inflammatory, and mild anxiolytic properties (Mondal *et al.,* 2011; Pattanayak *et al.,* 2010). When nausea arises alongside tension, swelling inside the body, or nervous system imbalance, these traits might bring some relief (Mondal *et al.,* 2011; Pattanayak *et al.,* 2010). Like many botanicals discussed here, its power against vomiting plays more of a background role rather than taking centre stage (Pattanayak *et al.,* 2010).

3.9 Amla (*Phyllanthus emblica* L.)

Amla gains recognition due to its ability to combat oxidative stress, tied closely to vitamin C, tannins, and polyphenols (Baliga and Dsouza, 2011). Though, it does not act directly against vomiting, its influence on gut integrity might ease stomach discomfort. Because of this effect, certain individuals experiencing nausea could notice subtle improvements (Baliga and Dsouza, 2011).

3.10 Cinnamon (*Cinnamomum verum* J. Presl)

Cinnamon works on digestion, easing gas, stirring up stomach activity, while reducing inflammation - effects tied closely to cinnamaldehyde and similar plant compounds (Ranasinghe *et al.,* 2013). Because it supports gut movement and comfort, relief from nausea linked to poor digestion becomes possible (Ranasinghe *et al.,* 2013) (Figure 1 and Table 1).

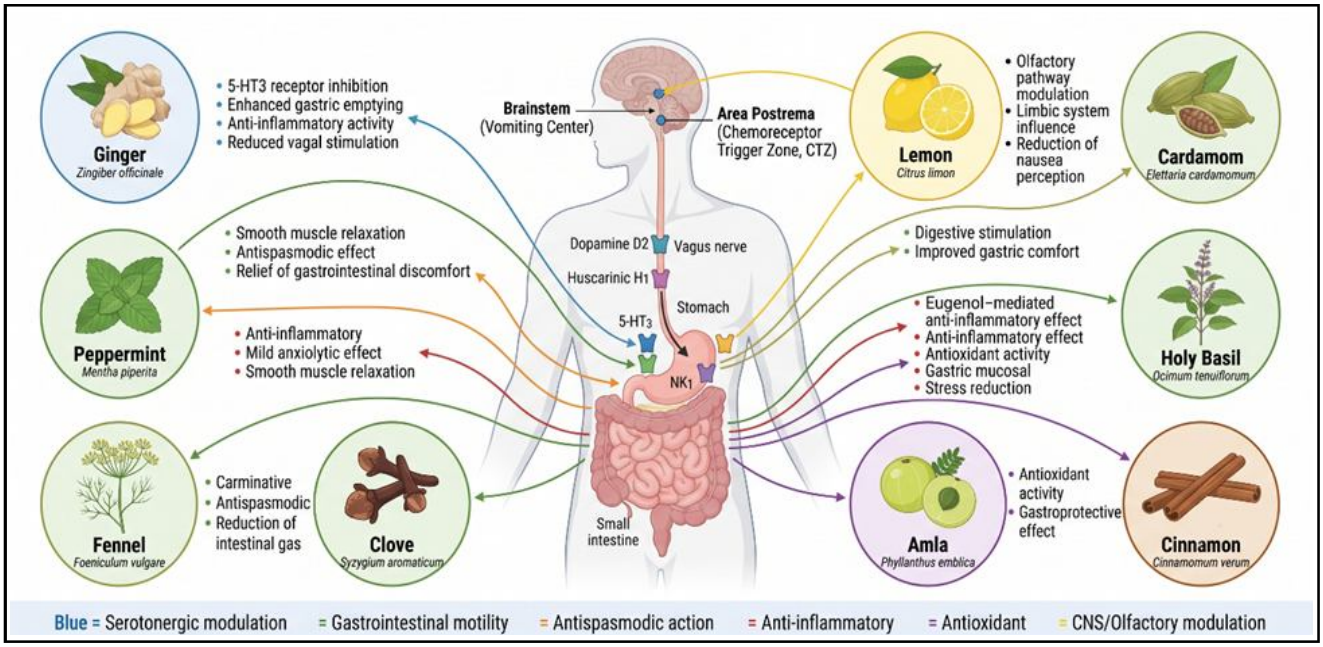

Figure 1: Mechanisms of action of herbal medicines used in the management of nausea and vomiting.

Major medicinal plants traditionally employed as antiemetic agents and their principal pharmacological mechanisms are illustrated. Ginger primarily inhibits 5-HT3 receptor-mediated signaling and enhances gastric emptying, whereas peppermint, fennel, and cinnamon improve gastrointestinal motility and exert antispasmodic effects. Chamomile, clove, and holy basil exhibit anti-inflammatory properties, while clove and amla provide antioxidant and gastroprotective effects. Lemon modulates central nervous system and olfactory pathways involved in nausea perception, and cardamom promotes digestive function. These complementary mechanisms collectively influence gut-brain communication, vagal signaling, gastric motility, and central emetic pathways to alleviate nausea and vomiting.

Table 1: Summary of herbal medicines which reduces nausea

S.No.	Drug	Active constituents	Mechanism	Uses
1	Ginger	Gingerols	5-HT_3 inhibition	Motion sickness
2	Peppermint	Menthol	Antispasmodic	Nausea
3	Chamomile	Flavonoids	Anti-inflammatory	Mild nausea
4	Fennel	Anethole	Carminative	GI disorders
5	Clove	Eugenol	Anti-inflammatory	Vomiting
6	Lemon	Limonene	CNS action	Pregnancy nausea
7	Cardamom	Essential oils	Digestive stimulant	Nausea
8	Basil	Eugenol	Adaptogenic	Motion sickness
9	Amla	Vitamin C	Antioxidant	Indigestion
10	Cinnamon	Cinnamaldehyde	Carminative	GI disorders

4. Pharmacological summary

Herbal remedies likely ease nausea not by targeting one specific receptor, but through several overlapping effects on body systems (Haniadka *et al.,* 2012; Zhao *et al.,* 2022). Instead of blocking signals outright, they appear to influence gut-to-brain communication via serotonin pathways, while also helping stomach emptying (Crichton *et al.,* 2019; Haniadka *et al.,* 2012). Spasms in intestinal muscles tend to lessen under their effect. Inflammation within the digestive tract often declines at the same time. Oxidative damage sees some degree of shielding. Alongside these physical changes comes a calming impact on nervous system imbalances tied to anxiety (Zhao *et al.,* 2022; Crichton *et al.,* 2019). Because symptoms like indigestion, gas, abdominal tightness, emotional strain, or dizziness frequently accompany queasiness, such broad activity makes botanicals a frequent choice (Badgujar *et al.,* 2014; Haniadka *et al.,* 2012).

5. Why herbal medicines are preferred over synthetic medicines

People sometimes choose herbal remedies, seeing them as less risky, closer to nature, cheaper, or more aligned with tradition compared to lab-made medications (Ekor, 2014; World Health Organisation, 2013). For minor queasiness, discomfort during pregnancy, or ongoing gut issues without clear structural cause, such options might feel milder, more suitable even (Lete and Allué, 2016; Viljoen *et al.,* 2014). Though not always targeted at one specific pathway, plant-based treatments can influence multiple body systems at once, unlike many standard anti-nausea pills (Haniadka *et al.,* 2012; Zhao *et al.,* 2022). Just because herbs are popular does not mean they work better for everyone (Ekor, 2014). When nausea follows chemo, or vomiting turns severe, proven drug treatments remain necessary (Chen *et al.,* 2024; StatPearls Publishing, 2024). Though plant-based remedies may help sometimes, their role fits alongside standard care - guided by proof, risk level, and patient needs (Ekor, 2014; Haniadka *et al.,* 2012).

6. Commercially available herbal formulations

Available in capsules, tablets, teas, syrups, essential oils, lozenges, and mixed herbal blends, plant-based remedies help ease nausea (World Health Organisation, 2013). While ginger extracts back their use with solid research, peppermint oil and lemon-scented therapies tend to appear where mild stomach discomfort or smell-triggered queasiness occurs (Crichton *et al.,* 2019; Lehrner *et al.,* 2005). Blends combining ginger, fennel, peppermint, basil, and cardamom show up frequently across both folk medicine and store shelves when several gut issues arise at once (Haniadka *et al.,* 2012; World Health Organisation, 2013).

7. Discussion

Though data exist, they show inconsistency across plant-based remedies for nausea (Chen *et al.,* 2024; Haniadka *et al.,* 2012). Notably studied among these is ginger - its backing comes from multiple clinical uses, particularly during pregnancy, alongside cancer treatment and surgery recovery contexts (Crichton *et al.,* 2019; Chen *et al.,* 2024; Viljoen *et al.,* 2014). In contrast, peppermint, chamomile, fennel, along with lemon, appear weaker under scrutiny, their benefits leaning toward minor gut discomfort rather than intense vomiting episodes (Lehrner *et al.,* 2005; Badgujar *et al.,* 2014; Srivastava *et al.,* 2010). Meanwhile, clove, cardamom, basil, amla, plus cinnamon carry theoretical promise rooted in lab findings and long-term cultural practice, yet firm trial support remains sparse despite biological plausibility (Chaieb *et al.,* 2007; Baliga and Dsouza, 2011; Ranasinghe *et al.,* 2013; Dutta and Ray, 2016).

Though progress exists, challenges persist here (Chen *et al.,* 2024; Haniadka *et al.,* 2012). Differing plants, ways to extract compounds, amounts used, and how they enter the body - each affects what emerges (Ekor, 2014; Haniadka *et al.,* 2012). Some work relies on narrow samples or mixes many symptoms without isolating vomiting outcomes specifically (Chen *et al.,* 2024; Hajková and Ševèíková, 2019). Knowledge gaps linger about safety and how herbs may alter medicine effects across certain groups (Ekor, 2014). Ahead lies a need for consistent herbal forms, experiments built on biological logic, solid trial methods, and results tied closely to patient experience (Chen *et al.,* 2024; Zhao *et al.,* 2022).

8. Conclusion

Though plant-based remedies play a role in easing nausea, their value lies mainly in complementary care (Ekor, 2014; Haniadka *et al.,* 2012). Because they influence serotonin pathways between gut and brain, these substances affect digestion, muscle function, inflammation, free radical levels, along with brain-driven bodily

responses (Crichton *et al.,* 2019; Haniadka *et al.,* 2012; Zhao *et al.,* 2022). While examining various herbs, researchers find ginger stands out due to stronger backing, yet others - like peppermint, chamomile, fennel, clove, lemon, cardamom, basil, amla, and cinnamon are noted more for secondary support (Badgujar *et al.,* 2014; Crichton *et al.,* 2019; Ranasinghe *et al.,* 2013; Srivastava *et al.,* 2010). Though findings so far show potential, they fall short of supporting widespread clinical approval without limits (Chen *et al.,* 2024; Ekor, 2014). Until methods become more consistent, data more robust, and risks thoroughly assessed, these plant-based treatments would not gain firmer footing in standard care (Chen *et al.,* 2024; Zhao *et al.,* 2022).

Availability of data and material

All data are provided within the manuscript.

Authorship contribution statement

Md Kaif Siddique, Ali Athar, Badruddeen, Juber Akhtar, Mohammad Ahmad, Akash Srivastava, and Anas Islam: Contributed to literature review, literature collection and analysis, drafting, reviewing, and editing the manuscript.

Mohammad Irfan Khan: Contributed to conceptualisation, methodology, supervision, literature analysis, critical revision, and final editing of the manuscript.

Muhammad Arif and Asad Ahmad: Contributed to conceptualisation, methodology, critical revision, and final approval of the manuscript.

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All authors gave their full consent for publication and submission to this journal.

Conflict of interest

The authors declare no conflicts of interest relevant to this article.

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