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An Overview on Avipattikar Churna: Miraculous Natural Herb of Ayurveda

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Abstract:

Avipattikar Churna is a classical Ayurvedic formulation renowned for its therapeutic efficacy in managing various digestive disorders. Comprising a synergistic blend of natural ingredients, including herbs like Triphala, Indian jalap, and black salt, Avipattikar Churna has been utilized in Ayurvedic medicine for centuries. This review provides a comprehensive overview of Avipattikar Churna, encompassing its traditional uses, phytochemical composition, pharmacological actions, and modern clinical research findings. The formulation's traditional uses highlight its role in alleviating hyperacidity, acid reflux, gastritis, indigestion, and constipation, among other gastrointestinal disturbances. Avipattikar Churna is esteemed for its balancing effect on the Pitta dosha, according to Ayurvedic principles, thereby restoring digestive harmony. Its diverse herbal components contribute to its multifaceted actions, including carminative, digestive stimulant, anti-inflammatory, and laxative properties. Phytochemical analysis reveals the presence of bioactive compounds such as tannins, flavonoids, alkaloids, and polyphenols in Avipattikar Churna, which underlie its therapeutic effects. These constituents exert antioxidant, anti-inflammatory, and gastroprotective actions, contributing to the formulation's efficacy in gastrointestinal disorders.

Modern pharmacological studies corroborate the traditional uses of Avipattikar Churna, demonstrating its potential in reducing gastric acidity, enhancing digestive functions, and ameliorating symptoms associated with acid-peptic disorders. Furthermore, clinical trials have evidenced its safety profile and efficacy in providing symptomatic relief in conditions like hyperacidity and acid reflux. According to the findings of this systematic study, avipattikar churna may have a wide range of therapeutic uses. Though encouraging, the considerable variation throughout studies and the small number of studies indicates that more research using strong and sufficiently powered study designs is necessary. On the basis of above research, we can say that Avipattikar Churna is a miraculous natural herb of ayurveda for the management of gastrointestinal disorders (Figure 1).

Key words: Avipattikar churna, Gastrointestinal Disorders, Indigestion, Miraculous Natural Herb, Peptic ulcer.

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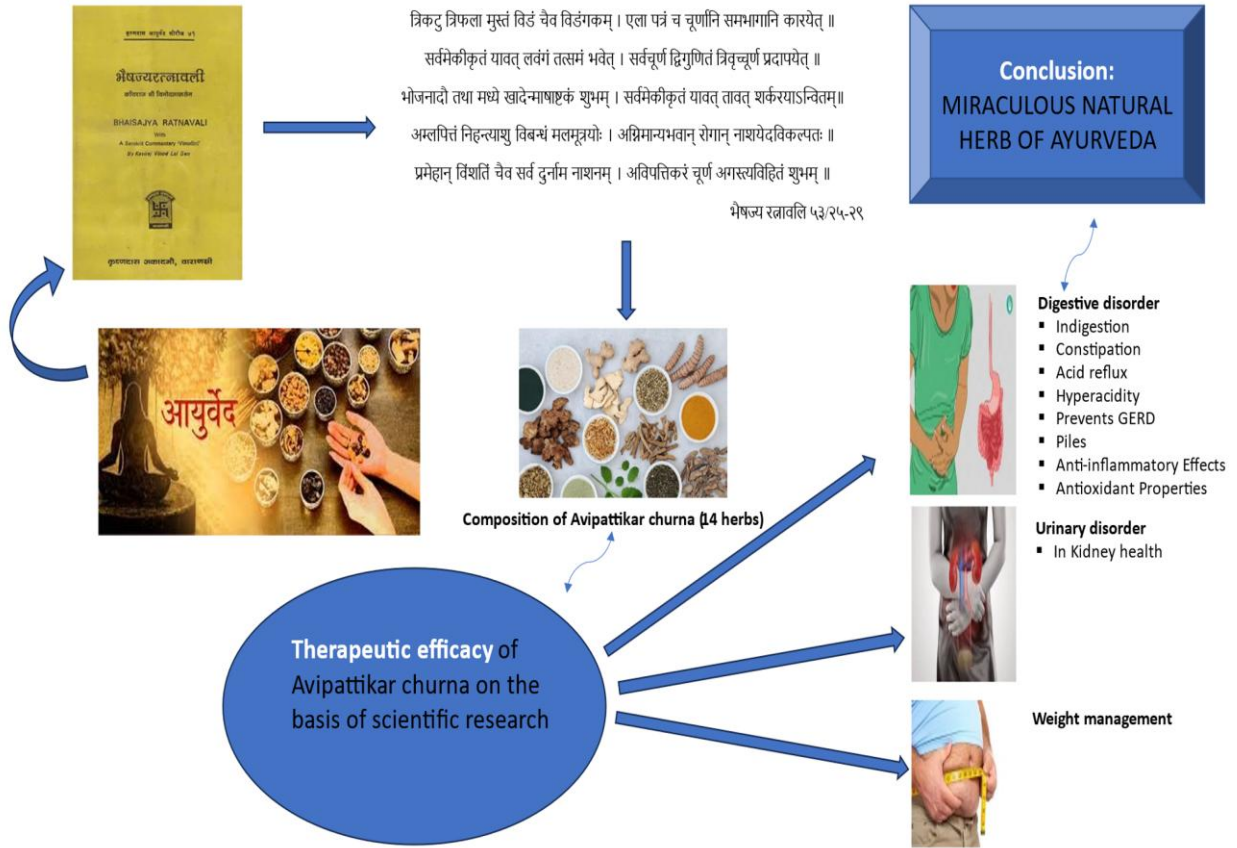


Figure 1: Graphical Abstract

1. Introduction:

Avipattikar Churna is a polyherbal formulation famous in ayurvedic medicine which is prominent among the important herbs of traditional system of medicine in India (Amritpal Singh, 2007). Which originated in India 5000 years ago (Nageshwar and Nripendra, 2024). Avipattikar churna is especially revered for its therapeutic properties in digestive health. The herbal powder is made by combining the precise combination of traditional Ayurvedic herbals which include (Table.1) Amalaki, Haritaki (chebulic myrobalan), vibhitaki (belliric myrobalan), Maricha, Shunthi, Pippali, Vida lavana, Vidang, Nagarmotha, Ela, Tejapatara, Launga, Nishotha and Sarkara which is supported by the islok of भैषज्य रत्नावलि ५३/२५-२९. (Kaviraj shree Ambikadattashatri Ayurvedacharya, 922 and Bhishagratna and Shastri, 2006).

त्रिकटु	त्रिफला	मुस्तं	विडं	चैव	विडंगकम्	एला पत्रं
	च चूर्णानि		समभागानि		कारयेत्	॥
सर्वमे	कीकृतं	यावत्	लवंगं	तत्समं	भवेत्	सर्वचूर्णं
	द्विगुणितं	त्रिवृच्चूर्णं			प्रदापयेत्	॥
भोजनादौ	तथा मध्ये	खादेन्माषाष्टकं			शुभम्	
सर्वमेकीकृतं	यावत्	तावत्	शर्करयाऽन्वितम्॥			
अम्लपित्तं	निहन्त्याशु	विबन्धं	मलमूत्रयोः			
अग्निमान्यभवान्	रोगान्	नाशयेदविकल्पतः				॥
प्रमे	हान्	विंशतिं	चैव सर्व	दुर्नाम	नाशनम्	
अविपत्तिकरं	चूर्णं	अगस्त्यविहितं			शुभम्	॥

It is renowned for its ability to balance pitta dosha (Ravte et al, 2015, Aviral and Satish 2016; and Shastri 2010). Which is one of the fundamental principles governing digestion and absorption in Ayurveda (Zaveri and Patel, 2011).

Avipattikar churna holds the most effective position among other Ayurvedic formulations for health management. When it comes to ailments like acidity, heartburn, indigestion, and nausea brought on by a Pitta dosha imbalance, avipattikar churna is incredibly beneficial (Charan et al, 2021),[10]. This is brought on by a sedentary lifestyle, poor eating habits, or a lack of physical activity. Avipattikar churna cools the body by lowering the excessive heat produced by the pitta dosha imbalance (Shri Baidyanath, 2018 and Angadi, 2016).

Avipattikar Churna Powder works by inhibiting prostaglandin and leukotriene synthesis; supplementing the diet and providing nutrients; possessing the activities due to the presence of piperine, piperlongumine, sylvatin, sesamin, diaeudesmin piperlonguminine, pipermonaline, and piperundecalidine constituents; blocking the T- lymphocyte-mediated cytotoxicity; increasing the gastric emptying time; increasing the humoral antibody production; possessing the hypolipidemic, hypoglycemic effects; possessing the strong inhibitory activity on pancreatic lipase; suppression of absorption mediated by gallic acid; inhibiting serum and hepatic mitochondrial thiobarbituric acid-reactive substance levels; increasing the expressions of hepatic (necrosis factor) NF-kappaB; inducing NO synthase (iNOS), and cyclooxygenase-2 (COX-2) protein levels;(Lockrey, 1999), improving digestion, eliminating natural toxins and supporting proper function of the liver; lowering the amount of liver and pancreas thiobarbituric acid-reactive substances(Thakkar and Patel, 2010); decreasing the blood glucose, serum total cholesterol, and triglycerides, and increasing the high density lipoproteins-cholesterol levels(Bhandari and Kamdod, 2012); lowering the systolic and diastolic blood pressures; increasing the even of fibrinolysis; possessing antibacterial activity due to presence of essential oils; possessing bactericidal activity(Yadav and Singh, 2023); treating various ailments; decreasing the gastric acid content; lowering the

formalin induced edema volume; producing the hepatoprotective activity against carbon tetrachloride induced liver toxicity(Praveen et al, 2020); healing various ailments; improving the insulin production; raising the glucose tolerance; possessing the hypotension, diuresis action; possessing the antioxidant activity(Altaf et al,2023);possessing the anticancer activity; possessing the antimicrobial action; possessing the anti-inflammatory action(Anosike, 2009; and Attari, 2019).

2. Composition and Active Ingredients:

Available in dietary supplement form, Avipattikar Churna contains 14 different Ayurvedic herbs and ingredients and is often used to treat digestive problems (Ambikadattashatri, 922; and Bhishagratna and Shastri, 2006).

Table 1. Natural ingredients present in Avipattikar churna

Name of Ingredients				
S. no.	Sanskrit Name	English Name	Hindi Name	Botanical Name
1	<i>Maricha</i>	Black Pepper	<i>Kali Marich</i>	<i>Piper nigrum</i>
2	<i>Shunthi</i>	Ginger	<i>Sonttah</i>	<i>Zingiber officinale</i>
3	<i>Pippali</i>	Indian long pepper	<i>Pippal</i>	<i>Piper longum</i>
4	<i>Amalaki</i>	Indian gooseberry	<i>Awala</i>	<i>Embelica officinalis</i>
5	<i>Vibhitaki</i>	Belliric Myrobalan	<i>Behada</i>	<i>Terminalia bellirica</i>
6	<i>Haritaki</i>	Chebulic myrobalan	<i>Harad</i>	<i>Terminalia chebula</i>
7	<i>Vida lavana</i>	Ammonium chloride	<i>Vida namak</i>	<i>Ammonium Salt</i>
8	<i>Vidang</i>	False black pepper	<i>Vaividang</i>	<i>Embelia ribes</i>
9	<i>Nagarmotha</i>	Nut grass	<i>Musta</i>	<i>Cyperus rotundus</i>
10	<i>Ela</i>	Cardamom	<i>Choti Elaichi</i>	<i>Elettaria cardamomum</i>
11	<i>Tejapatara</i>	Indian bay leaf	<i>Tejpata</i>	<i>Cinnamomum tamala</i>
12	<i>Launga</i>	Clove	<i>Laung</i>	<i>Syzygium aromaticum</i>
13	<i>Nishotha</i>	India Jalap	<i>Trivrit</i>	<i>Operculina turpethum</i>
14	<i>Sarkara</i>	Candy sugar	<i>Mishri</i>	<i>Saccharum officinarum</i>

3. Classical Uses of Avipattikar Churna:

3.1 Peptic Ulcers:

Avipattikar churna, a revered herbal formulation in ayurveda, offers a classical solution for managing peptic ulcers, a condition characterized by the erosion of the lining of the stomach or duodenum due to excessive gastric acid secretion and inflammation (Suryavanshi, 2015). Its efficacy in addressing peptic ulcers stems from a synergistic blend of herbs carefully

selected for their anti-inflammatory, ulcer-healing, and digestive-regulating properties (Aviral and Satish, 2016; and Dhanik et al, 2017).

In the study performed on rats, researchers determined that at a dose of 500 milligrams per kilogram (mg/kg), Avipattikar helped discourage the development of peptic ulcers by reducing the secretion of stomach acid. It should be noted that these results have not been repeated in humans, a necessary step before Avipattikar churna is determined to be a safe and effective treatment option for peptic ulcers (Keserla et al, 2021).

3.2 Prevents GERD:

Avipattikar churna comes highly recommended for offering symptomatic relief from gastroesophageal reflux disorder (GERD) (Baragi and Baragi, 2017), a condition characterized by the irritation of the food pipe due to the backward flow of stomach acid, leading to symptoms like heartburn, throat pain, chest pain, and a sour taste [25]. Its remarkable effectiveness in treating GERD lies in its ability to facilitate the unidirectional passage of food from the stomach to the intestines, thereby preventing the reflux of gastric contents into the oesophagus (Kulkarni et al, 2021). This mechanism of action efficiently alleviates the pain and discomfort associated with heartburn, providing significant relief for individuals suffering from GERD symptoms (Gadad and Gudaganatti, 2021).

3.3 Indigestion:

Indigestion, essentially an incomplete digestion process of consumed food, is a common ailment. Avipattikar churna stands out as a highly regarded Ayurvedic remedy for managing indigestion effectively (Vimala and Gricilda, 2014). It deepens (appetizer) and Pechan (digestive) properties in alleviating symptoms associated appetite and aiding in the proper digestion of food, Avipattikar churna facilitates the smooth functioning of the digestive system, addressing the root cause of indigestion [29]. Incorporating Avipattikar churna into one's routine can provide relief from discomfort and promote overall digestive wellness without resorting to harsh chemical interventions [10],[35].

3.4 Constipation:

Constipation refers to the discomforting state where individuals experience challenges in fully evacuating their bowels or passing hardened and dry feces. In ayurveda, constipation is attributed to an imbalance or aggravation of the vata dosha, particularly affecting the large intestine (Kulkarni and Ghurghure, 2018). Factors exacerbating this imbalance include indulging in junk foods, excessive consumption of caffeinated beverages like coffee or tea, irregular sleeping patterns, heightened stress levels, and feelings of depression. These elements contribute in the colon, leading to the manifestation of constipation [29].

Avipattikar churna, a revered herbal formulation deeply rooted in ayurvedic tradition, offers a classical solution for the common yet discomforting condition of constipation. Its efficacy in addressing this ailment lies in a carefully crafted blend of herbs known for their gentle yet potent laxative properties. At the forefront of its action is Haritaki, a key ingredient renowned for its ability to promote bowel regularity without causing dependency or harsh purgative effects [10].

The gentle laxative action of Haritaki in Avipattikar churna facilitates the smooth passage of stool, effectively relieving constipation while promoting overall digestive health. By supporting proper bowel function and regular elimination, it helps prevent the buildup of toxins in the body, thereby promoting detoxification and maintaining optimal health.

3.5 Kidney Health:

Studies have demonstrated that Avipattikar churna can decrease the likelihood of urinary tract infections (UTI) and kidneys issues by enhancing kidney's function. Moreover, it exhibits effectiveness and preventing oxalate buildup, aiding in the removal of urine salts such as calcium and oxalates. Additionally, it has shown promise in treating nephritis by reducing inflammation in the kidney's glomeruli, tubules, and interstitial tissue [31].

In the realm of ayurveda, Avipattikar churna, although primarily known for its digestive benefits, also offers significant support for kidney health. While it's not a direct treatment for kidney disorders, its holistic action on digestion and metabolism indirectly contributes to

kidney health maintenance (Patil and Shah, 2019). Avipattikar churna unique blend of herbs, including amla, Haritaki, and trikatu, collectively aids in detoxification, fluid balance and digestive regulation, which are essential aspects of kidneys health (Nair et al, 2010).

Amla, a key ingredient in Avipattikar churna, is rich in vitamin C and antioxidants stress and inflammation. By reducing inflammation in the body, including the kidneys, Amla supports renal health and function. Its diuretic properties also assist in flushing out toxins and excess fluids, easing the burden on the kidneys (Yadav and Singh, 2023; and Nair, 2010).

3.6 Fights Inflammation:

The potent antioxidant and anti-inflammatory properties of Avipattikar churna play a crucial role in reducing inflammation, which effectively alleviates pain and swelling (Altaf et al, 2023). This is experiencing difficulty urinating due to conditions such as an enlarged prostate or inflamed tissue. Avipattikar churna innate ability to mitigate discomfort and soreness contributes to regulating bladder movement, providing relief for those struggling with urinary issues [31].

3.7 Weight Loss:

Avipattikar churna offers a multifaceted approach to digestive wellness, including aiding in the prevention of overeating. By inducing a sense of early satiety before meals, it helps regulate appetite, reducing the likelihood of overindulgence. This mechanism not only promotes healthy eating habits but also contributes to weight management by preventing excessive calorie intake. Furthermore, avipattikar churna supports liver function and bile production, crucial for efficient fat digestion and breakdown. Its herbal composition stimulates the liver, enhancing its ability to produce bile, which aids in emulsifying fats and promoting their absorption. By optimizing digestive processes and supporting liver health (Thakkar and Patel, 2010), Avipattikar churna offers holistic support for overall well-being and weight management without resorting to synthetic interventions.

3.8 Piles:

In today's sedentary lifestyle, piles have emerged as a prevalent issue, often stemming from chronic constipation exacerbated by imbalances in all three doshas, particularly vata dosha (Aviral and Satish, 2016). The diminished digestive fire associated with aggravated vata can result in persistent constipation, a primary contributor to piles. If disregarded or untreated, this condition can progress to cause discomfort and swelling in the anal region, forming piles (Shri Baidyanath, 2018). Avipattikar churna dual action of alleviating pain and balancing both vata and pitta doshas renders it beneficial in managing painful piles. Its natural properties the risk of pile formation and providing relief from associated symptoms without reliance on synthetic remedies (Angadi, 2016).

3.9 Appetite stimulant:

Because of a lack of digestive fire Mand Agni, the food consumed may not be properly digested, leading to the formation of Ama (Ruchita and Yogesh, 2022). This can result in anorexia or loss of appetite, which is known as Aruchi in Ayurveda. It is a situation caused by an imbalance of the Vata, Pitta, and Kapha doshas (Ravte et al, 2015). There are some psychological factors that contribute to the incomplete digestion of food, resulting in insufficient secretion of gastric juice in the stomach and, as a result, loss of appetite. Because of its appetizer and digestion properties, taking Avipattikar Churna regularly will help you digest the food by digesting the Ama (Ruchita and Yogesh, 2022).

3.10 Treating heartburn:

Individuals suffering from heartburn, a common symptom of acid reflux, can benefit from avipattikar churna. It helps neutralize excess stomach acid, relieving the burning sensation [10].

Avipattikar churna is commonly used in ayurvedic medicine to alleviate heartburn and acidity. Its unique blend of herbs helps balance the digestive fire (Agni) and reduces excess acidity in the stomach, thereby relieving symptoms of heartburn (Ruchita and Yogesh, 2022). The keys ingredients like Tri Phala, Indian gooseberry (Amalaki), Long pepper (Pippali), and others work synergistically to soothe the gastrointestinal tract, reduce inflammation, and

promote proper digestion (Bhandari and Kamdod, 2012; and Nair et al, 2010). This traditional remedy is often preferred for its natural approach to managing heartburn without the side effects associated with conventional antacids (Yadav and Singh, 2023). However, as with any herbal remedy, it's advisable to consult with a qualified ayurvedic practitioner for proper dosage and personalized treatment.

4. Scientific Research on Avipattikar Churna:

Avipattikar Churna is a traditional Ayurvedic herbal formulation that has been used for centuries in India for the management of various gastrointestinal disorders, particularly hyperacidity, indigestion, acid reflux, and gastritis. While there is limited scientific research specifically focused on Avipattikar Churna as a standalone product, several studies have investigated its individual constituents and their potential therapeutic effects. Here are some key findings from scientific research related to Avipattikar Churna:

4.1 Anti-ulcer Activity: Research has demonstrated the anti-ulcerogenic effects of ingredients found in Avipattikar Churna. For example, studies on herbs like Amla (*Embolia officinalis*) and Licorice (*Glycyrrhiza glabra*) have shown potential in reducing gastric ulcers and protecting the gastric mucosa (Aviral and Satish, 2016; and Lockrey, 2019; and Anosike et al, 2009; and Vimala and Gricilda, 2014; and Gyawali, 2013; and Nair et al. 2010).

4.2 Antioxidant Properties: Many herbs present in Avipattikar Churna possess antioxidant properties. Antioxidants help in neutralizing free radicals and reducing oxidative stress, which can contribute to the development of gastrointestinal disorders. Herbs such as Amla and Long pepper (*Piper longum*) have been studied for their antioxidant effects (Bhandari and Kamdod, 2012; and Yadav and Singh, 2023; and Thakur and Chaudhary, 2021; and Altaf et al, 2023).

4.3 Anti-inflammatory Effects: Several ingredients in Avipattikar Churna have been investigated for their anti-inflammatory properties. Research suggests that compounds found in long pepper and Indian bay leaf (*Cinnamomum tamala*) may help alleviate inflammation in the gastrointestinal tract, potentially providing relief from conditions like gastritis (Bhandari and Kamdod, 2012; and Yadav and Singh, 2023; and Altaf et al, 2023; and Anosike et al, 2009).

4.4 Gastric Motility Regulation: Some herbs in Avipattikar Churna, such as long pepper and Indian bay leaf, have been studied for their effects on gastrointestinal motility. These herbs may help regulate gastric emptying and improve digestive function (Altaf et al, 2023; and Attari et al, 2019; and Nair et al, 2010; and Yadav et al, 2020; and Godara et al, 2018).

4.5 Acid-neutralizing Effects: Ingredients like Amla and Licorice have been reported to possess acid-neutralizing properties [39]. These herbs may help in reducing gastric acidity and providing relief from symptoms of hyperacidity and acid reflux (Bhandari and Kamdod, 2012; and Yadav and Singh, 2023; and Praveen et al, 2020).

4.6 Safety and Toxicity Studies: While Avipattikar Churna is generally considered safe when used as directed, studies evaluating the safety profile and potential toxicity of its constituents, especially in high doses or prolonged use, are important for ensuring its safe use (Patil and Shah, 2019) [35].

4.7 Clinical Trials: Although limited, some clinical trials have evaluated the efficacy of Avipattikar Churna in managing gastrointestinal disorders. These trials typically assess its effects on symptom relief, gastric acidity, and overall gastrointestinal health (Aviral and Satish, 2016; and Keserla et al, 2021; and Gyawali et al, 2013; and Nair et al, 2010; and Yadav et al, 2019; and Chauhan et al, 2015).

Overall, while there is a lack of comprehensive scientific research specifically focused on Avipattikar Churna as a whole formulation, studies on its individual ingredients provide insight into its potential therapeutic effects. Further research, including well-designed clinical trials, is needed to better understand the efficacy, safety, and mechanisms of action of Avipattikar Churna in the management of gastrointestinal disorders.

5. Side-effects of Avipattikar Churna Powder : The following is a list of possible side-effects that may occur from all constituting ingredients of Avipattikar Churna Powder. This is not a comprehensive list. These side-effects are possible, but do not always occur. Some of the side-effects may be rare but serious. Consult your doctor if you observe any of the following side-effects, especially if they do not go away [10],[35],[45].

- Asthenia
- Vertigo
- Abdominal distress
- Vomiting
- Edema
- Severe anoxia
- Gastrointestinal adverse effects
- Inhalation of piper nigrum has caused respiratory irritation
- Respiratory arrest
- Optic atrophy
- Abdominal pain
- Chest pain
- Dehydration
- Hypotension
- Confusion
- Shock
- Unconsciousness
- Nausea
- Abdominal fullness
- Myalgia
- Muscle weakness
- Dizziness

6. Properties of Avipattikar churna powder:

Avipattikar churna is renowned in ayurveda for its multifaceted properties, which are attributed to its constituent herbs. Here are the detailed properties:

6.1 Pitta pacifying: Avipattikar churna primarily balances the pitta dosha, which governs metabolism, digestion, and energy production (Sangeeta and Govinda, 2022). It helps to cool down excessive heat and acidity in the body, making it beneficial for conditions like hyperacidity, heartburn, and acid reflux (Madhavi and Sharda, 2019),[25].

6.2 Digestive aid: It improves digestion by stimulating the secretion of digestive juices and enzymes, thereby enhancing the overall digestive process. This aids in relieving symptoms of indigestion, bloating, and flatulence (Patil and Shah, 2019),[10].

6.3 Laxative: Avipattikar churna has mild laxative properties that helps regulate bowel movements. It promotes healthy elimination of waste from the intestines, preventing constipation and supporting detoxification [10].

6.4 Carminative: The herbs in avipattikar churna possess carminative properties, which alleviate gas and bloating by expelling trapped gas from the digestive tract. This can help reduce discomfort associated with gastrointestinal issues (Suryavanshi, 2015; and Keserla et al, 2021; and Vimala and Gricilda, 2014).

6.5 Anti-inflammatory: It exhibits anti-inflammatory properties, which can help soothe inflammation in the digestive system, particularly in conditions like gastritis and peptic

ulcers (Lockrey, 1999; and Yadav and Singh, 2023; and Altaf et al, 2023; and Anosike et al, 2009; and Thakur and Chaudhary, 2021).

6.6 Detoxifying: Avipattikar churna aids in detoxification by cleansing the digestive tract and removing accumulated toxins. This supports overall health and well-being by promoting the eliminations of waste products from the body (Vimala and Gricilda, 2014),[29].

6.7 Mild Diuretic: Some of the herbs in the formulation have diuretic properties, promoting the elimination of excess fluids from the body. This can be beneficial for conditions like water retention and edema (Kulkarni and Ghurghure, 2018).

Overall, Avipattikar churna is a well-rounded ayurvedic remedy that addresses various digestive issues while promoting balance and harmony within the body. However, it's essential to consult with a qualified ayurvedic practitioner before using it, especially if you have specific health concerns or medical conditions.

7. Precautions of Avipattikar Churna Powder:

Before using Avipattikar Churna Powder, inform your doctor about your current list of medications, over the counter products (e.g. vitamins, herbal supplements, etc.), allergies, pre-existing diseases, and current health conditions (e.g. pregnancy, upcoming surgery, etc.). Some health conditions may make you more susceptible to the side-effects of the drug [10]. Take as directed by your doctor or follow the direction printed on the product insert. Dosage is based on your condition. Tell your doctor if your condition persists or worsens. Important counselling points are listed below [35],[45].

- Do not use in large amounts.
- Pregnancy
- Pregnancy and Breastfeeding
- Pregnant, planning to get pregnant or breastfeeding
- Take caution if you have skin sensitivity
- cautiously consume if you have chest and lung diseases
- diabetes
- hypertensive patients
- patients with renal disease

8. Interactions with Avipattikar Churna Powder:

If you use other drugs or over the counter products at the same time, the effects of Avipattikar Churna Powder may change [45]. This may increase your risk for side-effects or cause your drug not to work properly. Tell your doctor about all the drugs, vitamins, and herbal supplements you are using, so that you doctor can help you prevent or manage drug interactions. Avipattikar Churna Powder may interact with the following drugs and products:

- Aspirin
- Fexofenadine
- Glimepiride
- Itraconazole
- Ketoconazole
- Lithium
- Lovastatin
- Phenytoin
- Pioglitazone
- Propranolol

9. Conclusion:

Avipattikar Churna stands as a cornerstone in Ayurvedic medicine for the management of gastrointestinal disorders. With its blend of potent herbs and traditional wisdom, this herbal formulation offers a holistic approach to digestive health. While scientific research continues to unravel its therapeutic potential, Avipattikar Churna remains a time-tested remedy, embodying the principles of Ayurveda in promoting overall well-being through natural means..

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12. References:

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