

## **Flatulent Foodstuff, an Agent in the Creation of Infantile Colic: a Narrative Study based on the Traditional Iranian Medicine and Modern Investigation**

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### **Abstract**

Colic is a common and annoying problem in infancy whose etiology is not well understood. Traditional Iranian Medicine (TIM) scientists know flatulent food effective in creating this disorder. Since the reduction or withdrawal of this kind of food in mother's and infant's nutrition can be effective in preventing flatulence, this study aims to study and identify flatulent foods and the mechanism of flatulence in traditional and modern medicine. The search was conducted using the following keywords: "flatulent", "flatulence", "colic" and "bowel sound (Gharagher)" in six pharmacopeias of Traditional Iranian Medicine.

Then, the scientific name of foodstuff was determined and the materias were scored based on the repetition in one or more traditional medicine book. Finally, by searching electronic resources, etiology and the mechanism of flatulence were evaluated for some of these materias. A total of 90 flatulent materias were found. Apples, cucumbers, pears, wheat, turnips and rice are the most flatulent plant materias. Etiology of flatulence in modern medicine is the gas production caused by the fermentation of the remaining food and carbohydrates by colon bacteria while in traditional medicine texts, flatulence occurs due to dysfunction in digestion performance which may be due to the type of the food.

As a conclusion, almost all foods that were introduced as flatulent in traditional medicine are known as flatulence generators in modern medicine resources, as well. Identification of these foods can help to reduce infantile colic.

**Key Words:** Infantile colic, Flatulence, Flatulent, Traditional Iranian Medicine, Medicinal plants.

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## 1- INTRODUCTION

Infantile colic is a widespread clinical problem in the first 3 months of life that is easily diagnosed, but its nature is not well known and its elimination is difficult (1) and it is a common cause of maternal distress and family dysfunction (2). Its reported prevalence is very different, as reported from 3.3% to 17.1% (3), and in some reports, this value is up 2% (4). The wide range of etiologic factors has been suggested to explain this disorder including nutritional factors and eating disorders, allergies, high constitutional tonicity, high bowel gas, cramps or rotation of the colon, functional immaturity of gastrointestinal tract and nervous system, insufficient oral gratification, progesterone deficiency and emotional stress due to fatigue or stress of family (5).

Although some researchers have questioned the attribution of the etiology of colic simply to digestive issues (6), some others know intestinal physiology as the key to the puzzle of infantile colic (7). However, since the release of some components of the food eaten by the mother (such as some proteins) into the milk has been proven (8); on the other hand, in several studies the impact of maternal diet on the creation of infantile colic has been shown (9-11) and taking certain anti-flatulence drugs by mothers has also been shown to improve infantile colic (12). Therefore, it seems that the knowledge of flatulent food and necessary anti-flatulent measures can be effective in prevention and treatment of infantile colic.

Flatulence is a common and important clinical symptom with functional and organic causes. Functional flatulence has high prevalence and is caused by changing the digestive function due to movement disorders, visceral hypersensitivity, inflammatory and immune disorders, psychological factors, genetic and environmental factors (13). Rome III

criteria are used in modern medicine for the diagnosis of flatulence, which include the feeling of flatulence or distention, recurrent visible for at least three days a month in the past three months, absence of adequate criteria for diagnosis of functional dyspepsia, Irritable bowel syndrome (IBS) or other digestive function disorders, the onset of symptoms from 6 months before the two mentioned criteria and the above two criteria have also occurred in the whole past three months (14).

In modern medicine, factors such as slow muscle contractions and peristalsis of digestive tract, eating certain foods, fatty foods or delayed gastric emptying, fast eating, coincidence with other diseases such as irritable bowel syndrome (15), fluid retention, abdominal wall muscle weakness, changes in sensory function are mentioned as the causes of flatulence (16). Given the importance of nutrition in creation of flatulence and its effects on infantile colic, this study was designed and aimed to determine flatulent foods in Traditional Iranian Medicine (TIM) and to compare it with common medicine and to express flatulence mechanism by these two medical school.

## 2- MATERIALS AND METHODS

This is a narrative study. For finding flatulent material, six authentic and reference TIM books from the 11th century to 18th century were used, including:

- Al-Abnia an Haghayegh al-Advia (Abu Mansur Movafagh heravi 11th century),
- Tohfa-Ibn-Baitar (Abdullah Ibn Ahmad Ibn Baitar 13th century),
- Ikhtiyarat-i-Badi (Ali Ibn Hussain Ansari Shirazi 15th century),
- Tohfa Tul Momineen (Hakim Momen Tonekaboni 17th century),

- Tazkira Oolulalbab - Jamea Al-Ajab al A'jab (Davood Ibn Omar Antaky 17th century), and
- Makhzan al Advieh (Hakim Seyyed Mohammad Hossein Aghili Khorasani 18th century).

The two books "Tohfa-Ibn-Baitar" (21), and "Tazkira Oolulalbab" (23) are in Arabic and the rest are Persian books (19, 20, 22, 24).

First, the above books were researched with the following keywords: "flatulent", "flatulence", "colic" and "bowel sound (Gharagher)". Then, the scientific name of the foodstuff were determined according to books of "The adaptation of old names of medicinal plants with scientific names" (17), and "Reference of medicinal plants" (18). After writing the scientific name of the foodstuff, those with similar scientific names and also the combined and build items were excluded and the foodstuff were scored from 1 to 6 based on

repetition in these books such that, for each repetition in each book one point was awarded to the foodstuff. Then, they were arranged on a table according to their scores. The etiology and mechanism of flatulence were studied from new sources and traditional medicine and by searching in electronic resources, the flatulence mechanism was investigated in a number of these material.

### 3- RESULTS

#### 3-1. The flatulent foodstuffs in TIM

After removal of combined and repeated items, the number of flatulent foodstuff breached to 90. Among them, 77 cases were plants, 12 cases were animals and one was a mineral item. The numbers of flatulent material mentioned in the reference books which were examined separately are given in **Table.1**.

**Table 1:** The number of flatulent foodstuffs in TIM Pharmacopeias

The name of Pharmacopeia	The number of flatulent foodstuffs
Al-Abnia an Haghayegh al-Advia	13
Tohfa-ibn-Baitar	14
Ikhtiyarat-i-Badi	29
Tohfa Tul Momineen	48
Tazkira Oolulalbab	50
Makhzan al-Advieh	60

32 repeated flatulent plant foodstuffs which have been presented at least in three reference books, that also had at least three points, were listed in **Table.2** with their scientific names based on their scores. Among the flatulent foodstuffs found, 6 foodstuffs have been presented in 5 books, 16 foodstuffs in 4 books and 18 foodstuffs in 3 books, 16 foodstuffs in 2 books and 34 foodstuffs in only one of the six reference books. Among the foodstuffs found, apples, cucumbers, pears, wheat, turnips and rice had the highest scores and their flatulence was mentioned in 5 of 6 books.

Some material create flatulence in certain circumstances, for example, lettuce and jujube (19), and basil, onions, hazelnuts, apples, pears and cannabis (20), cause flatulence in the case of high consumption and some, such as apples, pears and cedar are flatulent, if they are consumed raw. Traditional physicians considered taking some waters such as water of dock, warehouse, ponds, wells and canal (20), and lukewarm water (21) are involved in causing flatulence. Among foodstuffs with a score of 3, milk as an animal substance, was not listed in the table.

**Table-2:** The most frequent flatulent foodstuff in TIM Pharmacopeias

No.	Common name	Nature (19, 20)	Scientific name (17, 18)	References	Score
1	Rice	Hot and dry	<i>Oryza sativa</i> L.	(19-23)	5
2	Sweet apple	Hot and wet	<i>Malus domestica</i> Borkh	(19-23)	5
3	Wheat	Hot	<i>Triticum aestivum</i> L.	(19-21,23,24)	5
4	Turnip	Hot and wet	<i>Brassica rapa</i> L.	(19,20,22-24)	5
5	Cucumber	Cold and wet	<i>Cucumis sativus</i>	(19-23)	5
6	Pear	Hot and wet	<i>Pyrus communis</i> L.	(19-23)	5
7	Bean	Fresh: Cold and wet	<i>Vicia faba</i> L.	(19,20,22,24)	4
		Dry: Cold and dry			
8	Hazelnut	Hot and dry	<i>Corylus avellana</i> L.	(19,20,22,23)	4
9	Carrot	Hot and wet	<i>Daucus carota</i> L.	(19,20,22,23)	4
10	Pea	Hot and dry	<i>Cicer arietinum</i> L.	(19,20,22,23)	4
11	Lettuce	Cold and wet	<i>Lactuca sativa</i> L.	(19,20,22,23)	4
12	Sugar cane	Hot and wet	<i>Saccharum officinarum</i> L.	(19,20,23,24)	4
13	Beet	Hot	<i>Beta vulgaris</i> L.	(19,20,22,24)	4
14	Barley	Cold and dry	<i>Hordeum distichon</i> L.	(19-22)	4
15	Lentil	Cold and dry	<i>Lens esculenta</i> Mo	(19,20,22,23)	4
16	Grape	Hot and wet	<i>Vitis vinifera</i> L.	(19-21,24)	4
17	Squash	Cold and wet	<i>Lagenaria vulgaris</i> Ser	(19,20,22,23)	4
18	Torre	Hot and dry	<i>Allium porrum</i> L.	(19,20,22,23)	4
19	Beans	Hot and wet	<i>Phaseolus vulgaris</i> L.	(19,20,22,23)	4
20	Apricot	Cold and wet	<i>Prunus armeniaca</i> L.	(19,20,23,24)	4
21	Banana	Hot and wet	<i>Musa paradisiaca</i> L.	(19-21,23)	4
22	Bergamot	Cold and wet	<i>Citrus medica</i>	(20,22,24)	3
23	Barberry	Cold and dry	<i>Berberis vulgaris</i> L.	(19,20,23)	3
24	Basil	Hot and dry	<i>Ocimum basilicum</i> L.	(20,22,24)	3
25	Fresh date	Hot and wet	<i>Phoenix dactylifera</i> L.	(20,21,23)	3
26	Khondoroos	Hot and dry	<i>Triticum romanum</i> L.	(19,20,22)	3
27	Peach	Cold and wet	<i>Amygdalus persica</i>	(19,20,23)	3

28	Alfalfa	Hot and wet	Medicago sativa L.	(19,20,22)	3
29	Sweet pomegranate	Cold and wet	Punica granatum L.	(19,20,22)	3
30	Chestnut tree	Cold and dry	Castanea sativa Mill	(19,20,22)	3
31	Orach	Cold and wet	Atriplex hortensis L.	(19,20,22)	3
32	Tare	Hot and wet	Phaseolus mungo L.	(19,20,22)	3

### 3-2. The etiology of flatulence from the perspective of modern medicine

From the perspective of modern medicine, flatulence created bacteria in the colon due to residual fermentation of unabsorbed foods that produce gas (hydrogen and carbon dioxide). The amount of gas produced in different people with the same regime, is different. Because in addition to the diet, the metabolic composition and activity of colon bacteria are effective in the volume of the produced gas. In other words, the intestinal microbial composition in patients with flatulence is different with healthy people. A study in 2014 found that excessive flatus is associated with three related species of bacteria. These species can stimulate inflammatory pathways and increase the sensitivity, impaired tonic movements and reduce the toleration of intestinal gas (25).

Flatulence-producing food are known as Fermentable, Oligo-, Di-, Mono-saccharides and Polyols (FODMAPs). Various studies have shown the role of diet with small amounts of FODMAPs in the treatment of IBS (26). FODMAPs are carbohydrate family with low absorption in the intestines. As a result, there are fermented in the colon by microflora and the produced gas. On the other hand, due to their osmotic activity, they absorb water. In other words, the volume of gas and water together are increased and it leads to luminal distention. This luminal dilatation with visceral hypersensitivity symptoms creates flatulence and abdominal pain and may cause bowel habit

changes secondly. This family includes: Fructooligosaccharides (fructans, such as onions and wheat), Galactosaccharides (Galaktans such as cabbage and beans), Polyols (sorbitol, fungi, fruit drinks and artificial sweeteners), that have little absorption in all people; but lactose (such as milk and cream) and fructose (such as honey, apples, corn syrup), are low absorbed in subjects with weak enzymatic activity or transmission mechanism. In the case of fructose, it should be noted that the material may have impaired absorption that, their fructose and glucose proportion is more than one and their equal ratio does not generally create a problem. When lactose is also more than a certain amount, there is no problem, because most people have some degree of lactase activity (27).

In addition, soluble fiber (such as grains and fruits) produces gas due to lack of absorption in the small intestine and as a result of fermentation in colon. Most starches, including potatoes, wheat and corn also produce gas, when they are broken down in the colon (28). In a study, flatulent foods were given to healthy people in four groups of wheat bread, corn and barley, beans, soybeans, bean and pea; cabbage family, celery, onions, leeks, garlic, artichoke; and bananas, figs, peaches, grapes and dried plums, and it was observed that these people are experiencing the same symptoms for which flatulent patients have complained (25).

### 3-3. The etiology of flatulence from the perspective of TIM

In traditional medicine, "flatulent agent" is assigned to the material with additional moisture beyond its nature, that is converted to a material entitled "flatus". Flatus can be produced in the gastrointestinal tract, including the stomach and intestines or separately in the blood vessels of other organs (19, 20). Flatus is the material without consistency created as a result of the body heat impact on areas of food moisture. Flatus is generally one of the essential ingredients for life and activity in human body. Gas's (flatus) useful functions in the body are so many, among which one of the most important ones is movement of the material around the body and it naturally causes defecation and movement of intestines and is rapidly gnawing (29). Pomegranate, carrots, vegetables and flax seeds are the plants that help the desire and sex drive erectile dysfunction (ED) by producing flatus in the artery (20). On the other hand, TIM physicians considered some flatulent plants, such as beans, lentils, onion and fenugreek due to production of flatus involved in neurological disorders such as insomnia (30, 31).

Excessive flatus produced in the stomach, which is often accompanied by certain sounds (Gharaghar), is the result of incomplete digestion in the stomach which has two general reasons. The first reason is the food itself. If the food is flatulent, has a high volume or is too moist or rot and foul-smelling, it creates flatulence. The other reason is the inability to digest that can cause flatulence. This digestion inability is caused by the gastric mucus accumulation, drinking cold water, doing exercises after a meal, eating hot material after the cold, having empty stomach and in some cases cold environment (16).

#### **3-4. The comparison of flatulent foodstuffs in TIM and modern medicine**

Based on the above findings, different plants with different mechanisms are able

to cause flatulence. Avoiding these foods or the use of anti-flatulent compounds (32) are recommended for the treatment of infantile colic based on traditional medicine resources. Although this particular view towards creating flatulent colic due to the use of flatulent material by the mother (33) was not found in the literature of modern medicine, the research conducted on food consumed by mothers that stimulate colic in infants confirms this relationship to somehow. For example, in a study conducted by Lust et al. (1996), in studying 272 mothers and fed only by breastfeeding for 4 months concluded that eating vegetables of cabbage family, onions and milk by mothers could exacerbate the condition of colic infants (9). Given that all the three above substances have been identified in traditional medicine resources (19, 20) and the new articles (25, 34, 35) as a cause of flatulence, this view of TIM scientists in the etiology of infantile colic is acceptable and with trials on anti-flatulent plant material, its effectiveness on infantile colic may be evaluated. In this regard, Savino et al. (2005), in a placebo-controlled double-blind clinical trial on 93 infants with colic showed that prescription of a combination of three anti-flatulent plants of herb, fennel and lemon balm for infants with colic can improve symptoms within a week (36).

Considering the TIM point of view on the role of flatulent materials in the creation of infantile colic, recognizing flatulent plants is important. In the study of the present article, almost all the plants that have been introduced in TIM texts as flatulent, are known as flatulence generators in modern medicine resources, as well. For example, apples and pears, because of fructose, onions and wheat and also fructan, cabbage and beans, due to galactan can cause flatulence (37). However, there are cases in which the traditional and modern medicine does not agree. For example

recent studies suggest that rice is not flatulent (38) while in traditional medicine resources, certain types of rice (which have been cultivated in Greece and Rome) are known as flatulent (20). Different people with the same regime produce different amounts of gas which can be attributed to the composition of the intestinal microbial composition in modern medicine (39), while in traditional Iranian medicine it is attributed to the ability of the stomach to digest (40). The differences in intestinal microbial composition may be a result of differences in people's digestive system health.

#### 4- CONCLUSION

By this study on TIM, we observed that the number of flatulent plants known in each book was significantly more than the previous books (Table.1), which can reflect the growth of science and dynamic TIM at that time. However, with regards to the mechanism and how to create flatulent colic associated with flatulent drugs used by the mother, nothing was found in traditional medicine resources, while only a handful of clinical trials were conducted in the field of complementary medicine on infantile colic which have often also methodological problems (41). Given the limitations of this study, such as not getting strong clinical and laboratory studies to elucidate the association of the theory of the TIM scientists, performing some clinical trial and laboratory studies on this issue are suggested.

#### 5- CONFLICT OF INTEREST

The authors declare no conflict of interests in this article.

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