

A COMPREHENSIVE REVIEW OF *BILVA* (AEGLE MARMELLOS) FROM CHIKITSASTHANA OF ASHTANG HRIDAYA

Dr. Seema H. Thakare^{*1}, Umesh Patil²

^{*1}Associate Professor, Department of Rognidan & Vikruti Vigyana, Mahatma Gandhi Ayurved College Hospital & Research Centre, Salod (H), Wardha 442001. Datta Meghe Institute of Higher Education & Research (DU), Nagpur, Maharashtra, India.

²Professor, Department of Rognidan & Vikruti Vigyana, DMM Ayurved Mahavidyalaya & Rughalaya, Yavatmal.

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*Corresponding Author

Dr. Seema H. Thakare

Associate Professor, Department of Rognidan & Vikruti Vigyana, Mahatma Gandhi Ayurved College Hospital & Research Centre, Salod (H), Wardha 442001. Datta Meghe Institute of Higher Education & Research (DU), Nagpur, Maharashtra, India.



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ABSTRACT

In Ayurveda, herbs and different combinations of herbal drugs are used for the treatment of various disorders. *Aegle marmelos* (L.) *Correa* is one of the medicinal plants indigenous to India. It is mainly used for the treatment of diseases like dyspepsia, chronic diarrhoea, dysentery, peptic ulcers etc. Crude extracts of this plant possess antioxidant, antidiabetic, anticancer, antiulcer, anti-inflammatory, antimicrobial, antihyperlipidaemic properties and also shows antispermatic activity. *Bilva* is one of the contents of Dashamoola (10 root drugs) and is widely available in market in different formulations such as *Dashamoolakashaya*, *Dashamularishta*, *Dashamulakatutrayadi kashaya* etc. Acharya Charak praised *bilva* by including it in *Agryasangrahaniya*. According to him *Bilva* is best amongst those having property to absorb fluid from gastro intestinal tract (*Samgrahika*), appetizers (*Dipaniya*) and pacifier of *Vata-kapha dosha*. *Bilva* fruit has great reputation in the treatment of diarrhoeas and dysenteries that it was made official in British

Pharmacopoeia. So, the compilation of compounds of *bilva* fruit was done in the present review from Chikitsasthana of Ashtang Hridaya.

KEYWORDS: *Bilva*, *Aegle marmelos*, Ashtang Hridaya, *Atisar*, *Pravahika*.

INTRODUCTION

Our planet earth is full of medicinally treasured tree species. Out of total 250,000 living plant species *Aegle marmelos* (L.) Correa is one of the medicinal plants indigenous to India and has been used by the inhabitants of Indian subcontinent for over so many years. *Aegle marmelos* is considered to be sacred tree for Hindu. Its leaves are offered to Lord Shiva and Parvati during prayer.^[1,2] It is commonly known as *Bilva*, Bengal quince, Indian quince, Golden apple, Stone apple, Wood apple, Holy fruit, Maredo and Sriphal in India.^[3] Traditional medicines are mainly used for primary health care by approximately 80% of people from developing countries all over world among them maximum nearly 85% is only plant extracts. *Aegle marmelos* is mostly found in tropical and subtropical regions of India.^[4] Almost all parts of *Aegle marmelos* like fruits, leaves, stem bark and root bark are used in preparation of various ayurvedic medicines.^[5] These ayurvedic preparations are used for treating various disease conditions like dyspepsia, chronic diarrhoea, dysentery, peptic ulcers etc. It also used as laxative and to treat respiratory infections. Delicacies products like puddings, murabba & juice are prepared using mainly the fruit pulp.^[6] Multiple phytochemical compounds like phenols, alkaloids, flavonoids, saponins, terpenoids, cardiac glycosides, tannins and steroids are isolated from different parts of *Aegle marmelos*. All these compounds are biologically and pharmacologically active against various chronic diseases like gastrointestinal disorders, cancer and cardiovascular disorders. Crude extracts of this plant acts as antioxidant, antidiabetic.^[7] anticancer.^[8] antiulcer, anti-inflammatory.^[9] antimicrobial.^[10] antihyperlipidaemic.^[11] and also shows antispermatogenic activity.^[12]

Many formulations of *bilva* either in single or in compound form are described in *Briharttrayi* of Ayurveda. It is one of the contents of *Dashamoola* (10 root drugs) group which is commonly available in market in different formulations such as *Dashamoolakashaya*, *Dashamularishta*, *Dashamulakatutrayadi kashaya* etc.^[13] Acharya Sushruta mentioned *bilva* in *Brihatpanchmoola*, *Varunadigana* and *Ambasthadigana*.^[14] In Charak Samhita *bilva* is included in *Shothahara*, *Arshoghna*, *Asthapanopag* (decoction enema assisting *dravya*) and *Anuvasanopaggana* (unctuous enema assisting *dravya*).^[15] Acharya Charak praised *bilva* by including it in *Agryasangrahaniya*. According to him *Bilva* is best amongst those having property to absorb fluid from gastro intestinal tract (*Samgrahika*), appetisers (*Dipaniya*) and pacifier of *Vata-kapha dosha*.^[16] *Bilva* fruit has great reputation in the treatment of diarrhoeas and dysenteries that it was made official in British Pharmacopoeia. Ashtanga Hriday is a repository of various simple kalpas that the practitioner

will understand and use them in their practice. *Bilva* is commonly available medicinal plant with different pharmacological properties. Considering this, the compilation of compounds of *bilva* fruit was done in the present review from Chikitsasthana of Ashtang Hridaya.

AIM: To compile and analyze the data of *bilva* fruit from Ashtang Hridaya Chikitsasthana and draw inference from it.

OBJECTIVE

- To study literature of *bilva* fruit for its identification, properties and chemical composition.
- To compile the data about the *bilva* fruit from Ashtang Hridaya Chikitsasthana with the point name of the formulation containing *bilva* fruit, references, type of the formulation, name of the diseases in which it is used.
- To analyze the above data statistically.
- To draw inferences from observed Data.

Data source

Literature available in Ayurveda and contemporary medical science regarding therapeutic and pharmacological aspects of *bilva* was searched to find out advance researches on *bilva*. The various single or compound formulations of *bilva* used in different diseases mentioned in Ashtanghridaya Chikitsasthana were searched. Literature pertaining to *bilva* was searched from classical Ayurveda texts such as Charaka Samhita, Sushruta Samhita, Bhavprakash, and Ashtang Sangraha. Research work done pertaining to the drug was collected from Pubmed online, AYUSH portal and Google scholar. Huge literature was found based on preclinical and clinical studies reflecting applicability of *bilva* in different diseases.

Pharmacological Profile of *Bilva*

Aegle marmelos (L.) Correa is a small or medium sized deciduous tree from the Rutaceae family, armed with many axillaries, straight strong and long spines. Leaves are three foliate occasionally five-foliate. Flowers are greenish white in short axillary panicles. Fruits are large, globose with woody ring. The ripe fruit possess digestive properties & useful in various stomach related complications.^[17] The different vernacular Names & Taxonomical Classification of *Bilva* is given in Table No. 1 and Table No. 2 respectively. According to Ayurveda, it is *Kashaya –Tikta Rasatmaka* (astringent, bitter in taste), *Katu Vipaki* (pungent biotransformed rasa), *Ushna Virya* (hot potency) having *Grahi* (absorptive), *Ruksha* (dry)

Agnideepana (appetizing or carminative) properties. Being *tikta*, *kashay*, *rukha* it pacify *kapha dosha* & *vata dosha* due to *ushnavirya* but it aggravates *pitta dosha* because of *Katu Vipaka* & *Ushna Virya*. It helps digestion & metabolism thereby helps in pacification of *aam dosha* & hence may be used in disease condition like *Aamatisar* (diarrhoea associated with *āma*), *pakwatisar* (diarrhoea), *pravahika* (dysentery).^[18]

Table no. 1 - Vernacular Names of *Bilva*.^[19,20]

English	Indian quince, Golden Apple, bael fruit, elephant apple, Indian bael, Stone Apple, Holy Fruit
Hindi	Bel, Beli, Belgiri, Baelputri, sirphal, kooralam
Sanskrit	Shivadruma, Bilva, Vilva, Shivaphal
Urdu	Bel, Bel kham
Bengali	Bel, Bilivaohal, Billi
Tamil	Vilvamarum
Telugu	Bilvapandu
Kerala	Kuvalum
Marathi	Bela
Sindhi	Katori
Nepali	Bel, Gudu
Assamese	Bel
Gujarati	Bel, Bilivaohal, Billi
Kannada	Bilpatra, Malura, Kumbala
Konkani	Gorakamli
Indonesia	Mojo tree
Latin	<i>Aegle marmelos</i>
Oriya	Belo
Portuguese	Marmelo
Thai	Mapin, Matum

Table no. 2: Taxonomical Classification of *Bilva*.^[21]

Kingdom	Plantae
Sub-kingdom	Tracheobionta
Super-division	Spermatophyte
Division	Magnoliophyta
Class	Magnoliopsida
Sub-class	Rosidae
Family	Rutaceae
Order	Sapindales
Genus	<i>Aegle</i>
Species	<i>Marmelos</i>

Chemical composition of *Bilva* (*Aegle marmelos*)

The chemical constituents of *Aegle marmelos* include Marmelosin (impesation), Alloimpesation, Marmelide, Tannic Acids, Marmin, Umbelliferone, Skimminine,

Isopimpinelline, Marmelin, Skinmin, Marmesin, Marmesinin etc. Some chemical constituents like steroids, terpenoids, flavonoids, phenolic compounds, lignin, fat and oil, inulin, proteins, carbohydrates, alkaloids, cardiac glycosides and flavonoids are found in pulp of *Aegle marmelos*.^[22,23] The different chemical constituents of *Bilva* are given Table no. 3

Table No. 3: Different Phytoconstituents of Bilva.

Chemical Class	Phytoconstituents
Coumarins	The main component of bael fruit gum is called marmelosin. A. marmelos contains other compounds from the coumarins class, such as marmin, alloimperatorin, xanthoxol, scoparone, gummarmes in, imperatorin, methyl ether, scopoletin, umbelliferone, psoralen, and marmelide. Marmenol, 7- geranyloxycoumarin has also been stated.
Polysaccharides	Galactose, arabinose, uronic acid, and L-rhamnose are obtained on hydrolysis.
Alkaloids	Marmeline, dictamine, aegelin, aegelenine, fragrine are some alkaloids present in the bael tree.
Carotenoids	The pale color of the fruit is due to the presence of Carotenoids. Marmelosin, Skimmianine, and umbelliferone are the therapeutically main component of the bael plant.
Tannins	There is as much as 9 % tannin in the pulp of wild fruits and less in cultivated form. Also, tannin is present in leaves in form of Skimmianine
Seed Oil	Palmitic, stearic, oleic, linoleic and linolenic acid.

OBSERVATION AND RESULTS

From the Ashtang Hrudaya Chikitsasthan, a total of 45 references regarding *Bilva* fruit were compiled. (Figure no. 1) Among these, 28 references (62%) were accounting for specifically to the treatment of *Atisar* (Diarrhea), *Grahani* (IBS-like symptoms), and *Pravahika* (Dysentery). 12 references (27%) were compiled from *Arsha Chikitsa* while remaining 5 references (11%) were compiled from other diseases from chikitsasthana.

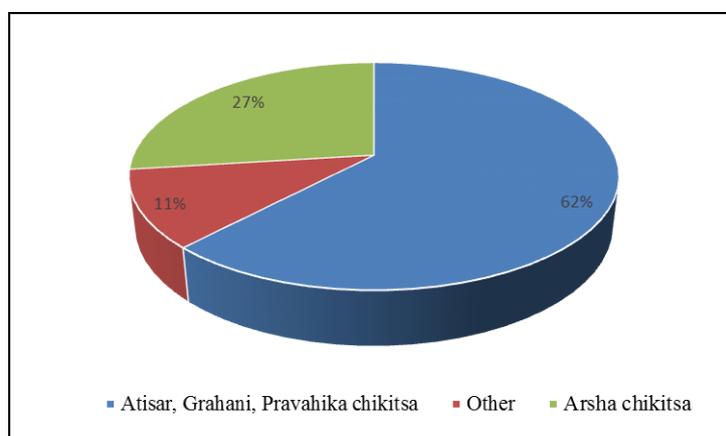


Figure No. 1 References of bilva from different diseases of A.H.

Data from Ashtang Hrudaya Chikitsasthana

The data compiled from references found in the chikitsasthana of Ashtang Hrudaya. The Table no. 4 specifically mentions the utilization of *Bilva* fruit in the treatment of diseases like *Atisar* (Diarrhoea), *Grahani* (IBS-like symptoms), and *Pravahika* (Dysentery).

Table no. 4: Different formulations and its uses in *Atisar*, *Grahani* and *Pravahika*.

Sr. No	Type of Formulation	Formulation	Disease	Reference
1	<i>Peya</i>	<i>Prushniparnyadi Peya</i>	<i>Jwaratarisar</i>	A.H.Chi. 1/28
2	<i>Kshirpak</i>	<i>Balbilva kshirpak</i>	<i>Pravahika</i>	A.H.Chi. 1/111
3	<i>Ghruta</i>	<i>Tejovatyadi ghruta</i>	<i>Grahani</i>	A.H.Chi. 4/51
4	<i>Ghruta</i>	<i>Panchakoladi ghruta</i>	<i>Pravahika</i>	A.H.Chi. 8/76
5	<i>Ghruta</i>	<i>Pathadi ghruta</i>	<i>Pravahika, Grahani</i>	A.H.Chi. 8/78
6	<i>Anuvasan basti</i>	<i>Pippalyadi Anuvasan</i>	<i>Pravahika</i>	A.H.Chi. 8/92
7	<i>Avaleha</i>	<i>Kutajadi Avaleha</i>	<i>Grahani</i>	A.H.Chi. 8/111
8	<i>Ghruta</i>	<i>Madhukotpaladi ghruta</i>	<i>Atisar, Grahani</i>	A.H.Chi. 8/133
9	<i>Pramathya</i>	<i>Bilvadi pramathya</i>	<i>Atisar</i>	A.H.Chi. 9/6
10	<i>Aahar (diet)</i>	<i>Balbilava in diet</i>	<i>Atisar</i>	A.H.Chi.9/11-12
11	<i>Peya</i>	<i>Shaliparnyadi peya</i>	<i>Atisar</i>	A.H.Chi.9/13
12	<i>Peya</i>	<i>Abhaydi peya</i>	<i>Atisar, Vatanuloman</i>	A.H.Chi.9/14
13	<i>Yavagu</i>	<i>Bilvadi yavagu</i>	<i>Pakwatatarisar</i>	A.H.Chi.9/23
14	<i>Dadhi</i>	<i>Bilavashalati siddha dadhi</i>	<i>Pravahika</i>	A.H.Chi.9/25
15	<i>Yamak Sneha</i>	<i>Marichadi yamaksneha</i>	<i>Atisar, Pravahika</i>	A.H.Chi.9/28
16	<i>Avaleha</i>	<i>Bilvadi avaleha</i>	<i>Sashoola pravahika</i>	A.H.Chi.9/35
17	<i>Kshirpaka</i>	<i>Balbilva siddha kshirpaka</i>	<i>Sashoola pravahika</i>	A.H.Chi.9/38
18	<i>Kwatha</i>	<i>Ativishadi kwatha</i>	<i>Atisar</i>	A.H.Chi.9/57
19	<i>Churna</i>	<i>Kirat tiktadi chura</i>	<i>Atisar</i>	A.H.Chi.9/62
20	<i>Anuvasan basti</i>	<i>Shatapushpadi Anuvasan</i>	<i>Sashoola Atisar</i>	A.H.Chi.9/71
21	<i>Kwatha</i>	<i>Bilvakarkatikadi kwatha</i>	<i>Atisar</i>	A.H.Chi.9/103
22	<i>Churna</i>	<i>Pathadi chura</i>	<i>Atisar</i>	A.H.Chi.9/109
23	<i>Churna</i>	<i>Yavanyadi chura</i>	<i>Atisar, Grahani</i>	A.H.Chi.9/112
24	<i>Piccha basti</i>	<i>Vachadi piccha basti</i>	<i>Sashoola Pravahika</i>	A.H.Chi.9/118
25	<i>Anuvasan basti</i>	<i>Bilvataila Anuvasan</i>	<i>Pravahika</i>	A.H.Chi.9/119
26	<i>Churna</i>	<i>Bilvadi Churna</i>	<i>Grahani</i>	A.H.Chi.10/10
27	<i>Churna</i>	<i>Nagaradi churna</i>	<i>Pravahika, Grahani</i>	A.H.Chi.10/39
28	<i>Peya</i>	<i>Ajajisiddha peya</i>	<i>Shopha, Atisar</i>	A.H.Chi.17/20

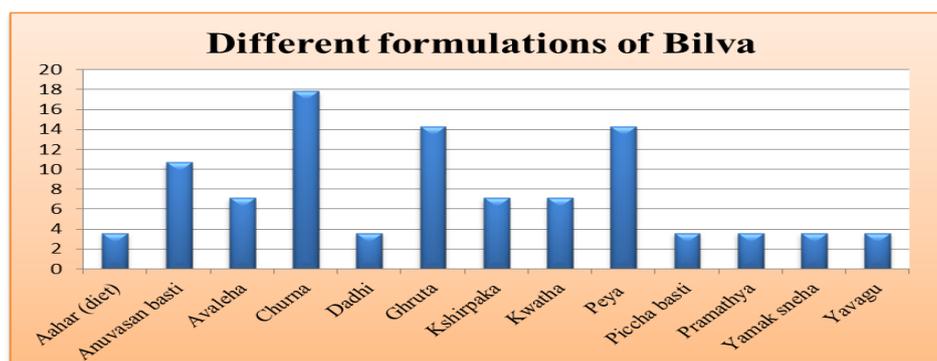


Figure no. 2 Different Formulations of *Bilva* from Ashtanghridaya.

DISCUSSION

When the data from the Ashtang Hrudaya Chikitsasthan is analysed, it is observed that *bilva* is used in various form like *peya*, *ghrita*, *avaleha*, *aahar* (diet), *churna*, *kwatha*, *basti* for the treatment of mainly the diseases of *Annavaha* & *Purishvaha srotas*. (Figure 2) It acts a digestive and also helps to absorb the excess water form stool because of its *tikta* & *kashay* taste respectively and thus helps to maintain the proper consistency of stool and hence called as best absorptive & appetizing or carminative agent.

Use of the *bilva* fruit in the different stages of *Atisar* and *pravahika*

Data from Astang Hrudaya Chikitsasthan was analysed for scrutinizing the use of the *bilva* in *Atisara* & *Pravahika*. Scrutiny revealed the wide range in which different types and stages of *Atisara* & *Pravahika* are treated with the help of *bilva*. Reference obtained are given in Table no. 5

Table no. 5: Use of *Bilva* in different stages of *Atisar* and *Pravahika*.

Condition of Disease	Reference
<i>Jwaratarisar</i>	(A.Hru. Ci.1/28)
<i>Kaphapittaj Atisar</i>	(A.Hru.Ci.9/13)
<i>Dipanpachan and Rucya in Atisar</i>	(A.Hru. Ci.9/28)
Stool smeared with mucuous, blood and pain in <i>Pravahika</i>	(A.Hru.Ci19/48)
<i>Pittatarisar</i>	(A.Hru.Ci 9/6)
<i>KaphajAtisar</i>	(A.Hru.Ci 9/7)
Pain in abdomen due to <i>pratilomitvayu</i> in <i>Atisar</i>	(A.Hru.Ci.9/35)
Stool with mucous and pain	(A.Hru.Ci.9/35)

Based on above observation it can be concluded that though *bilva* fruit aggravates *pitta dosha*, it is still utilized along with different drugs in managing all three *doshic* varieties types of *Atisara* (*vataj*, *pittaj*, *kaphaj*). This is because it primarily counteracts the *vata dosha*, which is crucial in triggering the onset of pathogenesis of *Atisar*.

Psoralen is one of the bioactive compounds in shows have antispasmodic property and hence used in condition like abdominal pain/cramp. Because of today's changing like style the patients of inflammatory bowel disease (IBS) are increasing in number. In modern medicine the treatment for IBS is mostly symptomatic and certain anti-diarrheal, laxative, anti-inflammatory and analgesic medicines may be used for it which gives minimal success for control and management of it. The anti-inflammatory activity of unripe fruit of *Aegle marmelos* was studied in animal models of IBS which shows reduction in severity of intestinal inflammation due to the flavonoids, phenolic compounds, and steroids present in the extract. The underlying mechanism for this action could involve the suppression of inflammatory mediators, including IL1, IL6, IL8, and TNF- α .^[24]

Pharmacological actions of *Bilva* fruit as per modern medicine

The antimicrobial activity of *bilva* was noted in *Giardia lamblia* & Rotavirus which proves its utility in Giardiasis and Rotaviral diarrhoea. it also controls several forms of infectious diarrhoeal diseases by preventing bacterial colonization to gut epithelium and production and action of certain enterotoxins. Thus, *bilva* can be used in the group of diseases that shows similarity with *Atisar vyadhi*.^[25]

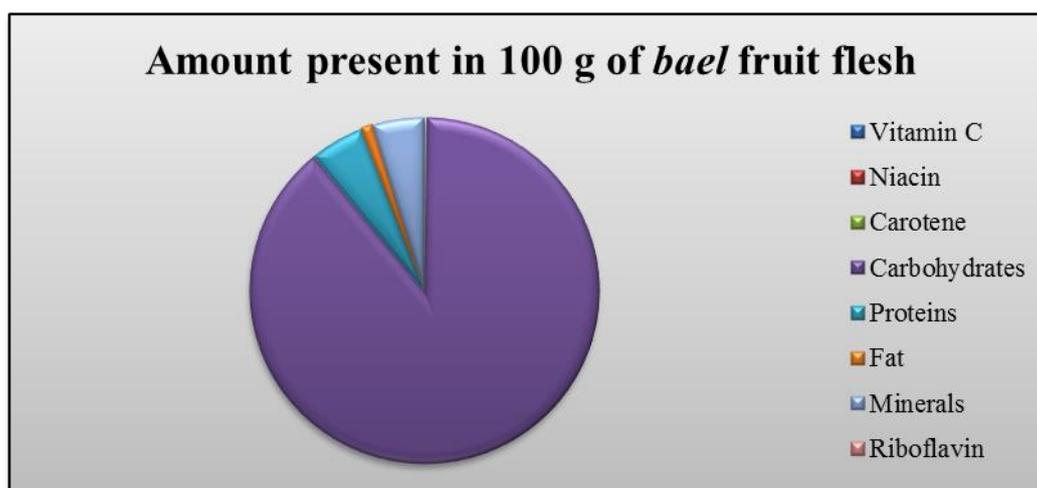
Use of *Bilva* as a diet

The body's origin is just a diet. The concept of *Pathyakaalpana* (medicated Food) is therefore much more relevant. As far as dietary formulations are concerned, Astanga Hrudaya quotes 32 % of the references to *bilva* for its use in the *Pathyakaalpana* (medicated diet). In addition, the *bilva* fruit contains 23 different varieties of formulations such as *kwath*, *avaleha*, *ghruta* etc. The use of *bilva* in the diet is quoted by a total of 6 types of formulation, accounting for 26 %. This indicates nutritional importance of the *bilva*.

One important reference is given for *bilva* to be included in the food formulation of diarrhoea treatment. Therefore, formulations based on the above information have been prepared from *bilva*, where water is the solvent and can be used as a dietary supplement. *Bilva* fruit also contains Vitamin like Vitamin C, Riboflavin, Niacin and also nutrients like Carbohydrates, Minerals Proteins, and Fats etc. The proportion of these nutrients per 100gm of *bilva* fruit is given in Table no. 6

Table No. 6: Nutritional Values of *Bilva*.

Components	Amount present in 100 g of bael fruit flesh
Vitamin C	8.0mg
Niacin	1.1mg
Carotene	55.0mg
Carbohydrates	31.8g
Proteins	1.8g
Fat	0.4g
Minerals	1.7g
Riboflavin	1.2mg
Thiamine	0.1mg

Figure no. 3 Different nutrients present in *Bilva*.

CONCLUSION

Aegle marmelos (L.) Correa is an important medicinal plant indigenous to India. This multidimensional herb is used in the management of diseases like dyspepsia, chronic diarrhoea, dysentery, peptic ulcers etc. It is considered as *Agrya* by Acharya Charak and it is best among those having property to absorb fluid from gastro intestinal tract (*Samgrahika*), appetisers (*Dipaniya*) and pacifier of *Vata-kapha dosha*. Total 45 references of *Bilva* were compiled from Ashtang Hrudaya Chikitsasthan and among them 62 % were accounting for specifically to the treatment of *Atisar* (Diarrhea), *Grahani* (IBS-like symptoms), and *Pravahika* (Dysentery). 32 % of the references to *bilva* are compiled for its use in the *Pathyakalpana* (medicated diet). Different formulations of including *kwath*, *avaleha*, *ghruta*, *peya*, *churna*, *kshirpaka*, *yavagu*, *yamak sneha* are used in GI tract disorders.

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