



RESEARCH ARTICLE

Ethnomedicinal plants of gastrointestinal disorders used by different ethnic communities of Berhampore sub-division of Murshidabad district, West Bengal, India

Jyotirekha Chakravarty and Adani Lokho*

Department of Botany, Siksha Bhavana, Visva-Bharati, Santiniketan, West Bengal - 731235, India.

Corresponding author email: lokhoabba@gmail.com

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Abstract

The present paper deals with 20 ethnomedicinal plants (14 families) used for treating stomach ailments/gastrointestinal disorders by the local communities of Berhampore Sub-division in Murshidabad district, West Bengal. The family Rutaceae has been recorded with the highest number of 3 species viz., *Aegle marmelos*, *Citrus x limon* and *Murraya koenigii*, followed by four families with two species each, viz., Euphorbiaceae (*Jatropha curcas*, *Jatropha gossypifolia*), Phyllanthaceae (*Phyllanthus acidus*, *P. emblica*), Apiaceae (*Centella asiatica*, *Coriandrum sativum*) and Combretaceae (*Terminalia arjuna*, *T. bellirica*) and nine families with a single species each, viz., Amaranthaceae (*Amaranthus spinosa*), Acanthaceae (*Andrographis paniculata*), Crassulaceae (*Kalanchoe pinnata*), Lamiaceae (*Mentha x piperita*), Rubiaceae (*Paederia foetida*), Myrtaceae (*Psidium guajava*), Scrophulariaceae (*Scoparia dulcis*), Anacardiaceae (*Spondias mombin*) and Zingiberaceae (*Zingiber officinale*). The most commonly used parts of the plant for various gastrointestinal disorders were observed both in leaves (39.13%) and fruits (30.43%), followed by latex, stem (8.70% each) and bark, root, rhizome (4.35% each) respectively. The maximum number of ethnomedicinal plants utilized for a particular ailment was recorded highest for two ailments i.e. dysentery and indigestion (17.65% each), whereas, the lowest was recorded for the worm infection in the alimentary canal (2.94%). The efficacies of the herbal treatment for various stomach ailments including indigestion as reported by the patients/respondent during the present investigation highlighted at different levels with very effective (40%), effective (30%), moderately effective (20%), and mildly effective (10%).

Keywords: Medicinal plants; Gastrointestinal disorders; Berhampore sub-division; Ethnic-community.

1. Introduction

The use of plants for medicinal purposes was one of the earliest forms of healthcare in human history. Theophrastus (ca 370-285 BC), known as the "Father of Botany", documented the usage of plants and established the generic names of several economically important species such as *Daucus*, *Asparagus* etc., which are still in use (Bennett, 2024). The use of medicinal plants in India is about 5000 years old, rooted in the ancient practices of different systems viz., Ayurveda, Unani, and Siddha (Mukherjee et al., 2017; Bhattacharjya et al., 2023). The *Rigveda* recorded 99 medicinal plants, *Yajurveda* with 82 species, and the *Atharvaveda* with 28 species, which were used for treatment of several deadly diseases (Bhattacharjya and Borah, 2008). The traditional system of healing continues to thrive even today with around 70-80% of India's rural population still relying on herbal medicines for their primary health care needs (Pareek, 1996; WHO, 2002; Sandhya et al., 2006; Chaudhary and Gupta, 2011; Datta et al., 2014; Taid et al., 2014; Panigrahy et al., 2016; Garg et al., 2021; Konar et al., 2022). India is home to approximately 45,000 plant species of which over 35,000 are recognized for their medicinal properties, and are utilized in various human cultures worldwide (Lewington, 1993; Begum and Mandal, 2016). It is one of the largest producers of medicinal plants, around 8,000 plant species are in used for various therapeutic purposes (Mistry, 2016).

The diverse geography of West Bengal which ranges from the Himalayas to the coastal plains supports a wide variety of flora that

has been an integral part of health practices and wellbeing for the local communities of the state (Vineeta et al., 2022). For centuries, the traditional knowledge of ethnomedicinal plants and its uses has been safeguarded and handed down through generations, particularly within the rural tribal communities (Chakraborty and Paul, 2014). Murshidabad district is renowned for its rich historical heritage and notable for its diverged vegetation pattern (Murshidabad, 2020). Historically, it has been recorded that, the Nawabs of Murshidabad actively supported both the traditional and the scholarly (Western/Allopathic) medicinal practices (Saha and Ghosh, 2012; Chattopadhyay, 2024).

There are several works on floristic study and medicinal plants of Murshidabad district which was carried out by other researchers in the past. Guha Bakshi (1984) documented 636 species of plants from the district and recorded 73 medicinal plants such as *Adhatoda vasica* Nees, *Aegle marmelos* (L.) Corr., *Aristolochia indica* L., *Andrographis paniculata* (Burm. f.) Wall. ex. Nees, *Bacopa monnieri* (L.) Pennell etc. Ghosh (2008) documented a total of 46 medicinal plants belonging to 30 families of angiosperms used by the tribal and the rural community for treating various ailments in the form of infusion, decoction, oil, paste, latex etc., from the West Rarh region of West Bengal. Mistry (2015a; 2015b) enlisted 30 sacred plant species like *Azadirachta indica* A. Juss., *Ficus benghalensis* L., *F. glomerata* Roxb., *F. religiosa* L., *Musa x paradisiaca* L., *Piper betel* L., *Aegle marmelos* (L.) Corr., etc. along with their ethnomedicinal usage belonging to 24 families. He also documented 52 medicinal plants such as *Aloe*

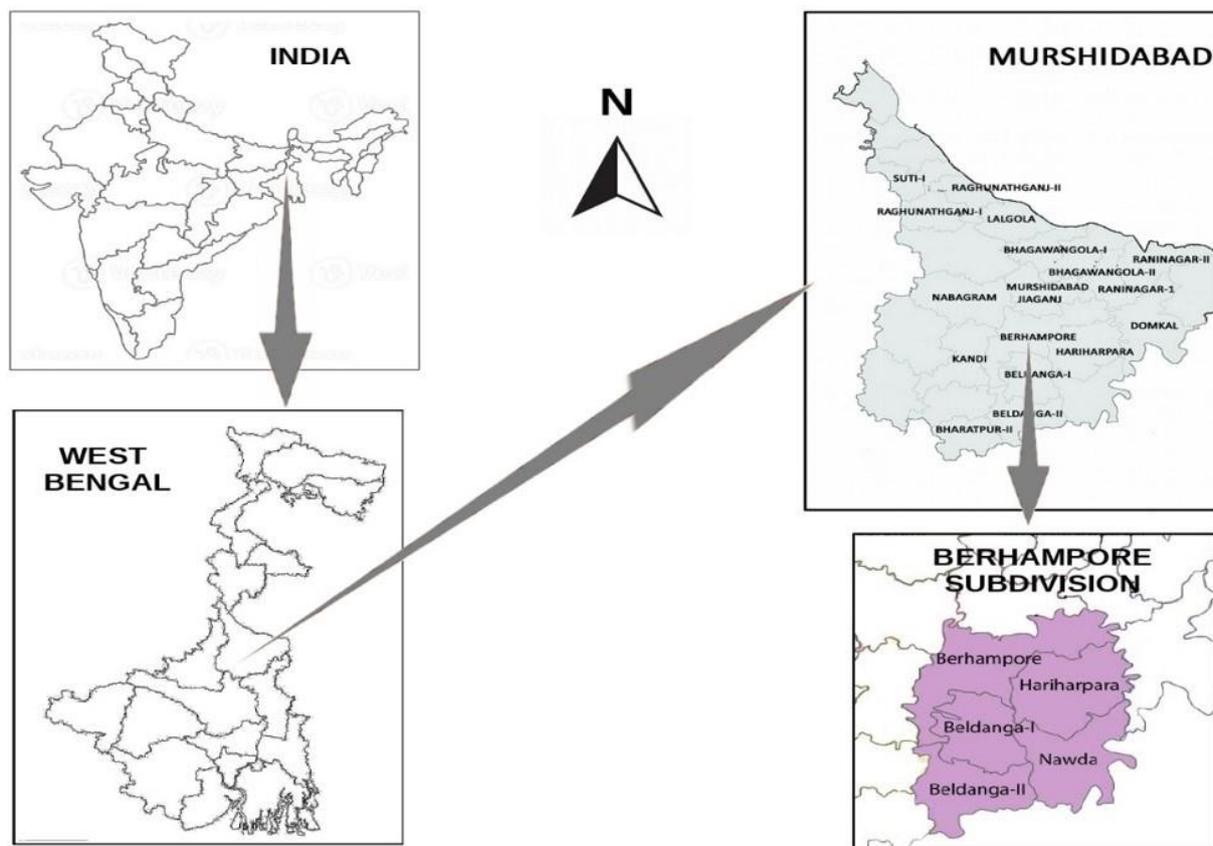


Figure 1. The map showing the location of the study area.

vera (L.) Brum.f., *Bacopa monnieri* (L.) Penell, *Azadirachta indica* A. Juss., *Piper betel* L., *Aegle marmelos* (L.) Corr., *Ocimum sanctum* L., *Cynodon dactylon* (L.) Pers., *Catharanthus roseus* (L.) G. Don, *Euphorbia nerifolia* L. etc. under 39 families which are used as medicine by the local people of Murshidabad district. Mistry (2016) documented 11 medicinal plants viz. *Momordica charantia* L., *Swietenia mahagoni* (L.) Jacq., *Mangifera indica* L., *Azadirachta indica* A. Juss., *Aegle marmelos* (L.) Corr., *Catharanthus roseus* (L.) G. Don, *Andrographis paniculata* (Burm. f.) Wall. ex Nees, *Acacia nilotica* (L.) Del., *Abroma augusta* (L.) L.f., *Tinospora cordifolia* (Willd.) Miers., and *Moringa oleifera* Lam. belonging to 10 families which are used for the treatment of Diabetes mellitus from the same district. Bandyopadhyay et al. (2019) documented the flora and fauna in some major sacred groves of the district viz., Pataleswar Shiv Mandir, Kiriteswari Temple, Domdoma Kali Mondir, Ramnagarhat Radhagobinda Mondir, Talbagan Kaborsthan Baro Bigha Kaborsthan, and Residency Cemetery of Babulbona in Murshidabad district. Some of the recorded sacred species are viz., *Aegle marmelos* (L.) Corr., *Alocasia fornicata* (Roxb.) Schott, *Annona reticulata* L., *Bombax ceiba* L., *Cassia fistula* L., *Commellina benghalensis* L., *Costus speciosus* (Koenig) Smith., *Ficus hispida* L., *F. racemosa* L., *Hemidesmus indicus* (L.) Schultes., *Azadirachta indica* A. Juss., *Lantana camara* L., and *Zizipus mauritiana* Lam.

Although different researchers in the past had documented the medicinal plants from the district, however, these are not a comprehensive account on ethnomedicinal plants for treating gastrointestinal disorders. Therefore, the present study aims to provide an insight into different uses of ethnomedicinal plants for treating different gastrointestinal related ailments by the tribal and other rural communities of Berhampore sub-division of Murshidabad district.

1.1 Study site

The present study was carried out in Murshidabad district of West Bengal, India. It is situated at the latitude 23.40°N and longitude 88.50°E. The geographical location of the district provides a unique climate and soil conditions and supports a diverse range of plant resources which is home to various herbal healers. The district consists of 5 administrative sub-divisions and 26 community development (CD) blocks (Murshidabad, 2015; Murshidabad, 2020). Berhampore (Sadar) sub-division has 5 CD blocks viz., Berhampore, Beldanga-I, Beldanga-II, Nowda, and Hariharpara.

2. Methodology

Extensive field surveyed was conducted during the period from March, 2023 to June, 2024 in 5 CD blocks viz., Berhampore, Beldanga-I, Beldanga-II, Nowda, and Hariharpara of Berhampore sub-division (Figure 1) inhabited by both the tribal (Santal and Oraon) and the non-tribal communities. The detailed information on different traditional methods of preparation such as decoction, paste, fresh latex etc. and the modes of consumption and medicinal significance was gathered through personal interviews with 50 knowledgeable local villagers (esp. elderly men) including traditional healers, *vaidyas*, *ojhas*, and local herbal medicinal vendors. A total number of 10 patients suffered from gastrointestinal disorders were selected and observed throughout the study period followed by rigorous personal interview and recorded the health condition of the patients to check the efficacies of the treatment. Photographs of the medicinal plants were captured in their natural habitat and the specimens were collected, dried and mounted on herbarium sheet following the standard method (Jain and Rao, 2016) and identified the plant materials with the help of relevant literature and experts and submitted to Department of Botany, Siksha Bhavana, Visva-Bharati, Shantiniketan, West Bengal, India for future references.

3. Result and discussion

Table 1. Detailed enumeration of the gastrointestinal medicinal plants and its mode of utilizations

SN	Scientific name	Local name	Family	Parts used	Diseases / ailments / usages	Mode of administration
1	<i>Aegle marmelos</i> (L.) Corr.	Bel	Rutaceae	Fruit	Diarrhea; Stomachache; Laxative, Digestive stimulant	(a) The flesh unripe fruit is sundried and grinded into fine powder. A tea-spoon of the preparation is added in a glass of water and taken once/twice in a day for five days to treat serious diarrhea. (b) One table spoon of fresh pulp of the ripe fruit is mixed in a glass of water and mixed with a pinch of black salt and the preparation is taken to treat stomachache. (c) Half of the fresh fruit pulp is directly taken in an empty stomach to treat indigestion and used as laxative.
2	<i>Amaranthus spinosus</i> L.	Kantanota/ Kantanotey	Amaranthaceae	Root	Indigestion and dysentery	The clean root is cut (approximately 1 inch each) into 4/5 pieces and boiled with 2 glasses of water till it is reduced to half. The decoction is taken for at least three days to treat dysentery and indigestion.
3	<i>Andrographis paniculata</i> (Burm. f.) Wall. Ex Nees	Kalomagh	Acanthaceae	Leaf, Tender Stem	Treatment of worm, Acid- reflux and gas; enhanced bowel movement (Laxative)	(a) The tender shoots (2-3 nos.) of the plant are soaked in water overnight and the filtrate (approximately 10 ml) is taken in an empty stomach for ten days for treating worms, acid reflux, gas trouble and clears the bowel movement. (b) A handful of clean leaves are grinded into a smooth paste and rolled into several small balls; sundried and kept in an airtight container. A ball is taken in an empty stomach for fifteen days to treat worms, acid reflux, gas, and used as laxative.
4	<i>Kalanchoe pinnata</i> (Lam.) Pers.	Patharkuchi	Crassulaceae	Leaf	Stomach upset	A handful of fresh leaves are mixed with water and a cup of the juice is taken for five days to treat stomach upset.
5	<i>Centella asiatica</i> (L.) Urb.	Thankuni	Apiaceae	Leaf, Stem	Chronic dysentery and blood in stool	(a) The tender shoots are chopped into pieces and blended with water and strained with the help of a sieve. About 10 ml of the filtrate is taken for five days to treat chronic dysentery and blood stool. (b) Cleaned fresh tender leaves (3-4 nos.) are taken raw in an empty stomach for five days to treat chronic dysentery and blood stool.
6	<i>Citrus x limon</i> (L.) Osbeck	Lebu	Rutaceae	Fruit, Leaf	Acidity, anti-vomiting, bloating	(a) The juice of a half lemon is mixed with water and black salt and taken after food to treat acidity and bloating. (b) The matured leaves (2-3 nos.) are crushed with hands and inhaled with a deep breath for instant relief from tendency or vomit.
7	<i>Coriandrum sativum</i> L.	Dhoney	Apiaceae	Fruit	Digestive stimulant	A half tea-spoon of dried or roasted seeds of the plant are chewed and taken after food to enhance digestion.
8	<i>Jatropha curcas</i> L.	Sada Jamalkutha, Sada Verenda	Euphorbiaceae	Sap (Latex)	Dysentery	The latex of a matured leaf is mixed with batasha (sugar drop) and the fresh preparation is taken in an empty stomach for three days to treat dysentery.
9	<i>Jatropha gossypifolia</i> L.	Laal Jamalkutha, Laal Varenda	Euphorbiaceae	Sap (Latex)	Blood dysentery	The latex of a matured leaf is mixed with batasha (sugar drop) and the fresh preparation is taken in an empty stomach for three days to treat dysentery.
10	<i>Mentha x piperita</i> L.	Pudina	Lamiaceae	Leaf	Indigestion, anti-vomiting, bloating	(a) About 30-40 pieces of fresh leaves are grinded, mixed with a cup of water and the strained fresh juice is taken after meal to treat indigestion problem. (b) The cleaned fresh leaves (5-7 nos.) are chewed and taken in an empty stomach to treat vomiting tendency and bloating.
11	<i>Murraya koenigii</i> (L.) Spreng	Rashun jhap, Karigach, Karipatta	Rutaceae	Leaf	Indigestion problem	Cleaned fresh leaves (5-6 nos.) are chewed and taken in an empty stomach for seven days to treat indigestion problem.
12	<i>Paederia foetida</i> L.	Gondho padali	Rubiaceae	Leaf	Stomach problem and indigestion	(a) About 20-25 leaves are taken and make into a paste and mixed with grounded lentils or grass pea (Khesari daal) along with the spices powder of coriander, cumin, turmeric, and salt. The spicy mixture is fried upon to make several small fritters and taken for stomach upset and indigestion problem. (b) About 10-15 fresh leaves are grinded with one clove of garlic into a paste and mixed with half tea-spoon of mustard oil and a pinch of table salt. The mixture is taken as a side-dish with steamed rice for treating stomach problem and indigestion.
13	<i>Phyllanthus acidus</i> (L.) Skeels	Rowal	Phyllanthaceae	Fruit	Indigestion problems	A piece of fresh fruit is taken with a pinch of salt after food for treating indigestion problem.
14	<i>Phyllanthus emblica</i> L.	Amloki	Phyllanthaceae	Fruit	Digestive stimulant	The whole fresh fruit is taken raw or either cut into 4-5 pieces, dried/boiled or mashed with salt and mustard oil and taken with rice as a stimulant for digestion.
15	<i>Psidium guajava</i> L.	Peyara	Myrtaceae	Leaf	Diarrhea and dysentery	About 2-3 cleaned tender leaves are chewed and eaten raw in an empty stomach for 3-4 days to treat diarrhea and dysentery.
16	<i>Scoparia dulcis</i> L.	Jastimadhu	Scrophulariaceae	Leaf	Dysentery	The fresh leaves (5-7 nos.) are chewed and eaten raw in an empty stomach, or a bunch of leaves are boiled in 1-2 cups of water and the decoction (about 15 ml) is taken for a week to treat dysentery.
17	<i>Spondias mombin</i> L.	Amra	Anacardiaceae	Fruit	Relief acidity problem	The juice of cut fresh fruits (4-5 nos.) mixed with jaggery and salt is taken in an empty stomach or the fruit is taken raw along with salt after the meal to treat acidity.
18	<i>Terminalia arjuna</i> (Roxb. ex DC.) Wt. & Arn.	Arjuna	Combretaceae	Dried bark of stem	Gas troubles	(a) The bark size of about 2-3 inches is crushed and boiled in water and a cup of the preparation is taken in an empty stomach for a week or two to treat gas formation in the stomach. (b) The dry bark (2-3 inches) is soaked in water for an overnight and the water is taken in the morning, or the dry bark (about 1 inch) is chewed and taken to treat gas formation in the stomach.
19	<i>Terminalia bellirica</i> (Gaertn.) Roxb.	Bohera	Combretaceae	Fruit	Gas troubles	The dry fruits (2-3 nos.) are soaked in water for an overnight and the filtrate water is taken in an empty stomach for about fifteen days to treat gas formation in the stomach.
20	<i>Zingiber officinale</i> Roscoe	Aada	Zingiberaceae	Rhizome	Indigestion problem, bloating, anti-vomiting	(a) The rhizome (about 3 inches) is grinded with water and the diluted. A cup of the diluted mixture is taken with a pinch of black salt after the meal to treat indigestion. (b) The cut pieces (about 2-3 inches) of rhizome are chewed with black salt and taken to treat bloating and vomiting tendency.

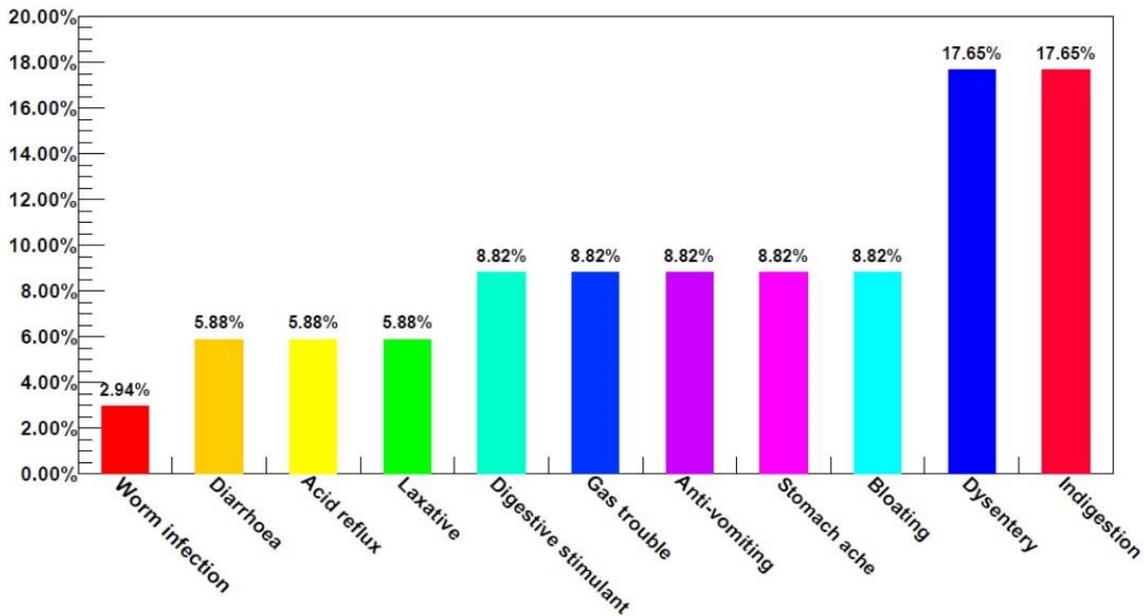


Figure 2. The distribution profile (in percentage) of ethno-medicinal plants for gastrointestinal disorders

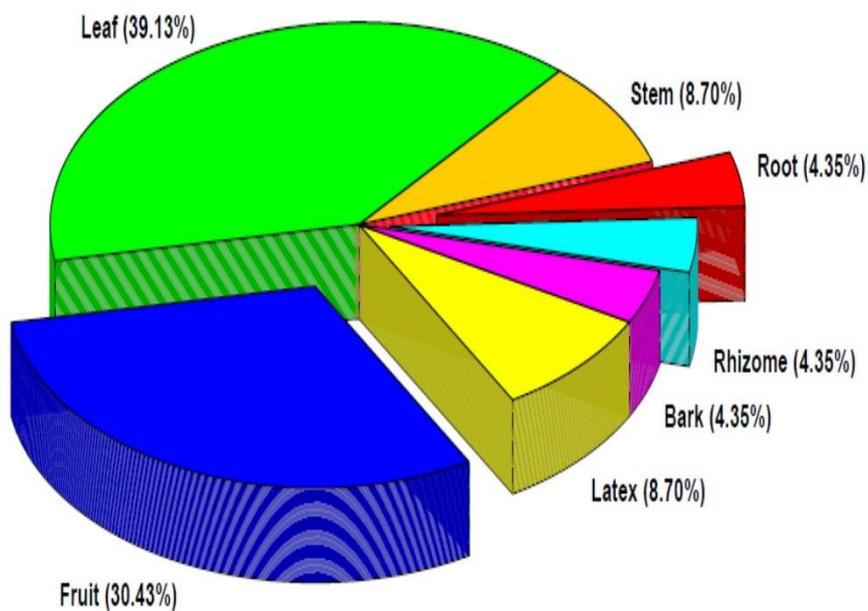


Figure 3. Different parts of plants used for treating gastrointestinal disorders in percentage (%).

In the present investigation 20 species of ethnomedicinal plants under 14 families of angiosperms were documented for treating different gastrointestinal ailments which are used by the ethnic-communities of Berhampore sub-division, Murshidabad district of West Bengal. Out of the total, 8 species viz., *Amaranthus spinosus* L., *Centella asiatica* (L.) Urb., *Terminalia bellirica* (Gaertn.) Roxb., *T. arjuna* (Roxb. ex DC.) Wt. & Arn., *Jatropha gossypifolia* L., *J. Curcas* L., *Paederia foetida* L. and *Scoparia dulcis* L. were collected from the wild and the other 12 species were gathered from the household gardens viz., *Andrographis paniculata* (Burm. F.) Wall. Ex Nees, *Spondias mombin* L., *Coriandrum sativum* L., *Kalanchoe pinnata* (Lam.) Pers., *Mentha x piperita* L., *Psidium guajava* L., *Phyllanthus emblica* L., *P. acidus* (L.) Skeels, *Murraya koenigii* (L.), *Aegle marmelos* (L.) correa, *Citrus x limon* (L.) Osbeck and *Zingier officinale* Roscoe. Amongst the families the highest recorded species (3 spp.) was

from family Rutaceae followed by four families with 2 species each viz., Euphobiaceae (*Jatropha curcas*, *Jatropha gossypifolia*), Phyllanthaceae (*Phyllanthus acidus*, *Phyllanthus emblica*), Apiaceae (*Centella asiatica*, *Coriandrum sativum*), and Combretaceae (*Terminalia arjuna*, *Terminalia bellirica*) and the nine families with one species each viz., Amaranthaceae (*Amaranthus spinosa*), Acanthaceae (*Andrographis paniculata*), Crassulaceae (*Kalanchoe pinnata*), Lamiaceae (*Mentha x piperita*), Rubiaceae (*Paederia foetida*), Myrtaceae (*Psidium guajava*), Scrophulariaceae (*Scoparia dulcis*), Anacardiaceae (*Spondias mombin*) and Zingiberaceae (*Zingiber officinale*) (Table 1).

The maximum number of the total plant species (17.65% each) was observed for treating two common gastrointestinal ailments i.e. dysentery and indigestion and the least number of medicinal plants

Table 2. Medicinal plants used by patients (10 number) for gastrointestinal disorders

Patient Identification Number (PID#)	Digestive disorder	Herbal remedy used
PID#1	Indigestion	<i>Paederia foetida</i> L.
PID#2	Indigestion	<i>Zingiber officinale</i> Roscoe
PID#3	Stomach upset	<i>Kalanchoe pinnata</i> (Lam.) Pers.
PID#4	Dysentery	<i>Centella asiatica</i> (L.) Urb.
PID#5	Indigestion	<i>Zingiber officinale</i> Roscoe
PID#6	Gas problem	<i>Terminalia arjuna</i> (Roxb. Ex DC.) Wt. & Arn.
PID#7	Blood dysentery	<i>Jatropha gossypifolia</i> L.
PID#8	Nausea	<i>Citrus x limon</i> (L.) Osbeck
PID#9	Constipation	<i>Andrographis paniculata</i> (Burm. F.) Wall. Ex Nees
PID#10	Indigestion	<i>Zingiber officinale</i> Roscoe

Table 3. Efficacy of medicinal plants used for the patients (%).

Perceived efficiency	Patient identification number (pid#)	Number of patients	Percentage
Very effective	PID#2,8,7	3	30%
Effective	PID#3,4,5,6	4	40%
Moderately effective	PID#9,10	2	20%
Mildly effective	PID#1	1	10%
Not effective	Nil	0	0%

(5.58%) are used for three diseases viz., diarrhoea, acid-reflux, and constipation. On the other hand, it was observed that, the rest of the ethnomedicinal plants (8.82% each) are used either as a digestive stimulant or other gastrointestinal disorders such as gas formation, stomach ache, vomiting and bloating respectively (Figure 2). Among the plant parts used for the medicinal purposes, the leaf portion is the most utilized (39.13%) plant parts recorded in the present study followed by other plant parts such as fruits (30.43%), latex and stem (8.70% each), roots, rhizomes, and bark (4.35% each) (Figure 3).

The percentage of the patients observed during the present investigative period shows varying degrees of efficacies. The remedies for treating gastrointestinal disorders with the ethnomedicinal plants as very effective was found to be 40%, followed by effective 30%, moderately effective 20%, mildly effective 10%, and not effective (0%) (Table 2 and Table 3).

From the present investigation, it is found that *Aegle marmelos* (L.) Corr. (Bel) is very effective for treating diarrhoea and stomachache. Apart from diarrhoea and stomachache *Aegle marmelos* (L.) Corr. (Bel) is also used as a laxative and digestive stimulant by the ethnic-communities of Berhampore sub-division of the district. Likewise, the fruit of *Aegle marmelos* (L.) Corr. (Bel) is reported for treating chronic dysentery, digestive disorders, laxatives and diarrhoea by certain ethnic communities from Gurugram district of Haryana (Parul et al., 2017), Mayurbhanj district of North Orissa (Rout et al., 2009) and several parts of West Bengal (Konar et al., 2022). Apart from *Aegle marmelos* (L.) Corr. (Bel), other ethnomedicinal plants such as *Centella asiatica* (L.) Urban (Thankuni), *Zingiber officinale* Roscoe (Aada), and

Phyllanthus emblica L. (Amlaki) are frequently used for treating gastrointestinal/ digestive disorders in West Bengal (Vineeta et al., 2022).

It is interesting to note, that, the whole plant of *Centella asiatica* (L.) Urban is extensively used for treating chronic blood dysentery by the ethnic communities of Berhampore sub-division of the district. Similarly, the tribal community of Coochbehar district uses the leaves of *Centella asiatica* (L.) Urban to treat diarrhoea, dysentery and eczema (Datta et al. 2014). Moreover, the ethnic communities of Nalbari district of Assam, uses the juice of *Centella asiatica* (twice daily) for treating stomach disorder and gastritis (Bhattacharya and Borah, 2008) and as a blood purifier by the tribal communities of different regions of West Bengal (Konar et al., 2022). On the other hand, the leaves of *Centella asiatica* is used to treat jaundice, increase memory and to boost immunity by the ethnic communities of Kandhamal district of Odisha (Panigrahy et al., 2016), source of energy (young and old) by the tribes of Chanda forest in Dinori district, Madhya Pradesh (Prana and Ahirwar, 2015).

The rhizome of *Zingiber officinale* Roscoe is used for treating indigestion, bloating, and anti-vomiting by the people of Berhampore sub-division of the district. Besides the zinger tea was found to be helpful for pregnant women from gastric discomfort and nausea (Paonam and Dhaliwal, 2024) and the rhizome is used for treating vomiting, nausea, cold and indigestion by the tribes of Odisha (Panigrahy et al., 2016). The fruit of *Phyllanthus emblica* L. is widely used for treating diarrhoea and as a laxative agent in West Bengal (Vineeta et al., 2022). However, the juice of the *Phyllanthus emblica* L. fruit is consumed by the ethnic communities of Berhampore sub-division to enhance digestion of food. Similarly, the tribal in the lateritic belt of West Bengal eats a slice of the fruit for the same effect (Begum and Mandal, 2016). In south India, the fruit of *Phyllanthus emblica* is used in one of the Ayurvedic formulation known as *Triphala* for treating constipation (Sandhya et al., 2006). The fresh latex of *Jatropha curcas* L. matured leaves is mixed with a few drops of sugar solution (*batasa*) and taken for three days to treat dysentery by the local communities of Berhampore sub-division. Likewise, the fresh latex is used by other communities in West Bengal to treat various ailments viz., dysentery (Datta et al., 2014), cuts and wounds (Ghosh, 2008), toothache by the Santhal, Kora and Oraon tribes (Mistry, 2015a, b; Begum and Mandal, 2016).

The leaves and fruits of other ethnomedicinal plants recorded in the present study are used for treating various gastrointestinal disorders; viz., *Citrus x limon* (L.) Osbeck (anti-vomiting and indigestion), *Coriendrum sativum* L. (digestive stimulant), *Kalanchoe pinnata* (Lam.) Pers. (stomach upset), *Mentha x piperita* L. (indigestion), *Psidium guajava* L. (diarrhoea and dysentery), *Paederia foetida* L. (stomach upset and indigestion), *Phyllanthus acidus* (L.) Skeels (indigestion), *Murraya koenigii* (L.) Spreng (indigestion), *Scoparia dulcis* L. (dysentery), *Andrographis paniculata* (Burm. F.) Wall. Ex Nees (acid reflux, stomach upset, worm) and *Spondias mombin* L. (acidity). Besides the leaves and the fruits, the root of *Amaranthus spinosus* L. the dried bark *Terminalia arjuna* (Roxb. ex DC.) Wt. & Arn. (gas formation) and *Terminalia bellirica* (Gaertn.) Roxb. are used for treating the digestive disorders (Table 1). Similar usage of the ethnomedicinal plants had been reported by other workers from Bengal, the leaves of *Kalanchoe pinnata* (Lam.) Pers. and *Paederia foetida* L. is used for treating flatulence and acidity, *Mentha x piperita* L. (indigestion), *Psidium guajava* L. (stomachache), *Amaranthus spinosus* L. (anemia, urinary problem), *Andrographis paniculata* (Burm. F.) Wall. Ex Nees. (jaundice and body ache) (Datta et al., 2014; Mistry, 2015a, b; Begum and Mandal, 2016; Vineeta et al., 2022). The leaves of *Andrographis paniculata* (Burm. F.) Wall. ex Nees is used for treating cold, cough and worm infection (Mistry, 2015 a, b; Begum and Mandal, 2016) in addition to the treatment of gastrointestinal disorders. For the first time, the uses of leaf latex of *Jatropha gossypifolia* L. leaf latex for treating blood dysentery, leaves of *Murraya koenigii* (L.) Spreng. and fruits of *Phyllanthus acidus* (L.) Skeels for treating gastrointestinal disorders have been recorded from the district.

The present findings are in congruence with the other Indian traditional medicine practices, that is, *Jatropha gossypifolia* L. *Phyllanthus acidus* (L.) Skeels and *Murraya koenigii* (L.) Spreng. are used for their digestive benefits (Sinha et al., 2012; Chakraborty et al., 2012; Panigrahy et al., 2016; Jain et al., 2017; Kumar et al., 2019; Bhusal and Thakur, 2021; Vineeta et al., 2022).

4. Conclusion

The present ethnomedicinal investigation on gastrointestinal disorders provides a comprehensive account of 20 medicinal plant species of Berhampore sub-division of Murshidabad district, West Bengal, India. These ethnomedicinal plants are traditionally used by both the tribals and the non-tribal local communities for different gastrointestinal disorders with the highest percentage (17.65%) of medicinal plants are used for indigestion and dysentery; while the least (5.58%) is administered for other ailments like constipation, diarrhea and acid reflux. The most harvested plant parts for medicinal uses are the leaves (39.13%), followed by fruits, latex, stems, and lastly roots, rhizomes and bark (4.35% each). The efficacy of the herbal medicine as recorded from the *in-situ* observation revealed that 40% of the patient's responses were found to be very effective and relied on natural resources for their daily healthcare. Therefore, effective exploration, documentation and sustainable management of these resources are essential for their preservation and conservation. Further scientific research is essential to explore the biochemical properties of these medicinal plants to isolate bioactive compounds and to validate their (plants) healing properties.

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Author's contributions

The authors equally contributed the concept and design of the present research work. The first author conducted the field survey, documented and drafted the paper and the second author supervised the research work, review, edited and communicate the manuscript.

Declaration of conflict of interest

The authors declared not conflict of interest.

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