Plants and the digestive system

Ágnes Alberti

Department of Pharmacognosy

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Phytotherapy in digestive disorders

Herbal drug	Action
Carminative / spasmolytic drugs	Omitting of intestinal colic
	Omitting of colic of the bile ducts
Choleretic, cholekinetic drugs	Secretion of bile
Antibacterial drugs	Restoration of the balance of the intestinal microbiota (intestinal flora)
Drugs containing bitter principles	Promotion of digestion
Drugs containing digestive enzymes	Promotion of digestion
Laxative drugs, drugs containing fibres	Promotion of defecation
Anti-diarrheal drugs	Treatment of diarrhea (in IBS)

Csupor (2012) Fitoterápia – Növényi szerek a gyógyászatban

Herbal drugs to stimulate appetite

Herbal drugs containing bitter principles:

Centaurii herba / Centaury*

Marrubii herba / White Horehound*

Harpagophyti radix / Devil's Claw root*

Gentianae radix / Gentian root*

Menyanthidis trifoliatae folium / Bogbean leaf*

Cardui benedicti herba / Blessed Thistle

Absinthii herba / Wormwood *

Aurantii amari epicarpium et mesocarpium / Bitter-orange epicarp and mesocarp*

Herbal drugs containing essential oil:

Cinnamomi cortex / Cinnamon*

Coriandri fructus / Coriander*

Millefolii herba / Yarrow*

Angelicae radix / Angelica root*

Curcumae xanthorrhizae rhizoma / Javanese Turmeric*

Herbal drugs containing polysaccharides:

Taraxaci folium et radix / Dandelion leaf and root

Trigonellae foenugraeci semen / Fenugreek*

Lichen islandicus / Iceland moss*

*** Ph. Eur. drug**

Herbal drugs in the treatment of dyspepsia

Herbal drugs containing bitter principles:

Centaurii herba / Centaury*

Marrubii herba / White Horehound*

Harpagophyti radix / Devil's Claw root*

Gentianae radix / Gentian root*

Menyanthidis trifoliatae folium / Bogbean leaf*

Cardui benedicti herba / Blessed Thistle

Absinthii herba / Wormwood *

Aurantii amari epicarpium et mesocarpium / Bitter-orange epicarp and mesocarp*

Herbal drugs containing other principles:

Cynarae folium / Artichoke leaf*

Taraxaci folium et radix / Dandelion leaf and root

Silybi mariani fructus / Milk Thistle fruit*

Herbal drugs containing essential oil:

Anisi fructus / Aniseed*, Anisi stellati fructus / Star anise*

Menthae piperitae folium / Peppermint leaf*, Menthae piperitae aetheroleum / Peppermint oil*

Cinnamomi cortex / Cinnamon*

Cardamomi fructus / Cardamon fruit

Foeniculi amari fructus / Bitter Fennel fruit*, Foeniculi amari fructus aetheroleum / Bitter Fennel fruit oil*

Coriandri fructus / Coriander*

Carvi fructus / Caraway fruit*, Carvi aetheroleum / Caraway oil*

Millefolii herba / Yarrow*

Angelicae radix / Angelica root*

Melissae folium / Melissa leaf*

Rosmarini folium / rosemary leaf*

Caryophylli flos / Clove*

Zingiberis rhizoma / Ginger*

Curcumae xanthorrhizae rhizoma / Javanese Turmeric*

*** Ph. Eur. drug**

Herbal drugs in the treatment of flatulence

Herbal drugs containing essential oil:

Menthae piperitae folium / Peppermint leaf*, Menthae piperitae aetheroleum / Peppermint oil*

Foeniculi amari fructus / Bitter Fennel fruit*, Foeniculi amari fructus aetheroleum / Bitter Fennel fruit oil*

Carvi fructus / Caraway fruit*, Carvi aetheroleum / Caraway oil*

Angelicae radix / Angelica root*

Herbal drugs containing polysaccharides:

Taraxaci folium et radix / Dandelion leaf and root

Herbal drugs containing bitter principles:

Gentianae radix / Gentian root*

*** Ph. Eur. drug**

Herbal drugs in the treatment of irritable bowel syndrome

Herbal drugs containing essential oil:

Menthae piperitae folium / Peppermint leaf*, Menthae piperitae aetheroleum / Peppermint oil*

Herbal drugs containing polysaccharides:

Plantaginis ovatae semen / Ispaghula*, Plantaginis ovatae seminis tegumentum / Ispaghula husk*

Lini semen / Linseed*

Psyllii semen / Psyllium seed*

Herbal drugs in the treatment of constipation

Herbal drugs containing anthraglycosides:

Rhamni purshianae cortex / Cascara bark*

Frangulae cortex / Frangula bark*

Aloes folii succus siccatus / Aloes, dried juice of leaves*

Sennae folium / Senna leaf*, Sennae fructus angustifoliae / Tinnevelly Senna pods*, Sennae fructus acutifoliae / Alexandrian Senna pods *

Rhei radix / Rhubarb root*

Herbal drugs containing polysaccharides:

Plantaginis ovatae semen / Ispaghula*, Plantaginis ovatae seminis tegumentum / Ispaghula husk*

Lini semen / Linseed*

Psyllii semen / Psyllium seed*

*** Ph. Eur. drug**

Herbal drugs in the treatment of diarrhea

Herbal drugs containing polysaccharides:

Plantaginis ovatae semen / Ispaghula*, Plantaginis ovatae seminis tegumentum / Ispaghula husk*

Herbal drugs containing tannins:

Agrimoniae herba / Agrimony*

Alchemillae herba / Alchemilla*

Quercus cortex / Oak bark*

Tormentillae rhizoma / Tormentil*

Bitter principles to stimulate appetite

Bitter principles: stimulate digestion, enhance secretion in all parts of the gastrointestinal tract

bitter taste receptors on the back part of tongue → **reflex effect,** through *vagus nerv* (higher doses needed to have the same effect when applied in the stomach)

- secretion of saliva and gastric juice is enhanced → stimulated appetite
- enhanced secretion of gastric acid from the parietal cells (in the lining of the stomach)
- enhanced secretion of gastrin → enhanced motor function of the stomach and small intestine, enhanced secretion of bile and digestive enzymes from the pancreas
- better digestion of the gastric and intestinal contents, ease of dyspeptic complaints (feeling of fullness, abdominal pain or discomfort, acid reflux, flatulence)

Application: ethanolic extracts of infusions,

- **without flaworing** (sugar, sweetener), more pleasant taste by applying a combination of several drugs
- **before meals**, no effect without eating
- too high concentrations have the opposite effect

Contraindications: gastric and duodenal ulcers

Herbal drugs containing bitter principles I.

Amara pura

Centaurii herba / Centaury
Pour 150 ml boiling water on 1-2 g herbal drug, steep the tea for 15 minutes, consume cold or lukewarm before meals

Gentianae radix / Gentian root
Pour 150 ml cold water on 1 g herbal drug, bring to boil, steep the tea for several hours, consume before meals

Menyanthidis trifoliatae folium / Bogbean leaf
Pour 150 ml cold water on 1 g herbal drug, boil,
Pour 150 ml boiling water on 1 g herbal drug,
} steep the tea for 10 minutes, consume without flaworing, 15-30 minutes before meals


Centaury


Bogbean


Gentian

Herbal drugs containing bitter principles II.

Amara aromatica

Angelicae radix / Angelica root
Pour 150 ml boiling water on 1 g herbal drug or pour 150 ml cold water on 1 g herbal drug, bring to boil, steep the tea for 10 minutes, consume before meals

Cardui benedicti herba / Blessed Thistle
Pour 150 ml boiling water on 2 g herbal drug, steep the tea for 30 minutes, consume 15-30 minutes before meals

Tea-blending: Centaury, Yarrow, Peppermint leaf

Rp. Centaurii herba
Millefolii herba
Menthae piperitae folium āā 20,0 g
M.f. species
D.S.: Pour 150 ml boiling water on 1-2 g herbal drug, consume cold or lukewarm before meals



Wormwood


Blessed Thistle



White Horehound

Herbal drugs containing essential oil
Essential oils in the treatment of dyspepsia

local irritation

- enhanced secretion of saliva and gastric juice
- enhanced production and secretion of bile

essential oils are excreted with the bile → flushing the bile ducts → **spasmolytic and antibacterial effect**

majoram, sage, savory, peppermint (menthol);
caraway, fennel fruit, coriander, aniseed, lovage, celery, parsley;
ginger, turmeric

Contraindications: forming of gallstones may be induced,
essential oils / herbal drugs with essential oils may be applied only when there is no predisposition toward the formation of gallstones (e.g. blockages wich inhibit the release of bile)

Stomachica

(drugs/preparations/substances, that stimulate appetite and improve digestion)

- **Aromatica** (**essential oils**)
- **Amara** (**bitter principles**)
- **Amara aromatica** (bitter principles in combination with essential oil):

  essential oil stimulates appetite in itself, too: it irritates the oral mucosa, increases the secretion of saliva; irritates the gastric mucosa and thus enhances secretion of gastric juice
- **Amara lucida** (bitter principles in combination with **plant mucilage**):

  protection, coating of the gastric mucosa → no irritating effect
- **Pungent tasting principles**: should be used with caution, powerful effect

  ginger: **gingerols, shogaols** (stimulates **thermoreceptors of the oral mucosa,** responding to warm stimuli**)**

  hot peppers, chili: **capsaicin** (irritation of mucosa + vanilloid receptors)

  Brassicaceae plants: **mustard oil glucosides**; cause necrosis in higher doses or when applied on not intact mucosa

Herbal stomachica I.

- ***Coriander**:* to treat dyspeptic complaints and inappetence; may cause allergic reactions (the components of the essential oil)

- ***Calamus root***: contains essential oil; spasmolytic effect, increases the secretion of saliva and gastric juice

  oil is supposed to cause duodenal carcinoma because of the presence of β-asarone

- ***Bitter-orange epicarp and mesocarp***: to treat dyspeptic complaints and inappetence

  Drug: dried epicarp and mesocarp of the ripe fruits partly freed from the white spongy tissue of the mesocarp and endocarp

  contains: volatile oil, flavonoids (bitter taste), bitter tasting triterpenes (limonoids) in the *albedo,* pectin

  linear furanocoumarins: photosensibilization

- ***Roman chamomile*****:** amara aromaticum, mild spasmolytic effect, antibacterial; may cause allergic reactions

  contains: essential oil, sesquiterpene lactones (e.g. nobilin) – stimulates appetite, flavonoids: apigenin (spasmolytic)

- ***Peppermint***

Herbal stomachica II.

digestives, stomachica:

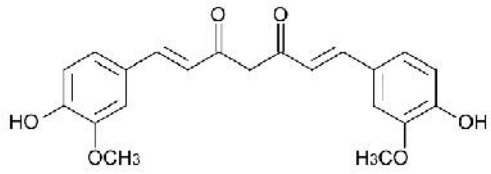
for the symptomatic treatment of digestive disturbances,

dyspeptic complaints, indigestion, to increase appetite

- ***Turmeric, Javanese Turmeric***: diarylheptanoids, essential oil

choleretic effect: enhanced production and secretion of bile, to treat disorders concerning the secretion of bile

aqueous or ethanol extracts: amara aromatica



curcumin

- ***Lesser galangal***: diarylheptanoids, essential oil

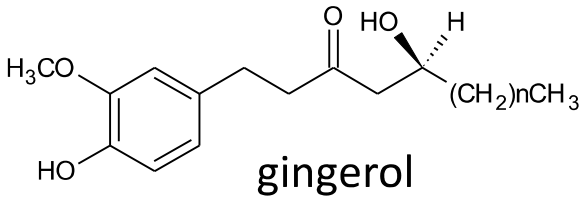
spasmolytic, anti-inflammatory (diarylheptanoids), antibacterial (essential oil)
aqueous and methanol extracts inhibit secretion of gastric juice

- ***Ginger:*** pungent principles (gingerols), essential oil

increased secretion of saliva and gastric juice (pungent principles)

gastrokinetic effect (prokinetic agent, propulsive): enhances gastrointestinal motility by increasing the frequency or strength of contractions; antiulcerative effect

Effects of ginger in the GI tract



gingerol

• ***gastroprokinetic action****:*
pungent tasting principles: increased secretion of saliva and gastric juice
increased gastrointestinal motility; antiulcerative effect

• ***anti-emetic action:*** pungent tasting principles (gingerols, shogaols), essential oil

- D_2 receptor inhibition,
- 5-HT_3 receptor antagonists: [6]-, [8]-, [10]-gingerol and [6]-shogaol anti-emetic by acting on the 5-HT_3 receptor ion-channel complex, by binding to a modulatory site distinct from the serotonin binding site (*in vitro*)

function of gingerol and shogaol alkyl group;

when extracts of ginger are applied, they have to contain high amounts of essential oil, too

antiemetics, used in the prevention and treatment of nausea and vomiting: in *clinical trials* effective in controlling **nausea and vomiting during pregnancy**, postoperative nausea and vomiting, motion sickness

Tea: Pour 150 ml boiling water on 2 g dried and powdered herbal drug, steep the tea for 5-10 minutes

Preparations of the Ph. Hg. VIII.
Stomachica

Tinctura amara

Rp.	Absinthii herba	60 g
	Centaurii herba	60 g
	Trifolii fibrini folium	60 g
	Aurantii pericarpium	20 g
	Alcoholum dilutum 40%	qu.s.

Wormwood, Centaury, Bogbean leaf, Bitter-orange epicarp and mesocarp

Tinctura aromatica

Rp.	Cinnamomi cassiae cortex	100 g
	Aurantii pericarpium	50 g
	Cardamomi fructus	25 g
	Caryophylli flos	25 g
	Alcoholum dilutum 40%	qu.s.

Cinnamon, Bitter-orange epicarp and mesocarp, Cardamon fruit, Clove

Preparations stomachica

Germany

GASTRITOL LIQUID

Chamomile flower (Matricariae flos)

Tormentil (Anserinae herba)

Licorice (Liquiritiae radix)

Angelica root (Angelicae radix)

Blessed Thistle (Cardui benedicti herba)

Wormwood (Absinthii herba)

Italy

MELCALIN® EPADOX

Chicory root (*Cichorium intybus*)

Blessed Thistle (*Cnicus benedictus*)

Common mugwort (*Artemisia vulgaris*)

Melissa leaf (*Melissa officinalis*)

Carminativa

Carminative agent, carminativum: prevents formation of gas in the gastrointestinal tract or facilitates the expulsion of gas

to treat flatulence, to ease intestinal spasms

Herbal drugs containing essential oil

- spasmolytic + digestive effects
- caraway fruit, bitter fennel fruit, aniseed, peppermint, marjoram
- dill oil: in pediatrics; instead of fennel oil for infants and toddlers (bitter fennel oil can contain toxic components which cause shortness of breath)

Tea: Pour 150 ml boiling water on 1-2 g chrushed herbal drug, cover and steep the tea for 5-10 minutes, consume hot, together with meals, 3 times daily

Essential oil: add 2-3 drops of oil to 2 dl water, consume together with meal

Carminative tea-blendings I.

- **Caraway fruit, Bitter Fennel fruit, Aniseed**

Rp. Carvi fructus contus. **contus., contusus = crushed**
Foeniculi fructus contus.
Anisi fructus contus. āā 20.0 g
M.f. species
D.S.: Pour 150 ml boiling water on 2 g blend, steep for 20 minutes, consume warm, after each meal.

- **Caraway fruit, Bitter Fennel fruit, Peppermint leaf, Melissa leaf**

Rp. Carvi fructus
Foeniculi fructus āā 20.0 g
Menthae piperitae folium
Melissae folium āā 30.0 g
M.f. species
D.S.: Pour 150 ml boiling water on 2 g blend, steep for 15 minutes, consume warm, after each meal.

- **Caraway fruit, Bitter Fennel fruit, Chamomile flower**

Rp. Carvi fructus
Foeniculi fructus āā 20.0 g
Matricariae flos ad 100.0 g
M.f. species
D.S.: Pour 150 ml hot water on 2 g blend, steep for 20 minutes, consume several times daily.

Carminative tea-blendings II.

- **Caraway fruit, Bitter Fennel fruit, Peppermint leaf, Chamomile flower**

Rp. Carvi fructus
Foeniculi fructus
Menthae piperitae folium
Matricariae flos āā ad 100.0 g
M.f. species
D.S.: Pour 150 ml boiling water on 2-3 g herbal drug, steep the tea for 15 minutes, consume hot, slowly sipping.

- **Caraway fruit, Bitter Fennel fruit, Wormwood, Yarrow**

Rp. Carvi fructus
Foeniculi fructus
Absinthii herba
Millefolii herba āā 25.0 g
M.f. species
D.S.: Pour 150 ml boiling water on 2 g herbal drug, steep the tea for 15 minutes, consume warm, before each meal.

Dietary fibres

compounds of plant origin, which **pass the human small intestine unchanged** and are not absorbed
they are *partly or entirely* **fermented** in the large intestine, during which they are degraded by the physiological intestinal flora to short chain fatty acids

they reduce plasma cholesterol levels, regulate blood glucose levels, have anti-diarrheal/laxative effects

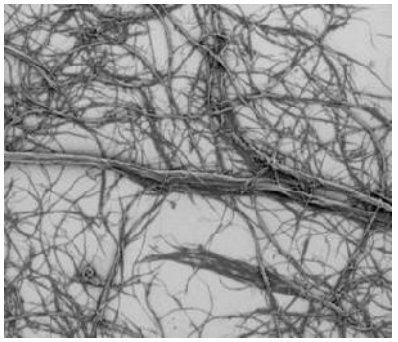
- **water-soluble (gel-forming) fibres:** e.g. pectins, mucilage polysaccharides, gums form hydrocolloids with water (e.g. agar gel contains up to 99.5% water)

- **water-insoluble fibres:** e.g. cellulose, plant cell wall components, lignin
are degraded by the intestinal flora to a lesser extent, are excreted with feces, have a high capacity to hold water → pronounced volume-enhancing effect

Water-holding capacity of dietary fibres

Cellulose fibres:

- **high surface area**
- high number of hydroxyl groups (**hydrogen bonds**)
- water-holding capacity: 5-6.5 g water / 1 g dry material



water-soluble (gel-forming) polysaccharides in general held more water

smaller particle size increases water-holding capacity

Fibre-containing food increase fecal weight (human study, n=6)

Food	Water-holding capacity (g water/g dry material)	Dose (g/day)	Fibre content (g)	Change in fecal weight (calculated for 20 g fibres)
Pectin	56.2	36	30.8	19%
Apple	12.8	25	21.9	40%
Carrot	11.8	30	20.1	61%
Cabbage	8.0	30	18.3	67%
Wheat bran	4.2	30	18.0	117%

AM Stephen, JH Cummings (1979) Water-holding by dietary fibre *in vitro* and its relationship to faecal output in man. Gut, 20: 722-729.;
ábra: https://blog.exilva.com/water-holding-capacity-how-microfibrillated-cellulose-does-it

Structure-dependent properties of plant fibres – Water-insoluble fibres

digesive enzymes do not degrade fibres: plant fibres are resistant to digestive enzymes of the pancreas and small intestine (e.g. α-amylase, lactase, lipase, pepsin, trypsin)

Plant fibres have different effects in distinct parts of the gastrointestinal tract

Water-insoluble fibres:

- **Swelling** due to their water-holding capacity (→ feeling of fullness) (e.g. cellulose)
- **Enhance the peristalsis** of the small intestine due to a reflex mechanism → decrease transit time
- Bind bile acids and other steroids (e.g. lignin)
- Are **not degraded by the flora** of the large intestine → more water-holding → enhance further the weight of feces + softer stool → **decreased transit time**

Structure-dependent properties of plant fibres – Water-soluble fibres

Plant fibres have different effects in distinct parts of the gastrointestinal tract

Water-soluble fibres:

- **Gel-forming** activity (e.g. pectins, gums, guar)
- **Increase the viscosity** of the contents of the small intestine → **increased transit time**
- **Modify absorption** (due to 1. increased viscosity, 2. forming of gel-coating on the mucosa, 3. binding of digestive enzymes)
- Bind bile acids (e.g. polysaccharides with hydrophobic groups: methylated pectins)
- Bind cations (e.g. polysaccharides with sulfate or uronic acid groups: pectins, alginates)
- Are **degraded by the flora** of the large intestine to short chain fatty acids (e.g. acetate, propionate, butyrate) and gases (flatulence can occur at the start of the application)

  → source of energy + **favorable milieu for the physiological flora**;

  → unfavorable for the pathogen microorganisms

Metabolic effects of dietary fibres

- Hydrogel effect → prolonged absorption of monosaccharides → decreased postprandial glucose levels and insulin secretion

  e.g. Psyllium seed, Ispaghula

- Binding of bile acids → decreased re-absorption, increased excretion (inhibition of enterohepatic circulation) → increased synthesis from endogenous and dietary cholesterol → decreased serum total and LDL cholesterol levels

  e.g. lignin, pectins, Psyllium seed, Ispaghula, Linseed

- Fibre-rich food: usually low-energy, low-fat, contains higher amounts of polyunsaturated fatty acids → decreased serum cholesterol and triglyceride levels

CAUTION! Dietary fibres decrease absorption of minerals, trace elements (e.g. calcium, iron, zinc) and other **medications**!

Therapeutic application of pectins

- plant cell walls components
- gel-forming properties
- in fruits, vegetables, e.g. pulp of apple: 10–15%, citrus peel: up to 30%

1. Dietary fibre

- in the supplemental, dietary treatment of **Type 2 Diabetes Mellitus** and **hypercholesterolemia**
- 15-30 g pectin/day for 3-4 weeks → 10-20% decrease in total serum cholesterol level

Modified absorption: 1. increased viscosity of the gastric content; 2. forming of gel-coating on the mucosa; 3. binding of digestive enzymes, inhibit forming of the enzyme-substrate complex; 4. increased excration of bile acids

2. Anti-diarrheal agent

- in the **treatment of unspecific diarrhea**, gastroenetritis, mild peptic ulcers
- 10-20 g perctin/day; e.g. 100-200 g grated apple, banana puree, carrot puree)

Anionic polysaccharides: adsorption of bacterial toxins
Degradation by the flora: favorable for the physiological flora + unfavorable for the pathogens
Gel-forming: coating of the mucosa

Laxatives

- **Osmotic laxatives**, e.g. fructose, sugar alcohols, lactulose
- **Laxatives that lubricate and irritate the gut wall**: castor oil (specific fatty acid composition, különleges zsírsav-összetétel, ricinoleic acid)
- **Laxatives that increase the gut content (fecal weight)**

✓ water-insoluble fibres: hold large amounts of water, swelling → shortened transit time

cellulose: can not be digested in the human GI tract; high doses can irritate the mucosa

carrot: contains **non-digestable fibres**, holds large amounts of water, increases fecal weight; well tolerated

✓ plant mucilage polysaccharides: hold large amounts of water, form colloid solutions → shortened transit time

✓ combination of cellulose + mucilage polysaccharides

Psyllium seed: in the outer layers of the husk epidermis mucilage, in the inner layers of the husk epidermis cellulose;
water intake is important! swells intensely, in a moment-like manner → may cause asphyxia, oesophageal obstruction and ileus

Mucilage polysaccharides

- heteropolysaccharides, can be extracted with both cold and warm water
- form viscous colloid solutions (sols) or hydrogels of high viscosity
- water-holding capacity → intensive swelling

Application

1. Coating:

- ***Decreased irritation***,
- ***Inhibited adhesion*** of pathogen bacteria (e.g. *Helicobacter pylori*),
- ***Modified absorption*** (intensive swelling, high viscosity) → reduction of raised blood sugar values after meals; reduction of serum triglyceride and cholesterol levels

They modify (inhibit) absorption of medicaments!

2. Laxative:

- Increase in the volume of the stool,
- Enhanced peristalsis
- Improved consistence of the stool

Psyllii semen – Psyllium seed
Plantaginis ovatae semen – Ispaghula
Plantaginis ovatae seminis tegumentum - Ispaghula husk

- **Laxative action:** non-digestable fibre + mucilage; volume effect (increased fecal weight)
- **Mucosa protective effect**
- **Metabolic actions:** when applied right before or together with meals

Application, indications:

1. all drugs: in case of habitual (persistent) constipation
daily doses: Psyllium seed 25-40 g / Ispaghula 8-40 g / Ispaghula husk 7-11 g; in 1-3 divided doses

2. Ispaghula husk: as an adjuvant in IBS constipation and in hypercholesterolemia
posology: 7-20 g Ispaghula husk daily, in 1-3 single doses

- **Consume at least 30 ml water/1 g herbal drug at the same time!**

Mix the preparation or herbal substance with the water, milk, fruit juice or similar aqueous liquid (**min. 30 ml/g**); **stir** briskly and swallow as quickly as possible.
can cause asphyxia and obstruction because of swelling in the oesophagus or in the small intestine!

- Apply at least **1 hour before or 2 hours after intake of other medicines**
- Undesired effects: flatulence, rarely allergic reaction (proteins)

Assessment report on Plantago afra L. et Plantago indica L., semen EMA/HMPC/599745/2012; Assessment report on Plantago ovata Forskk., semen EMA/HMPC/304360/2012; Assessment report on Plantago ovata Forssk., seminis tegumentum EMA/HMPC/199775/2012

Preparations containing dietary fibres

France

PSYLLIUM LANGLEBERT (Psyllium seed),

MUCIVITAL (Ispaghula husk),

SPAGULAX (Ispaghula),

AGIOLAX (Isphagula, Isphagula husk, *Tinnevelly Senna pods*)

Italy

SPIDILAX NORMO (Isphagula husk, inulin, lactulose)
TEVA PSILLIO E ACIDO IALURONICO (Isphagula husk)

Germany

PLANTABEN MADAUS (Ispaghula husk)

MUCOFALK (Ispaghula husk)

FLOSINE BALANCE (Ispaghula husk)

AGIOCUR MADAUS (Ispaghula, Ispaghula husk)

AGIOLAX MADAUS (Isphagula, Isphagula husk, *Tinnevelly Senna pods*)

Lini semen - Linseed

- 25% total fibre content, 3–10% water-soluble fibre content = mucilage
- water-insoluble and water-soluble fibres in the epidermis of the seeds → *in toto* herbal drug (as a whole) is effective;
- the effect can be enhanced by mildly crushing the linseed → fatty oil is released (improves rheology of the stool)
- single dose: 5-15 g (in 250 ml water), daily dose: 2-3 times daily
- The effect starts 12-24 hours later.

Cyanogenic glycosides in linseed (linustatin, neolinustatin, linamarin)

No toxic effects during the consumption of 50 g linseed daily for a longer period of time.

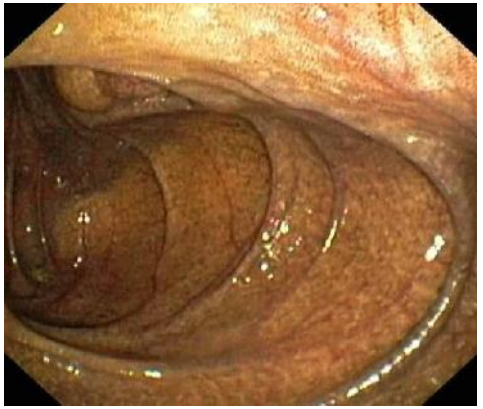
1. gastric pH is unfavorable for the glycosidase enzymes, which generate HCN; 2. human endogenic enzyme system neutralizes HCN; 3. HCN is degraded in the stomach to formic acid and ammonium chloride

Further mucilage drugs:

Althaeae radix – **Marshmallow root**
Althaeae folium – **Marshmallow leaf**
Malvae folium – **Common mallow leaf**
Malvae sylvestris flos – **Common mallow flower**

Herbal drugs containing anthraglycoside laxatives

- Senna leaf // Tinnevelly Senna pods, Alexandrian Senna pods // Cascara bark // Frangula bark // Rhubarb root
- Active principles reach the large intestine unmodified; enzymes of the bacterial flora cleave the glycosidic linkage of the sugar moieties; aglycones are absorbed → effect starts 6-10 hours later.
- **Increased motility and secretion**
- Increased PG-, 5HT-, NO secretion in the mucosa cells and enterocytes → luminal water retention
- Application as tea: water intake



Long-time application may cause mucosa irritation and hyperpigmentation of the mucosa in the large intestine; carcinogenic effect was supposed, however, there are no observations of malignus progression.

Restricted application:

- maximum 30 mg active substance/day, **for 2 week at the longest**
- only as laxative agents, are **not to be applied as slimming agents**
- **Contraindication:** ileus, inflammatory diseases of the intestines (e.g. Crohn's disease, colitis ulcerosa, appendicitis), unexplained abdominal compleints
- **May modify the elektrolyte balance**! (enhanced K^+ and water loss): contraindicated in severe dehydration and hypokalemia

Preparations containing anthraglycosides

France

AGIOLAX (Isphagula, Isphagula husk, Tinnevelly Senna pods *corresponding to 15 mg hydroxyanthracene glycosides, calculated as sennoside B*)

Italy

TISANA KELEMATA (Senna leaves)

X PREP (Alexandrian Senna pods extract)

PURSENNID (sennosides A + B)

Germany

AGIOLAX MADAUS (Isphagula, Isphagula husk, Tinnevelly Senna pods)

ALASENN KRÄUTERGRANULAT (Senna leaves, Tinnevelly Senna pods)

NEDA FRÜCHTEWÜRFEL (Tinnevelly Senna pods, Senna leaves, 30 mg Sennoside B)

Anti-diarrheal herbal drugs

Tannins

- Form complexes, water-insoluble associates with proteins (with inflammatory proteins, too)
- When applied in appropriate doses, the coagulation (complex-forming) is irreversible → protective layer on the surface of the mucosa
- Quality of the drug is of importance: application of condensed tannins is favorable (hydrolysable tannins are hard to dose properly)

Herbal drugs: black tea, rasberry leaf, mulberry leaf, agrimony, alchemilla, oak bark, tormentil

Application:
Black tea: Pour 150 ml cold water on 2 g tea leaves, bring to boil, steep the tea for 10 minutes, consume without flavoring or milk, slowly sipping

Tannins may adsorb other medicaments → apply at least 1 hour before or after intake of other medicines

Effects of tannins

Water-soluble, weak acid, phenolic compounds

Actions of tannins:

- **Adstringent** effect: tannins form complexes with proteins (e.g. with those of the mucosa), thus compose water-insoluble associates (coating) → protection of the mucosa, decreased irritation and secretion
- **Decreased peristalsis and secretion in the GI tract**
- Antimicrobial, antibacterial effect
- Inhibition of dental plaque formation: inactivation of *Streptococcus mutans* glucosyltransferase
- Anti-inflammatory effect: inhibition hyaluronidase, inhibition of the degranulation of mast cells, inhibition of leukocytes
- Antioxidant effect

Application: **unspecific diarrhea**, inflammatory complaints of the mouth and throat

Reducing inflammation of the oral mucosa: **tannins + mucilages + essential oil**

Interactions: tannins may adsorb other medicaments and thus inhibit their absorption

Inflammatory diseases of the gastrointestinal tract

- Gastric and duodenal ulcers
- Functional diseases of the gastrointestinal tract (IBD)
- Inflammatory diseases of the gastrointestinal tract: colitis ulcerosa, Crohn's disease
- Irritable bowel syndrome (IBS)

Ulcers

Aim: to prevent irritation of the gastric mucosa / recurrence of ulcer → **anti-inflammatory drugs + coating**

Chamomile: essential oil (***α-bisabolol, chamazulene carboxylic acid***); anti-inflammatory
Pour 150 ml boiling water on 2-3 g herbal drug, steep the tea for 5-10 minutes, consume without slowly sipping 3-4 times daily

Marigold: lipophilic triterpene alcohols (***faradiol esters***); anti-inflammatory
in higher doses cytotoxic

Licorice: triterpene saponins (***glycyrrhizic acid***); anti-inflammatory

- Tea as adjuvant therapy: Pour 150 ml boiling water on 1 g herbal drug, steep the tea for 15 minutes, consume 3 times daily
- High doses, long-time application: **mineralocorticoid side effects** - hypertonia, Na^+ and water retention, loss of K^+
- **Interactions** with corticosteroids, diuretics, cardioactive glycosides, anthraglycosides

Application of licorice in (gastric) ulcers

- Flavonoids of licorice: inhibitory activity against the growth of *Helicobacter pylori in vitro*
  Anti-*H. pylori* activity against clarithromycin and amoxicillin resistant strains

- **glycyrrhizic acid** and derivatives: antiulcer properties; raising the local concentration of prostaglandins → enhanced mucous secretion and cell proliferation

  enoxolon: used for the treatment of peptic ulcer

  carbenoxolon: used for peptic ulcer disease, gastro-oesophageal reflux and also it has been used for the symptomatic management of mouth ulceration as a gel or mouthwash

- double-blind human study, peptic ulcer patients (n=40, 30 days)

  Treatment: amoxicillin, metronidazole, omeprazole, licorice
  Control: amoxicillin, metronidazole, omeprazole, bismuth sub nitrate

  peptic ulcer healing rate (biopsy + histological study): 95% (control: 70%)
  H. pylori eradication (urease breath test): 55% (control: 40%)

T Fukai, A Marumo, K Kaitou, T Kanda, S Terada, T Nomura (2002) Anti-Helicobacter pylori flavonoids from licorice extract. Life Sciences, 71: 1449–1463.; MN Asl, H Hosseinzadeh (2008) Review of Pharmacological Effects of *Glycyrrhiza* sp. and its Bioactive Compounds. *Phytother Res,* 22: 709–724.; M Rahnama, D Mehrabani, S Japoni, M Edjtehadi, MS Firoozi (2013) The healing effect of licorice (*Glycyrrhiza glabra*) on *Helicobacter pylori* infected peptic ulcers. J Res Med Sci, 18: 532–533.

Irritable bowel syndrome (IBS)

- pathomechanism unknown; presumably chronic or recurrent immuno-activation in the gastrointestinal tract
- further factors: diet, diversions of the bacterial flora of the GI tract, deficiencies of the barrier function of GI mucosa, genetical factors
- therapy: corticosteroids, antibiotics, immunosuppressants, biological therapy (e.g. anti-TNF antibody)
- low effectiveness, severe side effects (infections, tumours)
- **phytotherapy: only symptomatic or adjuvant treatment**

Phytotherapeutic options in IBS

- **Bitter principles**: to improve digestion; not to be used on their own → in combination with anti-inflammatory drugs

- **Carminativa, spasmolytics**: digestive + spasmolytic effect; caraway, fennel, peppermint, marjoram

Phytotherapeutic options in IBS I.

Curcumin:

anti-inflammatory effect:

- inhibition of NF-κB activation (→ inhibition of COX-2, iNOS expression)
- down-regulation of COX-2, lipoxigenase, iNOS enzymes
- inhibition of inflammatory cytokines (TNF-α, IL-1, IL-2, IL-6, IL-8, IL-12)

(–)-CBD/cannabidiol: non-psychotropic, anti-inflammatory antioxidant, anti-apoptotic, immunomodulant (CB_2 receptor)

can control intestinal motility

In more recent clinical studies:

aloes gel, wormwood, wheatgrass juice

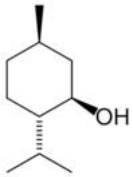
Boswellia serrata (Indian oli-banum), *Andrographis paniculata* (creat or green chireta)

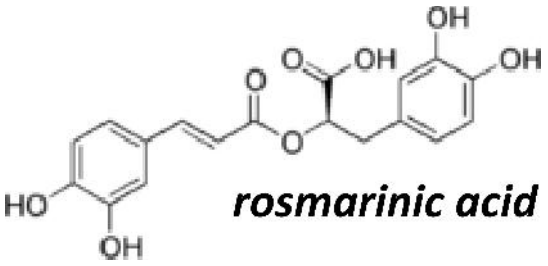
Phytotherapeutic options in IBS II.
Mentha × *piperita* / peppermint

Constituents:

- Essential oil: ***(–)-menthol***
- Phenolcarboxylic acids: ***rosmarinic acid***, caffeic acid, chlorogenic acid;
- Flavonoid glycosides: ***apigenin glycosides***

(–)-menthol

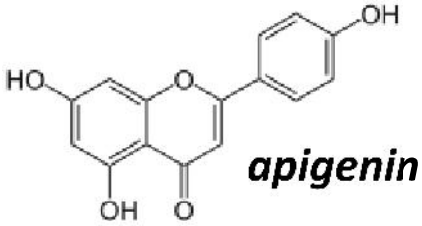




rosmarinic acid

Actions:

- Spasmolytic effect: flavonoids
- Antimicrobial effect: essential oil
- Carminative effect: essential oil
- Enhances secretion of saliva, gastric juice and bile: essential oil
- Choleretic effect: caffeic acid derivatives



apigenin

Indications:

Spasms of the gastrointestinal tract, the gall bladder and the bile ducts

Digestive disorders: dyspepsia, flatulence, gastritis

Effects of peppermint leaf, peppermint oil and menthol

stimulates the appetite, spasmolytic action (in the stomach and the oesophagus)

Effectiveness in IBS: meta-analysis (randomized, placebo controlled, double-blind studies)

WHO-monograph:

- **Antimicrobial action**
- **Choleretic activity:** extract containing flavonoids and the isolated flavonoids enhance secretion of bile acids in
- **Inhibition of smooth muscle contractions:** ethanol extract has a similar effect to that of atropin *in vitro*: inhibits smooth muscle contractions induced by acetylcholine and histamine

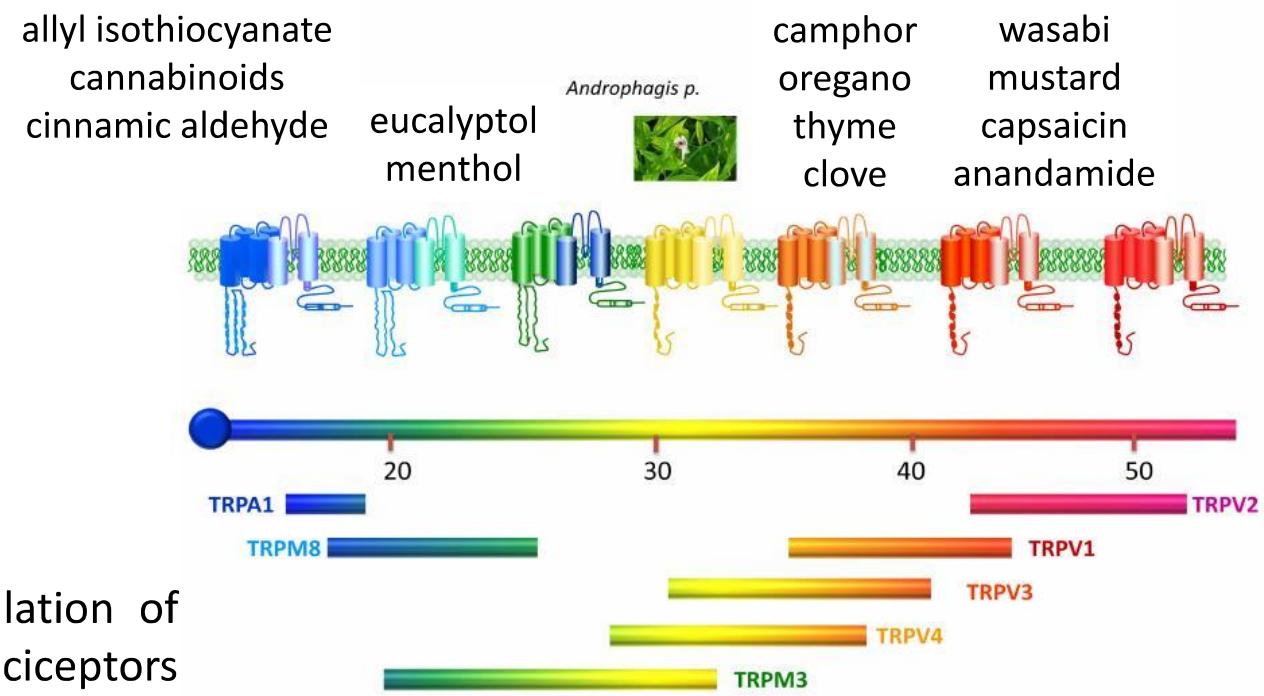
Pour 150 ml boiling water on **0.05-0.1 g peppermint oil** or **1-3 g dried peppermint leaf**, consume 3 times daily

Undesired effects

- Allergy
- Overdose: symptomes concerning the central nervous system
- Contraindicated in case of gall stones
- Contraindicated for infants and toddlers

ThermoTRP / thermotransient receptor potential channels

- TRPV (vanilloid), TRPM (melastatin), TRPA (ankyrin-like)
- thermosensory channels: a subfamily of the TRP channels that are activated by changes in the environmental temperature, from noxious cold (< 15 °C) to injurious heat (> 42 °C)
- each thermoTRP is also activated by specific compounds, known to induce the relevant thermal and pain sensations



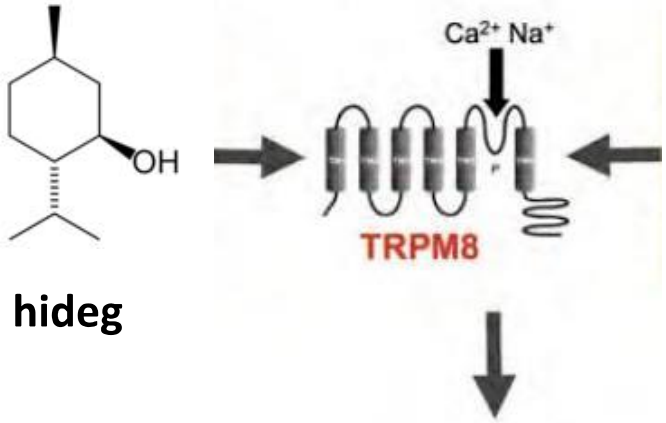
TRPV1 agonists:

- against neuropathic pain
- ***sensitisation phase:*** stimulation of periferial polymodal nociceptors through TRPV1 receptor
- ***desensitisation phase:*** activity of sensory neurons decreases, TRPV1 mediated release of proinflammatory mediators decreases

C Ferrandiz-Huertas et al. (2014) Trafficking of ThermoTRP Channels. Membranes, 4: 525-564.

Actions of menthol on TRPM8 receptor

- menthol: refreshing feeling, **smooth muscle antispasmodic activity in the GI tract → IBS**
- TRPM8 ion channel (cold and menthol receptor 1 = CMR1): primary molecular transducer of cold somatosensation in humans; high concentrations of menthol cause cold hyperalgesia in healthy humans
- Further agonists: eucalyptol, linalool, geraniol (essential oil components)



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Further TRPM8 agonists:
spearmint, caraway
melissa
eucalyptus
clove
lavender

Actions in the GI tract:
- **Smooth muscle relaxation**
- Choleretic action
- Anti-inflammatory action
- Analgesic action
- Antibacterial action

Therapeutic application:
- IBS
- Functional dyspepsia
- Smooth muscle spams
- Flatulence

https://www.medmedia.at/univ-innere-medizin/mehr-als-ein-after-dinner-mint-pfefferminze-fur-reizdarm-und-reizmagen/

Actions of STW 5 (Iberogast®) in dyspepsia

Mechanism of action	Tonic effect on the GI tract smooth muscles	Spasmolytic effect on the GI tract smooth muscles	Carminative effect	Anti-inflammatory effect	Antioxidant effect
bitter candytuft	●	●	○	●	●
angelica root	○	●	○	●	●
caraway fruit	○	●	●	●	●
chamomile flower	●	●	○	●	●
milk thistle fruit	○	●	○	●	●
melissa leaf	○	●	●	●	●
greater celandine	●	○	●	●	●
peppermint leaf	○	●	●	●	●
licorice root	○	●	○	●	●

Wagner H. Multitarget therapy - The future of treatment for more than just function dyspepsia. Phytomedicine 13 (2006) SV 122 – 129 módosítása

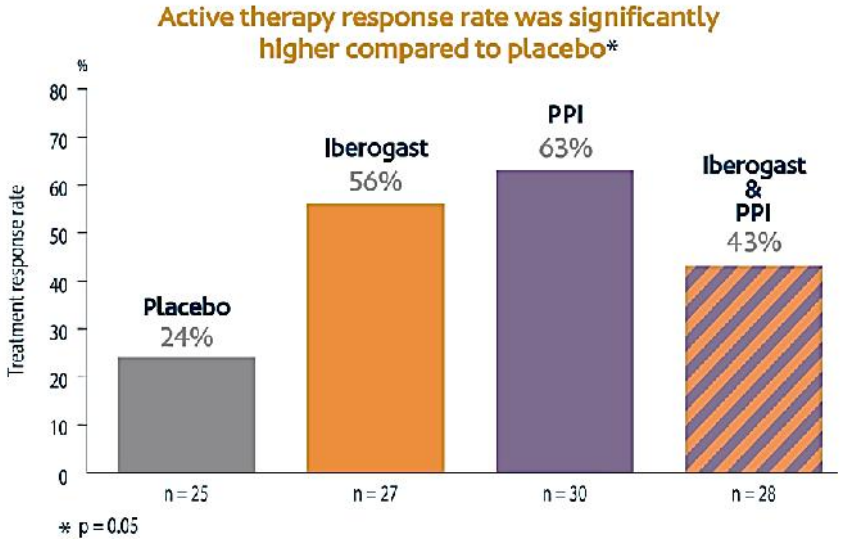
● Effect ○ No effect

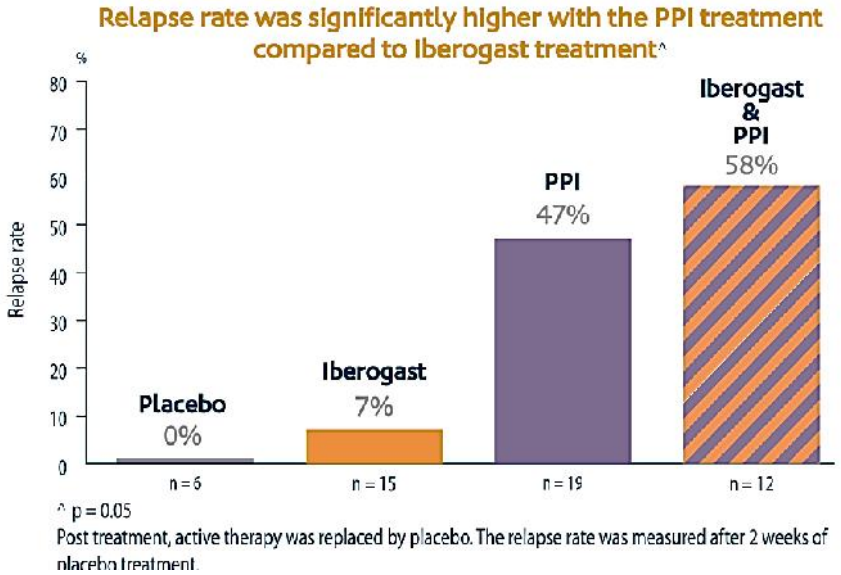
Double action: tonic (*Iberis amara*) + spasmolytic

Ottillinger és mtsai (2013) Wien Med Wochenschr. 163: 65-72.

STW 5 preparation in functional dsypepsia

- STW 5 and proton-pump inhibitors had similar effect during the 4-week study and were more effective as compared to placebo ($p<0.05$).
- After suspending the treatment, relapse rate was significantly higher with the proton-pump inhibitor treatment as compared to the STW 5 treatment.
- Treatment with combination STW 5 and proton-pump inhibitor was not more effective, however, relapse rate was significantly higher after suspending the treatment.





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