Bergamot

View 35 Products Containing: Bergamot

Scientific Name

Citrus bergamia, synonym Citrus aurantium var. bergamia.

Family: Rutaceae.

Background

Bergamot orange trees, indigenous to Calabria, Italy, are part of the Rutaceae family and *Citrus* genus (34355). The peel of the pear-shaped fruit contains the essential oils and other bioactive constituents, whereas the juice is used for nutrition (34359, 34362). The bergamot orange is unrelated to North American herbs also known as bergamot, which belong to the genus *Monarda* (bee balm or Oswego tea). This monograph exclusively encompasses bergamot orange.

Also known as: Aceite de Bergamota, Bergamot, Bergamot Orange, Bergamota, Bergamotier, Bergamoto, Bergamotte, Bergamotto Bigarade Orange, Huile de Bergamote, Oleum Bergamotte.

CAUTION: See separate listings for Bitter Orange and Sweet Orange.

History

People Use This For

Topically, bergamot oil is used to treat psoriasis in conjunction with long-wave ultraviolet light. Bergamot oil is also used topically for vitiligo, mycosis fungoides, and as an insecticide to protect the body against lice and other vermin.

By inhalation, bergamot oil is used as aromatherapy for anxiety.

In foods, bergamot oil is widely used as a citrus flavoring agent, up to 0.02% in gelatins and puddings.

In manufacturing of cosmetics, bergamot oil is used (up to 3% in perfumes and 0.25% in creams and lotions), in soaps, and suntan oils.

Safety

LIKELY SAFE ...when bergamot oil is used orally in amounts commonly found in foods. Bergamot oil has Generally Recognized As Safe status (GRAS) for use in foods in the US (4912).

POSSIBLY UNSAFE ...when used topically. Bergamot oil can act as a photosensitizer and can induce malignant changes (6).

CHILDREN: **POSSIBLY UNSAFE** ...when large amounts are ingested. Bergamot oil can cause intestinal colic, convulsions, and death (12).

PREGNANCY AND LACTATION: **POSSIBLY UNSAFE** ...when used topically (6).

Effectiveness

See detailed evidence summary

POSSIBLY INEFFECTIVE
Mental alertness. Some clinical evidence suggests that using bergamot oil as aromatherapy does not improve mental alertness and might actually impair mental alertness in healthy people due to its relaxing effects (34438, 34440).

INSUFFICIENT RELIABLE EVIDENCE to RATE
Anxiety. There is preliminary evidence that suggests using bergamot oil as aromatherapy does not help reduce anxiety in patients receiving concurrent radiotherapy (11452).

Psoriasis. Preliminary clinical research suggests that applying bergamot oil topically along with UVB therapy is no more effective than UVB therapy alone for reducing plaque severity in patients with chronic plaque psoriasis (34381).

More evidence is needed to rate bergamot for these uses.

Dosing & Administration

- **Adult**

  Topical:

  - **Psoriasis**: Topical bergamot oil has been applied as an adjunct treatment 30 minutes prior to ultraviolet B (UVB) therapy, three times weekly (34381). The duration of treatment varied according to plaque outcome, with discontinuation occurring either after plaque resolution, or after five consecutive procedures produced no observable effects.

- **Children**

  - Insufficient available evidence.

- **Standardization & Formulation**

  - Well-known standardization for bergamot is lacking. Moreover, the dispensing of bergamot essential oil during the practice of aromatherapy lacks any standardized measurement (PM:10578753).

Adverse Effects

Report an Adverse Reaction to Bergamot

General: Essential oils of bergamot, including bergamottin, have been studied in humans and may be toxic if taken orally. Vapors released during aromatherapy may irritate the eyes. According to secondary sources, it is not suggested to use bergamottin near children's faces. Bergamot and the chemically related compound 6',7'-dihydroxybergamottin are thought to underlie the effect ofgrapefruit juice on the metabolism of a variety of pharmaceutical drugs (34358). In a case report, excessive consumption (4L daily over 25 years) of bergamot-containing Earl Grey tea purportedly induced muscle cramps, fasciculations, paraesthesias, and blurred vision in a man (34344). A similar report has suggested that elevated bergapten levels from excessive Earl Grey tea consumption may adversely affect neural potassium flow (34346).

⊞ **Dermatologic**

⊞ **Other**

Toxicology

- In humans and animals, bergamot oil and its constituent bergamottin have demonstrated photosensitizing properties and are phototoxins responsible for Berloque dermatitis (34424, 34417, 34350, 34408, 34379, 34348). In order to study bergamot oil's photophysical, photomutagenic, and photocarcinogenic properties and the effect of UVA and UVB sunscreens, investigators have used the reaction of human skin to model perfumes containing five, 15, and 50ppm of 5-methoxypsoralen (5-MOP) in bergamot oil with and without a sunscreen added (34411). Although low concentrations of UVB and UVA sunscreens in perfumes protect against the phototoxicity of bergamot oil *in vitro*, they do not suppress the phototoxicity of bergamot oil on human skin (34411). *In vitro* studies determined that bergamot oil in fragrances is moderately phototoxic, with the photosensitivity of human skin being maximal two hours after perfume application (34411, 34377).
- Bergamot contains a variety of coumarins, including furanocoumarins, which have a wide range of biological activities (34345, 34392, 34412). Though the precise furanocoumarin content of various flavored foods remains unknown, products containing bergamot oil, lime oil, or cold-pressed citrus oils are likely to contain higher relative amounts (34412). In animal research, 150mg/kg of coumarins produced pathological changes in the liver of rats after repeated administration for at least seven days (34389). Also, minor and transient morphological changes were observed 24 hours following a single oral dose. Significant differences, however, were observed between rodent species and other species (34430, 34429). It appears that coumarins are less toxic in humans than they are in rodents (34389, 34433, 34431).
- In a case report, excessive consumption (4L daily over 25 years) of bergamot-containing Earl Grey tea induced muscle cramps, fasciculations, paraesthesias, and blurred vision in a man (34344).

Interactions with Drugs

ANTIDIABETES DRUGS

Interaction Rating = **Moderate** Be cautious with this combination.
Severity = Moderate • Occurrence = Possible • Level of Evidence = **D**

Animal research suggests that bergamot juice has hypoglycemic effects (34407). Theoretically, concomitant use with antidiabetes drugs might affect glucose control and increase the risk of hypoglycemia; use with caution. Dose adjustments to diabetes medications might be necessary. Some antidiabetes drugs include glimepiride (Amaryl), glyburide (DiaBeta, Glynase PresTab, Micronase), insulin, metformin (Glucophage), pioglitazone (Actos), rosiglitazone (Avandia), and others.

PHOTOSENSITIZING DRUGS

Interaction Rating = **Moderate** Be cautious with this combination.
Severity = Moderate • Occurrence = Probable • Level of Evidence = **D**

Topically, due to bergapten content, use of bergamot oil can compound photosensitizing effects and increase the risk of side effects (11019, 34343, 34350, 34363, 34377, 34408, 34410, 34417, 34421, 34422, 34426, 34428). Concomitant use should be avoided.

Interactions with Herbs & Supplements

HERBS AND SUPPLEMENTS WITH HYPOGLYCEMIC POTENTIAL: Animal research suggests that bergamot has hypoglycemic effects (34407). Theoretically, bergamot might have additive effects with other herbs that decrease blood glucose levels. Herbs with hypoglycemic potential include alpha-lipoic acid, devil's claw, fenugreek, garlic, guar gum, horse chestnut, Panax ginseng, psyllium, and Siberian ginseng.

Interactions with Foods

None known.

Interactions with Lab Tests

None known.

Interactions with Diseases

DIABETES: Bergamot might reduce blood glucose (34407). Use with caution in patients with diabetes.

SURGERY: Bergamot might reduce blood glucose (34407). Theoretically, bergamot might interfere with blood glucose control during and after surgical procedures. Tell patients to discontinue bergamot at least 2 weeks before elective surgical procedures.

Mechanism of Action

- **Constituents**: Bergamot contains carbohydrates, including solubilized carbohydrates present as monosaccharides, and a smaller proportion of oligosaccharides (34367). Other metabolites include low-molecular-weight flavonoids (34403, 34339, 34405), including at least C-glucosides (lucenin-2, stellarin-2, isovitexin, scoparin, and orientin 4'-methyl ether), and three O-glycosides (rhoifolin 4'-O-glucoside, chrysoeriol 7-O-neohesperidoside-4'-O-glucoside, and chrysoeriol 7-O-neohesperidoside) (34365). Other flavonoids include neohesperidin, hesperetin (aglycone), neoeriocitrin, eriodictyol (aglycone), naringin, and naringenin (aglycone) (34362). Bergamottin (5-geranoxypsoralen), a main component of bergamot oil, is a natural furocoumarin (34412), as are bergapten(5-methoxypsoralen [5-MOP]), 6,4,4'-trimethylangelicin, psoralen, 8-methoxypsoralen, 4,4',5'-trimethylazapsoralen, and citropten (5,7-dimethoxycoumarin) (34413, 34404, 34396, 34346, 34359, 34345, 34343, 34338, 34425, 34349). Other chemical markers include linalool and linalyl acetate; the markers and antioxidant and antifungal activities of the methanolic extracts vary slightly by altitude and latitude (34355, 34406). The oxygen heterocyclic compounds (coumarins, psoralens, and polymethoxylated flavones) are in the nonvolatile residue of the essential oils of bergamot (34341, 34396). A combined form of vitamin C is present, as are the elements Cd(II), Cu(II), Pb(II), and Zn(II) (34353, 34351). Contaminants of tetradifon, dicofol, and its decomposition product 4,4'-dichlorobenzophenone have also been found (34340). Other constituent compounds include pectins (34405) and terpenes (34382).
- **Analgesic effects**: In animals, intraplantar injection of bergamot essential oil dose-dependently inhibited the acute nociceptive behavioral response (i.e., licking and biting) to injected capsaicin via a peripheral opioid receptor-mediated mechanism (34406). Moreover, the injection of linalool and linalyl acetate, volatile components of bergamot essential oil, demonstrated an even stronger anti-nociceptive behavioral response than bergamot oil alone.
- **Antianxiety effects**: In a review with few available details, bergamot essential oil was investigated for its use as an anxiolytic aromatherapy agent (34400). In healthy adolescents, a combination aromatherapy, composed in part of bergamot, lowered

stress compared to placebo (34397). Also compared to placebo, a topical blend of bergamot and lavender essential oils increased perceived ratings of calmness and relaxation in healthy adults (34415).

- **Anticancer effects**: In human SH-SY5Y neuroblastoma cells *in vitro*, bergamot essential oil was shown to concentration-dependently inhibit Akt-mediated cellular proliferation via the stimulation of various proteolytic mechanisms, including cell shrinkage, cytoskeletal reorganization, DNA fragmentation, mitochondrial dysfunction, and caspase-dependent and -independent cell death (34414).
- **Anti-inflammatory effects**: The coumarins found in bergapten have been found to inhibit lipid peroxidation and generate neutrophil-dependent anion superoxides, important anti-inflammatory activities (34390, 34405). Bergapten and citropten have also been shown to inhibit interleukin-8 (IL-8)-mediated inflammation in *in vitro* models of cystic fibrosis (34413). Likewise, bergamot essential oil has been shown to inhibit proinflammatory COX-2 promoter activity in bovine arterial endothelial cells (34398).
- **Antilipemic effects**: In hyperlipidemic rats and humans, oral bergamot extract stimulated vasodilation, increased high-density lipoprotein (HDL) cholesterol, inhibited HMG-CoA reductase activity, lowered blood glucose, and decreased levels of triglycerides, total cholesterol, and low-density lipoprotein (LDL) cholesterol (34407).
- **Antimicrobial effects**: *In vitro*, as well as in food system research, bergamot oil decreased survival of *Arcobacter butzleri* (34375) and *Candida* spp. (34409, 34357, 34369). Also *in vitro*, a 1:1 blend of bergamot and orange essential oils has been shown to inhibit the growth of vancomycin-resistant and vancomycin-sensitive strains of *Enterococcus faecium* and *Enterococcus faecalis* (34402).
- **Antioxidant effects**: *In vitro*, bergamot flavonoids, like other flavonoids, had antioxidant activities (34360, 34384). In human umbilical vein endothelial cells (HUVECs), the protective effect of bergamot essential oil against TNF-alpha-induced cellular modifications has been observed via intracellular changes in nuclear factor-kappaB (NF-kappaB) activation, glutathione, and superoxide dismutase activity, as well as the malondialdehyde:4-hydroxynonenal ratio (34405). Animal studies suggest that bergamot antioxidants may help heal vascular disorders (34387).
- **Behavioral effects**: According to brain research in rats, bergamot essential oil has been shown to dose-dependently increase both the locomotor and exploratory behaviors of rats, which corresponds to an increased activity of faster frequency power bands within the EEG spectrum (34399).
- **Cardiovascular effects**: Animal studies suggest that bergamot antioxidants may help heal vascular disorders (34387). In healthy humans, a topical blend of bergamot and lavender essential oils decreased both pulse and blood pressure, compared to placebo (34415).
- **CYP450-modifying effects**: *In vitro*, bergamottin and 6',7'-dihydroxybergamottin, both found in grapefruit juice, inhibited cytochrome P450 3A4 and may affect the metabolism of a variety of agents, including felodipine (34358, 34380, 34388, 11976). In particular, grapefruit bergamottin reduced felodipine metabolism (increased the area under the plasma concentration time curve (AUC)) and increased the plasma peak drug concentration (11976).
- **Dental effects**: Bergamot may help heal gingival wounds; however, the mechanism of action is not well understood (34418, 34419, 34352).
- **Dermatological effects**: In animal studies, bergamot together with boxthorn, was found to play an active role in skin melanogenesis, increasing superoxide dismutase, collagen, and hair growth, while decreasing malondialdehyde (34354, 34425, 34416). Some researchers have suggested that bergamot may be helpful in treating vitiligo and psoriasis (34416). In particular, topical bergamot oil combined with ultraviolet B (UVB) therapy has been shown to reduce the number of necessary treatment procedures, as well was concomitant UVB dosages in patients with chronic plaque psoriasis (34381).
- **Gastrointestinal effects**: Animal studies showed that bergamot lowers the food efficiency rate (34364). *In vitro* studies showed that the addition of bergamot oligosaccharides increased the number of bifidobacteria and lactobacilli and decreased the clostridial population (34366). The coumarins found in bergapten have been found to inhibit lipid peroxidation and generate neutrophil-dependent anion superoxides, important immunosuppressor activities, especially useful in the treatment of inflammatory bowel disease (34390).
- **Immunosuppressant effects**: The coumarins found in bergapten have been found to inhibit lipid peroxidation and generate neutrophil-dependent anion superoxides, important immunosuppressor activities (34390).
- **Neurological effects**: According to *in vitro* research, bergamot may have neuroprotective effects (34401). Bergamot lessened neuronal damage caused by NMDA-induced excitotoxic stimuli in *in vitro* neuroblastoma cells by lowering levels of reactive oxygen species, deactivating calpain I, and reactivating Akt kinase (34374). Some human research has suggested that bergamot oil may affect the excitability of nervous system tissues in response to both visual and auditory stimuli (34435, 34436, 34437).
- **Psychological effects**: In healthy humans, the inhalation of bergamot oil lacked any significant effect on both EEG cortical arousal following exposure to a monotonous stress task (34438) and odor-associated word memory recall (34439). Also in healthy humans, bergamot oil impaired sustained visual vigilance (34440) and reduced the number of subjective, self-reported health complaints (34441). The perceived fragrance of bergamot essential oil has also been examined in relation to different types of work (34337). However, findings from this study, as they pertain particularly to bergamot, are lacking. In terminally ill cancer patients, hand massage with blended bergamot, lavender, and frankincense oils was shown to improve ratings of both pain and depression (34394).

Pharmacokinetics

- **Absorption**: Techniques used to determine the amounts of citropten and bergapten absorbed via the skin following the application of tanning products include high-performance liquid chromatography (HPLC), fluorescence spectroscopy, and ultraviolet spectroscopy (34404).
- **Metabolism**: *In vitro*, grapefruit bergamottin inhibited cytochrome P450 3A4 and increased both the area under the plasma concentration time curve (AUC) for felodipine, as well as its plasma peak drug concentration (11976).
- **Minimum inhibitory concentration (MIC)**: *In vitro*, a 1:1 blend of bergamot and orange essential oils inhibited the growth of vancomycin-susceptible and vancomycin-resistant strains of *Enterococcus faecium* and *Enterococcus faecalis*, at a MIC of

0.25-0.5% (v/v) (34402).

- **Minimum inhibitory dose (MID)**: *In vitro*, a 1:1 blended bergamot and orange essential oil demonstrated a MID of 50mg/L against vancomycin-susceptible and vancomycin-resistant strains of *Enterococcus faecium* and *Enterococcus faecalis* (34402).

Evidence Table / Discussion

See detailed Evidence Summary

References

See Monograph References

This monograph was last reviewed on 12/21/2012 and last updated on 2/13/2015. Monographs are reviewed at least once per year. If you have comments or suggestions on something that should be reviewed or included, please tell the editors. For details about our evidence-based approach, see our Editorial Principles and Process.

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