Technical Data Report

for

Ayapana

(Ayapana triplinervis)

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Ayapana

Family: Asteraceae
Taxon: Ayapana triplinervis (Vahl) R. M. King & H. Rob.
Synonyms: Eupatorium ayapana, Eupatorium triplinerve
Common names: Ayapana, aiapana, aiapaina, aipana, cagueña, curia, daun panahan, daun perasman, diapalma iapana, diarana-guaco, japana, japana-branca, sekrepatoe wiwir, pool root, white snakeroot, yapana
Parts Used: Leaf and stem

Herbal Properties & Actions		
Main Actions:	**Other Actions:**	**Standard Dosage:** Leaves
reduces nausea	stops bleeding	**Infusion:** 1 cup 1-3 times daily
antiseptic	cleanses blood	**Capsules:** 1-2 g twice daily
calms coughs	reduces fever	
protects liver	promotes sweating	
prevents ulcers	thins blood	
kills cancer cells		
heals wounds		

Ayapana is an ornamental erect perennial herb with aromatic leaves that grows 20 to 30 cm high. The 5-8 cm long leaves are smooth, opposite and lanceolate. The many flowering heads are each 6 to 13 millimeters long and bear about twenty pink flowers, which are 6 to 7 millimeters long. Ayapana is native to South America and can be found in the Amazon region of Brazil, Ecuador, Peru, and the three Guyanas. It has been introduced into the U.S. and can be found in Puerto Rico and Hawaii and it has naturalized in other tropical countries as well. Ayapana has three different Latin names (*Ayapana triplinervis, Eupatorium ayapana,* and *E. triplinerve*) but all three names refer to the same plant.

Ayapana is in the large Asteraceae plant family (which is also called the sunflower or daisy family). The Asteraceae is the second largest family in its division with some 1,100 genera and over 20,000 recognized species. Two common and well known North American medicinal plant species in the family are boneset (*Eupatorium perfoliatum*) and Joe-Pye-weed *(Eupatorium purpureum*).

TRIBAL AND HERBAL MEDICINE USES

The Shipibo-Conibo Indians of Peru take the leaf and stem of the plant internally for colic, stomach pain, edema, and as a depurative. They prepare a paste of the leaves to use externally on wounds and hemorrhages. For internal hemorrhages, snake bite and vomiting they juice the leaves and drink it internally. In Peruvian herbal medicine the plant is believed to be sudorific, cicatrizant, astringent, stomachic, stimulant, febrifuge, antidiarrhetic, and anti-tumorous. The leaves are prepared in infusions, decoctions, baths and plasters to protect the liver, for inflammation of the urinary tract, and for tetanus. An infusion of the leaf and stem is used as a digestive stimulant. Ayapana is thought to be antineoplastic and used for cancerous tumors in both Peru and Argentina. An infusion of the entire plant is also used in Argentina to stimulate menstruation.

In Brazilian herbal medicine the leaf juice and an infusion of the leaves and stems are considered tonic, stimulant, astringent, antidysenteric, and sudorific. An infusion of the leaves is mixed with honey and used for coughs and sore throats. A leaf infusion is also used for queasy stomachs, indigestion, diarrhea, fever, headaches, insomnia, nausea and vomiting, and stomach ulcers. The

leaf juice is used externally as an astringent and emollient. The leaf juice is also swished in the mouth for gingivitis and mouth ulcers. The leaf juice is highly reputed against snakebite in the Brazilian Amazon and it's considered a good sedative when taken internally and recommended externally for simple wounds and stubborn ulcers. Ayapana is also used for angina, gastric ulcers, cholera, eye and ear problems in Brazil.

In the Amazon region of the Guyanas (Surinam, Guyana, and French Guiana) ayapana is considered a febrifuge (reduces fever), alexiteric (anti-infective), sudorific (causes sweating), digestive, and laxative. A leaf infusion is employed for headaches, colds and flu, mouth sores and ulcers, and hypertension. The whole plant is decocted to relieve nausea and vomiting caused from malaria by the Palikur of French Guiana and this same decoction is used in Surinam for chronic diarrhea.

Ayapana can be found outside the Amazon where it is also used in other herbal medicine systems. In India a leaf infusion is considered a cardiotonic, diaphoretic, emetic, hemostat, laxative, stimulant, and tonic. In Trinidad, the plant is used for chest colds, constipation, fevers, flu, pneumonia, and yellow fever. In Malaya it is considered sudorific and used for bronchitis and diarrhea.

Ayapana was first written about in the United States in the 1887 American Journal of Pharmacy which noted: "The leaves are recommended against indigestion, pectoral complaints and in cholera, and were used for similar purposes in Europe in the early part of the present century." Ayapana leaves are official in the *French Pharmacopoeia*.

PLANT CHEMICALS

Ayapana is a rich source of naturally occurring coumarin chemicals. Coumarins are chemical compounds found in many plants and which usually have a sweet scent—much like newly-mown hay. Coumarin has clinical value as the precursor for several anticoagulant drugs; most notably, one widely prescribed drug called *warfarin*. Two of ayapana's coumarin chemicals are called *ayapanin* and *ayapin* which were first discovered in the late 1930s. These chemicals were reported to have pronounced blood-thinning or anticoagulant actions in four early studies.[1-4]

Ayapana also contains a coumarin named hernarin (7-methoxycoumarin) which may help explain why the plant is used in herbal medicine as an anti-tumor remedy. Recent research in 2005 reported that this chemical was toxic to cancer cells—including multi-drug resistant cancer cells[5] and leukemic cells.[6]

Plant chemicals documented in ayapana include: 1-8 cineol, alpha-phellandrene, alpha-terineol, ayapanin, ayapin, beta-selinene, borneol, bornyl-acetate, coumarin, daphnetin, dipentene, herniarin, hydrangetin, linalol, methylene-dioxy-6,7-coumarin, sabinene, stigmasterol, thymoquinone, thymohydroquinone, and umbelliferone.

BIOLOGICAL ACTIVITIES AND CLINICAL RESEARCH

In a laboratory study in 1998, a methanol extract of ayapana leaves did not evidence any antibacterial activity but did show a weak antifungal activity by researchers in Mauritius.[7] Other researchers in India working with a pet ether extract of the leaves also reported marginal or no results against various strains of bacteria and fungi.[8] An ethanol extract of the entire plant (harvested in Surinam) was reported to be active against *Bacillus subtilis* at 50 mg/ml but inactive against other bacterial, yeast and fungal strains tested.[9] Researchers in India reported a weak activity against several fungal strains with the leaf essential oil.[10] The essential oil of the flowers has yielded much better antimicrobial results than the plant itself. In 1979, researchers in India reported

a strong activity against 10 strains of fungi *in vitro* using the essential oil of ayapana flowers.[11] In 1993, the essential oil from the flowers of ayapana was reported to possess antibacterial (against staph, cholera, pneumonia, and shigella), as well as antiparasitic (*Ascaris*), and anthelminitic (*Taenia*) actions by researchers in India.[12] In an early animal study, the flower essential oil injected into mice was reported to have CNS depressant, analgesic, and sedative effects (as well as an *in vitro* antibacterial effect).[13] Several universities are supporting research concerning ayapana's use as an additive to stored food crops to keep common pests and insects from feeding on them.[14,15]

CURRENT PRACTICAL USES

Several companies specializing in "Amazon remedies" have launched products into the U.S. natural products market recently that classify their products as *Eupatorium triplinerve* and *Eupatorium ayapana*. However, consumers should be aware that these products are not, in fact, the ayapana plant described herein. These companies are using the Peruvian common name of "asmachilca" to market their product. This plant, is in fact, a completely different plant that derives from the mid- to high-Andes region up to 4000 m in elevation (and is not found in the Amazon at all). It is properly classified as *Aristeguieta gayana* (which has a synonym of *Eupatorium gayanum*), but it is NOT *Eupatorium ayapana*. Asmachilca is the indigenous name given to this plant by the Quechua or Ketchwa people of the Andes in Peru and Ecuador, and, in their herbal medicine system, this plant is mostly employed for asthma and as a diuretic. There are no published clinical studies, laboratory tests, chemical analyses, or toxicity studies on asmachilca, which is probably why these companies are trying to market their products incorrectly under the *Eupatorium ayapana* name instead.

While ayapana remains a popular herbal remedy in Peru today, due to the misleading or inaccurate marketing issues here, it is unclear whether there are actually any true *Ayapana triplinervis* products for consumers to choose from in the United States today. American consumers should consider these types of issues when looking for a reliable source of South American botanical products as well as reliable information about them.

Ayapana Plant Summary
Main Actions (in order): stomachic, pectoral, anti-ulcerous, vulnerary, antitumorous
Main Uses: 1. for digestive problems (nausea, vomiting, stomachaches) 2. for coughs, sore throat, colds, and bronchitis 3. for ulcers (mouth, skin, gastric) 4. for cuts, scrapes, and wounds 5. for tumors
Properties/Actions Documented by Research: analgesic, antibacterial, anticoagulant, antifeedant, antifungal, antiparasitic, anthelminitic, CNS depressant, pesticidal, sedative
Other Properties/Actions Documented by Traditional Use: antiseptic, antineoplastic, antitussive, antiulcerous, astringent, cardiotonic, cicatrizant, depurative, diaphoretic, emollient, hemostat, hepatoprotector, laxative, sedative, stimulant, stomachic, tonic, sudorific, vulnerary
Cautions: Contains natural coumarins which may thin the blood.

Traditional Preparation: Generally, if the entire plant is prepared into a natural remedy, a decoction method is use. When using the leaves (dried or fresh) an infusion method is typically

used.

Contraindications: Ayapana leaves contain naturally occurring coumarins. Coumarin has an anti-coagulant and blood thinning effect and is a precursor to coumadin drugs. Consult with your physician before taking this plant if you are taking coumadin drugs or if coumadin anticoagulant type drugs are contraindicated for your condition.

Drug Interactions: Ayapana may enhance or increase the effect of blood-thinning medications.

WORLDWIDE ETHNOMEDICAL USES	
Argentina	to stimulate menstruation, for tumors
Brazil	as an astringent, emollient, sedative, stimulant, tonic, and sudorific; for angina, cholera, coughs, diarrhea, ear infections, eye infections, fevers, gastric ulcers, gingivitis, headaches, indigestion, insomnia, mouth ulcers, nausea, skin ulcers, snakebite, sore throat, vomiting, and wounds
Bangladesh	as an hemostatic, antiseptic, cardiac stimulant, emetic, diaphoretic and laxative; used in ulcers and hemorrhages
Guayanas	as an alexiteric, digestive, febrifuge, laxative, and sudorific; for colds, diarrhea, flu, headaches, hypertension, mouth sores, mouth ulcers, nausea, ulcers, and vomiting
India	as a cardiotonic, diaphoretic, emetic, hemostat, laxative, stimulant and tonic
Malaya	as a sudorific; for bronchitis and diarrhea
Mauritius	as an alterative, antiscorbutic, emetic, diaphoretic, stimulant, and tonic; for bowel problems, cold, diarrhea, dyspepsia, fevers, flatulence, headaches, lung conditions, and ulcers
Peru	as a astringent, antineoplastic, cicatrizant, depurative, febrifuge, hepatoprotector, stimulant, stomachic, sudorific; for colic, diarrhea, edema, hemorrhages, indigestion, snakebite, stomachache, tetanus, tumors, vomiting, urinary tract inflammation, wounds
Philippines	as a sudorific and tonic; for fevers
Trinidad	for chest colds, constipation, fevers, flu, pneumonia, and yellow fever
United States	for cholera, indigestion, and respiratory complaints

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Ethnomedical Information on Ayapana (Ayapana triplinervis)

Part / Location	Documented Ethnomedical Uses	Type Extract / Route	Used For	Ref #
Leaves / Brazil	Used as a tonic, stimulant, astringent, antidysenteric and sudorific; for coughs and inflamed throats.	Infusion / Oral	Human adult	ZZ1099
Leaves / Brazil	Used as a sedative; for fevers, snakebites, and rebellious ulcers.	Decoction / Oral	Human adult	ZZ1013
Leaves / Brazil	Used for queasy stomach, nausea, indigestion, diarrhea, insomnia, vomiting, sore throat, and ulcers.	Infusion / Oral	Human adult	ZZ2013
Leaves / Brazil	Used as an astringent, emollient and cicatrizant.	Leaf juice / External	Human adult	ZZ2013
Leaves / Brazil	Used as an astringent; for snakebite, mouth ulcers and gingivitis.	Infusion / External	Human adult	ZZ1099
Leaves / Brazil	Used for gastric ulcers.	Not stated	Human adult	T08730
Leaves / Brazil	Used for fever, headaches, and colds.	Infusion / Oral	Human adult	K16654
Leaves / Guyanas	Used as a alexiteric (anti-contagion), febrifuge, sudorific, and digestive; for colds, grippe, and high blood pressure. Strong dose is vomitive. Weak dose is laxative.	Infusion / Oral	Human adult	ZZ1104
Leaves / Guyanas	Used for chronic diarrhea.	Decoction / Oral	Human adult	ZZ1104
Leaves / Guyanas	Used for headaches and oral sores.	Cataplasm / External	Human adult	ZZ1104
Leaves / India	Used as a stimulant, tonic, and diaphoretic. Used as a hemostatic.	Infusion / Oral Infusion / External	Human adult	A07694
Leaves / Peru	Used as a sudorific, digestive, depurative and stimulant; for colic, snakebite, and hemorrhages.	Infusion / Oral	Human adult	ZZ1101
Leaves / Peru	Used for colic, stomach pain, snakebite, edema, and as a depurative.	Leaf juice / Oral Infusion / Oral	Human adult	ZZ2003
Leaves / Peru	For external hemorrhages (nosebleeds, wounds, etc.).	Plaster / External	Human adult	ZZ003
Leaves / Peru	Used as a cicatrizant for external wounds and bleeding.	Powder / External	Human adult	ZZ1101 ZZ1105

Part / Location	Documented Ethnomedical Uses	Type Extract / Route	Used For	Ref #
Leaves / Peru	Used as a sudorific, cicatrizant, astringent, febrifuge, hepatoprotective, antidiarrhetic, and antitumoral; for inflammation of the urinary tract, liver problems, and tetanus.	Infusion / Oral	Human adult	ZZ2013
Leaves / Rodrigues Island	Mixed with epazote (*Ageratum conyzoides*) to treat flatulence.	Decoction / Oral	Human adult	K26851
Plant / Argentina	Used for tumors.	Not stated / Oral	Human adult	ZZ1022
Plant / Argentina	Used to stimulate abundant menstruation.	Infusion / Oral	Human adult	A05589
Plant / Brasil	Used for tetanus, angina, cholera, mouth infections, snakebite, ear and eye problems.	Infusion / Oral	Human adult	ZZ1079
Plant / Brazil	Used for tetanus, eczema, and grippe (flu).	Not stated / Oral	Human adult	ZZ2010
Plant / Guyanas	Used as an anti-vomitive to relieve nausea from malaria.	Not stated / Oral	Human adult	ZZ1104
Plant / India	Used as a cardiotonic, diaphoretic, emetic, hemostat, laxative, stimulant, and tonic.	Not stated / Oral	Human adult	ZZ1022 ZZ1106
Plant / Malaya	Used as a sudorific; for bronchitis and diarrhea.	Not stated / Oral	Human adult	ZZ1022 ZZ1106
Plant / Mauritius	Used as an alternative, antiscorbutic, diaphoretic, laxative, stimulant, tonic; for ulcers, dyspepsia, bowel problems, lung disorders, depression, inflammatory conditions, fevers, colds, diarrhea, and headaches.	Infusion / Oral	Human adult	AY2002
Plant / Peru	Used as a sudorific, digestive, and stimulant.	Infusion / Oral	Human adult	ZZ1105
Plant / Peru	Used for upper respiratory disorders.	Not stated	Human adult	AY2001
Plant / Philippines	Used as a sudorific, tonic, and for fevers.	Not stated / Oral	Human adult	ZZ1022 ZZ1106
Plant /Trinidad	Used for chest colds, constipation, fevers, flu, pneumonia, and yellow fever.	Not stated / Oral	Human adult	ZZ1022 ZZ1006
Plant / Not stated	Used as a digestive and stimulant.	Not stated / Oral	Human adult	ZZ1022
Plant / Not stated	Used for bronchosis, chest colds, constipation, diarrhea, fever, flu, pneumonia, sores, and yellow fever.	Not stated / Oral	Human adult	ZZ1106

Presence of Compounds in Ayapana (Ayapana triplinervis)

Compound	Chemical Type	Plant Part	Plant Origin	Quantity	Ref #
7-methoxycoumarin	Coumarin	Plant	Not stated	Not stated	ZZ1047
Ayapanin	Coumarin	Leaf	India	Not stated	T02884
Ayapin	Coumarin	Leaf Plant	India Not stated	Not stated Not stated	A07694 ZZ1047
Ayapin	Coumarin	Leaf	India	Not stated	T02884
Borneol		Plant	Not stated	480 ppm	ZZ1047
Borrnyl acetate		Plant	Not stated	275 ppm	ZZ1047
Cineol, 1-8	Monoterpene	Leaf essential oil	India	08.0%	K08302
Coumarin	Coumarin	Plant	Not stated	150 ppm	ZZ1047
Daphnetin	Coumarin	Entire Plant	India	00.00146%	M22431
Daphnetin dimethyl ether	Coumarin	Entire Plant	India	00.00133%	M22431
Daphnetin-7-methyl ether	Coumarin	Entire Plant	India	00.00113%	M22431
Dipentene		Plant	Not stated	440 ppm	ZZ1047
Hernarin	Coumarin	Leaf Plant	India Not stated	00.5% Not stated	A07694 ZZ1047
Hydrangetin	Coumarin	Entire Plant	India	00.0012%	M22431
Linalol		Plant	Not stated	390 ppm	ZZ1047
Methylene-Dioxy-6,7-Coumarin	Coumarin	Plant	Not stated	Not stated	ZZ1047
Phellandrene, alpha		Plant	Not stated	535 ppm	ZZ1047
Sabinene		Plant	Not stated	320 ppm	ZZ1047
Selinene, beta	Sesquiterpene	Essential Oil Plant	Canada Not stated	04.2% Not stated	K00541 ZZ1047

Compound	Chemical Type	Plant Part	Plant Origin	Quantity	Ref #
Stigmasterol	Steroid	Leaf	India	Not stated	T02884
Terineol, alpha		Plant	Not stated	310 ppm	ZZ1047
Thymoquinone	Monoterpene	Fresh aerial parts	Vietnam	00.0019%	K10340
Thymohydroquinone dimethyl ester	Monoterpene	Flower Essential Oil	India	50.36%	J11550
Thymohydroquinone methyl ester	Monoterpene	Plant	Not stated	2960 ppm	ZZ1047
Umbelliferone	Coumarin	Entire Plant	India	00.00113%	M22431

Biological Activities for Extracts of Ayapana (Ayapana triplinervis)

Plant Part - Origin	Activity Tested For	Type Extract	Test Model	Dosage	Result	Notes/Organism tested	Ref #
Essential Oil - India	CNS Depressant Activity	Essential Oil	IP Mouse	Various	Active		T08998
Essential Oil - India	Analgesic Activity	Essential Oil	IP Mouse	Various	Active		T08998
Essential Oil - India	Spontaneous Activity Reduction	Essential Oil	IP Mouse	Various	Active		T08998
Essential Oil - India	Hypothermic Activity	Essential Oil	IP Mouse	Various	Inactive		T08998
Essential Oil - India	Antibacterial Activity	Essential Oil	Agar plate	Not stated	Active		T08998
Essential Oil - India	Antifungal Activity	Essential Oil	Agar plate	Varied	Active	Several pathogenic fungi	T07197
Essential Oil - India	Antifungal Activity	Essential Oil	Agar plate	Varied	Active	*Aspergillus niger* *Aspergillus flavus* *Aspergillus fumigatus* *Microsporum gymseum* *Rhizopus nigricans* *Alternaria* species *Helminthosporium saccharii* *Cladosporum herbarum* *Trichothecium roseum* *Cunninghamella echinulata*	K08673
Essential Oil - India	Antifungal Activity	Essential Oil	Agar plate	Varied	Inactive	*Aspergillus candidus* *Aspergillus nidulans* *Trichophyton rubrum* *Mucor mucedo* *Penicillium digitatum* *fusarium oxysporum*	K08673
Flower Essential Oil India	Antiparasitic Activity	Essential Oil	In vitro	Not stated	Active	*Ascaris lumbricoides*	J11550
Flower Essential Oil India	Anthelmintic Activity	Essential Oil	In vitro	Not stated	Active	*Taenia solium*	J11550

Plant Part - Origin	Activity Tested For	Type Extract	Test Model	Dosage	Result	Notes/Organism tested	Ref #
Flower Essential Oil India	Antibacterial Activity	Essential Oil	Agar plate	Not stated	Active	*Vibrio cholera ogawa* *Staphylococcus aureus* *Dipplococcus pneumoniae* *Shigella flexneri*	J11550
Leaf - India	Antibacterial Activity	Pet Ether Ext	Agar plant	250 mcg/ml	Equivocal	*Bacillus subtilis* *Staphylococcus aureus* *Staphylococcus epidermidis* *Micrococcus luteus* *Escherichia coli* *Pseudomonas aeruginosa* *Salmonella typhi* *Vibrio cholera*	L21977
Leaf - India	Antibacterial Activity	Pet Ether Ext	Agar plant	1000 mcg/ml	Inactive	*Shigella dysenteriae* *Vibrio parahemolyticus*	L21977
Leaf - India	Antifungal Activity	Pet Ether Ext	Agar plant	250 mcg/ml	Equivocal	*Aspergillus niger* *Aspergillus flavus* *Alternaria* species *Fusarium solani*	L21977
Leaf - Mauritius	Antimicrobial Activity	MEOH Ext	Agar plate	Not stated	Inactive	*Escherichia coli* *Pseudomonas aeruginosa* *Salmonella typhi* *Staphylococcus aureus* *Candida albicans*	L13564
Leaf - Mauritius	Antifungal Activity	MEOH Ext	Agar plate	Not stated	Active	*Aspergillus niger*	L13564
Plant - Surinam	Antibacterial Activity	ETOH ext	Agar plate	50 mg/ml	Active	*Bacillus subtilis*	T14756
Plant - Surinam	Antimicrobial Activity	ETOH ext	Agar plate	50 mg/ml	Inactive	*Escherichia coli* *Aspergillus niger* *Pseudomonas aeruginosa* *Staphylococcus aureus* *Candida albicans*	T14756
Plant - Mauritius	Insecticidal Activity	Dried plant	In vivo	Not stated	Active	*Plutella xylostella* *Crocidolomia binotalis*	AY2003

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