Technical Data Report

for

VASSOURINHA

Scoparia dulcis

Sage Press

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Vassourinha

Preprinted from *Herbal Secrets of the Rainforest,* 2nd edition, by Leslie Taylor
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Family: Scrophulariaceae

Genus: *Scoparia*

Species: *dulcis*

Synonyms: *Scoparia grandiflora, Scoparia ternata, Capraria dulcis, Gratiola micrantha*

Common Names: Vassourinha, ñuñco pichana, anisillo, bitterbroom, boroemia, broomweed, brum sirpi, escobilla, mastuerzo, piqui pichana, pottipooli, sweet broom, tapixava, tupixaba

Parts Used: Leaves, bark, roots

Vassourinha is an erect annual herb in the foxglove family that grows up to 1/2 m high that produces serrated leaves and many small, white flowers. It is widely distributed in many tropical countries in the world and is found in abundance in South America and the Amazon rainforest. Vassourinha has long held a place in herbal medicine in every tropical country where it grows, and its use by indigenous peoples is well documented.

Indigenous tribes in Ecuador brew a tea of the entire plant to reduce swellings, aches, and pains. The Tikuna Indians make a decoction for washing wounds, and women drink the same decoction for three days each month during menstruation as a contraceptive and/or an abortifacient. In the rainforests of Guyana, indigenous tribes use a leaf decoction as an antiseptic wash for wounds, as an antiemetic for infants, as a soothing bath to treat fever, and in poultices for migraine headaches. Indigenous peoples in Brazil use the leaf juice to wash infected wounds, and place it in the eyes for eye problems; they make an infusion of the entire plant to use as an expectorant and emollient. Indigenous tribes in Nicaragua use a hot water infusion and/or decoction of vassourinha leaves (or the whole plant) for stomach pain, for menstrual disorders, as an aid in childbirth, as a blood purifier, for insect bites, fevers, heart problems, liver and stomach disorders, malaria, venereal disease, and as a general tonic.

Vassourinha is still employed in herbal medicine throughout the tropics. In Peru a decoction of the entire plant is recommended for upper respiratory problems, biliary colic or congestion, menstrual disorders, and fever; the leaf juice is still employed externally for wounds and hemorrhoids. In Brazilian herbal medicine the plant is considered emollient, febrifuge, hypoglycemic, emmenagogue, hypotensive, pectoral, and expectorant. A tea is prepared from the leaves or aerial parts of the plant for fevers and urinary tract diseases, upper respiratory disorders, bronchitis, coughs, menstrual disorders, and hypertension. The leaf juice or a decoction of the leaves is also employed topically for skin ulcers and erysipelas.

Some of vassourinha's many uses in herbal medicine have been validated by western research. In early research, vassourinha demonstrated a cardiotonic effect in animals.[1] More than 40 years later, researchers reconfirmed its hypotensive properties in rats and dogs (while increasing the strength of the heartbeat).[2] It also demonstrated anti-inflammatory activity in rats, antispasmodic activity in guinea pigs and rats, and analgesic actions in mice.[2–4] A single chemical was identified by scientists as being responsible for the analgesic effects.[4] Another researcher, in a 2001 study, again documented significant analgesic and anti-inflammatory effects in laboratory animals—and also indicated that the previously-isolated pain-relieving chemical demonstrated diuretic and barbiturate potentiation activity.[5] These documented actions could certainly explain its traditional use as a

natural remedy for pain of all types (including menstrual pain and cramps as well as during childbirth). In laboratory tests, vassourinha also showed active properties against bacteria and fungi, which could explain its sustained use for respiratory and urinary tract infections.[6,7] A methanol extract of vassourinha leaves (and, also, one isolated chemical present in it) showed cytotoxic actions against cancer cells (with a 66% inhibition rate) by Japanese researchers.[8,9] These findings fueled more research on the chemicals in this plant and their activities that is still ongoing today.

Phytochemical screening of vassourinha has shown that it is a source of novel phytochemicals in the flavone and terpene classification, some of which have not been seen in science before.[10,11] Many of vassourinha's active biological properties, including its anticancerous properties, are attributed to these phytochemicals. The main chemicals being studied are scopadulcic acids A and B, scopadiol, scopadulciol, scopadulin, scoparic acids A, B, and C, and betulinic acid.[12–16]

The antitumorous activity of scopadulcic acid B was demonstrated in a 1993 study,[17] and antitumor activity against various human cancer cell lines was reported again in 2001.[18] This chemical and another compound named *scopadulin* demonstrated antiviral properties in several studies, including against *Herpes simplex* I in hamsters.[19–21] Betulinic acid is another phytochemical that has been the subject of much independent cancer research (beginning in the late 1990s). Many studies report that this phytochemical has powerful anticancerous, antitumorous, cytotoxic, antileukemic, and antiviral (including HIV) properties.[22–25] This potent phytochemical has displayed selective cytotoxic activity against malignant brain tumors, bone cancer, and melanomas (without harming healthy cells).[26–28]

Scientists have been trying since the mid-1990s to synthesize several phytochemicals found in vassourinha, including scopadulcic acid B and betulinic acid, for their use in the pharmaceutical industry. Herbalists and natural health practitioners have used and will continue to use the plant as an effective natural remedy for upper respiratory problems and viruses, for menstrual problems, and as a natural analgesic and antispasmodic remedy when needed. Water and ethanol extracts administered intragastrically to mice at up to 2 grams per kilogram of body weight showed no toxicity.[3] Although vassourinha is considered a safe herb in herbal medicine practices, it should be avoided during pregnancy.

Documented Properties and Actions: Analgesic, antibacterial, antifungal, antiherpetic, anti-inflammatory, antiseptic, antileukemic, antispasmodic, antitumorous, antiviral, cardiotonic, cytotoxic, emmenagogue, emollient, expectorant, febrifuge, hypoglycemic, hypotensive, pectoral, refrigerant, vulnerary

Main Phytochemicals: Acacetin, amyrin, apigenin, benzoxazin, benzoxazolin, benzoxazolinone, betulinic acid, cirsimarin, cirsitakaoside, coixol, coumaric acid, cynaroside, daucosterol, dulcinol, dulcioic acid, friedelin, gentisic acid, glutinol, hymenoxin, ifflaionic acid, linarin, luteolin, mannitol, scopadiol, scopadulcic acid A & B, scopadulciol, scopadulin, scoparic acid A thru C, scoparinol, scutellarein, scutellarin, sitosterol, stigmasterol, taraxerol, vicenin, vitexin

Traditional Remedy: The reported therapeutic dosage generally used is 2–3 g daily or 1–2 cups daily of a standard infusion (in 1/2-cup dosages).

Contraindications: None documented by clinical studies; however**:**

- The indigenous use as an abortive and/or childbirth aid warrants that vassourinha should not be taken during pregnancy.
- Do not use in combination with antidepressants or barbiturates unless under the supervision of a qualified health care practitioner (see drug interactions below).
- A vassourinha extract recently demonstrated hypoglycemic activity, significantly lowering blood sugar levels in rats. This plant is probably contraindicated in people with hypoglycemia. Diabetics should check with their doctors before taking this plant and monitor their blood glucose levels closely.

Drug Interactions:

- One human study documented that an ethanol extract of vassourinha inhibited radioligand binding to dopamine and seratonin.[29] Another study reported that a water extract given intragastrically to rats potentiated the effects of barbiturates.[3] As such, it is likely that vassourinha has the potential to enhance the effect of barbiturates and selective serotonin reuptake inhibitor antidepressants.

WORLDWIDE ETHNOBOTANICAL USES

Country	Uses
Africa	Conjunctivitis, cough, diuretic, earache
Amazonia	Abortifacient, aches, antiemetic, bronchitis, contraceptive, cough, diarrhea, erysipelas, eye, fever, hemorrhoids, hepatosis, kidney disease, pains, sores (gonorrheal), stomach disease, swelling, wounds
Brazil	Abortifacient, analgesic, bronchitis, cardiopulmonary disorders, cough, diabetes, earache, emmenagogue, emollient, expectorant, eye problems, fever, gastric disorders, hemorrhoids, hypertension, hypoglycemic, insect bite, insecticide, jaundice, liver disorders, malaria, menstrual disorders, pectoral, upper respiratory disorders, skin, vermifuge, wounds
Central America	Bruise, diarrhea, emmenagogue, fever, gonorrhea, gravel, grippe, hepatosis, insecticide, kidney, menstrual disorders, purgative, skin infections, sore throat, stomach disease, stomach pain, wound
Dominican Republic	Astringent, diabetes, sore throat
Haiti	Amygdalosis, antiseptic, astringent, blennorrhagia, cough, diabetes, diuretic, dysmenorrhea, earache, emetic, gonorrhea, headache, inflammation, menorrhagia, nerves, piles, sores, sore throat, spasm, toothache, tumor
India	Antivenin, blennorrhagia, dysentery, earache, fever, headache, jaundice, stomach, toothache, warts

Country	Uses
Malaysia	Childbirth, cough, expectorant, labor, opium substitute, stomachache, syphilis
Nicaragua	Anemia, childbirth, blood cleanser, burns, cough, depurative, diarrhea, fever, heart, headache, infections, insect bite, itch, liver, malaria, menstrual disorders, snakebite, stings, stomach disorders, tonic, venereal disease
Nigeria	Analgesic, antidiabetic, antipyretic, diuretic, expectorant
Peru	Abortive, astringent, colic, contraceptive (female), diarrhea, emetic, febrifuge, fever, hallucinogen, hemorrhoids, kidney diseases, menstrual disorders, mucolytic, upper respiratory disorders, wounds (infected)
Surinam	Bronchitis, coughs, diabetes, febrifuge, jaundice, rash
Trinidad	Antidote, depurative, diabetes, dysmenorrhea, eczema, evil-eye, jaundice, mange, marasmus, ophthalmia, rash, sore
Venezuela	Astringent, blennorrhagia, diarrhea, menorrhagia, metroxenia
West Indies	Diarrhea, diabetes, dysmenorrhea
Elsewhere	Abortive, aches, albuminuria, anemia, antiemetic, antiseptic, aphrodisiac, bronchitis, childbirth, cicatrizant, cough, contraceptive, detoxification, diabetes, diarrhea, diuretic, dysentery, emetic, fever, gravel, headache, hyperglycemia, hypertension, ketonuria, kidney, leprosy, liver disease, menorrhagia, menstrual disorders, migraine, opium substitute, pains, purgative, refrigerant, retinitis, snakebite, stomachache, swellings, toothache, venereal disease, vermicide, vermifuge

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Ethnomedical Information on Vassourinha (Scoparia dulcis)

Plant Part / Location	Documented Ethnic Use	Type Extract / Route	Used For	Ref #
Aerial Parts Indonesia	Used as an opium substitute.	Not stated	Human Adult	A06590
Aerial Parts Malaysia	Decoction is taken by women to bring on labor. Used as an expectorant.	Hot H2O Ext / Oral Hot H2O Ext / Oral	Human (pregnant) Human Adult	A06590
Aerial Parts Bangladesh	Used to treat diarrhea, coughs and fever.	Infusion / Oral	Human Adult	K16617
Aerial Parts Vietnam	Used for detoxification, to treat fevers and coughs, for stomachache, and to induce labor.	Decoction / Oral	Human Adult	J14016
Entire Plant Brazil	Used for hypertension, diabetes, antipyretic & analgesic. Used for menstrual disorders. Used to treat gastric disorders and bronchitis. Used to treat skin wounds, and insect bites. Used to treat hemorrhoids. Used to treat diabetes. Used as an insecticide or vermifuge. Used for upper respiratory disorders and coughs. Used as a hypoglycemic, hypotensive, emmenagogue, and to treat hypertension.	Infusion / Oral Hot H2O Ext / Oral Infusion / Oral Infusion / External Infusion / Rectal Hot H2O Ext / Oral Not stated Decoction / Oral Hot H2O Ext / Oral	Human Adult Human Female Human Adult Human Adult Human Adult Human Adult Human Adult Human Adult Human Adult	K26071 AE1034 K26821 K26821 K26821 M22746 K18765 AE1033 AE1032
Entire Plant Bangladesh	Whole plant is used for excessive menstrual bleeding.	Plant / Oral	Human Female	K10069
Entire Plant China	Used to treat hypertension.	Decoction / Oral	Human Adult	K26821
Entire Plant Colombia	Used for snakebite.	Infusion / External	Human Adult	L15991
Entire Plant Ecuador	Used to treat swellings, aches and pains. Used as a contraceptive. Used as an abortifacient.	Hot H2O Ext / Oral Hot H2O Ext / Oral Hot H2O Ext / Oral	Human Adult Human Adult Human Adult	AE1029 T15375 AE1029
Entire Plant Guyana	Used to induce abortion.	Hot H2O Ext / Oral	Human (pregnant)	M01437
Entire Plant India	Used for dysentery. Used to treat jaundice. Used for toothache, blennorrhagia, and stomach problems.	Decoction / Oral Plant / Oral Hot H2O Ext / Oral	Human Adult Human Adult Human Adult	K23165 K23294 M18047

Plant Part / Location	Documented Ethnic Use	Type Extract / Route	Used For	Ref #
Entire Plant Ivory Coast	Used as an aphrodisiac and as a purgative. Enema is used to facilitate delivery of fetus.	Hot H2O Ext / Oral H2O Ext / Vaginal	Human Adult Human (pregnant)	A01966 A04941
Entire Plant West Indies	Used for diabetes and diarrhea.	Hot H2O Ext / Oral	Human Adult	T00701
Entire Plant Nicaragua	Used for bites, stings and burns. Used for childbirth, pregnancy and female problems. Used for infections, malaria, anemia, & venereal disease. Used for heart problems and “right sickness.”	Decoction / External Decoction / Oral Decoction / Oral Decoction / Oral	Human Adult Human (female) Human Adult Human Adult	L16047 L16047 L16047 M23149
Entire Plant Paraguay	Used for hepatosis. Used for stomach disease and hepatosis.	Infusion / Oral Hot H2O Ext / Oral	Human Adult Human Adult	H11234 M18047
Entire Plant Peru	Used as a mucolytic and febrifuge. Used as an astringent. Used for upper respiratory problems and fever. Used for respiratory problems and menstrual disorders.	Hot H2O Ext / Oral Hot H2O Ext / External Tincture / Oral Decoction / Oral	Human Adult Human Adult Human Adult Human Adult	T15323 T15323 AE1031 T15323
Entire Plant Senegal	Used as a cicatrizant.	Hot H2O Ext / Oral	Human Adult	T12145
Entire Plant Surinam	Used for rashes. Used for bronchitis, coughs, diabetes, jaundice and as a febrifuge.	Infusion / External Infusion / Oral	Human Adult Human Adult	J12451 J12451
Entire Plant Taiwan	Used for hypertension. Used for liver disease.	Hot H2O Ext / Oral Hot H2O Ext / Oral	Human Adult Human Adult	M18047 T14999
Fresh Entire Plant Brazil	Used as an expectorant. Used as an emollient.	Infusion / Oral Plant / External	Human Adult Human Adult	T15975
Fresh Entire Plant India	Used for fever. Used for headache.	Juice / Oral Leaves / External	Human Adult Human Adult	M23219
Fresh Entire Plant Nigeria	Used for an analgesic, an antidiabetic, expectorant, diuretic, and antipyretic.	Hot H2O Ext / Oral	Human Adult	T06510
Leaf Brazil	Used for eye problems. Used for erysipelas and ulcers. Used for fevers and urinary tract disorders.	Juice / External Juice / External Infusion / Oral	Human Adult Human Adult Human Adult	AE1030 XX1001 XX1001
Leaf Costa Rica	Infusion used as an emmenagogue.	H2O Ext / Oral	Human (female)	A00115

Plant Part / Location	Documented Ethnic Use	Type Extract / Route	Used For	Ref #
Leaf Guinea	Used as a vermicide.	Leaves / External	Human Adult	K27039
Leaf Guyane	Used as an antiseptic and to treat fevers. Used as an antiemetic for infants. Used for migraine headaches.	Decoction / External Decoction / Oral Poultice / External	Human Adult Human Infant Human Adult	AE1030
Leaf India	Used as an antivenin.	Leaves / External	Human Adult	K25892
Leaf Mexico	Used to treat stomach pain.	Leaves / Oral	Human Adult	K27077
Leaf Nicaragua	Used for infection, malaria, burns, a tonic, anemia, venereal disease, liver, stomach & menstrual disorders. Used for insect bites and stings. Used for snake bite. Used for childbirth. Used for belly pain, cough, fever, headache, diarrhea, infection of the liver, and to “clean the blood.”	Decoction / Oral Decoction / External Hot H2O Ext / Oral Leaves / Oral Infusion / Oral	Human Adult Human Adult Human Adult Human (pregnant) Human Adult	K27070 K27070 M23149 K26492 K26492
Leaf Peru	Used for hemorrhoids. Used to treat infected wounds. Used as a mucolytic, and febrifuge. Used as an astringent. Used for diarrhea, fevers, kidney diseases, as an abortive, emetic and female contraceptive.	Infusion / External Infusion / External Hot H2O Ext / Oral Hot H2O Ext /External Infusion / Oral	Human Adult Human Adult Human Adult Human Adult Human Adult	L04137 L04137 T15323 T15323 L04137
Leaf Trinidad	Used to treat diabetes.	Not stated / Oral	Human Adult	J19078
Leaf Juice India	Used for fever.	Leaf Juice / Oral	Human Adult	K23294
Leaf Juice Nepal	Used to treat headache.	Leaf Juice / External	Human Adult	K25347 K24886
Not Stated Thailand	Used for leprosy.	Not stated	Human Adult	W03804
Not Stated Thailand	Used for diabetes.	Not stated / Oral	Human Adult	J18701
Not Stated Brazil	Used to treat malaria.	Not stated / Oral	Human Adult	J14512
Root Central America	Used for profuse menses.	Hot H2O Ext / Oral	Human (female)	W02290

Plant Part / Location	Documented Ethnic Use	Type Extract / Route	Used For	Ref #
Root Brazil	Used for malaria, as a general febrifuge, to treat jaundice, liver disorders, and as an abortifacient. Considered emollient and pectoral; used for bronchitis.	Infusion / Oral Hot H2O Ext / Oral	Human Adult Human Adult	L15570 XX1001
Root Honduras	Used for stomach pains and diarrhea. Used for skin infections.	Decoction / Oral Decoction / External	Human Adult Human Adult	K27819
Root Martinique Island	Used for profuse menses.	Hot H2O Ext / Oral	Human (female)	W02290
Root West Indies	Decoction used for dysmenorrhea.	Hot H2O Ext	Human (female)	T00701
Root India	Used for warts.	Decoction / External	Human Adult	K11800

Presence of Compounds in Vassourinha (Scoparia dulcis)

Compound	Chemical Type	Plant Part	Plant Origin	Quantity	Journal #
Acacetin	Flavone	Leaf + stem	Taiwan	00.00111%	H07604
Amyrin, alpha	Triterpene	Entire plant	India	Not stated	N07354
Apigenin	Flavone	Entire plant	Paraguay	Not stated	M18047
Benzoxazin-3-one, 1-4: 2(h): 2-hydroxy	Nitrogen heterocy	Aerial parts	Vietnam	00.00136%	J14016
Benzoxazolin-2-one, 6-methoxy:	Nitrogen heterocy	Callus tissue	Japan	Not stated	K19824
Benzoxazolinone	Nitrogen heterocy	Entire plant	Bangladesh	00.075%	H06371
Benzoxazolinone, 6-methoxy	Nitrogen heterocy	Root Leaf + stem Entire plant Entire plant	Taiwan Taiwan Paraguay Bangladesh	Not stated 00.00235% 00.00223% Not stated	K03868 H07604 M29003 L16228
Benzoxazolone,2-3(h): 6-methoxy	Nitrogen heterocy	Aerial parts	Vietnam	00.00545%	J14016
Betulinic Acid	Triterpene	Root Entire plant Aerial parts Root Entire plant	China Bangladesh Vietnam Taiwan India	Not stated 00.05% 00.00136% Not stated Not stated	T05601 H06371 J14016 K03868 N07354
Cirsimarin	Flavone	Aerial parts	Brazil	Not stated	L09445
Cirsitakaoside	Flavone	Leaf	Brazil	Not stated	AE1002
Coixol	Nitrogen heterocy	Root	China	Not stated	T05601
Coumaric Acid, para:	Phenylpropanoid	Entire plant	Paraguay	Not stated	M18047
Cynaroside	Flavone	Entire plant	Paraguay	Not stated	M18047
Daucosterol	Steroid	Entire plant	Bangladesh	Not stated	L16228
Dulcinol	Diterpene	Entire plant	Bangladesh	00.035%	H06371
Dulcioic Acid	Triterpene	Entire plant	India	Not stated	N07354

Compound	Chemical Type	Plant Part	Plant Origin	Quantity	Journal #
Flavone, 3'-4'-5-5'-7-8-hexahydroxy:7-o-beta-d-glucuronide	Flavone	Entire plant	Paraguay	00.0016%	M18047
Friedelin	Triterpene	Aerial parts Entire plant	Vietnam India	00.00454% Not stated	J14016 N07354
Gentisic Acid	Benzenoid	Leaf	Trinidad	Not stated	A06190
Glut-5(6)-en-3-beta-ol	Triterpene	Aerial parts	Bangladesh	Not stated	K16617
Glutinol	Triterpene	Entire plant Entire plant Leaf + stem	India Brazil Taiwan	Not stated Not stated 00.00140%	N07354 K26071 H07604
3'-4'-5-5'-7-8-hexahydroxy flavone	Flavonoid	Entire plant	Paraguay	00.0016%	M18047
Hymenoxin	Flavone	Entire plant	Paraguay	00.00333%	M29003
Ifflaionic Acid	Triterpene	Entire plant Root	India Taiwan	Not stated Not stated	N07354 K03868
Linarin	Flavone	Entire plant	Paraguay	Not stated	M18047
Luteolin	Flavone	Entire plant	Paraguay	Not stated	M18047
Mannitol, d	Carbohydrate	Rootbark	India	Not stated	A14920
Scopadiol	Diterpene	Aerial parts Aerial parts Aerial parts	Taiwan China Thailand	00.05% 00.32% 00.45%	H11715 H11715 H11715
Scopadulcic Acid A	Diterpene	Entire plant Entire plant Entire plant	Paraguay Paraguay Paraguay	Not stated Not stated Not stated	H03213 M16400 M19811

Compound	Chemical Type	Plant Part	Plant Origin	Quantity	Journal #
Scopadulcic Acid B	Diterpene	Entire plant	Paraguay	Not stated	M25005
		Entire plant	Paraguay	Not stated	H04804
		Leaf	Not stated	Not stated	J11988
		Callus tissue	Not stated	Not stated	K11970
		Leaf	Paraguay	Not stated	M27930
		Entire plant	Paraguay	Not stated	H03213
		Entire plant	Paraguay	00.19333%	M29003
		Fruit	Paraguay	Not stated	M27930
		Entire plant	Paraguay	Not stated	M19811
		Stem	Paraguay	Not stated	M27930
		Root	Paraguay	Not stated	M27930
		Aerial parts	China	00.14%	H11715
		Aerial parts	Indonesia	00.40%	H11715
		Aerial parts	China	04.84%	H11715
		Aerial parts	Thailand	00.19%	H11715
Scopadulciol	Diterpene	Leaf	Not stated	Not stated	J11988
		Callus tissue	Paraguay	Not stated	J13351
		Leaf + stem	Taiwan	00.03533%	H07604
		Aerial parts	Taiwan	00.22%	H11715
		Aerial parts	China	00.8%	H11715
		Aerial parts	Thailand	00.21%	H11715
Scopadulin	Diterpene	Entire plant	Paraguay	Not stated	H06253
Scoparic Acid A	Diterpene	Entire plant	Paraguay	Not stated	H03568
		Entire plant	Paraguay	Not stated	H04804
		Callus tissue	Not stated	Not stated	K11970
		Entire plant	Paraguay	Not stated	M19811
		Leaf	Paraguay	Not stated	M27930
		Entire plant	Paraguay	Not stated	H11234
		Fruit	Paraguay	Not stated	M27930
		Entire plant	Paraguay	Not stated	H03213
		Stem	Paraguay	Not stated	M27930
		Root	Paraguay	Not stated	M27930
		Aerial parts	China	02.7%	H11715
		Aerial parts	Indonesia	01.87%	H11715
		Aerial parts	China	00.14%	H11715
		Aerial parts	Thailand	00.05%	H11715

Compound	Chemical Type	Plant Part	Plant Origin	Quantity	Journal #
Scoparic Acid B	Diterpene	Entire plant Entire plant Entire plant	Paraguay Paraguay Paraguay	Not stated 00.002% Not stated	M19811 H11234 H04804
Scoparic Acid C	Diterpene	Entire plant Entire plant Entire plant	Paraguay Paraguay Paraguay	Not stated 00.0007% Not stated	M19811 H11234 H04804
Scoparinol	Diterpene	Entire plant Entire plant	Bangladesh Bangladesh	Not stated 00.05%	L15592 H06371
Scutellarein	Flavone	Leaf Leaf Entire plant	India India Paraguay	Not stated Not stated Not stated	N02722 T00235 M18047
Scutellarein, 7-o-methyl:	Flavone	Leaf Leaf	India India	Not stated Not stated	N02722 T00235
Scutellarein-7-o-beta-d-glucuronide	Flavone	Leaf	India	Not stated	N02722
Scutellarin	Flavone	Leaf Entire plant	India Paraguay	Not stated Not stated	T00235 M18047
Scutellarin Methyl Ester	Flavone	Entire plant	Paraguay	Not stated	M18047
Sitosterol, beta:	Steroid	Rootbark Entire plant	India Bangladesh	Not stated Not stated	A14920
Stigmasterol	Steroid	Entire plant	Bangladesh	Not stated	L16228
Taraxerol	Steroid	Entire plant	Bangladesh	Not stated	L16228
Vicenin 2	Flavone	Entire plant	Paraguay	Not stated	M18047
Vitexin	Flavone	Entire plant	Paraguay	Not stated	M18047
Vitexin, iso:	Flavone	Entire plant	Paraguay	Not stated	M18047

OTHER PHYTOCHEMICAL SCREENING:

ALKALOIDS ABSENT	**LEAF + STEM**	**T05306**
	ROOT	**M15310**
	FLOWERS	**M15310**
ALKALOIDS PRESENT	**ENTIRE PLANT**	**L16047**
	SHOOTS	**M15310**
FLAVONOIDS ABSENT	**SHOOTS**	**M15310**
	ROOT	**M15310**
FLAVONOIDS PRESENT	**FLOWERS**	**M15310**
SAPONINS PRESENT	**SHOOTS**	**M15310**
	ROOT	**M15310**

Biological Activities for Extracts of Vassourinha (Scoparia dulcis)

Plant Part - Origin	Activity Tested For	Type Extract	Test Model	Dosage	Result	Notes/Organism tested	Ref #
Entire Plant India	Toxicity Assessment (quantitative)	ETOH-H2O (1:1) Ext	IP Mice	LD50 = 1.0 gm/kg			W00374
Entire Plant Brazil	Toxic Effect (general)	ETOH (95%) Ext ETOH (95%) Ext H2O Ext H2O Ext	Intragastric Mice Intragastric Rat Intragastric Mice Intragastric Rat	2.0 gm/kg 2.0 gm/kg 2.0 gm/kg 2.0 gm/kg	Inactive Inactive Inactive Inactive		K26071
Entire Plant China	Toxic Effect (general)	ETOH (100%)Ext	IP Rat	0.1 gm/kg	Active	Death within 6 hours.	K26821
Root Brazil	Uterine Stimulant Effect	H2O Ext	Rat Female	Not stated	Equivocal		A03531
Aerial Parts Japan	Cytotoxic Activity	MEOH Ext	Cell Culture	50.0 mcg/ml	Active	Ca-9kb (66% Inhibition.)	K27314
Aerial Parts Japan	Antitumor Activity	Fraction: Scopadulcic Acid B	Cell Culture IP Mice	Not stated	Active	Inhibited effects of tumor promoter.	AE1019
Aerial Parts Japan	Antitumor Activity	Fraction: Scopadulcic Acid B	Cell Culture	Not stated	Active	Inhibited phospholipid synthesis.	AE1019
Aerial Parts Japan	Antitumor Activity	Fraction: Scopadulcic Acid B	Mice	Not stated	Active	Inhibited induced skin tumors.	AE1019
Entire Plant USA	Antitumor Activity	Fraction: Scopadulcic Acid B	Cell Culture	Not stated	Active	Various human cancer cell lines.	AE1001
Entire Plant China	Spasmogenic Activity	ETOH (95%) Ext	Rat	183.0 mcg/ml	Active	Tyramine antagonized effect.	K26821
Entire Plant China	Spasmolytic Activity	ETOH (95%) Ext	Guinea Pig	ED50= 0.74 mg/ml	Active	vs. histamine-induced contractions.	K26821
Entire Plant India	Antispasmodic Activity	ETOH-H2O (1:1) Ext	Guinea Pig	Not stated	Active	vs. ACH- and histamine-induced spasms.	W00374
Entire Plant Nigeria	Anticonvulsant Activity	ETOH (70%) Ext	IP Mouse	Dose variable	Inactive	vs. metrazole- and strychnine-induced convulsions.	T06510

Plant Part - Origin	Activity Tested For	Type Extract	Test Model	Dosage	Result	Notes/Organism tested	Ref #
Entire Plant India	Anticonvulsant Activity	ETOH-H2O (1:1) Ext	IP Mouse	0.5 mg/kg	Inactive	vs. electroshock-induced convulsions.	W00374
Part Not Specified Japan	Smooth Muscle Relaxant Activity	ETOAC Ext H2O Ext Butanol Ext	Rabbit (aorta)	3.0 mcg/ml 3.0 mcg/ml 3.0 mcg/ml	Equivocal	vs. KCL- & norepinephrine -induced contractions.	J19977
Entire Plant Bangladesh	Analgesic Activity	Fraction: Scoparinol	Animal (in vivo)	Not stated	Active		L15592
Entire Plant India	Analgesic Activity	ETOH-H2O (1:1) Ext	IP Mouse	0.5 mg/kg	Inactive	vs. tail pressure method.	W00374
Entire Plant Brazil	Analgesic Activity	ETOH (95%) Ext H2O Ext	Intragastric mice Intragastric mice	1.0 gm/kg 1.0 gm/kg	Inactive Inactive	vs. tail flick response to radiant heat.	K26071
Entire Plant Brazil	Analgesic Activity	H2O Ext	Intragastric mice	1.0 gm/kg	Active	vs. acetic acid-induced writhing.	K26071
Entire Plant Brazil	Antiinflammatory Activity	ETOH (95%) Ext	Intragastric Rat	1.0 gm/kg	Inactive	vs. cotton pellet granuloma.	K26071
Entire Plant Brazil	Antiinflammatory Activity	ETOH (95%) Ext	Intragastric Rat	0.5 gm/kg	Active	vs. dextran-induced pedal edema.	K26071
Entire Plant Brazil	Antiinflammatory Activity	ETOH (95%) Ext	Intragastric Rat	1.0 gm/kg	Active	vs. carrageenan-histamine-, and dextran-induced pedal edema.	K26071
Entire Plant Brazil	Antiinflammatory Activity	H2O Ext	Intragastric Rat	0.5 gm/kg	Active	vs. carrageenan-induced pedal edema.	K26071
Entire Plant Bangladesh	Antiinflammatory Activity	Fraction: Scoparinol	Animal (in vivo)	Not stated	Active		L15592
Entire Plant India	Antiinflammatory Activity	ETOH-H2O (1:1) Ext	Oral Rat	0.5 mg/kg	Inactive	vs. carrageenin-induced pedal edema.	W00374
Entire Plant Brazil	Hypertensive Activity	H2O Ext	IV Rat	0.1 mg/kg	Active		K26071
Entire Plant Brazil	Hypotensive Activity	CHCL3 Ext	IV Rat	Not stated	Active		K26071
Entire Plant China	Hypertensive Activity	ETOH (95%) Ext	IV Dog IV Rat	0.5 mg/kg 0.5 mg/kg	Active Active	Prazosin antogonized effect.	K26821

Plant Part - Origin	Activity Tested For	Type Extract	Test Model	Dosage	Result	Notes/Organism tested	Ref #
Entire Plant China	Inotropic Effect Positive	ETOH (95%) Ext	Rat	25.0 mcg/ml	Active	Atrium	K26821
Entire Plant India	Diuretic Activity Hypoglycemic Activity Hypothermic Activity Semen Coagulation Spermicidal Effect	ETOH-H2O (1:1) Ext	IP Rat Oral Rat IP Mouse IP Mouse Oral Rat	0.25 Mg/kg 250.0 Mg/kg 0.5 Mg/kg 2.0% / animal Not stated	Inactive Inactive Inactive Inactive Inactive		W00374
Aerial Parts Japan	Antiviral Activity	Fraction: Scopadulcic Acid B	Cell Culture	Not stated	Active	*Herpes simplex* virus type 1	AE1020
Entire Plant USA	Antiviral Activity	Fraction: Scopadulcic Acid B	Cell Culture	Not stated	Active	*Herpes simplex* virus type 1	AE1001
Leaf India	Antifungal Activity	H2O Ext	Agar Plate	1:1 / plate	Active	*Fusarium oxysporum* *F. sp.lentis*	K18143
Entire Plant India	Antifungal Activity	ETOH-H2O (1:1) Ext	Agar Plate	25.0 mcg/ml	Inactive	*Microsporum canis* *Aspergillus niger* *Trichophyton mentagrophytes*	W00374
Entire Plant Nigeria	Antifungal Activity	ETOH (95%) Ext	Agar Plate	1.25 mg/ml 25.0 mg/ml	Inactive Inactive	*Periconia species* *Candida albicans*	L16218
Entire Plant India	Antiyeast Activity	ETOH-H2O (1:1) Ext	Agar Plate	25.0 mcg/ml	Inactive	*Candida albicans* *Cryptococcus neoformans*	W00374
Entire Plant Bangladesh	Antibacterial Activity	CHCL3 Ext	Agar Plate	Not stated	Active Active Active Active Active	*Klebsiella pneumoniae* *Proteus mirabilis* *Pseudomonas aeruginosa* *Staphylococcus aureus* *Staphylococcus pyogenes*	L16228
Entire Plant Bangladesh	Antibacterial Activity	H2O Soluble Fraction	Agar Plate	Not stated	Active Active Active Active Active	*Klebsiella pneumoniae* *Proteus mirabilis* *Pseudomonas aeruginosa* *Staphylococcus aureus* *Staphylococcus pyogenes*	L16228

Plant Part - Origin	Activity Tested For	Type Extract	Test Model	Dosage	Result	Notes/Organism tested	Ref #
Entire Plant Bangladesh	Antibacterial Activity	MEOH Ext	Agar Plate	Not stated	Active Active Active	*Klebsiella pneumoniae* *Proteus mirabilis* *Staphylococcus pyogenes*	L16228
Entire Plant Nigeria	Antibacterial Activity	ETOH (95%)Ext ETOH (95%) Ext	Agar Plate Agar Plate	25.0 mg/ml 39.0 mcg/ml	Inactive Active	*Pseudomonas aeruginosa* *Bacillus subtilis*	L16218
Entire Plant Senegal	Antibacterial Activity	MEOH Ext	Agar Plate	10.0 mg/ml 10.0 mg/ml 15.0 mg/ml	Active Inactive Active	several gram - organisms several gram + organisms *Sarcina lutea*	T09739
Entire Plant India	Antibacterial Activity	ETOH-H2O (1:1) Ext	Agar Plate	25.0 mcg/ml	Inactive	*Bacillus subtilis* *Escherichia coli* *Salmonella typhosa* *Staphylococcus aureus* *Agrobacterium tumefaciens*	W00374
Entire Plant Bangladesh	Diuretic Effect	Fraction: Scoparinol	Animal (in vivo)	Not stated	Active		L15592
Entire Plant Bangladesh	Barbiturate Potentiation	Fraction: Scoparinol	Animal (in vivo)	Not stated	Active	Potentiated pentobarbital-induced sedation ($p<0.05$)	L15592
Entire Plant Brazil	Barbiturate Potentiation	ETOH (95%) Ext ETOH (95%) Ext H2O Ext H2O Ext	Intragastric Mice Intragastric Rat Intragastric Mice Intragastric Rat	Dose 1.0 gm/kg Dose 2.0 gm/kg Dose 1.0 gm/kg Dose 2.0 gm/kg	Active Inactive Active Inactive		K26071
Entire Plant Brazil	Spontaneous Activity Reduction	ETOH (95%) Ext ETOH(95%)Ext H2O Ext H2O Ext	IP Rat IP Rat IP Mouse IP Rat	2.0 gm/kg 2.0 gm/kg 2.0 gm/kg 2.0 gm/kg	Inactive Inactive Inactive Inactive		K26071
Entire Plant Brazil	Antipyretic Activity	ETOH (95%) Ext	Intragastric Rat	Dose 2.0 gm/kg	Inactive	vs. yeast-induced pyrexia.	K26071
Entire Plant Colombia	Antivenin Effect	ETOH (95%) Ext	Not stated	Not stated	Inactive	vs. *Bothrops atrox* venom.	L15991
Entire Plant India	Antihyperglycemic Activity	Not stated	Oral Human Adult	Not stated	Inactive	Two cases of diabetes were studied.	A14287
Entire Plant Nigeria	Anticrustacean Activity	ETOH (95%) Ext	Not stated	LD50 >1000 ppm	Inactive	*Artemia salina*	L16218

Plant Part - Origin	Activity Tested For	Type Extract	Test Model	Dosage	Result	Notes/Organism tested	Ref #
Entire Plant Surinam	Binding Effect	ETOH (80%) Ext	Human Adult	10.0 mcg/ml	Active	Inhibited radioligand binding to dopamine receptor in human frontal cortex.	J12451
Entire Plant Surinam	Binding Effect	ETOH (80%) Ext	Human Adult	10.0 mcg/ml	Equivocal	Inhibited radioligand binding to adrengeric-receptor in human frontal cortex.	J12451
Entire Plant Surinam	Binding Effect	ETOH (80%) Ext	Human Adult	10.0 mcg/ml	Weak Activity	Inhibited radioligand binding to muscarinic receptor in human hippocampus tissues.	J12451
Entire Plant Surinam	Binding Effect	ETOH (80%) Ext	Human Adult	100.0 mcg/ml	Active	Inhibited radioligand binding to serotonin receptor in human frontal cortex.	J12451
Entire Plant Surinam	Binding Effect	ETOH (80%) Ext	Rat	10.0 mcg/ml	Active	Inhibited radioligand binding to adenosine NMDR receptor channel complex.	J12451
Entire Plant Surinam	Binding Effect	ETOH (80%) Ext	Rat (Lung)	10.0 mcg/ml	Inactive	Inhibited radioligand binding to beta-2-adrenergic receptor.	J12451
Entire Plant Surinam	Serotonin (5-ht) Receptor Binding Activity	CHCL3 Ext	Calf (Hippocampus)	100.0 mcg/ml	Active	Inhibited the binding of 3h-rauwolscine to serotonin receptors.	J10986
Entire Plant Taiwan	Glutamate-pyruvate-transaminase Inhibition	ETOH-H2O (1:1) Ext	Cell Culture Rat liver cells	1.0 mg/ml	Inactive	vs. CCL-induced hepatotoxicity.	T14999
Entire Plant Taiwan	Glutamate-pyruvate-transaminase Inhibition	ETOH-H2O (1:1) Ext	Cell Culture Rat liver cells	1.0 mg/ml	Inactive	vs. PGE-1-induced pedal edema.	T14999
Entire Plant Brazil	Insecticide Activity	ETOH (95%) Ext	Not stated	50.0 mcg	Inactive	*Rhodnius neglectus*	K18765
Entire Plant USA	Insecticide Activity	Plant	Not stated	Not stated	Inactive		A04807
Entire Plant USA	Antimalarial Activity	Fraction: Scopadulcic Acid A	In vitro	IC50=27mM IC50=19mM IC50=23mM	Active Active Active	D6 *P. falciparum* W2 *P. falciparum* MDR *P. falciparum*	AE1001

Plant Part - Origin	Activity Tested For	Type Extract	Test Model	Dosage	Result	Notes/Organism tested	Ref #
Part Not Specified Japan	H(+),K(+)-ATPase Inhibitor Activity	Fraction: Scopadulcic Acid B	Rabbit	Not stated	Active	Stabilized the K(+) form of the enzyme.	AE1018
Entire Plant USA	H(+), K(+)-ATPase Inhibitor Activity	Fraction: Scopadulcic Acid B	Cell culture	Not stated	Active	vs. proton pumps.	AE1001
Dried Stembark Brazil	Molluscicidal Activity	ETOH (95%) Ext H2O Ext	Not stated	1000 ppm	Weak Activity	*Biomphalaria glabrata* *Biomphalaria straminea*	W02949

Biological Activities for Compounds found in Vassourinha (Scoparia dulcis)

Compound Tested	Activity Tested For	Test Model	Dosage	Result	Notes/Organism tested	Ref #
Betulinic Acid	Cytotoxic Activity	Cell Culture	Not stated	Active Active	Medulloblastoma Glioblastoma	AE1024
Betulinic Acid	Cytotoxic Activity	Cell Culture	IC50=175	Active	Leukemia L1210 cells	AE1025
Betulinic Acid	Cytotoxic Activity	Cell Culture	Not stated	Active	Acts directly on mitochondria to induce cell apoptosis	AE1005
Betulinic Acid	Cytotoxic Activity	Cell Culture	Not stated	Active	Inhibited fibroblast growth of endothelial cells	AE1007
Betulinic Acid	Cytotoxic Activity	Cell Culture	10 mcg/ml	Active	Human Melanoma	AE1008
Betulinic Acid	Cytotoxic Activity	Cell Culture	Not stated	Active	Melanoma Neuroectodermal tumor Malignant brain tumor	AE1010
Betulinic Acid	Cytotoxic Activity	Cell Culture	3 mM	Active	Melanocytic Naevi	AE1012
Betulinic Acid	Cytotoxic Activity	Cell Culture	Not stated	Active	Melanoma	AE1012
Betulinic Acid	Cytotoxic Activity	Cell Culture	Not stated	Active	Neuroblastoma Medulloblastoma, Glioblastoma Ewing's sarcoma	AE1015
Betulinic Acid	Cytotoxic Activity	Cell Culture	Not stated	Active	Neuroblastoma cells (doxorubicin-resistent)	AE1015
Betulinic Acid	Cytotoxic Activity	Human Adult	Not stated	Active	Neuroectodermal tumor cells	AE1015
Betulinic Acid	Antitumor Activity	Mice	Not stated	Active	Inhibits topoisomerase I	AE1006
Betulinic Acid	Antineoplastic Activity	Cell Culture IP Mice	Not stated	Active	Inhibition of all neoplastic cell lines tested. Normal cells unaffected	AE1010
Betulinic Acid	Cytostatic Activity	Cell Culture	Not stated	Active	p53 mutant melanoma	AE1010
Betulinic Acid	Anticancerous Activity	Cell Culture	IC50=7.3	Active	Inhibits aminopeptidase N activity	AE1026
Betulinic Acid	Antiviral Activity	Cell Culture	Not stated	Active	Inhibits HIV replication	AE1027
Betulinic Acid	Antiviral Activity	Agar Plate	Not stated	Active	HIV-1 inhibitor	AE1028

GI = Gastric Intubation IG = Intragastric NG = Nasogastric IP = Intraperitoneally IV = Intravenously SC = Subcutaneously IM = Intramuscular

Compound Tested	Activity Tested For	Test Model	Dosage	Result	Notes/Organism tested	Ref #
Betulinic Acid	Antiviral Activity	Agar Plate	Not stated	Active	HIV-1	AE1014
Betulinic Acid	Antiviral Activity	Not stated	Not stated	Active	HIV	AE1006
Betulinic Acid	Antiviral Activity	Agar Plate	Not stated	Active	HIV (Inhibits virus-cell fusion)	AE1011
Cirsitakaoside	Mutagenic Effect	Cell Culture and Mice oral	5 mcg/ml 10 mcg/ml 15 mcg/ml	Inactive Inactive Active		AE1002
Cirsitakaoside	Antiproliferative Effect	Cell Culture and Mice oral	5 mcg/ml 10 mcg/ml 15 mcg/ml	Active Active Active	Proliferative index reduced. No effect on the mitotic index	AE1002
Scutellarein	Antiviral Activity Reverse Transcriptase Inhibitor Activity	Various	Not stated	Active	Avian myeloblastosis Rous-virus-2, Murine leukemia virus	AE1021
6-Methoxy-2-benzoxazolinone	Antifungal Activity	Agar Plate	Not stated	Active Active Active	*Botrytis cinerea* *Physalospora piricol* *Mycosphaerella arachidicola*	AE1004
6-Methoxy-2-benzoxazolinone	Antibacterial Activity	Agar Plate	Not stated	Active	*Proteus vulgaris*	AE1004
6-Methoxy-2-benzoxazolinone	Antiviral Activity	Cell Culture	Not stated	Active	Inhibited HIV-1 reverse transcriptase	AE1003
Linarin	Analgesic Activity	Mice	Not stated	Active	vs. writhing test	AE1017
Linarin	Antipyretic Activity	Mice	Not stated	Active	vs. yeast-induced hyperthermia test	AE1017
Vicenin	Antioxidant Activity	IP Mice	50 mcg/kg	Active	Pretreatment protected against radiation-induced liver lipid peroxidation	AE1023

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J12451	MEDICINAL PLANTS IN SURINAME: SCREENING OF PLANT EXTRACTS FOR RECEPTOR BINDING ACTIVITY. HASRAT,JA: DE BACKER,JP: VAUQUELIN,G: VLIETINCK,AJ: PHYTOMEDICINE 4 1: 59-65 (1997) (DEPT PHARM SCI UNIV ANTWERP ANTWERP B-2610 BELGIUM)
J13351	PRODUCTION OF SCOPADULCIOL BY CULTURED TISSUES OF SCOPARIA DULCIS. HAYASHI,T: GOTOH,K: KASAHARA,K: PHYTOCHEMISTRY 41 1: 193-196 (1996) (FAC PHARM SCI TOYAMA MED & PHARM UNIV TOYAMA 930-01 JAPAN)
J14016	2-HYDROXY-2-H-1,4-BENZOXAZIN-3-ONE FROM SCOPARIA DULCIS. KAMPERDICK,C: LIEN,TP: SUNG,TV: ADAM,G: PHARMAZIE 52 12: 965-966 (1997) (INST PFLANZENBIOCHEM HALLE GERMANY)
J14512	MALARIA AND ANTIMALARIAL PLANTS IN RORAIMA, BRAZIL. MILLIKEN,W: TROP DOCTOR SUPPL 1997 : 20-25 (1997) (ROYAL BOT GARDENS CENT ECONOMIC BOT SURREY TW9 3AE ENGLAND)
J18541	AN INVENTORY OF SOME VEGETABLE DRUG RESOURCES OF MAKAWANPUR DISTRICT NEPAL. MANANDHAR,NP: FITOTERAPIA 66 3: 231-238 (1995) (NATL HERB PLANT LAB KATHMANDU NEPAL)
J18701	USE OF MEDICINAL PLANTS FOR DIABETES IN TRINIDAD AND TOBAGO. MAHABIR,D: GULLIFORD,MC: PAN AM J PUBLIC HEALTH 1 3: 174-178 (1997) (NUTR METABOL DIV MINISTRY HEALTH TRINIDAD & TOBAGO SPAIN)

J19078	USE OF MEDICINAL PLANTS FOR DIABETES IN TRINIDAD AND TOBAGO. MAHABIR,D: GULLIFORD,MC: REV PANAM SALUD PUBL/PAN AM J PUBL HEALTH 1 3: 174-179 (1997) (NUTR METABOL DIV MINISTRY HEALTH TRINIDAD TOBAGO SPAIN)
J19977	EXCITATORY AND INHIBITORY EFFECTS OF PARAGUAYAN MEDICINAL PLANTS EQUISETUM GIGANTEUM, ACANTHOSPERMUM AUSTRALE, ALLOPYLUS EDULIS AND CORDIA SALICIFOLIA ON CONTRACTION OF RABBIT AORTA AND GUINEA-PIG LEFT ATRIUM. MATSUNAGA,K: SASAKI,S: OHIZUMI,Y: NATURAL MED 51 5: 478-481 (1997) (DEPT PHARM MOL BIOL FAC PHARMACEUTICAL SCI TOHOKU UNIV SENDAI 980-77 JAPAN)
K03868	6-METHOXYBENZOSAZOLINONE AND TRITERPENOIDS FROM ROOTS OF SCOPARIA DULCIS. CHEN,CM: CHEN,MT: PHYTOCHEMISTRY 15 : 1997-1999 (1976) (DEPT CHEM NAT TSING HUA UNIV HSINCHU TAIWAN)
K10069	MEDICAL ETHNOBOTANY OF THE MARMA TRIBE OF BANGLADESH. ALAM,MK: ECON BOT 46 3: 330-335 (1992) (FOREST RES INST CHITTAGONG BANGLADESH)
K11800	ETHNOBOTANICAL STUDY OF GOND TRIBE OF CHANDRAPUR AND GADCHIROLI DISTRICTS OF MAHARASHTRA STATE, INDIA. TIWARI,VJ: PADHYE,MD: FITOTERAPIA 64 1: 58-61 (1993) (POST GRAD DEPT BOT NAGPUR UNIV CAMPUS NAGPUR 440 010 INDIA)
K11970	PRODUCTION OF DITERPENOIDS BY CULTURED CELLS FROM TWO CHEMOTYPES OF SCOPARIA DULCIS. HAYASHI,T: OKAMURA,K: KAWASAKI,M: MORITA,N: PHYTOCHEMISTRY 33 2: 353-356 (1993) (FAC PHARM SCI TOYAMA MED & PHARM UNIV TOYAMA 930-01 JAPAN)
K16617	GLUT-5(6)-EN-3-BETA-OL FROM THE AERIAL PARTS OF SCOPARIA DULCIS. FEROUS,AJ: MAMUN,MA: HASAN,CM: FITOTERAPIA 64 5: 469-. (1993) (DEPT PHARM UNIV DHAKA DHAKA 1000 BANGLADESH)
K18143	ANTIFUNGAL ACTIVITY OF MENTHA SPICATA. SINGH,J: DUBEY,AK: TRIPATHI,NN: INT J PHARMACOG 32 4: 314-319 (1994) (DEPT BOT NATURAL PEST LAB UNIV GORAKHPUR GORAKHPUR 273009 INDIA)
K18765	A SCREENING METHOD FOR NATURAL PRODUCTS ON TRIATOMINE BUGS. SCHMEDA-HIRSCHMANN,G: ROJAS DE ARIAS,A: PHYTOTHER RES 6 2: 68-73 (1992) (INSTIT INVEST CIEN SALUD ASUNCION PARAGUAY)
K19824	6-METHOXY-2-BENZOXAZOLINONE IN SCOPARIA DULCIS AND ITS PRODUCTION BY CULTURED TISSUES. HAYASHI,T: GOTOH,K: OHNISHI,K: OKAMURA,K: ASAMIZU,T: PHYTOCHEMISTRY 37 6: 1611-1614 (1994) (FAC PHARM SCI TOYAMA MED & PHARM UNIV TOYAMA 930-01 JAPAN)
K23165	MEDICINAL PLANTS OF NETERHAT, BIHAR, INDIA. JAIN,SP: SINGH,SC: PURI,HS: INT J PHARMACOG 32 1: 44-50 (1994) (CENTRAL INST MED & AROMATIC PL LUCKNOW UP 226 016 INDIA)
K23294	TRADITIONAL PLANT REMEDIES AMONG THE KONDH OF DISTRICT DHENKANAL (ORISSA). GIRACH,RD: AMINUDDIN: SIDDIOUI,PA: KHAN,SA: INT J PHARMACOG 32 3: 274-283 (1994) (SURVEY MED PLANTS UNIT REG RES INST UNANI MED BHADRAK 756 INDIA)
K24886	HERBAL REMEDIES OF SURKHET DISTRICT, NEPAL. MANANDHAR,NP: FITOTERAPIA 66 3: 266-272 (1993) (NATL HERB PLANT LAB LALILPUR NEPAL)

K25347	HERBAL REMEDIES OF SURKHET DISTRICT, NEPAL. MANANDHAR,NP: FITOTERAPIA 64 3: 266-272 (1993) (NATL HERBARIUM PLANT LAB LATITPUR NEPAL)
K25892	ANTISNAKE VENOM BOTANICALS FROM ETHNOMEDICINE. SELVANAYAHGAM,ZE: GNANEVENDHAN,SG: BALAKRISHNA,K: RAO,RB: J HERBS SPICES MED PLANTS 2 4: 45-100 (1994) (FORENSIC SCI DEPT MADRAS 600 004 INDIA)
K26071	ANALGESIC AND ANTIINFLAMMATORY PROPERTIES OF SCOPARIA DULCIS L. EXTRACTS AND GLUTINOL IN RODENTS. FREIRE,SMDF: EMIM,JADS: TORRES,LMB: PHYTOTHER RES 7 6: 408-414 (1993) (DEPT PHYSIOL SCI UNIV FED MARANHAO MARANHAO BRAZIL)
K26492	MEDICINAL PLANTS OF NICARAGUA'S ATLANTIC COAST. BARRETT,B: ECON BOT 48 1: 8-20 (1994) (JOHNS HOPKINS UNIV HEALTH CHILD SURVIVAL FELLOW INCAP GUATEMALA GUATEMALA)
K26821	SYMPATHOMIMETIC EFFECTS OF SCOPARIA DULCIS L. AND CATECHOLAMINES ISOLATED FROM PLANT EXTRACTS. FREIRE,SMDF: TORRES,LMB: SOUCCAR,C: LAPA,AJ: J PHARM PHARMACOL 48 6: 624-628 (1996) (UNIV FED SAO PAULO SAO PAULO BRAZIL)
K27039	MEDICINAL PLANTS USED BY THE FANG TRADITIONAL HEALERS IN EQUATORIAL GUINEA. AKENDENGUE,B: J ETHNOPHARMACOL 37 2: 165-173 (1992) (DEPT TRAD MED PHARM FAC MED HEALTH SCI LIBREVILLE GABON)
K27070	ETHNOBOTANY OF THE GARIFUNA OF EASTERN NICARAGUA. COEE,FG: ANDERSON,GJ: ECON BOT 50 1: 71-107 (1996) (SCH PHARM UNIV CONNECTICUT STORRS CT 06268 USA)
K27077	INDIGENOUS PHYTOTHERAPY OF GASTROINTESTINAL DISORDERS IN A LOWLAND MIXE COMMUNITY (OAXACA, MEXICO): ETHNOPHARMACOLOGIC EVALUATION. HEINRICH,M: RIMPLER,H: BARRERA,NA: J ETHNOPHARMACOL 36 1: 63-80 (1992) (IST PHARM BIOL ALBERT LUDWIGS UNIV FREIBURG GERMANY)
K27314	CELL GROWTH INHIBITION OF KB CELLS BY PLANT EXTRACTS. ARISAWA,M: NATURAL MED 48 4: 338-347 (1994) (FAC PHARM SCI TOYAMA MED & PHARM UNIV TOYAMA 930-01 JAPAN)
K27819	MEDICINAL AND OTHER ECONOMIC PLANTS OF THE PAYA OF HONDURAS. LENTZ,DL: ECON BOT 47 4: 358-370 (1993) (ELECTRONIC MICROSCOPY LABR. UNIV. OF MISSISSIPPI JACKSON MS 39216 USA)
L04137	AMAZONIAN ETHNOBOTANICAL DICTIONARY. DUKE,JA: BOOK : 181- (1994) (USA)
L09445	IN VITRO AND IN VIVO STUDY OF THE CLASTOGENICITY OF THE FLAVONE CIRSITAKAOSIDE EXTRACTED FROM SCOPARIA DULCIS L. (SCROPHULARIACEAE). PEREIRA-MARTINS,SR: TAKAHASHI,CS: TAVARES,DC: TORRES,LMB: TERATOGEN CARCINOGEN MUTAGEN 18 6: 283-302 (1998) (DEPT BIOL FED UNIV MARAHAO SAO LUIS BRAZIL)
L15570	TRADITIONAL ANTI-MALARIAL MEDICINE IN RORAIMA, BRAZIL. MILLIKEN,W: ECON BOT 51 3: 212-237 (1997) (CENTRE ECONOMIC BOTANY ROYAL BOTANIC GARDENS SURREY ENGLAND)
L15592	ANALGESIC, DIURETIC, AND ANTI-INFLAMMATORY PRINCIPLE FROM SCOPARIA DULCIS. AHMED,M: SHIKHA,HA: SADHU,SK: RAHMAN,MT: DATTA,BK: PHARMAZIE 56 8: 657-660 (2001) (DEPT PHARMACY UNIV DHAKA DHAKA BANGLADESH)

L15991	SNAKEBITES AND ETHNOBOTANY IN THE NORTHWEST REGION OF COLOMBIA. PART III: NEUTRALIZATION OF THE HAEMORRHAGIC EFFECT OF BOTHROPS ATROX VENOM. OTERO,R: NUNEZ,V: BARONA,J: FONNEGRA,R: JIMENEZ,SL: OSORIO,RG: SALDARRIAGA,M: DIAZ,A: J ETHNOPHARMACOL 73 1/2: 233-241 (2000) (PROGRAMA OFIDISMO FACULTAD MED UNIV ANTIOQUIA MEDELLIN COLOMBIA)
L16047	SCREENING OF MEDICINAL PLANTS USED BY THE GARIFUNA OF EASTERN NICARAGUA FOR BIOACTIVE COMPOUNDS. COE,FG: ANDERSON,GJ: J ETHNOPHARMACOL 53 : 29-50 (1996) (DEPT ECOL EVOLUNT BIOL UNIV CONNECTICUT STORRS CT 06269 USA)
L16218	PRELIMINARY INVESTIGATION OF THE ANTIMICROBIAL AND BRINE SHRIMP LETHALITY PROPERTIES OF SOME NIGERIAN MEDICINAL PLANTS. AWACHIE,PIA: UGWU,FO: INT J PHARMACOG 35 5: 338-343 (1997) (DEPT CHEM UNIV NIGERIA NSUKKA NIGERIA)
L16228	CHEMICAL AND BIOLOGICAL STUDIES OF SCOPARIA DULCIS L. PLANT EXTRACTS. BEGUM,SA: NAHAR,N: MOSIHUZZSAMAN,M: J BANGLADESH ACAD SCI 24 2: 141-148 (2000) (DEPT CHEM UNIV DHAKA DHAKA 1000 BANGLADESH)
M01437	GUYANESE ETHNOMEDICAL BOTANY. A FOLK PHARMACOPOEIA. MIHALIK,GJ: ETHNOMEDICINE 5 : 83- (1978) (DEPT ANTHROPOLOGY UNIV PENNSYLVANIA PHYLADELPHIA PA USA)
M15310	A SURVEY OF THE PLANTS OF BHAGALPUR AND SANTHAL PARGANA FOR SAPONINS, FLAVONOIDS AND ALKALOIDS. SINHA,SKP: DOGRA,JVV: INT J CRUDE DRUG RES 23 2: 77-86 (1985) (DEPT BOT PLANT PHYSIOL LAB BHAGALPUR UNIV BHAGALPUR BIHAR 812007 INDIA)
M16400	THE CRYSTAL STRUCTURE OF SCOPADULCIC ACID A FROM PARAGUAY CRUDE DRUG "TYPYCHA KURATU (SCOPARIA DULCIS). HAYASHI,T: KISHI,M: KAWASAKI,M: ARISAWA,M: MORITA,N: J NAT PROD 51 2: 360-363 (1988) (FAC PHARM SCI TOYAMA MED & PHARM UNIV TOYAMA 930-01 JAPAN)
M18047	8-HYDROXYTRICETIN 7-GLUCURONIDE, A BETA-GLUCURONIDASE INHIBITOR FROM SCOPARIA DULCIS. KAWASAKI,M: HAYASHI,T: ARISAWA,M: MORITA,N: BERGANZA,LH: PHYTOCHEMISTRY 27 11: 3709-3711 (1988) (FAC PHARM SCI TOYAMA MED & PHARM UNIV TOYAMA 930-01 JAPAN)
M19811	IN VITRO AND IN VIVO ANTIVIRAL ACTIVITY OF SCOPADULCIC ACID B FROM SCOPARIA DULCIS, SCROPHULARIACEAE, AGAINST HERPES SIMPLEX VIRUS TYPE 1. HAYASHI,K: NIWAYAMA,S: HAYASHI,T: NAGO,R: OCHIAI,H: MORITA,N: ANTIVIRAL RES 9 6: 345-354 (1988) (TOYAMA MED PHARM UNIV SUGITANI JAPAN)
M22746	PLANTS IN TRADITIONAL MEDICINE IN BRAZIL. DE MELLO,JF: J ETHNOPHARMACOL 2 1: 49-55 (1980) (INST ANTIBIOTICS UNIV FED PERNAMBUCO RECIFE PE 50739 BRAZIL)
M23149	HERBAL MEDICINE AMONG THE MISKITO OF EASTERN NICARAGUA. DENNIS,PA: ECON BOT 42 1: 16-28 (1988) (DEPT ANTHROPOL TEXAS TECH UNIV LUBBOCK TX 79409 USA)
M23219	A SURVEY OF MEDICINAL PLANTS OF CHENCHU TRIBES OF ANDHRA PRADESH, INDIA. REDDY,MB: REDDY,KR: REDDY,MN: INT J CRUDE DRUG RES 26 4: 189-196 (1988) (DEPT BOT SRI VENKATESWARA UNIV TIRUPATI AP 517 502 INDIA)

M25005	SCOPADULCIC ACID B, A NEW TETRACYCLIC DITERPENOID FROM SCOPARIA DULCIS L. ITS STRUCTURE, H+-, K+-ADENOSINE TRIPHOSPHATASE INHIBITORY ACTIVITY AND PHARMACOKINETIC BEHAVIOUR IN RATS. HAYASHI,T: OKAMURA,K: KAKEMI,M: ASANO,S: MIZUTANNI,M: TAKEGUCHI,N: KAWASAKI,M: TEZUKA,Y: KIKUCHI,T: MORITA,N: CHEM PHARM BULL 38 10: 2740-2745 (1990) (RES INST ORIENTAL MED TOYAMA MED & PHARM UNIV TOYAMA 930-01 JAPAN)
M27930	TWO CHEMOTYPES OF SCOPARIA DULCID IN PARAGUAY. AYASHI,T: OKAMURA,K: KAWASAKI,M: MORITA,N: PHYTOCHEMISTRY 30 11: 3617-3620 (1991) (FAC PHARM SCI TOYAMA MED & PHARM UNIV TOYAMA 930-01 JAPAN)
M29003	A CYTOTOXIC FLAVONE FROM SCOPARIA DULCIS L. HAYASHI,T: UCHIDA,K: HAYASHI,K: NIWAYAMA,S: MORITA,N: CHEM PHARM BULL 36 12: 4849-4851 (1988) (FAC PHARM SCI TOYAMA MED & PHARM UNIV TOYAMA 930-01 JAPAN)
N02722	FLAVONOIDS OF SCOPARIA DULCIS AND STEMODIA VISCOSA. RAMESH,P: NAIR,AGR: SUBRAMANIAN,SS: CURR SCI 48 : 67- (1979) (DEPT CHEM JAWAHARLAL INST POSTGRAD MED EDUC + RES PONDICHERRY UT 605 006 INDIA)
N07354	TRITERPENOIDS OF SCOPARIA DULCIS. MAHATO,SB: DAS: MC: SAHU,NP: PHYTOCHEMISTRY 20 : 171-173 (1981) (DEPT CHEM OSMANIA UNIV HYDERABAD AP 7 INDIA)
T00235	FLAVONOIDS OF SCOPARIA DULCUS AND STEMODIA VISCOSA. RAMESH,P: NAIR,AGR: SUBRAMANIAM,SS: CURR SCI 48 : 67- (1979) (DEPT CHEM JIPMER PONDICHERRY UT 605 006 INDIA)
T00701	MEDICINAL PLANTS OF THE WEST INDIES. AYENSU,ES: UNPUBLISHED MANUSCRIPT : 110 P- (1978) (OFFICE OF BIOLOGICAL CONSERVAT SMITHSONIAN INSTITUTION WASHINGTON DC 20560 USA)
T05306	A CONTRIBUTION TO THE THAI PHYTOCHEMICAL SURVEY.CANNON,JR: DAMPAWAN,P: LOJANAPIWATNA,V: PHURIYAKORN,B: SINCHAI,W: SIRIRUGSA,P: SUVATABHANDHU,K: WIRIYACHITRA,P: J SCI SOC THAILAND 6 : 46-53 (1980) (DEPT CHEM FAC SCI PRINCE OF SONGKLA UNIV HAT YAI THAILAND)
T05601	COIXOL AND BETULINIC ACID OF SCOPARIA DULCIS L. LI,JX: LI,YC: NIE,RL: ZHOU,J: YUNNAN ZHIWU YANJIU 3 : 475-477 (1981) (INSTITUTE OF BOTANY ACADEMIA SINICA KUNMING CHINA)
T06510	STUDIES ON SOME PLANTS USED AS ANTICONVULSANTS IN AMERINDIAN AND AFRICAN TRADITIONAL MEDICINE. ADESINA,SK: FITOTERAPIA 53 : 147-162 (1982) (DRUG RES UNIT FAC PHARM UNIV IFE ILE-IFE NIGERIA)
T08133	THE CONCEPT OF PLANTS AS TEACHERS AMONG FOUR MESTIZO SHAMANS OF IQUITOS, NORTHEASTERN PERU. LUNA,LE: J ETHNOPHARMACOL 11 2: 135-156 (1984) (PERHONKATU HELSINKI 00100 FINLAND)
T09739	ANTIMICROBIAL ACTIVITY OF SOME MEDICINAL SPECIES OF DAKAR MARKETS. LAURENS,A: MBOUP,S: TIGNOKPA,M: SYLLA,O: MASQUELIER,J: PHARMAZIE 40 7: 482-485 (1985) (LAB CHIM SUB NATUR FAC MIX MED PHARM DAKAR SENEGAL)
T11569	INDIAN PLANTS WITH ORAL HYPOGLYCAEMIC ACTIVITY. JAIN,HC: ABSTR INTERNAT RES CONG NAT PROD COLL PHARM UNIV N CAROLINA CHAPEL HILL NC JULY 7-12 1985 : ABSTR-152 (1985) (PUBLICATIONS & INFO DIRECT (CSIR) NEW DELHI UT 110012 INDIA)

T12145	POPULAR MEDICINAL PLANTS OF THE MARKETS OF DAKAR (SENEGAL). TIGNOKPA,M: LAURENS,A: MBOUP,S: SYLLA,O: INT J CRUDE DRUG RES 24 2: 75-80 (1986) (LAB CHIM SUB NATUR FAC MED PHARM DAKAR SENEGAL)
T14999	ANTIHEPATOTOXIC ACTIONS OF FORMOSAN PLANT DRUGS. YANFG,LL: YEN,KY: KISO,Y: KIKINO,H: J ETHNOPHARMACOL 19 1: 103-110 (1987) (TAIPEI MED COLL TAIPEI TAIWAN)
T15323	VEGETALES EMPLEADOS EN MEDICINA TRADICIONAL NORPERUANA. RAMIREZ,VR: MOSTACERO,LJ: GARCIA,AE: MEJIA,CF: PELAEZ,PF: MEDINA,CD: MIRANDA,CH: BANCO AGRARIO DEL PERU & NACL UNIV TRUJILLO, TRUJILLO, PERU, JUNE, 1988 : 54PP- (1988) (UNIV TRUJILLO TRUJILLO PERU)
T15375	A SURVEY OF PLANTS WITH ANTIFERTILITY PROPERTIES DESCRIBED IN THE SOUTH AMERICAN FOLK MEDICINE. GONZALEZ,F: SILVA,M: ABSTR PRINCESS CONGRESS I BANGKOK THAILAND 10-13 DECEMBER 1987 : 20PP-. (1987) (LAB QUIM PROD NAT UNIV CONCEPCION CONCEPCION CHILE)
T15975	A SURVEY OF MEDICINAL PLANTS OF MINAS GERAIS, BRAZIL. HIRSCHMANN,GS: ROJAS DE ARIAS,A: J ETHNOPHARMACOL 29 2: 159-172 (1990) (INST INVEST CIENCIAS SALUD FAC CIENCIAS QUIM ASUNCION PARAGUAY)
W00374	SCREENING OF INDIAN PLANTS FOR BIOLOGICAL ACTIVITY. VI. DHAWAN,BN: PATNAIK,GK: RASTOGI,RP: SINGH,KK: TANDON,JS: INDIAN J EXP BIOL 15 : 208-219 (1977) (MED PLANTS PROJECT CENTRAL DRUG RES INST LUCKNOW UP INDIA)
W01223	SCREENING OF SOME PLANT EXTRACTS FOR ANTIFUNGAL PROPERTIES. NENE,YL: THAPLIYAL,PN: KUMAR,K: LABDEV J SCI TECH B 6 4: 226-228 (1968) (DEPT PLANT PATHOL U.P.AGR UNIV PANTNAGAR UP INDIA)
W02290	DIE HEILPFLANZEN DER VERSCHIEDENEN VOLKER UND ZEITEN,F.ENKE,STUTTGART. DRAGENDORFF,G: BOOK 1898 : 885PP- (1898) (NO ADDRESS GIVEN)
W02949	MOLLUSCICIDAL ACTIVITY OF PLANTS FROM NORTHEAST BRAZIL. PINHEIRO DE SOUSA,M: ROUQUAYROL,MZ: REV BRASIL PESQ MED BIOL 7 4: 389-394 (1974) (DEPT FARMACOL EXP CENT CIENC SAUDE UNIV FED CEARA CEARA BRAZIL)
W03804	A LIST OF THAI MEDICINAL PLANTS, ASRCT, BANGKOK. REPORT NO.1 ON RES. PROJECT. 17. WASUWAT,S: RESEARCH REPORT,A.S.R.C.T.,NO.1 ON RESEARCH PROJECT 17 1967 : 22PP-. (1967) (A.S.R.C.T. BANGKOK THAILAND)
AE1001	EFFICACY OF SCOPADULCIC ACID A AGAINST PLASMODIUM FALCIPARUM IN VITRO. RIEL,MA: KYEL,DE: MILHOUS,WK: J NAT PROD 65 4:614-5 (2002) (DEPT PARASITOLOGY, WALTER REED ARMY INST OF RES, MARYLAND, USA)
AE1002	IN VITRO AND IN VIVO STUDY OF THE CLASSTOGENICITY OF THE FLAVONE CIRSITAKAOSIDE EXTRACTED FROM SCOPARIA DULCIS L. (SCROPHULARIACEAE). PEREIRA-MARTINS,SR: TAKAHASHI,CS: TAVARES,DC: TORRES,LM: TERATOG CARCINOG MUTAGEN 18 6: 293-302 (1998) (DEPT BIOLOGY, FED UNI OF MARANHAO, SAO LUIS, BRAZIL)
AE1003	DEMONSTRATION OF ANTIFUNGAL AND ANTI-HUMAN IMMUNODEFICIENCY VIRUS REVERSE TRANSCRIPTASE ACTIVITIES OF 6-METHYOXY-2-BENZOXAZOLINONE AND ANTIBACTERIAL ACTIVITY OF HTE PINEAL INDOLE 5-METHOXYINDOLE-3-ACETIC ACID. WANG,HX: NG,TB: COMP BIOCHEM PHYSIOL C TOXICOL PHARMACOL: 132 2: 261-8 (2002) (DEPT MICRO, CHINA AGR UNI, BEIJING, CHINA)

AE1004	EXAMINATION OF PINEAL INDOLES AND 6-METHOXY-2-BENZOXAZOLINONE FOR ANTIOXIDANT AND ANTIMICROBIAL EFFECTS. WANG,HX: LIU,F: NG,TB: COMP BIOCHEM PHYSIOL C TOXICOL PHARMACOL 130 3: 379-88 (2001) (DEPT MICRO, CHINA AGR UNI, BEIJING, CHINA)
AE1005	ARE MITOCHONDRIA TARGETS OF ANTICANCER DRUGS RESPONSIBLE FOR APOPTOSIS? MARCHETTI,P: MORTIER,L: BEAUVILLAIN,V: FORMSTECHER,P: ANN BIOL CLIN (PARIS) 60 4: 391-403 (2002) (LABORATOIRE DE BIOLOGIE CELLULAIRE, FACULTE DE MEDECINE, PLACE VERDUN)
AE1006	BETULINIC ACID, A POTENT INHIBITOR OF EUKARYOTIC TOPOISOMERASE I: IDENTIFICATION OF THE INHIBITORY STEP, THE MAJOR FUNCTIONAL GROUP RESPONSIBLE AND DEVELOPMENT OF MORE POTENT DERIVATIVES. CHOWDHURY,A: MANDAL,S: MITTRA,B: SHARMA,S: MUKHOPADHYAY,S: MAJUMDER,H: MED SCI MONIT 8 7:BR254-65 (2002) (MOLECULAR PARASITOLOGY LAB, INDIANT INST OF CHEM BIOL)
AE1007	BETULINIC ACID INHIBITS GROWTH FACTOR-INDUCED IN VITRO ANGIOGENESIS VIA THE MODULATION OF MITOCHONDRIAL FUNCTION IN ENDOTHELIAL CELLS. KWON,HJ: SHIM,JS: KIM,JH: CHO,HY: YUM,YN: KIM,SH: YU,J: JPN J CANCER RES: 93 4: 417-25 (2002) (DEPT BIOSCI AND BIOTECH, SEJONG UNI, SEOUL, KOREA)
AE1008	BETULINIC ACID SENSITIZATION OF LOW PH ADAPTED HUMAN MELANOMA CELLS TO HYPERTHERMIA. WACHSBERGER,PR: BURD,R: WAHL,ML: LEEPER,DB: INT J HYPERTHERMIA: 18 2: 153-64 (2002) (DEPT RADIATION ONCOLOGY, KIMMEL CANCER CENTER AND THOMAS JEFFERSON UNI, PHILADELPHIA, USA)
AE1009	NATURAL PRODUCTS INHIBITING CANDIDA ALBICANS SECRETED ASPARTIC PROTEASES FROM TOVOMITA KRUKOVII. ZHANG, Z: ELSOHLY,HN: JACOB,MR: PASCO,DS: WALKER,LA: CLARK,AM: PLANTA MED: 68 1: 49-54 (2002) (NAT CENTER FOR NAT PROD RES, UNI MISSISSIPPI, USA)
AE1010	SELECTIVE CYTOTOXICITY OF BETULINIC ACID ON TUMOR CELL LINES, BUT NOT ON NORMAL CELLS. ZUCO,V: SUPINO,R: RIGHETTI,SC: CLERIS,L: MARCHESI,E: GAMBACORTI-PASSERINI,C: FORMELLI,F: CANCER LETT: 175 1: 17-25 (2002) (ISTITUTO NAZIONALE PER LO STUDIO E LA CURA DEI TUMORI, MILAN, ITALY)
AE1011	NEW DEVELOPMENTS IN ANTI-HIV CHEMOTHERAPY. DE CLERCQ,E: CURR MED CHEM: 8 13: 1543-72 (2001) (REGA INST FOR MED RES, KATHOLIEKE UNI LEUVEN, BELGIUM)
AE1012	BETULINIC ACID REDUCES ULTRAVIOLET-C-INDUCED DNA BREAKAGE IN CONGENITAL MELANOCYTIC NAEVAL CELLS: EVIDENCE FOR A POTENTIAL ROLE AS A CHEMOPREVENTIVE AGENT. SALTI,GI: KICHINA,JV: DAS GUPTA,TK: UDDIN,S: BRATESCU,L: PEZZUTO,JM: MEHTA,RG: CONSTANTINOU,AI: MELANOMA RES: 11 2; 99-104 (2001) (DEPT SURGICAL ONCOLOGY, UNI ILLINOIS, CHICAGO, USA)
AE1013	ANTHELMINTIC ACTIVITY OF THE STEM BARK EXTRACTS OF BERLINA GRANDIFLORA AND ONE OF ITS ACTIVE PRINCIPLES, BETULINIC ACID. ENWEREM,NM: OKOGUN,JI: WAMBEBE,CO: OKORIE,DA: AKAH,PA: PHYTOMEDICINE: 8 2: 112-4 (2001) (NAT INST FOR PHARM RES AND DEVELOPMENT, ABUJA, NIGERIA)

AE1014	ANTI-HUMAN IMMUNODEFICIENCY VIRUS ACTIVITY OF YK-FH312(A BETULINIC ACID DERIVATIVE), A NOVEL COMPOUND BLOCKING VIRAL MATURATION. KANAMOTO,T: KASHIWADA,Y: KANBARA,K: GOTOH,K: YOSHIMORI,M: GOTO,T: SANO,K: NAKASHIMA,H: ANTIMICROB AGENTS CHEMOTHER: 45 4: 1225-30 (2001) (DEPT MICROB AND IMMUNO, KAGOSHIMA UNI DENTAL SCHOOL, JAPAN)
AE1015	BETULINIC ACID INDUCES APOPTOSIS THROUGH A DIRECT EFFECT ON MITOCHONDRIA IN NEUROECTODERMAL TUMORS. FULDA,S: DEBATIN,KM: MED PEDIATR ONCOL: 35 6: 616-8 (2000) (UNI CHILDREN'S HOSPITAL, ULM, GERMANY)
AE1016	THE PLANT METABOLITE 6-METHOXYBENZOXAZOLINONE INTERACTS WITH FOLLICLE-STIMULATING HORMONE TO ENHANCE OVARIAN GROWTH. BUTTERSTEIN,GM: SCHADLER,MH: BIOL REPROD: 39 2: 465-71 (1988) (DEPT BIOLOG SCI, UNION COLLEGE, SCHENECTADY, USA)
AE1017	ANALGESIC AND ANTIPYRETIC ACTIVITIES OF AN AQUEOUS EXTRACT AND OF THE FLAVONE LINARIN OF BUDDLEIA CORDATA. MARTINEZ-VAZQUEZ,M: RAMIREZ APAN,TO: AGUILAR,H: BYE,R: PLANT MED: 62 2:137-40 (1996) (INSTITUTO DE QUIMICA, UNIVERSIDAD NACIONAL AUTONOMA DE MEXICO, MEXICO)
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AE1019	ANTITUMOR-PROMOTING ACTIVITY OF SCOPADULCIC ACID B, ISOLATED FROM THE MEDICINAL PLANT SCOPARIA DULCIS L. NISHINO,H: HAYASHI,T: ARISAWA,M: SATOMI,Y: IWASHIMA,A: ONCOLOGY: 50 2: 100-3 (1993) (DEPT BIOCHEM, KYOTO PREFECTURAL UNI OF MED, JAPAN)
AE1020	ANTIVIRAL AGENTS OF PLANT ORIGIN. II. ANTIVIRAL ACTIVITY OF SCOPADULCIC ACID B DERIVATIVES. HAYASHI,T: HAYASHI,K: UCHIDA,K: NIWAYAMA,S: MORITA,N: CHEM PHARM BULL (TOKYO): 38 1: 239-42 (1990) (FAC OF PHARM SCI, TOYAMA MED AND PHARM UNI, JAPAN)
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AE1022	RADIATION PROTECTION OF HUMAN LYMPHOCYTE CHROMOSOMES IN VITRO BY ORIENTIN AND VICENIN. VRINDA,B: UMA DEVI P: MUTAT RES: 498 1-2: 39-46 (2001) (DEPT RADIOBIOL, KASTURBA MED COLLEGE, MANIPAL, INDIA)
AE1023	RADIATION PROTECTION BY THE OCIMUM FLAVONOIDS ORIENTIN AND VICENIN: MECHANISMS OF ACTION. UMA DEVI,P: GANASOUNDARI,A: VRINDA,B: SRINIVASAN,KK: UNNIKRISHNAN,MK: RADIAT RES: 154 4: 455-60 (2000) (DEPT RADIOBIOL, KASTURBA MEDICAL COLLEGE)
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AE1025	ENHANCED CYTOTOXICITY OF SOME TRITERPENES TOWARD LEUKEMIA L1210 CELLS CULTURED IN LOW PH MEDIA; POSSIBILITY OF A NEW MODE OF CELL KILLING. NODA,Y: KAIYA,T: KOHDA,K: KAWAZOE,Y: CHEM PHARM BULL (TOKYO) 45 10: 1665-70 (1997) (FAC OF PHARM SCI, NAGOYA CITY UNI, JAPAN)

AE1026	BETULINIC ACID INHIBITS AMINOPEPTIDASE N ACTIVITY. MELZIG,MF: BORMANN,H: PLANT MED: 64 7: 655-7 (1998)
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AE1028	BETULINIC ACID DERIVATIVES: A NEW CLASS OF SPECIFIC INHIBITORS OF HUMAN IMMUNODEFICIENCY VIRUS TYPE 1 ENTRY. SOLER,F: POUJADE,C: EVERS,M: CARRY,JB: HENIN,Y: BOUSSEAU,A: HUET,T: PAUWELS,R: DE CLERCQ,E: MAYAUX,JF: LE PECQ,JB: DEREU,N: J MED CHEM: 39 5: 1069-83 (1996) (RHONE-POULENC RORER, CENTRE DE RECHERCHE DE VITRY-ALFORTVILLE, VITRY SUR SEINE, FRANCE)
AE1029	THE HEALING FOREST. MEDICINAL AND TOXIC PLANTS OF THE NORTHWEST AMAZONIA. SCHULTES,RE: RAFFAUF: RF DIOSCORIDES PRESS: PORTLAND, OREGON: 1990
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AE1031	PLANTAS MEDICINALES DE USO POPULAR EN LA AMAZONIA PERUANA. KEMBER MEJIA: RENG,ELSA: AECI AND IIAP: LIMA, PERU. 1995
AE1032	FARMACIAS VIVAS, SISTEMA DE UTILIZACO DE PLANTAS MEDICINAIS PROJETADO PARA PEQUENAS COMUNIDADES. MATOS,FJ ABREU. EDICOES UFC: FORTALEZA, BRAZIL. 1994
AE1033	MANUAL DE FITOTERAPIA. COIMBRA, RAUL. 2ND ED. EDITORA CEJUP: BELEM, BRAZIL. 1994
AE1034	PLANTAS MEDICINAIS BRASILEIRAS, CONHECIMENTOS POPULARES E. CIENTIFICOS. DE ALMEIDA,ER: HEMUS EDITORA LTDA: SAU PAULO, BRAZIL. 1993
XX1001	MEDICINAL PLANTS OF BRAZIL, MORES, WB; RIZZINI, CT; PEREIRA, NA; (2000) (BOOK PUBLISHED BY: REFERENCE PUBLICATIONS, INC. ALGONAC, MI 48001)

Clinical Abstracts

Oncology 1993 Mar-Apr;50(2):100-3

Antitumor-promoting activity of scopadulcic acid B, isolated from the medicinal plant Scoparia dulcis

Nishino, H, et al.

Scopadulcic acid B (SDB), a tetracyclic diterpenoid isolated from a medicinal plant, Scoparia dulcis L., inhibited the effects of tumor promoter 12-O-tetradecanoylphorbol-13-acetate (TPA) in vitro and in vivo; SDB inhibited TPA-enhanced phospholipid synthesis in cultured cells, and also suppressed the promoting effect of TPA on skin tumor formation in mice initiated with 7,12-dimethylbenz[a]anthracene. The potency of SDB proved to be stronger than that of other natural antitumor-promoting terpenoids, such as glycyrrhetinic acid.

Pharmazie 2001 Aug;56(8):657-60

Analgesic, diuretic, and anti-inflammatory principle from Scoparia dulcis.

Ahmed M, et al.

Scoparinol, a diterpene, isolated from Scoparia dulcis showed significant analgesic ($p < 0.001$) and anti-inflammatory activity ($p < 0.01$) in animals. A sedative action of scoparinol was demonstrated by a marked potentiation of pentobarbital-induced sedation with a significant effect on both onset and duration of sleep ($p < 0.05$). Measurement of urine volume after administration of scoparinol indicated its significant diuretic action.

J Nat Prod 1992 Dec;55(12):1748-55

Scoparic acid A, a beta-glucuronidase inhibitor from Scoparia dulcis.

Hayashi T, et al.

The 70% EtOH extract of Scoparia dulcis showed inhibitory activity against beta-glucuronidase from bovine liver. Bioassay-directed fractionation of the active extract led to the isolation of three labdane-type diterpene acids, scoparic acid A [1] [6-benzoyl-12-hydroxy-labda-8(17), 13-dien-18-oic acid], scoparic acid B [2] [6-benzoyl-14,15-dinor-13-oxo-8(17)-labden-18-oic acid], and scoparic acid C [3] [6-benzoyl-15-nor-14-oxo-8(17)-labden-18-oic acid], the structures of which were established by spectral means, including X-ray analysis. Scoparic acid A was found to be a potent beta-glucuronidase inhibitor.

J Pharm Pharmacol 1996 Jun;48(6):624-8

Sympathomimetic effects of Scoparia dulcis L. and catecholamines isolated from plant extracts.

Freire, S. M., et al.

The herb Scoparia dulcis L. is used in Brazilian folk medicine to treat bronchitis, gastric disorders, haemorrhoids, insect bites and skin wounds, and in oriental medicine to treat hypertension. A previous study has shown that extracts of S. dulcis have analgesic and anti-inflammatory properties; in this work the sympathomimetic activity of an ethanolic extract of Scoparia dulcis L. has been investigated in rodent preparations in-vivo and in-vitro. Administration of the extract (0.5-2 mg kg-1, i.v.) to anaesthetized rats produced dose-related hypertension blocked by the alpha-adrenoceptor antagonist prazosin (1 mg kg-1). Partition of the extract in chloroform-water yielded an aqueous phase 20 times more potent than the extract; this produced hypertension in either reserpine-treated or pithed rats. In untreated and reserpine-treated rats the same fraction (1-3 x 10(3) micrograms mL-1) produced concentration-dependent contractions of the vas deferens musculature parallel to those obtained with noradrenaline (10(-8)-10(-4)M). Prazosin (10(-7)M) reduced the maximum contractile effect of the aqueous fraction, and shifted the concentration-response curves for noradrenaline to the right. The aqueous fraction (25 and 50 micrograms mL-1) increased the inotropism of electrically driven left atria of rats, the effect being blocked by propranolol (0.4 microgram mL-1). In preparations of guinea-pig tracheal rings the aqueous fraction (1-3 x 10(3) micrograms mL-1) relaxed the muscle contraction induced by histamine (10(-4) M) in proportion to the concentration. The effect was antagonized competitively by propranolol (1.5 microM). High-performance liquid-chromatographic analysis of the aqueous fraction revealed the presence of both noradrenaline and adrenaline in the plant extract. The results indicated that both catecholamines may account for the hypertensive and inotropic effects obtained after parenteral administration of S. dulcis extracts. This sympathomimetic activity is, however, unrelated to the previously reported analgesic and anti-inflammatory properties of the plant extract, but may explain its effectiveness upon topical application in the healing of mucosal and skin wounds.

Chem Pharm Bull (Tokyo) 1990 Apr;38(4):945-7
Antiviral agents of plant origin. III. Scopadulin, a novel tetracyclic diterpene from Scoparia dulcis L.
Hayashi, T., et al.
The structure and stereochemistry of scopadulin, a novel aphidicolane-type diterpene isolated from Scoparia dulcis L. have been established from spectral data and single-crystal X-ray analysis of its acetone solvate.

J Nat Prod 2002 Apr;65(4):614-5
Efficacy of scopadulcic acid A against Plasmodium falciparum in vitro.
Riel, M.A.,
Scoparia dulcis is a perennial herb widely distributed in many tropical countries. It is used as an herbal remedy for gastrointestinal and many other ailments, and in Nicaragua extracts are used to treat malaria. Phytochemical screening has shown that scopadulcic acid A (SDA), scopadulcic acid B (SDB), and semisynthetic analogues are pharmacologically active compounds from S. dulcis. SDB has antiviral activity against Herpes simplex virus type 1, antitumor activity in various human cell lines, and direct inhibitory activity against porcine gastric H(+), K(+)-ATPase. A methyl ester of scopadulcic acid B showed he most potent inhibitory activity against gastric proton pumps of 30 compounds tested in one study. Compounds with antiviral, antifungal, and antitumor activity often show activity against Plasmodium falciparum. In P. falciparum, the plasma membrane and food vacuole have H(+)-ATPases and the acidocalcisome as an H(+)-Ppase. These proton pumps are potential targets for antimalarial therapy and may have their function disrupted by compounds known to inhibit gastric proton pumps. We tested pure SDA and found in vitro activity against P. falciparum with an IC(50) of 27 and 19 microM against the D6 and W2 clones, respectively. The IC(50) against the multidrug-resistant isolate, TM91C235, was 23 microM.

Teratog Carcinog Mutagen 1998;18(6):293-302
In vitro and in vivo study of the clastogenicity of the flavone cirsitakaoside extracted from Scoparia dulcis L. (Scrophulariaceae).
Pereira-Martins, S. R., et al.
The mutagenic effect of the flavone cirsitakaoside extracted from the medicinal herb Scoparia dulcis was evaluated in vitro by using human peripheral blood cultures treated with doses of 5, 10, and 15 microg of the flavone/ml culture medium for 48 h. The compound proved to be mutagenic at the highest concentration tested (15 microg/ml). Furthermore, the proliferative index was significantly reduced in all cultures treated with the flavone, although the mitotic index was not reduced. However, the clastogenic activity of the flavone cirsitakaoside was not observed when Swiss mice were treated orally with doses
of 10, 20, and 30 mg/animal for 24 h.

Antiviral Res 1988 Sep;9(6):345-54
In vitro and in vivo antiviral activity of scopadulcic acid B from Scoparia dulcis, Scrophulariaceae, against herpes simplex virus type 1.
Hayashi, K., et al.
The antiviral activity of five diterpenoids isolated from Scoparia dulcis L., Scrophulariaceae, was examined in vitro against herpes simplex virus type 1. Among these compounds, only scopadulcic acid B was found to inhibit the viral replication with the in vitro therapeutic index of 16.7. The action of scopadulcic acid B was not due to a direct virucidal effect or inhibition of virus attachment to host cells. Single-cycle replication experiments indicated that the compound interfered with considerably early events of virus growth. The influence of scopadulcic acid B on the course of the primary corneal herpes simplex virus infection was investigated by means of a hamster test model. When the treatment was initiated immediately after virus inoculation, scopadulcic acid B, when applied orally or intraperitoneally, effectively prolonged both the appearance of herpetic lesions and the survival time at the dose of 100 and 200 mg/kg per day.

J Nat Prod 1991 May-Jun;54(3):802-9

Scopadulciol, an inhibitor of gastric H+, K(+)-ATPase from Scoparia dulcis, and its structure-activity relationships.

Hayashi, T., et al.

A new tetracyclic diterpenoid, scopadulciol [3], together with 6-methoxybenzoxazolinone, glutinol, and acacetin, was isolated from the 70% EtOH extract of Scoparia dulcis collected in Taiwan. Its structure was elucidated to be 6 beta-benzoyl-12-methyl-13-oxo-9(12)a,9(12)b-dihomo-18-podocarpanol on the basis of spectral data. It mildly inhibited hog gastric H+, K(+)-ATPase. Examination of the inhibitory activities of derivatives of scopadulcic acid B [2], including 3, revealed that methylation of the carboxyl group and introduction of an acetyl group or oxime at C-13 or C-18 markedly enhanced the inhibitory activity, while debenzoylation reduced the activity. Among the 30 compounds tested, compound 12, a methyl ester of scopadulcic acid B [2], showed the most potent activity.

Mem Inst Oswaldo Cruz 1991;86 Suppl 2:149-51

Analgesic activity of a triterpene isolated from Scoparia dulcis L. (Vassourinha).

Freire SM, et al.

Analgesic and anti-inflammatory activities of water (WE) and ethanolic (EE) extracts of Scoparia dulcis L. were investigated in rats and mice, and compared to the effects induced by Glutinol, a triterpene isolated by purification of EE. Oral administration (p.o.) of either WE or EE (up to 2 g/kg) did not alter the normal spontaneous activity of mice and rats. The sleeping time induced by sodium pentobarbital (50 mg/kg, i.p.) was prolonged by 2 fold in mice pretreated with 0.5 g/kg EE, p.o. Neither extract altered the tail flick response of mice in immersion test, but previous administration of EE (0.5 g/kg, p.o.) reduced writhings induced by 0.8% acetic acid (0.1 ml/10 g, i.p.) in mice by 47%. EE (0.5 and 1 g/kg, p.o.) inhibited the paw edema induced by carrageenan in rats by respectively 46% and 58% after 2 h, being ineffective on the paw edema induced by dextran. No significant analgesic or anti-edema effects were detected in animals pretreated with WE (1 g/kg, p.o.). Administration of Glutinol (30 mg/kg, p.o.) reduced writhing induced by acetic acid in mice by 40% and the carrageenan induced paw edema in rats by 73%. The results indicate that the analgesic activity of S. dulcis L. may be explained by an anti-inflammatory activity probably related to the triterpene Glutinol.

Cancer Lett 2002 Jan 10;175(1):17-25

Selective cytotoxicity of betulinic acid on tumor cell lines, but not on normal cells.

Zuco, V., et al.

Betulinic acid is a triterpene with selective cytotoxicity against melanoma, neuroectodermal and malignant brain tumor cell lines. In this study the betulinic acid activity was evaluated, in comparison with doxorubicin, on different human neoplastic and non-neoplastic cell lines and on proliferating normal lymphocytes. Growth inhibition was evident in all the neoplastic cell lines independently on p53 status and histotype. Antiproliferative activity of betulinic acid was related to a cytotoxic effect on two p53 wild-type and on one p53 mutant cell lines and to a cytostatic effect on one p53 mutant melanoma clone. At the same concentrations, normal cells were unaffected indicating a selective effect of this agent. A cytotoxic activity of doxorubicin was evident on all the tested systems. In vivo experiments, performed on one of these cell lines, confirmed the antineoplastic activity of this drug. These data support further preclinical studies of betulinic acid not confined to melanoma and neuroectodermal tumors independently of p53 status.

Med Pediatr Oncol 2000 Dec;35(6):616-8

Betulinic acid induces apoptosis through a direct effect on mitochondria in neuroectodermal tumors.

Fulda, S., et al.

We identified BetA [betulinic acid] as a new cytotoxic agent active against neuroectodermal tumor cells including neuroblastoma, medulloblastoma, glioblastoma and Ewing sarcoma cells, representing the most common solid tumors of childhood. RESULTS: BetA induced apoptosis by a direct effect on mitochondria independent of accumulation of wild-type p53 protein and independent of death-inducing ligand/receptor systems such as CD95. Mitochondrial perturbations on treatment with BetA resulted in the release of soluble apoptogenic factors such as cytochrome c or AIF from mitochondria into the cytosol, where they induced activation of caspases. Overexpression of the anti-apoptotic proteins Bcl-2 or Bcl-X(L) that blocked loss of the mitochondrial membrane potential and cytochrome c release from mitochondria also conferred resistance to BetA. Most importantly, BetA exhibited potent antitumor activity on neuroblastoma cells resistant to CD95- or doxorubicin-triggered apoptosis and on primary tumor cells from patients with neuroectodermal tumors. CONCLUSIONS: Thus, BetA may be a promising new agent in the treatment of neuroectodermal tumors including neuroblastoma in vivo.