

Technical Data Report

for

CLAVILLIA

Mirabilis jalapa



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Clavillia

Preprinted from [Herbal Secrets of the Rainforest](#), 2nd edition, by Leslie Taylor
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Family: Nyctaginaceae

Genus: *Mirabilis*

Species: *jalapa*

Synonyms: *Mirabilis dichotoma*, *M. odorata*

Common Names: Clavillia, four-o'clocks, jalap, maravilla, bonina, boa-noite, bonita, a'bbass, beauty of the night, belle de nuit, bella di notte, buenas tardes, bunga pukul empat, dondiego de noche, false jalap, flower of a'bbas, gecesefase, geje safe, gulabbas, gulbank, gulbas, isabelitta, morning rose, Peru, nodja, noche buena, numera, pathrachi, sanji phuli, segerat, slavelilla, tiare moe, tzu mo li, ubat jerawat, zi mo li

Parts Used: Roots, leaves, flowers

Clavillia is a perennial plant that reaches a height of 50–100 cm from a tuberous root. Some cultivated species also can grow up to a meter in height. It produces beautiful flowers that usually open around 4 o'clock in the afternoon—hence its common name, *four o'clocks*. It is a popular ornamental plant grown worldwide for the beauty of its flowers (which can be white, red, pink, purple, or multicolored) and their sweet fragrance. It first was recorded botanically in 1753; already it had been widely distributed as an ornamental plant throughout the tropics of the world. There is some disagreement about from whence it derived originally: Mexico, Chile, or India. Today, clavillia is naturalized throughout the tropics of South America, Latin America, France, and India. In Brazil the plant is known as *clavillia*, *maravilha*, or *bonina*; in Peru it is known as *jalapa* or *maravilla*.

The indigenous people of the Amazon enjoy the beauty of clavillia's flowers as much as city dwellers, and often plant it in their gardens. They employ the plant medicinally as well. Indigenous Peruvian people use a root decoction as a diuretic; the Shipibo-Conibo Indians put the flowers in baths to treat colds and flu. In Brazil, the Kayapo Indians inhale the powdered, dried flowers as a snuff for headaches, and use a root decoction to wash wounds and to treat such skin afflictions as leprosy. The Assuraní Indians in Brazil crush the seeds to use as a peppery condiment on foods, and grate the tuberous root into cold water and drink it for intestinal parasites. The tribal people of Orissa, India grind the roots of the plant into a paste with black pepper and take it orally for conjunctivitis. They also apply the juice of the leaves to fungal infections of the skin.

These indigenous practices impelled clavillia's presence in herbal medicine systems around the world. In Mexico, the entire plant is decocted and used for dysentery, vaginal discharge, infected wounds, and bee and scorpion stings. In Peru, the plant and/or tuber is used as a diuretic, laxative, and purgative. The juice of the flower is used to clear herpes lesions and for earaches. In Brazilian herbal medicine, a paste is made of the leaf and flower and applied to affections of the skin such as itchiness, eczema, herpes, skin spots, and skin infections. The juice of the root is dropped into the ear for earaches. Brazilians also use the root to combat worms, intestinal parasites, leucorrhea, hydropsy, diarrhea, dysentery, abdominal colic, syphilis, and liver affections. In the United States, the plant is used for mumps, bone fractures, and as an abortifacient to hasten childbirth.

Phytochemical analysis of clavillia shows that it is rich in many active compounds including triterpenes, proteins, flavonoids, alkaloids, and steroids. Of particular interest to researchers is a group of amino acid-based proteins, coined *mirabilis antiviral proteins* (MAPs); these chemicals

have shown specific antiviral and antifungal actions. The chemicals are produced in the seeds, roots, and young shoots, and help the plant protect against various plant viruses and soil-borne fungi. In 1994, The Japan Tobacco Company was awarded a U.S. patent on the MAPs in clavillia as being effective in protecting economically-important crops (such as tobacco, corn, and potatoes) from a large variety of plant viruses (such as tobacco mosaic virus, spotted leaf virus and root rot virus).¹ Researchers in Hong Kong isolated another MAP in the roots of clavillia with the same antiviral actions, and also noted, "The MAP demonstrated to possess abortifacient activity in pregnant mice, inhibitory effects on cell-free protein synthesis, and antiproliferative effects on tumor cells."² The MAPs found in clavillia have shown to inhibit protein synthesis and other cellular processes (such as inactivating ribosomes) in viral cells.^{3,4} The highest concentration of MAPs are found in the seeds of the plant, followed by the roots, then leaves.⁵ The seeds, however, are a significant source of other peptide chemicals with actions similar to the neurotoxic peptides found in spider venom.⁶ These peptides are in the same classification as (and act similarly to) another plant-derived toxic peptide, ricin (now being employed as a biological weapon); as compared with ricin, though, clavillia's peptides are only about 1/30th as toxic.⁶ Because of this toxicity, though, the seeds are not generally used in herbal medicine systems (despite researchers' documentation of significant antimicrobial actions attributed to them).⁷⁻⁹

The plant and root have demonstrated other biological activities in addition to the antiviral actions of the MAPs. In 2001, researchers found new phenolic compounds in clavillia which demonstrated *in vitro* action against the yeast *Candida albicans*.¹⁰ A hot water extract of the flower, leaf, and root of clavillia has shown antifungal activity in another *in vitro* study.¹¹ Other research on the leaf and branches of clavillia did not confirm any antimicrobial actions, therefore, these properties are probably attributed only to the root of the plant.^{12,13} In early research, the root of the plant (in water and ethanol extracts) also demonstrated mild uterine stimulant actions in rats, and antispasmodic actions in guinea pigs.¹⁴

Clavillia, the lovely, sweet-smelling ornamental, has also earned its place in herbal medicine practices around the world; its array of biological activities continue to support its continued use worldwide. As most research surrounding this plant's activity has occurred in the past ten years, more findings regarding clavillia's power and versatility will likely explain more of its indigenous uses and unearth new applications for it.

Documented Properties and Actions: Antifungal, antimicrobial, antiviral, antispasmodic, antibacterial, diuretic, alterative, carminative, cathartic, hydragogue, purgative, stomachic, tonic, vermifuge

Main Phytochemicals: Alanine, alpha-amyrins, arabinose, beta amyrins, betalamic acid, betanin, brassicasterol, beta-sitosterols, 2-carbosyarabinitol, campesterol, daucosterol, d-glucan, dopamine, hexacosan-1-ol, indicaxanthin, isobetanin, 6-methoxyboeravinone C, methylabronisoflavone, mirabilis antiviral proteins, mirabilis peptides, miraxanthins, n-dotriacontane, n-hentriacontane, n-heptacosane, n-hexacosane, n-nonacosane, n-octacosane, n-pentacosane, n-pentatriacontane, n-tetracosane, n-tetratriacontane, n-triacontane, n-tricosane, n-tritriacontane, oleanolic acid, stigmasterol, tartaric acid, trigonelline, tryptophan, ursolic acid, vulgaxanthin I

Traditional Remedy: One-half cup of a standard root infusion or 1–2 ml of a 4:1 tincture once or twice daily.

Contraindications:

- The seeds of the plant contain neurotoxic chemicals and should not be ingested.
- Phytochemicals in clavillia have been documented to have an abortifacient activity. *Mirabilis jalapa* itself has not been demonstrated to have a uterine stimulant effect, but its use in pregnancy is not advised.

Drug Interactions: None known.

WORLDWIDE ETHNOBOTANICAL USES

Country	Uses
Brazil	Analgesic, chagas disease, colic, contusions, diarrhea, diuretic, dysentery, earache, eczema, freckles, herpes, hydrophy, itch, intestinal parasites, leucorrhea, liver, purgative, skin, skin infections, syphilis, urticaria, wounds, worms
Cuba	Anthelmintic, herpes
Guatemala	Abscesses, aches, bruises, conjunctivitis, dermatitis, furuncles, gonorrhoea, inflammations, leucorrhoea, mucosal lesions, ringworm, scrofula, skin, skin fungal infections, sores, ulcer, vaginitis, wounds
India	Conjunctivitis, edema, food, fungal infections, inflammation, pains, swellings
Mexico	Bee sting, dysentery, scorpion sting, tonic, vaginal discharge, wounds
Peru	Earache, dermatitis, diuretic, herpes, laxative, purgative
U.S.A.	Abortifacient, bone fractures, childbirth, mumps
Elsewhere	Abscesses, alterative, anthelmintic, aphrodisiac, arthritis, boils, buboes, burns, bruises, carminative, cathartic, colic, diabetes, diuretic, dropsy, dyspepsia, gonorrhoea, hepatitis, herpes, hypochondria, hydragogue, laxative, liver, menstruation, muscle pains, piles, pimples, purgative, sores, splenitis, strains, stomachic, thrush, tonic, tumors, urogenital inflammation, urticaria, vermifuge, wounds

References

1. Habuka, N., et al. "Antiviral protein." U.S. Patent no. 5,340,732. 1994.
2. Wong, R. N. S., et al. "Characterization of *Mirabilis* antiviral protein—a ribosome inactivating protein from *Mirabilis jalapa* L." *Biochem. Int.* 1992; 28(4): 585–93.
3. Vivanco, J. M., et al. "Characterization of two novel type 1 ribosome-inactivating proteins from the storage roots of the Andean crop *Mirabilis expansa*." *Plant Physiol.* 1999; 119(4): 1447–56.
4. Kataoka, J., et al. "Adenine depurination and inactivation of plant ribosomes by an antiviral protein of *Mirabilis jalapa* (MAP)." *Plant Mol. Biol.* 1992; 20(6): 111–19.
5. Bolognesi, A. et al. "Ribosome-inactivating and adenine polynucleotide glycosylase activities in *Mirabilis jalapa* L. tissues." *J. Biol. Chem.* 2002; 277(16) 13709–16.

6. Cordeiro, N., et al. "The purification and amino acid sequences of four Tx2 neurotoxins from the venom of the Brazilian 'armed' spider *Phoneutria nigriventer* (Keyes)." *FEBBS Lett.* 1992; 310(2): 153–56.
7. Cammue, B. P. A., et al. "Isolation and characterization of a novel class of plant antimicrobial peptides from *Mirabilis jalapa* L. seeds." *J. Biol. Chem.* 1992; 267(4): 2228–33.
8. De Bolle, M. F. C., et al. "Antimicrobial peptides from *Mirabilis jalapa* and *Amarantus caudatus*: expression, processing, localization and biological activity in transgenic tobacco." *Plant Mol. Biol.* 1996; 31(5): 993–1008.
9. Kusamba, C., et al. "Antibacterial activity of *Mirabilis jalapa* seed powder." *J. Ethnopharmacol.* 1991; 35(2): 197–99.
10. Yang, S.W., et al. "Three new phenolic compounds from a manipulated plant cell culture, *Mirabilis jalapa*." *J. Nat. Prod.* 2001; 64(3): 313–17.
11. Caceres, A., et al. "Plants used in Guatemala for the treatment of dermatophytic infections. Screening for antimycotic activity of 44 plant extracts." *J. Ethnopharmacol.* 1991; 31(3): 263–76.
12. Dimayuga, R. E., et al. "Antimicrobial activity of medicinal plants from Baja California Sur (Mexico)." *Pharmaceutical Biol.* 1998; 36(1): 33–43.
13. Caceres, A., et al. "Screening of antimicrobial activity of plants popularly used in Guatemala for the treatment of dermatomucosal diseases." *J. Ethnopharmacol.* 1987; 20(3): 223–37.
14. Dhar, M. L., et al. "Screening of Indian plants for biological activity: Part I." *Indian J. Exp. Biol.* 1968; 6: 232–47.

The information contained herein is intended for education, research, and informational purposes only. This information is not intended to be used to diagnose, prescribe or replace proper medical care. The statements contained herein have not been evaluated by the Food and Drug Administration. The plant described herein is not intended to diagnose, treat, cure, mitigate, or prevent any disease.

Ethnomedical Information on Clavillia (Mirabilis jalapa)

Plant Part / Location	Documented Ethnomedical Use	Type Extract / Route	Used For	Ref #
Entire Plant Brazil	Used for abdominal colic, diarrhea, dysentery and syphilis.	Not Stated	Human Adult	ZZ1097
Flower Brazil	Used for chagas disease and for wounds.	Cooked Not Stated	Human Adult	ZZ1002
Flower + Root Brazil	Used as a purgative, diuretic and analgesic.	Not Stated	Human Adult	ZZ1092
Leaf + Flower Brazil	Used for wounds and affections of the skin; itch, urticaria, eczema and infections of the skin. Used for contusions. Used for affections of the skin; pruritis, eczema and infection of the skin.	Decoction External ETOH Ext External Paste External	Human Adult	ZZ1081
Leaf Brazil	Used against skin spots (freckles) and herpes.	Juice External	Human Adult	ZZ1092
Root + Stem Brazil	Used for earache.	Juice External	Human Adult	ZZ1092
Root Brazil	Used for pustular eruptions, leucorrhea, hydropsy, diarrhea, dysentery, abdominal colic and syphilis. Used to combat leucorrhea, colic, syphilis, hydropsy and liver affections. Used for tape worms and intestinal parasites. Used for leucorrhea, hydropsy, liver affections abdominal colic, diarrhea, dysentery and syphilis.	Not Stated Not Stated Infusion Oral Various Oral	Human Adult Human Adult Human Adult Human Adult	ZZ1013 ZZ1002 ZZ1081 ZZ1079
Root Canary Islands	Used as a laxative.	Infusion Oral	Human Adult	T10928
Leaf China	Used to treat abscesses. Used to treat wounds.	Decoction Not Stated Juice Not Stated	Human Adult	AD1005
Root China	Used for arthritis.	Hot H2O Ext Oral	Human Adult	X00003
Root Cook Islands	Used for anal thrush. Grated root in water or coconut water is applied.	H2O Ext External	Human Adult	T09553
Root Cuba	Used as an anthelmintic.	Hot H2O Ext Oral	Human Adult	W01270
Flowers Cuba	Used to treat herpes.	Juice External	Human Adult	W01270
Tuber Easter Island	Used for muscle pains in the body.	Decoction External	Human Adult	K27814
Flower + Leaf + Root Guatemala	Used for derma-mucosal lesions, for ringworm and for skin fungal diseases.	Hot H2O Ext External	Human Adult	M27151

Plant Part / Location	Documented Ethnomedical Use	Type Extract / Route	Used For	Ref #
Leaf Guatemala	Used for gonorrhoea. Used for body aches.	Infusion Oral Decoction External	Human Adult Human Adult	K27236 K28434
Leaf Guatemala	Used for wounds, ulcers, bruises and sores, for skin diseases, infections of the skin and mucosa, skin irritations, dermatitis, inflammations, scrofula, abscesses, furuncles, leucorrhoea, vaginitis. Used for conjunctivitis.	Hot H2O Ext External Hot H2O Ext Ophthalmic	Human Adult	T15445
Entire Plant India	Used to treat edema.	Plant Oral & External	Human Adult	T09390
Leaf India	Fed to hens to yield more eggs. Used on swellings. Used to reduce inflammation. Used for fungal infections.	Leaves in Ration Leaves External Not Stated Juice External	Chicken Female Human Adult Human Adult Human Adult	T00583 K26667 AD1006 AD1001
Root India	Used for conjunctivitis. Used to cure various pains. Crushed roots fried in ghee are eaten.	Paste Oral Root Oral	Human Adult Human Adult	AD1001 T10115
Tuber India	Used as food.	Tuber Oral	Human Adult	K26667
Root Iran	Used as a laxative and vermifuge.	Infusion Oral	Human Adult	I00004
Root Jamaica	Used as a laxative.	Hot H2O Ext Oral	Human Adult	W01270
Leaf Malaysia	Used as a purgative.	Infusion Oral	Human Adult	J13478
Branches Mexico	Used for infected wounds and for sting of scorpion and bee. Used for dysentery.	Branches Not Stated Branches Oral	Human Adult Human Adult	L06056
Entire Plant Mexico	Used to treat white vaginal flux. Plant boiled for a drink as a tonic taken by elderly people.	Not Stated Vaginal Hot H2O Ext Oral	Human Female Human Adult	K16948 W01266
Root Nepal	Used to treat menstrual disorders.	Powder Oral	Human Female	K26239
Leaf Pakistan	Used as a maturant for boils and buboes.	Hot H2O Ext External	Human Adult	M26197
Leaf Juice Pakistan	Used to allay the heat and itching in urticaria arising from dyspepsia.	Juice External	Human Adult	M26197
Root Pakistan	Used as a purgative and for piles.	Hot H2O Ext Oral	Human Adult	M26197
Leaf Peru	Used as a diuretic and laxative.	Hot H2O Ext Oral	Human Adult	T15323

Plant Part / Location	Documented Ethnomedical Use	Type Extract / Route	Used For	Ref #
Flower Peru	Used for earache and herpes.	Juice External	Human Adult	ZZ1093
Seed Peru	Used for dermatitis.	Powder External	Human Adult	ZZ1093
Root Peru	Used as a diuretic. Used as a diuretic. Used as a diuretic and a laxative. Used as a purgative.	Decoction Oral Decoction Oral Hot H2O Ext Oral Not Stated	Human Adult Human Adult Human Adult Human Adult	L04137 ZZ1045 T15323 ZZ1093
Leaf Rarotonga	Used to treat gonorrhea.	Juice Oral	Human Adult	K08575
Flowers Rodriguez Islands	Used for burns. Used for urogenital inflammations.	Flowers External Decoction Oral	Human Adult	K26851
Root Taiwan	Used for liver disease.	Hot H2O Ext Oral	Human Adult	T14999
Entire Plant USA	Used for mumps. Used as an abortifacient and to hasten childbirth. Used for bone fractures.	Hot H2O Ext Oral Plant External	Human Adult Human Adult	T15879
Root West Indies	Used as a diuretic and anthelmintic	Not Stated Oral	Human Adult	T00701
Root Not Stated	Used as an aphrodisiac, diuretic and purgative; used for the treatment of dropsy.	Not Stated	Human Adult	AD1002 AD1003 AD1004
Entire Plant Not Stated	Used as an alterative, calminative, cathartic, hydragogue, purgative, stomachic, tonic and vermifuge for abscesses, boils, bruises, colic, diabetes, dropsy, hepatitis, herpes, hypochondria, pimples, sores, splenitis, strains, tumors, urticaria and wounds.	Various	Human Adult	ZZ1050

Presence of Compounds in Clavillia (Mirabilis jalapa)

Compound	Chemical type	Plant Part	Plant Origin	Quantity	Ref #
Abronisoflavone, 2'-o-methyl:	Isoflavone	Suspension Culture	China	00.37037%	H27962
Alanine	Proteid	Leaf Leaf	India India	Not stated Not stated	K07026 K01698
Amyrin, alpha:	Triterpene	Root	Pakistan	00.37%	K27977
Amyrin, alpha: acetate	Triterpene	Root	Pakistan	Not stated	K27977
Amyrin, beta:	Triterpene	Seed	India	Not stated	K21763
Amyrin, beta: 3-o-alpha-l-rhamnosyl-o-beta-d-glucoside	Triterpene	Seed	India	Not stated	K21763
Arabinose		Root	Not Stated	Not stated	ZZ1095
Arabinitol, 2-carboxy:	Carbohydrate	Leaf	USA	38 nmol/gm	K22890
Betalamic acid	Betaxanthin	Petals	Germany	Not stated	M29558
Betanin	Betaxanthin	Flowers	Italy	Not stated	W04363
Betanin, iso:	Betaxanthin	Flowers	Italy	Not stated	W04363
Boeravinone b, 4-hydroxy-9-o-methyl:	Flavonoid	Suspension Culture	China	00.55555%	H27962
Boeravinone c, 6-methoxy:	Flavonoid	Suspension Culture	China	00.29629%	H27962
Brassicasterol	Steroid	Aerial Parts Aerial Parts	Pakistan Pakistan	00.00004% Not stated	J19309 M26197
Campesterol	Steroid	Leaf	India	Not stated	K01698
Citric acid	Alkane to c4	Leaf	India	Not stated	K01698
Daucosterol	Steroid	Seed	India	Not stated	K21763
Dopamine	Isoquinoline alkaloid	Petals	Italy	Not stated	W03034
Dotriacontane, n:	Alkane c5 or more	Leaf	India	Not stated	K01698

Compound	Chemical type	Plant Part	Plant Origin	Quantity	Ref #
Fat	Lipid	Seed	Not Stated	39,000-46,000 ppm	ZZ1095
Galactose		Root	Not Stated	Not stated	ZZ1095
Glucan, d:	Carbohydrate	Cotyledons	India	Not stated	M06791
Glycine	Proteid	Leaf Leaf	India India	Not stated Not stated	K07026 K01698
Hentriacontane, n:	Alkane c5 or more	Leaf	India	Not stated	K01698
Heptacosane, n:	Alkane c5 or more	Leaf	India	Not stated	K01698
Hexacosan-1-ol	Alkanol c5 or more	Leaf	India	Not stated	K01698
Hexacosane, n:	Alkane c5 or more	Leaf	India	Not stated	K01698
Indicaxanthin	Betaxanthin	Petals Flowers	Italy India	Not stated Not stated	W03034 L13184
Leucine	Proteid	Leaf Leaf	India India	Not stated Not stated	K07026 K01698
Lignoceric acid	Lipid	Leaf	India	Not stated	K01698
Mirabilis antiviral protein (MAP)	Proteid	Root Tuber	Japan Hong Kong	Not stated Not stated	K10759 K09120
Mirabilis antiviral protein-4 (MAP-4)	Proteid	Root	Italy	Not stated	AD1007
Mirabilis antiviral protein-S (MAP-S)	Proteid	Seed	Italy	Not stated	AD1008
Mirabilisoic acid	Lipid	Flowers	India	Not stated	H29800
Mirabalisol	Diterpene	Flowers	India	Not stated	H29800
Mirabilis anti-plant-viral protein	Proteid	Suspension Culture Suspension Culture	Japan Japan	00.0095% 00.63000%	M18231 M16698
Mirabilis peptide jm-amp-s	Proteid	Seed	Belgium	Not stated	H15541
Mirabilis peptide mj-amp-1	Proteid	Seed	Not stated	Not stated	H08273

Compound	Chemical type	Plant Part	Plant Origin	Quantity	Ref #
Mirabilis peptide mj-amp-2	Proteid	Seed Seed	Not stated Belgium	Not stated Not stated	H08273 H20571
Miraxanthin I	Betaxanthin	Flowers Petals	India Italy	Not stated Not stated	L13184 W03034
Miraxanthin II	Betaxanthin	Flowers Petals	India Italy	Not stated Not stated	L13184 W03034
Miraxanthin III	Betaxanthin	Flowers Petals	India Italy	Not stated 00.00028%	L13184 W03034
Miraxanthin IV	Betaxanthin	Flowers Petals	India Italy	Not stated 00.00037%	L13184 W03034
Miraxanthin V	Betaxanthin	Petals	Italy	00.00328%	W03034
Miraxanthin VI	Betaxanthin	Petals	Italy	00.00078%	W03034
Nonacosane, n:	Alkane c5 or more	Leaf	India	Not stated	K01698
Octacosane, n:	Alkane c5 or more	Leaf	India	Not stated	K01698
Octadeca-cis-11-14-dienoic acid, 8-hydroxy:	Lipid	Seed Oil	India	Not stated	M05871
Oleanolic acid	Triterpene	Aerial Parts Aerial Parts	Pakistan Pakistan	00.00003% Not stated	J19309 M26197
Pentacosane, n:	Alkane c5 or more	Leaf	India	Not stated	K01698
Pentatriacontane, n:	Alkane c5 or more	Leaf	India	Not stated	K01698
Phytol, trans:	Diterpene	Aerial Parts	Pakistan	00.00013%	J19309
Polysaccharide (<i>Mirabilis jalapa</i>)	Carbohydrate	Root	India	Not stated	M17573
Protein	Inorganic	Seed	Not Stated	171,000-181,000 ppm	ZZ1095
Protein map (<i>Mirabilis jalapa</i>)	Proteid	Suspension Culture	Japan(cult)	Not stated	T14606
Quercetin	Flavonol	Aerial Parts	South Korea	Not stated	T03014
Resin		Root	Not Stated	30,000 ppm	ZZ1095

Compound	Chemical type	Plant Part	Plant Origin	Quantity	Ref #
Sitosterol, beta:	Steroid	Seed Aerial Parts Leaf Aerial Parts Leaf	India Pakistan India Pakistan India	Not stated Not stated Not stated 00.00007% Not stated	K21763 M26197 K01698 J19309 K01698
Sitosterol, beta: beta-d-glucoside		Plant	Not Stated	Not stated	ZZ1095
Sitosterol, beta: acetate	Steroid	Aerial Parts	Pakistan	00.00004%	J19309
Starch	Carbohydrate	Seed	Taiwan	56.4%	N16034
Sterol analysis	Steroid	Entire Plant	Not stated	Not stated	J18332
Stigmasterol	Steroid	Aerial Parts Aerial Parts Leaf	Pakistan Pakistan India	Not stated 00.00003% Not stated	M26197 J19309 K01698
Tartaric acid	Alkane to c4	Leaf	India	Not stated	K01698
Tetracosane, n:	Alkane c5 or more	Leaf	India	Not stated	K01698
Tetratriacontane, n:	Alkane c5 or more	Leaf	India	Not stated	K01698
Triacotane, n:	Alkane c5 or more	Leaf	India	Not stated	K01698
Tricosan-12-one	Alkanone c5 or more	Leaf	India	Not stated	K01698
Tricosane, n:	Alkane c5 or more	Leaf	India	Not stated	K01698
Trigonelline	Proteid	Root	Jamaica	Not stated	W01270
Tritriacontane, n:	Alkane c5 or more	Leaf	India	Not stated	K01698
Tryptophan	Proteid	Leaf Leaf	India India	Not stated Not stated	K07026 K01698
Tyramine	Isoquinoline alkaloid	Petals	Italy	Not stated	W03034
Urs-12-en-28-oic acid, 3-oxo: methyl ester	Triterpene	Aerial Parts	Pakistan	00.00006%	J19309
Ursolic acid	Triterpene	Aerial Parts Aerial Parts	Pakistan Pakistan	Not stated 00.00005%	M26197 J19309

Compound	Chemical type	Plant Part	Plant Origin	Quantity	Ref #
Valine	Proteid	Leaf	India	Not stated	K07026
		Leaf	India	Not stated	K01698
Vulgaxanthin I	Betaxanthin	Petals	Italy	Not stated	W03034
		Flowers	India	Not stated	L13184

OTHER PHYTOCHEMICAL SCREENING:

ALKALOIDS ABSENT	AERIAL PARTS	T03014
ALKALOIDS PRESENT	SEED	J08873
FLAVONOIDS PRESENT	AERIAL PARTS	T03014
IRIDOIDS PRESENT	AERIAL PARTS	T07364
STEROIDAL SAPONINS PRESENT	AERIAL PARTS	T03014

Biological Activities for Extracts of *Clavillia* (*Mirabilis jalapa*)

Part - Origin	Activity Tested For	Type Extract	Test Model	Dosage	Result	Notes/Organism tested	Ref #
Aerial Parts India	Toxicity Assessment (quantitative)	ETOH-H ₂ O(1:1) Ext	IP Mouse	1.0 gm/kg	Active		A03335
Root Not Stated	Toxicity Assessment (quantitative)	ETOH-H ₂ O(1:1) Ext	IP Mouse	500.0 mg/kg			A03335
Entire Plant Singapore	Toxic Effect (general)	Plant	Oral Human Adult	Not stated	Active		T15330
Aerial Parts India	Uterine Stimulant Effect	ETOH-H ₂ O(1:1) Ext	Rat Female	Not stated	Inactive	Uterus(estrog).	A03335
Seed Brazil	Neurotoxic Effect	Not stated	Not stated	Not stated	Active	Contains neurotoxins.	AD1011
Entire Plant Taiwan	Antimutagenic Activity	Hot H ₂ O Ext	Not stated	3.0 mg	Inactive	<i>Salmonella typhimurium</i> TA98. vs. picrolonic acid induced mutagenicity.	T14099
Branches Mexico	Antimutagenic Activity	Hot H ₂ O Ext	Not stated	3.0 mg	Inactive	<i>Salmonella typhimurium</i> TA98. vs. benzopyrene induced mutagenicity.	T14099
Branches Mexico	Antibacterial Activity	ETOH(95%) Ext	Agar Plate	2.8 mg	Equivocal Equivocal Inactive Inactive	<i>Bacillus subtilis</i> <i>Staphylococcus aureus</i> <i>Escherichia coli</i> <i>Streptococcus faecalis</i>	L06056
Leaf Guatemala	Antibacterial Activity	ETOH-H ₂ O(1:1) Ext	Agar Plate	50.0 microliters	Inactive	<i>Neisseria gonorrhoea</i>	K27236
Leaf Guatemala	Antibacterial Activity	Tincture	Agar Plate	30.0 microliters	Inactive	<i>Escherichia coli</i> <i>Pseudomonas aeruginosa</i> <i>Staphylococcus aureus</i>	T15445
Not Stated Brazil	Antibacterial Activity	Not stated	Not stated	Not stated	Inactive	<i>Escherichia coli</i> <i>Bacillus subtilis</i> <i>Staphylococcus aureus</i> <i>Streptococcus faecalis</i>	T15630

Part - Origin	Activity Tested For	Type Extract	Test Model	Dosage	Result	Notes/Organism tested	Ref #
Seed Zaire	Antibacterial Activity	H2O Ext	Agar Plate	14.0 ml	Active	<i>Escherichia coli</i>	M28301
		H2O Ext	Agar Plate	15.0 ml	Active	<i>Salmonella typhosa</i>	
		H2O Ext	Agar Plate	15.0 ml	Active	<i>Shigella flexneri</i>	
		H2O Ext	Agar Plate	16.0 ml	Active	<i>Vibrio cholera</i>	
		H2O Ext	Agar Plate	25.0 ml	Active	<i>Staphylococcus aureus</i>	
		H2O Ext	Agar Plate	25.0 ml	Active	<i>Streptococcus pyogenes</i>	
		H2O Ext	Agar Plate	25.0 ml	Inactive	<i>Enterobacter species</i>	
		MEOH Ext	Agar Plate	50.0 ml	Active	<i>Enterobacter species</i>	
		MEOH Ext	Agar Plate	50.0 ml	Active	<i>Escherichia coli</i>	
		MEOH Ext	Agar Plate	50.0 ml	Active	<i>Salmonella typhosa</i>	
		MEOH Ext	Agar Plate	50.0 ml	Active	<i>Shigella flexneri</i>	
		MEOH Ext	Agar Plate	50.0 ml	Active	<i>Streptococcus pyogenes</i>	
		MEOH Ext	Agar Plate	50.0 ml	Active	<i>Vibrio cholera</i>	
		MEOH Ext	Agar Plate	50.0 ml	Weak Activity	<i>Staphylococcus aureus</i>	
		MEOH-H2O(2:1)	Agar Plate	0.4 mg/ml	Active	<i>Staphylococcus aureus</i>	
		MEOH-H2O(2:1)	Agar Plate	4.0 mg/ml	Active	<i>Enterobacter species</i>	
		MEOH-H2O(2:1)	Agar Plate	4.0 mg/ml	Active	<i>Escherichia coli</i>	
		MEOH-H2O(2:1)	Agar Plate	4.0 mg/ml	Active	<i>Salmonella typhosa</i>	
		MEOH-H2O(2:1)	Agar Plate	4.0 mg/ml	Active	<i>Shigella flexneri</i>	
		MEOH-H2O(2:1)	Agar Plate	4.0 mg/ml	Active	<i>Streptococcus pyogenes</i>	
MEOH-H2O(2:1)	Agar Plate	4.0 mg/ml	Active	<i>Vibrio cholera</i>			
Not Stated Brazil	Antimycobacterial Activity	Not stated	Not stated	Not stated	Inactive	<i>Mycobacterium smegmatis</i>	T15630
Callus Tissue Japan	Antiviral Activity	Not stated	Not stated	Not stated	Active	Plant pathogens.	M28970
Root USA	Antiviral Activity	Not stated	Potato Plant	Not stated	Active	Inhibited viral infection when sprayed over potato plants.	AD1009
Not Stated Brazil	Antifungal Activity	Not stated	Not stated	Not stated	Inactive	<i>Neurospora crassa</i>	T15630
Flower + Leaf + Root Guatemala	Antifungal Activity	Hot H2O Ext	Broth Culture	1.0 ml	Active Active Inactive Inactive	<i>Epidermophyton floccosum</i> <i>Trichophyton mentagrophytes; var. Algodonosa.</i> <i>Microsporum canis</i> <i>Trichophyton mentagrophytes; var. Granulare.</i>	M27151

Part - Origin	Activity Tested For	Type Extract	Test Model	Dosage	Result	Notes/Organism tested	Ref #
Seed USA	Antifungal Activity	Not stated	Agar Plate	Not stated	Active	<i>Alternaria brassicola</i> <i>Ascochyta pisi</i> <i>Botrytis cinerea</i> <i>Cercospora beticola</i> <i>Colletotrichum lindemuthianum</i> <i>Fusarium culmorum</i> <i>Fusarium oxysporum</i> <i>Nectria haematocca</i> <i>Phoma betea</i> <i>Pyrenophora tritici-repentis</i> <i>Pyricularia oryzae</i> <i>Rhizoctonia solani</i> <i>Verticillium dahliae</i> <i>Venturia inaequalis</i>	AD1017
Not Stated Brazil	Antiyeast Activity	Not stated	Not stated	Not stated	Inactive	<i>Candida albicans</i>	T15630
Branches Mexico	Antiyeast Activity	ETOH(95%) Ext	Agar Plate	2.8 mg	Inactive	<i>Candida albicans</i>	L06056
Leaf Guatemala	Antiyeast Activity	Tincture	Agar Plate	30.0 microliters	Inactive	<i>Candida albicans</i>	T15445
Entire Plant Puerto Rico	Molluscicidal Activity	Aqueous slurry	Not stated	LD100=>1m ppm	Inactive Inactive	<i>Lymnaea columella</i> <i>Lymnaea cubensis</i>	T04621 T04621
Root Not Stated	Antispasmodic Activity	ETOH-H2O(1:1) Ext	Guinea Pig Ileum	Not stated	Active	vs. ACH- and histamine-induced spasms	A03335
Aerial Parts India	Cytotoxic Activity	ETOH-H2O(1:1) Ext	Cell Culture	ED50=>20.0 mcg/ml	Inactive	Ca-9kb.	A03335
Root Not Stated	Cytotoxic Activity	ETOH-H2O(1:1) Ext	Cell Culture	ED50=>20.0 mcg/ml	Inactive	Ca-9kb.	A03335
Leaf Malaysia(cult)	Epstein-barr Virus Early Antigen Induction	Ether Ext	Cell Culture	1.0 mcg/ml	Inactive	<i>Virus-Epstein-barr</i> . Assay designed to test for tumor promoting activity.	J13478
Leaf Malaysia	Inflammation Induction	Ether Ext	External Mouse Ear	10.0 microliters	Inactive	Assay designed to test for tumor promoting activity.	J13478
Root Taiwan	Glutamate-pyruvate-trans- aminase Inhibition	ETOH-H2O(1:1) Ext	Cell Culture	1.0 mg/ml	Inactive	Cells-rat-liver. Vs.CCI4-induced hepatotoxicity.	T14999

Part - Origin	Activity Tested For	Type Extract	Test Model	Dosage	Result	Notes/Organism tested	Ref #
Root Taiwan	Glutamate-pyruvate-trans-aminase Inhibition	ETOH-H2O(1:1) Ext	Cell Culture	1.0 mg/ml	Inactive	Cells-rat-liver. vs. PGE-1-induced pedal edema.	T14999
Aerial Parts South Korea	Tyrosinase Inhibition	MEOH(80%) Ext	Not stated	100.0 mcg/ml	Weak Activity		J16249

Biological Activities for Compounds of Clavillia (Mirabilis jalapa)

Compound Tested	Activity Tested For	Test Model	Dosage	Result	Notes/Organism tested	Ref #
Mirabilis antiviral protein (MAP)	Abortifacient Activity	Mice pregnant	Not stated	Active		K09120
Antimicrobial peptides Mj-AMP1 and Mj-AMP2	Neurotoxic Effect	Insects	Not stated	Inactive	No effect on pulse transmission in insect nerves.	H08273
Mirabilis antiviral protein (MAP)	Ribosome-Inactivating Protein Activity	Not stated	Not stated	Active Active	Inhibits ribosome activity, therefore protein synthesis. Inhibits poly(A), DNA and tobacco mosaic virus RNA.	AD1007
Mirabilis antiviral protein (MAP)	Ribosome-Inactivating Protein Activity	Rabbit reticulocyte	Not stated	Active	Inactivates both eukaryotic and prokaryotic ribosomes through RNA N-glycosidase activity.	AD1012
Mirabilis antiviral protein (MAP)	Ribosome-Inactivating Protein Activity	Prokaryote Eukaryote	Not stated	Active Active	<i>E. coli</i> Not stated.	AD1014
Mirabilis antiviral protein (MAP)	Ribosome-Inactivating Protein Activity	Prokaryote Eukaryote	IC50=200 nM Not stated	Active Active	<i>E. coli</i> Rabbit reticulocyte.	AD1015
Mirabilis antiviral protein (MAP)	Protein Synthesis Inhibition	Not stated	Not stated	Active	Type 1 ribosome-inactivating protein.	K09120
Mirabilis antiviral protein (MAP)	Protein Synthesis Inhibition	Rabbit reticulocyte	IC50=3.5 nM	Active	Inhibited protein synthesis, with 1/30 the activity of the ricin A chain.	AD1013
Antimicrobial peptides Mj-AMP1 and Mj-AMP2	Antibacterial Activity	Agar Plate	Not stated	Active Inactive	Gram-positive bacteria. Gram-negative bacteria.	H08273
Antimicrobial peptides Mj-AMP1 and Mj-AMP2	Antibacterial Activity	Agar Plate	IC50=2-500 µg/ml	Inactive Active	Gram negative bacteria <i>E. coli</i> and <i>Erwinia carotovora</i> . Gram positive bacteria <i>Bacillus megaterium</i> and <i>Sarcina lutea</i> .	AD1016
2'-o-methylabronisoflavone	Antifungal Activity	Agar Plate	IC50=25 mcg/mL	Active	<i>Candida albicans</i> DSY1024	H27962
4-hydroxy-9-o-methyl boeravinone b	Antifungal Activity	Agar Plate	IC50=48 mcg/mL	Active	<i>Candida albicans</i> DSY1024	H27962
6-methoxy-boeravinone c	Antifungal Activity	Agar Plate	IC50=200 mcg/mL	Inactive	<i>Candida albicans</i> DSY1024	H27962

Compound Tested	Activity Tested For	Test Model	Dosage	Result	Notes/Organism tested	Ref #
Antimicrobial Peptide Mj-AMP2	Antifungal Activity	Agar Plate	Not stated	Active		H20571
Mj-AMP1	Antifungal Activity	Agar Plate	IC50=6-300 mcg/mL	Active	13 plant pathogenic fungi.	H08273
Mj-AMP2	Antifungal Activity	Agar Plate	IC50=0.5-20 mcg/mL	Active	13 plant pathogenic fungi.	H08273
Antimicrobial peptides Mj-AMP1 and Mj-AMP2	Antifungal Activity	Agar Plate	20 mu.l	Active	<i>Fusarium culmorum</i>	AD1016
Mj-AMP1	Antifungal Activity	Agar Plate	IC50=20 mu.g/ml IC50=200 mu.g/ml IC50=60 mu.g/ml IC50=6 mu.g/ml IC50=30 mu.g/ml IC50=15 mu.g/ml IC50=200 mu.g/ml IC50=15 mu.g/ml IC50=25 mu.g/ml IC50=300 mu.g/ml IC50=6 mu.g/ml IC50=12 mu.g/ml l IC50=12 mu.g/ml	Active	<i>Alternaria brassicola</i> <i>Ascochyta pisi</i> <i>Botrytis cinerea</i> <i>Colletotrichum lindemuthianum</i> <i>Fusarium culmorum</i> <i>F. oxysporum f. sp pisi</i> <i>F. oxysporum f. sp. Lycopersici</i> <i>Nectria haematococca</i> <i>Phoma betae</i> <i>Pyrenophora tritici-repentis</i> <i>Pyricularia oryzae</i> <i>Verticillium dahliae</i> <i>Venturia inaequalis</i>	AD1016
Mj-AMP2	Antifungal Activity	Agar Plate	IC50=6 mu.g/ml IC50=6 mu.g/ml IC50=2 mu.g/ml IC50=1 mu.g/ml IC50=3 mu.g/ml IC50=5 mu.g/ml IC50=10 mu.g/ml IC50=0.5 mu.g/ml IC50=6 mu.g/ml IC50=20 mu.g/ml IC50=0.5 mu.g/ml IC50=0.5 mu.g/ml IC50=1 mu.g/ml	Active	<i>Alternaria brassicola</i> <i>Ascochyta pisi</i> <i>Botrytis cinerea</i> <i>Colletotrichum lindemuthianum</i> <i>Fusarium culmorum</i> <i>F. oxysporum f. sp pisi</i> <i>F. oxysporum f. sp. Lycopersici</i> <i>Nectria haematococca</i> <i>Phoma betae</i> <i>Pyrenophora tritici-repentis</i> <i>Pyricularia oryzae</i> <i>Verticillium dahliae</i> <i>Venturia inaequalis</i>	AD1016
Mj-AMP1	Antifungal Activity	Wheat Grapevine Sugarbeet	100 mu.g/ml	Active	<i>Septoria nodorum</i> <i>Plasmopara viticola</i> <i>Cercospora beticola</i>	AD1016

Compound Tested	Activity Tested For	Test Model	Dosage	Result	Notes/Organism tested	Ref #
Antimicrobial peptides Mj-AMP1 and Mj-AMP2	Antifungal Activity	Agar Plate	10 mg/ml	Active Active Active Active Active Active Active Active Active Not stated	<i>Penicillium pinophilum</i> <i>Aureobasidium pullulans</i> <i>Aspergillus niger</i> <i>Penicillium digitatum</i> <i>Colletotrichum musae</i> <i>Botrytis cinerea</i> <i>Fusarium culmorum</i> <i>Geotrichum candidum</i> <i>Verticillium albo-atrum</i>	AD1016
Antimicrobial peptides Mj-AMP1 and Mj-AMP2	Antifungal Activity	Agar Plate	2.5 mg/ml	Active Active Active Active Active Active Active Active Active	<i>Penicillium pinophilum</i> <i>Aureobasidium pullulans</i> <i>Aspergillus niger</i> <i>Penicillium digitatum</i> <i>Colletotrichum musae</i> <i>Botrytis cinerea</i> <i>Fusarium culmorum</i> <i>Geotrichum candidum</i> <i>Verticillium albo-atrum</i>	AD1016
Antimicrobial peptides Mj-AMP1 and Mj-AMP2	Antiyeast Activity	Agar Plate	500 mu.g/ml	Active	<i>Saccharomyces cerevisiae</i>	AD1016
Mirabilis antiviral protein (MAP)	Antiviral Activity	Not stated	Not stated	Active	<i>Tobacco mosaic virus</i> <i>Potato virus X</i> <i>Potato virus Y</i> <i>Potato spindle tuber viroid</i> Activity due to its ribosome-inactivating protein activity.	AD1009
Mirabilis antiviral protein (MAP)	Antiviral Activity	Not stated	Not stated	Active		K09120
Mirabilis antiviral protein (MAP)	Antiviral Activity	In vitro	Not stated	Active	Endogenous MAP can enter the cytoplasm of a cell and induce viral resistance by causing the cell to undergo apoptosis.	AD1010
Mirabilis antiviral protein (MAP)	Antiproliferative Activity	Not stated	Not stated	Active	Tumor cells.	K09120

Literature Cited - Clavillia (Mirabilis jalapa)

A03335	SCREENING OF INDIAN PLANTS FOR BIOLOGICAL ACTIVITY: PART I. DHAR,ML: DHAR,MM: DHAWAN,BN: MEHROTRA,BN: RAY,C: INDIAN J EXP BIOL 6 : 232-247 (1968) (MEDICINAL PLANTS PROJECT CENTRAL DRUG RES INST LUCKNOW UP INDIA)
H08273	ISOLATION AND CHARACTERIZATION OF A NOVEL CLASS OF PLANT ANTIMICROBIAL PEPTIDES FROM MIRABILIS JALAPA L. SEEDS. CAMMUE,BPA: DE BOLLE,MFC: TERRAS,FRG: PROOST,P: VAN DAMME,J: REES,SB: VANDERLEYDEN,J: BROEKAERT,WF: J BIOL CHEM 267 4: 2228-2233 (1992) (JANSSENS LAB GENET CATHOLIC UNIV LEUVEN LEUVEN B-3000 BELGIUM)
H15541	MIRABILIS JALAPA ANTIBACTERIAL PEPTIDES AND RAPHANUS SATIVUS ANTIFUNGAL PROTEINS: A COMPARATIVE STUDY OF THEIR STRUCTURE AND BIOLOGICAL ACTIVITIES. DE BOLLE,MFC: TERRAS,FRG: CAMMUE,BPA: REES,SB: BROEKAERT,WF: DEV PLANT PATHOL 2 : 433-436 (1993) (FA JANSSENS LAB GENET CATHOL UNIV LEUVEN LOUVAIN B-3001 BELGIUM)
H20571	ANTIMICROBIAL PEPTIDES FROM MIRABILIS JALAPA AND AMARANTHUS CAUDATUS: EXPRESSION, PROCESSING, LOCALIZATION AND BIOLOGICAL ACTIVITY IN TRANSGENIC TOBACCO. DE BOLLE,MFC: OSBORN,RW: GODERIS,IJ: NOE,L: ACLAND,D: HART,CA: TORREKENS,S: VAN LEUVEN,F: BROEKAERT,WF: PLANT MOL BIOL 31 5: 993-1008 (1996) (FA JANSSENS LAB GENET KATHOLIEKE UNIV LEUVEN HEVERLEE B-3001 BELGIUM)
H27962	THREE NEW PHENOLIC COMPOUNDS FROM A MANIPULATED PLANT CELL CULTURE, MIRABILIS JALAPA. YANG,SW: UBILLAS,R: MC ALPINE,J: STAFFORD,A: ECKER,DM: TALBOT,MK: ROGERS,B: J NAT PROD 64 : 313-317 (2001) (PHYTERA INC WORCESTER MASS 01605 USA)
H29800	CONSTITUENTS OF THE FLOWERS OF MIRABILIS JALAPA. ALI,M: ANSARI,SH: PORCHEZHIAN,E: J MED AROMAT PLANT SCI 23 4: 662-665 (2001) (FAC PHARMACY JAMIA HAMDARD NEW DELHI INDIA)
I00004	MEDICINAL PLANTS. VOL 4, 5TH ED, TEHRAN UNIVERSITY PUBLICATIONS, NO 1810/4, TEHRAN, IRAN, 1992. ZAGARI,A: BOOK 4 : 969-PP (1992) (DEPT PHARMACOGNOSY COLL PHARMACY TEHRAN UNIV MED SCI TEHRAN IRAN)
J08873	ALKALOID SCREENING. VI. SMOLENSKI,SJ: SILINIS,H: FARNSWORTH,NR: LLOYDIA 38 3: 225-255 (1975) (DEPT PHARMACOG PHARMACOL COLL PHARM UNIV ILLINOIS MED CENT CHICAGO IL 60612 USA)
J13478	TUMOUR PROMOTING ACTIVITY OF PLANTS USED IN MALAYSIAN TRADITIONAL MEDICINE. ILHAM,M: YADAY,M: NORHANOM,AW: NAT PROD SCI 1 1: 31-42 (1995) (INST ADV STUD UNIV MALAYA KUALA LUMPUR MALAYSIA)
J16249	INHIBITORY EFFECTS OF HERBAL EXTRACTS ON DOPA OXIDASE ACTIVITY OF TYROSINASE. SHIN,NH: LEE,KS: KANG,SH: MIN,KR: LEE,SH: KIM,YS: NAT PROD SCI 3 2: 111-121 (1997) (COLL PHARM CHUNGBUK NATL UNIV CHEONGJU SOUTH KOREA)
J18332	DIVERSITY OF STEROL BIOSYNTHETIC CAPACITY IN THE CARYOPHYLLIDAE. SALT,TA: XU,S: PATTERSON,GW: ADLER,JH: LIPIDS 26 8: 604-613 (1991) (ARS USDA BELTSVILLE MD 20705 USA)
J19309	TERPENOIDS AND STEROIDS OF THE AERIAL PARTS OF MIRABILIS JALAPA LINN. SIDDIQUI,BS: ADIL,Q: BEGUM,S: SIDDIQUI,S: PAK J SCI IND RES 37 3: 108-110 (1994) (H E J INST CHEM UNIV KARACHI KARACHI 32 PAKISTAN)
K01698	SOME CHEMICAL CONSTITUENTS OF THE LEAVES OF MIRABILIS JALAPA. BEHARI,M: ANDHIWAL,CK: STREBL,M: COLLECT CZECH CHEM COMMUN 41 : 295- (1976) (CHEM LAB SHRI VARSHNEYA COLL ALIGARH UP 202001 INDIA)
K07026	AMINO ACIDS IN CERTAIN MEDICINAL PLANTS. BEHARI,M: ANDHIWAL,CK: ACTA CIENC INDICA 2 3: 229-230 (1976) (CHEM LAB S.V.COLLEGE ALIGARH UP INDIA)

K08575	TRADITIONAL MEDICINAL PLANTS OF RAROTONGA, COOK ISLANDS. PART II. HOLDSWORTH,DK: INT J PHARMACOG 29 1: 71-79 (1991) (DEPT CHEM UNIV BRUNEI DARUSSALAM 3186 BRUNEI)
K09120	CHARACTERIZATION OF MIRABILIS ANTIVIRAL PROTEIN - A RIBOSOME INACTIVATING PROTEIN FROM MIRABILIS JALAPA L. WONG,RNS: NG,TB: CHAN,SH: DONG,TX: YEUNG,HW: BIOCHEM INT 28 4: 585-593 (1992) (HONG KONG BAPTIST COLL CHINA)
K10759	MIRABILIS JALAPA ANTIVIRAL PROTEIN ANALOG AND ITS MANUFACTURE WITH ESCHERICHIA COLI. HABUKA,N: MIYANO,M: MATSUMOTO,T: NOMA,M: PATENT-EUR PAT APPL-504,919 : 35PP-. (1992) (JAPAN TOBACCO INC JAPAN)
K16948	MEDICINAL PLANTS USED IN SOME RURAL POPULATIONS OF OAXACA, PUEBLA AND VERACRUZ, MEXICO. ZAMORA-MARTINEZ,MC: POLA,CNP: J ETHNOPHARMACOL 35 3: 229-257 (1992) (CENT INV FOREST AGROP DIS FED MEXICO 04110 MEXICO)
K21763	CHEMICAL EXAMINATION OF SEED OF MIRABILIS JALAPA. SAXENA,VK: GUPTA,HM: NATL ACAD SCI LETT(INDIA) 9 5: 135-. (1986) (DEP CHEM DR HARISINGH GOUR VISHWAVIDYALAYA SAGAR 470 003 INDIA)
K22890	DISTRIBUTION OF 2-CARBOXYARABINITOL AMONG PLANTS. MOORE,BD: ISIDORO,E: SEEMANN,JR: PHYTOCHEMISTRY 34 3: 703-707 (1993) (DEPT BIOCHEM UNIV NEVADA RENO 89557 USA)
K26239	AN ETHNOBOTANICAL SURVEY OF HERBAL DRUGS OF KASKI DISTRICT, NEPAL. MANANDHAR,NP: FITOTERAPIA 65 1: 7-13 (1994) (NATL HERBARIUM PLANT LAB LALIPUR NEPAL)
K26667	ETHNOBOTANICAL OBSERVATIONS ON IRULARS OF TAMIL NADU (INDIA). RAMACHANDRAN,VS: NAIR,NC: J ECON TAX BOT 2 : 183-190 (1981) (BOT SURVEY INDIA COIMBATORE 641 003 INDIA)
K26851	MEDICINAL PLANTS OF RODRIGUES. GURIB-FAKIM,A: SWERAJ,MD: GUEHO,J: DULLOO,E: INT J PHARMACOG 34 1: 2-14 (1996) (CHEM DEPT FAC SCI UNIV MAURITIUS REDUIT MAURITIUS)
K27236	ANTIAGONORRHOEAL ACTIVITY OF PLANTS USED IN GUATEMALA FOR THE TREATMENT OF SEXUALLY TRANSMITTED DISEASES. CACERES,A: MENENDEZ,H: MENDEZ,E: COHOBON,E: SAMAYAO,BE: JAUREGUI,E: PERALTA,E: CARRILLO,G: J ETHNOPHARMACOL 48 2: 85-88 (1995) (FAC CHEM SCI PHARM UNIV SAN CARLOS GUATEMALA CITY GUATEMALA)
K27814	A PRELIMINARY STUDY OF MEDICINAL PLANTS OF EASTER ISLAND, SOUTH PACIFIC. HOLDSWORTH,DK: INT J PHARMACOG 30 1: 27-32 (1992) (CHEM DEPT UNIV BRUNEI DARUSSALAM GADONG 3186 BRUNEI)
K27977	TRITERPENES FROM MIRABILIS JALAPA. BEGUM,S: ADIL,Q: SIDDIQUI,BS: SIDDIQUI,S: FITOTERAPIA 55 2: 177-. (1994) (H E J INST CHEM UNIV KARACHI KARACHI 32 PAKISTAN)
K28434	MEDICINAL PLANTS OF TWO MAYAN HEALERS FROM SAN ANDRES, PETEN, GUATEMALA. COMERFORD,SC: ECON BOT 50 3: 327-336 (1996) (DEPT ECOL EVOLUTION ORG BIOL TULANE UNIV NEW ORLEANS LA 70118 USA)
L04137	AMAZONIAN ETHNOBOTANICAL DICTIONARY. DUKE,JA: BOOK : 181- (1994) (USA)
L06056	ANTIMICROBIAL ACTIVITY OF MEDICINAL PLANTS FROM BAJA CALIFORNIA SUR (MEXICO). DIMAYUGA,RE: VIRGEN,M: OCHOA,N: PHARMACEUTICAL BIOL 36 1: 33-43 (1998) (DEPT AGRONOMIA UNIV AUTONOMA BAJA CALIFORNIA LA PAZ MEXICO)
L13184	PHYTOCHEMICAL INVESTIGATION ON MIRABILIS JALAPA. ANSARI,SH: ALI,M: HAMDARD MED 43 3: 65-67 (2000) (FAC PHARMACY JAMIA HAMDARD NEW DELHI INDIA)

M05871	AN 8-HYDROXYOCTADECA-CIS-11,14-DIENOIC ACID FROM MIRABILIS JALAPA SEED OIL. AHMAD,MS: RAUF,A: MUSTAFA,J: OSMAN,SM: PHYTOCHEMISTRY 23 10: 2247-2249 (1984) (DEPT CHEM ALIGARH MUSLIM UNIV ALIGARH UP 202 001 INDIA)
M06791	SOME STRUCTURAL FEATURES OF THE D-GLUCAN FROM THE SEED OF MIRABILIS JALAPA. GHOSH,TK: RAO,CCVN: CARBOHYDR RES 90 2: 243-250 (1981) (DEPT OF MACROMOLECULES INDIAN ASSO CULTIVATION SCIEN CALCUTTA WEST BENGAL 32 INDIA)
M16698	SELECTION OF CULTURED MIRABILIS JALAPA L. CELL STRAINS PRODUCING HIGH LEVELS OF ANTI-PLANT-VIRAL PROTEIN. IKEDA,T: KATAOKA,J: KONNO,Y: IMAIZUMI,S: KUWATA,S: TAKANAMI,Y: MATSUMOTO,T: AGR BIOL CHEM 52 6: 1383-1388 (1988) (CENT RES INST JAPAN TOBACCO INC YOKOHAMA 227 JAPAN)
M17573	STRUCTURAL STUDIES OF A NEUTRAL POLYSACCHARIDE FROM THE ROOT BULB OF MIRABILIS JALAPA. RAY,B: GHOSAL,PK: THAKUR,S: MAJUMDAR,SG: CARBOHYDR RES 176 2: 324-328 (1988) (DEPT CHEM NAT PROD LAB UNIV BURDWAN BURDWAN WEST BENGAL 713 104 INDIA)
M18231	EFFECTS OF CULTURE CONDITIONS ON THE FORMATION OF ANTI-PLANT-VIRAL PROTEIN BY HIGHLY PRODUCING CELL STRAINS OF MIRABILIS JALAPA L. IKEDA,T: KONNO,Y: KATAOKA,J: MATSUMOTO,K: AGR BIOL CHEM 52 10: 2611-2613 (1988) (GEN RES INST JAPAN TOBACCO INC YOKOHAMA 227 JAPAN)
M26197	CONSTITUENTS OF MIRABILIS JALAPA. SIDDIQUI,S: SIDDIQUI,BS: ADIL,Q: BEGUM,S: FITOTERAPIA 61 5: 471-. (1990) (H E J INST CHEM UNIV KARACHI KARACHI 32 PAKISTAN)
M27151	PLANTS USED IN GUATEMALA FOR THE TREATMENT OF DERMATOPHYTIC INFECTIONS. 1. SCREENING FOR ANTIMYCOTIC ACTIVITY OF 44 PLANT EXTRACTS. CACERES,A: LOPEZ,BR: GIRON,MA: LOGEMANN,H: J ETHNOPHARMACOL 31 3: 263-276 (1991) (FAC CHEM SCI UNIV SAN CARLOS GUATEMALA 01012 GUATEMALA)
M28301	ANTIBACTERIAL ACTIVITY OF MIRABILIS JALAPA SEED POWDER. KUSAMBA,C: BYAMANA,K: MBUYI,WM: J ETHNOPHARMACOL 35 2: 197-199 (1991) (DEPT BIOL CENT RECHER SCI NAT KIVU ZAIRE)
M28970	PLANT VIRUS INHIBITOR AND ITS MANUFACTURE WITH MIRABILIS JALAPA. IKEDA,T: SHINNO,K: MATSUMOTO,T: IMAIZUMI,S: KUWATA,S: TAKANAMI,Y: PATENT-JAPAN KOKAI TOKKYO KOHO-63 123,386 : 8PP-. (1988) (JAPAN TOBACCO INC JAPAN)
M29558	EFFECT OF DOPA FEEDING OF BETAXANTHINS IN VARIOUS SPECIES OF CENTROSPERMAE. RINK,E: BOHM,H: PHYTOCHEMISTRY 30 4: 1109-1112 (1991) (INST BIOCHEM PFLANZ AKAD WISS DDR HALLE/SAALE DDR-401 GERMANY)
N16034	ISOLATION AND CHARACTERIZATION OF THE STARCH FROM FOUR-O'CLOCK FLOWER (MIRABILIS JALAPA L.) SEED. CHANG,SM: TZENG,SL: LII,CY: J FOOD SCI 48 4: 1238-1241 (1983) (INST CHEM ACADEMIA SINICA TAIPEI NANKANG TAIWAN)
T00583	ETHNOBOTANY OF THE RATAN MAHAL HILLS, GUJARAT, INDIA. BEDI,SJ: ECON BOT 32 : 278-284 (1978) (DEPT BOTANY M.S.UNIV BARODA VADODARA GUJJURAT 2 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)
T03014	PHYTOCHEMICAL SCREENING OF KOREAN MEDICINAL PLANTS I. WOO,WS: CHI,HJ: YUN,HS: WOO,LK: YAKHAK HOE CHI 20 : 138-144 (1976) (NAT PROD RES INST SEOUL NATL UNIV SEOUL 110 SOUTH KOREA)
T04621	TERRESTRIAL PLANTS MOLLUSCICIDAL TO LYMNAEID HOSTS OF FASCILIASIS HEPATICA IN PUERTO RICO. MEDINA,FR: WOODBURY,R: J AGR UNIV PUERTO RICO 63 : 366-376 (1979) (PUERTO RICO JUNIOR COLLEGE RIO PIEDRAS PUERTO RICO)

T07364	IRIDOID-CONTAINING KOREAN MEDICINAL PLANTS (I). CHI,HJ: KIM,HS: LEE,SY: KOREAN J PHARMACOG 12 : 19-22 (1981) (NAT PROD RES INST SEOUL NATL UNIV SEOUL 110 SOUTH KOREA)
T09390	ETHNOMEDICINAL PLANTS OF JAUN SAR-BAWAR HILLS, UTTAR PRADESH, INDIA. JAIN,SP: PURI,HS: J ETHNOPHARMACOL 12 2: 213-222 (1984) (CENT INST MED AROMATIC PLANTS LUCKNOW UP 226016 INDIA)
T09553	TRADITIONAL AND HERBAL MEDICINE IN THE COOK ISLANDS. WHISTLER,WA: J ETHNOPHARMACOL 13 3: 239-280 (1985) (PACIFIC TROPICAL BOTANICAL GARDEN LAWAI HI 96765 USA)
T10115	MEDICO-BOTANIC SURVEY OF MEDICINAL AND AROMATIC PLANTS OF KATRA VALLEY (J. & K.STATE) INDIA. KAPUR,SK: SARIN,YK: INDIAN DRUGS 22 1: 4-10 (1984) (REGIONAL RESEARCH LAB JAMMU TAWI J & K 180 001 INDIA)
T10928	CONTRIBUTION TO THE ETHNOPHARMACOLOGICAL STUDY OF THE CANARY ISLANDS. DARIAS,V: BRAVO,L: BARQUIN,E: HERRERA,DM: FRAILE,C: J ETHNOPHARMACOL 15 2: 169-193 (1986) (DEPT FARMACOG FARMACODIN FAC FARM UNIV LA LAGUNA TENERIFE CANARY IS SPAIN)
T14099	ANTIMUTAGENIC ACTIVITY OF EXTRACTS FROM ANTICANCER DRUGS IN CHINESE MEDICINE. LEE,H: LIN,JY: MUTAT RES 204 2: 229-234 (1988) (DEPT BIOCHEM CHUNG SHAN MED & DENTAL COLL TAICHUNG TAIWAN)
T14606	EFFECTS OF NUTRITIONAL AND HORMONAL FACTORS ON THE FORMATION OF ANTI-PLANT-VIRAL PROTEIN BY MIRABILIS JALAPA L.CELLS IN SUSPENSION CULTURE. IKEDA,T: NIINO,K: KATAOKA,J: MATSUMOTO,T: AGR BIOL CHEM 51 11: 3119-3124 (1987) (CENT RES INST JAPAN TOBACCO PUBLIC CORP YOKOHAMA 227 JAPAN)
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 & NAEL UNIV TRUJILLO, TRUJILLO, PERU, JUNE, 1988 : 54PP- (1988) (UNIV TRUJILLO TRUJILLO PERU)
T15330	POISONOUS PLANTS IN SINGAPORE - A COLOUR CHART FOR IDENTIFICATION WITH SYMPTOMS AND SIGNS OF POISONING. WEE,YC: GOPALAKRISHNAKONE,P: CHAN,A: TOXICON 26 1: 47-. (1988) (NATL UNIV SINGAPORE SINGAPORE SINGAPORE)
T15445	SCREENING OF ANTIMICROBIAL ACTIVITY OF PLANTS POPULARLY USED IN GUATEMALA FOR THE TREATMENT OF DERMATOMUCOSAL DISEASES. CACERES,A: GIRON,LM: ALVARADO,SR: TORRES,MF: J ETHNOPHARMACOL 20 3: 223-237 (1987) (CEMAT FAC CHEM SCI PHARM UNIV SAN CARLOS GUATEMALA CITY GUATEMALA)
T15630	HIGHER PLANTS WITH BIOLOGICAL ACTIVITY - PLANTS OF PERNAMBUCO. I. CHIAPPETA,ADA: FRANCISCO DE MELLO,J: MACIEL,GM: REV INST ANTIBIOT UNIV FED PERNAMBUCO RECIFE 21 1/2: 43-50 (1983) (NO ADDRESS GIVEN)
T15879	ETHNOPHARMACOLOGIC ANALYSIS OF MEDICINAL PLANTS USED BY LAOTIAN HMONG REFUGEES IN MINNESOTA. SPRING,MA: J ETHNOPHARMACOL 26 1: 65-91 (1989) (DEPT ANTHROPOL UNIV MINNESOTA MINNEAPOLIS MN 55455 USA)
W01266	MEDICINAL PLANTS UTILIZED BY THE PIMA MONTANES OF CHIHUAHUA. PENNINGTON,CW: AMER INDIGENA 33 : 213-232 (1973) (NO ADDRESS GIVEN)
W01270	MEDICINAL PLANTS OF JAMAICA. IV. ASPREY,GF: THORNTON,P: WEST INDIAN MED J 4 : 145-165 (1955) (NO ADDRESS GIVEN)

W03034	PIGMENTS OF CENTROSPERMAE. 5. BETAXANTHINS FROM MIRABILIS JALAPA L. PIATTELLI,M: MINALE,L: NICOLAUS,RA: PHYTOCHEMISTRY 4 : 817-823 (1965) (IST CHIM ORG UNIV NAPOLI NAPLES I-80134 ITALY)
W04363	PIGMENTS OF CENTROSPERMAE-II. DISTRIBUTION OF BETACYANINS. PIATTELLI,M: MINALE,L: PHYTOCHEMISTRY 3 5: 547-557 (1964) (CENT NAZ CHIM SOST ORG NAT CNR INST CHIM ORG UNIV NAPLES NAPLES ITALY)
X00003	PLANTS USED FOR RHEUMATISM, ARTHRITIS AND RELATED CONDITIONS IN CHINESE TRADITIONAL MEDICINE. KONG,YC: PERSONAL COMMUNICATION : - (1977) (DEPT BIOCHEM CHINESE UNIV HONG KONG HONG KONG CHINA)
ZZ1002	PLANTAS MEDICINAIS BRAZILEIRAS, CONHECIMENTOS POPULARES E CIENTIFICOS. ALMEIDA, DE, E. R. SAO PAULO: HEMUS EDITORA LTDA (1993)
ZZ1013	DICIONARIO DAS PLANTAS UTEIS DO BRAZIL. CRUZ, G. L: 5 TH ED. RIO DE JANEIRO: BERTRAND (1995)
ZZ1045	USEFUL PLANTS OF AMAZONIAN PERU. SECOND DRAFT. VASQUEZ, M. R. FILED WITH USDA'S NATIONAL AGRICULTURAL LIBRARY (1990)
ZZ1050	MEDICINAL PLANTS OF THE WORLD. DUKE, JA: WAIN KK: COMPUTER INDEX WITH MORE THAN 85,000 ENTRIES. 3 VOLS. P 1654 (1981)
ZZ1079	PLANTAS DE CURAM: CUDIE DA SUA SAUDE ATRAVES DE NATUREZA, 5 TH ED. MOREIRA, FREDERICO. SAO PAULO, BRAZIL: HEMUS EDITORA LTDA (1996)
ZZ1081	PLANTAS QUE CURAM. 11 TH ED. PANIZZA, SYLVIO: DE MATO, CHERIO. SAO PAULO, BRAZIL: IBRASA (1997)
ZZ1092	AGROMIDIA SOFTWARE. PLANTAS MEDICINAIS (CD-ROM). SAO PAULO, BRAZIL (2002)
ZZ1093	PERU-EL LIBRO DE LAS PLANTAS MAGICAS, 2 ND ED. ZADRA, DE, ADRIANA ALARCO. LIMA: CONCYTEC (2000)
ZZ1095	HANDBOOK OF PHYTOCHEMICAL CONSTITUENTS OF GRAS HERBS AND OTHER ECONOMIC PLANTS. DUKE, JAMES A. BOCA RATON, FL: CRC PRESS (1992)
AD1001	MIRABILIS JALAPA L. MS SWAMINATHAN RESEARCH FOUNDATION.
AD1002	DICTIONARY OF ECONOMIC PLANTS. UPHOF, J, C. TH. WEINHEIM (1959)
AD1003	A DICTIONARY OF PLANTS USED BY MAN. USHER. G. CONSTABLE (1974)
AD1004	FLORA OF VICTORIA. EWART. A.J.
AD1005	MEDICINAL PLANTS OF CHINA. DUKE, J.A. : AYENSU, E. S. REFERENCE PUBLICATIONS, INC (1985)
AD1006	GLOSSARY OF INDIAN MEDICINAL PLANTS (INCLUDING THE SUPPLEMENT). CHOPRA, RN: NAYAR, SL: CHOPRA, IC: COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH, NEW DELHI (1986)
AD1007	RIBOSOME-INACTIVATING AND ADENINE POLYNUCLEOTIDE GLYCOSYLASE ACTIVITIES IN MIRABILIS JALAPA L. TISSUES. BOLOGNESI, A: POLITO, L: LUBELLI, C; BARBIERI, L: PARENTE, A: STIRPE, F: J BIOL CHEM 277 16: 13709-16 (2002) (DIPARTIMENTO DI PATOLOGIA SPERIMENTALE, UNIVERSITA DI BOLOGNA, VIA SAN GIACOMO, BOLOGNA, ITALY)

AD1008	RELIABLE SEQUENCE DETERMINATION OF RIBOSOME - INACTIVATING PROTEINS BY COMBINING ELECTROSPRAY MASS SPECTROMETRY AND EDMAN DEGRADATION. DI MARO, A: FERRANTI, P: MASTRONICOLA, M: POLITO, L: BOLOGNESI, A: STIRPE, F: MALORNI, A: PARENTE, A: J MASS SPECTROM 36 1: 38-46 (2001) (DIPARTIMENTO DI CHIMICA ORGANICA E BIOLOGICA, UNIVERSITA DI NAPOLI FEDERICO II, VIA MEZZOCANNONE 16, NAPLES, ITALY)
AD1009	CHARACTERIZATION OF TWO NOVEL TYPE I RIBOSOME-INACTIVATING PROTEINS FROM THE STORAGE ROOTS OF THE ANDEAN CROP MIRABILIS EXPANSA. VIVANCO, JM: SAVARY, BJ: FLORES, HE: PLANT PHYSIOL 119 4: 1447-56 (1999) (DEPARTMENT OF PLANT PATHOLOGY AND BIOTECHNOLOGY INSTITUTE, THE PENNSYLVANIA STATE UNIVERSITY, UNIVERSITY PARK, PENNSYLVANIA, USA)
AD1010	ADENINE DEPURINATION AND INACTIVATION OF PLANT RIBOSOMES BY AN ANTIVIRAL PROTEIN OF MIRABILIS JALAPA (MAP). KATAOKA, J: HABUKA, N: MIYANO, M: MASUTA, C: KOIWAI, A: PLANT MOL BIOL 20 6: 1111-9 (1992) (LIFE SCIENCE RESEARCH LABORATORY, JAPAN TOBACCO INC, KANAGAWA)
AD1011	THE PURIFICATION AND AMINO ACID SEQUENCES OF FOUR TX2 NEUROTOXINS FROM THE VENOM OF THE BRAZILIAN 'ARMED' SPIDER PHONEUTRIA NIGRIVENTER (KEYS). CORDEIRO MDO, N: DINIZ, CR: VALENTIM, ADO C: VON EICKSTEDT, VR: GILROY, J: RICHARDSON, M: FEBS LETT 310 2: 153-6 (1992) (CENTRO DE PESQUISA E DESENVOLVIMENTO, FUNDACAO EZEQUIEL DIAS, BELO HORIZONTE (MG), BRAZIL)
AD1012	SPECIFICITIES OF RNA N-GLYCOSIDASE ACTIVITY OF MIRABILIS ANTIVIRAL PROTEIN VARIANTS. HABUKA, N: MIYANO, M: KATAOKA, J: TSUGE, H: NOMA, M: J BIOL CHEM 267 11: 7758-60 (1992) (LIFE SCIENCE RESEARCH LABORATORY, JAPAN TOBACCO, INC, KANAGAWA)
AD1013	SUBSTANTIAL INCREASE OF THE INHIBITORY ACTIVITY OF MIRABILIS ANTIVIRAL PROTEIN BY AN ELIMINATION OF THE DISULFIDE BOND WITH GENETIC ENGINEERING. HABUKA, N: MIYANO, M: KATAOKA, J: TSUGE, H: AGO, H: NOMA, M: J BIOL CHEM 266 35: 23558-60 (1991) (LIFE SCIENCE RESEARCH LABORATORY, JAPAN TOBACCO, INC, KANAGAWA)
AD1014	ESCHERICHIA COLI RIBOSOME IS INACTIVATED BY MIRABILIS ANTIVIRAL PROTEIN WHICH CLEAVES THE N-GLYCOSIDIC BOND AT A2660 OF 23 S RIBOSOMAL RNA. HABUKA, N: MIYANO, M: KATAOKA, J: NOMA, M: J MOL BIOL 221 3: 737-43 (1991) (LIFE SCIENCE RESEARCH LABORATORY, JAPAN TOBACCO, INC, KANAGAWA)
AD1015	EXPRESSION AND SECRETION OF MIRABILIS ANTIVIRAL PROTEIN IN ESCHERICHIA COLI AND ITS INHIBITION OF IN VITRO EUKARYOTIC AND PROKARYOTIC PROTEIN SYNTHESIS. HABUKA, N: AKIYAMA, K: TSUGE, H: MIYANO, M: MATSUMOTO, T: NOMA, M: J BIOL CHEM 265 19: 10988-92 (1990) (LIFE SCIENCE RESEARCH LABORATORY, JAPAN TOBACCO, INC, KANAGAWA)
AD1016	BIOCIDAL PROTEINS. DE BOLLE, M, ET AL. ZENECA LIMITED. US PATENT # 5,942,663 (1999)
AD1017	SYNTHETIC ANTIBIOTICS. EDWARDS, DAVID. NCE PHARMACEUTICALS, INC. US PATENT #6,020,312. (2000)