Pharmaceutical Biology
1998, Vol. 36, No. 1, pp. 33–43

1388-0209/98/3601-0033$12.00

ANTIMICROBIAL ACTIVITY OF MEDICINAL PLANTS FROM BAJA CALIFORNIA SUR (MÉXICO)

R. Encarnación Dimayuga*, M. Virgen and N. Ochoa

Universidad Autónoma de Baja California Sur, Departamento de Agronomía, A.P. 19-B, La Paz, B.C.S., 23080, México

ABSTRACT

Ethanol extracts of 109 plants reported to be used in the traditional medicine of Baja California Sur (México) were tested for antimicrobial activity against Staphylococcus aureus, Bacillus subtilis, Streptococcus faecalis, Escherichia coli *and* Candida albicans. *Of these, 64 were active against one or more test organisms.*

INTRODUCTION

Researchers increasingly turn their attention to folk medicine for new drug leads. The discovery of new drugs useful against clinical diseases caused by bacteria, yeast, fungi, and viruses is not uncommon among higher plants (Sundar, 1996), and the potential for finding useful chemotherapeutics from the medicinal plants of Baja California Sur (México) is high. There is no systematic research of the therapeutic claims reported in the traditional medicine of Baja California Sur. Most native plants of this area have not been investigated.

The recent appearance of reports on the identification of different natural sources with antimicrobial activity is evidence of an ongoing effort in the field (Madubunji, 1995; Sundar, 1996).

According to the World Health Organization, in 1996, infectious diseases were the main cause of death. Annually, 17 million people, mostly children, died in this manner (OMS, 1996). Considering the records of the Health Secretary and Public Assistance of Mexico, infectious diseases are an important problem that require resolution (Sistema Nacional Epidemológica, 1995). This is reflected in the traditional medicine of Baja California Sur where most of the plants are used against infectious diseases. Since there is little scientific information about the curative properties of resources used in the popular medicine of this area, we decided to investigate plants used to treat infectious ailments in the traditional medicine of Baja California Sur for antimicrobial activity.

The low cost and simple technique of agar diffusion bioassays is advantageous in the determination of the antibacterial activities of crude drugs. This classical method requires the substances tested be soluble in water, or can diffuse into agar. Accordingly, antibacterial activity was determined using the agar diffusion method with filter paper discs (Rios et al., 1988; Encarnación & Keer, 1991).

MATERIALS AND METHODS

Collection of Plant Materials

Plants reported as used in traditional medicine of Baja California Sur were collected from different locations in the region (Encarnación & Contreras, 1992; Encarnación & Agúndez, 1995). Each specimen was labeled, numbered, annotated with the date of collection, the locality, and the medicinal use. A set of herbarium specimens were retained at the Agronomy Department of the Universidad Autónoma of Baja California Sur (México) for identification. Duplicate specimens were deposited at the herbarium of the Biology Institute, Universidad Nacional Autónoma of México, México City.

Preparation of Extracts and Disks

To prepare initial extracts for biological testing, one

Keywords: Baja California Sur, México, plant extracts, antimicrobial activity, *Bacillus subtilis*, *Staphylococcus aureus*, *Streptococcus faecalis*, *Escherichia coli*, *Candida albicans.*

* Author to whom correspondence should be addressed.

part (approx. 5 g) of dried material was macerated for 8 days with about five parts (v/v) (approx. 15 ml) of ethanol (three times). Since the purpose of our study was qualitative determination, not quantitative, the weight and volume of the extracts were not recorded. However, the ratio between the amount of plant and the volume of the solvent was kept constant. The ethanol extracts were evaporated at temperatures ≤40°C and 20 mg of the dry residue of each sample was again dissolved in 1 ml of ethanol. Filter paper disks (7 mm diameter) were impregnated with 140 µl (2.8 mg) of each solution and dried at room temperature.

Microorganisms

Four different laboratory bacteria and one yeast strain were used; *Staphylococcus aureus, Bacillus subtilis, Streptococcus faecalis* (Gram-positive), *Escherichia coli* (Gram-negative), and *Candida albicans* (yeast).

Growth Medium

Screening was done on plates of peptone agar (15 to 20% agar, pH 7.0 to 7.4) sterilized for 15 min at 120°C. Approximately 20 ml of this medium was added to each 100 mm sterile petri dish. Incubations were performed for 24 h to control sterility.

Antibacterial Testing

All tests were done by placing the disks, impregnated with the ethanol crude extracts, on the agar surface previously inoculated with a sterile hyssop containing a suspension of each type of microorganism. The suspension was inoculated in 5 ml of nutrient agar liquid (Gram-positive and Gram-negative microorganisms) or 5 ml of Sabouraud liquid (yeast), and incubated for 24 h at 37°C. The growth and purity of each suspension were verified by using a Gram stain procedure. Standard discs of chloramphenicol (30 mg/disk), erythromycin (15 mg/disk) and nalidixic acid (30 mg/disk) were used as reference (positive) controls. A disk treated with ethanol used for the preparation of plant extracts served as a negative control. The plates were incubated at 37°C for 24 h and the diameter of the zones of inhibition around each disc measured and recorded at the end of the incubation period.

RESULTS AND DISCUSSION

The antimicrobial activity of 109 plants used in traditional medicine of Baja California Sur (México) were tested. From this group of plants, 5 were identified to the genus level and 104 to species. The results are in the Appendix. During the investigation of traditional medicine as practiced in Baja California Sur, Mexico, the medicinal plants reported in the Appendix were collected from different localities, during different seasons, and were shown by different informants during the interviews (Encarnación & Contreras, 1992; Encarnación & Agúndez, 1996). As can be seen in the Appendix, in some cases a plant with the same local name was collected two or three times and the samples were identified with different botanical names, as for "Manzanilla del Monte" identified as *Perytile californica* (E-250) and *P. aurea*, showing different antimicrobial activities. Another example is represented by a plant named "Salvia real" or "Salvia" identified as *Hyptis tephrodes* (E-139) and *H. laniflora* (E-85), which also show different antimicrobial activities. "Cardo" or "Chicalote" has been collected several times and this plant has been identified as *Argemone chisosencis* (E-142), *A. gracilenta* (E-57), and *A. ochroleuca* (E-289). These three samples have shown different activities and consequently may have different components which can explain why a medicinal plant reported with one or two common names can be reported with different medicinal uses.

The informants from different localities can give a plant different common names. For that reason, a plant may be collected several times, but after taxonomical identification, all the samples were identified as the same species, as for example "Salvavida", "Hierbabuena de Castilla", "Valeriana", and "Poleo Silvestre", identified as *Lippia alba* (E-155, E-184, E-194, E-196). The four samples of this plant showed different activities. The amount of secondary metabolites in a plant can vary with the season, the part of the plant, and the type of the soil (Anand & Nityanand, 1984; Tyler et al., 1988). This can explain the differences in the results from the same plant material collected at different locations and times.

As can be seen from the Appendix, the antimicrobial screening was performed on a sample of the branch, the whole plant, or the aerial part of the plant, because we took the plant part an informant indicated he used.

It was not always possible to collect adequate amounts of material for screening and herbarium specimens during the interviews. Consequently, the amounts used for extraction were not recorded but the ratio between the amount of the plant and the volume of the solvent was always the same. Since the purpose of the screening was qualitative, the results summarized in the Appendix meet the objective of the present investigation.

Most of the extracts were active against Gram-positive microorganisms. Among these, 51 (46.8%) were active against *S. aureus*, 50 (45.9%) against *B. subtilis*, and 19 (17.4%) against *S. faecalis.* Three extracts (2.8%) were active against *E. coli* (Gram-negative) and 6 (5.5%) against *C. albicans* (yeast).

In the Appendix, it can be seen that 88 (80.7%) plants are used in traditional medicine against different complaints that could be produced by microorganisms, such as fever, bronchitis, stomachache, achne, cystitis, urethritis, etc. From this group of plants, 64 (58.7%) were active or slightly active against one or more of the microorganisms used in this bioassay.

These results clearly show a good correlation between traditional medicine and the antimicrobial screening results. The present study will serve as a guide to help us select plants with antimicrobial activity for further work on the isolation and characterization of active components.

ACKNOWLEDGEMENTS

We wish to thank UABCS and CONACYT (F500–N9306) for research support. We also thank Ing. Jorge Agúndez from the Department of Agronomy, UABCS, and the group (O. Tellez, F. Ramos, J.L. Villa Señor, M. Sousa and T.P. Ramamoorthy) of the Botanical Department of the Biological Institute of the Universidad Autónoma of México (UNAM) for the identification of the specimens. We are very grateful to Mark Roman of the Scripps Institution of Oceanography of the University of California, San Diego, CA, U.S.A. for supplying the microorganism strains. We are also very grateful to Dr. Fred Williams and Dr. Ellis Glazier for their assistance.

REFERENCES

Anand N, Nityanand S (1984): Integrated approach to development of new drugs from plants and indigenous remedies. In: Krogsgaard-Larsen P, Christensen SB, Kofod H, eds., *Natural Products and Drug Development*. Alfred Benzon Symposium 20, Munksgaard, Copenhagen, p. 83.

Encarnación R, Keer GS (1991): Antimicrobial screening of medicinal plants from Baja California Sur, México. *J Ethnopharmacol 31:*181–192.

Encarnación R, Contreras G (1992): Medicina Tradicional de B.C.S. *Revista Médica del IMSS 30:* 297–308

Encarnación R, Agúndez J (1995): Medicina Tradicional de B.C.S. *Revista Mexicana Cien Farm 26:* 25–24.

Madubunji II (1995): Antimicrobial activities of the constituents of *Garcinia kola* seeds. *Int J Pharmacog 33:* 232–237.

OMS (1996): Organización Mundial de la Salud. Informe sobre la Salud en el mundo. Combatir las enfermedades promover el desarrollo. Resumen de Orientación. Sadag, Francia, pp. 1–12.

Rios JL, Recio MC, Villar A (1988): Screening methods for natural products with antimicrobial activity; a review of the literature. *J Ethnopharmacol 23:* 127–149.

Secretaria de Salud y Asistencia Pública. Sistema Nacional de vigilancia Epidemiologica (1995): Vigilancia Epidemiologica Semana 42, México. EPI-1–95.

Sundar RK (1996): Antibacterial activity of some medicinal plants of Papua New Guinea. *Int J Pharmacog 34:* 223–225.

Tyler VE, Brady LR, Robbers JE (1988): Pharmacognosy, 9th ed. Lea and Febiger, Philadelphia, p. 7.

Accepted: October 2, 1997

APPENDIX. ANTIMICROBIAL ACTIVITY OF MEDICINAL PLANTS FROM BAJA CALIFORNIA SUR.

Local Name	Family Name Plant Name (Voucher Specimen)	Plant Part Tested	Medicinal Use	Antimicrobial Activity [a,b]				
				a	b	c	d	e
	ACANTHACEAE							
Ramajo blanco o Rama ceniza	*Beloperone californica* Benth. (E-177b)[c]	Branches	Bite of poisonous snake	−	+	−	−	−
	ANACARDIACEAE							
Ciruelo del monte, ciruelo cimarrón	*Cytocarpa edulis* (Brandegee) Standley (E-218)	Branches	Toothache, to disinfect gums, to strengthen teeth, kidneyache, prostate troubles, and pimples	−	+	−	−	−
Ciruelo rojo (Cultivado)	*Spondias* sp. (E -80)	Branches	Tonsilitis	−	++	−	−	−
	APIACEAE							
Hinojo, anison	*Foeniculum vulgare* Mill (E-156)	Branches	Stomachache, diarrhea, cough, colic in children, nervousness, backache	+	+	−	−	−
	APOCINACEAE							
Cacaloxuchitl Xacaloxuchitl Blanco	*Plumeria acutifolia* Poir. (E-268)	Branches	Heart problems, wart	−	−	−	+	−
Otatabe	*Vallesia glabra* (Cav. Link.) (E-145)	Branches	Wart, rheumatism, sting of “lopon” or Scorpaena sp. and sting ray	−	−	−	−	−
	ASCLEPIADACEAE							
Clavel Aleman	*Cryptostegia grandiflora* (Roxb) R. Br. (E-49)	Branches	Reported to be toxic	−	−	+	−	−
Talayote, güirote	*Matelea cordifolia* (A.Gray) Woodson. (E-159)	Branches	For sting of poisonous animal	−	−	−	−	−
Güirote	*Sarcostemma clausum* Jack. Sch. (E-186)	Aerial Part	Reported to be toxic (Produces diarrhea and pain in animals)	−	+	−	−	−
	ASTERACEAE							
Prodigiosa	*Artemisia absinthium* L.(E-134)	Branches	Gall bladder, stomach ulcer, parasites, diabetes, blood pressure, stomachache	++	−	−	−	−
Aviginio	*Cosmos sulphureus* Cav. (E-216)	Aerial part	Stomach troubles	−	+	−	−	−
Incienso	*Encelia farinosa* A.Gray. (E-97)	Leaves, flower	To treat horses after gelding, skin ulcers of the legs	−	−	−	−	−
Cola de zorra	*Haplopappus spinulosus* (Pursh) DC subsp. scabrellus (Greene) Hall (E-240)	Whole plant	Cystitis, urethritis	++	++	−	−	−
Manzanilla	*Matricaria chamomilla* L. (E-211)	Whole plant	Colic or stomachache, infection in the eyes, to accelerate childbirth or menstruation, diarrhea, dysentery, “tetanus”, headache, cold, fever, pimples, skin ulcers, earache, sting of scorpion	−	−	−	−	−

Table continues

Table (continued)

Local Name	Family Name Plant Name (Voucher Specimen)	Plant Part Tested	Medicinal Use	Antimicrobial Activity [a,b]				
				a	b	c	d	e
Parrandera	*Pectis hankeana* D.C. Schu. Bip. (E-176)	Whole plant	Cough	−	−	−	−	−
Manzanilla del monte	*Perityle californica* Benth. (E-250)			−	−	+	−	−
	Perytile aurea Rose. (E-66)	Whole plant	Venereal diseases	++	++++	−	−	−
Candelón	*Pluchea odorata*. (L.) Cass. (E-209)	Leaves	Headache	++	+	−	−	−
Anís	*Tagetes micrantha* Cav. (E-165)	Seeds	Cure stomach troubles and promote eating colics or stomachache, heart troubles	−	+	−	−	−
Xempazuchitl rojo	*Tagetes* sp. (E-231)	Flower	Stomachache, Stomach troubles	+	−	+	−	−
Xempazuchitl	*Tagetes patula* L. (E-115)	Flower	Dysentery and cough	++	−	++	−	++
Diente de león	*Taraxacum officinale* Weber (E-233)	Whole plant	Produce diarrhea	++	++	−	−	−
Santa Lucía	*Trixis peninsularis* S.F. Blake. (E-185)	Branches	Stomachache and diarrhea, fever, to stop vomiting, parasites (taenias sp.)	−	++	−	−	−
Guisapolón	*Xanthium strumarium* L. (E-215)	Whole plant	Cystitis, urethritis, stones in kidney	++	++	++	−	−
	AVICENNIACEAE							
Mangle rojo	*Avicennia nitida* Jacp. (E-192)	Branches	Skin ulcers, mouth blister, diarrhea, rheumatism, tonsilitis, tuberculosis, inflammation of intestine, venereal diseases, circulation, cramp and aches in the legs	−	+	−	−	−
	BIGNONIACEAE							
Cualtecomate o tecotomate	*Crescentia alata*. HBK. (E-131)	Fruit	Bruises, stomachache, backache, to fortify the blood for lung, cough, cold, parasites, bronchial asthma	++	+	−	−	−
	BRASSICACEAE							
Mostaza	Aff *Capsella* sp. (E-246)	Branches	For poison, headache, chest ache, fever, dysentery	++	−	−	−	−
Lentejilla	*Lepidium nitidium* Nutt. (E-256)	Aerial part	Dysentery	++	−	−	−	−
	BURSERACEAE							
Copalquín	*Bursera filicifolia* Brandegee. (E-164)	Stem, bark	Pneumonia, wounds, stomach ulcers, skin ulcers, cough	++	++	+	−	−
Copal, copal colorado	*Bursera hindsiana* (Benth). Engler (E-136)	Branches, gum	Wounds or infected wounds, to close wounds, scabies, antiinflamatory, bites of snake, black widow spider, and dog and stings of scorpion, bees and or wasps, cough, tonsilitis, colds, circulation, strengthen teeth, toothache, varicose veins, fungi, umbilical cord inflammation	+	−	−	−	−
	BUXACEAE							
Jojoba	*Simmondsia. chinensis* Lick. Schneider. (E-346)	Branches	Skin ulcers	−	−	−	−	−

Table continues

Table (continued)

Local Name	Family Name Plant Name (Voucher Specimen)	Plant Part Tested	Medicinal Use	Antimicrobial Activity [a,b]				
				a	b	c	d	e
	CACTACEAE							
Pitallita, viejitos	*Mamillaria dioica* K. Brandegee. (E-225)	Aerial part	Ache or earache, cystitis, urethritis, blood pressure, inflamed gums	−	−	−	−	−
Ceribe	*Opuntia bigelovii* Engelm.(E-239)	Aerial part	Fever, stomachache	−	−	−	−	−
Cholla	*Opuntia cholla* Weber. (E-340)	Root	Stomach troubles, fever, cold, hepatitis, diabetes, diarrhea, after childbirth to conceive, cystitis, urethritis, gum inflammation, measles, vomiting, blood pressure, encourage appetite	−	+	−	−	−
Pithaya agría	*Stenocereus gummosus.* (Engelm.) Gibson and Acvak. (E-172)	Aerial part, fruit	Sting of poisonous snake and stingray, blood pressure, parasites, to control cholesterol	−	+	+	−	−
Pithaya dulce	*Stenocereus thurberi.*(E-267)	Aerial part, flower	Sting of bee, “lopon” or Scorpaena sp., sting ray, snake bite, wounds, blood pressure, ulcers, cancer, heart trouble	−	−	−	−	−
Raja matraca, matraca	*Wilcoxia striata* (Brandegee) Britt and Rose. (E-138)	Whole plant	To sterilize animals, produce paralysis in animals, to wash wounds, kidneyache, abortion, hemorrhoids, cystitis, urethritis, rheumatism	++	−	−	−	−
	CAESALPINACEAE							
Palo zorrillo	*Cassia emarginata* L. (E-220)	Branches	Headache	−	−	−	−	−
Palo brea	*Cercidium praecox* (Ruíz and Pavón) Harms. (E-304)	Branches	Toothache, cough with vomiting	−	−	−	−	−
Vichi	*Senna villosa* P. Mill. Irwin & Barneby (E-273)	Aerial part	Gastric ulcer	−	−	−	+	−
	CELASTRACEAE							
Hierba del cuervo	*Schaefferia shrevei* Lundell. (E-158)	Branches	Rabies, rheumatism, it is poisonous, dandruff	−	++	−	−	−
	COMMELINACEAE							
Vergüenza, sinvergüenza	*Tradescantia commelnoidea* Schult. (E-91)	Branches	Diarrhea with blood, stomach ache, to stop vomiting, cough, headache, bruises, parasites	++	−	++	−	−
	CONVOLVULACEAE							
Tripa de aurea	*Ipomea pes-caprae* (L.) R. Br. (E-178)	Whole plant	Paralysis, rheumatism, fever, stingray, kidney stones, cystitis, urethritis	−	−	−	−	−
	CRASSULACEAE							
Bruja	*Bryophyllum* sp. (E-326)	Leaves	Sore throat, headache, boils or carbuncle, eyeache, diarrhea and vomit	−	+	−	−	−

Table continues

Table (continued)

Local Name	Family Name Plant Name (Voucher Specimen)	Plant Part Tested	Medicinal Use	Antimicrobial Activity [a,b]				
				a	b	c	d	e
	CUCURBITACEAE							
Melón coyote	*Cucumis dipsaceus* Enrenb.ex Spach (E-251)	Fruit, aerial part	Stomach ulcers, stomachache, stomach troubles, infected wounds, diabetes	−	+	−	−	−
	CYPERACEAE							
Quereme	*Cyperus esculentus* L. (E-237)	Whole plant	Fever, cough with vomiting, cold, cough, bodyache	++	−	−	−	−
	CHENOPODIACEAE							
Galletilla ó galleta	*Atriplex barclayana* Benth. D.Dietr. (E-199)	Whole plant	Sting of “lopon” or *Scorpaena* sp. and stingray	++	−	−	−	−
Epazote	*Chenopodium ambrosioides*. L. (E-137)	Whole plant	Parasites, stomachache dysentery, colic after childbirth, to clean the uterus and expulsion of placenta, menstrual colics produce abortion, it isused before childbirth, to normalize the menstruation, abscess in the tooth, sting of scorpion and bee	++	+	−	−	−
	ERICACEAE							
Madroño	*Arbutus peninsularis* Rose and Goldman. (E-170)	Branches	Circulation	++	++	+	−	++
	EUPHORBIACEAE							
Hierba del cáncer o H. de la fístula. Sanalotodo	*Acalypha comonduana* Millsp. (E-150)	Leaves, branches	Cancer, fistulas, skin ulcers, wounds, burns, stomach ulcers, varicose veins, gastritis, blister in the mouth, stomachache diabetes, parasites	−	++	−	−	−
Liga	*Euphorbia californica* Benth. (E-160)	Branches	Burns, bruises, inflamed wounds, venereal disseases, skin ulcers and broken bones	−	−	−	−	−
Matacora	*Jatropha cuneata* Wigg& Rollins (E-241)	Branches	Hemorrhoids, wounds, venereal diseases, kidney problems	−	−	−	−	−
Candelilla, Canelilla	*Pedilanthus macrocarpus* Benth. (E-113)	Stem	Produce paralysis in animals, warts, produces diarrhea, sap will burn skin	−	−	−	−	−
Higuerilla	*Ricinus communis* L. (E-179)	Whole plant	Headache, sore throat hydropsy, fever, to reduce inflammation of the stomach, wounds	−	−	−	−	
	FABACEAE							
Trébol	*Melilotus* sp. (E-248)	Whole plant	Malnutrition	+	+	−	−	−
San Isidro	*Tephrosia palmeri* S. Wats.(E-217)	Branches	Diarrhea	−	−	−	−	−

Table continues

Table (continued)

Local Name	Family Name Plant Name (Voucher Specimen)	Plant Part Tested	Medicinal Use	Antimicrobial Activity [a,b]				
				a	b	c	d	e
	FAGACEAE							
Encino negro	*Quercus devia* Goldman. (E-168)	Branches	Cancer	+++	−	−	−	−
Encino roble	*Quercus tuberculata* Liebm. (E-166)	Branches	Hemorrhage, abortion, inflammation of the ovaries	++	−	−	−	−
	GERANIACEAE							
Geranio de olor	*Pelargonium graveolens* Liffer. (E-200)	Branches	Stomachache, diarrhea, constipation, dysentery, gastritis, menstrual colics, vaginal hemorrage, hemorrage in wounds, heart pain or inflammation of the left side of the chest, nervousness, earache and cough	−	++	−	−	−
	KRAMERIACEAE							
Mesquitillo, tabardillo	*Krameria parvifolia* Benth. (E-235)	Whole plant	Tonsilitis	−	−	−	−	−
	LAMIACEAE							
Salvia, salvia real	*Hyptis tephrodes* A. Gray. (E-139)	Branches	Earache, deafness, to clean the uterus after childbirth, intestinal fever, for bile, cough, bronchitis, tuberculosis, rheumatism, bad smelling feet and diabetes	++	−	−	−	++
	Hyptis laniflora Benth. (E-85)			++	++	−	−	−
Hierbabuena. Menta	*Mentha spicata* L.(E-190)	Aerial part	Menstrual colic	−	−	−	−	−
Romero	*Rosmarinus officinalis* L. (E-154)	Whole plant	Conjunctivitis, burns, avoiding abortion, uterine infections, haemorrhage, to close wounds, nose bleed, astringent, cold, wounds, skin ulcers, bleeding after child birth, blood sucker of the legs	+++	++	+	−	−
	LILIACEAE							
Sábila	*Aloe vera* L (E-207)	Leaves	Antinflammatory, rheumatism, cystitis, urethritis, dandruff, deafness, stomachache, diabetes, pimples, to lose weight, ulcers, gall bladder, abscess, toothache, sore throat, to close wounds, “sting of animals”, skin ulcers, headache	−	−	−	−	−
	LINACEAE							
Linasa	*Linum lewissi* Pursh. (E-253)	Whole plant	Stomachache, diarrhea, fever, constipation, vaginal haemorrhage, vomiting, kidney inflammation, stomach troubles	−	−	−	−	−
	LORANTHACEAE							
Toje de mezquite	*Phoradendron californicum* Nutt. (E-114)	Whole plant	Vomiting, stomachache, diarrhea, stomach troubles, improve digestion, wounds varicose veins, kidney problems	+	+	−	−	++

Table continues

Table (continued)

Local Name	Family Name Plant Name (Voucher Specimen)	Plant Part Tested	Medicinal Use	Antimicrobial Activity [a,b]				
				a	b	c	d	e
	MALPHIGIACEAE							
Matanel, mantenene, gallineta	*Mascagnia macroptera* (Sesse & Moc.) Niedenzu. (E-108)	Branches	Rheumatism, infected wounds, burns, sore throat, bruise, bad position of the bones, diabetes, abortion	++	++	++	−	−
	MALVACEA							
Malva blanca, malva de castilla	*Malva parviflora* L (E-210)	Whole plant	Measles, fever, constipation, stomachache, diarrhea, dysentery, cold and fever, tetanus, inflamation, allergy and itching, bittermouth	+	−	−	−	−
	MARTYNIACEAE							
Espuela del diablo	*Proboscidea altheafolia* (Benth.) Decne. (E-161)	Aerial part	Infected wounds	++	−	+	−	−
	MIMOSACEAE							
Vinorama	*Acacia farnesiana* (L.) Willd. (E-229)	Branches	Cow mastitis	−	+++	−	−	−
Dai blanco	*Desmanthus fruticosus* Rose. (E-128)	Branches	To fortify the teeth, produces diarrhea	++	−	−	−	−
Palo blanco	*Lysiloma candida* Brandegee. (E-180)	Branches	Diarrhea in cattle, dysentery, wounds, toothache, reduce inflammation of gums, fortify the teeth, stomachache, burns, diabetes, haemorrhage, varicose veins, tonsilitis	++	−	−	−	−
Uña de gato.	*Mimosa brandegeei* Robison. (E-129)	Branches	Ulcer	++	+	−	−	−
Celosa	*Mimosa xantii* A. Gray. (E-121)	Branches	To treat boils of the head and groin	++	−	−	−	−
	MIRTACEAE							
Guayabo	*Pssidium guajaba* L. (E-219)	Shoots	Dysentery, stomach troubles, diarrhea, for headache after drinking, colic, vomiting, parasites, wound, skin infection, headache, high blood pressure	++	−	++	−	−
	MORINGACEAE							
Guajilote	*Parmentiera aculeata.* HBK Seen. (E-90)	Branches	Earache	−	−	−	−	−
	NYCTAGINACEAE							
Mocho Sambesarambe	*Boerhaavia coccinea* Mill. (E-174)	Whole plant	Measles, to avoid abortion and haemorrhage, sting of “matavenado”, to calm children	+	+	+	−	−
Maravilla	Mirabilis jalapa L (E-52)	Leaves, branches	Infected wounds, dysentery, sting of scorpion and bee	+	+	−	−	−
	PAPAVERACEAE							
Cardo o chicalote	*Argemone chisosensis* G.B. DW. (E-142)	Aerial part	Infected eyes, cattle udders, diabetes, to produce hair	−	−	−	−	−

Table continues

Table (continued)

Local Name	Family Name Plant Name (Voucher Specimen)	Plant Part Tested	Medicinal Use	Antimicrobial Activity [a,b]				
				a	b	c	d	e
	Argemone gracilenta.Greene. (E-57))			++	++++	++	–	+++
	Argemone ochroleuca Sweet. (E-289			+	+	–	–	–
	PINACEAE							
Pino piñonero	*Pinus lagunae* Passini. (E-167)	Branches	Chest ache, bruises and cold	++	–	–	–	–
	PIPERACEAE							
Rama santa, corazón de Jesus, palo santo	*Piper auritum* HBK. (E-119)	Leaf, branches	Cold, cough, to ease respiration, sting of poisonous snake, palpitation	–	–	–	–	–
	POACEAE							
Grama	*Cynodon dactylon*(L.) Pers.(E-148)	Whole plant	Cystitis, urethritis, kidney and bladder problems, varicose veins	+	–	–	–	–
Zacate colmillo	*Sorghum halepense.* (L) Pers. (E-243)	Whole plant	Reported to be toxic	+	+	–	–	–
	POLYPODIACEAE							
Flor de piedra	*Cheilanthes myriophylla* Desv. (E-189)	Whole plant	Prostatitis, diarrhea, cough	–	–	–	–	–
Hierba del golpe	*Nephrolepis pectinata* (Willd) Schott (E-79)	Branches	Bruise, broncho-pneumonia	–	–	–	–	++
	RHAMNACEAE							
Palo colorado	*Colubrina glabra* S. Wats. (E-171)	Branches	Pneumonia, tonsilitis	++	+	+	–	–
Sarampión, palo negrito	*Condalia globosa* I.M. Jonhston var. *globosa.*(E-141)	Whole plant	Bruises and inflammation, burns, wounds, ulcered veins, rheumatism, to accelerate cases of measles	+	+	–	–	–
	ROSACEAE							
Cerezo capulín, cerezo	*Prunus serotina* Enrh. supsp. virens. (Wood & Standl.) McVaugh.(E-169)	Branches	Fever, cold, to fortify the blood	+++	–	–	–	–
Rosa de castilla	*Rosa chinensis* Jacq. (E-204)	Flower	Infected eyes, constipation and colics in children, diarrhea, stomach inflammation, stomachache, cough, cold laxative, to sleep	–	–	+	–	–
	RUBIACEAE							
Naranja agría	*Citrus aurantium* L. (E-72)	Branches	Stomachache and vomiting	+	+	–	–	–
	RUTACEAE							
Zapote blanco	*Casimiroa edulís* Hove and Lex. (E-193)	Branches	High blood pressure, tetanus, bruises wounds, nervousness, heart	–	–	–	–	++++
Ruda	*Ruta graveolens* L (E-149)	Branches	Earache, weakness, nervousness, sleeples, heart problems, headache, blood pressure, fever, colics, stomachache and gas, amoebas, cold, toothache, louse, abortion	–	+++	–	–	–

Table continues

Table (continued)

Local Name	Family Name Plant Name (Voucher Specimen)	Plant Part Tested	Medicinal Use	Antimicrobial Activity [a,b]				
				a	b	c	d	e
	SALICACEAE							
Alamo	*Populus fremontii* S. Wats (E-197)	Branches	Bruises, skin ulcer, leprosy	+	++	++++	−	−
Sauce	*Salix bonplandiana*. H.B.K. (E-202)	Branches	Anemia, cold	−	++	−	−	−
	SCROPHULARIACEAE							
Canutillo	*Russelia retrorsa* Geene f. *nudiscostata* Carlson. (E-162)	Whole plant	Kidney, cystitis urethritis, rheumatism, venereal diseases, blood circulation	−	−	−	−	−
	SOLANACEAE							
Bashata	*Lycium fremontii var. congestum* C.L. Hitchc. (E-242)	Branches	Headache, varicose veins, infection of the eyes, reumathism	+	−	−	−	−
Hierba de la vibora tomate de vibora, tomatillo	*Physalis phidelphica* Lam. (E-118)	Whole plant	For poison, blood, skin ulcer, leprosy	++	++	−	−	−
Copa de oro	*Solandra guttata* Don. (E-191)	Branches	Nervous, fever, cough	−	+	−	−	−
	STERCULIACEAE							
Hierba de la cangrena	*Hermania palmeri* Rose. (E-105)	Branches	Wounds difficult to close	−	−	−	−	−
	VERBENACEAE							
Salvavida, hierbabuena de castilla, valeriana, Poleo silvestre	*Lippia alba* (Mill.) N.E.Brown (E-155) (E-184) (E-194) (E-196)	Branches	Stomach ache or diarrhea, parasites, nervousness, headache, to control blood pressure, menstrual colics, abortion, after childbirth, toothache, weakness, teeth in children	++ − − −	− ++ − ++	+ − − −	− ++ − −	− − − −
Uvalamo	*Vitex mollis* H.B.K.(E-198)	Bark	To expel the placenta	−	+	−	−	−
	VITACEAE							
Parra	*Vitis vinifera* L. (E-230)	Branches	Headache	−	++	−	−	−
	ZYGOPHYLACEAE							
Guayacan	*Guaicaum unijugum* T.S. Brandegee. (E-227)	Aerial part	Rheumatism, cold	−	++++	++	−	−

[a]Grading of results: −, no zone of inhibition: +, zone of inhibition less than 10 mm in diameter; ++, zones of inhibition of 10 to 15 mm in diameter; +++, zone of inhibition 15 to 20 mm in diameter; ++++, zone of inhibition more than 20 mm of diameter.
[b]Test organisms: A, *Staphylococcus aureus*; B, *Bacillus subtilis*; C, *Streptococcus faecalis*; D, *Escherichia coli*; E, *Candida albicans*.
[c]Voucher specimen number: E-177b = Encarnación 177b.