



The Arenal Volcano. Photo ©2010 Steven Foster

PLANTS OF
SEMILLAS
SAGRADAS
By Rafael Ocampo and Michael J. Balick, PhD



Chaya *Cnidoscolus chayamansa* Photo ©2010 Steven Foster

Editor's Note: In 1994, Paul Schulick, founder of the herb and dietary supplement company New Chapter (Brattleboro, VT), established Finca Luna Nueva, an organic farm, in the volcanic rainforest of northern Costa Rica. Its mission is the organic production of tropical plants for use in New Chapter's products. A decade later, through the enthusiasm and commitment of three other individuals, Rafael Ocampo, Steven Farrell, and Thomas Newmark, along with the hard work of many local people, Semillas Sagradas—the Sacred Seed Sanctuary—was established on the grounds of Finca Luna Nueva. This sanctuary is now a place where a collection of over 300 species of medicinal plants grows, is studied by researchers, and enjoyed by visitors. Semillas Sagradas, the first in a movement of many similar gardens to be established around the world, is devoted to preserving the diversity of local and regional medicinal plants, as well as the traditional wisdom and cultural knowledge of healing herbs.

A book celebrating the plants of Semillas Sagradas was published in 2009, co-authored by Rafael Ocampo and Michael J. Balick, PhD, and edited by Ruth Goldstein and Katherine Herrera. Ocampo is a botanist, author, and technical advisor on many medicinal plant projects in Central America, and Dr. Balick is a noted ethnobotanist, author, and vice president and director of the Institute of Economic Botany at The New York Botanical Garden, as well as a long-time member of the ABC Board of Trustees. Their book, freely available online, profiles 30 of the plant species currently growing in the Semillas Sagradas garden at Finca Luna Nueva.

The authors and publishers of *Plants of Semillas Sagradas: An Ethnomedicinal Garden in Costa Rica* have kindly given the

American Botanical Council permission to excerpt passages on a few of the medicinal plant species profiled in the book. Those excerpts are reprinted here with only minor stylistic editing.

The American Botanical Council thanks the book's authors and publishers for sharing this content with *HerbalGram* and its readers. Those interested in learning more about the plants of the extraordinary Semillas Sagradas garden are encouraged to access the full text of the book at <http://fincalunanuevalodge.com/sacred-seeds/semillas-sagradas.pdf>. Some may even consider viewing the gardens in person. Visitors can make arrangements to stay at Luna Nueva Lodge while exploring the garden and its environs (<http://fincalunanuevalodge.com/>).

CNIDOSCOLUS CHAYAMANSA

Synonym - *Cnidocolus aconitifolius*

Family - Euphorbiaceae

Common names - chayamansa, chicasquil (Central America); chay (Maya Indians, Guatemala), chaya (Guatemala); chaya, chaya mansa (Mexico); tree spinach (English).

Description

A succulent shrub growing up to 2 m high. Leaves are round with 5 lobes, more broad than long, with abundant latex. Flowers white, small, less than 10 mm long, blooming frequently, with male and female flowers found together at the end of long stems and having a faintly unpleasant scent. Fruit pods are rounded and approximately 2.5 cm in width.

History and Traditional Use

This plant is an important food as well as a medicinal plant in the American tropics.^{1,2} There are 2 species, *Cnidocolus chayamansa* and *C. aconitifolium*, which are both edible and very similar in appearance. The former can be eaten raw, while the second needs to be cooked due to the presence of glycosides that are inactivated on cooking.

Cnidocolus aconitifolium present in Costa Rica is popularly known as chicasquil, a name of Nahuatl origin that could be derived from *zicatl* (ant) and *quilitl* (young shoot), in reference to the irritating hairs on the young parts of small branches. The young leaves are eaten cooked and are highly nutritious.³ The chayamansa (*C. chayamansa*) is a recent introduction that is more palatable and nutritious, having been brought from Mexico in the 1980s by Costa Rica's Ministry of Agriculture and Livestock. The chaya (*C. chayamansa*) is cultivated in the Yucatán and Peten in Guatemala.

In Costa Rica, greater genetic variety of the genus *Cnidocolus* is to be found in the Quitirrisí area of Puriscal and in Santa Cruz, Guanacaste. It is important to note that 5 types of chaya have been chronicled, 2 domesticated varieties and 3 wild ones. Of the first two, one has narrower leaves and is known by Mayan Indians in Mexico as *kekenshay* or *chaykeken*, and this seems to be the favorite not just because it has fewer thorns but also because it cooks better and is tastier. The wild varieties, known as *tzintzinchay*, have more thorns and longer leaves.⁴ The protein content of this

plant exceeds that found in such common vegetables as spinach and alfalfa.

In Yucatán, Mexico, this species is used medicinally to treat a wide variety of conditions through the stabilization of blood pressure, to reduce weight, increase available calcium, improve blood circulation, aid digestion, reduce eye irritations and the inflammation of veins and hemorrhoids, treat constipation, help in the expulsion of urine and breast milk, and to lower levels of cholesterol and uric acid. It is also used to prevent coughing, and as a decongestant and to disinfect lungs, to prevent anemia, improve memory and brain function, relieve arthritis, treat diabetes, and cure infections of the teeth, gums, and the tongue as well as skin diseases. It helps in the growth and development of bones and muscles in children and increases energy levels of women during menstruation.⁵

Pharmacology and Biological Activity

The raw leaf extracts in *Cnidocolus chayamansa* and the related species, *C. aconitifolius*, have been shown to have strong antioxidant activity due to the high concentrations of total phenolic content.⁶

Toxicity

Wild varieties can be harmful if eaten raw, due to their spines and their sap.

Conservation Status and Trade

There is no information available on the plant's conservation status. However, being commonly cultivated, it is assumed the species is not under threat. The plant has been promoted by national and international organizations as a dietary complement due to the high level of calcium in its leaves. It is sold on the international market in pickled form.

Chaya *Cnidocolus chayamansa* Photo ©2010 Steven Foster





PSYCHOTRIA IPECACUANHA

Synonym - *Calicocca ipecacuanha*, *Cephaelis ipecacuanha*, *Evea ipecacuanha*, *Uragoga ipecacuanha*

Family - Rubiaceae

Common names - raicilla, ipecacuana (Costa Rica); raicilla (Nicaragua); raicilla (Panama); poaia, ipecacuanha preta, ipecacuanha anelada, raíz preta, poaia do mato, ipeca do rio, ipeca de mato grosso (Brazil); raicilla (Colombia); ipecac (English).

Description

Small herbaceous plant 20–30 cm tall, with a thin, twisted, and slightly woody stem. Leaves opposite, oval-lanceolate. Flower small, white in a terminal inflorescence. Small oval fruit with blackish berries.

History and Traditional Use

Costa Rica, Nicaragua, Panama, and Colombia pioneered rational exploitation of the medicinal plant *Psychotria ipecacuanha*. The extract of the root of ipecacuana is used as an amoebicide, an emetic, and as an expectorant. Its main components are isoquinolic alkaloids, of which emetine is the most important for the pharmaceutical industry.⁷ In Europe, the use of ipecacuana as a plant-based drug dates back to 1762. In the 1940s it became one of the pharmaceutical industry's most important drugs in the United States and Europe.^{8,9} Since pre-Columbian times, ipecacuana was one of many plants used by indigenous populations in the American humid tropics. When Spaniards learned of the virtues

of its root, it was taken back to Spain, from where its use spread throughout Europe. The plant from Brazil was first mentioned by Purchas, the well-known traveler, in 1625. According to Fischer, it was introduced into European medicine in 1686 when King Louis XIV of France bought the secret remedy from a charlatan called Hervetius, who successfully used the remedy to treat diarrhea and dysentery and discovered that the ipecacuana was the main ingredient.¹⁰ It was not until 1817 that Pelletier and Magendie discovered emetine, the main alkaloid.⁷

Ipecacuana has been and continues to be an irreplaceable drug. It is also to be noted that the synthetic drug does not have the same medicinal properties as that extracted directly from the plant, especially when this plant-based drug is derived from plantations.¹¹ García-Barriga refers to its cultivation as a result of depletion of wild populations.¹² Morton reports on its origins in tropical forests between Bolivia and Brazil and notes its cultivation in Nicaragua, Costa Rica, and Panama.⁹ It is currently cultivated in Nicaragua and Costa Rica.¹³

Ipecac *Psychotria ipecacuanha* Photo ©2010 Steven Foster



The rhizomes and roots of this species are used in syrup form as an expectorant in Costa Rica, in powdered form as a diaphoretic, and in higher doses, also in syrup form, as an emetic. Nuñez mentions its effectiveness in treating amoebic dysentery, alveolar pyorrhea, and other amoebal infections, as well as the slight effect cefaline, one of the plant's alkaloids, has as an antitussive and expectorant when taken as a syrup.¹⁴ Gupta notes that in Brazil it is said to be effective against diarrhea, as an expectorant and an amoebicide, that it is also used in treating bronchitis and amoebic dysentery, and for its antitussive and sudorific properties.¹⁵ In Colombia, the root of ipecacuana is used in small doses as a repulsive to stimulate intestinal movements and in higher doses to provoke vomiting.¹²

Pharmacology and Biological Activity

Gupta indicates that the latex/sap is used to make a syrup to treat accidental poisoning in children, but that the fluid extract of ipecacuana should not be used to induce vomiting.¹⁵ Emetine hydrochloride is the medicine of choice for hepatic amoebiasis,¹⁶ and Trease and Evans report on the compound being extensively used in the treatment of amoebic diseases and alveolar pyorrhea.⁷ Morton also reports on it having an expectorant effect and its use in various cough medicines.⁹ Emetine is a protein synthesis inhibitor, and in doses over 1 g administered over a long period, it can cause myositis at the injection site, diarrhea, sickness, hypotension, dyspnea, palpitations, hematuria, circulatory collapse, and present neuromuscular symptoms.¹⁵ According to Morton it can also cause itching and inflammation of the skin.⁹ The aqueous extract of the root has shown strong anti-viral activity against type 2 herpes, A2 influenza, type 2 poliomyelitis, and vaccinia (small pox virus).¹⁵ It is a plant that is widely used in homeopathy and by the pharmaceutical industry.

Toxicity

Ipecacuana powder is a respiratory irritant, and repeated exposures can cause rhinitis (a type of sinus allergy) and asthma.¹⁵

Conservation Status and Trade

Populations of this species in Colombia and Costa Rica had already disappeared by the 1970s and were replaced by cultivated plots.¹² Despite its economic and historic importance, there are no studies to shed light on its conservation status.¹³ Costa Rica and Nicaragua are the only countries that have cultivated ipecacuana under forest cover since the 1950s. It was previously harvested from the wild, causing conflict with indigenous populations who also used the plant. The plant has now disappeared from the wild, and various attempts to substitute the naturally occurring medicinal components with synthetic preparations have been unsuccessful due to the quality of cultivated material. Both Costa Rica and Nicaragua are currently producers of raw material for the international market due to the quality of their rootstock. In 2006, the European industry was eagerly seeking new sources of the raw material from producer countries as supply had fallen as low prices paid in earlier years had discouraged farmers who grew this crop.



QUASSIA AMARA

Synonym - *Quassia alatifolia*, *Quassia officinalis*

Family - Simaroubaceae

Common names - kini, quiniclu (Bribri Indians, Costa Rica), kinina (Cabecar Indians, Costa Rica), hombre grande, big man (Costa Rica); cuasia (Mexico); hombre grande, palo grande (Guatemala); cuasia, hombre grande, limoncillo, tru (Honduras); hombre grande, chile de río, chirrión de río (Nicaragua); guabito amargo, crucete, hombre grande (Panama); cuasia, bitter-ash (West Indies); cuasia amarga (Bolivia); pau quassia, quina, falsa quina, murubá, murupa (Brazil); cuasia, creceto morado, contra-cruceto (Colombia); quashiebitters, quassia-bitters (Guyana); amargo, cuasia, simaba (Peru); surinam quassia (English).

Description

A shrub or treelet growing to 6 m, with a stem reaching 10 cm in diameter. Leaves pinnately compound, 5–11 cm long by 4–7 cm wide, obovate to oblong, dark green on upper surface, slightly pale on the underside. Flowers in thin panicles, red with pink base, petals 2.5–4.5 cm long. Fruits black, 1.5 cm oblong, each with one seed.

History and Traditional Use

During the 18th century, a Surinamese man called Quassi acquired fame in treating fevers with a secret treatment using this plant, the medicinal reputation of which spread throughout Europe after Rolander took it to Sweden in 1756. Linnaeus later identified this plant as *Quassia amara*, in reference to Quassi and its bitter taste. Calolus M. Blom published its first description in 1763,^{17,18} referring to it as *Lignum quassiae*, and it became highly popular as a febrifuge, a tonic, and to treat dysentery.

Quassia amara is a traditionally used medicinal plant, known for its bitter properties and its qualities as a tonic by indigenous populations in South America.¹⁹ Pittier noted it as being “very scarce in dry forests in Costa Rica’s Pacific region and one of the main remedies used by Indian communities. They break the trunk into 30–60 cm pieces, one of which they take with them on their travels, and occasionally manage to sell in markets in the interior, being used for fevers, and an infusion of the grated pieces being taken as an aperitif.”²⁰

Historically, the wood of *Quassia amara* has been confused with another bitter species, *Picrasma excelsa*, commonly referred to as Jamaican quassia, quássia-das-Antillas, quássia-nova, and lenhodesan martín, which is widely used as a medicinal plant in Jamaica and other Caribbean islands.⁷ The most widely used common name for *Quassia amara* in Latin America is cuasia, followed by *hombre grande* (big man), the latter not in fact corresponding to any particular characteristic of the species. The internationally used common name is Surinam quassia. The vernacular names used by indigenous groups in Costa Rica—quiniclu, kini, and kinina—have a common denominator in that they all refer to the bitter taste of its tissue and to quinine (*Cinchona* spp.) that is also bitter.

According to Taylor, the common names of quassia amarga and quassia amer have been used to refer to *Simarouba amara* and *S. glauca*, of the family Simaroubaceae, which has amoebicidal properties.²¹ In Argentina *Q. amara* has also been confused with other species of bitter wood, and specifically the family Simaroubaceae (*Picrasma crenata*) present in the humid subtropical region of Misiones. According to Oliveira, Akisue, and Akisue, the name Quássia-do-Brasil refers to the species *Picrasma crenata*, which has a variety of other common names, including quássia amarga, pau-tenente, pau-amarelo, and pau-quassia.²² Two species exist in

Brazil: *Q. amara*, known as false quinine, which grows wild in the humid Amazonian region of Belén and Pará, and *Picrasma crenata*, also known as *Aeschryon crenata* and commonly known as Pau-amarelo, which grows wild in Mata Atlântica. Morton refers to the use of *Picramnia antidesma*, a small shrub common to forest undergrowth and known as *hombre grande* and *cascara amarga* in Central America, the Caribbean, and Mexico.⁹

Plants characterized by the presence of bitters in their tissues are important natural resources in traditional remedies but have given rise to considerable confusion when establishing their botanical identity. However, it is clear that although there is no confusion in the traditional use of *Q. amara* for medicinal purposes in the tropics, misunderstandings have arisen in literature due to confusing local names and the lack of access to botanical specimens.²³

An infusion of the macerated wood is used as a bitter tonic in Costa Rica to stimulate the appetite and to treat diarrhea. It is considered to be effective in treating fever, and liver and kidney stones, as well as in treating weakness of the digestive system.^{24,25} In Panama an infusion of the wood is used as a febrifuge, for the liver, and for snake bites,²⁶ and in Brazil it is used to combat dysentery, dyspepsia, intestinal gases, vesicular colic, malaria, and as a febrifuge.^{9,15} In Peru an infusion of the bark is used as a febrifuge and to treat hepatitis, and it is also macerated in water or alcohol, used as a tonic;²⁷ and in Colombia as a bitter for dyspepsia, anorexia, and malaria.¹² In Honduras the boiled bark is used for stomachache, diabetes, urinary problems, diarrhea, and migraine, and to fortify the blood,²⁸ and in Nicaragua the root is used for snakebites. For this a 20 cm piece of root is crushed, water is added, and then the liquid strained and drunk; and for malaria, 2 ounces of the bark are cut, boiled in water, and drunk 3 times daily.^{29,30} Barnes, Anderson, and Phillipson refer to its being used as a gastric stimulant and as having anthelmintic properties.³¹ It has been traditionally used for anorexia, dyspepsia, and nematode infestations (taken orally or rectally). A dose between 0.3 and 0.6 g of dry wood in an infusion is recommended 3 times a day.

Pharmacology and Biological Activity

The aqueous extract of *Quassia amara* wood, used to evaluate intestinal movement in mice (doses of 500 and 1,000 mg/kg), results in an increase in intestinal motility when compared with the control group, only in the case of the highest dose.³² Another study shows that doses of both 500 mg/kg and 1,000 mg/kg result in increased intestinal movement.³³ The same authors find that the aqueous extract, independently of the dosage, shows important activity in protecting against gastric lesions caused by indomethacin, ethanol, and stress. Teixeira et al. refer to a personal communication with S.C. Oliveira, who carried out an *in vitro* study with aqueous solutions obtained from the lyophilized leaves of *Q. amara* that showed activity against types of erythrocytic *Plasmodium*



Surinam quassia *Quassia amara* Photo ©2010 Steven Foster



Surinam quassia *Quassia amara* Photo ©2010 Steven Foster

falci-parum in concentrations of 0.05mg/ml and 0.125 mg/ml.³⁴ Barnes, Anderson, and Phillipson refer to quassinoids present in *Q. amara* wood being 50 times more bitter than quinine.³¹

Toxicity

Research on the acute toxicity of *Quassia amara* wood was carried out in Costa Rica on NGP-UCR albino mice. Two tests involved oral administration and intraperitoneal injection. The first test showed no mortality or evident signs of toxicity after 48 hours of observation. The results of the second test with a dose of 500 mg/kg showed signs of piloerection, a reduction in motor activity, and a partial loss of righting reflex. All test subjects recuperated 24 hours after the extract had been administered. Similar signs were apparent with the 1,000 mg/kg dose, but all animals died within 24 hours after being administered the raw aqueous extract.³² Another bioassay carried out on the lethality of *Artemia salina* containing an ethanolic extract of the chloroformic (alkaloidal) fraction of *Q. amara* wood, shows a high level of toxicity.³⁵ Cáceres refers to a study carried out by Njar et al. on reproductive toxicity;^{36,37} methanolic extract of the bark administered orally to rats at doses of 100, 1,000, and 2,000 mg/kg over 8 weeks significantly reduces testicle weight, epididymo, seminal vesicle and sperm count, and increases the size of the pituitary gland. No changes were noted in sperm motility or morphology. The levels of serum testosterone, luteinizing hormone (LH), and follicle stimulant hormone (FSH) were significantly reduced. The levels of testosterone do not vary within the groups that had been administered with the extract plus LH and quassin plus LH, compared with the control group. No relationship was shown between dose-

dependence and the administered doses. All the effects disappear 8 weeks after suspension of treatment. No lethal effects were found on Leydig cells *in vivo* and *in vitro*.³⁷ The chloroformic extract in doses of 12.5, 25, 50, and 100% were administered to rats once a day for 15 days. No behavioral or body weight changes were noted in the animals during treatment with any of the dilutions. Testicular weight and the epididymo were reduced through dose-dependent treatment. The sperm parameters of the epididymo presented evidence of toxicity related to the dose in that there was a significant decrease in sperm count, motility, and the viability and morphology of the sperm.³⁸

Conservation Status and Trade

Although there are no studies on the conservation status of wild populations in the region, Ribero et al. refer to its endangerment in Brazil.³⁹ The 20th century saw a marked reduction in wild populations as a result of trade, and in 1998 it was observed that raw material entering Germany from the Americas was no longer *Q. amara* wood. Its substitution with other bitter raw materials of the Simaroubaceae family is a clear indicator that the species is under threat and, according to Ocampo and Díaz, justifies the development of agroecological cultivation models in Costa Rica.²⁵

The wood and bark of *Q. amara* are sold on local markets for medicinal use and as tinctures through herb stores in the tropics,⁴⁰ and the wood and dry bark have been commercialized in large volumes on the international market as chips for pest control.²⁵ For example, in 2006 a small trader from Germany requested 3 tons of the dried wood from Costa Rica.

UNCARIA TOMENTOSA

Synonym - *Nauclea aculeata*, *Nauclea tomentosa*, *Ourouparia tomentosa*,
Uncaria surinamensis, *Uncaria tomentosa* var. *dioica*

Family - Rubiaceae

Common names - rangallo, bejuco de agua (Costa Rica); uña de guara (Honduras); rangaya (Panama); unha de gato (Brazil); bejuco de agua, tua juncara, uña de gato (Colombia); uña de gato (Ecuador); samento and unganangui (Ashaninka Indians, Peru), pao tati mosha (Shipibo–Conibo Indians, Peru), uña de gato, uña de gavilán, garra gavilán, garabato amarillo, garabato colorado, (Peru); uña de gavilán (Venezuela); cat's claw (English).

Description

Climbing vine reaching 30 m in the rainforest canopy, with a stem diameter up to 30 cm. Branches have strong, sharp woody thorns, curved downwards like cats' claws, reaching 2 cm in length and 0.4–0.6 cm wide. Leaves ovate or elliptical, 9–17 cm long by 4.3–9.0 cm wide. Terminal or axillary inflorescence reaching 9 cm length. Flowers sessile, yellowish in color.

History and Traditional Use

According to Barnes et al., the root, bark of the root and stem, and the leaves of *Uncaria tomentosa* are employed for traditional medicine.³¹ In Peru the plant is used to treat inflammation in organs and/or organ systems such as arthritis, dermal inflammations, genitourinary tracts, asthma, gastric ulcers, and diabetes.⁴¹ Gupta refers to its use in treating malignant tumors, rheumatism, arthritis, diabetes, and cirrhosis.¹⁵ Two spoonfuls of the plant are boiled in 1.5 l of water for 30 minutes; the liquid is strained and cooled, and half a glass is drunk 3 times a day before meals.

The Shipibo-Conibo indigenous population in Yarinacocha, of the Ucayali department in Peru, refer to *Uncaria tomentosa* as *pao tati mosha*, *paoti* meaning curved, and *mosha* meaning thorn. Reference is made to a variety of uses such as venereal diseases, gastric and intestinal ulcers, kidney problems, and snakebites for which the juice of the fresh vine or the liquid from boiled bark is drunk. In the case of snakebites, the fresh bark is also grated and applied as a poultice. The abundant, slightly bitter juice (water) of the vine can be drunk to quench the thirst, which also has medicinal properties.⁴²

According to Schultes and Raffauf, in Guayana the juice from the boiled bark is used in the treatment of dysentery,⁴³ and EMBRAPA reports the bark being commonly used in Brazil against diarrhea, cystitis, gastritis, diabetes, and viruses.⁴⁴

Pharmacology and Biological Activity

Among the isolated compounds, pentacyclic oxindolic alkaloids were shown to have immuno-stimulatory and

inhibitory effects on the growth of leukemia cells,⁴⁵ and according to Wagner, Kreutzkamp, and Jurcic, the isolated alkaloids cause a considerable increase in phagocytosis.⁴⁶ The aqueous or ethanolic extracts also show cytostatic action, as well as having contraceptive and anti-inflammatory capacities.⁴⁷ The anti-inflammatory activity in free extracts of the tannins⁴⁸ and the anti-viral activity⁴⁹ have confirmed these results. This plant decreases inflammation in osteoporosis, and the mechanism appears to involve the ability of the plant extract to inhibit the protein called tumor necrosis factor- α (TNF- α), as well as acting as an antioxidant.⁵⁰

Toxicity

There is no reported cytotoxic effect on bacterial cells in the following concentrations: 10, 20, 30, 40, 50, 75, and 100 mg/ml.⁴⁵

Conservation Status and Trade

The boom for cat's claw on national and international markets has given rise to massive harvesting from wild populations with devastating effects, especially in Peru. Although conservation strategies have resulted, no studies exist to determine its conservation status.

Information is available on trade in Colombia, but no reference is made to volumes and prices.⁵¹ In Brazil, Silva et al. refer to internal trade and export, but make no reference to volumes or prices.⁵²

Peruvian statistics on production and trade collected by the National Institute for Natural Resources (INRENA) indicate that cat's claw started acquiring commercial value on national and international markets in 1992 when various marketing channels emerged. In 1995, INRENA issued 400 permits for the commercialization of the plant, and it was in that same year that the volume traded reached 726,684 kg—of which 89% was bark—exported to 24 countries and resulted in a sudden increase in the extraction. However, this was followed by a slump in international demand, due to market saturation and excessive reserves at the main collection points.⁵³ HG



Cat's Claw *Uncaria tomentosa* Photo ©2010 Steven Foster

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Cat's claw *Uncaria tomentosa* Photo ©2010 Steven Foster