



The Sabal

Sucrose-Free Sips Suit Acacia Ants

by Elizabeth Pennisi

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The thorny acacia tree has strong allies: vicious, centimeter-long ants whose nasty bite scares off plant-eating animals and also humans. In return for defending acacias, the ants get free meals and places to live. The key to this sweet deal is the sucrose-free nectar provided by the plant, says Martin Heil, an ecologist at the Max Planck Institute for Chemical Ecology in Jena, Germany. As he and his colleagues report in

Science Vol 308(5721):560-563, April 2005 a sucrose-degrading enzyme produced by the acacia customizes its nectar to appeal to the right ant partners. The defensive-minded ants that protect the tree prefer their nectar without sucrose, while other ants do not, the researchers found.

Furthermore, the acacia ants have actually decreased their own production of the same sucrose-degrading enzyme, reinforcing this particular pairing of insect with plant. The work “gives one of the first examples of a biochemical basis for behavior difference in plant-insect

mutualisms,” says Robert Thornburg, a biochemist at Iowa State University in Ames. “It shows that coevolutionary trends can be underlain by biochemistry.”

Biologists have documented many cases of coevolution, wherein two species provide for each other and through time develop mutual dependency. Researchers have long known that acacias and *Pseudomyrmex* ants co-mingle: The ants fend off herbivores and in return live inside the safety of *Acacia*’s thorns and eat the plant’s nectar. Because each seedling must reestablish this relationship, the plant must have a way to attract the right ants, Heil explains.

Wilhelm Boland, a chemist at the Jena institute and Heil’s collaborator, proposed that the key lies in the seedling’s extra floral nectar. Working at two sites in Mexico, Heil exposed *Pseudomyrmex* ants and other ants to nectars from four swollen-thorn acacia species and from three other *Acacia* species that don’t depend on the specialized ants. He also tested all the ants’ preferences for solutions containing varying kinds and amounts of sugar.

All 11 of the ant species that don’t live on swollen-thorn acacias bypassed those trees’ nectar, whereas the two species of acacia specialists went right to it and, for the most part, rejected the other nectars. The various ants

differed in their tastes for the sugar mixtures as well, says Heil. The nonresident ants headed for solutions filled with sucrose, whereas the acacia ants lapped up solutions lacking this particular sugar. When Heil’s team added sucrose to the swollen-thorn acacia’s nectar, the two groups of ants switched roles.

Heil and his colleagues attribute the sucrose-depleted nectar of the acacia to an enzyme called invertase, which is secreted into the nectar by the plant and breaks down sucrose into glucose and fructose. Invertase activity was 10 times greater in the nectar of the swollen-thorn acacias than in the nectar of plants that don’t have ant partners.

“This study reveals that specificity can be achieved relatively simply,” says Anurag Agrawal, an ecologist at Cornell University. He predicts that other organisms also home in on the sucrose-poor nectar and coexist with the ant-plant pair. “Though the relationship is specific, it is unlikely to be purely a two-species interaction,” says Agrawal.

Diane Davidson, a tropical ecologist at the University of Utah in Salt Lake City, calls the Heil study “rigorous” but wonders if the acacia’s ant partners add sucrose-degrading microbes to the nectar. Other strategies could also be used by acacias, she notes. For example, some plants secrete wax that only specialized “wax runner” ants can travel on.

Nonetheless, says Thornburg, Heil and his colleagues “are actually starting to get to the mechanisms” of mutualism. How sweet.



Feeding station. In return for fending off the acacia’s enemies, ants feast on its nectar-filled globules.

CREDIT: M. HEIL *ET AL.*

Lives of a Forest

Science 22 April:479

If a tree falls in the moist tropical forest of Panama’s Barro Colorado Island, ecologists at the Smithsonian Tropical Research Institute (STRI) might not hear it. But they will find out, thanks to their regular surveys of the locale, which began in 1981. Now anyone can download 20 years’ worth of data from this project to monitor tropical trees. About every 5

years, STRI researchers have fanned out through a 50-hectare plot on the island, counting, measuring, and mapping every tree above chest height. The census has tracked more than 350,000 trees from 300 species, including the golden guayacan (*Tabebuia guayacan*), and is one of the longest-running ecology studies, says group leader Richard Condit. After filling out a short questionnaire, visitors can download data from the first four surveys and use them to calculate values such as mortality and growth rates for different species. Website: ctfs.si.edu/datasets/bci



Birding Festival, Butterfly Festival, and Nature Festival Plant Materials List

Plant materials list recommended for sale by the Native Plant Project during the Birding Festival (Harlingen, TX in November), the Butterfly Festival (Mission, TX in October) and the Nature Festival (McAllen, TX in March).

Birding Festival Plants

Common Name	Scientific Name	Form
Brasil	<i>Condalia hookeri</i>	Shrub
Brush Holly	<i>Xylosma flexuosa</i>	Shrub
Cenizo	<i>Leucophyllum frutescens</i>	Shrub
Chilipiquin	<i>Capsicum annuum</i>	Shrub
Colima	<i>Zanthoxylum fagara</i>	Shrub
Coral Bean	<i>Erythrina herbacea var. arborea</i>	Shrub
Desert Yaupon (Capul)	<i>Schaefferia cuneifolia</i>	Shrub
Drummond's Turks Cap	<i>Malvaviscus drummondii</i>	Shrub
Manzanita (Barbados Cherry)	<i>Malpighia glabra</i>	Shrub
Potato Tree	<i>Solanum erianthum</i>	Shrub
Shrubby Blue Sage	<i>Salvia ballotiflora</i>	Shrub
Sierra Madre Torchwood	<i>Amyris madrensis</i>	Shrub
Skeltonbush	<i>Viguiera stenoloba</i>	Shrub
Tamaulipan Fiddlewood	<i>Citharexylum berlandieri</i>	Shrub
Torrey's Croton	<i>Croton incanus</i>	Shrub
Anacua	<i>Ehretia anaqua</i>	Tree
Anacahuita (Mexican Olive)	<i>Cordia boissieri</i>	Tree
Cedar Elm	<i>Ulmus crassifolia</i>	Tree
Chapote (Texas Persimmon)	<i>Diospyros texana</i>	Tree
Sugar Hackberry	<i>Celtis laevigata</i>	Tree
Texas Ebony	<i>Chloroleucon ebano</i>	Tree
Texas Huisache	<i>Acacia minuata</i>	Tree
Texas Sabal Palm	<i>Sabal mexicana</i>	Tree
Betony Mistflower	<i>Conoclinium betonicifolium</i>	Herbaceous
Pigeon-berry	<i>Rivina humilis</i>	Herbaceous
Tropical Sage	<i>Salvia coccinea</i>	Herbaceous
Variegated Huaco	<i>Manfreda variegata</i>	Herbaceous
Snapdragon Vine	<i>Maurandya antirrhiniflora</i>	Vine

Butterfly Festival Plants

Common Name	Scientific Name	Form
Blue Boneset	<i>Eupatorium azureum</i>	Shrub
Brushland/Desert Lantana	<i>Lantana achyranthifolia</i>	Shrub
Crucita	<i>Chromolaena odorata</i>	Shrub
Drummonds's Turk's Cap	<i>Malvaviscus drummondii</i>	Shrub
Michele's/Hammocks Lantana	<i>Lantana canescens</i>	Shrub
Low Croton	<i>Croton humilis</i>	Shrub
Mexican Trixis	<i>Trixis inula</i>	Shrub
Oregano	<i>Lippia graveolens</i>	Shrub
Shrubby Blue Sage	<i>Salvia ballotiflora</i>	Shrub
Skeltonbush	<i>Viguiera stenoloba</i>	Shrub
Sweet Stem	<i>Aloysia macrostachya</i>	Shrub
Texas Lantana	<i>Lantana urticoides</i>	Shrub
Vasey's Adelia	<i>Adelia vaseyi</i>	Shrub
Whitebrush	<i>Aloysia gratissima</i>	Shrub
Anacahuita (Mexican Olive)	<i>Cordia boissieri</i>	Tree
Betony Mistflower	<i>Conoclinium betonicifolium</i>	Herbaceous
False Honeysuckle	<i>Justicia pilosella</i>	Herbaceous
Silky-Leaf Frogfruit	<i>Phyla strigulosa</i>	Herbaceous
Trailing Mistflower	<i>Fleishmannia incarnata</i>	Herbaceous
Tropical Sage	<i>Salvia coccinea</i>	Herbaceous
White Plumbago	<i>Plumbago scandens</i>	Herbaceous
Balloon Vine	<i>Cardiospermum halicacabum</i>	Vine
Blue Passion Flower Vine	<i>Passiflora foetida</i>	Vine
Corky Stemmed Passion Flower-Vine	<i>Passiflora suberosa</i>	Vine

Nature Festival Plants

Common Name	Scientific Name	Form
Brush Holly	<i>Xylosma flexuosa</i>	Shrub
Cenizo	<i>Leucophyllum frutescens</i>	Shrub
Chilipiquin	<i>Capsicum annuum</i>	Shrub
Colima	<i>Zanthoxylum fagara</i>	Shrub
Cortes' Croton	<i>Croton cortesianus</i>	Shrub
Drummond's Turk's Cap	<i>Malvaviscus drummondii</i>	Shrub

Hachinal	<i>Heimia salicifolia</i>	Shrub
Michele's/Hammocks Lantana	<i>Lantana canescens</i>	Shrub
Low Croton	<i>Croton humilis</i>	Shrub
Manzanita (Barbados Cherry)	<i>Lippia graveolens</i>	Shrub
Mescal Bean (TX Mnt Laurel)	<i>Sophora secundiflora</i>	Shrub
Oregano	<i>Malpighia glabra</i>	Shrub
Shrubby Blue Sage	<i>Salvia ballotiflora</i>	Shrub
Sierra Madre Torchwood	<i>Amyris madrensis</i>	Shrub
Sweet Stem	<i>Aloysia macrostachya</i>	Shrub
Tamaulipan Fiddlewood	<i>Citharexylum berlandieri</i>	Shrub
Texas Lantana	<i>Lantana urticoides</i>	Shrub
Vasey's Adelia	<i>Adelia vaseyi</i>	Shrub
Yellow Sophora	<i>Sophora tomentosa</i>	Shrub
Anacahuita (Mexican Olive)	<i>Cordia boissieri</i>	Tree
Anacua	<i>Ehretia anaqua</i>	Tree
Cedar Elm	<i>Ulmus crassifolia</i>	Tree
Chapote (Texas Persimmon)	<i>Diospyros texana</i>	Tree
Sugar Hackberry	<i>Celtis laevigata</i>	Tree
Tenaza	<i>Pithecellobium pallens</i>	Tree
Texas Ebony	<i>Chloroleucon ebanum</i>	Tree
Texas Sabal Palm	<i>Sabal mexicana</i>	Tree
Betony Mistflower	<i>Conoclinium betonicifolium</i>	Herbaceous
Silky Leaf Frogfruit	<i>Phyla strigulosa</i>	Herbaceous
Chisme	<i>Portulaca pilosa</i>	Herbaceous
Orange Zexmenia	<i>Wedelia texana</i>	Herbaceous
Purple Ground Cherry	<i>Quincula lobata</i>	Herbaceous
Tiny Tim	<i>Dyssodia tenuiloba</i>	Herbaceous
Tropical Sage	<i>Salvia coccinea</i>	Herbaceous
White Germander	<i>Teucrium cubense</i>	Herbaceous

Native Plant Rescue: **The Valley Nature Center** will rescue native plants about to be destroyed by construction companies, developers, or no longer wanted by home owners. Call 956-969-2475.

Exclusively Native plant sources:

Benito Trevino, Landscaper/Grower, Rio Grande City 487-4626

Valley Nature Center -- Native Plants, Weslaco 969-2475

Richard Holverson, Plants and Consulting, La Feria 797-2102

Mother Nature's Creations, Harlingen 428-4897

The Sabal is the Newsletter of the Native Plant Project and conveys information on the native habitats, and environment of the Lower Rio Grande Valley Texas. Co-editors: Gene Lester and Eleanor Mosimann. **You are invited to submit articles for *The Sabal*.** They can be brief or long. Articles may be edited for length and clarity. Black and white line drawings -- and colored photos or drawings -- with or without accompanying text are encouraged. We will acknowledge all submissions. Please send them, preferable in electronic form - either Word or WordPerfect, to: Native Plant Project, P.O. Box 2742, San Juan, TX 78589 or contact Gene Lester @ 956-425-4005, or g_lester48@msn.com. See *The Sabal* and our 4 handbooks on the

website. www.nativeplantproject.org

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Native Plant Project Annual Membership Application Form

Regular \$15 per year Contributing \$35 per year Lifelong \$250 one time fee per individual. Members are advised of meetings, field trips, and other activities through *The Sabal*. Dues are paid on a calendar year basis. Send checks to Native Plant Project, P.O. Box 2742, San Juan, Texas 78589.

Name _____

Address _____

City/State/Zip _____

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New Renewal Address Change

Comments/ suggestions/ speaker recommendations should be sent to: Native Plant Project, P.O. Box 2742, San Juan, TX 78589 or contact G. Lester @ 956-425-4005 or g_lester48@msn.com

Native Plant Project Meetings – No Board or General meetings are scheduled until September 27, 2005 when Jim Everitt will give a program on cacti.

Board and General Meeting 2005:

January 25 September 27
February 22 October 25
March 22 November 22
May 24

Board Meeting Only 2005:

April 26 December 27

Highlights of the NPP Board Meeting on May 24, 2005: Summary of the Minutes of the Native Plant Project Board Meeting May 24, 2005. Summary of the Minutes of the NPP Board of Directors Meeting May 24, 2005 The board approved a donation of up to \$400 to the NABA International Butterfly Park for materials and signage for a rare plant garden. The board approved a donation of \$1000 to the Valley Nature Center for its building fund in appreciation for the use of the VNC for NPP meetings over many years.

Native Plant Project
P.O. Box 2742
San Juan, TX 78589



