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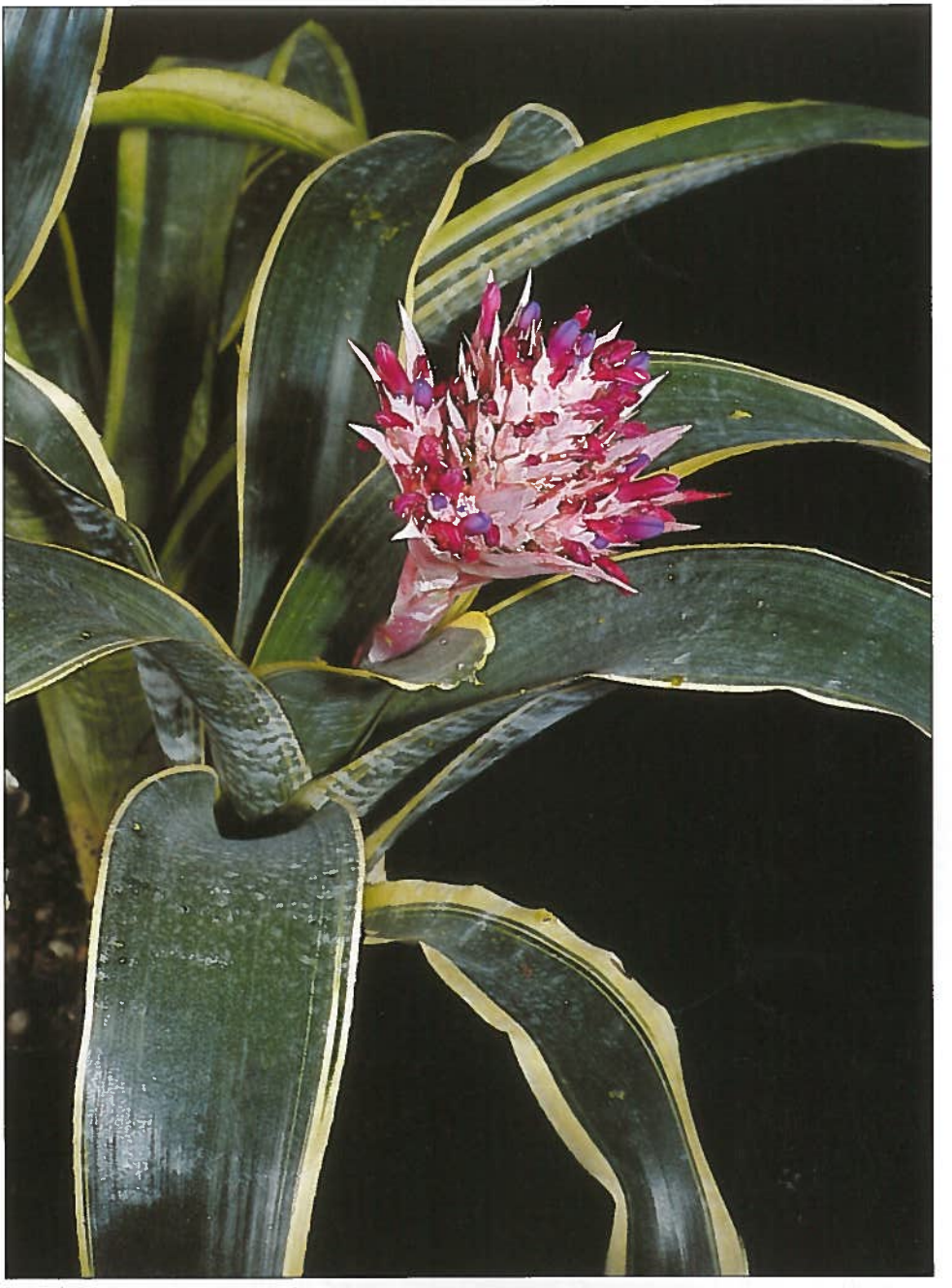
Journal of The Bromeliad Society



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Cover photographs. Front: Front: *Aechmea fasciata* 'Albomarginata.' Photograph by Marcel Lecoufle. **Back:** *Guzmania musaica* inflorescence showing damage caused by weevils in the genus Cholus. Text begins on page 172. Photograph by Simon Pierce.

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Two Apple-green New Species from Southeastern Brazil

Elton M. C. Leme[1] & Bruno Rezende Silva[2]

Neoregelia ruschii **Leme & B. R. Silva, sp. nov.** (Figures 1, 2, and 5)

A *N. petropolitana* Leme, cui affinis, laminis foliorum subduplo angustioribus, dense vel subdense spinulosis, spinulis basalibus atrocastaneo-purpureis, sepalis brevioribus, obtusis differt.

TYPE: Brazil. Espírito Santo State, Santa Teresa, Reserva Biológica de Santa Lúcia, way from Mata de Areia to Ruschi Memorial, 27 Apr. 2000, leg. *E. Leme 4896, B. R. Silva, C. Nicoletti, M. Zonnoni, E. Colnago & K. Green,* fl. cult. Dec. 2000. Holotype: HB. Isotype: MBML. Paratype: *E. Leme 4894, B. R. Silva 309, C. Nicoletti, M. Zannoni, E. Colnago & K. Green,* fl. cult. Nov. 2000 (HB).

Plant epiphytic, propagating by short basal stolons. **Leaves** 15–18 in number, suberect at anthesis, forming a narrow, lax to subdense funnelform rosette. **Sheaths** elliptic to obovate, 8–9 × 5.5–6.5 cm, subdensely and inconspicuously pale-lepidote on both sides, purplish inside and toward apex. **Blades** linear, very inconspicuously if at all narrowed at base, 14–26 × 2–2.6 cm, very inconspicuously and sparsely white-lepidote, light green, lustrous, thinly chartaceous in texture, margins sometimes slightly undulate toward base, densely to subdensely spinulose, spines slightly antrorse, 0.5–1 mm, 2–8 mm apart, the basal ones dark purplish-brown, apex acute to rounded and slenderly apiculate, apiculous 2–3 mm long. **Scape** 2–3 cm long, 0.7–0.8 cm in diameter, glabrous, white. **Scape bracts** ovate to oblong-ovate, acute and apiculate, entire to spinulose at apex, membranaceous, glabrous, the upper ones (involucral bracts) ca. 30 × 17 mm, about equaling the pedicels. **Inflorescence** capitate, simple, umbellate, deeply sunk in the center of the rosette, ca. 45 mm long, 25–30 mm in diameter, densely flowered. **Floral bracts** linear, acute and minutely apiculate, 15–22 × 2–7 mm, equaling to slightly shorter than the pedicels, membranaceous, glabrous, entire, ecarinate. **Flowers** 13 to 30 in number, ca. 52 (–60) mm long (with petals extended), fragrant, pedicels 20–23 (–30) mm long, 1.5–2 mm in diameter, distinctly more developed in the anthetic flowers and protruding them from the rosette higher than the pre-anthetic ones, sparsely and pale lepidote, subterete toward apex, slightly complanate at base. **Sepals** asymmetric, subelliptic, obtuse, 11–12 × 5–6 mm, connate at base for 3–4 mm, entire, ecarinate, reddish-punctulate to dark red toward apex, glabrous. **Petals** narrowly subspathulate, narrowly acute, 21–25 × 4–6 mm, connate at base for 4–5 mm, spreading-recurved at anthesis, whitish toward base except for the lilac apex,

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[2] Uiversidade Federal do Rio de Janeiro, Museu Nacional, Departamento de Botânica, Quinta da Boa Vista, São Cristóvão, Rio de Janeiro, RJ, CEP 20940-040e-mail: brunorez@mn.ufrj.br

E. Leme

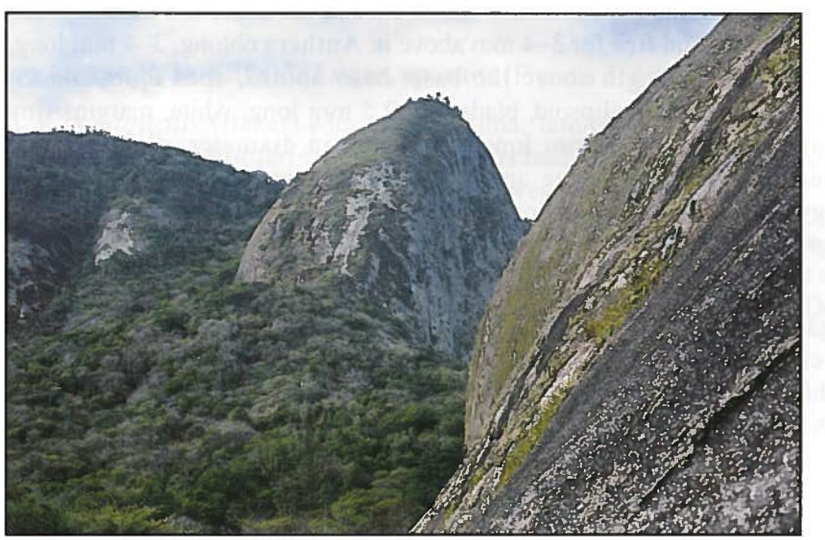
Figure 1: *Neoregelia ruschii*: type-specimen in bloom.

Figure 2: *Neoregelia ruschii*: close up on flowers

E. Leme

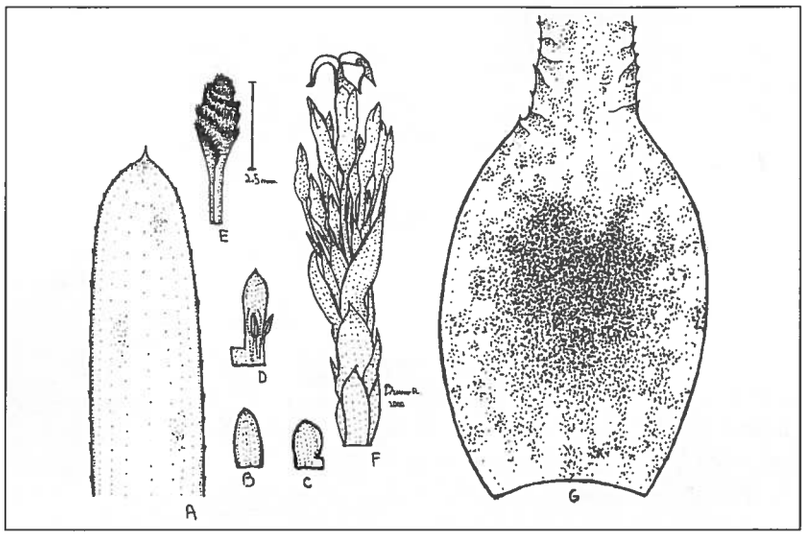
E. Leme

Figure 3: *Vriesea costae*: type-specimen in bloom.



E. Leme

Figure 4: Habitat of *Vriesea costae* on a nearly vertical and inaccessible rock on the right.



Bruno R. Silva

Figure 5: *Neoregelia ruschii* (A-G): A) leaf apex; B) floral bract; C) sepal; D) petal; E) stigma; F) inflorescence; B) leaf sheath

bearing 2 longitudinal callosities which exceed the anthers. **Filaments** adnate to the petal tube and free for 3–4 mm above it. **Anthers** oblong, 3–4 mm long, fixed at 1/3 of their length above the base, base obtuse, apex apiculate. **Stigma** conduplicate-spiral, ellipsoid, blades ca. 2.5 mm long, white, margins fimbriate. **Ovary** ellipsoid, 6–8 mm long, ca. 4 mm in diameter, glabrous, white or greenish-white toward the apex; placentation apical; ovules many, obtuse; epigynous tube ca. 1 mm long. **Fruits** nearly globose, whitish, with a sweet fragrance.

This new species is very closely related to *N. petropolitana*, from the Órgãos Mountains of Rio de Janeiro State. However, it can be distinguished from its closest relative by its leaf blades nearly two times narrower, occasionally undulate at base, with densely to subdensely spinulose margins, and basal spines dark purplish castaneous, as well as by the shorter, obtuse sepals.

Located above 1,000 meters of altitude, the Santa Lúcia ecological reserve, where *N. ruschii* grows as a facultative epiphyte, has a very high rainfall and is frequently covered by mist and clouds. These conditions, prevalent in most of the Atlantic Rain Forest, enable many Bromeliaceae of the Nidularioid complex, including *N. ruschii*, to adopt a very special strategy against insect herbivory, the protection of floral parts by immersion in water (Leme, 2000). The narrow funnelform rosette of *N. ruschii* and the short scape cause the complete immersion of the inflorescence, including the sepals. This condition is overcome by individual flowers as their pedicels greatly elongate the day preceding anthesis, making them available to their pollinators.

Most of the species in the Nidularioid complex have fruits and persistent calyx deeply colored and odorless, strongly suggesting the ornitophilous dispersal of seeds (Benzing,1999). In this case, color is the main attractive force because birds have a good vision and a poor sense of smell, in addition, the long persistent and resistant calyx can help birds to pull out the fruits. *Neoregelia ruschii* as well as a few species of *Nidularium* (Leme, 2000) are exceptions to this rule for having small sepals whose apex disintegrates in fruiting stage, as well as fruits with a sweet fruit-like scent. Small flightless rodents and marsupials, with a strong sense of smell, are probably attracted by the sweet odor of the fruits (Benzing, 1999), being probably the main dispersers of seeds in these species.

A rich aquatic fauna in Bromeliad tanks can process the organic matter that falls in and release mineral nutrients faster, in a typical mutualistic relation (Benzing, 1990). The adaxial purplish coloration present in the leaf sheaths of *N. ruschii*, as well as other species, has been suggested by Benzing (1980) as a means of protecting the organisms in the tanks by concealing them from predators.

This new species is named after the past naturalist and hummingbird specialist Augusto Ruschi, responsible for the creation of the Santa Lúcia Ecological Reserve, where *N. ruschii* was found, and for the organization of the Museu Mello Leitão situated at Santa Teresa County.

Vriesea costae B. R. Silva & Leme, sp. nov. (Figures 3, 4 and 6)

A *V. goniorachis* (Baker) Mez, cui proxima, laminis foliorum viridibus, subtus glabris, bracteis floriferis minoribus, petalis basi ligulis binis apice grosse laciniatis ornatis, stigmata lobis crenulatis, ovulis breviter caudatis differt.

TYPE: Brazil. Rio de Janeiro State, Niterói, Parque Estadual da Serra da Tiririca, Praia de Itacoatiara, Pedra do Costão, Camaleão, about 200 m above sea level, Jul. 2000, *B. R. Silva 115, E. Leme 4926 & A. S. Garcia*, fl. Cult. Dec. 2000 to Feb. 2001. Holotype: HB.

Plant rupiculous, propagating by short basal shoots, flowering ca. 70 cm tall. **Leaves** 28–30, very densely rosulate, subcoriaceous, forming a funnelform rosette at base. **Sheaths** broadly elliptic, suberect and slightly inflated, 8–11 × 6–8.5 cm, very densely pale brown-lepidote, castaneous to blackish toward base. **Blades** narrowly triangular, acuminate-caudate, suberect to nearly spreading, 21–24 × 3–4 cm, light green except for the dark reddish margins, subdensely but very inconspicuously white-lepidote adaxially, glabrous abaxially. **Scape** suberect, 25–35 cm long, ca. 0.7 cm in diameter, glabrous, light green. **Scape bracts** the basal ones foliaceous with recurved apex, upper ones erect, broadly ovate, broadly acute and minutely apiculate, ca. 25 × 20 mm, subcoriaceous, light green or the apex dark purple to nearly blackish, slightly shorter than the internodes. **Inflorescence** simple, linear, suberect-ascending toward apex, 20–30

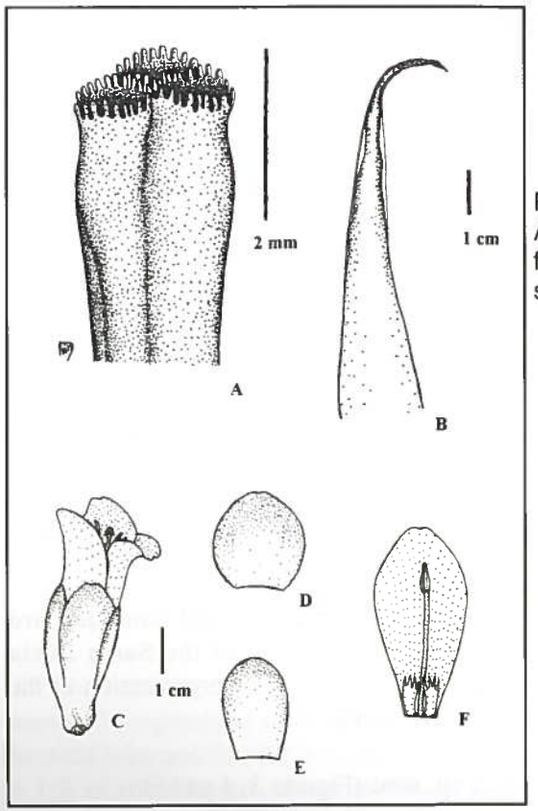


Figure 6: *Vriesea costae* (A-F): A) stigma; B) leaf apex, abaxial face; C) flower; D) floral bract; E) sepal; F) petal

Bruno R. Silva

E. Leme

Figure 7: Two of the collectors of *Vriesea costae* on the top of the mountain above Itacoatiara Beach, facing Maricá plains, in the State Park of Serra da Tiririca. On the left, Angelo Santana Garcia, on the right, Bruno Rezende Silva.

cm long, distichously 18 to 25-flowered, rachis 4–6 mm in diameter, stout, flexuous, slightly angled, green, glabrous. **Floral bracts** orbicular, obtuse-emarginate, 20–24 × 20 mm, glabrous outside, very inconspicuously white-lepidote inside, ecarinate, coriaceous, strongly concave and gibbous, green toward base, dark purple or dark purplish-wine near the apex, base bearing very inconspicuous auricles slightly decurrent on the rachis, about equaling 1/3 of the sepals length and not completely enfolding them, secund with the flowers. **Flowers** ca. 45 mm long, anthesis nocturnal, densely arranged and downwardly secund at anthesis, pedicels ca. 10 mm long, stout, green, glabrous. **Sepals** oblong-obovate, obtuse and emarginate, ca. 20–21 × 15–16 mm, yellowish-green except for the brownish-purple apical margins, ecarinate, inconspicuously lepidote inside, glabrous outside, coriaceous and thick at base. **Petals** subspathulate-obovate, apex emarginate, spreading-recurved at anthesis, ca. 40 × 20 mm, forming a campanulate corolla ca. 25 mm in diameter at apex, very pale yellowish-green, bearing at base two subsymmetrical, obovate, coarsely long-laciniate, 7–9 × 3 mm appendages adnate to the petals for ca. 5 mm. **Filaments** slightly complanate, free, ca. 30 × 2 mm. **Anthers** ca. 6 mm long, dorsifixed near the base, base shortly sagittate, apex obtuse. **Stigma** tubular, green, about equaling the anthers, ca. 2 mm in diameter at apex, lobes truncate, apical margins erect, crenulate. Ovules shortly caudate.

This new species resembles *V. goniorachis*, but differs from it by its light green leaf blades, which is glabrous abaxially, shorter floral bracts, petals bearing at base two appendages with an apex coarsely laciniate. *Vriesea costae* can be also distinguished by crenulate stigma lobes, and the shortly caudate ovules. It is named in honor of the botanist Andréa Costa, from Museu Nacional do Rio de Janeiro, now working intensively in the revision of the genus *Vriesea* in Brazil.

Vriesea costae is only known from the west face of a 260 m high granite mountain, flanking the beautiful beach of Itacoatiara, in Niterói City, located across Guanabara bay from Rio de Janeiro. The species dominates the most vertical and inaccessible parts of the rock, a fact that might explain its late discovery, despite exhaustive botanical collections in the region. Other bromeliads that share the rupiculous habitat on the same mountain, but on less vertical parts are: *Alcantarea glaziouana* (Lemaire) Leme, *Tillandsia araujei* Mez, *Neoregelia cruenta* (Graham) L. B. Smith and *Aechmea nudicaulis* (Linnaeus) Grisebach.

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Benzing, D. 1980. The biology of the bromeliads. Mad River Press, California. 1999. Seed dispersal by fleshy-fruited bromeliads: misconceptions and directions for deeper inquiry about mechanisms. Bromélia 5 (1-4): 23-35.

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Disliked - Defensive - Darling Dyckias

Bob Paulsen

If there is a Cinderella in the bromeliad family I suppose the genus *Dyckia* might be it.

I began to collect and grow these plants in 1987. There was something of a challenge to grow them well and to get them to flower (I had not seen one in flower up until then). I was attracted by their rugged, hardy tenacity and by the pretty and intricate patterns and lines, especially on the foliage of well grown succulent types. The underside leaf patterns are particularly intriguing.

There are still only about twenty dyckias in my collection. They range from the small *Dyckia minarum*, about 10 cm in diameter, to *D. encholirioides*, 75 cm across, and bearing a branched inflorescence two meters tall with pretty yellow bell-shaped flowers. This shape is typical for the genus and the flowers also come in a few shades of orange.

The principle adopted in collecting was to choose a representative variety of plants having color, distinctive foliage or growth habits. Examples are *Dyckia* 'Suntan', *D.* 'Silver King', *D. platyphylla* and *D.* 'Betty Fennel'.

My plants are grown in 18cm squat pots out in the garden, about 250 meters from the seashore where they get plenty of sunshine. The pots are filled to the top with the growing mix because they remain there for two or three years (sometimes more) and the mixture settles fairly quickly. During the growing period, the plants are lifted from the pots when the root system is established and more mixture is added. There is better growth when the bottom leaves, as far as is possible, clear the outer rim of the pot. It is natural for the bottom leaves to dry out but they tend to spoil more easily when touching the rim of the pot.

Other reasons I grow dyckias in wide diameter pots, are that they provide a more suitable environment for a strong, healthy root system which is essential for this terrestrial genus, and contrary to commonly held ideas, they grow much better when they are watered thoroughly and regularly.

Dyckias grow very dense layers of foliage and a larger pot allows for better water penetration. Some hand watering will be necessary when larger plants mature. Shriveled and dehydrated leaves are the result of too little moisture, and furthermore, dry conditions in the potting mix encourage the proliferation of root aphids.

One of the daunting tasks is breaking up the clumps and repotting offsets. Leather gloves are needed of course. I usually do this job when the warm weather comes, but remember that dyckias flower in spring so it is probably better to wait until they finish flowering. I must confess, however, that I have broken up plants at all times of the year and have had little trouble with rotting off. Mind you, we

have a very mild winter on the Sunshine Coast of Australia. After removal from the pot the whole plant is cleaned up, dead leaves removed with long nosed pliers and the offsets are carefully, broken, cut or sawn off, sprayed with fungicide and allowed to dry. I have not yet had to resort to the practice of one fellow bromeliad grower, who shall remain nameless, who chopped off the pups with an axe.

The potting mix used is simply fifty percent of my recipe for neoregelias and vrieseas etc., consisting of fine pine bark, peat moss, foam granules and charcoal, and fifty percent good quality commercial potting mix. I also recycle my old bromeliad mix. When potting offsets from other bromeliads, I use new mixture, but keep the used mix provided it is not completely broken down and that it is clean. I use this, half and half, with the commercial potting mix as above. Slow release fertilizer is added at the time of potting the offsets.

In the last few years, almost every one of my dyckias has flowered. They have provided much satisfaction and pleasure. They need to be allowed to clump for two or three years for better flowering results, although recently I divided one variety early in winter and each of the potted offsets flowered. Pot cultivation of dyckias gives me work aplenty. If I had the room I would plant them in the ground. With a little care they thrive.

Come on now, 'ave a go at collecting a few dyckias!

Queensland, Australia

(Reprinted from the newsletter of the Bromeliad Society of New Zealand, 40(8):15-16,20; August 2000.)

Schedule of Events for WBC 2002

Hattie Lou Smith and Kathy Risley

The Schedule of events for WBC 2002 is listed below. Note that instead of the usual breakfast, a buffet luncheon for all registrants is scheduled on May 16. There are still many opportunities for volunteers to assist in such areas as security assignments, hospitality registration, show placement and the raffle table. Approximately 14 vendors have signed up for space in the plant sales area. A large area has also been set aside for membership sales of bromeliads or bromeliad-related items, but please remember that you will need to obtain bar codes from the Sales Chair, Joyce Brehm. You can contact her at 619-277-1030 or by e-mail at joycesjoy@aol.com

Donations from affiliates or individuals to be applied toward the cost of the scientific seminars or show awards would be greatly appreciated. Please send them to Hattie Lou Smith, Vice President, World Conferences at 3400 River Run Lane, Ft. Myers, FL 33905.

Monday May 13	Tour of Florida Aquarium (9 a.m.)
Tuesday, May 14	Tour of Rob Branch's place - Selby Gardens (8 a.m.)
8:30 a.m.	BSI Board continental breakfast
9:00 a.m.	Set-up for show
9:00 a.m.	Set-up for exhibits
9:00 a.m.	Set-up of hospitality and registration areas
9:00 a.m.	BSI Board of Directors meeting
Wednesday, May 15	Tour - A day at the beach (10:30 a.m.)
8 a.m.	Set-up of exhibits and sales areas
8:30-9:30 a.m.	Scientific Seminar continental breakfast
9:00 a.m.	Judges school
9:00 a.m. - 4:00 p.m.	Entries accepted for show [Note: No entries received after 4:00 p.m. without prior approval.]
9:00 Am. - 4:00 p.m.	Scientific Seminar
10:00 a.m.	Hospitality & Registration Stations open
5:00 p.m. - 7:00 p.m.	Reception for International attendees
7:30 p.m.	Harry Luther presentation
Thursday, May 16	Tour: Sunken Gardens - Palm Gardens (8:30 a.m.)
	Tour: Dunedin historic trip (1:15 - 5:30 p.m.)
7:30-8:30 a.m.	Judges and clerks continental breakfast
8:00 a.m.	Set-up for exhibits and sales continues
8:30 a.m.	Judges and clerks meeting
9:00 a.m.	Judging begins
10:00 a.m.	Hospitality and registration stations open
Noon	Benefit drawing (raffle table)
12:30 p.m.	Luncheon for all registrants
5:00 p.m.	Cash bar - Welcome to all
6:00 p.m.	Sales room open for business

Friday May 17	Free home tours (9-12 a.m. and 1-4 p.m.)
9:00 a.m.	Opening of bromeliad show rooms, sales area
9:00 a.m.	Seminars begin
9:00 - 9:45 a.m.	Nat DeLeon
10:15 - 11:00 a.m.	Renate Ehlers
11:15 - Noon	Dr. John Utley
2:00 - 2:45 p.m.	Peggy Nuse [Artistic forum]
3:15 - 4:00 p.m.	David Shigi
10:00 Am.	Hospitality - registration station open
Noon	Benefit drawing (raffle table)
4:00 - 6:00 p.m.	Preview of rare plants for auction, silent auction begins
6:30 p.m.	Cash bar - announcement of silent auction winners
7:00 p.m.	Rare plant auction
Saturday, May 18	Tour: Florida Botanic/Heritage (8:30 a.m.)
9:00 a.m.	Bromeliad show and sale rooms open
9:00 a.m.	Seminars continue
9:00 - 9:45 a.m.	Jose Manzanares
10:00 - 10:45 a.m.	Pam Koide
11:00 - 11:45 a.m.	Tom Koerber
2:00 - 2:45 p.m.	Elton Leme
3:00 - 3:45 p.m.	Keith Golinski
10:00 a.m.	BSI Judges certification meeting
10:00 a.m.	Hospitality-registration station open
Noon	Benefit drawing (raffle table)
1:00 - 3:00 p.m.	Packing room open
3:00 - 3:30 p.m.	Preview of Cryptanthus Soc. rare plant auction - cash bar
3:30 - 5:15 p.m.	Cryptanthus Society rare plant auction
6:30 p.m.	Cocktails - cash bar - entertainment begins
7:00 - 10:00 p.m.	Banquet
Sunday, May 18	No tour - free to roam the city
9:00 a.m.	Bromeliad show and sales rooms open
9:00 a.m.	Cryptanthus Society Board meeting
9:00 a.m.	Seminars continue
9:00 - 10:15 a.m.	Ken Marks - Michael Andreas [Web site forum]
10:30 - 11:15 a.m.	Dr. Meg Lowman
11:30 - 12:15 a.m.	Odean Head
10:00 a.m.	Hospitality station open
11:00 a.m.	Affiliates and newsletter editor forum
Noon	Benefit drawing (raffle table)
1:00 p.m. -3:00 p.m.	Packing room open
3:00 p.m.	Begin break down
Monday, May 20	Tours: Selby Gardens in morning, Tropiflora Nursery in afternoon.

Fort Myers, Florida

Affiliates in Action

Gene Schmidt

An article from the Bangkok Post, dated March 13, 2001 states that a village headman wants the government of Thailand to establish a fund to help people in his area to switch from growing pineapples to dairy farming after elephants destroyed local pineapple plantations. The elephants come from the nearby Kui Buri National Park to raid the pineapples. While there is no scarcity of food in the jungle where they live, the elephants have developed a taste for pineapple fruit. The farmers have tried using electric fences, firecrackers, and barbed wire to keep them away, but all have failed. For more information go to the website:www.bangkokpost.com . *[I did check the archives of the Bangkok Post to find out further that in the following weeks several elephants had been poisoned, and some farmers were continuing their call for government funds to cover the cost of switching from growing pineapples to either cattle or dairy farming. - Gene] (The Bromeliad Society of Greater Chicago News, April 2001)*

Staying on the topic of pineapples, Bob Wright of the South Bay (CA) Bromeliad Associates writes about an issue (March, 2001) of Prevention Magazine that includes an article about using the rind or peel of a fresh pineapple to remove a corn (or callous) from the foot. The article also states that people who process the raw fruit can lose their fingerprints. If anyone knows about pineapple processing, Bob would be interested in hearing from you. *(South Bay Bromeliad Associates Newsletter, April, 2001)*

The February meeting of the Hawai'i Bromeliad Society included an impromptu program by Tom Stuart on potting pineapple cuttings. The pineapple tops came from a cooking class held prior to their meeting at the Lyon Arboretum, and they hated to see twenty potential plants go to waste. Tom says to cut the top off about an inch into the flesh of the pineapple and let the wet flesh dry out for a few days to prevent decay. Peel off the lower dead leaves, and put into a small pot. Use sticks if necessary to stabilize the plant until it takes root. *(Hawai'i Bromeliad Society Newsletter, Vol. XXIII, No. 3, March, 2001)*

The Board of the Bromeliad Society of Central Florida passed a motion to give lifetime memberships to the following people: Bert Foster, Tom Lineham, Audrey and Bill McCrory, Ed and Dorothy NcNulty, and Jim Pearce. Congratulations to those members for their work in promoting the BSCF. *(Bromeliad Society of Central Florida Newsletter, Vol. XXVII, No. 2, February, 2001)*

Jeff Sorensen, President of the Saddleback Valley Bromeliad Society (CA), visited the Bahamas recently and while there, contacted Ulrich and Ursula Baensch, authors of the excellent book Blooming Bromeliads. "I was hoping to see their gardens but unfortunately a recent hurricane destroyed nearly everything you see in their book! All the greenhouses were knocked down and the Baensch's decided not to rebuild but instead to create a "conventional"

garden. In addition, Dr. Baensch has had a stroke and is slowly recuperating, so he is unable to receive visitors. We certainly wish Dr. Baensch speed in his recovery." *(Puptalk, Publication of the Saddleback Valley Bromeliad Society, Vol.8, No. 6, June, 2001)*

In the May issue of the New Zealand Bromeliad Journal, Marjorie Lowe writes that Sarah Beresford, Editor of the New Zealand Gardener, contacted her inquiring about the possibility of a knowledgeable member being interviewed for an article on bromeliads. Marjorie suggested that Peter Waters, the Scientific Officer, would be a suitable person. Peter is a Director of the BSI as well, which was an extra bonus. The projected two-page article turned into a five-page article with another inside page and the front cover. So if you would like some great photographs and an interesting article, buy the May issue of the NZ Gardener. The Society continues to grow, according to Graham West, President, mainly due to the excellent efforts by the committee. In the last financial year the society had approximately 200 new members, bringing total membership to over 480. *(Bromeliad Society of New Zealand, Inc. Journal, Vol. 41, No. 4 & 5, April & May, 2001)*

Penrith Goff, President and Editor of the Southeastern Michigan Bromeliad Society, had a great response to an article printed in the Detroit Free Press just before their March meeting. It featured George Klosterman amid his large collection of bromeliads under lights. George stated, "I received a number of phone calls, several visitors came to the Tollgate meeting, and I had requests for four talks on bromeliads. Two of these were to fourth grade classes. Too young? The students were extremely attentive and receptive and asked thoughtful questions." Equally rewarding was a presentation to the 47th Horticultural Workshop, a group of women who are actively involved in horticultural therapy in hospitals, nursing homes, and other institutions. While horticultural therapy is most often carried on in outdoor gardens, bromeliads have great potential for winter "gardening" and for those who cannot go outdoors. Atmospheric tillandsias, for example, in addition to visual and tactile stimulation, offer the possibility of creating one's own work of art with minimal effort. *(The Southeastern Michigan Bromeliad Society Newsletter, May/June, 2001)*

The March 2001 issue of Living magazine by Martha Stewart, features a five page article on bromeliads, complete with color photography. Sources for the article were Craig M. Allen, horticulturist at Fairchild Tropical Gardens in Miami, FL; and Pamela Koide, owner of Bird Rock Tropicals in California and president of the North County (CA) Bromeliad Society. If you understand Martha Stewart's penchant for perfection, then you know the article is a good primer for those new to bromeliad culture.

Duluth, Minnesota

Membership Contest for 2001

The BSI announces the initiation of a regional membership contest to begin on September 1, 2001. The following procedures will be in effect:

1. Eligibility: First-time BSI members or lapsed renewal members (identified as past members with a lapsed membership of 12 months or more).
2. Application process: Online sign-up, telephone, fax or postal membership applications submitted to membership secretary.
3. Period: September 1, 2001 through February 28, 2002.
4. Prizes for winning region:

a) Directors of region. Would be recognized and announced at WBC 2002.

b) New members: Two new members will be selected from a drawing from those joining from that region. The first drawn would win the first prize, Ulrich Baensch's beautiful book which is now out of print. The second prize will be Victoria Padilla's landmark publication, also out of print. The winners will be announced at WBC 2002, but need not be present to win.

5. Determination of winning region: Determination will be made based upon the percentage of increase over numbers in each region as of September 1, 2001.

Organizational Change

At the May 26, 2001 BSI Board of Directors meeting at Selby Gardens, the need for a second vice-president was recognized because of the expanded role and assumption of lead responsibility by the BSI involving world conferences. The board established a second vice-president position with the sole responsibility of overseeing world conference planning. Based upon the excellent job that she and Joyce Brehm did in planning and staging the San Francisco conference in July, 2000 Hattie Lou Smith was elected to the new position of Vice President, World Conferences.

Jack Reilly was elected to fill the First Vice President slot. In order to assume his new responsibility, Jack had to resign as BSI Director for the Central Region.

On June 26, President Tom Wolfe appointed Martha Goode of Chicago to fill the remaining period of Jack's 2000-2002 term. Martha and her husband, Steve, who is editor of the Chicago affiliate newsletter, reside in Crystal Lake, Illinois. She has been collecting bromeliads for 24 years, been an active member of the Bromeliad Society of Greater Chicago for nine years, and a member of the BSI for the last four years. She is currently serving as secretary of the Chicago affiliate and assisting her husband in assembling its newsletter.

Eizi Matuda's Contribution to the Bromeliaceae of Chiapas, Mexico

Robert Guess and Virginia Guess

The Japanese botanist, Eizi Matuda (1894-1978), was one of several foreign nationals who contributed significantly to the botanical knowledge of Chiapas, Mexico. Educated as a biologist in Japan and Taiwan with a special interest in botany, Matuda arrived in Chiapas in 1922, with minimal background in the Spanish language or the natural history of Mexico. He became a naturalized Mexican citizen in 1928, and for the next half century dedicated himself to studying the rich plant life of his adopted country. In 1962, after completing his thesis on taxonomic and ecological studies of southeastern Chiapas, he was awarded a doctorate from the University of Tokyo. At the time of his death, he was internationally respected as an authority on the flora of Mexico and recognized for his work on Bromeliaceae.

Professor Matuda immigrated to Mexico in order to join a farming community founded by thirty-six Japanese agronomists on the Pacific coast of Chiapas. These pioneers settled in the small pueblo of Acacoyagua in 1897 as part of a program sponsored by the Japanese government to develop overseas colonies. Referred to as the "Enomoto Colony" in honor of a Foreign Minister of Japan, officials intended the settlement to serve as a model for future immigrations that would relieve the population pressures in Japan and subsequently open international trade markets. Although the long term results of the program did not fulfill the expected promise, the project did lead to a permanent Japanese colony in Acacoyagua, and encouraged other settlements throughout Latin America.

The town of Acacoyagua, where Matuda made his first home in Mexico, is situated along a major highway (Mexico 200) that courses northwest to southeast from Tonalá in the north, to Tapachula near the frontier between Mexico and Guatemala. The route, bordered on one side by the steep mountain range of the Sierra Madre de Chiapas and on the other by the Pacific Ocean, runs through the flat, narrow coastal plain, often referred to by its pre-Hispanic name of Soconusco. Agriculture is fairly successful throughout most of this region due to abundant rainfall and rich alluvial soil.

In this hot, humid environment, Matuda established Finca La Esperanza, approximately 150 hectares of low-lying land located three kilometers north of Acacoyagua. His property, along the flank of the Sierra Madre de Chiapas, was situated in the shadow of the towering peak of Monte Ovando, a part of the Cordon de Ovando that reaches an elevation of over 2000 meters. Matuda was the first botanist to study the flora of this mountain. From here, when time away from his agricultural work permitted, he systematically gathered live plants as well as amassed a large collection of dried specimens for his personal herbarium

Robert Guess

Figure 8. An imposing obelisk in the plaza of Acacoyagua, Chiapas, commemorates the arrival in 1897 of the first colonists from Japan.

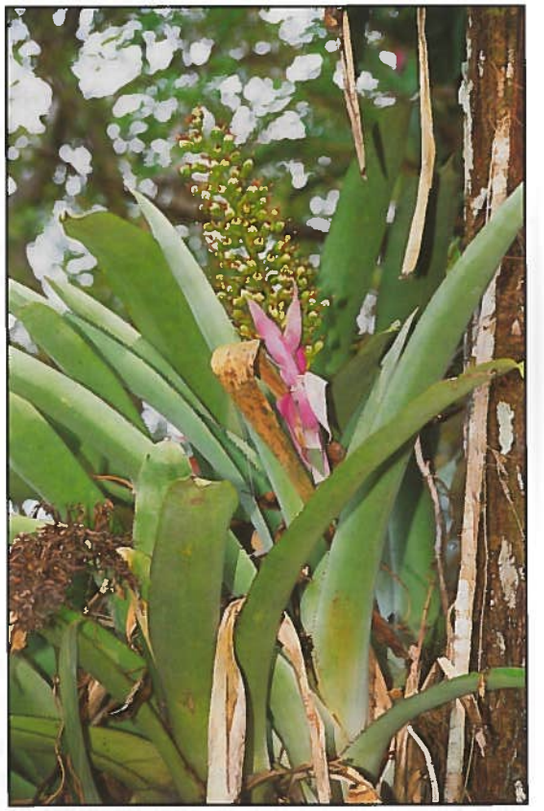
Robert Guess

Figure 9. Eizi Matuda's herbarium at Finca La Esperanza, today in shambles, once housed a portion of his collection of botanical specimens.

Robert Guess

Figure 10. Monte Ovando, destination for Eizi Matuda's early plant collecting, dominates the skyline beyond Acacoyagua.

Figure 11. *Aechmea matudae* flourishes near Acacoyagua on the Pacific Coastal Plain of Chiapas. The scape bracts maintain their pink color long after the plant flowers.



Robert Guess

including several new species of Bromeliaceae. As his knowledge of regional plants and their use in herbal remedies expanded, local people frequently consulted him for advice on their physical ailments.

By the mid 1930s, he was able to devote more time to his investigations. During his numerous botanical forays to various ecological zones in Chiapas, he collected the four endemic bromeliads that bear his name: *Tillandsia eizii* L. B. Smith and *Tillandsia matudae* L.B. Smith from the Central Highlands; *Pitcairnia matudae* L. B. Smith from Monte Ovando; and, *Aechmea matudae* L.B. Smith from Acacoyagua. In addition, he described four others: *Billbergia chiapensis* Matuda, *Tillandsia beutelspacheri* Matuda, *Vriesea ovandensis* Matuda, and *Vriesea chiapensis* Matuda.

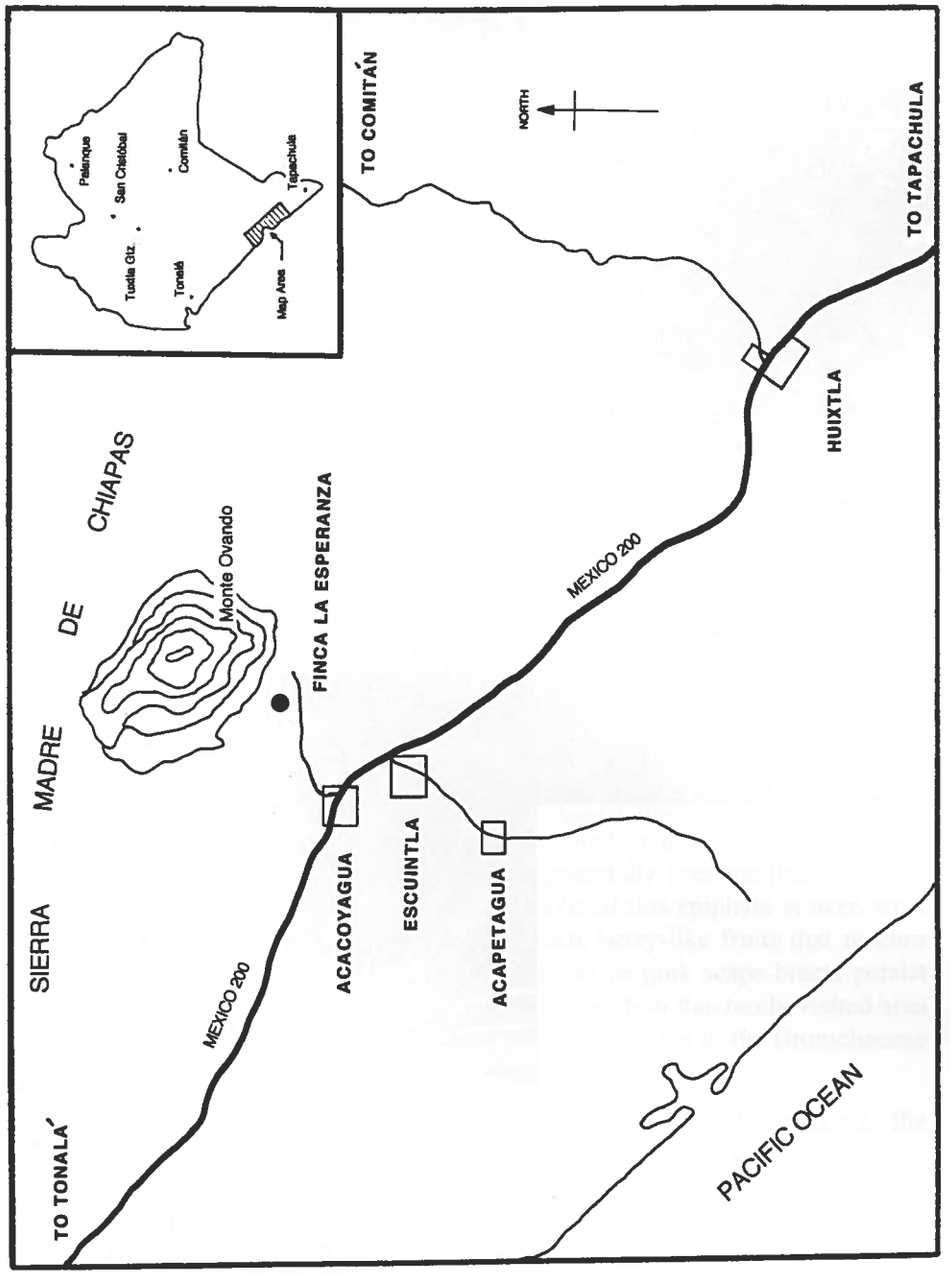
For help with plant identification, Matuda sent much of his collection for further analysis to Dr. Cyrus L. Lundell at the University of Michigan in Ann Arbor. The U.S. National Herbarium also became a depository for his specimens, where Lyman B. Smith eventually described those belonging to the Bromeliaceae. It is noteworthy that in Smith's (1951) initial description of *Aechmea matudae*, he referred to the species as *Aechmea matudai*.

In 1952, Matuda published the first compendium on the Bromeliaceae of Chiapas, but his life-long ambition was to write a "Flora of Chiapas." In this definitive work, he hoped to substantiate his theory that Chiapas represented a significant transitional zone between true Mexican and true Central American botanical elements. A summons, however, from the Mexican government interrupted his plans. In 1949, at the behest of President Miguel Alemán Valdés, Eizi Matuda moved with his family to Mexico City to join the staff at the Universidad Nacional Autonóma de México (UNAM).

Once settled in Mexico City, Matuda expanded his studies to include the flora from other parts of Mexico. Throughout his life, he continued to discover new species, among them *Hechtia matudae* L.B. Smith from the state of Morelos as well as numerous other bromeliads; published major botanical works such as one on the Araceae; and frequently represented Mexico at international scientific meetings. In 1978, on his homeward journey after attending the Second Latin American Botanical Congress in Rio de Janeiro, he died while on a field trip in Peru.

Before Eizi Matuda left Finca La Esperanza, his home for almost thirty years, he sold his property which was subsequently subdivided into several small farms. Today, his former dwelling on the finca has been rebuilt in its original style to serve as a primary school for children from nearby colonias. Only the ruins of one original building remain standing, a wooden structure with a tile roof that may have been part of his herbarium.

On a recent trip to Acacoyagua (January 2001), we visited this site of Matuda's former finca. Here we encountered a number of *Aechmea matudae*, the little known species that he first recorded in November of 1947. Specimens of



Robert Guess

Figure 12: Pacific Coastal Plain of Chiapas where Eizi Matuda embarked on his lifetime of work dedicated to the flora of Mexico.

Robert Guess

Figure 13. *Tillandsia matudae* blooms in the high-altitude, moist forests of the Central Highlands of Chiapas.

Robert Guess

Figure 14. *Tillandsia matudae*, with its rose-colored digitate spikes and white petals, barely visible here at the end of flowering, is one of several small Tillandsias endemic to Chiapas.

Robert Guess

Figure 15. *Tillandsia eizii*, bathed in the cool mists of the cloud forest, thrives under the gray, bleak skies of the Northern Highlands of Chiapas.

this large aechmea grow at elevations of 150 to 250 meters, and nestle in the notches of trees that range from ten to fifteen meters high. The leaves of *A. matudae*, some up to a meter in length, drape gracefully over the tree branches. By early to mid January, when the flowering cycle of this epiphyte is over, what remains is an erect stalk of closely packed, green, berry-like fruits that reaches approximately sixty centimeters in height. Distinctive pink scape-bracts persist into the fruiting stage. The species continues to flourish in this rarely visited area seemingly as a living reminder of Eizi Matuda's contribution to the Bromeliaceae of Chiapas.

Over 100 years after the arrival of the first colonists from Japan, the community of Acacoyagua preserves much of its Japanese heritage. An impressive obelisk erected in 1968 in the plaza inscribed with the names of these original pioneers honors the seventieth anniversary of their arrival. Nearby stands a plaque dedicated to the memory of Professor Eizi Matuda, one of the community's most renowned citizens. Dated November 30, 1979, it reads:

> *En memoria del ilustre biologo Profesor Eizi Matuda pionero del estudio de la flora chiapaneca y guia moral y espiritual de muches natives de la region.El Monte Ovando, monumento vivente y tesoro botanico que fue siempre su pasion, le rinde justo y eternal homenaje.*
>
> *El pueblo de Acacoyagua y La colonia japonese de Mexico 1894 1978*

ACKNOWLEDGEMENTS

Based on the recollections of several members of the Japanese community in Acacoyagua and Escuintla, we were able to reconstruct a small part of Eizi Matuda's life in Chiapas, as well as to clarify the actual locality and name of his finca. Our sincere thanks to Doña Francesca Takemura, owner of Finca Jalapa, who escorted us to the site of Matuda's Finca La Esperanza; to Señor Facundo Yamamoto, grandson of one of the original Japanese settlers in Acacoyagua, who recalled as a child being treated by Matuda with herbal medicines; and, to all those in Acacoyagua who received us with such graciousness.

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An Interesting new *Guzmania* from Panama

Harry E. Luther[1]

Both Costa Rica and Panama are relatively well known botanically most recently from a regional treatment (Utley *et al.* 1994). Despite this attention, conspicuous and often beautiful novelties continue to be discovered such as the attractive guzmania described below.

Guzmania cerrohoyaensis H. Luther, sp. nov. (Figure 16.)

TYPE: Panama. Prov. Veraguas. Cerro Hoya, wet forest at the summit, 1450 m, 28 May 01, C. *Skotak & H. Chavarria* s.n. (Holotype: SEL).

A *Guzmania angustifolia* (Baker) Wittm. cui affinis sed planta permajore, inflorescentia brevissimus et petalis brevioribus differt.

Plant a terrestrial, caulescent with a repent stem to over 1 m long (! Skotak). **Leaves** densely imbricate along the stem, laxly spreading, 20–45 cm long, thin coriaceous. **Leaf sheaths** elliptic, 6–8 × 3–4 cm, castaneous toward the base, densely brown punctate-lepidote throughout. **Leaf blades** ligulate, acute to attenuate with the apex recurved, 20–25 mm wide, green, somewhat reddish abaxially, densely pale punctate-lepidote throughout, the centermost becoming red mottled at anthesis. **Scape** very short and inconspicuous, 2–4 cm × 4–5 mm, shorter than the leaf sheaths. **Scape bracts** densely imbricate, subfoliaceous to narrowly triangular, acute to acuminate, green tinged or striated red, pale punctate-lepidote throughout. **Inflorescence** simple, ellipsoid, 4–5 × 2–3 cm, polystichously 8–12-flowered. **Floral bracts** densely imbricate, erect, elliptic, acute to acuminate, 25–32 × 12–17 mm, very thin-coriaceous to membranaceous, nerved, rosy red when fresh, drying cream to tan, scattered pale punctate-lepidote abaxially. **Flowers** with a 4–5 mm long, stout pedicel, erect, opening during the day. **Sepals** elliptic, acute, very thin-coriaceous, 20 mm long, connate at the base for 5 mm, pale green, glabrous. **Corolla** spreading at the apex. **Petals** ligulate, broadly acute, 40–45 mm long, connate for ca. 25 mm, bright yellow. **Stamens** and style included. **Fruit** unknown.

This new species differs from the similar and related *Guzmania angustifolia* by being much larger with longer ligulate leaves (20–45 cm long vs. 8–15 cm long and subtriangular), with a shorter inflorescence (4–5 vs. 5–8 cm long) and with shorter petals (40–45 vs. 65–70 mm long).

Sympatric bromeliads reported by the collectors were *Guzmania sanguinea* (André) André ex Mez and *Pitcairnia* cf. *hitchcockiana*, L.B. Sm.; the latter a new country record.

[1] Director, Mulford B. Foster Bromeliad Identification Center, Marie Selby Botanical Gardens, 811 South Palm Avenue, Sarasota, FL 34236 USA.

H. Luther.

Figure 16. *Guzmania cerrohoyaensis*

Guzmania cerrohoyaensis appears to be a narrow endemic known only from the type collection and a few cultivated plants. Hopefully its forest habitat at the summit of Cerro Hoya will receive additional study and protection.

ACKNOWLEDGMENTS

I thank the collectors who sent material of the new plant and the artist, Stig Dalström, for the illustration.

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Sarasota, Florida

A Probable Mistake in Taxonomy

Ana Rousse

Knowing that a mistake in identification takes a long time to be clarified by botanists, I hope to correct a probable misidentification with this note. In Volume 50(6):248 (November-December 2000), the figure identified as *Guzmania squarrosa* forma *lutea*, should be *Guzmania gloriosa* forma *lutea*.

This species is seldom found in ordinary collections but has been well known since 1898. Victoria Padilla has a color picture in one of the past *Journals*.[4] Also, Lyman Smith has a brief description of *G. gloriosa* in the Flora Neotropica Monograph number 14 part 2 on page 1348.

I collected this plant in the Andes in Tachira State near El Cobre at an altitude of more than 2500 m. The encapsulated seeds that it produced did not grow in Caracas in 1993.

Ana Rousse

Figure 17. *Guzmania gloriosa* (André) André ex Mez

[Ed note: When Harry Luther, Director of the Bromeliad Identification Center at Marie Selby Botanical Gardens was consulted, he felt that due to the range of variability within the two species and without the plant in hand to examine, he would only be venturing a guess, which he would prefer not to do. According to Harry, "I've been misled by too many photos; I need to see a specimen."]

Caracas, Venezuela

Bromeliad Flowers, an Attractive Meal for Weevils at Cerro Jefe, Panama.

Simon Pierce[1] and Richard A. Gottsberger[1]

Bromeliads in the wild usually show little sign of damage inflicted by herbivorous insects. Indeed, walking through the cloud forest at Cerro Jefe, Central Panama, most bromeliads appear healthy (aside from leaf-cutter ant damage to inflorescences and leaf margins of *Pitcairnia arcuata* and *P. valerii*). Frank (1999) argues that an apparent lack of pests simply reflects low population densities of pest species. He points out that a number of insects, particularly weevils (Coleoptera, Curculionidae), do attack bromeliads. Indeed, certain weevils appear to target bromeliads, although bromeliads from different genera may play host (Frank, 1999). Depending on the species of weevil, larvae and/or adults may feed on the plant. A single egg is laid on a leaf base; the larva then burrows into the stem and feeds along its length (Vaurie, 1976; Frank, 1999). This weakens the stem and can kill the plant. Adult weevils are usually recorded eating leaves, but here we present a number of observations of these beetles feeding on the flowers of various bromeliads at Cerro Jefe.

During August 2000 (wet season) we observed a large species of weevil (19–23 mm long) eating the flower buds of *Guzmania calamifolia* André ex Mez var. *calamifolia* (six occasions), *G. coriostachya* (Grisebach) Mez (two occasions), and *G. musaica* (Linden & André) Mez var. *concolor* H. Luther (three occasions). The adult weevil has mouth parts at the end of a rostrum (the long 'beak'), with which it makes a hole in the side of the flower bud, gradually pushing the rostrum deeper as it eats (Figure 18). This weevil belongs to the genus *Cholus* (Cholinae) and was also collected from Cerro Jefe by entomologist Henry Stockwell during the 1970's, although the species remains undescribed (H. Stockwell, pers. comm.). It is also apparently identical to the *Cholus* species that Howard Frank reports hitching a ride to Florida, possibly on a bromeliad from Panama (see photo at www.ifas.ufl.edu/~frank/cholus.jpg). For our purposes this weevil will be referred to as '*Cholus* species 1'.

Cholus weevils were difficult to observe - often from a distance of several meters they would detect us and drop off the plant. It was then impossible to find them in the dense, tangled undergrowth. Falling to the ground appears to be the least energetic and most effective escape route - birds are important predators of adult weevils (Kok and Louw 1994), and taking wing might not be an ideal option for these weak flyers. In common with other flying insects weevils have well-developed eyes, and presumably rely on vision to detect potential predators.

[1] Smithsonian Tropical Research Institute, P. O. Box 2072, Balboa, Panama City, Republic of Panama.

Also during August, another undescribed species of *Cholus* ('Cholus sp. 2') was observed on the same three bromeliad species as *Cholus* sp. 1, and was also observed mating on *Guzmania calamifolia* (Figure 19). Presumably weevils congregate around food sources, and bromeliads may provide an important mating ground for bromeliad-eating weevils. A more familiar weevil, *Metamasius sellatus*, was also found feeding on *Guzmania calamifolia* and *G. musaica* var. *concolor* in August (not shown).

In November (late wet season), a flower of *Werauhia capitata* (Mez & Wercklé) J.R. Grant was found containing four small black weevils (Baridinae, Centrinini, possibly *Limnobaris* species). These had eaten through a petal and into the cavity of the unopened bud, and were grazing on the filaments of the stamens. *Limnobaris* weevils usually eat the pollen of monocots, and are typically found on inflorescences composed of numerous small white flowers. Their shiny black appearance is thought to be a kind of camouflage, resembling the gaps between flowers (H. Stockwell, pers. comm.).

Another *Werauhia capitata* plant hosted both species of *Cholus* (Figure 20). *Cholus* sp. 2 had pierced the petals of a flower bud - the bud was about to open, and so the petals were no longer fully enclosed by the tougher sepals. The *Cholus* were joined by a small weevil with a thin, brown, stick-like body (Brentidae, *Ulocerus* cf. *sordidus* Sharp). This species is usually associated with rotting wood, and eats fungi and other small insects - it does not eat living plant tissue. Possibly it was attracted by the colorless mucilage that coats the inflorescence of this bromeliad (H. Stockwell, pers. comm.).

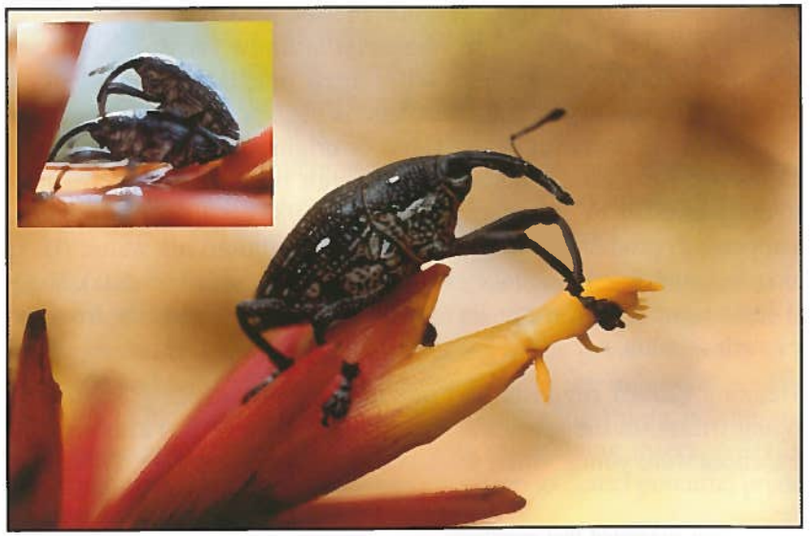
All bromeliad species observed under attack from weevils at Cerro Jefe produce inflorescence mucilage (Figure 21; see also Pierce and Gottsberger [2001] for a photo of mucilage on *Guzmania musaica* var. *concolor*), although less so in the case of *G. calamifolia*. When dried, mucilage of *Werauhia capitata* yields only 0.3 % dry matter (i.e., mucilage is 99.7 % water). Currently nothing is known about the chemical composition or origin of the solid component, but mucilages are produced consistently enough by certain species that it is undoubtedly exuded by the plant (see Utley, 1983). *Guzmania globosa* L.B. Smith appears to produce more mucilage when conditions are wetter (H. Luther, pers. comm.), and dried mucilage can re-hydrate (unpublished data), suggesting that at least some of the water in mucilages originates directly from external sources such as rainwater.

Benzing (2000) suggests that mucilage of *Guzmania globosa* insulates developing fruits[2]. In the species at Cerro Jefe, mucilage was also present when inflorescences were young, often weeks before flowering proper. We suggest that

[2] It has also been suggested that mucilages could have an anti-microbial role (H. Luther, pers. comm.). However, we inoculated sterile agar with mucilage from Werauhia capitata (n=6) and, after five days incubation at 40°C, fungal hyphae were evident growing outwards from the mucilage, and a number of bacterial colonies were apparent adjacent to the mucilage (data not shown). Therefore, mucilages are not sterile.

Figure 18. *Cholus* sp. 1 feeding on *Guzmania calamifolia*, with section through damaged flower (inset).

Simon Pierce



Simon Pierce

Figure 19. *Cholus* sp. 2 on *G. calamifolia*, and mating (inset).

Simon Pierce

Figure 20. *Cholus* spp. on *Werauhia capitata*.

Figure 21. Inflorescence mucilages of *W. capitata* and *G. coriostachya* (inset).

Simon Pierce

mucilages protect the inflorescence and flowers from herbivores throughout development. Mucilage could either act as a physical barrier or as a decoy food, distracting herbivores from more vital parts of the plant. Indeed, we have observed weevils stationary and with their rostrums in the mucilage, once for as long as half an hour (*Cholus* sp. 1 on *Guzmania coriostachya*), and no damage was observed on these plants. Inflorescences with little or no mucilage are frequently found with weevil damage (Back cover). Being composed mainly of water, production of mucilage would not use many of the plant's mineral or carbohydrate resources, and would thus be an 'inexpensive' defense. The bromeliad species we observed flowered and produced mucilage only during the wet season, when water is in plentiful supply and adult weevils are active (H. Stockwell, pers. comm.).

In conclusion, the bromeliad population at Cerro Jefe plays host to a number of floriphagous (flower-eating) weevil species, some of which have yet to be formally described. Many of these bromeliads produce mucilage that coats the developing inflorescence and may possibly impede weevils.

RELATED WEBSITES

For further information on weevils:

www.ifas.ufl.edu/~frank/wvbrom.htm
www.fcbs.org/articles/olan_creel.htm
www.ifas.ufl.edu/~eny3005/lab1/Coleoptera/Curculionid.htm
www.coleopsoc.org/nwslttrs.shtml
www.insects.org/entophiles/coleoptera/cole_003.html

ACKNOWLEDGEMENTS

Many thanks to Henry P. Stockwell for sharing his expertise concerning the Curculionidae of Panama, Harry E. Luther (Marie Selby Botanical Gardens) for his thoughts on mucilage, Howard Frank (University of Florida) for comments on the manuscript, and to Lina Gonzalez for scanning.

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Board of Directors Opening for Texas Region, 2002-2004 Term

At the close of the nomination period for the 2002-2004 term for the BSI Board of Directors, only one candidate had been nominated for the California, Florida, Louisiana and International director openings. Three candidates were nominated for the two available openings in the Texas Region. Therefore, those of you residing within the Texas Region will find a ballot enclosed in this issue of the JOURNAL to select TWO directors for your region. The Candidates are:

Ed Doherty is a resident of Dallas, Texas and is the current President of the Greater Dallas-Fort Worth Bromeliad Society. He has also served that affiliate as Vice President and Show Chairman. An enthusiastic collector, Ed has presented programs on his trips to Ecuador, Peru, Costa Rica, Belize and Guatemala. In addition to the Dallas-Fort Worth group, he belongs to the Houston, Caloosahatchee, New Zealand and Southwest Bromeliad Guild affiliates. He is an accredited BSI Judge. Ed graduated with a B.A. from Lafayette College and an L.L.B. from Columbia University. He is currently Chairman and CEO of Kaneb Pipeline Partners.

Gary Gillick lives in Kingwood, Texas, and has been a member of the Houston Bromeliad Society since 1993. He has been a past president and served on the board of directors, and as a plant sales chairman of that organization. He has been collecting and raising bromeliads since his childhood in Lansing, Michigan, and has a special interest in the terrestrial species. He has given several programs on them. Academic credentials include a B.S. in Microbiology from the University of Michigan, an M.S. and Ph.D. in microbiology from the University of Illinois. He is currently a Professor of Cancer Biology at the University of Texas - M.D. Anderson Cancer Center and is President of the Graduate School Faculty of Biomedical Sciences at the M.D. Anderson Hospital at the University of Texas.

Alan (Rick) Richtmeyer is a resident of Spring, Texas and is currently serving on the BSI Board of Directors for the 1991-2001 term. He is seeking re-election to the 2002-2004 seat. In addition to serving on the BSI board, Rick is President of the Bromeliad Society of Houston, and has served that affiliate as a vice president and a member of its board of directors. He is also a Past President of the Southwest Bromeliad Guild, a Past President of the Greater Dallas-Fort Worth Bromeliad Society and has served them as a show chairman and a judges chairman. He is presently the classification chairman for the 2002 World Bromeliad Conference in St. Petersburg. He was the Judged Show Chairman at the world conference in Houston in 1998 and Judges Chairman at the 1996 WBC in Orlando. Rick has B.S. and M.S. degrees in geology from Michigan State University and is Geological Advisor, North Africa Oil and Gas Exploration, for Nuevo Energy Company.

Return the ballots to: Vicky Chirnside, 951 Southland Rd., Venice, FL 34293

Bromelain. II - Potential Digestive Activity of Bromelain at the pH Level of the Human Stomach

Samuel P. Fletcher[1] and Gregory R. Brown[1]

Bromelain, a protein digesting enzyme from pineapples (*Ananas comosus*), is a commonly advertised herbal supplement to aid digestion (Fletcher et al., 2001). In the first paper of this series[2] we introduced and discussed some of the history, biology, and human uses of bromelain. In this contribution we report on the results of an experiment designed to test the digestive performance of bromelain at the pH (acidity) level typical of the human stomach. Bromelain has its greatest digestive capacity at a pH of 4.5 (Harrach *et al.*, 1995), yet the human stomach is a highly acidic environment with pH typically around 2.5. The objective of this study was to test the claim that bromelain has digestive activity in the environment of the human stomach. In other words, does exposure of bromelain to the acidic conditions of the human digestive system denature the enzyme, thereby making it ineffective as an aid to digestion?

Materials and Methods

Bromelain was obtained from two sources. Powdered bromelain, was purchased from Sigma Chemical Co. (sigma product no. B4882), and tablets of dietary supplement bromelain (Now®) were purchased from a local "health-food" retail store. The Sigma Chemical bromelain is extracted from pineapple stems, and since pineapple stems are reported to be the source for all commercial forms of bromelain (Rowan, A., *et. al.*, 1990), we have assumed that the bromelain in the dietary supplement tablets also came from pineapple stems. For the remainder of this paper the bromelain from Sigma chemical Co. will be referred to as standard-bromelain, and the dietary supplement tablets as dietary-bromelain.

One of the standards for measuring the activity of proteolytic enzymes is the ability of the enzyme to digest gelatin. The standardized gelatin digesting unit, or GDU, is defined as the amount of enzyme which will hydrolyze 1.0 mg of amino nitrogen from gelatin in 20 minutes at pH 4.5 at 450 C (113° F). Gelatin powder (Sigma product no. G-8150; Sigma Chemical Co,) was used in this study. All solutions were prepared using deionized water (H_20), and pH measurements were made using a Corning model 220 pH meter. Dilute hydrochloric acid (Hcl) was used to adjust the pH of gelatin solutions to the correct level (pH 2.5 and 4.5). Separate solutions of bromelain, each at 1000 GDUs, were prepared for both the standard-bromelain and the dietary-bromelain. For each digestion reaction experiment, 100 mg of gelatin were dissolved in one ml of pH-adjusted deionized H_2O. Digestion reactions were done by adding 100

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[2] J. Bromeliad Soc. 51(3):130-136

microliters of the 1000 GDU dietary-bromelain solution to one set of vials containing pH-adjusted gelatin, and 100 microliters of the 1000 GDU standard bromelain solution to a replicate set of gelatin solutions. The bromelain and gelatin were mixed and incubated at 37° C (approximates normal human body temperature) for 20 minutes. Digestion reactions at each pH were replicated 10 times, resulting in four experimental groups, i.e., standard-bromelain and dietary-bromelain at both pH 2.5 and pH 4.5. Since the optimum activity for bromelain is reported at pH 4.5, the pH 4.5 experimental groups were used as controls.

The digestive activity of bromelain was measured using absorbance spectrophotometry (Reed *et al.*, 1998) and the Bradford Reagent assay for protein determination (Sigma B4916; Sigma Chemical Co.) were used to determine protein concentrations (i.e., undigested gelatin proteins) in each digestion trial.

A two sample t-test was used to compare bromelain's proteolytic activity at pH of 2.5 and pH of 4.5. A two sample t-test was used because the sample number was less than 30 and the standard deviation from the population mean was unknown. A critical confidence level of one percent (0.01) was used.

Results

One hundred mg of gelatin dissolved in one ml H_20 produced a thick, transparent gel at room temperature, and at 37° C, a highly viscous liquid. After addition of bromelain and 20 minutes of incubation at 37° C, the solution no longer formed a gel at room temperature and was especially less viscous at 37°.

Initial tests were conducted to verify that neither the nature of the gelatin, nor the bromelain were effected by hydrolytic action of HCl used to adjust pH. Results of the t-test indicate no significant statistical difference ($p = 0.01628$) between average protein concentrations of gelatin at pH 2.5 and pH 4.5. In addition, within the dietary- and standard-bromelain treatment replicates, there was no significant statistical difference ($p = 0.02696$, and $p = 0.6010$ respectively) between pH 2.5 and 4.5 (see Table 1). Therefore, the changes that were observed in protein concentration were due to the enzymatic activity of bromelain.

Dietary-bromelain mixed with gelatin at pH 2.5 had significantly higher undigested gelatin protein levels, relative to the pH 4.5 mixtures ($p = 1.244 \times 10^{-4}$). In addition, the average absorbance value for the standard-bromelain reactions was higher for the pH 2.5 standard-bromelain than for those at pH 4.5 ($p = 6.294 \times 10^{-5}$) (see Table 1). The higher absorbance values indicate that less protein was digested at the pH of 2.5, relative to the pH 4.5 reactions. Therefore, the proteolytic activity of bromelain was reduced at the pH of 2.5.

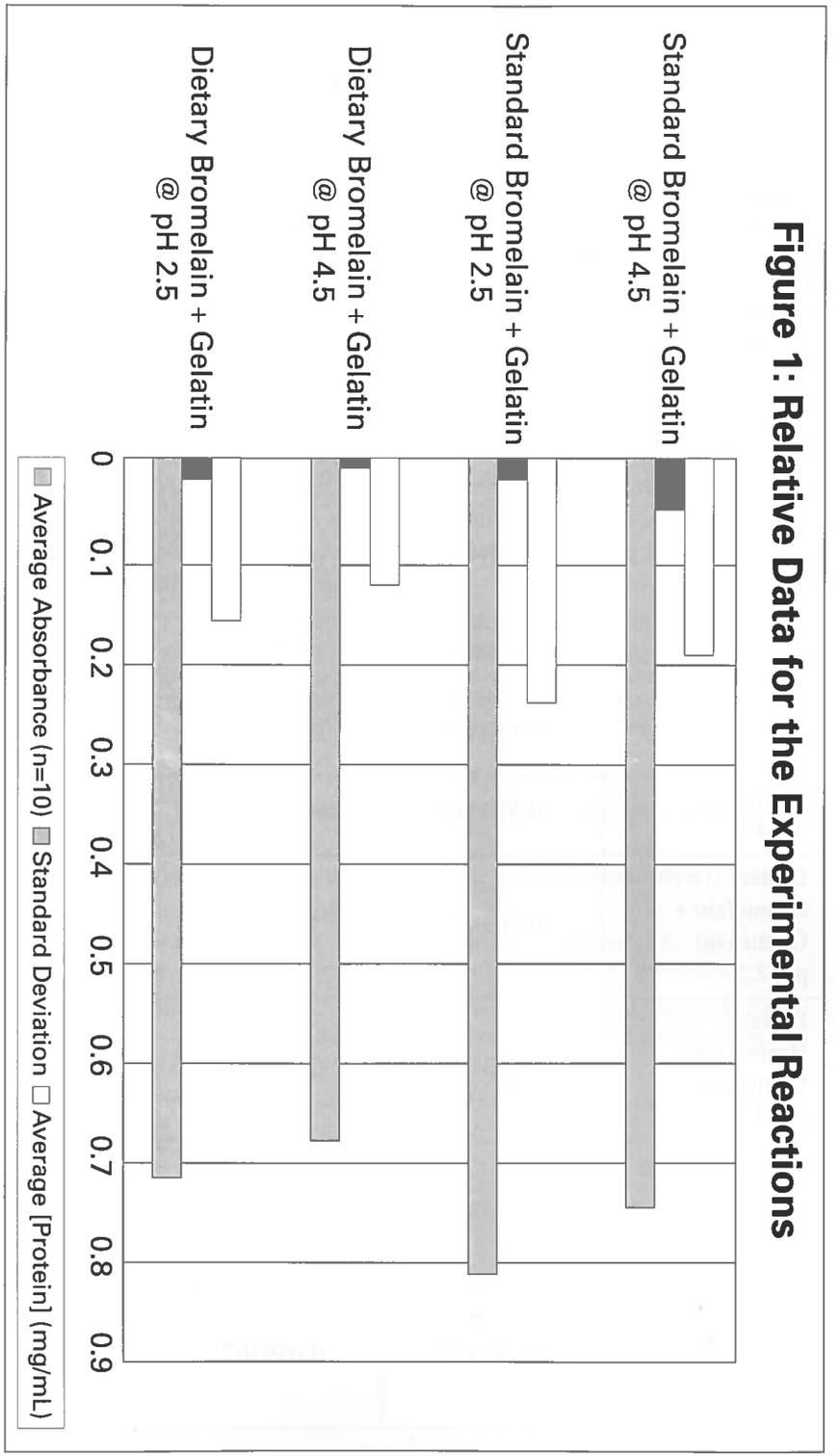

Figure 22: The bar graph of shows the average absorbance at 595 nm, the standard deviation. and the average protein concentration for the four experimental reaction sets. The graph displays the higher protein concentrations observed in the reactions at pH 2.5.

Table 1: Data of Reagents and experimental reactions.

	Average Absorbance (N = 10)	Standard Deviation	Average [Protein] (MG/ML)
Dietary Bromelain @ pH 2.5	0.550431	0.026433	>0.1
Dietary Bromelain @ pH 4.5	0.522326	0.02575	>0.1
Standard Bromelain @ pH 2.5	0.617048	0.033072	0.1
Standard Bromelain @ pH 4.5	0.610548	0.019622	0.1
Bradford Reagent	0.489893	0.010957	- - -
Gelatin @ pH 2.5	0.512492	0.012013	>1
Gelatin @ pH 4.5	0.527412	0.01312	>1
Dietary Bromelain + Gelatin @ pH 2.5	0.709473	0.02066	0.16
Dietary Bromelain + Gelatin @ pH 4.5	0.673196	0.011118	0.12
Standard Bromelain + Gelatin @ pH 2.5	0.815925	0.017883	0.24
Standard Bromelain + Gelatin @ pH 4.5	0.741429	0.039367	0.19

Discussion

Although bromelain does have the ability to break down proteins in some conditions, this *in-vitro* experiment supports the suggestion that bromelain is inhibited in the pH of the human stomach. If you are taking bromelain tablets, it probably does little to increase your ability to digest protein in your stomach.

This conclusion is not surprising as it is well established that enzymes operate under specific environmental conditions and the pH of the human stomach is significantly lower (more acidic) than the optimal pH for bromelain.

According to The Washington Post "increasing numbers of Americans are falling seriously ill or even dying after taking dietary supplements that promise everything from extra energy to sounder sleep," (Gugliotta, 2000). Our increasing interest in being healthier by taking herbal supplements heightens the concern for truth in herbal/dietary supplement claims. We believe consumers would benefit from an organized scientific effort to evaluate the efficacy of herbal supplement claims.

For future work, it would be interesting to test the proteolytic activity of bromelain after it has passed the stomach and entered subsequent segments of the human digestive system because some enzymes can be denatured, lose their activity, and thereafter be renatured to reestablish their catalytic activity. Although such a test would be complex, it would be interesting to test bromelain's proteolytic activity and other possible physiological effects *in-vivo*.

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Laramie, Wyoming

A new Variety of *Vriesea splendens*

Francisco Oliva-Esteve

Northern Venezuela has produced many botanical surprises, including numerous new bromeliad discoveries. One such discovery was a variety of *Vriesea splendens* with longitudinal white stripes first collected on Margarita Island, Nueva Esparta State, by Mulford B. Foster in 1955. He named it *Vriesea splendens* var. *striatifolia* M.B. Foster.

During one of our excursions to Cerro La Chapa, a mountainous range located in the north central State of Yaracuy in Venezuela, we found yet another interesting new variety of *Vriesea splendens*, this one with a solid green spike and yellow petals. Cerro La Chapa is situated north of Nirgua, a small town known for its numerous orange groves.

This new variety grows as an epiphyte and terrestrial in a verdant cloud forest composed of huge trees and high altitude endemic palms, such as *Dictyocaryum fuscum* and *Asterogyne yaracuyensis*.

***Vriesea splendens* var. *chlorostychya* Oliva-Esteve var. nova.** (Figures 23 and 24)

A conspecficis varietatibus bracteis floralibus viridibus differt; a varietate striatifolia folis viridibus concoloribus diversa.

TYPE: Venezuela. Yaracuy State. Cerro La Chapa, Nirgua, about 210 kilometers from Caracas, (130 miles); growing at 1200 m altitude, in a cloud forest among other bromeliads, such as *Guzmania cylindrica*, *G. nubigena*, *G. squarrosa*, *G. mucronata*, *Catopsis sessiliflora*, *Mezobromelia capituligera* var. *lutea*, *Vriesea platynema*, *Aechmea lasseri* and *Tillandsia amicorum*.

Plant ca. 80–90 cm tall. **Leaves** green, arching, forming a broad, laxly crateriform rosette. **Leaf sheaths** elliptic, 3–4 cm wide, finely pale lepidote on both sides, yellow-green. **Leaf blades** 60–70 cm long, 3–4 cm wide, narrowed toward the base, flat in the middle, lustrous green, apiculate. **Scape** erect, 1 cm diameter, 25 cm long, with tightly sheathing green bracts. **Inflorescence** simple, 40–55 cm long, lanceolate, acuminate, compressed, green. **Floral bracts** densely imbricate, narrow, triangular, acuminate, incurved toward apex, glabrous, green. **Sepals** elliptic, obtuse, yellow. **Petals** ligulate, 2–4 cm long, yellow.

ACKNOWLEDGMENT

I would like to thank Professor Bruno Manara for his assistance in preparing the Latin diagnosis.

Caracas, Venezuela

Francisco Oliva-Esteve

Figure 23. *Vriesea splendens* var. *chlorostychya* Oliva-Esteve

Francisco Oliva-Esteve

Figure 24. Inflorescence of *Vriesea splendens* var. *chlorostychya*

WORLD CONFERENCE PIN AVAILABLE NOW

Depicting the theme "Bromeliad Beach Party"

The 15th World Bromeliad Conference to be held at the St. Petersburg (Florida) Hilton Hotel from May 14 through 19, 2002, is coming up fast. The pin commemorating the event is available for advance sale now.

The Artist for the 15th World Bromeliad Conference pin is Merridee Smith. She is married to a long-time bromeliad collector, Keith Smith. They live in Auburn, California where Merridee hand paints botanicals, especially bromeliads from Keith's collection, on silk. From these paintings she produces fine art and clothing. Some of you were able to see her work first hand at WBC 2000 in San Francisco. Merridee also enjoys teaching silk painting workshops in both California and Hawaii, and is a member of Silk Painters International. Last year she retired from her profession as a forensic scientist to pursue her love of silk painting on a full-time basis.

Merridee painted this design first on silk. It was then translated into a cloisonné pin for your enjoyment.

The pin will sell for $10.00 at the world conference, but if ordered prior to the conference, can be obtained for $8.00 including postage. It is available through the BSI online store at BSI.ORG.

The Bromeliad Society International

The purpose of this nonprofit corporation is to promote and maintain public and scientific interest in the research, development, preservation, and distribution of bromeliads, both natural and hybrid, throughout the world. You are invited to join.

Photograph by Simon Pierce

Guzmania musaica with holes in the sepals typical of damage caused by weevils in the genus *Cholus* at Cerro Jefe, Panama. See the text beginning on page 172. Photograph by Simon Pierce.

Calendar

24-26 Aug	The Bromeliad Society of Greater Chicago will hold its 16th annual standard bromeliad show at the Chicago Botanical Garden, Glencoe, IL. Contact: Ardie or Jack Reilly at 217-486-5874 or by e-mail at jar56@one-eleven.net
24-26 Aug	The Greater Dallas-Fort Worth Bromeliad Society will host the 28th annual Southwest Bromeliad Guild and 7th annual International Cryptanthus Show at the Fort Worth Botanic Garden Center in Fort Worth , Texas. Contact: Flo Adams (817) 467-7500.
12-15 Oct	11th Australian Bromeliad Conference 'Brom-A-Warra' at Wollongong, New South Wales, Australia. Contact: Graham Bevan, 25 Tallwong Cres., Dapto 2530 or e-mail Eileen Killingley at john.killingley@det.csiro.au
27 Oct	The Bromeliad Society of Central Florida will host the 2001 Extravaganza of the Florida Council of Bromeliad Societies at the Maitland Civic Center, 641 S. Maitland Ave., Maitland, FL (just north of Orlando). Activities include a large sale, interesting speakers, rare plant auction and banquet. Admission and parking are free, but there is a charge for the banquet. Hours are 9 a.m. to 5 p.m. Contact: Eloise Beach, 407-886-8892, e-mail floridapro@aol.com.
9-11 Nov	The Caloosahatchee Bromeliad Society will host its 2001 Standard BSI Bromeliad Show and Sale at Terry Park, 3410 Palm Beach Blvd., Fort Myers, FL. Judging will be held on Friday and the show and sales areas will be open to the public on Saturday and Sunday. For more information contact Dr. Lawrence Giroux, FAX 941-997-6377 or by e-mail at n2finchs@peganet.com or Brian Weber, 941-591-4268 or by e-mail at brianweber1b@aol.com.