BROMELIAD SOCIETY OF GREATER CHICAGO

THE BSGC NEWS

July/AUGUST 2019

President	Lori Weigerding	(630) 888-7516
Vice President	Martha Goode	(815) 459-1623
Treasurer	Paula Derning	(847) 295-2559
Secretary	OPEN	
Newsletter Editor	Steve Goode	stevegoode1@ameritech.net
WEB SITE		http://bromeliad-chicago.org
Webmaster		Lori Weigerding

Our next meeting is Sept. 8th at 2pm in the Lakeside room at the Chicago Botanic Garden. We need to discuss doing a Show next year with the Day Lily and Iris Society on the weekend of July 18th. The Goodes will present their pictures of the Mitchell Park domes in Milwaukee.

President's Column

On a sad note we lost another icon in the bromeliad world and for BSGC. We lost Jack Riley, he went to be reunited with his wife Ardie. I miss them both, but rejoice in the knowledge that they're in heaven watching over us together again.

Well the weather is beginning to turn. Pretty soon we'll have to be bringing in our plants for the winter. Hopefully you're all set with room to bring them all in. Make sure you remember to check them for all those nasty little critters!

The plants I got from Anne are doing well. Hopefully I'll be able to figure out a way to have more bromeliads.

Look forward to seeing you all at the next meeting!

Lori Weigerding

Steve and I visited the Milwaukee Domes since it has been probably 20 years since we were there last. The Mitchell Park Domes in Milwaukee replaced the conservatory which was demolished in 1955. A national design competition was won by a Milwaukee architect, Donald Grieb. His design was for three conoidal glass domes, each with its own distinct climate.

They were a temperate dome for seasonal displays, a desert dome and a tropical dome. Each dome is one acre under glass, 140 feet across by 85 feet tall. Construction commenced in 1959 with completion in 1967. By building in six stages, they were able to avoid the cost of bonding. The total cost was $4.5 million.

A temporary structure was constructed within each dome until it was self-supporting. A network of concrete members was pre-cast on site in order to form the conoidal frames. A “skin layer’ made up of aluminum tubing and 1/4" thick reinforced glass were pre-assembled and placed over this structure. Then a three ton 37 foot diameter cap was placed on top of each dome. It remains the only conservatory of this kind in the world.

The design of the structures permits over 85% of the available light to be transmitted to the plants through the 1/4" thick wire imbedded glass. The fans on the top of each dome and those along the side draw in fresh outdoor air to cool the domes during hot weather. Each dome has a complete air change in 3 ½ minutes. The air can also be heated, dried or humidified by the systems hidden at the outer rim of the domes.

The plants are watered by hand every day. City water is pumped into a water tank in the basement and then heated. The tropical Dome has a misting system.

Pests are controlled by biological means, beneficial insects.

Show Dome “Under the Sea”

The Show Dome has five seasonal displays. The current one is “Under the Sea” and runs until September 8th.

They have a reciprocal agreement with other botanical gardens so if you belong to the Chicago Botanic Garden or other Gardens, you get in free.

The Tropical Dome represents a typical tropical rainforest. Besides the plants, there are some birds, frogs, toads, turtle and fish.

The size of the dome allows for four layers of plant life. The layer that gets the most sunlight, the emergent layer is represented by the Kapok tree (Ceiba Pentandra). It can reach 225 ft but it is trimmed annually and kept at 60 feet.

The next layer is the canopy and includes edible plants: banana, orange, tamerind, pomello and papaya. There is also bamboo, mahogany, ebony and teak which are harvested for their wood.

The understory gets less light and this is where foods such as coffee, kava and pepper grow. Also, you will find some shrubs, climbing ferns and dioons.

The bottom layer receives less than 2% of the sunlight. Many of these we use as houseplants: philodendrons, pepperomias, bromeliads, orchids, ferns, marantas and calatheas.

There are epiphytic plants: stag horn ferns, bromeliads and orchids. Some of the vining plants are vanilla, passiflora, quisqualis and aristolochia.

The Desert Dome has plants from the Old World and New World deserts. The North American deserts include the Sonoran, Mohave and Chihuahuan deserts. Some of the plants from Madagascar are Euphorbia milii, Madagascar periwinkle, allaudia and pachypodium. From Africa comes many aloes, many caudiciforms, lithops and columnar Euphorbias. South America has many dry areas in Argentina, Chile, Bolivia, Brazil, Peru and Colombia.

If you have a chance, we recommend going there since it isn't that far. On your way back, you can stop and fill your tank with much cheaper gas. (100% gasoline is available in Wisconsin. Better fuel economy!

I found the following old newsletter in my garage. Maybe I need to clean it out but I think this is worth sharing first.

The Sarasota May 1998 had the following article on Anthocyanin by Jack Sullivan.

ANTHOCYANIN

BY Jack Sullivan

1. Introduction

The red coloration found in bromeliads, cranberries, carnivorous plants, etc. is caused by plant pigments known as anthocyanins. Because of the interest created in pigment-free forms of certain carnivorous plants, Barry Meyers-Rice (UC-Davis), the editor of the Carnivorous Plant Newsletter, asked me to put together a brief summary of the science of these pigments. While somewhat technical, it's a fascinating topic, especially in the areas of evolution and biology. If you're interested in learning more about this topic, read on! (This is a modified draft of the paper submitted to Barry for publication in the September 1998 issue of his Newsletter.)

2. Biology

Anthocyanins are members of a class of nearly universal, water soluble, terrestrial plant pigments that can be classified chemically as both flavonoid and phenolic. They are found in most land plants, with the exception of the cacti and the group containing the beet. They contribute colors to flowers and other plant parts ranging from shades of red through crimson and blue to purple including yellow and colorless. (Every color but green has been recorded).

Anthocyanins apparently play a major role in two very different plant processes: for one, attracting insects for the purpose of pollination. Advantage is made of the fact that the pigments absorb strongly in the UV (ultraviolet), visually attracting insects but with light wavelengths that are invisible to humans. These pigments play a major role in plant pollination and in predation in carnivorous plants, attracting insects into the trap apparatus. (Anthocyanins play a very versatile role in pollination, especially in the Bromeliaceae. Certain bromeliads turn a vivid red just before and during pollination but soon revert to the original green color characteristic of the photosynthesis pigment, chlorophyll.

Anthocyanins are not a biochemical dead end but rather a dynamic signalling device that can be switched on when needed by the plant to assist in pollination. They are then degraded by plant enzymes when no longer needed to attract pollinators to flowers.) In their second major role, anthocyanin-related pigments serve as a UV screen and are produced in response to exposure of the plant to UV radiation, protecting the plant's DNA from damage by sunlight (UV causes the paired strands of genetic material in the DNA double helix to become cross linked, preventing cell division and vital cellular processes like protein production).

And in a third, and no less significant role, anthocyanins serve as anti-feedents, their disagreeable taste serving to deter predatory animals.

In a related defense mechanism, anthocyanin production can be induced by ionizing radiation, which can damage DNA as readily as UV can. Chemical messengers apparently signal the damage to DNA and induce anthocyanin production in these plants.

The bio synthesis of this class of pigment is accomplished by a series of enzymes that are bound to cell membranes and that help convert two central biochemical building blocks derived from photosynthesis (acetic acid and the amino acid phenylalanine) found in the cell's cytoplasm through a series of discrete chemical steps into the final pigments which are then excreted on the other side of the membrane into vacuoles in the epidermal cell layer. Significant genetic change in the DNA coding for the production of these enzymes result in loss of pigment production.

Anthocyanin pigments can be produced by growing plant cells in tissue culture. Plants having no pigmentation themselves in cultivation were subsequently demonstrated to produce anthocyanin in tissue culture. Environmental factors affecting anthocyanin production included light (intensity and wavelength with blue and UV being most effective), temperature, water and carbohydrate levels, and the concentrations of the elements nitrogen, phosphorous and boron in the growth medium. Anthocyanin production can be induced by light, blue being the most effective color. Low light levels also induce the formation of different flavonoid pigments, which is another interesting adaptive response on the part of plants. (Tillandsias, for example develop a bright red coloration due to induced anthocyanin production if grown in strong light. For some addition observations on possible alternate roles for anthocyanin in Tillandsia, see noted bromeliad expert David Benzing's personal observation as quoted in Paul T. Isley III's excellent book Tillandsia.

3. Evolution

Anthocyanin-type pigments are found only in terrestrial plants. They are not found in animals, marine plants or in microorganisms. It is theorized that anthocyanin production is an evolutionary response to plants first venturing onto the stark primordial landscape under intense UV radiation. (Significant screening of the earth's surface from the effect of UV radiation didn't occur until after the advent of terrestrial plants. Oxygen in large amount first had to be generated by the photosynthesis of land plants before the UV-screening ozone layer was formed.)

The evolution of insect vision to respond to the unique wavelengths of light presented by flowering plants is an interesting scenario, as is the evolution of these plants to take advantage of the insect's attraction to the sight of anthocyanins. Obviously, the plants came first and developed anthocyanins as a defense mechanism long before the first insect evolved. Flowering plants subsequently found in anthocyanin a handy way to attract pollinators. Carnivorous plants took advantage of the pollination attraction mechanism to serve as an effective visual lure for their prey.

4. Chemistry

Anthocyanin pigments are assembled from two different streams of chemical raw materials in the cell: both starting from the C2 unit acetate (or acetic acid) derived from photosynthesis, one stream involves the shikimic acid pathway to produce the amino acid phenylalanine. The other stream (the acetic acid pathway) produces 3 molecules of malonyl-Coenzyme A, a C3 unit. These streams meet and are coupled together by the enzyme chalcone synthase (CHS), which forms an intermediate chalcone via a polyketide folding mechanism that is commonly found in plants. The chalcone is subsequently isomerized by the enzyme chalcone isomerase (CHI) to the prototype pigment naringenin, which is subsequently oxidized by enzymes like flavonoid hydroxylase and coupled to sugar molecules by enzymes like UDP-O-glucosyl transferase to yield the final anthocyanins. More than five enzymes are thus required to synthesize these pigments, each working in concert. Any even minor disruption in any of the mechanism of these enzymes by either genetic or environmental factors would halt anthocyanin production.

Anthocyanin production was used as a visual marker in early studies of chemotaxonomy which studies the relationships of organisms based on their biochemical constituents. It gave support to the one gene-one enzyme theory that is a central tenet in the field of molecular biology.

BIBLIOGRAPHY

1. Secondary Metabolism, by J. Mann. 2nd edition, pp. 275-285. Oxford Univ. Press, 1987. ISBN 0-19-855529-6

2. Secondary Plant Products, ed. E.A.Bell and B.V. Charwood. Encyclopedia of Plant Physiology, New Series, vol. 8, pp. 340-349. Springer-Verlag, 1980. ISBN 0-387-09461-X

3. Natural Product Chemistry, by Kurt B.G. Torssell, pp. 138-145. John Wiley & Sons, 1983. ISN 0-471-10378-0 paperbk).

4. Plant Cell and Tissue Cultre by J. Reinert and M.M. Yeoman. Pp48-50 (Experiment 13: Callus Formaton and Anthocyanin Production in Cultures of Haplopaapus gracilis.) Springer Verlag, 1982 ISBN 3-540-11316-9

5. Tillandsia, by Paul T. Isley III pg. 92. Botanical Press, 1987. ISBN 0-9617675-02

We were sorry to hear of the passing of Del Busczynski earlier this year. He was always a big volunteer at our Shows. He also helped at the Chicago Botanic Garden and other places. He was also a extra in one of the Batman Movies.