The BEGONIAN

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Monthly Publication of the American Begonia Society, Inc.

The BEGONIAN

Founded by Herbert P. Dyckman January, 1932

GENERAL OFFICES

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PRESIDENT'S MESSAGE

The Begonian is published to express our views on the horticultural and scientific technics of growing begonias. These views should be respected.

If someone should disagree with an article, then he should be encouraged to write a rebuttal, one which will not degrade the author of the article he is rebutting.

I have only been a member of the board for a short time and to this date we have had four editors. Each editor had been criticized by many until he quit office and another editor took over the responsibility, then the old editor was praised and the new one criticized. This job is the most thankless, the most important, and the most time consuming one the Society has to offer. The Begonian threads our Society together.

We should give each editor and his staff our fullest support. When a mistake occurs we should be lenient. After all, an editor is only human. If you do have helpful suggestions, let the editor know.

John W. Provine
President

COVER PICTURE

The plant, *B. acida,* was grown and photographed by Ben Marcus, Brooklyn, N.Y.

CONTENTS

CALENDAR

February 2 — Westchester Branch — 7:30 p.m. — Gene Daniels, prominent member of the Theodosia Burr Shepherd Branch, grower and hybridizer will divulge some of his secrets (we hope) about growing Tuberous Begonias. He may show some of his excellent slides if time permits. Everyone is welcome. Visit Westchester and learn.

February 20 — Regular meeting Seattle Begonia Society — Program "Dish Gardens"—7:00 p.m.—7002 23rd N.W.

AIMS AND PURPOSES OF THE AMERICAN BEGONIA SOCIETY, INC.

The purpose of this Society shall be:

TO stimulate and promote interest in *Begonias* and other shade-loving plants;

TO encourage the introduction and development of new types of these plants;

TO standardize the nomenclature of Begonias;

TO gather and publish information in regard to kinds, propagation and culture of *Begonias* and companion plants;

TO issue a bulletin which will be mailed to all members of the Society; and

TO bring into friendly contact all who love and grow *Begonias.*

BEGONIA SHOWS QUESTIONS AND ANSWERS

By Ruth Pease

"Are judges allowed to enter their plants in shows they judge?" is a question often asked.

Answer: Some organizations have a show ruling stating judges may not enter plants in their show. This eliminates the problem of last-minute changing of assignments when a judge brings his plants to be entered.

It is difficult to assign judges properly if they plan to exhibit since they do not know early enough which plants they will enter. Judging chairmen prepare their teams of judges and their assignments early in the season, soon after their show schedules have been finalized.

This year postcards were included with invitations to judge asking the judges if they planned to enter and in which division.

In all shows judging chairmen and show committees realize the necessity of having fair and efficient judges. Judging chairmen have to plan their judging assignments carefully, placing judges with certain knowledge and know-how with others who may have the same ability but for different types of Begonias. These judges then have to be considered for their personality traits also, how well they get along with others. They are human and have their viewpoints and differences.

We try to rotate judges listed with the ABS as much as possible, using those that have taken judging courses, who have attended classes, and who have worked on shows. Many know their Begonias, but have not taken time to up-date themselves, to learn the presently accepted judging procedures, classifying of Begonias for show purposes or the point scoring system. This is a must. A show should run smoothly. To be efficient, judges must keep up with the latest procedures in order to be able to complete assignments as requested. Without the knowledge of the correct use of the point scoring system, a judge can unwittingly cause an exhibitor to lose his chance to win an award.

For instance, when judges are in disagreement, they can settle their differences by point-scoring the entry, but they must know how to use the system down to its finest detail. This can only be learned by studying the booklet itself, and obtaining and reading the judging course.

Point scoring is required for entries being considered for division, perpetual and challenge trophies at the ABS Annual Shows.

Another reason to rotate and change teams of three judges every year is that the judges want a challenge, to do their best when they find new and fresh entries to judge. To give them the same assignments and have them judge only certain types of plants each year doesn't allow them to grow, and a carelessness sets in which isn't fair to the exhibitors or to the judges.

Being teamed with different people each year is refreshing. Not only is the judging assignment of importance, but the contact with other judges and growers is also of major importance to keep our judging practices and procedures up to par and up to date.

Some of our members have served as clerks with judges for years and feel they are entitled to a judges card. Experience is what is needed and they have observed and understand the procedures from doing, but they may not know and understand the classifications, the point scoring system, and this is what they need to know to become judges with the ABS. The homework quiz sheets should be a challenge for them to complete and easier for them to accomplish than for those who have not had this experience.

There has also been concern about the time of the year for shows and whether or not a master calendar of shows should be maintained. This is easier said than done since buildings available for shows are booked months in advance and plans cannot always be made for next year's show immediately upon the close of the present year's show. In the case of the ABS Annual Shows, a branch wishing to host the show must make the offer at the Annual Meeting and then needs to locate the site and make the necessary booking arrangements. There aren't that many buildings available at a cost that is acceptable to the society.

The result is that there may be several branch and local garden club shows going on at the same time. This means that judging chairmen must make their assignments early. Some judges are very much in demand because of their availability to judge, their willingness to take time from their businesses and homes, and to travel distances to do this service. They are also invited time after time because they do keep up with the newer show rules and show schedules, the newer procedures of each of the organizations, and are interested in obtaining point scoring schedules for the plants they are to judge. These are usually the judges who are able to do their judging in a business-like manner, who can discuss and make up their minds amicably. Judging chairmen do not want to invite those individuals who are difficult, who do not complete their assignments, or follow the instructions of the judging chairmen and the show rules.

We have heard some complain that they have won in other shows and not in a specialized show. This is unfortunate since the judges of the specialized show know their particular plants. They are growers themselves. They know what to look for. They may not always be invited or available to judge a local garden club show.

Notwithstanding the exhibitor who brings in poor entries and expects to win, we feel that exhibitors should have a sense of fair play, be good sportsmen. Not all can win in every show. To some it is sufficient to know their entries were well-grown, well-groomed and they were proud to show them. There are those times, however, when poor judging was the cause of an exhibitor losing out. This is what we want to avoid whenever possible. To those who always bring in specimen Begonias, winning is like an added bonus, frosting on the cake. Others feel the sense of competition keenly and losing isn't to their liking.

Judges must do their best at all times, and their decisions must be fair and just so that all who enter feel they received the finest in the way of judging.

Listing of judges registered with the American Begonia Society will begin in the next issue of the Begonian.

For those of you who plan to order judging courses we ask that you add 75¢ to the cost of $6.00 for the course. This will enable us to send the course to you as Printed Matter, Special Handling. If you wish to have the information forwarded as First Class or Airmail, an additional $1.50 is required. We have found the Postal Rates have increased as well as the cost of reprinting the courses themselves.

Send your questions to Ruth Pease, 8101 Vicksurg Avenue, Los Angeles, Calif. 90045.

EPIDERMAL OUTGROWTHS IN BEGONIA

By Harriet B. Creighton
Ruby F. H. Farwell Professor of Botany
Wellesley College, Wellesley, Mass. 02181

(Continued from Last Issue)

However, he shows the outgrowth leaf blades only and not the two stipules found at the base of most of the small leaves. More about the actual structure of the out-growths later. Ultimately, quite by accident — a story too long to tell — I found a very crude way to induce outgrowths. And, having discovered it, I found that I had only rediscovered what had been learned accidently 50 years before (Smith, 1919 and 1920). It is always embarrassing to have missed papers in a search of the literature. In this case, however, there was as compensation the fun of finding how to induce outgrowths after a succession of failures. What I have been doing since 1967 is to try to discover the internal, physiological factors that make the crude method work. In short, I wanted to try to find out what makes a plant sometimes exhibit its hereditary potential and at other times not.

Exactly, what is the crude but effective method of inducing *B. phyll.* to produce outgrowths on the shoot system? It is to damage the root system. Even careful transplanting may produce the stimulus and rough transplanting or actual cutting off of many roots is a powerful one. Some growers knew this, but others had not realized the causal relationship because the response does not occur until a month or so after the root damage. The leaves and stems that ultimately produce outgrowths are those that are completely enclosed in the stipules of the young leaves that are at the tip of stems at the time the stimulus arrives (Fig. 7). What are the consequences of damaging a root system?

Figure 7.

Stem tip of *B. phyll.* showing stipules of successively younger leaves enveloping the actual growing region and the young leaf and stem that could, if stimulated, produce outgrowths. About natural size.

One effect, certainly, is the formation of many new secondary roots back from the stub ends of broken off roots. Why might the new roots have any effect on what is going on a number of feet away up in the shoot system? Smith (1919, 1920) who first studied the problem because his *B. phyll.* plants did not always have shoot system outgrowths suggested that the water stress that occurred after root damage was the probable stimulus. This hypothesis was in line with the thinking of plant physiologists at the time. By the time I rediscovered the role of root damage, I was thinking in different terms. Plant hormones had been discovered in the later 20's. Between then and the 60's much had been learned about auxins, gibberellins, cytokinins, and other plant hormones.

The hypothesis, obvious in the late 60's, was that some substance or substances were being produced in the shoot system, where, though present in very small amount, triggered a response in specific cells. You recall that a hormone, plant or animal, is defined as a substance produced in one part of an organism that is moved to another part, where, present in low concentration, it produces a specific effect in particular cells.

In B. *phyll.* what has to be done to test the hypothesis that hormones stimulate the production of outgrowths? It does not seem to be necessary to establish that new root tips and young growing roots of begonias produce hormones. Other kinds of plant roots do, and so unless later it proves to be necessary, it does not seem to be crucial to extract from begonias and chemically purify the known, active substance or substances. Today, these substances can be purchased and can be applied to the plant to see what they do. The assumptions behind such an experiment are: that a substance applied to the surface be absorbed; that it will get to the sensitive cells in an effective amount; and most importantly, that it was not there already in those cells in sufficient amount from its natural internal source. If, therefore, a response is observed, you know the substance applied to the plant did get into the plant, did get to the "target" cells, and was the only factor that had been in them in such a limited amount that, until it was introduced, they could not respond. If no response is observed, then, perhaps the substance did not get to the responsive cells at an effective concentration; or perhaps it was not in limited supply; or perhaps, this substance has nothing to do with the response; or the cells were not in a responsive state.

The first thing to do is to apply a hormone, wait a month or so, and see whether any outgrowths develop. A synthetic auxin is the active material in "Tomato-set". The potassium salt of gibberellic acid is in "Wonder-Brel". Both of these trademarked and patented products are available in aerosol containers, and so these substances can be sprayed either all over the shoot system or only on stem tips. One typical experiment consisted of 6 control plants that received no hormone; 3 plants that were sprayed with the synthetic auxin (beta-napthoxyacetic acid); 3 that got synthetic gibberellin (potassium gibberellate); and 3 that were sprayed with both. To be more sure that the materials got to the leaf and stem cells of the sensitive age, the treatment was repeated two days later.

The results obtained in several experiments with a total of more than 50 plants are that no outgrowths appeared on the leaves or stems of the controls; that both the auxin and the gibberellin can kill the stem tip, but not always; that when the tip survives, as it does more than two-thirds of the time, there can appear outgrowths on the stem internodes and leaves on about one-half of plants, whereas the other half of the treated plants are like the contols. Some of the plants that produced outgrowths had been treated with gibberellin alone, some with auxin alone, and some with both. That the gibberellin had gotten in was evident from the fact that the internodes and the petioles of the treated plants elongated 3 to 4 times as much as the controls and as the auxin-only plants. Two plants of the twenty that received both hormones, had the most outgrowths which is some evidence that the auxin got in and worked synergistically with the gibberellin. But, obviously, as soon as a larger clone can be built up more experiments must be carried out. All that can be said at present is that these two hormones *may* stimulate outgrowths.

What information is there that the adventitious outgrowths arise from some specific type of cell — the target cells where hormones would have their effect? I found early in my study of *B. phyll.* as I later discovered Smith (1919, 1920) had reported, though not quite accurately, that outgrowths arise from epidermal cells, with no cells from underlying layers involved. Normally, epidermal cells never produce anything except more epidermal cells, or stomatal cells, or hair cells. Smith thought the outgrowths were maverick hairs, but they are not. I can understand how he misinterpreted what he saw under the microscope because he was studying leaves that were producing so many outgrowths that they and the hairs got all mixed up.

When you examine leaves that are producing relatively few outgrowths or stems, and stems have fewer hairs than leaves, the hairs and the outgrowths are completely separate. In fact, those epidermal cells that are going to produce either glandular hairs or nonglandular hairs begin to divide at about the same time as cells that have been stimulated to divide and will produce outgrowths. This critical time is when most leaf or stem epidermal cells, normally, would not divide again. You may know that in the growth of a leaf or a stem, for some time, the epidermal cells increase in number by division, then enlarge a little, and divide again. The epidermal layer thus continues to cover the growing leaf or stem. But then there comes a time when the epidermis keeps up with enlargement and elongation by the expansion of the epidermal cells already present.

In stimulated *B. phyll.,* many epidermal cells stop dividing and expand normally, but, depending upon how great was the stimulation, others continue to divide. The two new cells formed from each parental cell cannot expand against the pressure of the normally expanding epidermal cells. Why, I do not know. The result is that each responding epidermal cell becomes subdivided. Fig. 8 shows both normal, non-dividing, epidermal cells and a group of subdividing cells. The subdivision may continue until there are 60-70 cells within the confining walls of an original single epidermal cell. The new cells near the outer surface of the epidermal cell continue to divide and expand outward.

Within a week or so, a "mound" of cells is formed above the level of the normal epidermis. The outer

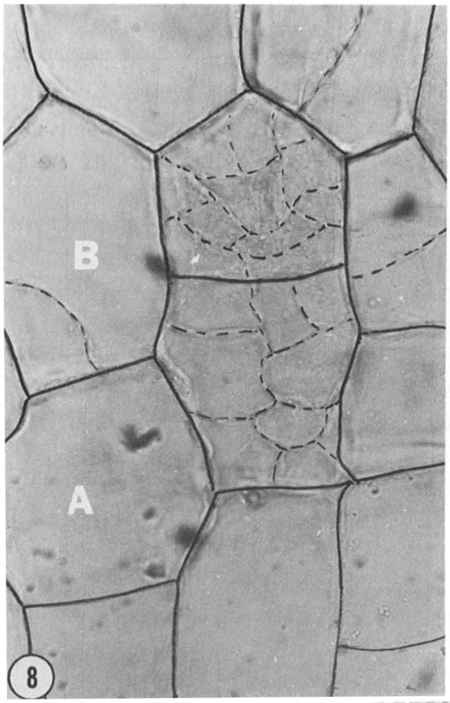

Figure 8.

Surface view of B. phyll. epidermal cells. Solid lines have been added to emphasize individual cell limits. Dotted lines show limits of cells formed by subdivision within individual epidermal cells as an outgrowth starts. Area shown less than 1/16 inch (1 mm) A. Normal, nondividing cell. B. Subdivided cell.

layer of its cells take on the characteristics of normal epidermal cells, dividing and increasing in size and dividing, continuing thus to cover the growing mound. Then, when the mound may be small or large, cells beneath this epidermis-like layer, in two regions, divide more frequently than those elsewhere. Soon two elongated bulges, each tipped by a glandular hair are discernable. It becomes evident that they are two stipules (Fig. 9). In form, they are just like the two stipules that develop at a normal stem tip when a leaf is being produced. Unlike normal stipules they attain only a length of 1/16-1/8 of an inch (1-2 mm). Normal stipules grow to be an inch (25 mm) or more in length. For many outgrowths stipule formation is the end of the line. For others, however, the next parts of a leaf, the petiole and the blade, begin to grow out between the stipules.

Although there are variations in their shape, all of the developing

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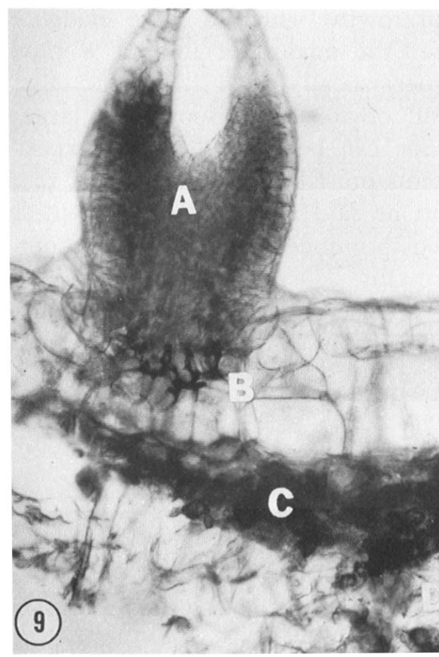

Figure 9:

Free-hand cross section of *B. phyll.* leaf showing: A. Outgrowth consisting of two stipules tipped by glandular haris; B. Upper epidermis with sub-divided cells and a very small "mound" (see text); C. Chloroplast containing cells of the mesophyll; D. Leaf vein. Stipule height about 1/32 of an inch (0.5 mm).

ROUND ROBIN NOTES

Interest in the Robins is growing. New requests are arriving frequently, many of them from newer members of A.B.S. A new flight has been launched on "Windowsill Growing," which still needs a few more members. A flight on "Tuberous Begonia Growing" has been suggested — anyone interested? We need a few more members for an "All-Texas" flight.

Ruth Ihara, Washington, D.C., reported seeds of B. *acaulis* and B. *rajah*, planted in August germinated in 2½ weeks, sitting right under the fluorescent lights.

Lillian Bergeron, Louisiana, plants her seeds then puts them in her oven where pilot light supplies enough bottom heat until they germinate. She then moves them to her warm greenhouse.

Mary Griffith, Maryland, followed a suggestion that the lid be left off the plastic box containing her seedlings during the watering session, for fresh air. It was exactly what her Begonia seedlings needed as they are doing much better now.

Phyllis Setford, Australia, lives in a hot and dry area where temperatures often go to 108° for a week at a time, up to 114° a few times. Humidity is very low so last summer she put bits of carpet on greenhouse floor and that seemed to help.

Olive Lever, New Zealand, reported a very hot summer there. She said: I have hardly lost any wee plants this year; if they do not have much root or look at all frail, I don't even put them in soil — just plant them in vermiculite and they really thrive.

Olive reports: we enjoy making waterfalls, etc., in our larger terrariums, they are most effective. I usually make a pool at the base of the rocks out of a sawn piece of Agate rock. Some of them are so effective with a blue and white swirling effect of waves.

Fausta Waite, Pennsylvania, acquired B. 'Mumtaz' in October and finds the older leaves have the characteristics of B. *goegoensis* while the younger leaves resemble more their B. *rajah* parent in color. It is doing well in an uncovered fish bowl at the margin of the lights. She finds it slow-growing and notes that before the new growth exhibits itself, the last leaf attains full size.

Margaret Benz, Colorado, has had exceptional luck rooting pieces of B. *rajah*. Just ½" random cut pieces have rooted. Her large plant of it has bloomed but she couldn't get it to set seed.

Anita Sickmon, Kansas, says: authorities have always insisted that B. *ficicola* likes practically no light but I put mine in same light with B. *rajah* and B. *versicolor* and it has grown. I had it in a dark corner where it was a little warmer and it stood still for a year. Others report they find it needs light, too.

Quote from "The Buxtonian" (courtesy Evelyn Hurley, Massachusetts): "The Ed Thompsons of Long Island (winner of sweepstakes for the last two years at the Eastern Convention) had a specimen of the Kusler hybrid, B. 'Miyo Berger', that was lush and healthy, nearly two feet tall with many stems, well branched, with dark foliage of lovely sheen."

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CLAYTON M. KELLY SEED FUND

No. 1—B. masoniana syn. B. 'Iron Cross'.

Discovered by Mason in 1952. One of the most beautiful Begonias in cultivation. White-hairy, reddish stems and large, roundish, firm puckered leaves. Nile-green, marked with contrasting bold pattern of brown-red in the form of a cross. Older leaves are overlaid with silver and covered bristles on back. Sometimes B. *masoniana* can be very temperamental about germinating and after waiting four or five weeks a few plants will appear. Eventually all will germinate. Price $1.00 per pkt.

No. 2—B. dayi, Mexico.

Large, thick, shiny leaves more yellow than green, the veins heavily penciled with dark mahogany on top, dark red beneath. Flowers ivory. Likes to grow warm and dryish. Price $1.00 per pkt.

No. 3—B. luxurians, Brazil.

Leaf like a small-scale palm, fuzzy and limp. Inflorescences are not large and colorful; the beauty of the foliage more than compensates for the modesty of the blooms. Price $1.00 per pkt.

No. 4—B. cathcarti, India.

Large, thick, cordate leaves, bristly hairs on stems when grown cool. Flowers large, white. Plant needs humidity. Price $1.00 per pkt.

No. 5—B. popenoei.

Plant that bore seed came from Munich, Germany, under name given here, which is erroneous. Bright green leaves, white flowers. Grows in wet tropical forests; likes to rest in winter. Price $1.00 per pkt.

No. 6—B. fuchsioides, Colombia; Mexico.

One of the best forms of this Begonia with orange-red flowers. Price $1.00 per pkt.

No. 7—B. lindleyana.

Plant came from the collection of Dr. Irmscher. The name is wrong, however. It is rhizomatous with beautiful pink flowers. Price $1.00 per pkt.

No. 8—B. monophylla Pavon, Mexico.

See cover picture and story in November 1972 *The Begonian* by Fred Barkley and Kalil Boghdan. This is an accurate and detailed description of B. *monophylla* Pavon syn *unifolia.* Price $1.00 per pkt.

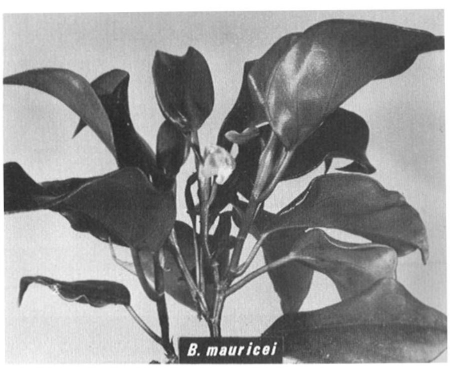
No. 9—B. cathayana x B. deliciosa.

A few months ago seed of B. *cathayana* were offered by Seed Fund, and several people who purchased them got plants of the cross offered here. This is indeed a beautiful plant with the characteristics of B. *cathayana* plus the white spots of B. *deliciosa* and we are fortunate to have seed from a friend in Holland

who has the plant. Price $1.00 per pkt. See photo.

No. 10—B. mauricei, Trinidad.

New Begonia from the small island of Trinidad off the coast of Venezuela. There is a full account of this plant in July 1971, The Begonian, written by Ziesenhenne. (Back issues of The Begonian may be purchased from ABS Librarian). I, personally, am very thrilled at the prospect of offering seed of such a rare and beautiful plant. Price $1.00 per pkt. See photo.



B. mauricei

No. 11—B. plumieri, A. DC.

Pretty little dwarf. Ten inches high from the base to the tip of the inflorescence with shiny dark green leaves. The flowers are white with a crimson blotch in the center. Good terrarium plant or under lights where space is limited. Price $1.00 per pkt.

No. 12—B. socotrana.

Grows from very small tubers. Low, spreading habit with stout, light green, succulent stems; leaves are roundish, peltate with a cup-like depression in the center, thin and light green; margins crenate; flowers rose-pink in many-flowered inflorescences. This species is the ancestor of a large group of Christmas-flowering begonias known as B. cheimantha, and of the winter flowering group B. hiemalis. Price $1.00 per pkt.

No. 13—B. tenuifolia, Java.

Rhizomes thick and stubby, short branched and ascending; leaves long petioled, thin textured, obliquely broad-ovate, pointed, obscurely-lobed and toothed, bright green. Flowers large, soft pink. Price 50 cents per pkt.

Please send requests
for seed to:
Mrs. Florence Gee
Seed Fund Administrator
234 Birch Street
Roseville, California 95678

ROUND ROBIN

(Continued from Page 35)

Anita Sickmon, Kansas, reports her B. *ignea* tuber has really grown this year — but no bloom so far. She's had it about three years and each year the old tuber dies and makes a new tuber below. This year shoots came from both ends of the tuber so she broke one off and now has two pots with big tubers in them. She is anxiously waiting to see what they do but is sure they will rot just like the smaller ones did in other years. There must be a quite large tuber beneath as the new tuber, in other years, was always bigger than the old one.

Anita's B. *bulbillifera* which she received as a tiny bulbil a couple of years ago has grown more this year and the tiny bulbils formed on the plant are really dropping.

To join a Robin (or several, if you like) write:

Mrs. Mae Blanton
Round Robin Director
Rt. 4, Box 159A
Lewisville, Texas 75067

RESEARCH REPORT

By M. Carleton L'Hommedieu
Research Director

The Herb Warrick Question and Answer Project

Some of the A.B.S. members may wonder what has happened to the Herb Warrick Question and Answer project that was in *The Begonian* for four months. These questions were to be answered by the A.B.S. members and the answers were to appear in *The Begonian.*

Since only two members at large of the A.B.S. sent in answers to some of the questions, I decided that the majority of our members were not interested in such a project and so it was terminated. However, since two members were kind enough to send in their answers, I think that it is appropriate for me to place them in *The Begonian.*

The answers were received from Mrs. Iris Cohen of Liverpool, New York, and Mrs. Louise Sharps of Laconia, New Hampshire. Since both ladies answered the same questions, I will designate Mrs. Cohen's by (A); and Mrs. Sharps' by (B); and my own comments by (C). The questions can be found in *The Begonian* issues of Dec. 1971, and Jan. 1972.

Question: If the root ball of a begonia could be kept damp, what would happen if the plant were suspended in an inverted position? Why?

Answer: (A) If a plant is hung upside down, the leaves and stems will turn 180 degrees and start to grow upward again and toward the light. A plant will grow upwards regardless of the position of the roots, because this aspect of growth is governed by the rotation of the earth, and possibly a negative tropism toward gravity.

(B) The roots would bend toward the rim of the pot and the stem would turn up around the pot, eventually becoming upright. This phenomenon is known as geotropism. The roots growing in the direction of the force of gravity is called positive geotropism. Stems growing against the force of gravity are said to be negatively geotropic.

(C) Tropism comes from the Greek word meaning "to turn." Geotropism means "earth turning." The response to light is phototropism.

Question: What are the cultural procedures for growing certain begonias in terrariums? Why do some, like 'Rajah', versicolor, goegoensis, and others, need such high humidity? How can they stand so little air movement around their leaves?

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EPIDERMAL OUTGROWTHS

(Continued from Page 34)

blades have one common characteristic. They are bilaterally symmetrical, that is, the two portions on either side of the midvein are mirror images (See A., Fig. 1 and Fig. 10). Why is this of interest? Because the mature leaves of *B. phyll.* are bilaterally very asymmetrical, as are leaves on most begonias. But, the first leaf produced by the epicotyl of all of the germinating begonia embryos I can find out about are like these outgrowth leaves. Bilateral symmetry seems to be the inherent characteristic of the seedling, or juvenile, begonia leaves. In normal seedlings there is a leaf-by-leaf transition to asymmetry so that by the 3rd or 4th leaf formed at the seedling stem tip the adult leaf form is attained. There

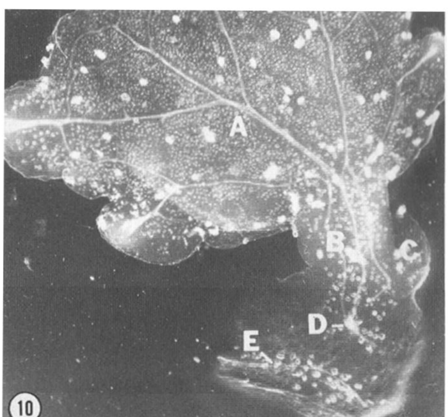

Figure 10.

Whole foliar outgrowth cleared and flattened to show venation. A. Mid-vein of blade, which in this leaf does not continue to the tip (see text); B. Petiole; C. One of the two stipules, the other lying under the petiole; D. End of outgrowth venation in the mound; E. Vein of parent leaf. Outgrowth leaf about ¼ inch long (5 mm).

is no explanation of juvenile leaf form in any of the many kinds of plants that exhibit it. There is no way to know whether *B. phyll.* has juvenile foliage because the plant is sterile and there are no seedlings. But it is intriguing that these adventitious leaves look like the juvenile, first formed leaves of many, if not all, begonia seedlings.

As the outgrowth stipules and petiolate leaf blades mature, veins mature in them. As in normal leaves, the maturation starts near the tip of each tooth under a hydathode (defined below) and progresses back down toward the base of the blade and down through the petiole. The foliar outgrowth shown in Fig. 10 has been made transparent so that the completed venation is more easily seen. This leaf is a queer one because no vein developed at its apex. The reason, probably, is that for some reason no hydathode matured there. A hydathode is an opening between 2 epidermal cells into the interior of a leaf and is much like the hole formed between the two guard cells that is called a stoma. The only difference is that swelling and shrinking of guard cells can close and open the stoma, whereas the hydathode guard cells stay swelled and the opening is always open. For reasons no one knows the first conducting cells differentiate just below this opening. The local, gaseous environment is obviously different there and somehow this may induce cells to become conducting cells rather than chloroplast containing mesophyll cells.

All of the leafy outgrowths, both their stipules and their blades are strikingly different from normal leaves in one anatomical feature. The veins they develop never connect with the veins of the parent plant. They differentiate down from the blade through the petiole, and down from the stipules, into the mound and then stop. Between the end of the outgrowth venation and the venation of the leaf or stem on which they are formed there are from 15-20 living cells of the mound (Fig. 10). Not only do the mound cells not become conducting cells, but at the place where the vein differentiation stops, a whole group of cells usually become conducting cells. They make a whole bulbous mass, as if substances coming down from the leaf accumulated there. Both hormones and sugar are known to be involved in vascular cell differentiation. This is of real interest to a developmental anatomist. So little is known either in plants or in animals, about why some cells mature into specialized cells and others into other kinds, that any example of differential development is grasped for study. This example may be amenable to experimentation. Sometime I hope to have time to experiment with the addition of substances to see whether applied at the right time I could induce the differentiation of conducting cells right on through the mound to a vein of the parent plant.

Earlier, when mentioning adventitious stems I said that *B. phyll.* produces some (Fig. 5). What happens in less than 1% of the foliar outgrowths, usually, is that in the mound between the stipules and the leaf, a stem tip originates. Why this ever happens, I do not know, and why, since it does, it doesn't always happen, I don't know either. When it does, the first one or two leaves formed by this stem tip are of the juvenile form. By the time the third or fourth leaf is produced the transition to the asymmetrical adult form is made. The little stem may be no more than 1/16 inch (1-2 mm) long, too small to be easily noticed, when the asymmetrical leaf shape informs you that it is there. It grows slowly probably because its water and its mineral supply must be moved from the parent plant's veins through the unspecialized living mound cells before reaching its conducting system. I have looked at several hundred of them under the microscope and never found any vascular connection even when they are several years old. I am letting some get to be 5 years old, still on the parent plant, to see whether anything happens.

One would expect that the adventitious stem outgrowths might produce some adventitious roots. Ordinary begonia stems do, readily, from stem cuttings. These do, usually only under favorable circumstances, however (Fig. 5). If they are growing out of the parent stem, near the soil level where the air is moist and where soil and detritus accumulate, after a few years, roots grow out. Experimentally, rooting can be induced by the application to the parent stem or leaf of some rooting compound such as "Rootone" or "Hormodin."

Greater success is achieved if the adventitious stem is removed from the parent plant, along with some of the parent leaf or stem, and these pieces treated with the rooting compound before being placed in a moist atmosphere. Once adventitious roots are growing, the whole plantlet can be put into potting soil. As soon as its root system is established, it starts to grow rapidly. It can absorb its own water and minerals from the soil. It makes all other substances like carbohydrates, proteins and hormones for its growth. A new plant just like the parent is on its way. Asexual reproduction of the parent has occurred. It could occur in nature. How frequently it would, depends upon how frequently conditions are proper for inducing the formation, first, of an adventitious stem, and then, the formation of adventitious roots on that stem. Since no one knows where *B. phyll.* comes from, no one knows whether it does ever reproduce itself naturally in this wya, in sufficient numbers to keep the species going. It may be one of those organisms that without man's intervention woud have long since become extinct.

The fact that *B. phyll.* can produce adventitious plantlets under the proper environmental conditions, and because it is a sterile plant that cannot reproduce sexually by seeds, has led some people to sugest that there is some causal relationship between sterility and the production of these asexual propagules. However, there is no sound basis whatsoever for thinking that because *B. phyll.* cannot reproduce sexually it developed a means of asexual reproduction. Lots of kinds of plants reproduce both ways. The Kalanchoes are a familiar example. Secondly, there is no known nor imagined way in which the hereditary failure to produce seeds could possibly lead to the hereditary ability to produce adventitious plants. Plants do not have the brains to know that they are sterile and figure out a way to propagate their kind by some vegetative means. Of course, one can say, if it seems reasonable to him, that the foresight was in the mind of the Creator.

If you are still with me there is one more thing to tell you about *B. phyll.* Neither von Martius, de Candolle, nor Smith, nor any of the others who have written about this plant has described the outgrowths that it produces on its inflorescences. They are conspicuous enough that I am sure people must have seen them, but never realized that what they were seeing was botanically of great interest. These outgrowths when examined under a hand lens turn out to be small male flowers (Fig. 6). I suppose I could coin the term floramania, but I won't. These floral outgrowths arise, as do the foliar outgrowths, from epidermal cells only. Normally, you will recall, flowers are formed at the stem tip, the floral parts arising, like leaves, from cell multiplication in sub-epidermal layers.

When a strong stimulation of a *B. phyll.* plant occurs at the time that an inflorescence is at the critical stage in its development, as a bud in the axil of a leaf, there may be both foliar and floral outgrowths on the main peduncle. Usually, however, all outgrowths are floral and so are all of those on the latter formed branches of the inflorescence. It still is not known what makes a stem tip cease to produce foliage leaves, separated by stem tissue which grows into lengthy internodes, and then begin to produce modified leaves, the sepals, petals, stamens and carpels, separated by very short internodes, i.e., a flower. The developmental problem is an important one to study because it would be useful sometimes to maintain the vegetative growth of a plant and at other times to initiate reproductive growth. Many people have worked on what causes the developmental shift and much is known, but not enough.

Now here is *B. phyll.* which when its axillary buds are flower buds, produces epidermal outgrowths that usually develop into flowers. Yet rarely, very rarely, these outgrowths on the basal peduncle are leaves. Here again, *B. phyll.* provides a situation in which it might be possible to apply substances, alone or in combination, at the right concentration, at the right time to see whether some control over floral development could be achieved. Probably, however, another plant, hopefully a fertile begonia might be better. I say this because on *B. phyll.* the small flowers do not develop very far — a pedicel, a bract or two, sepals, petals and only rudimentary though identifiable stamens. A whole outgrowth is rarely 3/8 of an inch (5 mm) long.

All of the flowers of the thousands I have examined are staminate. You know that begonias produce male flowers before they produce female flowers. I have been disappointed not to find at least one carpellate (female) floral outgrowth coming out of the last formed branches of the inflorescence. Possibly there is not time before the inflorescences absciss and fall off. The early abscission is because no fruits (capsules) develop, because no seeds are forming, because no embryos are started, because no eggs are ever matured. Thus, there are no hormones moving out of the fruits down the pedicels and then down the peduncles inhibiting the production of abscission layers. If there is a begonia that is fertile so that its inflorescences would stay on longer, then experiments to try to get at what controls flowering might be more profitable. Perhaps someone will find a floramaniac fertile begonia. It wouldn't surprise me. Nothing about begonias will any more.

There are dozens of unanswered questions concerned with plant development to which begonias in their great variety can possibly contribute answers. The members of the American Begonia Society who have contributed funds for fundamental botanical research can expect that sometime, as more observational and experimental studies are supported, begonias may yield some clues to the fundamental biological problem — how does a normal organism develop its characteristic form? This is because what is learned about the morphogenesis of an abnormal organism cannot fail to illuminate the growth controlling processes in normal organisms. Furthermore, the structure and functioning of plant cells are in so many ways similar to those of animals, that information from them may yield clues to animal developmental problems. For us humans, then, begonias are worth studying as well as enjoying.

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RESEARCH REPORT

(Continued from Page 38)

Answer: (A) I think the most important thing for terrariums is adequate drainage, or more accurately, adequate absorption of excess moisture, and careful watering to prevent soggy roots. Plants that are inherently from a jungle atmosphere will have a large number of stomata, thin leaves, and practically no provision for water storage. Hence they will dry up easily in the average indoor atmosphere. Since air movement promotes evaporation, a plant that prefers high humidity is probably better off in still air. Since a plant absorbs CO_2 during the day, and oxygen at night, it meets its own gaseous needs essentially.

Question: It has been said that plants like company. Is there any truth to this and how do they benefit each other? Is it all shading or humidity?

Answer: (A) Probably the observed reaction of plants liking "company" is due to their need for humidity. It can easily be observed that desert plants prefer to have much space between them.

(B) It is my opinion that plants like company but it is not as easy to explain as transpiration or "Susie shading Little Joe." Each plant seems to be an individual trying to outdo each other just to please the grower.

(C) We all know that plants like humidity. Plants themselves are the most efficient humidifiers. They give off moisture in the air all the time. Plants grown in abundance in homes do better than plants grown singly. More plants create a more humid atmosphere to their mutual benefit.

Question: When certain begonias grow better in a covered terrarium or closed Wardian case, how do the plants grow without air movement? Do the stomata open and close normally?

Answer: (A) The answer to this is the same as to a previous question. Even when the air is apparently still, molecular movement will cause enough circulation of gases to keep the plants satisfied.

(B) Plants in a Wardian case do not need air movement to survive. Yes, the stomata open and close normally. Proof of this is the transpiration of the plants (water collecting on the glass).

Question: What happens when foliage feeding is applied? Should the undersides of the leaves also be sprayed with liquid food? Most commercial plant food is applied at a mix strength of one tablespoon to one gallon of water. Is this solution too strong for foliage feeding?

Answer: (A) Supposedly, when foliar feeding is applied, the chemicals are absorbed through the surface of the leaves. I would hesitate to apply much spray to the underside since the stomata might become clogged or injured. They are designed for the exchange of gases rather than liquids. A very mild solution is probably more desirable.

(B) When plants are fed soluble

plant food by spraying the leaves, it is absorbed through the stomata of the leaves. The underside should be sprayed because all leaves have stomata on the underside, while some have none on the top. One tablespoon of soluble food per gallon of water is too strong. You should use two teaspoons per gallon of water.

(C) When used as directed, water soluble fertilizer can be used with safety when applied to the foliage of virtually all plants and it does not have to be washed off to prevent burning. The liquid is absorbed thru the leaves when foliage feeding is applied. I have never read of any harm to the leaf when applied to either side. Foliage feeding is always used at a lesser strength than for soil feeding; usually about one-half the strength. However, always go according to the directions when using a specific brand of fertilizer.

Question: Is it necessary for night temperature to drop below the daytime temperature? How much?

Answer: (A) Many authorities suggest a nighttime drop of about ten degrees for some plants. I have not found that it makes much difference, and I think other factors are more important.

(B) Plants seem to grow better if night temperature is dropped at least five degrees. In nature nighttime temperature is generally less. Plants' natural functions are geared to this change.

(C) Night temperature generally varies from five to ten degrees. It is probably necessary for some plants. This would be a good project for some of the members to try out.

BEGONIA 'EXOTICA'

(Copy of a letter to Mr. Womersly)

Dear Mr. Womersly:

I have just read your article on Begonia 'Exotica' in The Begonian (vol. 39, p.270,271) and I think I have one correction that you will welcome. At the time of the fire the whole Berlin *Begonia* collection was on loan to Irmscher and has survived intact. See Wildenowia vol. 1, p. 27. 1953.

This situation does not detract in any way from the importance of the study of living *Begonia* but does ensure that it will get a necessary support from herbarium studies. I might add that a new study on *Begonia* classification is underway in the States and that Professor Fred A. Barkley in his analytical list of "The Species of Begoniaceae" has taken the first giant step in that direction.

Cordially yours,
Lyman B. Smith
Senior Botanist
Department of Botany
National Museum of
Natural History -
Smithsonian
Institution

THE RESEARCH FUND PROJECT

All of the necessary begonia plants have been supplied to Dr. Moser for the project on stem leaf cuttings of cane begonias. They now have about fifty different species and hybrid begonia plants to work with. This was accomplished through the co-operation of the following members to whom I wish to express my thanks; Anita Sickmon and her Round Robin members in the Kusler Hybrid Flight; Jack Golding and some of his Knickerocker members; James Wyrtzen, Rosetta White who furnished a large number of the Kusler hybrids; Yvonne Wells of the Mesquite Branch; and Ed. and Millie Thompson.

A senior, Miss Bonnie Greener of Piscataway, New Jersey, has been selected to work on our research project under the guidance of Dr. Moser. She is in the College of Agri-

(Continued on Page 47)

Miss Bonnie Greener standing along side of one of the benches of begonias propogated by her.

Dr. Moser advising Miss Greener on some of the problems involved in the project.

BRANCH DIRECTORY

VISITORS ARE ALWAYS WELCOME AT THESE MEETINGS

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R D No. 1, Box 121,
Mystic, Conn. 06355

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1619 S. Beckley Ave., Dallas, Texas 75224

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El Cerrito, Calif. 94530

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770 Monroe Ave. N.E., Renton, Wash. 98055

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Mrs. Marie Schmidt, Secy.
1296 Prospect
Pomona, Calif. 91766

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Mrs. B. A. Russell, Secy.
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128 West 58th St., New York
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505 East 82nd St.
New York, N.Y. 10028

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Great Western Savings and Loan Bldg.
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Mrs. Paul E. Powell, Secy.
3031 Shakespear Dr., Los Alamitos, Calif. 90720

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Commack, L.I., N.Y. 11725

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1962 Cederdale, Baton Rouge, La. 70808

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Sacramento, Ca. 95823

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WILLIAM PENN BRANCH
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Mrs. Stuart J. Bracken, Secy.
727 Mt. Moro Rd., Villanova, Pa. 19085

RESEARCH FUND PROJECT

(Continued from Page 45)

culture and Environmental Science at Rutgers University. Her major field of interest is Horticulture.

The preliminary work has been carried on by Dr. Moser and the student will now be doing the work on the project. The first stage has been to propagate stock plants and then screen the various varieties for their ability to form shoots from leaf cuttings. Miss Greener has made two kinds of leaf cuttings of each variety. One is a leaf wedge cutting and the other is a whole leaf with petiole attached.

By the first of the year, they will have the results of the first experiment and will select two varieties, one which will give some shoots and another which grows no shoots. Chemical and environmental treatments will be given to these shoots during the first half of 1973. Initial results should be available in June.

M. Carleton L'Hommedieu
Research Director

PUBLICATION NOTICE

All material for publication — articles, notices, photographs — should be sent to the Editor, preferably five weeks before date of publication. Deadline is the first of the month preceding month of publication.

Advertising copy and inquiries should be sent to the Advertising Manager.

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