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RESEARCH NEWSLETTER

This Flower Bulb Research Program Newsletter is published by Anthos, Royal Trade Association for Nurserystock and Flowerbulbs in cooperation with Dr. Bill Miller of Cornell University.

Flower Bulb Research Program
Cornell

Dept. of Horticulture Cornell University
134 Plant Science Building
Ithaca, NY 14853, USA
Phone: + 1 0016072272780
Fax: + 1 0016072559998
wbm8@cornell.edu

Anthos
Royal Dutch Trade Association for Flowerbulbs and Nursery Stock

Weeresteinstraat 10
P.O Box 170
2180 AD Hillegom
Phone: +31 252 53 50 80
Fax: +31 252 53 50 88
secretariaat@anthos.org
www.anthos.org

The newsletter is distributed in North America bij the North American Flowerbulb Wholesalers' Assn, 2424 Hwy 72/221 E, Greenwood, SC 29666, email: nafwa1@aol.com

William B. Miller
Cornell University

A Bit of Reflection

This Research Newsletter is the 20th to be published since we began them in 2003 as a way of communicating results of the Group I Research Program to members, customers and others interested in the program. In these newsletters we usually report in a rather detailed way the results of Cornell research done in cooperation with, and on behalf of, the industry. Below is a partial listing of the major topics in the past 20 newsletters.

- Topflor and Bulb Crops (Mar. 09)
- Planting Mix, Planting Depth and Growth Regulators on Dutch Grown Calla Lilies (Dec. 08)
- Potential Technologies to Reduce Ethylene Injury in Tulips (Aug. 08)
- The Effects of Short-Term Ethylene Exposure on the Forcing Quality of Tulip Bulbs (PPO, Aug. 08).
- Postharvest Leaf Yellowing and it's Control in Oriental Hybrid Lilies (May 08)
- Boron Deficiency in Tulip (Feb. 08)
- Update on 1-MCP and Tulips (Feb. 08)
- Topflor dips for Hyacinth Height Control (Feb 08)
- Causes and Control of Cold-Storage-Induced Bud Necrosis in 'Mona Lisa' Lilies (July 07)
- Fusarium, Tulips and Ethylene: Not as Simple as You Thought (May 07)
- Using Florel to Control Upper Leaf Necrosis and Reduce Height in Pot Oriental Hybrid Lilies (Feb. 07)
- Drying Out of Perennials is the Most Important Factor in Quality Loss in the Chain (Feb. 07)
- Combining Flowerbulbs and Perennials: Increasing the Market for Both (Aug. 06)

- Many Cultivars of Cutflower Hybrid Lilies Make GREAT Garden Plants (May 06)
- Field Grown Lilies for Late Season Cut Flowers: A Preliminary Report (May 06)
- Exploiting New Gardening Trends and the "New Consumer" (May 06)
- Using Alcohol to Reduce Growth of Paperwhite Narcissus (Feb. 06)
- TopFlor, a New Growth Regulator, Registered in the US (Feb. 06)
- Hyacinth Height Control: Avoiding Floppy Stems (Feb. 06)
- Saving Energy and Maintaining Tulip Bulb Quality with a new Ethylene Sensor (PPO, Feb. 06)
- Producing and Using Bulbous Plants for Mixed Planters (Nov. 05)
- Problem of Black Shoots In Oriental Hybrid Lilies Closer To A Solution (PPO, Nov. 05)
- Past, Current, and Future Research Results of the Flowerbulb Research Program (July 05)
- What Causes Upper Leaf Necrosis on Oriental Hybrid Lilies? (Apr. 05)
- Controlling Upper Leaf Necrosis on 'Star Gazer' lilies (Apr. 05)
- Perennialization of Hyacinth Cultivars in Ithaca, Long Island, and Clemson, SC (Oct. 04)
- Trichoderma (Oct. 04)
- 4th Year Narcissus Ratings in Ithaca, Long Island, and Clemson (Apr. 04)
- Preventing ethylene problems in tulip bulbs with FreshStart (PPO, Apr 2004)
- Handling Bareroot Perennials (Nov. 03)
- Growth Regulation for Potted Hybrid Lilies (July 03)

From the list, you can see there is a great deal of immediately useful, practical information for bother exporters and their customers. For example, in forcing, we have developed a large body of information on growth regulator usage on both spring bulb crops, and lilies (e.g. March 2009, Feb. 2008 and July 2003). Information on controlling postharvest bud browning in Oriental hybrid lilies was given in July 207, and the novel use of Florel a an agent for both height control and control of upper leaf necrosis in Oriental hybrid lilies was presented in Feb. 2007. Fascination in lilies for postharvest improvement (reduced leaf yellowing and longer flower life) was presented in May 208, and Alex Chang's work on upper leaf necrosis in oriental hybrid lilies came in April 2005.

On the landscape and dry sale side, our initial work on perennialization of bulb species was presented in April and Oct. 2004. Dr. Terri Starman presented an array of beautiful mixed containers featuring bulbous plants in Nov. 2005. In May 2006, we published an article demonstrating that new cultivars of "cut flower lilies" perennialize beautifully in zone 5, which prompted a wider planting of lilies to further evaluate this. And, in August 2006, we presented information on garden combinations of flower bulbs and perennials with an eye to increasing the market for both.

Since the Flower Bulb Research Program began at Cornell in 1998, we have engaged in a number of perennial projects with the aim of improving storage potential and regrowth performance in North America. Results of this work were communicated in Nov. 2003 and Feb. 2007. A very

important outcome of this work was the recommendation for growers to be very careful in their bareroot planting practices, and the concept of "planting high" was introduced (planting bareroots such that the buds and crown are under the soil is detrimental for regrowth in nearly all cultivars examined).

Finally, we have always engaged in some more fundamental, longer-term research on topics of great importance to the industry. The most significant one has probably been our efforts in Fusarium, ethylene, and tulips. The research in the May 2007 newsletter revealed that tulip cultivars vary widely in their ability to support significant levels of ethylene when infected with Fusarium. Some cultivars support very low levels of ethylene, whereas other cultivars seem to cause, allow, or support ethylene production at levels many times "the normal level" of ethylene. Such research does not provide a total and immediate solution to a problem, but opens our eyes to the complexity of the problem, and forces us to think in new and different ways. Perhaps knowledge on the wide variation in ethylene production might be useful for breeding cultivars that lead to less ethylene production.

The Newsletters have proven to be a valuable source of information on bulb forcing and landscaping. They are archived on the Anthos web site, and, all will be on our soon-to-be-updated Cornell flower bulb web site at www.flowerbulbs.cornell.edu

Cornell's NEW Bulb Labyrinth Makes Its Debut!

In the fall of 2008, students in Bill Miller's Herbaceous Plant Materials course planted a flowerbulb labyrinth as a class project. We did this to give students experience with flower bulbs, and also to support the The Bulb Project and it's focus on kids, garden, and human well being (see http://www.thebulbproject.org/). This labyrinth is actually the second to be planted at Cornell. The first labyrinth, planted in the fall of 2007 suffered from drainage problems due to a problem with site location and has been more or less abandoned. We laid out and installed a "7 Ring Classical Cretan Labyrinth" as outlined on the Labyrinthos web site (http://www.labyrinthos.net/typolab02.html)

The labyrinth began flowering on April and was probably in peak flowering May 8-10, but many more flowers were still to open. This first year display is especially nice, with the muscari, daffodils and tulips all in flower at the same time. It will be interesting to se how the flowering sequence changes in coming years. Two open houses, drawing nearly 200 people, were held in early May.

A web site describing the project, including some excellent high angle images and video can be found on Cornell's web site at:
http://www.hort.cornell.edu/department/faculty/wmiller/bglannuals/labyrinth/

A few quick facts about the labyrinth:

- The labyrinth is approximately 60' (19 meters) wide
- Approximately 125 total hours of labor were needed to plan for and plant the labyrinth
- Planting trenches were 8-10" wide. Ring spacing is 36", giving a walking path of 24-26 inches. For maintenance of the grass, this is about the minimum width.
- Laid out and dug in late September. Planted 7 October.
- 8,000 Muscari, 5,000 mixed daffodils, 2,000 mixed (mostly darwin hybrid) tulips for a total of 15,00 bulbs.
- Bulbs were layered (daffodils deepest, then tulips and muscari above them)
- This project could definitely be accomplished by a community or school volunteer group. Certainly the digging is heavy work, but many hands make easy work, and there are many areas for kids to involved.
- Bulbs were supplied through the IBC with excellent help from Sally Ferguson.

Image 2163.

Image 2203.

Mechanical Stress and Cold Water Reduce Growth in Lilies

In Bill Miller's greenhouse management course this spring, a group of students conducted an experiment that will be of interest to exporters. The group (Katy Johnson, Geoff Reeves, Jed Barker and Becky Gillette) grew Easter lilies using three treatments, in addition to an untreated control. When the plants were about 1 cm tall, treatments began, and were:

- Untreated control
- Plants touched or "mechanically stimulated" each day. "Touching" meant mowing your hands up and down the stem, touching the leaves, for 20 seconds each day.
- Cold water (about 60 ml, at 3C) was poured onto the growing point each day
- Same as above, except the water temperature was 20C.

The results were fascinating! Within 1 week, growth differences were seen, and these differences became larger as time went on. The photo shows plants a little after the visible bud stage, and the large differences in growth are apparent.

The mechanical stimulation or "touching" treatment has been well known for years to cause reduced stem growth, resulting in shorter, more compact plants. Mechanical stress/stimulation can easily accomplished in commercial greenhouses, perhaps my attaching thin ropes or plastic sheeting to booms, and moving the booms back and forth across the crop. Potential problems could be disease transmission or mechanical damage (tearing of leaves, etc.), but could be a useful technique in many crops.

The water treatments were even more interesting. It is important to note that the water treatments were given by pouring water onto the growing point, not onto the soil, so this had nothing to do with root or soil temperature. The effect is clearly one of the water temperature on the growing point, as plants in the warm water treatment were exactly the same size as the controls. We did these treatments daily, and the resulting plants might be too short, but it is a good demonstration.

We did this experiment based on results from Blom et al. in Guelph, Canada, who published research on this technique several years ago. Their results showed the colder the water, the shorter the plants that resulted, so it is not necessary to use water that is specifically 3C. It would be interesting to see what effect, if any, cold water applications have on spring bulb growth.

Left to right: Easter lilies treated with: Control, 20 seconds per day touching the leaves (mechanical stress) 2 ounces cold (3C) water poured on the growing point, or 2 ounces 20C water poured on the growing point. Image 1649.

Ethylene, Fusarium, and Tulip Color Sports

By Gerardo Suazo, Simon Laan and Bill Miller

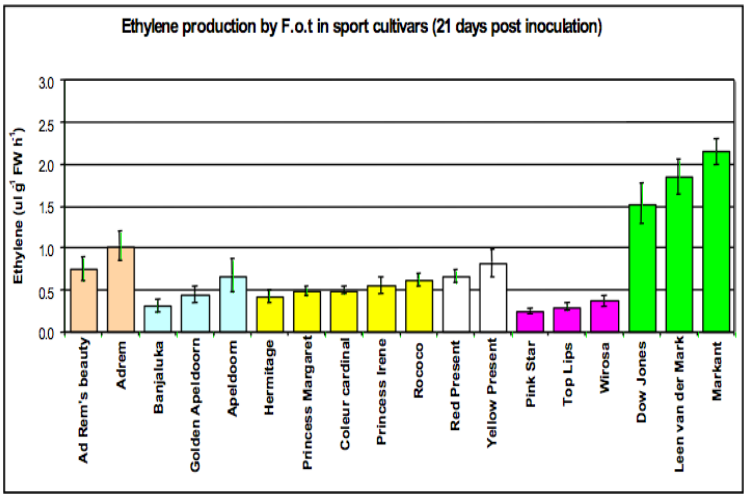
"Red Present forces just like Yellow Present", and "Couleur Cardinal and its sports all force alike". We are used to considering sports as being essentially identical plants, with nearly identical horticultural characteristics, differing only in flower color, or perhaps flower form. But, how far does this go? Are sports really "identical" in all characteristics other than the obvious one of flower color or form? This was the question that Simon Laan, our research intern for 2009-2009, was interested in investigating as part of his internship requirements for HAS Den Bosch. Simon worked with my Cornell Ph.D. student, Gerardo Suazo to inoculate a range of tulip sports with a particular

strain of Fusarium, then followed ethylene production by the bulbs (actually, of course, by the fungus) over 28 days. In the experiment, we had examples of color sports from 6 cultivars: Couleur Cardinal, Apeldoorn, Wirosa, Ad Rem, Yellow Present and Leen vd Mark. With Apeldoorn, 4 generations of sports were represented (although we did not have Hans Mayer). The cultivars used are shown below:'

Mother	Daughter	Granddaughter	Great granddaughter
Ad Rem	Ad Rem's Beauty		
Apeldoorn	Golden Apeldoorn	(Hans Mayer)	Banjaluka
Couleur Cardinal	Rococo Princess Irene	Prinses Margriet	Hermitage
Yellow Present	Red Present		
Wirosa	Top Lips		
Leen vd Mark	Dow Jones Markant		

Bulbs were inoculated with Fusarium, and held in a humid chamber over the 28 day experiment. Weekly, bulbs were sealed for 30 minutes, and the amount of ethylene produced measured y gas chromatography. A quick preview of the results is shown in the figure, for 21 days after inoculation. Basically, each parent cultivar and its sports show very similar levels of ethylene production. For example, Wirosa, Pink Star and Top Lips all have very low levels of ethylene production, and Ad Rem and Ad Rem's Beauty show similar, but higher levels of ethylene. Leen vd Mark and it's sports Dow Jones and Markant together show high levels of ethylene production. This experiment was conducted two separate times, with very similar results each time.

This experiment builds on our work showing that cultivars vary a great deal in their ability to support ethylene production by Fusaruium (see May 2007 newsletter). The current experiment provides the first evidence that tulip sports may also show similar responses to Fusarium in terms of ethylene production. While too early to make an absolute conclusion (we need more data with more sport groups) it seems likely that within a sport family, a similar level of ethylene could be expected to be produced by infected bulbs.



Ethylene production by Fusarium infected tulip bulbs, 21 days after inoculation. Cultivars are grouped by color into "cultivar families".