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RESEARCH NEWSLETTER

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Postharvest Growth Control of Tête-à-Tête

Even though Tête-à-Tête is a "dwarf" daffodil, its postharvest growth (while flowering) is excessive and it is desirable to reduce this growth. To this end, we have trialed Bonzi or Piccolo (paclobutrazol), Sumagic (uniconazole), and TopFlor (fluprimidol) as possible plant growth regulators (PGRs) for Tête-à-Tête. Throughout these studies, when applied at similar economic rates (e.g., at similar PGR material cost per pot or per bulb), paclobutrazol (Bonzi or Piccolo) have consistently been more effective than Sumagic (unicolazole). We have also seen excellent results with TopFlor, but this chemical is currently under development and not yet on the market. Dipping bulbs for 120 minutes into 50-100 ppm paclobutrazol (Bonzi or Piccolo) with bulb cooling durations of 14-15 weeks has been effective.

12/14 cm Tête-à-Tête plants nearing the end of flowering. After dipping in Bonzi, bulbs were cooled 15 weeks, forced to bud color, then held 7 days in a low-light, 20C postharvest room. L to R: Control, 50, 100, 200, 400 ppm Bonzi, given as 10 minute pre-plant dip.

With longer cooling durations (later forcing), we have found somewhat higher concentrations are needed (e.g., 100-150 ppm). These treatments have little to no effect on the height of the plants when they are brought out of the cooler, thus are of no value in preventing "cooler stretch". Furthermore, they usually *have relatively little effect during forcing in the greenhouse.* They do, however, exert a powerful effect in the postharvest phase, and typically reduce elongation by 15-30%, as can be seen in the photos below. More details on this can be seen on the 2004 CD, and in an upcoming newsletter.

Shelf-life of flowerbulbs and perennials increases dramatically in Modified Atmosphere Packages

Researchers Henk Gude and Marga Dijkema at PPO Lisse have been working on Modified Atmosphere Packaging (MAP) during the past 2 years. A MAP package is a consumer package consisting of a film with a low permeability for oxygen and carbon dioxide. The respiration of the product inside the package causes the oxygen level to reduce to such levels that sprout development is minimized. An additional advantage of the film is that it is virtually impermeable to water, thus preventing drying out of the product. Since plant respiration is the crucial process in creating a certain oxygen level the researchers have measured the respiration of different bulbs and perennials at different temperatures. Especially the increase in respiration upon transfer of the plants from low storage temperatures to retail temperatures was given much attention. Based on these measurements films with specific oxygen permeabilities were produced by a manufacturer of these films. Preliminary tests with bulbs and perennials in these films revealed that the shelf-life of perennials increased from 3 weeks in traditional packages to 8 to 9 weeks in MAP-packages, in some cases even without any filling material. It is likely that the MAP-packages will be improved even further. Other aspects of this research project are the type of filling material and the development of a so called (MAP) transit-bag for the storage and transport of larger quantities of product.

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Past, Current, and Future Research Results of the Flowerbulb Research Program

By Bill Miller, Cornell University

Each year, the Flowerbulb Research Program at Cornell University publishes a CD with a full reporting of experiments, data, and observations from past years' research activities. In 2003, we began publication of the Research Newsletter as an additional means of communicating activities and findings of the research program to the industry.

In this Newsletter, I will highlight a number of research topics on which we are currently working, a couple that have finished, and a few that are just beginning. By no means is this a complete list of our activities! Ideas for research originate from many sources, including the Research Committee, from Cornell faculty, staff, and students, from growers and users of flowerbulbs in North America, and from North American bulb importers and distributors. Readers wanting more details are first referred to the annual CD, and also to our website at www.flowerbulbs.cornell.edu. You may always feel free to contact me at Cornell University. My email is wbm8@cornell.edu, and I welcome any and all comments, including suggestions for additional research problems and topics.

Growth Regulators and Hybrid Lilies

In a continuing program, each year we evaluate a number of cultivars of hybrid lilies for response to plant growth regulators (PGRs) with the objective of tailoring them for growth in pots. In the long term, there is no doubt that continued development of genetically dwarf cultivars needing no PGRs is the best solution, and there are certainly some suitable cultivars available. On the other hand, there is great deal of industry interest in this kind of work, and in using the kinds of cultivars available in the cut assortment. In the annual CD, a full report can be found, with cultivar forcing characteristics, and suggestions as to kind and rate of growth regulator to be used. The photo gives an idea of the possibilities that can be obtained.

Effect of pre-plant bulb dips on size 14/16 'Algarve' LA-hybrid lily. 2004. Treatments are (L to R): Control, Bonzi at 50, 100, 200, or 300 ppm, Sumagic at 2.5, 5, 7.5 or 10 ppm, and TopFlor at 10 or 50 ppm, given as a 1 minute dip.

Our effort in this area has mainly been geared towards bulb dips into the PGRs (Bonzi or Piccolo [paclobutrazol], Sumagic [uniconazole], or, experimentally, TopFlor (fluprimidol]). The results can be summarized as follows:

- Most lily cultivars can be easily dwarfed by economical rates of PGRs
- Cultivar differences exist, however, and must be accounted for
- Effective PGR treatments typically have no effect on forcing time or flower size In a typical commercial setting, the PGR dip solution keeps effectiveness for a long time. For example, at least 55 14/16 cm bulbs can be dipped into a liter of solution without reducing the effectiveness of the solution.

Fascination in Lilies

One of the early success stories of the program was our work on the hormonal formulation, Fascination, on Easter and hybrid lilies. Fascination is a legally available (Valent, USA) mixture of benzyladenine (BA) and gibberellin$_{4+7}$ (GA_{4+7}). It is also available to apple growers as Promalin. In lilies, the gibberellin component of Fascination has specific effects on leaves, keeping them

green and in many cases, totally eliminating leaf yellowing that might occur in the greenhouse (especially for Easter lilies), or after postharvest cold storage (all lilies). Fascination is also highly effective in prolonging flower life of most lilies, in many cases by 25-30%. Growers forcing oriental hybrid lilies in pots are now commonly spraying their crops with 25-50 ppm GA_{4+7} (from Fascination) within 2 weeks of flowers opening. Such a treatment will allow the grower to cold-store the plant at 5C for up to 10-14 days, without leaf yellowing or flower drop. Flowers will continue to open and with good color. While growers should *always* be advised to cold-store hybrid lilies for as short a time as possible, Fascination has proven to be an excellent tool to improve plant quality in an increasingly tough marketplace.

Fascination in Tulips?

The above results for Fascination and lilies may be only the beginning for the potential of this chemical for flowerbulbs! In 2004, Martijn Verlouw, our Dutch student intern for the year, became interested in Fascination, and conducted an experiment with two species tulips. The results were quite stunning. It was clear that the Fascination sprays dramatically increased the flower life for both cultivars, as shown in the photo. There did not appear to be any effect of the gibberellin in terms of stretching the upper internode.

Effect of Fascination sprays on the appearance of the species tulip 'Little Beauty'. Left: control plant (sprayed with water) and right, a plant sprayed with 100 ppm Fascination.

Many more experiments will needed to see the general effects of Fascination on species and hybrid tulips. If these results hold true and if upper internode elongation is not stimulated, Fascination treatments could become extremely important for pot tulip production in the future. This is certainly an avenue we wish to pursue in the upcoming year.

Bringing Flowerbulbs into Mixed Containers

In North America, the major growth sector in recent years has been "vegetative annuals", personified by new breeding efforts in crops such as calibrachoa, verbena, scaevola, angelonia, "tropicals", bacopa, and a host of other plants. These plants have found a huge use in mixed containers, including large and small patio containers or hanging baskets. Flowerbulbs have been notably absent in the plant pallette used in these containers. Dr. Terri Starman of Texas A&M University might be changing this. Dr. Starman is an expert in designing mixed containers and in 2004, with bulbs supplied by the Research Committee and funding from Cornell's Post/Schenkel Foundation, she created a series of containers featuring flowerbulbs mixed with other vegetative annual or tropical plants. Dr. Starman presented this work at the NAFWA conference in Florida in March, and will be authoring an article in an upcoming research newsletter. In the meantime, you may log onto the website below for a preview of her work.
http://aggiehorticulture.tamu.edu/floriculture/container-garden/index.html

Have a Drink With Your Paperwhites!

An inquiry from the New York Times in February 2005 prompted us to investigate the effects of growing paperwhite narcissus with dilute alcohol solutions. It seems that a reader of the Times "discovered" that pouring a little gin onto paperwhites growing on pebbles in the home caused them to stay shorter, and not fall over. Realizing this would be a very popular research topic, we immediately began a series of experiments looking into this phenomenon, and we thank Jan Doornbosch of International Bulb Co. for his generous, last minute donations of the bulbs used in these experiments. A full report will be published later on, but the bottom line is that growing paperwhites in a 4 to 5% solution of alcohol is actually an excellent growth regulation technique! When grown in 5% alcohol, plants are about half the height of plants grown in water. Given that most liquors are 40% alcohol, this is equal to 1 part of booze to 9 parts of water. Gin, vodka, whiskey, rum, tequila, and schnapps are all equally effective, so long as they are given at the same alcohol concentration (realizing that liquors can come in different strengths). Beer and wine (red or white) are *not* recommended as they kill the bulbs. The initial article leading to this work is on the NY Times website at:
http://events.nytimes.com/2005/02/17/garden/17qna.html?ex=1120276800&en=abdba0639c63d115&ei=5070

Postharvest Bud Necrosis in Oriental Hybrid Lilies

This project is just getting started. The American Floral Endowment has generously agreed to fund a proposal we wrote on a problem we are calling "postharvest bud necrosis" in oriental hybrid lilies (see photo below). Growers in the southern US especially see this problem in summer crops. The plants look fine in the greenhouse, but if cold-stored after forcing, rapidly (within a few days) develop dark spots and blotches on the buds *in the cooler*. The cause of this problem is not known, but we do know that cultivars vary in their susceptibility. For example, 'Mona Lisa' and 'Sissi' are sensitive. We will be starting work on this problem this summer, and will report our findings as they develop in the future

Postharvest Bud Necrosis, a new problem being investigated by the Flowerbulb Research Program at Cornell University. These buds are from the cultivar 'Sissi', and the browning began after 4-5 days in a 3C cooler.

Perennialization of Flowerbulbs in the Landscape

From 1999 to 2003, a large experiment was conducted at Cornell (Ithaca, NY, zone 5), Riverhead (Long Island, zone 6), and Clemson University (Clemson, SC, zone 7). The objective was to evaluate 200 cultivars and species of bulbous plants for their perennialization ability in these three climates. The results of this work have been published in past Research Newsletters (Nos. 3 and 4, in 2004). The basic conclusions were as one might expect: perennialization ability varies enormously by species, tulips are relatively poor perennializers, and, in general, narcissus are excellent perennials. Hyacinths were also surprisingly good as a group. A highly condensed report of the results was published in cooperation with the IBC (in 2004), and full details are available on the website (www.flowerbulbs.cornell.edu) under "Publications" and on the 2003 CD.

Combinations of landscape bulbs and perennials

As a follow-up to the above project, we began in fall 2004 a program looking at trying to identify good combinations of bulbs and perennials. A "good" combination might be one where there is sequence of bloom, where the bulb and perennial flower at the same time in a pleasing way, or where the perennial might be especially good in covering senescing leaves of the bulb after it flowers. In fall 2004, bulbs were planted into numerous established perennials, giving more than 400 combinations of bulbs and perennials. The five trial sites are Ithaca, Riverhead, NY, Guelph Ontario (Univ. Guelph), Columbia, SC (Riverbanks Zoo) and Dallas Texas (Dallas Arboretum). This program mirrors a similar one being done in Europe by the IBC. Results will be released when they are available.

Perennial regrowth and washing

In 2001-2003, we conducted a series of experiments with PPO, Lisse to determine the main effects of several commercial procedures on regrowth vigor of exported, bareroot perennials. The most important finding of this work was that the normal washing process in Holland has no negative effects on the regrowth of plants after export. Based on this work, problems with regrowth might indicate other problems with the plant, digging time, storage or shipping conditions, or handling by the grower in North America. We have just started a follow up project, where storage and handling conditions are being further explored. Results of this work will be forthcoming as the project unfolds.

Perennial Planting Depth

While considering problems with regrowth of perennials, we conducted several experiments looking at planting depth of the bare root. Commercial recommendations often state "plant the crown 1 to 1-1/2 inches (3 to 5 cm) deep". Our results very clearly show that such planting depths are almost always bad for regrowth. When the crown is planted so the buds are at or slightly above the soil line, superior growth results. This simple technique has held true for nearly every species we have tested (more than 20). We have extensively publicized this finding in the Research Newsletter (No. 2, Nov. 2003), in numerous trade journals in the US, and in many industry presentations since 2003. More information, including a photographic guide for planting depth on a number of bare root crowns, can be found at http://www.flowerbulbs.cornell.edu.

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