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IFAS EXTENSION

**Cooperative Extension Service**

**Institute of Food and Agricultural  
Sciences**

## **PACKINGHOUSE NEWSLETTER**

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Key Index Words: Biological decay control, *Pseudomonas syringae*, green mold, *Penicillium*, Packinghouse Day, Indian River Postharvest Workshop

All previous and present Packinghouse Newsletters (PHNL) are available on the Internet at the University of Florida's postharvest web site (<http://postharvest.ifas.ufl.edu>) and can also be accessed through our citrus resources web site (<http://flcitrus.ifas.ufl.edu>). E-mail delivery of this newsletter may occur as much as a month before the printed version. To receive e-mail delivery, simply contact the editor (see contact information above).

**Editors Note:** Please welcome **Dr. Jan Narciso**, microbiologist with the USDA/ARS, Citrus and Subtropical Products Laboratory in Winter Haven, FL. Dr. Narciso comes to the USDA after a long history of plant pathology work, including work most recently with UF/IFAS on citrus packinghouse food safety and field and packinghouse sanitation.

### ***Pseudomonas* Biological Control Agents: Do They Have a Role in Citrus Packinghouses?**

**Jan A. Narciso**, USDA/ARS, Citrus and Subtropical Products Lab, Winter Haven  
[jan@citrus.usda.gov](mailto:jan@citrus.usda.gov)

Preliminary data from studies at the USDA/ARS in Winter Haven show potential short-term benefits from the use of biological control agents (*Pseudomonas*) in preserving citrus fruit quality. Biological control is a component of an Integrated Pest Management (IPM) strategy and involves controlling pest organisms by using other organisms rather than by chemical or production practices. There are several types of interactions between organisms that can be used for biocontrol, such as

the production of by-products by one organism that are toxic to the other (antibiosis); competition (for nutrients); predation (using target organism as a food source), and the production of chemicals that induce host resistance (Gardener and Fravel, 2002). In particular, Smilanick and Denis-Arrue (1992) found that *Pseudomonas* species inhibit green mold development by successfully competing for nutrients. Interactions between microorganisms and plants are complex, and biological factors that affect plants are not independent from non-biological (i.e., environmental) factors. Therefore, the effectiveness of various biological decay control methods is more profoundly affected by application methods, environmental conditions, etc. than is the effectiveness of synthetic chemical decay control methods.

There are several companies producing biocontrol agents ranging from those that sell a single product to others that market not only the biocontrol product, but an integrated control program. Some biocontrol organisms are marketed to control a specific pathogen, while others can be used in a general way. Some examples of biological control agents are Aspire\* (*Candida oleophila* I-182), which targets *Botrytis* and *Penicillium* fungi on citrus and pome fruits, and Bio-Save LP\* (*Pseudomonas syringae*) which targets *Botrytis cinerea*, *Penicillium* spp., *Mucor pyroformis*, and *Geotrichum candidum* in pome fruits, citrus, cherries, and potatoes. There are many other examples of biological control agents and more are being registered and introduced as concern grows over environmental and human health and safety. Following is a preliminary report of a project which examined the efficiency of Bio-Save 10LP\* (*Pseudomonas syringae*, Village Farms Bio-Save Division, Longwood, FL). The strain of *Pseudomonas syringae* used for these studies is cold tolerant and is shipped in a frozen powdered form. It is certified organic for lines where this type of processing has become incorporated.

The studies were undertaken using late season (May) 'Ruby' red grapefruit collected from a commercial grove, washed in a commercial fruit washer and sanitized with 1% Storox (BioSafe Systems, Glastonbury, CT)\*. After drying in air, a third of the fruit were inoculated with *Penicillium digitatum* (green mold) and *Penicillium italicum* (blue mold), each at  $1 \times 10^6$  spores/mL. After 24 hours at 77 °F (25 °C), the fruit were dipped for 10 seconds in a suspension of Bio-Save 10LP ( $1 \times 10^7$  colony forming units (cfu) of the bacterium *Pseudomonas syringae*). In a packinghouse, the bacterial suspension can also be sprayed or dripped on the fruit (Brown and Chambers, 1996). After drying, the fruit were thinly coated with an organic wax (Nature Coat 10/12\*, Fresh Mark Corp., Mascotte, FL). Control fruit were not treated with Bio-Save but were coated with Nature Coat. Another set of fruit were coated with Nature Coat containing TBZ (0.28 oz/gallon water; Freshguard 598\*, FMC Corp., Lakeland, FL). After treatment, all fruit were stored at 55 °F (13 °C) and checked for decay every week.

Most lesions found in the Bio-Save treated fruit were small and dry and sporulation was delayed and/or decreased when compared with the control fruit. After three weeks at 55 °F, results showed 48% decay from green mold in the control fruit, 14% in the Bio-Save, and 10% in the TBZ coated fruit. Other researchers have found similar results. Brown and Chambers (1996) found that commercially harvested fruit treated with *Pseudomonas syringae* developed significantly less green mold than untreated fruit, but more green mold than TBZ or Imazalil treated fruit. Delayed application of *Pseudomonas* after wounding and inoculation can produce variable results. While Brown and Chambers (1996) found that delayed application of *Pseudomonas* for 24 hours or longer after wounding greatly reduced its ability to control green mold, we still found substantial green mold control even if *Pseudomonas* was applied 24 hours after wounding. Other researchers have

shown that *Pseudomonas* is not effective against stem-end rots caused by *Diplodia* or *Phomopsis*, and our studies support these findings. While some researchers have shown success incorporating *Pseudomonas* into various fruit coatings, our studies show that Bio-Save is most effective when applied after washing the fruit, just prior to wax application, but not as effective when incorporated in the wax.

Recent surveys suggest an increased interest in biological control as an alternative for, or as an addition to, a comprehensive program. The mode of action of the Bio-Save organism as a competitive antagonist rather than an eradicant makes this organism more effective in controlling wound pathogens (e.g. *Penicillium* and *Geotrichum*) than in controlling decay organisms that are already established on their hosts before harvest (e.g. stem-end rots, anthracnose).

The use of biologicals requires more knowledge intensive management than the use of synthetic chemical control methods and there is often special handling required with these products. The Bio-Save organism must be suspended in water and applied soon after mixing. To ensure that all wounds are exposed to the bacterium, care should be taken to cover the entire fruit. Since *Pseudomonas* is a living organism, it is necessary to take caution with sanitizers (i.e. chlorine) that are used in conjunction with the bacterium: too much sanitizer, not enough dry time between applications, or any residual sanitizer can dramatically decrease the effectiveness of Bio-Save.

It is important to be aware of the benefits, costs, and applications of these organisms for your program to make it safe and profitable. There are a number of additional sources where information on biocontrol products can be found; including extension reports, agricultural bulletins, the EPA website (<http://www.epa.gov/>), and the American Phytopathological Society webpage (<http://www.apsnet.org/>: follow directions to biological control materials).

#### **Literature Cited:**

- Brown, G.E. and M. Chambers. 1996. Evaluation of biological products for the control of post-harvest diseases of Florida citrus. Proc. Fla. Hort. Soc. 109:278-282.
- Gardener, B.B and D.R. Fravel. 2002. Biological control of plant pathogens: Research, commercialization, and application in the USA. Plant Health Progress doi: 10.1094/PHP-2002-0510-01-RV.
- McGuire, R.G. 2002. Population dynamics of postharvest decay antagonists growing epiphytically and within wounds on grapefruit. Phytopathology 90(1):1217-1223.
- Smilanick, J.L. and R. Denis-Arrue. 1992. Control of green mold of lemons with *Pseudomonas* species. Plant Dis. 76:481-485.

Mention of any trademark does not constitute a guarantee or endorsement of this product by the USDA and does not imply its approval to the exclusion of others that may also be suitable.

\* Manufacturer's name

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## Forty-Third Annual Citrus Packinghouse Day

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Thursday, September 2, 2004  
Citrus Research and Education Center  
700 Experiment Station Road,  
Lake Alfred, FL 33850

Lunch Sponsor: DECCO/Cerexagri  
Includes exhibits by more than 30  
companies

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## Indian River Postharvest Workshop

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Thursday, September 9, 2004  
Indian River Research and Education Center  
2199 S. Rock Rd.  
Ft. Pierce, FL 34945

Lunch Sponsor: FMC FoodTech  
No exhibitors

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Mark your calendars for the Citrus Packinghouse Day on September 2<sup>nd</sup>, and the Indian River Postharvest Workshop on September 9<sup>th</sup>. Both programs begin at 9:30 AM. Presentations at each event will **not** be identical.

**Packinghouse Day** program will include presentations on:

- How to pass a 3<sup>rd</sup> party food safety audit, with brief information about EurepGap and BRC (British Retail Consortium) requirements. (Keynote speaker **Juan Muniz** with **Primus Labs**.)
- Packinghouse biosecurity.
- Prospects for good fruit quality this year.
- Use of color separation before degreening.
- Prospects and progress for robotic harvesting of fresh Florida citrus.
- New developments in the use of Radio Frequency Identification (RFID) tags.
- Prevention of physiological disorders of fresh citrus this season.

**Indian River Postharvest Workshop** program will include the latest information on packinghouse biosecurity issues (Renée Goodrich), and 1.5 hours of presentation by Juan Muniz (Primus Labs.) covering:

- How to pass a 3rd party food safety audit.
- EurepGap Food Safety Requirements.
- BRC (British Retail Consortium) Food Safety Requirements.

**Both programs** will offer the same supplemental training sessions covering:

- Food Safety - Worker Health and Hygiene.
- Forklift Driving Safety.
- Packinghouse Postharvest Treatments - Biocides, Waxes, Recordkeeping, Hygiene, and Environmental Safety for Citrus Operations.

A Certificate of Completion will be awarded to each person completing the training. **Pre-registration is free, but required** for both programs. To register, simply fill out the form below and mail or fax to Jane Wilson 700 Experiment Station Rd. Lake Alfred FL 33850; 863-956-4631; [mjw@crec.ifas.ufl.edu](mailto:mjw@crec.ifas.ufl.edu). Visit the UF Postharvest Website (<http://postharvest.ifas.ufl.edu>) for more information (including program details) or contact Dr. Mark Ritenour at (772) 468-3922, ext. 167 ([mritenour@ifas.ufl.edu](mailto:mritenour@ifas.ufl.edu)).

## Registration Form

### **I will be attending:**

**Packinghouse Day**

September 2, 2004. CREC Lake Alfred, FL

**Indian River Postharvest Workshop**

September 9, 2004. IRREC Fort Pierce, FL



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**Admission** - Admission is free. Please return registration form by August 27, 2004.

**Seminars** – Seminars will focus on important issues currently faced by citrus packers such as packinghouse food safety and biosecurity.

**Workshops** – workshops will offer training in food safety, forklift safety, and postharvest chemical handling and application.

**Lunch** will be provided by our industry sponsors:

**Decco/Cerexagri** – Packinghouse Day

**FMC FoodTech** – Indian River Postharvest Workshop

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Name \_\_\_\_\_ Company \_\_\_\_\_

Address \_\_\_\_\_

Phone \_\_\_\_\_ Fax \_\_\_\_\_ E-mail \_\_\_\_\_

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**Please indicate sessions you plan on attending:**

Main Session – Seminars 9:30am - 12:00pm

**Workshops (please choose up to 2 from the list below)** - 2 hours each, may be concurrent with seminars (or tradeshow at Packinghouse Day).

Food Safety - Worker Health and Hygiene

Forklift Safety

Packinghouse Postharvest Treatment Training – Biocides, Waxes, Recordkeeping, Hygiene, and environmental safety for Citrus Operations

**Mail or fax completed forms to Jane Wilson 700 Experiment Station Rd. Lake Alfred FL 33850; Fax: (863) 956-4631; Tel: (863) 956-1151, ext. 1309; mjw@crec.ifas.ufl.edu.**

## The Packinghouse Newsletter - 200 Issues

### Bill Grierson

Professor Emeritus, CREC Lake Alfred

A Lasting Footprint

“We can make our lives sublime  
and departing leave behind us  
Footprints on the sands of time.”

Every researcher secretly hopes to leave some acknowledged “footprint on the sands of time”, but the chances are slim. Successful agricultural research usually melds into anonymous “recommended procedures.” Today, I doubt anyone associates my name with pallet box harvesting, degreening rooms that no longer cause horrendous decay claims, the causes and prevention of Zebraskin of tangerines, Sloughing of red grapefruit, or chilling injury of any grapefruit. But a simple, reasonable request from the then Packinghouse Managers Assn. seems to have done the trick.

In the last week of August 1965, I attended the Packers pre-season meeting and answered a slew of questions. Someone spoke up: “Doc, you have got all this good information. Why don’t you send it to us regularly?” It was promptly decided that if I gave them enough copies of a newsletter, they would distribute it to their members PDQ.

I promptly got together with the late Andy McCornack, the Commission’s Decay Control Specialist. We drew up a newsletter, a secretary mimeographed 100+ copies and within two days one of our technicians delivered them to the Packers. Thereafter, we could get an urgent PHNL to the Packers in seldom over three days.

This worked fine until a number of other people asked to be on the mailing list. So I set up a system worthy of my tight-fisted Scottish ancestors. Anyone else wanting to receive our PHNL had to give us a dozen stamped and addressed envelopes. We then stamped the last envelope “TO CONTINUE THIS SERVICE SEND 12 MORE ENVELOPES.” This worked fine and did not cost the taxpayer a nickel.

But anything so efficient and cost effective was unthinkable to officialdom. I was ordered to send PHNLs only through the marvelously inefficient, exceedingly slow University Editorial Office (One time they sent out a PHNL with pages 1 & 4 of our material and pages 2 & 3 from some Forestry newsletter!).

So I had to hand over this inefficient system to Will Wardowski (the first ever Packinghouse Extension Specialist).

But now Mark is emancipated! In a development undreamed of in my day, he distributes PHNL by E-mail.

Moreover, this PHNL footprint became international when first Israel, then Australia (with gracious acknowledgments) copied our PHNL.

Bully for Florida!

**Will Wardowski**

Professor Emeritus, CREC Lake Alfred

Bill Grierson published and edited the first 23 Packinghouse Newsletters. The early editions were in letter format on the then Citrus Experiment Station letterhead. Readers still supplied their own postage stamps until Issue No. 64, when the mailing was from Gainesville. Prior to that time, drawers of self addressed stamped envelopes made up the mailing list. A note to either send more envelopes or stop getting the newsletter was included when a subscriber's last envelope was used, which made the list self purging. Overseas readers even managed to send U.S. postage or money to buy stamps. That was a labor intensive, but effective system that limited readers to those who were really interested. Newsletters were also sent in bulk for distribution to the Florida Citrus Packers and other organizations.

Back in 1969 as a new Extension Specialist who knew a lot about apples, I arrived at Lake Alfred. Bill Grierson handed me Packinghouse Newsletter and Citrus Packinghouse Day and said "these are now yours." With the assistance of postharvest citrus leaders like Bill Grierson, Andy McCornack, and Eldon Brown the job was done. Acceptance and advice from many friends in the packing and supply companies was also essential. Many industry leaders contributed articles to the newsletters. Thirty-one years and 167 Newsletters later, Packinghouse Newsletter was handed to Mark Ritenour. Mark modernized the publication, including color photographs and making it available primarily by e-mail. The days of readers supplying their own postage stamps are gone forever.

The newsletter was being kept by individuals and libraries around the world, but it was increasingly difficult to find an article in back issues. An index was created with Issue No. 50, January 9 1973 and continues to be maintained.

Imitation is the most sincere form of flattery. Friends in Australia published Packingshed Newsletter using our style and format, including Available Publications. They were somewhat apologetic, whereas we were honored that they valued our work enough to imitate it.

Over the years the cover of Packinghouse Newsletter included scenes drawn by CREC staff and friends. Eventually, with Issue No. 64, August 26, 1974 we were told that newsletter distribution had to be from Gainesville, and that the heading could include our drawings. With Issue No. 87, July 11, 1977 all newsletter covers were required to be of the same style. Another uniform style was required with Issue No. 171, March 15, 1974, and again in Issue 198, July 18, 2003 with Mark Ritenour as editor. Anyone interested in seeing the history of old issues can find them on line at <http://postharvest.ifas.ufl.edu/phnl-i.htm>.

I am honored to be asked to make a contribution to this 200th edition of Packinghouse Newsletter. Mark Ritenour is carrying on a long tradition of supplying information to the Florida fresh citrus industry.

**David J. Hall**

Technical Director, Fresh Mark Corporation, Mascotte, FL

When I moved to Florida in the Fall of 1976, I had been involved in the citrus industry for 14 years in California/Arizona. The last 7 had been with a service company. During that time the one obstacle I faced was getting information regarding the problems and processes we had to deal with.

Information was available, but we had to go looking for it and most new ideas came along the grapevine. The University of California and the USDA had competent knowledgeable people but we had to bring the questions to them. You might say that the system was reactive.

In Florida it was like entering a different world. Here was Lake Alfred with a proactive program. Here the scientists were actively seeking to provide information to the industry. My first Packinghouse Newsletter (No. 83) was a revelation. I was soon at Will Wardowski's office begging for back copies of the PHNL. Here was a practical education in packinghouse procedures and problems that no college course is designed to address.

The number of examples illustrating the value of PHNL are many but the following two, I think, well illustrate the point. First, in January of 1989 PHNL (No. 156) carried a practical report on the value of the then new truck bin drencher. The practical information illustrated the value of this technology and today there are several of these installations throughout the state. The second example that comes to mind is the reporting on frozen fruit separation. Since severe freezes occur only occasionally in Florida, many newer packinghouse people may not have experience with handling freeze damaged fruit. PHNL numbers 4, 20, 27, 35, 115, 116, 117, and 160 have been there with up to date information when needed.

Congratulations to Dr. Bill Grierson who planted the seed, to Dr Will Wardowski who carried on to greater reach and utility, and to Dr. Mark Ritenour who brought the Packinghouse Newsletter into the computer age.

Congratulations on Packinghouse Newsletter No. 200. They say that imitation is the sincerest form of flattery. If that is true then the Packinghouse Newsletter must be blushing heavily. In recent years several newsletters have sprung up but PHNL must be considered the standard bearer.

### **Mark A. Ritenour**

Associate Professor, Indian River REC, Ft. Pierce

It has been an honor to take over the reins of this well-established and utilized newsletter for the past 4 years. When I arrived in Florida in 1998, I grabbed every copy of the PHNL that I could find from Will Wardowski. The index that had been maintained over the years was invaluable for actually finding the information for which I was looking. Though I had copies of practically all PHNL issues, I knew that most people did not. Furthermore, I found that it could take up to a month for a completed and approved newsletter to make it through the system and arrive in the hands of the packers. Though we currently still mail printed copies of the PHNL, posting of all PHNL issues (with index) at the University of Florida Postharvest website (<http://postharvest.ifas.ufl.edu>) has made electronic distribution of the newsletter almost instantaneous, and made finding information from past issues quick and easy. The quality of the older posted newsletters reflects the quality of the best copy I could find. If someone has a "cleaner" copy, please consider mailing it to me so that we can use it to update the website. It is my sincere desire to continue enhancing the distribution of timely information to citrus packers and I am always open to new suggestions about how to improve the PHNL. Here's to the next 200 issues!