if pH is kept above 11.5%. This results in a reduced cost per carton of treatment to the citrus packinghouse manager; a reduction of phenol effluents; and a reduction of lowered risk potential for fruit burn. A greater reward, in today's concern of pesticides, is we in the citrus industry continue to be stewards of the environment and we use the pesticide judiciously.

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EFFECTIVENESS OF AEROSOL FUNGICIDE APPLICATIONS IN THE DEGREENING ROOM FOR CONTROL OF CITRUS FRUIT DECAY

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Abstract. **Decay is more severe in degreened fruit because the degreening process itself promotes decay, and because packingline fungicide treatments have to be delayed until after degreening. In an attempt to reduce decay, dry or aqueous aerosol formulations of thiabendazole, imazalil, or benomyl were applied to crates or pallets of oranges early in the degreening process. These treatments were compared with aqueous drench applications before degreening and with aqueous non-recovery spray (NRS) applications after degreening. Significant amounts of fungicide residue usually remained on fruit after dry or aqueous aerosol treatments. Aqueous aerosol applications of benomyl were the only aerosol treatments that consistently reduced stem-end rot (SER) caused by *Diplodia natalensis.* None of the aerosol applications effectively controlled green mold caused by *Penicillium digitatum.* For the control of SER, applications of aerosols during degreening were never as effective as drench treatments applied before degreening, and only occasionally as effective as non-recovery spray treatments applied after degreening. Drench treatments followed by NRS applications were more effective than an aerosol treatment followed by a NRS application. Pre-cooling the fruit before degreening, to induce condensation of moisture on fruit surfaces to improve distribution of the fungicide residues, did not consistently enhance the efficiency of aerosol decay control treatments.**

A major decay in ethylene-degreened Florida citrus fruit is stem-end rot (SER) caused by the fungus *Diplodia natalensis* P. Evans (2). The degreening process, which may last as long as 4 days in the early part of the season, enhances the development of SER. Furthermore, in the degreening season, fungicide treatments are normally delayed until after the fruit is degreened and washed. Such late applications of fungicide are often not effective for the control of diplodia SER or of green mold, caused by *Penicillium digitatum* Sacc., because the causal fungi have invaded the rind too deeply by this time to be affected by the fungicide. Much better control can be achieved by applying the fungicide before degreening, either in the form of a preharvest spray (1) or postharvest drench (3), followed by additional fungicide treatment(s) after degreening and washing.

The fresh citrus industry required an effective method for applying a fungicide to pallets of fruit after they were placed in the degreening room. One method that had been suggested was to apply the fungicides through the humidification system. Another suggestion was to ignite formulated self-burning tablets of thiabendazole or imazalil and sublime the materials in smoke or dust applications. Some success in control of diplodia SER and green mold has been reported with sublimed thiabendazole released in storage rooms (9). Historically, however, applications of fungicides to harvested commodities as aerosols generally have been less effective than aqueous solution, suspension, or emulsion treatments (6).

In this study, we compared aerosol applications of thiabendazole, imazalil, or benomyl during degreening with currently used drench or non-recovery spray (NRS) treatments of these fungicides for decay control. Fungicide residues were measured in some trials to determine if sufficient fungicide was deposited on the fruit for effective decay control.

Materials and Methods

Fruit. Tests were conducted on 'Hamlin', 'Pineapple' or 'Valencia' oranges *Citrus sinensis* (L.) Osbeck harvested during the 1985-87 seasons from groves which had received no preharvest fungicide spray treatments. For a large scale test in 1987, 24 pallet bins of 'Valencia' oranges were provided by the Haines City Citrus Growers Association (HCCGA).

Fungicides and application. The fungicides tested were thiabendazole (TBZ) (42.28% F), imazalil (44.6% E), and

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benomyl (50% W). Fruit were drenched before degreening by dipping them in aqueous preparations of these fungicides for 30 seconds. Dry aerosol applications of thiabendazole were applied soon after placing fruit in the degreening room by igniting self-burning formulated tablets that contained 7 or 20.6 grams of thiabendazole. Dry aerosols of imazalil were generated from self-burning tablets or cannisters that contained 10 or 4.88 grams active ingredient, respectively. Aqueous aerosols were produced during the initial hours of degreening with a Tifa Microsol Model 202 mechanical aerosol generator (Tifa Square, Millington NJ 07946). Particle sizes ranged from 50-200 μm in diameter at generator settings of 1 through 11. Smallest sizes were formed at the lower settings. The unit was filled with 2*l* of fungicide suspension on an hourly basis during treatment.

Applications of aerosols were made in a small closed degreening room (47.6 m^3) where air currents formed by the circulating fan carried particles to fruit contained in wooden or plastic tomato crates or wooden pallet bins. Non-recovery spray applications to fruit after degreening were made using previously described methods (4).

Fruit handling. All fruit, except that obtained from HCCGA, were graded and randomized before treating. Fruit were degreened with 5-8 ppm ethylene at 85° F at relative humidities of 92-96%. In some tests, naturally colored 'Pineapple' and 'Valencia' oranges were treated with ethylene to induce decay rather than to enhance color. Untreated fruit and fruit receiving NRS treatments alone or in combination with drench or aerosol treatments were washed after degreening. Fruit receiving only drench or aerosol applications were left unwashed after degreening so that the residues would remain on the fruit to obtain maximum decay control.

Fruit from HCCGA were aerosol-treated with 12*l* of 1200 ppm benomyl during degreening, and then were transported back to the HCCGA packinghouse for handling and packing. Additional fruit of the same lot was degreened there, and then packed on the same date. Samples of 12 cartons with 100-125 fruit were selected from each of 4 treatments: control, aerosol treated, in-line fungicide treatment of 2% sodium o-phenylphenate during washing and 1000 ppm TBZ NRS application after washing, and combination aerosol and in-line treatment.

All fruit were waxed with a solvent wax, packed in 4/5 bushel fiberboard cartons, and stored at 70° F and 85-90% relative humidity. Decayed fruit were identified, recorded, and removed at weekly intervals. In some tests, fruit were inoculated before treatment to a depth of 3 mm at one location on the fruit equator with 5 μl of spore suspension of *P. digitatum* adjusted to 10^6/ml.

Fungicide residues on fruit were determined in some of the experiments. In these, 5 fruit were randomly removed from each replication of a treatment, and they were macerated in a blender. A representative sample of approximately 300-400 grams of fruit slurry was placed in a heavy duty plastic freezer bag, frozen, and thawed just before analysis with high-performance liquid chromatography as previously described (5).

Results

Thiabendazole applications. Decay control and residues with the use of dry aerosol treatments of thiabendazole are shown in Table 1. Significant and uniform distribution of residues of thiabendazole were deposited on fruit in the pallet bin and crates (Trials 1 and 2, Table 1). However, they were not as high as those resulting from a drench application. Significant control of SER was obtained with the thiabendazole drench treatment or NRS treatment of imazalil, when applied either alone or in combination. Drench treatments of thiabendazole before degreening were more effective than NRS treatments of imazalil after degreening. No control was obtained with the aerosol treatment to fruit in a pallet bin, nor did this treatment enhance the level of control achieved with the NRS treatment of imazalil. Similar results were observed with fruit treated in tomato crates in Trials 2 and 3 (Table 1), though some control of SER with the aerosol treatment was observed in Trial 2. Additional studies in Trials 1 and 2 (data not shown) with artificially inoculated fruit, showed no control of green mold with aerosol treatment, but good control with a pre-degreening drench application.

Aqueous aerosol treatments of thiabendazole provided no better control of SER and green mold than the sublimed treatments (Table 2). A reduction in SER was observed in only one treatment; at the lowest aerosol rate used in Trial 2. Significant residues of thiabendazole were recovered from all treated fruit in this trial, and those from aerosol treatments followed the same order as the applied concentrations. Free water condensed on cool fruit at treatment did not increase decay control or thiabendazole residues.

Imazalil applications. Significant control of SER and significant amounts of imazalil were deposited on fruit with dry aerosol applications in Trial 1 of 2 trials (Table 3.) The aerosol treatment applied during degreening, however, did not improve decay control efficacy of TBZ NRS application that followed degreening. Drench treatments before

Table 1. Efficacy of dry aerosol applications of thiabendazole and aqueous applications of thiabendazole or imazalil for the control of diplodia stem-end rot (SER).

	Trial 1[z]		Trial 2		Trial 3
Treatments[y]	SER %	Residues ppm	SER %	Residues ppm	SER %
Untreated	29.9a[x]	0.00 c	49.3a	0.00 c	30.1a
Aerosol, T	31.3a	0.43 b	37.3 b	0.56 b	32.4a
Aerosol, M	29.3a	0.36 b	—	—	—
Aerosol, B	34.4a	0.36 b	—	—	—
Aerosol, T, I NRS	9.6 b	—[w]	29.3 bc	—	23.6 b
Aerosol, M, I NRS	11.8 b	—	—	—	—
Aerosol, B, I NRS	10.0 b	—	—	—	—
I NRS	11.1 b	—	27.6 c	—	21.3 b
TBZ Drench	2.6 c	0.87a	1.3 d	1.59a	—
TBZ Drench, I NRS	0.0 d	—	0.9 d	—	—

[z]Treatments in Trials 1, 2, and 3 consisted of 3 replications of Hamlin, Pineapple, and Valencia oranges which contained 90, 75, and 72 fruit/replication, were degreened 66, 64, and 72 hours, and were stored for 3, 2, and 3 weeks, respectively.
[y]Aerosol treatment in Trial 1 consisted of three 20.6 g tablets applied to fruit in a pallet bin which were separated after degreening into samples taken from the top (T), middle (M), and bottom (B) of the pallet. In Trials 2 and 3, aerosol treatments consisted of four 7 g and 20.6 g tablets, respectively, which were applied to fruit in tomato crates. Drench and non-recovery spray (NRS) treatments of imazalil (I) or thiabendazole (TBZ) were applied at a concentration of 1000 ppm.
[x]Mean separation in columns by Duncan's multiple range test, 5% level.
[w]No data taken.

Table 2. Efficacy of aqueous aerosol, drench, or non-recovery spray applications of thiabendazole for control of diplodia stem-end rot (SER) and green mold (GM) in degreened Hamlin oranges.

	Trial 1[z]		Trial 2		
Treatments[y]	SER %	GM %	SER %	GM %	Residues ppm
Untreated	10.8a[w]	4.5a	36.3a	13.3a	0.00 f
NRS	1.0 b	2.lab	20.4 c	7.5a	1.81a
Drench	2.4 b	0.7 b	3.8 d	2.5 b	1.39 b
Aerosol, 4L	14.2a	1.7ab	27.1 bc	13.3a	0.18 e
Aerosol, 8L	9.7a	2.4ab	34.6ab	11.3a	0.31 d
Aerosol, 12L	11.8a	2.4ab	28.8ab	12.9a	0.73 c
Aerosol, 12L, C[x]	—[v]	—	29.6ab	10.8a	0.69 c

[z]Treatments in Trials 1 and 2 were composed of 3 replications which contained 96 and 80 fruit/replication, were degreened 53 and 72 hours, and were stored 3 and 2 weeks, respectively.
[y]Aerosol applications (2000 ppm) were applied at a setting of 1.5 on the Microsol unit which delivered 2 liters (L) in approximately 50 minutes. Drench and non-recovery spray (NRS) treatments were applied at a concentration of 1000 ppm.
[x]Fruit were cooled overnight at 60F to induce condensation on fruit surfaces upon transfer to the degreening room.
[w]Mean separation in columns by Duncan's multiple range test, 5% level.
[v]No data taken.

degreening, alone or in combination with a TBZ NRS treatment, left the highest imazalil residues and provided the most effective decay control. Green mold, developing in fruit artificially inoculated before fungicide treatment in both trials, was reduced by imazalil drench treatments, but not by aerosol applications (data not shown).

Results with aqueous aerosol applications of imazalil (Table 4) were similar to those with the smoke applications (Table 3). Control was poor even though effective residues of imazalil were deposited on the fruit. Aerosol treatments were less effective than the NRS application, and both were less effective than the drench treatment. Enhanced distribution of residues, caused by free water condensed on the fruit surfaces, did improve decay control. Still, control was not as good as that obtained with NRS or drench treatments.

Benomyl applications. All aerosol applications of benomyl were made in water. After the first trial, 0.1% Ortho X-77 spreader was added to the formulation so settings below 9 could be used to apply smaller particle sizes without clogging the Microsol aerosol generator. In 2 trials with 'Pineapple' oranges (data not shown), comparisons of benomyl at the same rate with particle sizes produced at settings of 2 vs 11 did not show an effect of particle size on SER control efficacy or benomyl residues. At a setting of 2, some variation was observed in residue and SER control with aerosol treatments to 'Valencia' oranges in a pallet bin (data not shown). Significant SER control occurred in samples taken from the top and middle portion of the bin, but not from samples removed from the bottom. Residues of benomyl were recovered from fruit taken at all locations, but residues on bottom samples (0.17 ppm) were significantly less than residues on fruit from the middle (0.23 ppm) or top (0.27 ppm).

Table 3. Efficacy of dry aerosol applications of imazalil and aqueous applications of imazalil or thiabendazole for control of diplodia stem-end rot (SER) in degreened Valencia oranges.

	Trial 1[z]		Trial 2	
Treatments[y]	SER %	Residues ppm	SER %	Residues ppm
Untreated	31.9a[x]	0.00 c	30.0 bc	0.00 b
Aerosol	24.3 b	0.85 b	54.2a	0.19 b
Aerosol, TBZ NRS	17.6 c	—[w]	35.8 b	—
TBZ NRS	15.2 c	—	20.0 cd	—
I Drench	7.1 d	6.93a	10.4 d	3.96a
I Drench, TBZ NRS	4.3 d	—	1.7 e	—

[z]Treatments in Trials 1 and 2 were composed of 3 replications which contained 70 and 80 fruit/replication, were degreened 69 and 70 hours, and were stored 2 and 3 weeks, respectively.
[y]Four 10 g tablets were ignited in Trial 1, and three 4.88 g tablets were used in Trial 2 to generate aerosol treatments applied to fruit in tomato crates. Drench and non-recovery spray (NRS) treatments of imazalil (I) or thiabendazole (TBZ) were applied at a concentration of 1000 ppm.
[x]Mean separation in columns by Duncan's multiple range test, 5% level.
[w]No data taken.

Table 4. Efficacy of aqueous aerosol, drench, or non-recovery spray applications of imazalil for control of diplodia stem-end rot (SER) in degreened Valencia oranges.

Treatments[z]	SER %	Residues ppm
Untreated	50.0a[x]	0.00 e
NRS	21.3 d	1.22 b
Drench	2.3 e	6.58a
Aerosol, 4L	44.4ab	0.24 d
Aerosol, 8L	39.8 bc	0.37 cd
Aerosol, 12L	45.8ab	0.48 cd
Aerosol, 12L, C[y]	35.2 c	0.56 c

[z]Each treatment was replicated 3 times, and each replicate contained 72 fruit. Fruit were degreened 72 hours, and stored 2 weeks. Aerosol applications (2000 ppm) were applied at a setting of 2.0 on the Microsol unit which delivered 2 liters (L) in approximately 45 minutes. Drench and non-recovery spray (NRS) treatments were applied at a concentration of 1000 ppm.
[y]Fruit were cooled overnight at 60F to induce condensation on fruit surfaces upon transfer to the degreening room.
[x]Mean separation in columns by Duncan's multiple range test, 5% level.

Aerosol applications of benomyl consistently reduced the incidence of SER, but not green mold (Tables 5, 6). Drench treatments (Table 5) before degreening, however, controlled both decays more effectively than the aerosol treatments. Presence of free water on fruit surfaces at the time of treatment did not enhance decay control, even though residues were higher. The aerosol treatment followed by an imazalil NRS application was more effective than the NRS treatment alone (Table 6). However, a benomyl NRS application was not improved by the benomyl aerosol treatment. Washing reduced SER in fruit after 2 weeks of storage.

In the trial with fruit from HCCGA (data not shown), the aerosol treatment significantly reduced the incidence of diplodia SER after 4 weeks of storage from 44% in the untreated control to 27% in the treatment. Fruit receiving the combined aerosol with in-house fungicide treatments developed 5% SER after similar storage, but this level was no different than the 6% that occurred in fruit receiving only the commercial packinghouse fungicide treatments. Residues from the aerosol treatment varied among pallets, ranging from none, detected at a 0.02 ppm detection level, to as much as 0.34 ppm.

Discussion

For effective control of diplodia SER and green mold, sufficient fungicide, at least 0.2 ppm or greater on a whole

Table 5. Efficacy of aqueous aerosol, drench, or non-recovery spray applications of benomyl for control of diplodia stem-end rot (SER) and green mold (GM) in Hamlin oranges degreened for 72 hours and stored for 2 weeks.

Treatments[z]	Trial 1			Trial 2		
	SER %	GM %	Residues ppm	SER %	GM %	Residues ppm
Untreated	35.3a[w]	4.0a	0.00 e	37.8a	11.6ab	0.00 g
NRS	5.7 d	0.6 bc	1.15a	19.1 b	7.2 b	0.77 b
NRS[y]	—[v]	—	—	14.4 bc	10 9ab	0.25 de
Drench	0.7 e	0.3 c	1.14a	0.3 d	0.3 c	0.95a
Aerosol, 4L[y]	16.3 bc	0.3 c	0.12 d	15.6 b	10.6ab	0.10 f
Aerosol, 8L[y]	20.3 b	1.7ab	0.21 c	15.0 bc	9.7ab	0.19 e
Aerosol, 12L[y]	9.3 cd	2.0ab	0.35 b	14.7 bc	5.9 b	0.29 d
Aerosol, 12L, C[y,x]	—	—	—	8.8 c	6.9 b	0.40 c
Untreated, C[x]	—	—	—	41.9a	16.3a	0.00 g

[z]Treatments in Trials 1 and 2 contained 3 and 4 replications, each with 100 and 80 fruit, respectively. Aerosol applications (1200 ppm) in Trials 1 and 2 were applied at a setting of 9 and 2 on the Microsol unit which delivered 2 liters (L) in approximately 15 and 25 minutes, respectively. Drench and non-recovery spray (NRS) treatments were applied at a concentration of 600 ppm.
[y]In Trial 2, benomyl was applied with 0.1% Ortho X-.77 spreader.
[x]Fruit were cooled overnight at 60F to induce condensation on fruit surfaces upon transfer to the degreening room.
[w]Mean separation in columns by Duncan's multiple range test, 5% level.
[v]Do data taken.

fruit basis, must be deposited on the fruit to inhibit fungal growth. The chemical also must be present under the button and in injuries, where most fungal penetration occurs. In these studies, enough fungicide residue from aerosol treatment usually was deposited on the fruit to provide significant decay control (5). However, the lack of good control with aerosol treatments indicates that fungicide particles failed to reach infection sites in sufficient amounts to prevent infection by decay organisms. Occasionally, some improvement in distribution of a fungicide occurred by inducing the accumulation of free water during treatment, but the additional control obtained was not consistent enough to be of practical significance.

Aerosol applications of benomyl were more effective than such applications of TBZ or imazalil for the control of diplodia SER. Benomyl may have been more effective because of higher fungicidal activity against this organism (7), or its local systemic activity (8). Thiabendazole has almost as much fungicidal activity as benomyl, but it is not systemic and remains on the fruit surface after application (7). Imazalil, though systemic (4), is not as active against *Diplodia* as benomyl or TBZ (7).

Table 6. Efficacy of aqueous aerosol applications of bnomyl and aqueous applications of benomyl or imazalil for control of diplodia stem-end rot in Pineapple oranges degreened for 72 hours and stored for 2 weeks.

Treatments[z]	Percent stem-end rot	
	1 week	2 weeks
Untreated but washed	21.9a[y]	39.1 b
Untreated and unwashed	21.9a	56.6a
B NRS	6.6 b	14.1 de
I NRS	17.5a	36.0 b
Aerosol	7.5 b	23.2 c
Aerosol, B NRS	4.1 b	9.4 e
Aerosol, I NRS	6.6 b	21.6 cd

[z]Treatments were applied to 4 replications, each with 80 fruit. Twelve liters of benomyl (B) at 1200 ppm with 0.1% Ortho X-77 spreader were applied at a setting of 2 on the Microsol unit which delivered 2 liters in approximately 25 minutes. Non-recovery spray (NRS) treatments of benomyl (B) and imazalil (I) were applied at concentrations of 600 and 1000 ppm, respectively.
[y]Mean separation in columns by Duncan's multiple range test, 5% level.

Greater quantities of fungicide apparently would have to be applied in aerosol applications than is required with applications of solutions, suspensions, or emulsions. Approximately 2.5 times as much benomyl was needed with the aerosol application in the degreening room filled with pallet bins of fruit, as would have been required to treat this same amount of fruit with 600 ppm of benomyl in water. Even then, residues from the aerosol treatment were insufficient in some samples. Much of the material is lost when it settles on walls, false ceilings, flooring, and pallet boxes. An even distribution of the fungicide particles on fruit from aerosol applications may be even more difficult to achieve in large commercial degreening rooms.

Based on these studies, dry or aqueous aerosol formulations of TBZ, imazalil, or benomyl, of the particle sizes tested here, do not appear to be sufficiently effective to recommend their use in commercial degreening rooms. Rather, aqueous preharvest sprays (1) or drench applications (3) applied before degreening would be more effective. Unfortunately, the recent withdrawal by the manufacturer of benomyl for postharvest use on citrus prevents application of this material in drench treatments. However, a benomyl spray at preharvest or drench treatment with TBZ can still be used to reduce postharvest decays.

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MEASURING AIR EXCHANGE RATES FOR CITRUS DEGREENING ROOMS

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Abstract. **A technique was developed and tested to measure the air exchange rates (AER) in citrus degreening rooms. The procedure entails a step function introduction of CO_2 and monitoring its subsequent decay to the ambient background level. This decrease was modeled by a first-order equation, $C(t) = C_b + (C_o - C_b)e^{-kt}$. In the commercial rooms tested, the AER varied from 16.5 air exchanges/hr to a low of 0.6 air exchanges/hr in newly constructed rooms.**

Degreening of Florida citrus is an importation unit operation to market early season fruit that has achieved internal maturity with little or no change in external appearance from green to yellow or orange. Also, some degreening is used on later season fruit, especially 'Valencia' in February to April harvesting period. Conditions for degreening have been extensively studied since the early 1950's in Florida (2) and has led to standard practices (3, 7) for control and implementation of ethylene, humidity, temperature, and fresh air exchange rate (AER). Air exchange rate is number of room air changes per unilt time based on the volume of an empty room. These general procedures have been implemented in other countries (1) where citrus degreening or coloring is required. Similar processes are also used on other commodities such as tomatoes (6). The essential process is one of removing green pigment via ethylene and to accelerate the process by controlled temperature and humidity while mitigating fruit desiccation and the potential for decay.

Most of the variables in degreening rooms that require control, specifically temperature and humidity, can be readily measured. Ethylene requires either estimation via an absorbing media sampling tube or gas chromatography equipment. The AER has not been measured directly but has been obtained inferentially by estimating a fresh air inlet area and air velocity through that inlet. However, other openings may exist where air either infiltrates or escapes from the room. Since the AER is important in designing the heating requirement, etc. and associated operating costs of degreening rooms, this study was directed toward developing a technique to directly measure AER. The techniques may be suitable for other produce storage facilities, greenhouses, or growth chamber facilities (5). Principal objectives of this study were to:

a. develop a procedure to measure AER in citrus degreening rooms.
b. evaluate the technique in pilot plant and commercial degreening rooms.

Methodology

The procedure that was utilized to measure AER required the introduction of CO_2 into a degreening room in a short time and then to monitor the attenuation of CO_2 as a function of time. This reduction should follow the well-known decay rate equation:

$$C(t) = C_b + (C_o - C_b)\exp(-kt)$$

where $C(t)$ = conc at any time t; C_b = baseline conc; C_o = initial conc and k = decay rate constant. For this study, the k value is of direct importance as it represents AER/V where V is room volume.

A schematic of the experimental equipment is presented in Fig. 1. A cylinder of gaseous CO_2 was located external to the room and plumbed into a manifold which was modified to introduce CO_2 across the width of the room under test. To measure the CO_2 level, an infrared portable gas analyzer was employed with the analyzer output directed to a strip chart recorder. Typically, an initial concentration of 1500 to 3500 ppm was introduced with room circulation fans operating and the curtains closed. The analyzer had a full scale capability of 5000 ppm. Degreening room vents and curtain or both were then opened to a predetermined setting. All tests were done in empty rooms in order to make a more precise volumetric calculation and to avoid CO_2 evolution from fruit. It was also necessary to establish baseline readings without internal combustion engines in the immediate vicinity.

For both pilot plant and field work, tests were conducted in triplicate. A test was considered complete when the CO_2 level reached a steady state level for at least 10 min. Values at 5 min intervals were taken from the chart for model analysis. Also, the time corresponding to a 50% reduction in $(C_o - C_b)$ was noted.

Tests were conducted at three sites: pilot plant facility at Lake Alfred Citrus Research & Education Center, Haines City CGA (HCCGA) and A. Duda & Sons (LaBelle, FL). The rooms of A. Duda & Sons were recently constructed while the Haines City CGA degreening facility

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