

## Mark Your Calendar

### **East Texas Fruit and Vegetable Conference**

February 20, 2007

Tyler Rose Graden Center

Tyler, Texas

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## Irrigation and Fertilization of Fresh Market Tomatoes

The Tomato Magazine / February 2005

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A warm season crop, fresh market tomatoes can be produced in approximately 60 days. While the crop does require a large investment in time and labor, attention to proper management can pay off in increased yields and profits.

So reported Dorota Z. Haman, Ph.D., Department of Agricultural and Biological Engineering, University of Florida-Gainesville. Tomatoes can be irrigated using a variety of irrigation systems, she reminded the group, mentioning drip, seepage, surface and sprinklers. Sprinkler irrigation can be portable, self-propelled (traveling gun) or solid set system.

Plasticulture (plastic-covered raised beds with drip irrigation lines under the plastic) is frequently used on fresh market tomatoes. Polyethylene plastic film, used for mulch, accelerates plant growth by increasing soil temperature and stabilizing moisture.

“Properly scheduled drip irrigation, used in conjunction with plastic mulch helps maintain optimum soil moisture, aids plant establishment and promotes excellent crop growth throughout the season. Drip irrigation also allows for ‘prescription’ applications of fertilizer and other chemicals.

Well-managed early spring vegetables on plastic mulch generally mature one to two weeks earlier than those on bare ground. High value crops such as tomatoes, cantaloupe, peppers, cucumbers, squash, eggplants, watermelon and okra mature earlier, produce higher yields and have improved quality. Other advantages of plasticulture include added protection against decay (preventing contact with contaminated soil) and reduced weed growth.

When considering irrigation and fertilization under plasticulture, it is important to think in terms of rows, not field surface. In bare ground vegetable production scenarios, fertilizer and irrigation rates are typically expressed in lbs/acre and gallons/acre, respectively. Under plasticulture, however, the number of linear feet of beds in an acre becomes more important than the actual surface of the field. It is helpful to think in terms of lbs/100 linear bed feet (lbf) for fertilization injections and gallons/100 lbf for irrigation and take into account the bed spacing.

Soil should be tested and the test recommendation carefully followed. A soil sample has to be recent, representative and large enough to ensure valid results. The soil test recommendation has to be understood and properly implemented. Typically, 20 to 50 percent of N and K<sub>2</sub>O and 100 percent of P<sub>2</sub>O<sub>5</sub> and micronutrients recommended are applied as pre-plant fertilizer. The remaining 50 to 80 percent of N and K<sub>2</sub>O are injected through the drip

system.

It is important to monitor plant nutritional status through the season, she stressed. Early in the season (from transplanting to fruit set), this can be done with a sap test or foliar analysis. For petiole and leaf analysis, a representative sample should be made with at least 20 leaves selected randomly throughout the field from recently collected, fully mature leaves.

Efficient water application is critical to successful production of vegetables. Irrigation scheduling is knowing when to start irrigation and how much to apply – in a way that satisfies crop water needs, conserves water and does not leach mobile nutrients. Irrigation scheduling requires: (1) a target water volume to apply; (2) guidelines on how and when irrigation should be split to several applications; (3) a method to account for effective rainfall; and (4) a practical method to monitor soil moisture.

Irrigation amount (target volume) should aim at replacing daily crop evapotranspiration (Etc). Etc may be determined from actual reference evapotranspiration (ET<sub>o</sub>), historical ET<sub>o</sub>, class A pan evaporation or empirical values when no other estimates are available. Irrigation amount should not exceed soil water holding capacity. Otherwise, water is wasted and mobile nutrients are leached. How far water moves down the soil profile is a rather abstract concept because it is not visible. The amount of water applied in one irrigation event should not exceed the soil water holding capacity of the wetted root volume.

“When irrigation amounts required (daily crop water use) is larger than the water holding capacity of the wetted root volume, then irrigation should be applied in two or three events (split applications) throughout the day.

Theoretically, the irrigation amounts that can be held in the root zone can be calculated based on the soil’s physical properties and the width of wetted area on both sides of the drip tape, the researcher explained. If the wetting width of the soil is 12 inches (6 inches on each side of the drip tape) – assuming a 0.75 in/foot soil water holding capacity and allowing a 50 percent soil water depletion – the theoretical largest water amounts that can be stored in soil are 24 gal/100 ft within the top 12 inches, 36 gal/100 ft within the top 18 inches and 48 gal/100 ft within the top 24 inches. These numbers can be used as guidelines for calculating the time of water application.

Under plasticulture production, rainfall contributes little to replenish soil moisture because of the plastic mulch. Since the plastic mulch protects the bed from rainfall, there is no need to apply additional fertilizer after a leaching rain. However, when the field gets flooded, mobile

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## *Irrigation & Fertilization Continued*

nutrients may be leached out of the root zone or carried out of the field through surface runoff. The need for additional fertilizer may be assessed after field drainage by monitoring sap test levels of nitrate and potassium. Another consequence of using the plastic mulch is that an irrigation may still be needed after a small rain. Soil moisture measurements may be used to assess the need for additional irrigation.

To understand the stress level imposed on plants between irrigation events, growers are advised to monitor soil moisture levels daily. Soil moisture may be reported in terms of soil water tension (soil matric potential) or volumetric water content (VWC). The recommended range for vegetable production on very sandy soils (like in Florida) is to maintain SWT between 6 to 8 cb (field capacity) and 15 cb. Vegetables may tolerate SWT up to 25 cb without yield reduction on loamy soils.

Instruments available for routine monitoring of soil moisture for vegetable crops are tensiometers, granular matrix sensors (modified gypsum blocks), time domain reflectometry probes (TDR) and dielectric probes, the researcher explained, advising those desiring more information to check <http://edis.ifas.ulf.edu/AE266>.

Haman cautioned her audience to keep a daily record of all irrigation applications. Growers also are required to keep pesticide records, she said. Fertilization records are usually kept in relation to soil testing and implementing the recommendations. However, vegetable growers seldom document their irrigation practices.

Haman recommended that a daily log contain soil moisture measures (SWT or VWC) at selected depths, rainfall, an estimate of weather demand for water (evapotranspiration) and irrigation amount (gallons/field or duration of irrigation).

“Application uniformity of 85 to 95 percent is expected from a new, well-designed drip irrigation system,” she said. “As the irrigation system is used for water and fertilizer applications throughout the growing season, the application uniformity may remain the same if the system is well managed, but will most likely decline with time,” she warned. “A comprehensive maintenance plan will reduce the adverse effects of the agents that reduce application uniformity: small solids in suspension, organic matter, micro-organisms and chemical residues on application uniformity. Without a maintenance plan, the risk of complete emitter clogging and crop loss becomes real. Every vegetable grower who uses drip irrigation should recognize that prevention of clogging is the most important practice in drip system maintenance. A maintenance plan should include: (1) a filtration system; (2) chlorination and acidification; (3) flushing; and (4) regular inspection of irrigation system components.”

Haman advised the group to remember that irrigation and fertilization should always be managed together. Scheduling decisions, regarding time and volume of water application guessing should be avoided.

“Poor irrigation management negates the potential benefits of a well-designed fertilization program,” the researcher warned. “The irrigation system should be well maintained and operated at the highest irrigation efficiency and uniformity possible.”

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### **Make Safety Job #1 with Regular Inspections**

Mark Wade

The Grower/March 2004

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As you consider the events that occur throughout the year, probably none is more important than regularly scheduled (and unscheduled, surprise) safety inspections.

According to one study published in the Journal of the American Medical Association in 1998, workers suffer an estimated 13.2 million nonfatal injuries and 862,000 illnesses annually for a total cost of \$171 billion each year. The figure doesn't reflect the number of accidents that go unreported or the cost of legal ramifications.

So a vibrant and active safety program is a must. But, in order to make sure that training and policies are actually being followed and that facilities and vehicles are being properly maintained, an active inspection program is required.

General workplace inspection checklists are available from a variety of sources, but you may want to customize a form for your specific operation. Use of an outside inspector can offer an unbiased set of eyes and

“catch” those things that you grow accustomed to seeing every day.

Routinely scheduled inspections may not offer the element of surprise, but the goal is to eliminate violations not catch people at their worst. Often inspectors need access to locked rooms and individuals, so scheduled inspections can ensure that keys and people are available. However, stopping by unannounced now and then is not all that bad either.

Formal safety inspections should be conducted at least every six months and followed up by a written list of suggested improvements. Managers should respond to the recommendations in writing with a list of items that were corrected, or an explanation as to why the correction has not been made. Set aside a specific period of time for the inspections- -don't try to rush through them.

Remember, the objective of any safety program is to create and maintain a safe work environment. The inspection is a tool to measure the programs effectiveness

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## *Job Safety Continued*

and the level of compliance.

Coming down hard during the inspection (but keep it non-personal and professional) will improve working conditions, reduce costs and perhaps save lives. Let your employees know why the inspections are being done, that safety policies will be followed and that their safety come first.

### **19 safety items to look for during an inspection**

Some of the major things to look for during an inspection include, but are not limited to, the following:

- Review the following areas: general organization and cleanliness, training program activities, ergonomics, fire, hazardous materials, equipment and machinery, etc.
- Documentation—Training, equipment service, inventory logs and OSHA's log of work related injuries and illnesses (and any other required documents) should be well documented and maintained.
- Are Material Safety Data Sheets complete and readily available?
- Are employees wearing required protective clothing such as gloves, safety glasses, face shields, and ear plugs?
- Are all safety guards on equipment (like bench grinders, PTO's and augers)?
- Make sure emergency exits are properly lit, clearly marked and unlocked.
- Fire extinguishers should be visible, accessible

and in good working condition. They should be regularly inspected and certified. Replace any extinguishers that are more than 20 years old.

- Verify the presence of appropriate safety and employee rights posters as required by workers compensation, the Department of Labor, OSHA, and the Equal Opportunity Commission (EEOC).
- Look for loose conduit, exposed wires and open fuse boxes.
- Make sure emergency power shut-off switches are clearly marked and accessible.
- Shop areas should be neat and clean—free from excess debris.
- Flammable materials should be stored in metal cabinets and marked clearly.
- Store chemicals like pesticides and fertilizers in a designated, secure location.
- Does every product have a clear label identifying its contents?
- Maintain and post current emergency contact information sheets.
- First Aid, spill clean-up and hazardous material kits should be available and complete. Don't forget to restock first-aid supplies as you use them.
- Are vehicles well maintained and serviced?
- Also examine restrooms, parts rooms and kitchens.
- And the list can go on and on.

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### **Spray Coverage for Onion Thrips Control: What kind of spray technology works best for onion thrips control? Onion World May/June 2006**

Dr. Emilio Gil, a visiting professor with the Department of Entomology, Cornell University, Geneva, N.Y., recently addressed that question. He was a guest speaker during the 2006 Empire Fruit and Vegetable Conference onion session, held Feb. 16 in Syracuse, N.Y.

Thrips remain one of the major pests of onions and one of the most important from an economic point of view. Pesticide applications are widely used to control these insects.

In recent years, there have been important advances in both pesticide formulations and application technologies. For optimal results, those advances must be used closely with each other.

The absolute need to improve both quality and profit of pesticide applications requires a coordinated effort in all aspects involved in the process: characteristics of pesticide, target (pest, disease, weed, etc.), specific crop conditions and selected application technologies for spray distribution.

Development and improvement of each one of these subjects must be conducted in parallel with the other

ones, the main goal of achieving the best integration and the most suitable benefit of the applied dose.

#### **Nozzle: The Key Factor**

The method of pesticide application and its formulation strongly affect how it reaches its target. The trajectory from the spray nozzle to the target and the nature of the uptake is being intensively investigated for both economical and environmental reasons.

One of the most important factors affecting the final result, measured in terms of deposition ( $\text{mg}/\text{cm}^2$ ), or coverage (percent total area), is related to the type of nozzle and its placement on the sprayer. Most of the spraying applications are made using hollow cone nozzles placed close to each other (12 inches) on a boom sprayer. In spite of 'theoretical' better penetration of this type of nozzles, any other disadvantages can be listed when you compare it with flat fan nozzle ones: poor uniformity across the swath leads to possible over- and under-dosing.

Because this type of nozzle doesn't need overlapping, booms with an improved stability system lead into

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*Spray Technology Continued*

heterogeneous distribution. Droplet spectrum produced by hollow cone nozzles, in general has, lower values of VMD than those obtained with flat fan nozzles. In this sense, the use of small droplets together with high pressures can considerably increase the risk of drift and promote excessive wear on pumps and nozzles.

Gill described new developments in nozzle technology that allow proposing alternative options rather than conventional flat fan nozzles. The principle objective of such new developments is to increase coverage, improve uniformity in all parts of the crop and reduce the risk of drift.

In 2005, a field test was conducted by Cornell University. The main objective was to determine and evaluate the spray coverage in onions obtained with different tests of nozzles.

“Hollow cone nozzles (Albuz ATR red @ 120 PSI), air injection nozzles (Teejet yellow at 120 PSI) were used to apply approximately 50 GPA in all cases,” Gill noted. “Water sensitive paper placed in top, middle and bottom levels of the stem (front and rear), as well as in the leaves axils, were used to quantify (using a digital scanner and Droplet Scan image analysis system) the percentage of coverage obtained.”

Average values are shown in Table 1.

Both hollow cone nozzles (32.4 percent) and twin cap nozzles (35.5 percent) produced similar results in terms of leaf coverage, the speaker said. Similar values for hollow cone nozzles and twin cap nozzles can be explained

because with hollow cone nozzles excessive coverage measured on the front side of WSP allows for compensation of poor depositions on the back side.

“Major differences have been observed in the top level,” Gil observed. “Air injection offers the lowest values on coverage due to high VMD of the produced droplets. In terms of uniformity, the higher value has been obtained with Air Injection Nozzles, not only according to the placement (top, middle, and bottom) but also in front/back depositions.

“Also, this nozzle, due to its higher capacity of penetration, offers the highest coverage on axils without differences between hollow cone nozzles and twin cap ones, he added. “In general those last ones present the highest uniformity in front/back depositions.”

Table 1. Percent of coverage obtained with different nozzle

Nozzle Type	Hollow Cone	Air Injection	Twin Cap
Axils	29%	38.2%	29.1%
Top	40.6%	23.7%	46.6%
Middle	33.6%	28.4%	34.7%
Bottom	23.0%	22.4%	25.1%

**East Texas Fruit & Nut Conference**

February 20, 2007- Rose Garden Center, Tyler

2.5 CEUs (1.0 Law & Regulations, 0.5 IPM and 1.0 General) will be awarded to TDA license holders

<b>AGENDA</b>			
		12:00 pm	Break For Lunch Commercial Exhibit Viewing
8:00 am	Registration - \$20/person Refreshments and Commercial Exhibit Viewing	1:00 pm	<b>Concurrent Sessions:</b>
8:30 am	General Session.....Rick Hirsch, Presiding Welcome.....Dr. Ramona Kellam		<b>Fruits-</b> Blaine Jernigan, Presiding <i>Thoughts on Peach Orchard Establishment.....Mr. Jim Kamas</i>
8:35 am	Small Business Ideas/Issues for Fruit & Vegetable Growers.....Dr. Greg Clary		<i>Selecting Peach and Plum Varieties.....Mr. Jim Kamas</i>
9:15 am	Disease & Chemical Updates for Fruit & Vegetable Growers.....Dr. Karl Steddum		<b>Vegetables-</b> Brian Cummins, Presiding <i>Hoop House Vegetable Production Updates.....Mr. Steve Upson</i>
9:45 am	Drip & Other Irrigation Systems for Fruit & Vegetable Operators.....Dr. Guy Fipps		<i>Watermelon and Tomato Production.....Dr. Frank Dainello</i>
10:45 am	Break, Refreshments, Commercial Exhibit Viewing		
11:00 am	Texas Department of Agriculture Laws & Regula- tions Updates.....Dr. Don Renchie	3:30 pm	<b>Adjourn – Have a Safe Trip Home!</b>