VEGETARIAN NEWSLETTER

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University of Florida
Institute of Food and Agricultural Sciences
Cooperative Extension Service

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Vegetarian Archive

Print Version

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◆ Water Movement in Strawberry Beds
◆ Fresh-Market Tomato Variety Trial NFREC, Quincy, Spring 2002
◆ Vegetable and Melons Consumption Down in 2001, but Likely to Rise in 2002
◆ National Organic Standards

VEGETABLE GARDENING
◆ Catfish and Cucumbers

List of Extension Vegetable Crops Specialists

* * * * * * * UPCOMING EVENTS CALENDAR * * * * * * *

Florida Drip Irrigation School. GCREC-Dover. November 13, 10:00-4:00. Contact Christine at 813-744-6630. Programs are offered free of charge but require pre-registration.

Florida Drip Irrigation School. NFREC-Live Oak. December 4, 9:00-4:00. Contact Laurie at 386-362-1725. Programs are offered free of charge but require pre-registration.

Cucurbitaceae 2002. Naples Beach Hotel and Golf Club; Naples, Fla. December 8-12. Contact Don Maynard 941-751-7636 x239 or dnma@mail.ifas.ufl.edu.

WATER MOVEMENT IN STRAWBERRY BEDS

An increasing concern for proper water usage and irrigation efficiency requires a better understanding of water movement in strawberry beds. The major factor that determines water movement in the soil is macro- and micro- pore space in the soil. Pores in the soil are simply free space not occupied by soil particles; this can be visualized as air filled spaces between soil particles. While there is no definitive differentiation between macro- and micro- pores, macro-pores are generally considered to be larger than 0.06 millimeter in diameter and anything smaller is considered a micro-pore. Sandy soils usually have a porosity of 35-50% and finer textured soils have porosity of 40-60%. With larger soil constituents, sandy soils will have a greater number of macro pores. Water movement through macro-pores usually is accomplished from mass flow. This is the movement of water due to gravity, generally in a downward direction. In micro-pores water movement is more commonly a factor of capillary action, which can move water laterally. The distribution of macro- and micro-pores depends on several factors, soil compaction, aggregation, and type. Soil compaction and aggregation can be altered to some degree while soil type is a location specific factor that can only be changed by changing location or the movement of mass quantities of soil.

Soil compaction may be the easiest factor to control in a field setting. The use of deep tillage, to breakup compacted layers in soil, can improve the drainage of a field. Because macro-pore volume of the compacted layer is increased, gravitational water is allowed to move freely through it instead of laterally on top of it. If this is true then the reverse should also be true. To improve the lateral movement of water in a planting bed, a more compacted bed will have fewer macro-pores and more micro-pores due to the forcing of soil particles together; improving movement to the sides or shoulders of the bed. As an example, in a "loose" bed water from a drip tape will preferentially move downward, whereas in a "tight" bed water movement will still move downward, but not as great a rate with more water being moved towards the side of the bed through capillary action of the micro-pores.

Soil aggregation is the binding or flocculation of soil particles to one another. Soil aggregates are naturally occurring clumps of soil and help increase the numbers of micro-pores present in the soil. There are four factors that control soil aggregation: physical movements of soil particles, organic matter content of the soil, cation concentrations in the soil, and tillage. Organic matter in the soil is the major factor contributing to aggregate formation. As organic materials break down, bacteria and fungi produce gels and other products which bind soil particles together. Physical movement of soil particles can be accomplished through natural freeze - thaw and wetting - drying cycles, action of soil organism, and root growth. These actions force soil particles together promoting aggregation. Some cations (positively charged ions) such as calcium and magnesium (which both have a +2 charge) can help bind negatively charged soil particles together in a process called flocculation. However, cations such as sodium (which only has a +1 charge) can cause the dispersal of soil particles. Tillage can have both a positive and negative impact on soil aggregation. Incorporation of organic materials uniformly in the soil (from crop residues or green manure and cover crops) enhances soil aggregation in the short term. However, in the long term, repeated tillage operations speed up the break down of organic matter in the soil reducing aggregation and movement of machinery through the field can break stable soil aggregates.

What does this mean to a strawberry grower? If the physical properties of a soil are known and how that soil behaves, determinations can be made on the amount of water needed to irrigate to a certain depth or to wet a given volume of the bed. In the sandy soils surrounding Plant City, lateral movement of water in the soil is very poor. Drs. Joe Noling and James Gilreath have preformed tests using dyes to determine where water moves in terms of fumigant application. These tests were duplicated looking at the use of different drip tapes with different flow rates and emitter spacing and their effect on water movement. On a commercial farm, two tapes with low rates of 24 and 27 with flow rates of gal/100 ft/hour with 12 inch emitter spacing, and at the GCREC-Dover a tape with 4 inch emitter spacing and a 32 gal/100 ft/hour flow rate were tested. Both test areas contained living strawberry plants spaced 15 inches apart and had received no irrigation for a month. All beds in this study were "tight" beds, formed with 3 passes of bedding equipment. Irrigation lengths of 1, 2, 3, 4, 6, and 8 hours were the treatments (Table 1). During the first 20 minutes of irrigation of all beds, a blue indicator dye was injected. At the end of each irrigation treatment, beds were dissected both length and cross wise to determine where water had moved. The distance that the dye moved downward, lengthwise and crosswise was measured. Calculations were made to determine percent of the root zone which was wetted. Root zone volume was defined as the width of the bed multiplied by distance between drip emitters multiplied by a rooting depth of 15 inches. Wetted volume was the product of multiplying downward dye movement (15" maximum) by lengthwise movement (with emitter spacing being the maximum) by width of dye movement towards the edges of the bed (36" maximum).
It can be seen that there is little difference between the 24 or 27 gal/100 ft/hour tapes. It takes both of these tapes 6 hours for the wetting pattern of two adjacent emitters (12 in apart) to converge. However, with the 32 gal/100 ft/hour tape with 4 inch emitter spacing, the wetting patterns converged after only one hour. This tape also allowed for deeper penetration of water and provided less water movement to the sides of the beds than the other two tapes. This is due to the fact that on the commercial farm a very distinguishable compacted layer existed at a depth of 17 inches. No irrigation with any of these tapes was successful in wetting all the way to the shoulders of the bed (Figures 1-6). In further studies at the GCREC-Dover the effect of pulsing irrigation through the drip system will be explored as a means to move water to the edges of the bed obtaining uniform coverage for fertilizer and any other chemical supplied through the irrigation system.

<table>
<thead>
<tr>
<th>Hours of Irrigation</th>
<th>Flow rate (gal/100 ft/hr)</th>
<th>Emitter spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>24</td>
<td>12&quot;</td>
</tr>
<tr>
<td></td>
<td>27</td>
<td>12&quot;</td>
</tr>
<tr>
<td></td>
<td>32</td>
<td>4&quot;</td>
</tr>
<tr>
<td>1</td>
<td>14</td>
<td>16</td>
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<td>2</td>
<td>27</td>
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<td>4</td>
<td>47</td>
<td>38</td>
</tr>
<tr>
<td>6</td>
<td>51</td>
<td>53</td>
</tr>
<tr>
<td>8</td>
<td>63</td>
<td>61</td>
</tr>
</tbody>
</table>

Fig. 1

Fig. 2
During the 2000-2001 production season 43,800 acres of tomatoes were harvested with a farm-gate value of over $588 million. Total production was 63.7 million 25-pound boxes or an average yield of 1,456 boxes per acre. Tomatoes accounted for more than 34% of the total value of vegetables grown in Florida during the 2000-2001 production season making it the most valuable vegetable crop in Florida. In the panhandle area of Florida, tomatoes are by far the most valuable of the vegetable crops.

A tomato variety was conducted at the North Florida Research and Education Center, Quincy during the spring season of 2002 to evaluate fresh market (large rounds) tomato varieties and potential new hybrids. *Tomato spotted wilt* has become a serious problem in the north Florida/south Georgia production area. This replicated trial included 22 entries, with 8 of them claiming resistance to *Tomato spotted wilt*.

Entries were seeded on 6 February into planter flats containing a commercial media. Cell size of flats were 2 in. by 2 in. by 3 in. Seedlings were fertilized weekly with a dilute solution of 15-16-17 (N-P$_2$O$_5$-K$_2$O) peat-lite special. Plants were hardened off before transplanting by reducing temperature, water and fertilizer.

Figure 1-6. Cross sections of strawberry beds after 1, 2, 3, 4, 6, and 8 hours of irrigation with drip tape that has a 4 inch emitter spacing and a flow rate of 32 gal/100 ft/hr.
Production was on raised full bed mulched system. Beds were fumigated with methyl bromide/chloropicrin (67/33) at 350 lbs/acre before mulch (black) application. Irrigation was with single drip tube placed 6 inches off center. Total fertilization was 195-60-195 lbs/acre of N-P2O5-K2O. Row spacing was 6 feet between rows with a finished bed width of 36 inches. Transplanting was done on 27 March. Plots consisted of 12 plants spaced 20 inches apart. Plots were tied 4 times and maintenance pesticides were used as needed to control pest problems. Design was a random complete block with 4 replications. Fruit were harvested at or beyond the mature-green stage on 13, 19 and 27 June. At each harvest fruit were graded and sized into medium, large and extra-large fruit. Weights and fruit numbers of each size along with cull weight were recorded. *Tomato spotted wilt* incidence was rated on 22 May and 12 June just prior to harvest.

This trial is one of the first to evaluate a large number of *Tomato spotted wilt* resistant hybrids. Seven of the resistant hybrids showed no symptoms of *Tomato spotted wilt*, one hybrid, ‘BHN 640’ had one plant that showed symptoms of *Tomato spotted wilt* and presence of *Tomato spotted wilt virus* was confirmed in lab by ELISA (Table 1). One other hybrid ‘SVR 1432427’ also showed low incidence (2 plants out of 48) to *Tomato spotted wilt*. This hybrid is not supposed to be resistant to *Tomato spotted wilt* but has resistance to *Tomato yellow leaf curl*. Incidence of *Tomato spotted wilt* ranged from a low of 0.0 to a high of 37.5 % for ‘Sunpac’. For yields, only total yield information is being presented. Total yields ranged from a high of 2771 boxes/a for ‘RFT 0849’ to a low of 1493 boxes/a for ‘RFT 6153’. Fruit size ranged from 8.2 oz for ‘BHN 543’ to a low of 6.0 oz for ‘Rockstar’

Since this is the first university replicated trial for many of the *Tomato spotted wilt* resistant hybrids, care is needed in using these results for recommendations. Also all of these resistant varieties are using the same source of resistance.

<table>
<thead>
<tr>
<th>Entry</th>
<th>Source</th>
<th>Yield (boxes/a)</th>
<th>Average fruit weight (oz)</th>
<th>*Tomato spotted wilt (%)</th>
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<tr>
<td>RFT 0849 (R)</td>
<td>Sygenta</td>
<td>2771 a’</td>
<td>6.9 d-f</td>
<td>0.0 g</td>
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<tr>
<td>BHN 640 (R)</td>
<td>BHN Research</td>
<td>2695 ab</td>
<td>7.2 c-e</td>
<td>2.1 fg</td>
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<tr>
<td>SVR 1432427</td>
<td>Seminis</td>
<td>2641 a-c</td>
<td>7.9 ab</td>
<td>4.2 e-g</td>
</tr>
<tr>
<td>BHN 444 (R)</td>
<td>BHN Research</td>
<td>2633 a-c</td>
<td>7.5 b-d</td>
<td>0.0 g</td>
</tr>
<tr>
<td>BHN 577 (R)</td>
<td>BHN Research</td>
<td>2545 a-d</td>
<td>6.9 d-f</td>
<td>0.0 g</td>
</tr>
<tr>
<td>FL 91</td>
<td>Seminis</td>
<td>2456 a-e</td>
<td>7.2 c-e</td>
<td>12.5 c-g</td>
</tr>
<tr>
<td>SVR 1405037 (R)</td>
<td>Seminis</td>
<td>2444 a-e</td>
<td>6.4 fg</td>
<td>0.0 g</td>
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<tr>
<td>HMX 0800 (R)</td>
<td>Harris Moran</td>
<td>2440 a-e</td>
<td>7.3 c-e</td>
<td>0.0 g</td>
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<tr>
<td>FL 47</td>
<td>Seminis</td>
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<td>7.2 c-e</td>
<td>22.9 a-d</td>
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<tr>
<td>Fla. 7964 (R)</td>
<td>GCREC</td>
<td>2365 a-f</td>
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<td>Fla. 7810</td>
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<td>2327 a-g</td>
<td>6.9 d-f</td>
<td>12.5 c-g</td>
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<td>Fla. 7973</td>
<td>GCREC</td>
<td>2246 b-g</td>
<td>7.5 b-d</td>
<td>18.8 b-e</td>
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<td>Agriset 761</td>
<td>Agrisales</td>
<td>2168 c-h</td>
<td>7.1 c-e</td>
<td>18.8 b-e</td>
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<td>BHN 543</td>
<td>BHN Research</td>
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<td>8.2 a</td>
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<td>Sunpride</td>
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<td>RFT 0252</td>
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<td>Sunpac</td>
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<td>1893 f-i</td>
<td>7.6 a-c</td>
<td>37.5 a</td>
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<tr>
<td>Rockstar</td>
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<td>RFT 6153</td>
<td>Sygenta</td>
<td>1493 i</td>
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</table>

z Denotes variety resistant to *Tomato spotted wilt*.
Y Mean separation Duncan’s multiple range test, 5 % level.
VEGETABLE AND MELONS CONSUMPTION DOWN IN 2001, BUT LIKELY TO RISE IN 2002

In 2002, per capita vegetable and melon disappearance (also referred to as use or consumption) is forecast to rise 1 percent to 451 pounds. Increased use of fresh canning, and freezing vegetables is expected to outweigh reduced use of potatoes and sweet potatoes. Canned and frozen vegetables are expected to rise 2 to 3 percent as the economy improves, output rises, and prices soften. Potato use in 2002 is expected to decline due to higher retail prices most of the year caused by smaller storage supplies from the short 2001 crop.

In 2001, per capita vegetable and melon use declined 1 percent to 449 pounds. Fresh-market use (excluding potatoes) was unchanged at 173 pounds while freezing (down 1 percent) and canning (down 3 percent) use were lower. Per capita use of potatoes, the largest vegetable category, likely increased 1 percent to 140 pounds, reflecting lower prices stemming from the record-large 2000 fall potato crop.

Highlights in consumption trends from 2001 include:

- Record-high per capita use of fresh-market tomatoes, which reached 17.9 pounds. However, processing tomato use reached its lowest point since 1988 as the recession slowed demand for food away from home;
- The recession also impacted fresh-market onion use, which declined 1 percent to 18.1 pounds per person despite adequate supplies and low prices;
- Fresh-market sweet corn use posted a record-high 9.4 pounds per person, but the canning market continued its long-term decline;
- Snap bean use continued to move slowly upward as small gains in fresh and freezing use outweighed reduced caning use;
- Despite a small gain in the fresh market, carrot use declined for the fourth consecutive year after posting a record-high in 1997;
- Pickling cucumber use may have hit its lowest point since 1952, but fresh use remained stable;
- Melon use recovered from a brief slide in 2000 led by increased watermelon and cantaloupe use;
- Despite the smallest fresh-market use since 1990, per capita potato use increased 1 percent as processing use rose 2 percent.

The Census Bureau released the final revised U.S. figures linking the 1990 and 2000 population censuses. The impact of incorporating the final Census 2000 population estimates for 1991-2000 (and beyond) has been to reduce total per capita vegetable use. For example, the estimate of total vegetable per capita use declined by 12 pounds in 1999 as total disappearance was divided into a larger population base. The July 1, 1999 population estimate increased from 272.9 million to a revised 278.9 million. Although per capita use estimates have been trimmed, all familiar long-term consumption trends remain intact.


NATIONAL ORGANIC STANDARDS

The American Vegetable Grower, August 2002 issue, has a special 23 page report on U.S. National Organic Standards. The Table of Contents lists:

- Defining the Process
- Setting the Standard
- The Long and Winding Road
- Earning a Seal of Approval
- Look for the Label
- Selling Quality Assurance
- Organic Resources

Page 23 on Organic Resources lists 21 web sites for more information. For anyone interested in growing organic or being able to provide a client information, check out this source.
CATFISH AND CUCUMBERS

Alternative fumigation strategies and alternative marketing strategies are a few of the many alternatives being looked at to improve profitability in agriculture. One alternative that has been worked on along the fringes of the mainstream is aquaponics – growing aquatic organisms and vegetables together.

One reason these techniques have not become widespread is that the ideal conditions for optimum yields of each product grown apart don’t necessarily coincide with the conditions that exist when you grow them together. Most of the work to date has been done with the systems separated using the water from the fish tanks to fertilize a bed of vegetables or using the crops to filter and clean the water before it is returned to the tanks. Although a sound environmental approach, it probably doesn’t improve profitability compared to each product grown apart. So it must be said up front that more work needs to be done before aquaponics can be successfully combined into commercial production systems beyond the hobby, educational, or eco-tourism uses.

A great review of work done to date is contained at the ATTRA site (Appropriate Technology Transfer for Rural Areas) http://www.attra.org. Just click on Greenhouse and look for the publication Aquaponics – Integration of Hydroponics with Aquaculture.

One system covered in the paper is the University of Virgin Islands Aquaponic System which uses the floating raft design employed in Florida and elsewhere as described in the University of Florida video Building a Hydroponic Floating Garden – SV295. Floating hydroponic raft systems seem to be a good fit for aquaponics. Recent work in Sanford has shown that using a floating raft that provides more above water root zone volume will allow larger plants like greenhouse cucumbers and tomatoes to be produced successfully compared to the system described in the video which is best for leafy salad crops and basil. To combine this with aquaculture would require deeper troughs and recirculating, filtered water.

Another Florida information resource, besides IFAS’s own Sea Grant program, is the Harbor Branch Oceanographic Institution in Ft. Pierce, FL (acted@hboi.edu or www.aquaculture-online.org). They have day long or week long courses on aquaculture. I spent three days there this summer. Dorm accommodations are included in the class tuition and I must say I met some pretty interesting characters passing through. HOBi is one of those places where they provide free bicycles on campus – you just ride where you want to go and leave the bicycle for the next person to pick up. For us dyed-in-the-wool horticulturist, a good starter resource is a book called Small Scale Aquaculture by Steven Gorder which can be purchased from Aquatic Eco-Systems in Apopka, FL.

Aquaponics needs considerable research work to establish production guidelines and test economic parameters before it could be recommended to commercial producers. However, considering the cost of aquatic products in the supermarkets and aquarium stores, this could be a good fit.

(Tyson - Vegetarian 02-09)
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