252 Neptune Ohio State record watermelon

What do you do different?

This is a very good question and when people ask me this I normally say, "nothing". But, this of course is not true. So, I start talking about the hundreds of hours we spend in our patch and all the crazy things we growers do. Usually about two to three minutes is all people really want to know, and they seem disappointed that there is no magic seed or secret fertilizer that we use.

Here are some of the basic things we do,

1. Drip irrigation
2. Mycorrhizae
3. Compost tea
4. Try to encourage root growth
5. No weeds (use landscaping cloth)
6. Cover stump and keep dry
7. Get a good soil sample and make amendments
8. Water more than once a day
9. CO2

Patch size

Our watermelon patch is 600 square feet. We only grow two plants per year and allow 300 square feet per plant. Our theory is two or three good plants are better than 10 average plants. The plants this year were grown side to side because of a slight hillside. I like to grow our plants downhill. With watermelons, you can have a main vine, then two strong vines coming off the stump. I normally take the first vine and run it straight away from the stump. The 252 watermelon was set on the main vine at 10.5 feet.

Soil Preparation

Our Fall Preparation starts by clearing the garden of all plants. Last year, we added chopped cornstalks with maple leaves to start (8 to 10 cubic yards). Then we added old manure and tilled it in. We planted winter rye, and during the first rain, we sprayed five ounces of molasses per gallon. In the spring, we took a soil sample and sent it to Western Laboratories Inc. We went by their recommendations and added accordingly. Our Ph was 6.7 and the organic matter was 3.18%. We also added 6 cubic yards of mushroom compost and the contents of our compost pile. Our total patch size is 3500 square feet, which includes our pumpkins and watermelons.

Seed Starting

The seeds were started on April 8th. We file our seeds and soak them in a water and 10% hydrogen peroxide mix for 10 to 12 hours. We use the paper towel method to start our seeds. Then once they germinate, I put them in our heating chamber (85 Degrees) for about two days. Once they are up, the seedlings go to the grow lights. Keep your grow lights within one inch of the seedlings to help them from growing straight up. We use two gallon pots filled with ProMix and one teaspoon of RTI's mycorrhizae. Our pots are cut in half and then taped back together to make transplanting easier. Unlike pumpkins, you can start your seeds a lot sooner and have them vine before you set them out. We have not had a problem with root bound because of the bigger pots. We set our plants out in the greenhouses on May 3rd.

Ok, so far the same old thing. Now let's get to what we do different. When our plants are ready to come out of the greenhouse, we put down black landscaping cloth, the kind you buy at Lowes or Home Depot. We pin it down with wire pins and coat hangers. When the plants start to vine, I use the same type of pins to hold the vines down. Your roots will grow right through the cloth but weeds won't. The next step is to try to encourage root growth. Watermelons won't tap down roots like pumpkins, but you can encourage root growth by covering the vines with a mix that we use. In a 5 gallon bucket, we mix half a bucket of ProMix, one cup Kelp, one cup alfalfa, and two cups of worm castings. Before we cover the vines, we sprinkle some mycorrhizae under the vine. With our pumpkins, we put the mycorrhizae in the ground about two inches.

Pollination

We pollinated the 252 watermelon on June 20th. It was 10.5 feet out from the stump. We crossed the 267 Edwards plant with our 197.5 Neptune. We use a small shade cloth to keep the melon cool and dry. Once we pick the melon we want, we build a large frame over it and cover it with plastic. Inside this "tent", we use Decon for mice and chipmunks.

Drip Irrigation

We use drip tape to water our plants. They receive about 10 gallons of water, twice a day at 7 a.m. and 4 p.m., 20 gallons total. We also feed our plants through the drip irrigation.

Foliar Diseases and Insects

A Hudson Backpack sprayer is used to apply all chemicals and fertilizers. We use Companion, Daconil, Kocide, and Bayer Advanced in our fungicide roataion. For insects, we use Menace 7.9% Bifenthrin, Bayer Advanced, and Seven for spot treatment. We keep the stump covered with a 2x2 foot piece of Plexiglas and four wooden legs.

Fertilizers

We try to make all soil amendments in the spring, but I still add some things during the season.

We apply,

-Neptune's Fish and Seaweed once a week
-CO2 every other week
-Compost tea every Sunday morning
-Nutri-Aid 0-52-34, two tablespoons per gallon weekly

Late Season Protection

Once the nighttime temperatures start to drop, we keep our melons covered with blankets to try maintaining the melon's inside temperature. We open the covers on the melons during the day; this is the only time the melons get sunlight. The 252 melon was still growing ¾ pounds a day on October 2nd. The melon taped 97x61x48= 206 inches. The estimated weight was 242.5 lbs and it was 104 days old.

The 2010 AG Gene Pool

This year the top 100 AGs in the world range from the fabulous new world record "1810.5 Stevens 10" down to about the 1330 level. To put this 1330 figure in perspective, as recently as 2006 the top 100 went down to 1075 pounds.

Where grown? USA 86% -- WI-14 MI-10 OH-10 PA-10 CA-8 MA-5 NY-5 NH-5 SD-4
RI-4 ME-3 VT-2 MN-2 OR-2 KY-1 IL-1 Total=86
Canada 9% -- ON-4 QC-3 NB-1 NS-1 Total=9
Europe 5% -- UK-2 Belgium-2 Germany-1 Total= 5 Grand Total =100

Year mother seed grown 2009-43% 2008-13% 2007-34% 2006-5% 2005-5%
Total=100%

We have to wonder why the low figure for 2008. Also to see that 43% of the top 100 were grown from 2009 and thus "unproven" seed is quite revealing. I think at one time, the strategy was to wait a year and see what good mothers surfaced and proved themselves, simply because so many new seeds proved to be a disappointment. Now it appears that with the continual improvement of the gene pool and grower's knowledge, they have the confidence to try a high proportion of carefully selected seeds the first year out and it is working quite well. After all, somebody has to take that first step.

Pollination of the mother seed – 4% by "damaged" AGs and 96% by "sound" AGs.

Since I started looking into the "parentage" of the top AGs in the early 1990's, and then making "family trees", the curiosity about the past has not left me and this year again I have made pedigrees for the top 100.More about the past later because right now I know the keenest growers want to know more about what to try next year.

Following are the 2009 top mothers, based on at least 2 offspring showing in the top 100,the first figure is the number of offspring:

6--- 1421.5 Stelts 09--- 1385 Jutras 07 x 904 Stelts 06
3--- 1725 Harp 09--- 1385 Jutras 07 x self
3--- 1544.5 Revier 09-- 1385 Jutras 07 x 1161 Rodonis 07
3--- 1622 Young 09--- 1207 Young 07 x 1385 Jutras 07
2--- 1303 Sweet 09--- 1161 Rodonis 07 x 1413 Werner 08(dmg)
2--- 1236 Harp 09--- 998 Pukos 05 x 1385 Jutras 07
2--- 1456 Rose 09--- 985 Werner 06 x 1209 Kuhn 08

From the huge number of possible new seeds, top growers selected the above for their own good reasons. When at least 2 of those seeds produce in the top 100 the first year, they deserve closer future attention.

Al Eaton Art 10-1, rev. Nov 12/2010

A River of Genes

The worlds top 100 official AGs this year and their ancestors represent the AG gene pool. As well as a "pool" I like to think about it as a "river of genes". The river flows from the past and on into the future, there is a mainstream, there are side currents that diminish and dry up and undercurrents that sometimes boil to the surface. No matter what, the river flows on losing some genes every year and strengthening others.

This river can be traced back to the 1980's when some of the big names were Dill, Neily, Stellpflug, Waterman, Laemmle, Gancarz and Thompson. It can be shown that certain AGs from these growers were the ancestors of our modern AGs and the start of the "river" in terms of documentation. The surviving ancestors from that era ranged from the "493.5 Dill 81" (world record) to the "609 Laemmle 89" (#7 in the world '89).

In recent years I have noticed two main currents leading this river and I will call them the "Wallace" family (1450 Wallace 06 and 1068 Wallace 03) and the Pukos family (998 Pukos 05 and 1231 Pukos 05). The two Wallaces go back to the 845 Bobier 00 and 898 Knauss 01 while the two Pukos go back to the 1446 Eaton 04 and the 1420 LaRue 04. Crosses between these two families account for many of the leaders in the 2010 "river of genes", including the 2009 and 2010 world records.

Looking at 2007,the most common AGs in the mother's pedigree of the 2010 top 100 are:
41- - 1385 Jutras 07- - 1068 Wallace 03 x 998 Pukos 05 (ie.1385 shows up 41 times)
21- - 1161 Rodonis 07- - 1231 Pukos 05 x 1450 Wallace 06
13- - 1207 Young 07- - 1370 Rose 03 x 1068 Wallace 03
8- - 1566 Rodonis 07- - 1450 Wallace 06 x 1231 Pukos 05

The 1370 Rose 03- - 1260 Weir 01 x 712 Kuhn 00, provides a strong third family in the mix.

Is this concentration serious? Will AGs get "inbred" and deteriorate over time? It seems to me the answer is an obvious "no". One has only to consider that every seed in an AG has a somewhat different genetic code as is clear by looking at the diverse shapes and colours of offspring from almost any modern AG. When the 1385 Jutras is crossed with other AGs, the Jutras seed name is the same but the seed genetics are not identical.

For good genes on the sidelines, I suggest that these are well worth a close look:

####-- no Wallace or Pukos genes- - 1556 Werner 07, 991 Urena 05, 985 Werner 06, 1470 Urena 09,1127 Swarts 09 (and several other of the Swarts AGs)

####-- interesting and different genes- -1140 Stevens 08, 1381 Swarts 08, 1287 Gansert 09, 1375 Liggett 08.

It will be fascinating, as usual, to see what another year brings. A.Eaton Nov/10 Art-10-2

All time seeds
Where the Mother and Father were Heavy on both sides list

(Presented to you by the OVGPG)

(This list is comprised of seeds that the mother and fathers weight averaged at least 1400#, self pollinations and sibs were also included as well)

1. **1725.0 Harp 09 (1385.5 Jutras 07 x self)**
   Self pollination (1725.0)

2. **1725.0 Sweet 10 (1161.0 Rodonis 07 x 1303.0 Sweet 09)**
   pollinator grew the 1605.0 Sweet 10 ave=1665.0

3. **1605.0 Sweet 10 (1303.0 Sweet 10 x 1161.0 Rodonis 07)**
   pollinator grew the 1725.0 Sweet 10 ave=1665.0

4. **1810.5 Stevens 10 (1161.0 Rodonis 07 x 1421.5 Stelts 09)**
   pollinator grew the 1468.5 Stevens 10 ave=1639.5

5. **1468.5 Stevens 10 (1421.5 Stelts 09 x 1161.0 Rodonis 07)**
   pollinator grew the 1810.5 Stevens 10 ave=1639.5

6. **1596.0 Werner 10 (1462.5 Starr 09 x 1421.5 Stelts 09)**
   pollinator grew the 1634.0 Werner 10 ave=1615.0

7. **1544.5 Revier 09 (1385.5 Jutras 07 x 1161.0 Rodonis 07)**
   pollinator grew the 1579.0 Revier 09 ave=1561.75

8. **1557.0 Hilstolsky 09 (1272.5 Hilstolsky 07 x self)**
   Self pollination (1557.0)

9. **1634.0 Werner 10 (1421.5 Stelts 09 x 1236.0 Harp 09)**
   pollinator grew the 1461.0 Werner 10 ave=1547.5

10. **1421.0 Stelts 09 (1385.5 Jutras 07 x 904.0 Stelts 06)**
    pollinator grew the 1662.5 Stelts 09 ave=1541.75

11. **1385.5 Jutras 07 (1068.0 Wallace 03 x 998.6 Pukos 05)**
    pollinator grew the 1689.0 Jutras 07 ave=1537.0

12. **1461.0 Werner 10 (1236.0 Harp 09 x 1462.5 Starr 09)**
    pollinator grew the 1596.0 Werner 10 ave=1528.5

13. **1674.5 Connolly 10 (1725.0 Harp 09 x 1596.0 Wallace 09)**
    pollinator grew the 1370.0 Connolly 10 ave=1522.25

14. **1370.0 Connolly 10 (1596.0 Wallace 09 x 1725.0 Harp 09)**
    pollinator grew the 1674.5 Connolly 10) ave=1522.25

15. 1316.0 Harp 09 (985.0 Werner 06 x 1385.5 Jutras 07)
pollinator grew the 1725.0 Harp 09 ave=1520.5

16. 1475.0 Revier 09 dmg (1207.0 Young 07 x 1385.5 Jutras 07)
pollinator grew the 1544.5 Revier 09 ave=1509.75

17. 1460.0 Rose 10 (1207.0 Young 07 x 1161.0 Rodonis 07
pollinator grew the 1554.0 Rose 10 ave=1507.0

18. 1592.0 Platte 10 (1566.0 Rodonis 07 x 1303.0 Sweet 09)
pollinator grew the 1420.0 Platte ave=1506.0

19. 1425.0 Revier 09 (985.0 Werner 06 x 1161.0 Rodonis 07)
pollinator grew the 1579.0 Revier 09 ave=1502.0

20. 1536.0 Sweet 10 (1288.0 Wallace 08 dmg x 1385.5 Jutras 07)
pollinator grew the 1459.0 Sweet 10 ave=1497.5

21. 1459.0 Sweet 10 (1385.5 Jutras 07 x 1288.0 Wallace 08 dmg)
pollinator grew the 1536.0 Sweet 10 ave=1497.5

22. 1333.0 Young 09 (1483.5 Werner 08 x 1288.0 Wallace 08dmg)
pollinator grew the 1658.0 Young 09 ave=1495.5

23. 1493.0 Shenoha 10 (991.0 Urena 05 x self)
Self pollination (1493.0)

24. 1489.0 Sweet 09 (1413.5 Werner 08dmg x self)
Self pollination (1489.0)

25. 1503.0 Neptune 09 (1521.5 Werner 08 x 1556.5 Werner 07)
pollinator grew the 1466.0 Neptune 09 ave=1484.5

26. 1466.0 Neptune 09 (1556.5 Werner 07 x 1521.5 Werner 08)
pollinator grew the 1503.0 Neptune 09 ave=1484.5

27. 1675.0 Hopkins 10 (1325.0 Hopkins 09 x 1140.0 Stevens 08 dmg)
pollinator grew the 1293.5 Hopkins 10 ave=1484.25

28. 1236.0 Harp 09 (998.6 Pukos 05 x 1385.5 Jutras 07)
pollinator grew the 1725.0 Harp 09 ave=1480.0

29. 1493.5 Michaud 10 (1288.0 Wallace 08 dmg x 1662.5 Stelts 09)
pollinator grew the 1445.5 Michaud 10 ave=1469.5

30. 1445.5 Michaud 10 (1662.5 Stelts 09 x 1288.0 Wallace 08 dmg)
pollinator grew the 1493.5 Michaud 10 ave=1469.5

31. 1468.0 Richards 09 (998.6 Pukos 05 x self)
Self pollination (1468.0)

32. 1500.5 Revier 08 dmg (985.0 Werner 06 x 1207.0 Young 07)
pollinator grew the 1428.0 Revier 08 ave=1464.25

33. 1556.5 Werner 07 (1308.5 McKie 06 x 985.0 Werner 06)
pollinator grew the 1363.0 Werner 07 ave=1459.75

34. 1662.5 Stelts 09 (904.0 Stelts 06 x 1350.5 Starr 07)
pollinator grew the 1248.0 Stelts 09 ave=1455.25

35. 1364.5 Hopkins 09 (1500.5 Revier 08 dmg x 1140.0 Stevens 08 dmg)
pollinator grew the 1543.0 STEVENS 09 ave=1453.75

36. 1413.5 Werner 08 dmg (1556.5 Werner 07 x 1385.5 Jutras 07)
pollinator grew the 1483.5 Werner 08 ave=1448.5

37. 1631.5 Mckie 07 (1041.5 McKie 06 x 1308.5 McKie 06
pollinator grew the 1256.5 McKie 07 ave=1444.0

38. 1445.5 Werner 09 (1161.0 Rodonis 07 x 1264.5 Werner 08)
pollinator grew the 1430.0 Werner 09 ave=1437.75

39. 1568 Connolly 08 dmg (1566.0 Rodonis 07 x 1689.0 Jutras 07)
pollinator grew the 1307.0 Connolly est. 07 ave=1437.5

40. 1524.0 Starr 07 (227.0 Leland 06 x 985.0 Werner 06)
pollinator grew the 1350.5 Starr 07 ave=1437.25

41. 1350.5 Starr 07 (985.0 Werner 06 x 227.0 Leland 06)
pollinator grew the 1524.0 Starr 07 ave=1437.25

42. 1489.6 Kline 10 (1185.0 Kline 09 x 1370.0 Rose 03)
pollinator grew the 1383.0 Kline 10 ave=1436.3

43. 1207.0 Young 07 (1370.0 Rose 03 x 1068.0 Wallace 03)
pollinator grew the 1662.0 Young 07 ave=1434.5

44. 1407.0 Rose 10 (1456.0 Rose 09 x 1207.0 Young 07)
pollinator grew the 1460.0 Rose 10 ave=1433.5

45. 1432.0 Carlson/Peteresen 04 dmg (1370.0 Rose 03 x 1370.0 Rose)3
Self pollination (1432.0)

46. 1663.0 Zoellner 10 (1421.5 Stelts 09 x 1421.5 Stelts 09)
pollinator grew the 1198.0 Zoellner 10 ave=1430.5
(sib)

47. 1198.0 Zoellner 10 (1421.5 Stelts 09 x 1421.5 Stelts 09)
pollinator grew the 1663.0 Zoellner 10 ave=1430.5
(sib)

48. 1325 Starr 08 (227.0 Leland 06 x 227.0 Leland sib, clone 06
pollinator grew the 1524.0 Starr 07 ave=1424.5

49. 1336.0 Patton 10 (1457.0 Patton 08 x 1180.5 Pukos 07)
pollinator grew the 1504.0 Patton 10 ave=1420.0

50. 1674.0 Marsh 10 (1488.0 Marsh 09 x 1544.5 Revier 09)
pollinator grew the 1165.0 Marsh ave=1419.5

51. 1294.5 Revier 09 (1428.0 Revier 08 x 1385.5 Jutras 07)
pollinator grew the 1549.5 Revier 09 ave=1419.5

52. 1520.0 Sperry 10 (1385.5 Jutras 07 x 1725.0 Harp 09)
pollinator grew the 1314.0 Sperry 10 dmg ave=1417.0

53. 1445.0 Kline 10 (1264.0 Kline 09 x 1370.0 Rose 03)
pollinator grew the 1383.0 Kline 10 ave=1414.0

54. 1130.0 Jutras 07 (1354.0 Checkon 04 x 998.6 Pukos 05)
pollinator grew the 1689.0 Jutras 07 ave=1409.5

55. 1452.0 Ghaye 09 (1350.0 Starr 07 x 1309.0 Hebb 08)
pollinator grew the 1360.0 Ghaye 09 ave=1406.0

56. 1455.0 Clark 10 dmg (1017.0 Clark 08 x 1544.5 Revier 09)
pollinator grew the 1353.0 Clark 10 ave=1404.0

57. 1402.5 Bosworth 07 (1068.0 Wallace 03 x self)
Self pollination (1402.5)

58. 1506.0 Hopkins 10 (1421.5 Stelts 09 x 1140.0 Stevens 08 dmg)
pollinator grew the 1293.5 Hopkins 10 ave=1399.75

(note: should anyone know of a seed that should be on this list or if there is a needed correction please email it to Bazkitball@aol.com . Please put "MotherFatherData" in the subject line, so if corrections or additions are needed they can be made. Thank you.)

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Understanding Plants: Part 1

Editor's Note: This is the first in a three-part series.

All of us that work in plant-related industries deal with plant physiology to one degree or another. Plant physiology can be defined as the study of the physical and chemical processes that go on within living plants. Stated more simply, it refers to how plants operate and how they respond to the environment. This subject is actually quite complicated, involving numerous chemical, biological, and physical processes. I have agreed to write a three-part series for OFA, attempting to explain certain important aspects of plant physiology in easy-to-understand terms.

First of all, as humans, if we are hot or cold or hungry or thirsty or otherwise uncomfortable, we have the ability to do something about it, to correct that discomfort. Plants, on the other hand, have to sit and take whatever the environment is giving them. They can't make a sandwich, get a glass of water, or put on a sweater. However, plants have developed a number of rather ingenious ways to monitor and adapt to their environments. Plants don't have brains, so they don't think like people or animals. However, at any given time, whether it is a petunia seedling or a giant redwood, plants constantly monitor levels of moisture, humidity, temperature, and light. They do this through mechanisms called biochemical pathways. Humans have a similar response to their environment. When your body is hot, you will likely start to perspire. This is not a voluntary or cognitive response. You don't think, "Gee, it's hot, I better start sweating." Via its own biochemical pathways, your body knows that it is heating up, and the evaporative cooling of perspiration is one way your body avoids excessive temperatures.

You were probably taught in science class that green plants take in carbon dioxide and give off oxygen. Technically, this is only half true. During daylight hours, plants are absorbing moisture and nutrients through their root systems, and carbon dioxide through the pores in the leaves called stomates. With these raw materials plus energy from light, plants manufacture the building blocks they need to survive and grow. During the day, the plant is making amino acids, simple sugars, and other basic molecules. Interestingly, if the plant is drought stressed and must close the stomates to conserve moisture, this photosynthesis will be temporarily interrupted because the plant can't absorb adequate carbon from the atmosphere. Plants don't do much growing when they are excessively dry. During the day, the plant is taking in carbon dioxide and giving off oxygen.

At night, the whole thing changes. The stomates close, and moisture and nutrient absorption largely cease. The plant goes into an assembly mode, putting together the building block molecules it made in the daytime, assembling them into proteins, enzymes, carbohydrates, fats, etc. This is why some fruits and vegetables are sweeter when the nights begin to cool. On cool nights some of the building blocks such as sugars may be left in their simple state, rather than being made into starches or complex carbohydrates.

For a long time, I wondered why plants didn't grow extra roots. If you were a plant, wouldn't it be helpful to have some extra reserve roots on hand, in case of drought, root disease, excess temperature or wind? Plants, for the most part, don't do this, and I found out why after reading a text book called *Plant Roots: The Hidden Half.* The limiting factor in a plant's ability to grow large quantities of roots is generally carbon. Plants must budget the carbon they take in from the atmosphere to flowers, leaves, stems, and fruits as well as roots. There is generally not enough carbon available for the plant to make reserve roots. This is why it is more difficult to regenerate a damaged root system in a low light environment such as a dark greenhouse or interiorscape. There is less light, less photosynthesis, and less carbon.

It is also interesting to note that when everything is perfect in the plant's environment, the quantity of carbon dioxide in the atmosphere is usually the limiting factor in a plant's ability to grow and develop. If the temperature is perfect, the moisture is perfect, the fertility is perfect, the light is perfect, and the humidity is perfect, plant growth is limited by carbon in the atmosphere.

In the area of nutrient management many plants have rather elegant ways of obtaining what they need to survive and grow. Many plants can secrete acids from their roots in order to increase nutrient absorption in a high pH environment. Some plants can do this better than others. That explains why some plants like tomatoes and verbena can grow fairly well in high pH environments, while others like pentas and geranium have more difficulty. Some plants can even secrete chelating agents from their roots in order to help with micronutrient absorption.

Plants also have the ability to direct ions in the transpiration stream. In simpler terms, plants have some degree of control over what nutrients they absorb, and to an extent can control where they put those nutrients. Through these metabolic pathways, a plant "knows" where things like boron or iron or phosphorus are needed for their development, and they can send those nutrients where they are needed. Plants can sense when they are deficient in something, and can use various types of absorption tricks to absorb more of that nutrient. At the same time, plants perceive when they are taking in too much of

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something. Let's say a plant is taking in too much sodium or fluoride. It senses this through the biochemical pathways, and can arrange to send these elements to the tips or margins of the older leaves, with the ultimate intention of shedding those older leaves and thereby reducing the effects of the toxicity. This is why most nutrient toxicities occur in older foliage.

Dealing with moisture relations is especially important for most plants. Plants have a moisture economy, where moisture is absorbed through the roots, passes through the stems, and ultimately out through the stomates in the leaves. At the onset of dry conditions, the plants can close their stomates, or sometimes primarily close the stomates on the upper leaf surface. They can encourage their roots systems to absorb and transport more water. The plant will start to make hormones that can induce leaf drop if the dry conditions are severe or persist for a long time. The wilting response is a physiological way for plants to reduce their moisture loss until better conditions return.

On the flip side, when plants are growing in excessively wet or flooded conditions, they have several response options they can use. Some plants can transport oxygen down to the roots in order to help them survive. Other plants may wilt to reduce the sun exposure. Waterlogged soils generate ethylene. Some plants respond to this ethylene by dropping older leaves when exposed to it. This is why an overwatered plant can look fairly similar to an under watered plant.

We'll continue this study of plants in Part 2 of this series that will appear in the November/December issue of the *OFA Bulletin*.

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Understanding Plants: Part 2

Editor's Note: This is the second in a three-part series.

In the first installment of this series, I tried to simplify the very complex field of plant physiology down to concepts that growers can utilize in making production decisions. This can be a very slippery slope, as there are usually exceptions in any form of biology. Most plants may respond a certain way, but certain types of plants may respond differently. Second, most of the research that has been performed in plant physiology has related to agronomic crops such as wheat or soybeans. There really aren't many scientific publications relating to the plant physiology of greenhouse ornamentals. Third, science has not completely figured out many of the mechanisms of plant physiology, so we are looking at a somewhat incomplete picture. Regardless, I think boiling plant physiology down into simple concepts can help growers do a better job.

In 1898, Frances Darwin observed that the stomates of a leaf facing a bright window opened during the daytime, while leaf surfaces facing away from the window kept their stomates closed. This activity enables plants to selectively catch light and photosynthesize when conditions are right, while conserving moisture by closing the stomates where light levels are inadequate. Think of a bushy plant, where some leaves are heavily shaded within the plant, while others may be exposed to strong light. The guard cells surrounding stomates tend to open with exposure to blue and red light, which stimulates the cells to open the stomates. Moisture levels and carbon dioxide concentrations also can affect the opening of stomates. The short version here is that when stomates are closed, due to poor light, moisture stress, or other factors, photosynthesis is not taking place and your plants are not doing much growing.

Plant roots are somewhat selective in where they "choose" to grow within the media. Many plants will develop extra roots in moist pockets of media. Conversely, they often grow fewer roots in dry areas within the container. A careful look at a typical greenhouse-grown 6-inch plant may reveal an abundance of roots in the middle and lower areas of the root ball, especially at the interface between the container and the media. With diurnal heating and cooling, plastic containers often expand and contract a little bit, giving the roots a fair amount of aeration and moisture at the same time. You often see fewer roots near the surface of the pot where the media is typically drier and sometimes much higher in salt content.

How does excessive fertilizer burn plants? It is not that the plants take in too much of the fertilizer and somehow injure themselves! In a normal potted plant, the salinity level of root cells is greater than that of the surrounding soil moisture. Therefore, moisture enters the root cells relatively easily. The moisture moves from a lower salt concentration to a higher concentration, without the plant having to do too much work. When fertility becomes excessive, this easy transport of moisture into root cells is hampered. As a result, plants can show wilt symptoms, despite very good soil moisture levels. This may prompt a grower to add additional water and fertilizer.

If the levels of fertilizer salts become too high, moisture is actually pulled out of the root cells back into the media. This is what causes the root injury, scorched leaves, and defoliation often associated with fertilizer burn. It is not just the nitrogen that contributes to fertilizer burn. All of the soluble salts in fertilizer or irrigation water can contribute to the problem. In fact, plants with high soluble salts generally are deficient in nitrogen in the leaf tissue due to nutrient uptake problems caused by the salt gradient.

Plant roots can also be selective about the physical properties of the media throughout which they grow. Most commercial potting media have at least two ingredients, and frequently three or four. One reason for this is that with multiple media components, the individual particles of peat, bark, perlite, or whatever fall together in different ways as the pot is filled. This creates different types of aeration and moisture microclimates into which the roots can grow. Potting media made up of only one component are relatively rare, as they can often result in problematic rooting environments for most plants. Very compacted soils and media may limit root growth by reduction of aeration, increased moisture holding capacity, and sometimes even physical impediment to root growth. The common foliage plant Aglaonema has difficulty growing in very heavy clay soils, presumably due to the succulent nature of their root systems. They grow fine in sandy soils, lightly clay soils, or even very acidic soils, but they have trouble growing roots in soils that are difficult to penetrate.

Some plant varieties are known to produce fewer roots in an opaque, white pot as opposed to a darker-colored black or green container. Some roots prefer not to grow in well-lit environments. Others may proliferate fairly well in such environments, and may even manufacture chlorophyll in the roots in order to help capture this light. Container color can also affect media temperature in certain parts of the root ball. Such factors are usually unimportant in greenhouse culture, though in outdoor productions in warm climates, you will often see the best root growth on the north side of the container, where cooler root temperatures prevail.

Plants will often orient their leaves toward or away from the sun or an artificial light source, depending on the plants requirements. Plants growing in relatively low light levels may orient their leaves perpendicular to the sun in order to increase light reception. If plants are stretching and growing toward a light source such as the sun or a window, it indicates that the plants are not receiving enough light.

Under very high light conditions, plants may orient their leaves vertically or even twist their leaves in an effort to minimize sun exposure. For example, dieffenbachias and aglaonemas will both have very vertical, upright leaves under very high light regimes. Plants with long tapered leaves such as dracaenas will twist their leaves during periods of high light, especially if temperatures are high. Heat and light are interrelated. You can grow many plants at higher-than-normal light levels if temperatures are mild. Under warmer temperature conditions, plants may respond more negatively to higher light levels.

Plants can also adjust their chlorophyll content to help match the light levels with their need for photosynthates. Many ornamental plant varieties will become somewhat pale under high light regimes. Metabolically, the plants sense that they are receiving enough light, so they don't bother to make much in the way of additional chlorophyll. If you take those same plants and put them in a greenhouse with heavier shade, the plants will often quickly make additional chlorophyll, sensing that their energy requirements are not being met. If plants are a little pale under a high light regime, spraying them with a direct precursor of chlorophyll such as magnesium nitrate will often result in a temporary color response. Whether it needs it or not, the plant absorbs the magnesium nitrate and turns at least some of it into chlorophyll. In many plants that response only seems to last about two weeks.

The third and final installment of this series will appear in the January/February 2011 issue.

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ofa

Looking back 5 years----Where are they now?

We all know that AG growers continued this year to make great weight increases but how have various regions fared to date all time, compared to 5 years ago? Thanks to Kelly Klinker of Indiana (www.ipga.us) we have a 2010 list of the all time top 10 official AGs that I can compare to those of 2005.

REGION	RANK 2005	RANK 2010	Diff.	Diff.	TTA 2005	TTA 2010	Diff.
Ontario	1	11		-10	1244	1417	173
Pennsylvania	2	2	none	none	1241	1560	319
New Hampshire	3	13		-10	1240	1412	172
Ohio	4	1	+3		1237	1589	352
Washington	5	15		-10	1232	1402	170
Rhode Island	6	5	+1		1230	1505	275
Oregon	7	10		-3	1186	1423	237
New York	8	7	+1		1174	1469	295
Massachusetts	9	9	none	none	1162	1450	288
Nova Scotia	10	20		-10	1136	1256	120
Quebec	11	16		-5	1135	1358	223
California	12	6	+6		1127	1480	353
Indiana	13	30		-17	1053	1129	76
Wisconsin	14	3	+11		1043	1545	502
Iowa	15	12	+3		1040	1416	376
New Brunswick	16	19		-3	1038	1257	219
British Columbia	17	24		-7	1033	1221	188
Michigan	18	4	+14		1030	1519	489
Minnesota	19	14	+5		1021	1410	389
Prince Edward Island	20	29		-9	960	1143	183
Maine	21	22		-1	953	1246	293
Belgium	22	17	+5		925	1338	413
Connecticut	23	23	none	none	924	1236	312
South Dakota	24	8	+16		923	1467	544
Illinois	25	21	+4		917	1246	329
West Virginia	26	28		-2	839	1160	321
Utah	27	32		-5	837	1063	226
Manitoba	28	34		-6	824	1028	204
North Carolina	29	35		-6	817	1005	188
Colorado	30	26	+4		801	1185	384

Comments—this can be likened to a long distance race with no end in sight and where all teams are advancing but some faster than others.

The fastest 5 year TTA gains-- South Dakota, Michigan, Wisconsin, California, Minnesota, Belgium

The slowest 5 year TTA gains—Indiana, Ontario, New Hampshire, Washington, Nova Scotia, P.E.Island

Note that ON, NH and WA have had their time in the spotlight and now it is the turn for others to be there.

Al Eaton Jan, 2011 Article AGs 2010-4