The Language of the Plant

It may come as a shock to many people, but most vegetable crops have the same growth characteristics. Yes, there is a difference in degree between crops and even between varieties. The basic principals, however, are the same.

Objective of Crop Production:

- Maximize the production of carbon compounds (sugars) in the leaves.
- Move these compounds to the seeds, fruit, or storage tissue of the crop.

For many of our crops, we want strong cell wall tissue that will hold a lot of water. This adds low cost weight to the crop that we sell.
As our crop grows, we see certain things; color, height, length of branches or vines, number of fruit, etc. If the crop gets under stress and losses color, we apply nitrogen. This may result in several days greener color; however, it does not solve our problem of yields and quality. It may even reduce quality. We need to have a better understanding of the language of the plants.

The key word for understanding the plant is STRESS. As with people and animals, STRESS is always present…sometimes great and sometimes small. Our objective is to minimize it.

STRESS always starts in the roots. If they become flooded and lose oxygen, they cause plant STRESS. If the soil becomes too dry, the roots do not grow correctly and it causes plant STRESS. If the roots become "leaky" they attract diseases and it causes the plant STRESS.

Roots try to grow continuously. They expand just behind the root cap. It is this area (about 10 mm) behind the root cap where most water and nutrients are absorbed for plant growth. The active roots remain active for about 7 to 14 days. The roots or rooting area older than 7 to 14 days are not functional. Therefore, actively growing new roots are essential for normal plant growth. If root growth is negatively affected, it results in plant STRESS.

It is important that the growing area just behind the root cap has adequate calcium for strong cell wall formation. If calcium is not sufficient in this critical zone, the root cells will be weak. This will result in "leaky" roots which will attract disease and cause plant STRESS.

Roots not only supply the plant with water and nutrients, they supply necessary plant hormones such as Cytokinins. This hormone will help activate auxiliary bud activity and help suppress other hormones that may be "out of balance". The balancing of Ethylene hormone may be Cytokinin's most important function.

Let's now go above ground and learn about the plant. The plant is hormone driven. Most fertilizer nutrients affect hormones. The main nutrient to affect hormones is nitrogen…more importantly nitrate forms of nitrogen. It stimulates IAA and auxin that cause great terminal growth. The more nitrate you apply, the greater the vegetative growth will become.

Unfortunately, if the plant comes under STRESS, plants with higher nitrates will have more disease and lower quality of storage tissue (physiological disorders). In addition, more blooms will appear and more blooms and fruit will be aborted. We have all seen this.
The hormones caused by nitrogen can increase yields and can also reduce yields and quality if the growing season causes STRESS. **Why?**

When plants come under STRESS, protein hydrolyzes to ammonia. The ammonia becomes toxic and causes the plant to produce Ethylene (the aging hormone). In turn, Ethylene promotes enzymes that act like "PACK MAN" they eat up cell wall tissue that causes soft fruit, soft storage tissue, underdeveloped tissue, blossom-end-rot and other problems called physiological disorders.

The bad guy in the whole scenario is Ethylene…the aging hormone. It is stress related. It causes blooms. It causes blooms and fruit to abort. It causes maturity. If the plant is STRESSED early, it causes early dying. We have all seen plants forced in to early maturity (early dying) when crops are STRESSED by either abnormal weather or disease. If we have high levels of Ethylene in the plant creating a lot of "PAC MEN" who chew up cell walls, we have created a perfect situation for disease infection.

If you have followed the above, let me now take you through the "plant talk". We are trying to grow the most profitable crop, so we apply a liberal amount of nitrogen that primarily feed our plant in the form of nitrate. When the nitrate gets into the leaf, it produces protein and organic acids. The more nitrates that go into the leaves, the more organic acids will be produced in the leaves.

The organic acids "demand" cations such as potassium, magnesium, and calcium to neutralize them. They prefer calcium. This increases the calcium gradient between the leaves and other plant parts…the "giant sucking sound". This depletes other plant parts of needed calcium. This is what causes physiological disorders…bitter pit, hollow heart, blossom-end-rot, soft onion, cavity spot, tip burn, etc. Adequate boron in the plant will reduce the leaves "sucking ability". This is why boron inhibits calcium problems.

The above problem is bad, but the worse is still to come. The calcium problem in the storage tissue usually happens when the plant is making vigorous growth. During this period, root growth slows down. The roots are not capable of supplying adequate calcium to alleviate this problem. In fact, calcium is drawn out of the root growing points and stolen growing points. Just as stolens abort their meristematic tissue during the rapid growth of potatoes, all plants abort meristematic root tissue. There simply is not enough calcium in the meristematic tissue for normal cell growth.

The above cause "leaky roots" which attract disease. Worse yet, it causes STRESS. This increases Ethylene in the plant which makes the plant susceptible to disease. The roots can no longer produce enough hormones to control the Ethylene build-up. It's now fungicide time. If we could stop the build up of Ethylene, I believe we could suppress disease development.
So, high nitrogen use can cause physiological problems, quality problems, storage problems, and disease problems in our plants. Do we then greatly reduce the nitrogen that we use…even if it reduces the yield of our plants? **NO!**
Now, comes the commercial!! We reduce the nitrate nitrogen that our plant feeds on. This reduces organic acids in the leaves and reduces the "giant sucking sound" of calcium.

- We use **Nitro-Plus** which is liquid amine nitrogen and calcium solution, instead of the common forms of nitrogen. We supply a larger quantity of calcium in the feeding zone of the roots and stolens.

- We inject **Nitro-Plus** into the bed or seeding areas before transplanting or seeding.

- We use **Nitro-Plus** (soil applications), and (foliar applications) integrated into our total nitrogen programme. We recommend that this unique nitrogen supplies at least 1/3 of total nitrogen applied. Where STRESS is greater, higher rates are beneficial.

The other method which is used in conjunction with the **Nitro-Plus** programme is a foliar treatment which will suppress Ethylene build-up in the plant.

- We spray with Harvest Plus GA, SET, Desert Mix, Calcium 5 S, Calcium 5 X and Nitrate Balancer every 7 to 14 days according to the plant needs.

What should we see, if we follow this programme?

1. A larger diameter stem.
2. A larger and whiter root growth.
3. More branches and fruiting points.
4. A more even set of fruit.
5. Wider leaves.
6. Stronger cell walls:
   a) Less drooping of the plants.
   b) Stronger stems.
   c) Heavier tissue.
7. More storage tissue.
8. Less early dying.
9. Better storage and/or shelf life.

"WE CAN ONLY LEARN BY UNDERSTANDING THE LANGUAGE OF THE PLANT."

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