



### **Potassium Deficiency**

## **NUTRIENT DEFICIENCIES**

In order to understand the nutrient requirements of a strawberry plant we need to understand the requirements at the different stages as I have outlined in previous Newsletters. If we have to list the Nutrient in order of deficiencies as we see them they would be as follows in order of the nutrient most often deficient to least: Nitrogen, Boron, Potassium, Calcium, Sulfur, Magnesium, Phosphorus, Zinc, manganese, Iron, Copper.

### **NITROGEN**

Nitrogen deficiencies usually show up in older tissue first. The reason for this is that as the plant becomes deficient it will translocate the major elements from the older tissue to the younger developing tissue. Symptoms are leaves begin to turn pale green and then yellow as the deficiency progresses and eventually the leaves turn a red colour with the large veins remaining green. Leaves will eventually turn a yellow colour and necrosis will take over causing death. Younger leaves will emerge and remain green but their size will be reduced. The calyx of the strawberry will turn red.

It is a must to monitor Nitrogen levels during those stages that we have identified as critical. A strawberry plant as it approaches fruit set will change rapidly in its Nitrogen requirements.

### **BORON**

The first symptom of this deficiency will show up as tip burn or blunting off of the new emerged leaves. If Boron deficiency is not corrected rhizoctonia crown rot may appear.

The growth of runners will be reduced and distance between mother and daughter plants will decrease. The mother plant will stop growing completely until the deficiency is corrected.

Flower initiation and flower bud development is inhibited and the production of pollen and its viability will be reduced.

Flower size will be small and the obvious sign is a space between the flower petals. Fruit will be small and disfigured. If Boron deficiency is only temporary fruit may not be disfigured but will be small with few viable seeds. Late flowers will blast and not form fruit.

Root growth is restricted and they will turn black.

Boron levels in the tissue must be greater than 30 ppm and in the case of K uptake we will want to maintain Boron greater than 60 ppm.

### **POTASSIUM**

The oldest leaves are affected first. This first appears as a tanning or browning of the younger mature leaf blade upper margin. As this deficiency progresses onward the purplish tanning or browning appears on the upper leaf like paint brush marks and advances to the mid rib at the base of the leaf and on the part of the petiole. The leaf will eventually become necrotic and die.

## CALCIUM

At first this deficiency looks like Boron deficiency as the leaves emerge from the crown with tip burn and the blunt end. With Calcium deficiency however the entire leaf will be disfigured. Without Calcium there is nothing to build new cells therefore the tissue is disfigured.

The petiole will have brown elongated flecking on them and the under sides of the leaves will have globs of sap oozing from the veins.

Seeds on the fruit will be densely packed together because the fruit is unable to expand due to poor cell formation.

Root damage occurs before symptoms show up on the leaves. Root hairs stop growing and die back. The tip of the primary root is killed followed by branch rootlet development behind the dead tip.



## SULFUR

Sulfur deficiency is often times mistaken for Nitrogen deficiency. Leaves turn a light green colour and remain yellow do not turn red as with nitrogen deficiency nor does the calyx turn red. In most cases one of the leaflets will be smaller than the other two. Every season in strawberries we see low levels of S deficiency.

The nitrogen test kit or tissue tests will determine if it is N or S.

## MAGNESIUM

Foliage symptoms affect the old leaves with the young leaves remaining green. Usually shows up as light green spots that can barely be seen with the naked eye. If you shade the leaf from the sun it is easier to pick out these areas.

As it progresses a reddish purple colour starts to develop near the leaf margin and progresses inward between the veins. In early stages the leaf will have a green band at the margin of the leaf but as Mg deficiency progresses the discolored areas become necrotic and die. The light green areas between the veins become necrotic spots.

Petioles remain unaffected where as with potassium deficiency they developed lesions.

## ZINC

Zinc deficiency begins as a pale colour to the leaf. As it progresses a green halo appears around the serrated margins of the young leaves with the center of the leaf having a uniform interveinal chlorosis. As the deficiency progresses the leaf will begin to turn red where this chlorosis is most pronounced. Leaf size will also be stunted.



## PHOSPHORUS

Early symptoms are a dark greenish purple sheen to the upper surface of the leaf. As the deficiency progresses the entire leaf surface will take on a purplish colour with the lower surface more pronounced than the upper surface.

Blossoms will be delayed and stunted.

Roots will die back, become stunted and dark.

## MANGANESE

The young foliage develops a pale green colour as the first symptom. Unlike the Zinc deficient leaf there is no green margin. The leaf takes on a netted chlorotic appearance.

As the deficiency progresses the chlorotic areas become necrotic from the outside edge of the leaf inward and the leaf cups upward. The necrosis spread inward between the veins but it gradual kills the entire leaf as it progresses towards the midrib.

## NUTRITIONAL DISORDERS BELOW THE GROUND

During my field visits I will cut open crowns and examine them. In the following using the pictures provided I will try to describe what I am looking for.

The crown is a culmination of events that has taken place and can sometimes lead us to answers. This analysis can be very helpful in redefining our programs for next season or responding to a problem in this season.

A healthy crown should be bulbous and white. Some varieties will be wider than others but usually a good round, white crown growth indicates conditions are favorable.

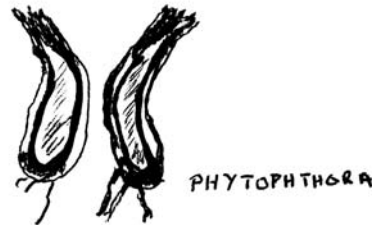
In a healthy crown the tissue should be clear and dense not flaky. A flaky crown will indicate usually poor K or CA conditions or both and will be more prone to disease and winter damage.

## NITROGEN DEFICIENCY

A crown that has been grown in low or deficient N conditions will not have the good round crown appearance but will be smaller narrow and red in appearance. Older crowns will be always darker than newer crowns that had sufficient N in their production year.

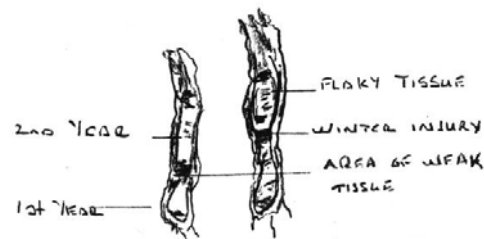
## PHOSPHORUS

A crown that has been subjected to poor P levels will be much narrower and often rots will show up in the root and outer edge of the crown. Crown vegetative area will be very dark or blackish with disease apparent. Root formation will be poor.



## POTASSIUM

Low K levels again the crown will be narrow particularly in the area between yearly crowns. Crowns will be dark in appearance and areas of decay will show up in the base of the crown. Potassium deficient crowns will appear flaky in the center and less dense. New crowns will be more prone to winter injury. This narrowing of the crown is more pronounced than that of Nitrogen or Phosphorus deficiency.



## **CALCIUM**

Crowns showing low Ca levels will have more damage from disease and very poor root growth. Although these crowns may be wider than other nutrient deficiencies shown, the density of the crown will be poorer. This level of cell density is why these crowns are more prone to disease.

All these pictures are from first year crowns when we examine crowns in the field some of the best information we gather comes from old decayed crowns and the physical appearance. Digging up crowns will also give us good information on how well our planters are set and if we are creating any soil movement during field operations. Shifting soils and moving crowns that are established will destroy root systems.

If you want to dig crowns and send me a picture for examination prepare a solution of water and lemon juice to dip the crowns in when you cut them open. This will preserve the colour of the crowns so that you can lay them out and take a picture of them.