

# **Foliar Nutrition**

**By: Jerry H. Stoller**

**During 1953, the U. S. Atomic Energy Department provided a grant and radioisotopes of all nutrients to Michigan State University. The objective was to study the foliar absorption of fertilizer nutrients and trace their movement in the plants.**

**All nutrients are absorbed by the leaves. They were even absorbed through the woody tissue of trees. There can be no debate about this.**

**Question: Which is the most efficient way to correct nutrient problems? Through the roots? Through the leaves?**

Answer: For the following nutrients, foliar application is used more effectively. For some, soil application is totally ineffective:

- Iron
- Manganese
- Molybdenum
- Calcium
- Boron
- Cobalt
- Zinc
- Copper

Everyday, we drive through the country and observe corn plants that have magnesium deficiency...even though granular magnesium has been applied with granular fertilizer.

**Question: How can you most effectively apply the other nutrients...Nitrogen, Phosphate, Potash, and Sulfur?**

Answer: We recommend the application of these nutrients in the soil. We band a "starter fertilizer" and sidedress the balance of the nutrients....either at planting or after the crop is up. They can also be applied through irrigation

**Question: If crops run out of nitrogen, phosphate or potash, can the correction be made with foliar application of these nutrients?**

Answer: Of course they can.

**Question: Do roots need to "take up" fertilizer in order to live?**

Answer: No. The roots receive their food from the leaves. They merely absorb nutrients which are transferred to the leaves. The leaves use the nutrients to make photosynthates. They are then transferred down to the roots for "root food".

**Question: Would it not be more efficient to bypass the soil problems and put nutrients initially into the leaves?**

Answer: Yes

**Question: Are any plants being fertilized with only foliar fertilizers?**

Answer: Yes. Most of the pineapples grown in the world are primarily fed through the foliage. Other crops have been experimentally raised with 100% foliar fertilizers. We now have projects on citrus and fruit trees.

**Question: Why don't we use 100% foliar feeding?**

Answer: It's a matter of economics. The cost of 6 to 7 applications by sprayers would be more expensive than wasting money on inefficient soil application of nitrogen, phosphate, potash and sulfur.

**Question: How inefficient is soil fertilization?**

Answer: When we apply fertilizer to this year's crop, only about 50% of the nitrogen, 15% of the phosphate, 25% of the potash and 50% of the sulfur is recovered by this year's crops. Some more will be recovered by next year's crops.

**Question: What nutrient deficiencies can not be economically corrected with soil application at critical growth periods?**

Answer:

- Iron (on some soils)
- Manganese (on some soils)
- Calcium
- Magnesium (on some soils)
- Molybdenum

**Question: Do you know that foliar fertilizer is only recommended when soil application does not work?**

Answer: Yes.

**Question: Would it be correct to say that foliar fertilizers always work and soil fertilizers (for all nutrients) does not always provide adequate amounts?**

Answer: Yes. Again, economics dictate which nutrients are used in the soil.

**Question: Does no-till or minimum-till affect the efficiency of soil applied fertilizer?**

Answer: Yes. We were taught at the University to raise the fertilizer levels in the whole plow layer (about 10" inches). With no-till farming, it is impossible to mix the fertilizer that deep. Non-mobile nutrients will "build up" on the soil surface in 3 to 4 inches.

**Question: Which nutrients are non-mobile?**

Answer: All nutrients except nitrogen, sulfur and chloride. Potash is slightly mobile.

**Question: How do you market foliar fertilizers?**

Answer: We ask our customers if they want to use foliar fertilizers containing non-mobile nutrients to protect their plants against deficiencies, or would they rather wait to first see if their plants have problems.

We let our customers make the choice. Our job is to educate them so that they will make an intelligent choice.

Our company does not need to sell foliar fertilizers to make a profit.

**Question: Is the use of foliar fertilizers growing?**

Answer: Yes.

**Question: Why?**

Answer: Growers who use foliar fertilizers to supplement soil applied fertilizers make more money. Why else would they do so?

**Question: Do you think that in the future a greater percentage of fertilizers will be foliar applied?**

Answer: Yes.

**Question: Why?**

Answer:

- Environmental considerations
- Cost of fertilizer nutrients
- Lower unit cost of production

**Question: Is there ONE consistent philosophy that guides your recommendation?**

Answer: Yes. Never apply less quantity of nutrients than the crops remove. As good soil stewards, we can not deplete the nutrient levels (mine) the soil.

**Q: Why does your Company recommend greater amounts of some nutrients (more than normal) which would be foliar applied?**

A: We have learned to understand the "Language of the Plant".

- Higher levels of calcium are needed to protect the plant against disease.
- Higher levels of copper and boron are needed for the same purpose.
- A good case can also be made for zinc, manganese and molybdenum.

**Q: Would this enable us to use less expensive fungicides?**

A: Yes. Perhaps more importantly, we can control disease like Ergot, Fusarium and Kernal Bunt for which there are no effective fungicide controls.

**Q: Do you believe that it is possible to control fungi, bacteria and viruses through foliar nutrition?**

A: Yes. These controls may need assistance from plant growth hormones and polyamides. We are already field testing some products.

**Q: Why haven't companies developed these techniques before?**

A: Its simple. They do not understand the "Language of the Plants" or there is more profit in selling fungicides and bactericides. No one figured out the method of suppressing viruses.

**Q: Are there other reasons to use nutrients for foliar application?**

A: Yes. To move sugars (carbohydrates) from the leaves to the pods, grain and storage tissue of plants during periods when the plant is not inclined to do so. Normally, these nutrients are applied in combination with plant hormones and polyamides.

**Q: Why is your company successful in the introduction of these concepts?**

A: All of us are products of our training. We are taught certain concepts in the university. We hold on to the concepts. This reduces our ability to accept counter-concepts.

- In countries with higher levels of education, all new concepts must be introduced by the "educated community" that does research. Growers have been trained to listen only to the authorities ... any other sources, like our company, are not credible.
- In third world countries, growers do not have the "educated elite". They only want the problem solved. They are willing to try new concepts. We make more rapid progress in these countries.

**Q: Is it possible that you are taking advantage of these "less learned people"?**

A: They usually understand the "Language of the Plant" better than those who are educated. This is how they survive. If your product does not satisfy their problem, they will not use it again.

**Q: Are you implying that experts in developed countries can hold back new ideas from implementation?**

A: I am not implying that. I am stating that. You must realize that everyone operates in their own self interest ... no matter what they say. The survival of their career and family depends upon it.

**Q: Are you really saying that our education and training will narrow our scope and inhibit new possibilities?**

A: Yes. It is more difficult for us to "unlearn" before we can "relearn". The uneducated people do not have this problem.

**Q: You keep making statements about intelligent people who refuse to learn. Can you give me examples?**

A: Yes.

- Bacterial problems can be reduced by a high dosage of calcium in combination with other things. Yet, very expensive products are continually researched that reduce the problem, but they do not solve the problem.
- Cold storage and controlled atmosphere building are constructed to reduce post harvest problems. These problems should be controlled before harvest.
- Salty soils reduce yield and crop quality. It is credited to chloride. The problem is really sodium. This is an easy problem to solve.
- Problems of crop stress can be caused by using too much nitrogen. The problem is not nitrogen, it is *nitrate* nitrogen.
- Nitrogen is the main nutrient that controls yields. This is true, but no one has told us why. Nitrogen is an effective "miner" of other nutrients from our soil. It is not only a pollutant, but eventually it will cause us to use more potash, copper, boron and other nutrients.

**Q: How has your group discovered so many unusual concepts?**

A: We read and study research that has been done by qualified people at universities, government groups, and private groups. We add our interpretations to that of the researchers. It may differ. Our greatest advantage, however, is that we work with over 70 different crops. We understand the great similarity of plants ... not the differences. Much of the research on one crop can be transferred to other crops. This can only be done if you understand "The Language of the Plant".

**Q: Do you believe that people will become less dependent on soil testing and tissue testing?**

**A: Yes. They will be more dependent on manipulating the plant as it grows. This is not only a matter of fertility, it primarily concerns hormone balance.**

**Q: Hormone balance?**

A: Yes. Hormones determine the size, shape and yield of plants ... not fertilizer. Fertilizer may, however, effect the hormone balance.

**Q: How important do you believe that growers equate fertilizer to yield ...either soil applied or foliar applied?**

A: I ask the following question at grower meeting .. "which is the most important factor in your yields over the last ten years: Fertilizer type and amount? OR Weather? 99% vote for weather ... even those who have irrigation.

**Q: Why do they think that weather is more important?**

A: Because it is. The weather affects the hormone balance of the plant. Farmers are not very impressed with fertilizer. It's the first thing that they reduce when cost reduction is necessary. They do not reduce fungicide and insecticide ... which are weather related. They do not feel that strongly about fertilizer.

**Q: How can we make them feel more strongly about fertilizer?**

A: We can only do so, if we can use it to correct variations in the "weather effect" on their crop. It must be done in conjunction with plant growth hormones and polyamides.

**Q: What is the first step in this process?**

A: LEARN THE [LANGUAGE OF THE PLANT](#).