

Nutri-Facts

Nutri-Facts #8

Agronomic information on nutrients for crops

It's the Law — Zinc Is Required by Crops

IT'S NOT JUST a good idea that the speed of light is 186,000 miles per second — **It's the Law.** Without this law of physics it would be impossible to precision level a farm field with a laser, for example.

It's not just a good idea that crop plants require zinc (Zn) — **It's the Law.** Zinc is one of the 16 essential nutrients that plants need for growth and reproduction. Zinc is a micronutrient and is required in smaller amounts than some other nutrients, but it is essential. If Zn is limiting or in short supply, crop yields and farm profits will suffer, and crop utilization of other fertilizer nutrients, such as nitrogen (N), will decrease. Poor nutrient utilization from an imbalanced fertility program is an environmental concern...and cuts profits.

It's the Law — Zinc in Soils

Zinc deficient soils are fairly common throughout North America. They are especially common in areas of high soil pH. High pH soils are naturally occurring and pH can influence the availability of most nutrients, including Zn (**Figure 1**). In acid soils with low pHs, a Zn deficiency can be induced by heavy applications of lime. In both cases Zn compounds are formed at higher pHs

Zinc concentration in the soil can decrease 30 fold for every pH unit increase between 5.0 and 7.0 — **It's the Law.**

which are less soluble and less available to the plant.

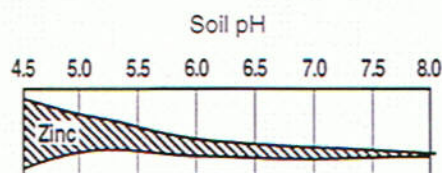


Figure 1. Effects of soil pH on zinc availability.

Plants growing on soils testing very high in phosphorus (P) and low in Zn have been noted to suffer even more from Zn deficiency. This syndrome is sometimes mistakenly considered as a P tie-up of Zn. Applying P to a soil with sufficient Zn levels will not produce a Zn deficiency.

Consultants and laboratories caution that when P soil tests are high and annual P applications are still needed for high yields, one pound of Zn should be applied for every 20 pounds of P.

Zinc deficiencies tend to occur

early in the growing season when the soils are cold and wet. This is due to slow root growth compared to rapid shoot growth. The slow growing root system is unable to take up enough Zn to supply the shoot. Plants sometimes appear to outgrow this deficiency, but the damage has already been done, and yields can still be significantly reduced.

Much of the soil's available Zn is associated with the organic matter in the topsoil. Land leveling, tiling and erosion can cause Zn deficiencies in crops by exposing subsoils low in organic matter, low in native Zn, or with a higher pH.

Here are a couple of rules of thumb you can use...sandy soils are frequently more deficient in Zn than heavier soils...high pH (alkaline) soils, regardless of texture, are more likely to be Zn deficient than low pH (acid) soils. But remember...acid soils may also be zinc deficient. Soil test to be sure you're not overlooking this important nutrient!

It's the Law — Zinc in Crops

Zinc was one of the first micronutrients recognized as essential for plants. Although it's required in small amounts...high yields are impossible without it. Some crops are more responsive to Zn than others.

Table 1. Responsiveness of crops to Zn.

Most response	Medium response	Least response
Beans	Barley	Asparagus
Corn	Potatoes	Carrots
Onions	Soybeans	Grass
Sorghum	Sudangrass	Oats
Sweet Corn	Sugarbeets	Peas
Citrus	Table beets	Rye
Rice	Tomatoes	Cabbage
Peaches	Alfalfa	Celery
Pecans	Clover	Lettuce
Flax	Cotton	Grapes
Hops		
Pine		

- Smaller leaves (little leaf)
- Shortened internodes (rosetting)
- Broad white bands on each side of the midrib in corn and grain sorghum (white bud)

Solving the Zinc Deficiency Problem

Zinc recommendations vary considerably from crop to crop. Soil tests and plant analyses are important tools for correcting and diagnosing Zn deficiencies. The best practice is to correct Zn deficiencies before or at planting.

Zinc can be soil applied as a broadcast or band application. Broadcast applications may require 10 to 20 lb of actual Zn/A, which may last for 4 to 5 years. Annual band applications may require only 3 to 4 lb/A. Rates depend on soil test levels...and on crop to be grown.

Where soil tie-up of Zn is expected under high pH or where an emergency situation exists on an established crop, Zn may be applied as a foliar spray. Foliar sprays usually require about 0.5 to 1.0 lb Zn/A. **Table 2** shows the effects of application methods of Zn on corn yields in Kentucky.

Table 2. Percentage of field trials and corn yield responses from Zn application.

Application Method (sites)	Percent of trials			
	Less than 5 bu/A	5-10 bu/A	11-15 bu/A	More than 15 bu/A
Broadcast (31)	55	6	19	20
Row (28)	29	21	29	21
Foliar (31)	26	36	6	32

Kentucky

Zinc responses can be spectacular ...and highly profitable (**Table 3**).

Table 3. Irrigated soybean responses to pre-plant Zn can be profitable.

Zn treatment, lb/A	Yield, bu/A	Leaf composition % P	Leaf composition ppm Zn	Increased return from Zn, \$/A
0	30	.260	17.9	
2	46	.165	24.9	86.00
4	50	.177	28.9	106.00

Kansas

Don't let this important nutrient limit your yields...and profits. ■

Functions and Deficiency Symptoms

Zinc is essential to many enzyme systems in plants. It controls the production of important growth regulators which affect new growth and development. One of the first indications of Zn deficiency is stunted plants resulting from a shortage of growth regulators. Symptoms of Zn deficiency may include:

- Stunted plants
- Light green areas between the veins of new leaves

For further information contact:



IPNI
INTERNATIONAL
PLANT NUTRITION
INSTITUTE

Suite 550
3500 Parkway Lane
Norcross, Georgia, U.S.A.
30092-2806
Phone: (770) 447-0335
www.ipni.net



FAR
INTO THE FUTURE
FOUNDATION FOR AGRONOMIC RESEARCH

Suite 300
107 S. State Street
Monticello, Illinois, U.S.A.
61856-1968
Phone: (217) 762-2074
www.farmresearch.com