

Beware! **High Soil Zinc Can Kill Peanuts**

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Peanuts are hypersensitive to high soil zinc (Zn) levels. Zinc levels that will kill peanuts have no affect on most crops. Sources of Zn found in soils include limestone, fertilizers, Zn-containing pesticides, burned tires, animal manure, biosolids, and some industrial byproducts, in addition to naturally occurring minerals. Once soils are contaminated with Zn, levels will remain high for a long time because annual crop removal of Zn is only between 0.10 and 0.15 pounds Zn per acre per year.

Symptoms of Zn toxicity in peanut are striking. Splitting of the stem (Fig. 1) and lesions on leaf petioles are characteristic of toxicity. Symptoms typically occur 4 to 6 weeks after emergence but may occur as early as 2 weeks after emergence. Afflicted peanut plants are yellow, severely stunted, and typically die or remain unproductive season long (Fig. 2). Zinc toxicity is worse at low soil pH. Soil Zn and pH levels at which Zn toxicity occur in peanut are listed in Table 1. Toxicities can occur with as little as 1 pound of soil test Zn per acre at a soil pH less than 5.8. Zinc levels in soils fertilized and limed according to soil test guidelines typically have 2 to 5 pounds Zn per acre, so applications of waste materials or high-Zn pesticides are not necessary to encounter problems with Zn toxicity in peanuts. Toxicities will be worse in sandy soils than clayey soils at the same soil test zinc level and soil pH.

Old peach orchards, hog lots, and fields heavily amended with poultry litter may have soil test Zn levels of 100 pounds per acre or more. Extreme levels of Zn like these will eliminate these soils for peanut production. **Soil test Zn levels above 30 pounds per acre will be difficult to manage even though theoretically maintaining the pH between 6.2 and 6.5 should alleviate the toxicity.**

The only effective method of managing high Zn soils is the diligent maintenance of soil pH in the appropriate range for the level of Zn found. Uniform mixing of the lime throughout the root zone is recommended. Tilling twice with a rotary tiller or disking in two directions provides reasonably uniform mixing. Liming to high soil pH cannot cure all Zn toxicity problems,



Fig. 1 Split peanut stems due to Zn toxicity. (Va. Tech. website)



Fig. 2 Peanuts stunted from Zinc toxicity. (N.C.S.U. website)

because raising soil pH above 6.5 in well-drained soils and above 6.2 in poorly-drained soils may result in manganese deficiencies in the peanut crop and subsequent crops such as cotton, wheat, or soybean. High levels or additions of compost, calcium, and/or phosphorus reduce Zn toxicity somewhat but are not practical means of overcoming severe toxicities.

Notice: The following table provides a guideline for the **minimum pH** requirement to avoid Zn toxicity under perfectly uniform soil conditions. However, given the risk of loss on a high value crop, the difficulty of achieving uniform pH, and the non-uniform distribution of Zn in soils, **the maximum Zn level in peanut fields should probably not exceed 30 lb/ac.**

Fields with **Zn levels of 6 - 10 lb/ac should be limed to at least 6.2 pH**; fields with **Zn levels of 11 to 20 lb/ac should be limed to at least 6.4**; and fields with **20 - 30 lb Zn/ac should be limed to 6.5.**

Fields limed to the 6.4 to 6.5 range may require a foliar application of 0.5 lb elemental manganese as MnSO₄, Tecmangam, or Man-Gro DF to prevent Mn deficiency. Do not lime to pH levels greater than 6.5.

The following steps should be taken to avoid Zn build-up in peanut rotations:

- Avoid poultry litter. Poultry litter increases soil disease problems (*Rhizoctonia limbro*) in peanuts as well as containing Zn.
- Avoid excessive Zn in corn fertility programs.
- Do not use Zn-contaminated lime sources.

Table 1. Minimum soil pH necessary to avoid Zn toxicity in peanuts at different levels of soil test Zn (Mehlich I extractant - Clemson soil test procedure). From Jessica Davis-Carter, 1993.

Soil test Zn, lb per acre	Minimum soil pH
<1	5.7
1 - 4	5.8
5 - 10	5.9
11 - 20	6.0
21 - 30	6.1
31 - 40	6.2
41 - 50	6.3
51 - 60	6.4
61 - 70	6.5