



## Trace Elements

*Rory Maguire, Professor and Extension Specialist, Virginia Tech*  
*Steve Heckendorn, Soil Testing Laboratory Manager, Virginia Tech*

### Introduction

If your Soil Test Report indicates one or more trace elements are needed. Select the appropriate sections in this note for information on the recommended trace elements and the specific rates and methods of application. Apply only those trace elements that are recommended, and only at the recommended rates!

### Zinc (Zn)

Zinc deficiency has been found on corn, small grains, and grain sorghum in Virginia. If your Soil Test Report indicates a need for zinc, select from one of the following application methods:

#### 1. Broadcast and disked-in or plowed-down.

- a. Coastal Plain soils—apply 10 to 12 pounds of elemental zinc per acre when using zinc sulfate or zinc oxide as the source, or 2 to 3 pounds of elemental zinc per acre when using the zinc chelates, such as zinc EDTA, as the source.
- b. Piedmont or Appalachian Region soils – apply 20 to 25 pounds of elemental zinc per acre when using zinc sulfate or zinc oxide as the source. Zinc chelates are not economical sources when zinc is broadcast on Piedmont or Appalachian Region soils.

Broadcast applications at the above rates will correct deficiencies for a period of 3 to 5 years. The most feasible way of broadcasting the zinc would be to have it mixed with a fertilizer that is to be spread.

2. **Seed contact placement.** Zinc can be applied in contact with the seed at planting time as part of the fertilizer application being made with a grain drill or fertilizer attachments on the planters. Use care in the rate of application of the pop-up fertilizer for corn and grain sorghum to avoid germination injury. If you use this method of application, apply 1/2 pound of elemental zinc per acre when using zinc chelates as the source, or 1 pound per acre when using zinc sulfate as the source. This method of application will not correct the deficiency in succeeding crops, and you will need to apply zinc each year these crops are planted.

#### 3. Sideband placement for corn and grain sorghum.

Zinc can be applied with the starter fertilizer at planting time. Where this method is used, apply 6 to 8 pounds of elemental zinc per acre using either zinc sulfate or zinc oxide as the source, or 1 to 2 pounds per acre when using zinc chelates as the source. This method of application will not correct the deficiency for succeeding crops, but would need to be applied each year these crops are grown.

4. **Foliar application.** Zinc can be supplied to crops through zinc-containing sprays applied directly to the leaves and stalks. If you use this method, apply 1/2 pound of elemental zinc per acre per application when using the zinc chelates as the source, or 1 pound per acre per application when using zinc sulfate or zinc oxide (micronized) as the source. Usually, the best application time for corn and grain sorghum is when plants are 6 to 8 inches high. Use enough water to wet the plants.

### Manganese (Mn)

Manganese deficiency has been found on soybeans and peanuts grown in Virginia (Note: manganese and copper deficiencies have been documented in small grains, but there are no soil-test calibrations for determining these deficiencies). If your Soil Test Report indicates a need for manganese, select from one of the following application methods:

1. **Foliar application.** Apply 3/4 to 1 pound of elemental manganese per acre in enough water to wet the entire plant. Manganese sulfate, manganese oxide (micronized), manganese chelates, and EDTA-chelates may be used as sources of manganese. If you use chelates, use the 3/4 pound rate. Repeat application (i.e., from 1 to 3 applications) if deficiency symptoms reappear. Make all applications before August 15.

Manganese can be applied with pesticides if the manganese source and the pesticide are compatible, if applying them as a mixture does not violate label restrictions on the pesticide, and if it does not violate state or federal regulations. Some manganese formulations

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reduce weed control when combined with glyphosate in Roundup-Ready soybeans. If combining manganese with glyphosate, use EDTA-chelated manganese.

- 2. Sideband placement.** You can add manganese to a starter fertilizer that is to be applied at the time the crop is planted. If you use this method, apply 8 to 10 pounds of elemental manganese per acre using manganese chelates as the source. Place starter fertilizers 2 inches below the seed level to avoid salt injury to the germinating seed.
- 3. Seed contact placement.** (*Important – for peanuts ONLY! This method of application may damage soybeans.*) Manganese can be applied in contact with the peanut seed at planting time using fertilizer attachments on the planters. Use care in the rate of application to avoid germination injury. If you use this method of application, apply 3 to 5 pounds of elemental manganese per acre using an available granular manganese fertilizer source. This method of application will only correct the deficiency in the immediate crop and you will need to apply manganese each year the peanuts are planted.
- 4. Broadcast application.** Broadcast application is not practical in a system of indirect fertilization. If manganese is to be broadcast, apply it within 2 to 3 weeks of the time the crop will be planted because of the short residual effect of broadcast applications. Apply 25 to 30 pounds of elemental manganese using manganese sulfate or manganese oxide as the source.

## Boron (B)

Boron deficiency has been found on alfalfa, apples, cotton, peanuts, and on several commercial vegetable crops grown in Virginia. The following are suggested rates and methods of boron application (for boron fertilization of apples, refer to Note #10):

- 1. Alfalfa.** Apply 2 to 4 pounds of elemental boron per acre per year with a broadcast fertilizer.
- 2. Asparagus.** Apply 2 pounds of elemental boron per acre every 3 years with a broadcast fertilizer.
- 3. Broccoli, Cauliflower, Cabbage.** Apply 2 to 3 pounds of elemental boron per acre per year with a broadcast fertilizer.
- 4. Brussels Sprouts, Collards, Muskmelons, Onions, Peas, Peppers, Tomatoes, White Potatoes.** Apply 1 to 2 pounds of elemental boron per acre per year with a broadcast fertilizer.
- 5. Cotton.** Apply 1/2 pound of elemental boron per acre per year in a compatible labeled pesticide spray or dust or as a separate foliar application.
- 6. Peanuts.** Apply 1/2 pound of elemental boron per

acre per year at the early-bloom stage in a compatible labeled pesticide spray or dust or as a separate foliar application.

## Molybdenum (Mo)

Molybdenum deficiency has been found on alfalfa, soybeans, and on certain commercial vegetable crops grown in Virginia. If your Soil Test Report indicates a need for molybdenum, the following are suggested rates and methods of application for the particular crop to be grown:

- 1. Alfalfa.** Molybdenum may be applied as a foliar spray at the rate of 1/2 pound of elemental molybdenum per acre or as a seed treatment at the rate of 1 ounce of elemental molybdenum per acre. *Important – molybdenum is toxic to livestock!* Do not graze forage until after a soaking rain if molybdenum is sprayed on forage.
- 2. Broccoli, Cauliflower.** Apply 1/4 pound of elemental molybdenum per acre with a broadcast fertilizer.
- 3. Soybeans.** Molybdenum may be applied as a foliar spray at the rate of 1/2 pound of elemental molybdenum per acre or as a seed treatment at the rate of 1 ounce of elemental molybdenum per acre. Molybdenum as a seed treatment should not be combined with an inoculant, as it can be toxic to rhizobia bacteria.

## Additional Information

For more information, contact your local Virginia Cooperative Extension office or see <http://www.ext.vt.edu>.