12-1981

Molybdenum Nutrition of Crops in Kentucky

J. L. Sims

University of Kentucky

Right click to open a feedback form in a new tab to let us know how this document benefits you.

Follow this and additional works at: https://uknowledge.uky.edu/pss_views

Part of the Soil Science Commons

Repository Citation
https://uknowledge.uky.edu/pss_views/107

This Report is brought to you for free and open access by the Plant and Soil Sciences at UKnowledge. It has been accepted for inclusion in Soil Science News and Views by an authorized administrator of UKnowledge. For more information, please contact UKnowledge@lsv.uky.edu.
Molybdenum (Mo) is one of eight micronutrient elements required for the growth of plants. Research conducted in California nearly 40 years ago established its need for plant growth. Mo deficiencies have been reported throughout the world, especially on acid soils in the United States, Australia, and New Zealand. Generally, the Mo requirement of leguminous crops is greater than for non-legumes, but many non-leguminous field and vegetable crops have responded to additions of fertilizer Mo under severe deficiency conditions. Of all the nutrient elements required by plants for growth, Mo is needed in smallest amounts.

Role of Molybdenum in Plants

Mo is essential for nitrogen fixation by bacteria in the nodules on the roots of legumes. It is also essential for the process of nitrate reduction in all crops. Since non-leguminous crops absorb most of their nitrogen in the nitrate form, it must be changed chemically within the plants to the amino form which is the form found in protein. This process is called nitrate reduction and is necessary for the growth of plants.

Soil Content of Molybdenum

The total Mo content of soil is extremely low, generally on the order of 4 or 5 lbs. per acre. Only a small portion of the total, less than 5%, is available for uptake by plants. Most soils in Kentucky appear to be on the borderline of sufficiency, and when amounts of available Mo are decreased through increased soil acidity, double cropping, or high yields, then deficiencies may appear. The availability of soil Mo to plants is closely related to soil pH and generally increases as pH increases. In most soils and for most crops, deficiencies of the element do not occur when soils are properly limed to pH 6.2 or above.

Plant Needs for Molybdenum

Plants vary widely in their requirements for Mo and in their ability to extract Mo from soils. Sufficient Mo levels in plants have been reported at tissue concentrations as low as 0.3 parts per million to as high as 1.6 ppm for leguminous crops. Generally,
for non-leguminous crops, sufficiency levels have ranged from 0.1 to 0.5 ppm. The minimum level of plant Mo necessary for maximum yields of burley tobacco is about 0.4 ppm. Levels of Mo toxic to plants generally have been reported to be greater than 200 ppm in plant tissue; however, forages containing greater than 10 ppm may be toxic to livestock feeding on them.

Use of Molybdenum in Kentucky

Currently Mo fertilizer response has been noted for only three crops grown in Kentucky. These are burley tobacco, soybeans, and alfalfa. The over-riding factor influencing the availability of Mo to tobacco is fertilizer-induced soil acidity. Growers in Kentucky are applying an average of 2200 pounds per acre of mixed fertilizer and an additional 250 pounds of nitrogen. This leads to the generation of enough soil acids that soil pH at midseason is often 0.6 to 1.0 pH unit below that prior to N-P-K fertilization. Such increased acidity greatly lowers the availability of Mo to tobacco plants. Thus, growers need to lime tobacco soils to pH 6.4 to 6.6 in order that soil pH remains above 5.5 throughout the growing season. When soil pH decreases below 5.5 one can expect lower availability of both soil and fertilizer Mo as well as phosphorus, magnesium, and calcium. In addition, solubility of soil manganese and aluminum is often increased below soil pH values of 5.5 and 5.0, respectively, and these elements often are toxic to plants.

The advantages noted when Mo was used on soils that needed it include (a) improved early growth, (b) less manganese toxicity, (3) increased cured leaf yields, and (d) small increases in dollars per cwt. The most meaningful advantage to the grower is increased cured leaf yield.

Mo is also required for nitrogen fixation in soybeans and other forage legumes such as alfalfa, red clover, etc. If the root zone does not contain enough available Mo, nodulation and nitrogen fixation are decreased. Research has shown that number of nodules, nodule weight, relative nitrogen fixing activity, seed nitrogen content, and seed yields of soybeans were all increased by use of Mo.

When Mo application is recommended, it may be applied satisfactorily to soybeans by either soil or seed applications. However, seed treatment with 1 or 2 ounces of sodium molybdate (0.4 to 0.8 ounces of elemental Mo) per acre is the easiest and perhaps the most satisfactory method where no seed inoculant is needed.

For further recommendations on applying Mo to tobacco, soybeans, and new seedlings of forage legumes, see AGR-1 Publication of the Agronomy Department, University of Kentucky, Lexington, or contact your County Extension Agent.