

Molybdenum in Ag Production

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Molybdenum (moly) is required in small quantities by plants to produce proteins. All plants need moly.

Since there is no accepted soil test for moly, **plant tissue samples are used to identify low levels and deficiencies in crops.**

Plants with low moly levels have fewer pods, fewer bolls, smaller grain heads and are usually shorter or much taller than “normal.” Plants with deficient molybdenum levels also have poor nitrogen efficiency. They may be lacking in quality characteristics such as low falling numbers (wheat) or low test weight (soybeans).

Low moly crops usually have both increased disease and insect pressure, requiring more insecticide or fungicide applications.

Molybdenum is more available at soil pH 6.4 or higher, acid soils will reduce the amount of soil moly available to all plants.

Critical functions of moly:

- * The most widely discussed role of moly in plant nutrition is its role in nitrate reductase activity, the process of nitrate conversion to ammonium,
- * Legume *Rhizobia* bacteria require moly for N fixation (taking nitrogen out of the air and providing to the plant)
- * Moly applications with fungicides increased disease suppression, increased leaf photosynthesis and yields
- * Moly is essential in it's role of iron absorption and translocation (iron is key to plant disease resistance and fruit retention)
- * Low plant moly levels increase plant nitrate (not ammonium) levels leading to pod loss, boll shed and increased disease pressure from leaf spot in cotton and soybeans
- * Soil applications of moly has a suppressive effect on pathogenic **nematodes**
- * Moly increases spout resistance in wheat: in 2017, applying Moly16 with iron increased wheat test weight by three lbs. /bu. and improved falling number scores by 50 points.
- * Moly is linked with more efficient utilization of potassium and phosphorous inside the plant. With high fertilizer prices, it is critical to increase these nutrient efficiencies.



Above: cotton on left sprayed with moly, iron and boron compared to boron alone (right). Adding moly and iron reduced cotton target spot severity by 50% and produced over 200 lbs. /acre more cotton lint.

Below: Moly deficiency in wheat. Maintaining sufficient moly levels in wheat prior to flag-leaf emergence will contribute to an extended (up to two weeks) dormancy period after wheat is mature.

Extending the dormancy period reduces risks of low falling numbers and low test weight scores.

(wheat photo courtesy of IPNI)



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* In a five-year study, NCSU found a 3.2 bu./acre yield increase in soybeans when a foliar application of .08 ozs. /acre of moly was applied to soybeans at R2 but got NO response when applied at .032 ozs./acre. The amount applied makes a difference.

* In ag.systems' plots, foliar applications of moly increased soybeans yields by eight bu./acre when applied twice, the first at early flowering.

Moly levels are difficult to build in soils. Water soluble Moly (which is the form heartily absorbed by all plants) leaches, so it needs to be "spoon-fed" throughout the course of the crop cycle. Moly levels need to be around 3 ppm in leaf plant tissue samples for most crops.

Correcting Moly Deficiencies

The best way to correct moly deficiencies is to apply Sodium Molybdate Solution (16% molybdenum) in preplant soil applications and in-season post-emergence .

Post-emergence applications with iron as iron sulfate will improve performance of moly and iron. Though tissue sampling is highly recommended, here are some rules of thumb:

Soybeans: Apply 4–6 ozs. /acre of Moly16 with burndown or early post-emergence chemicals. At early flowering, apply .5-1.0 ozs. /acre of Moly16 with fungicide. Apply a 2nd application of Moly16 with fungicide three weeks later. Use 2 ozs./acre if only one application is to be made. In 2020 ag.systems plots, adding 2.0 ozs./acre as a foliar produced 6.5 bu./acre more soybeans. Early is always better than late.

Cotton: Apply 3-6 ozs. /acre of Moly16 burndown or post-emergence chemicals. At early flowering, apply 1.0 ozs. /acre of Moly16. Apply a 2nd application of Moly16 between 2-3 weeks later. Keep to lower rates of nitrogen fertilizer to reduce losses from square/boll shed, target spot and boll lock.

Wheat and Barley: apply 3-6 ozs. of Moly16 in fall with burndown or early weed control. Apply 1 oz. /acre of Moly16 with spring top-dress and again with the last fungicide application.

Corn: apply 3-6 ozs. of Moly16 with spring burndown or early weed control. Apply 2 ozs. /acre of Moly16 with sidedress nitrogen or a late fungicide application.

Vegetables: Apply 4 ozs. /acre of Moly16 prior to planting or setting. Start leaf sampling when first flower is in bud. Apply as necessary either through the drip irrigation or as a foliar with iron and manganese.



Molybdenum deficiency in soybeans (top), barley (middle) and watermelons (bottom)