

Yellow crops more common right now due to heavy rains (6 June, 2013)

Portions of Montana have received heavy rains in the last several weeks (Fig. 1). Yellow and light green leaves on crops in the wetter, cooler areas are likely due to nitrogen (N) and possibly sulfur (S) deficiency.

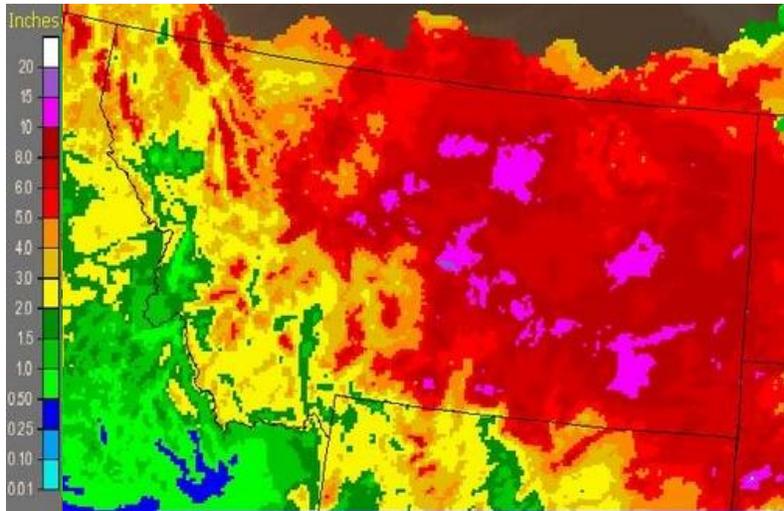


Figure 1. May 6 to June 5, 2013, precipitation in Montana. Provided by the U.S. National Weather Service.

In cereals, N deficiency commonly shows as uniform yellow discoloration from the leaf tip backward in the form of a 'V', appearing in older leaves first (Fig.2). Even legumes may be N deficient if they are too young or their roots too wet to be fixing their own N or taking up sufficient soil N. Sulfur deficiency also causes uniform yellowing, but shows up on upper, younger leaves first (Fig. 3). In contrast, yellowing due to disease, and some nutrients other than N and S, is usually non-uniform, striped or spotty.

In cool wet conditions N deficiency may be caused by leaching, runoff, loss of N to the atmosphere, or decreased uptake by the crop due to poor root growth. If loss to the atmosphere or runoff is likely, then the N has left the field and will likely need to be re-applied. Loss to the atmosphere of N- gas (N_2) or nitrous oxide (N_2O) is more likely in warm conditions and wetter areas of the field with relatively high organic matter. Loss as ammonium gas (NH_3 ; volatilization) is less likely during wet periods because rain helps push urea to depths where it can't escape to the atmosphere.

To determine if N has been lost from the field, test the soil for nitrate and ammonium to at least 3 feet if possible. Ammonium can be omitted if N fertilizer was applied at least a month ago because it will likely have converted to nitrate by now. If the soil test indicates a major loss of N has occurred, re-apply fertilizer N taking into account changes in yield potential.



Fig. 2. N deficiency in barley. Top leaves are N deficient, bottom leaf is normal.



Fig. 3. S deficient field pea plants.

If the N deficiency is due to leaching below the reach of young roots or poor uptake because of water saturated soils, then patience is likely the best approach, but yields could be lost by being too patient. If the weather warms and dries soon, then root growth will improve and plants will get their necessary N. If the N is leached only a few inches below the young roots, then it is not out of reach for long. Nitrogen leached lower in the root zone is not necessarily a total loss. If the roots reach that source near the time of flowering, the N boost can increase grain protein. However, in coarse or shallow soils, leached N may be beyond the depth of even mature roots.

A rescue treatment for N is to apply 10 to 20 units of N as 28% or 32% urea ammonium nitrate solutions (3 to 6 gallons per acre). Solutions can be sprayed on with a weed sprayer, or if the ground is too wet, they can be flown on. A rescue treatment for S is to apply 3 to 5 units of S as granular ammonium sulfate (21-0-0-24) or spray on a liquid S formulation. With all foliar applications be aware of potential leaf burn. The risk of burn increases when herbicides, fungicides, surfactants, or S are included in a mix with N.

If you consistently see S deficiencies (most common on irrigated, coarse textured soils), adding elemental S in the fall prior to the growing season could help. Elemental S slowly becomes available to plants and should not leach. A single application may provide S over 2 to 3 years.

Ammonium based products contain N that is immediately available unlike urea. Treatment with urea ammonium nitrate or ammonium sulfate should help in all cases except if N deficiency is due to poor root growth in saturated soils. Both should help the crop green-up and encourage faster root growth to 'catch up' to N that has moved out of reach of shallow young roots. Only about 10% of foliar applied N is taken up directly by the leaf, which is likely not enough to correct a major N deficiency.

For more information see the Montana State University Extension bulletin "*Practices to Increase Wheat Grain Protein*", a recent presentation by Jones on timing of foliar application as well as a 2011 presentation on mid-season nutrient catch up, and press releases on all these topics. Nutrient deficiency symptoms are described in Nutrient Management Module No. 9. All of these are available on Jones' website <http://landresources.montana.edu/soilfertility>. If you have questions, call or email: Clain Jones, Extension Soil Fertility Specialist, clainj@montana.edu, 406-994-6076.