Heavy rains can strip away mobile soil nutrients

June 18 2013

(Phys.org) —Heavy spring rains in portions of the state have probably increased yield potentials but may also be increasing nutrient losses of nitrogen, sulfur and chloride. In addition, water-logged soils and cool temperatures increase disease potential and decrease plant nutrient uptake due to poor root growth.

"To prevent yield losses and low protein, fertilizer can be added now, but only after verifying that the crop is nutrient deficient," said Clain Jones, Extension soil fertility specialist in the Department of Land Resources and Environmental Sciences at Montana State University.

Visual identification of deficiencies can be seen in a variety of ways. Nitrogen deficiency commonly shows as uniform yellow discoloration from the leaf tip backward, appearing in older leaves first. Even legumes may be nitrogen deficient if they are unable to fix their own nitrogen or take up sufficient nitrogen. Sulfur deficiency also causes uniform yellowing, but shows up on upper, younger leaves first. In contrast, yellowing due to disease or lack of other nutrients is usually non-uniform, striped or spotty. For example, chloride, which can also leach, shows up as spots on certain varieties of wheat.

To determine if nitrogen has been lost from a field, test the soil for available ammonium and nitrate to at least three feet deep, if possible. Jones said ammonium testing can be omitted if urea fertilizer was applied at least a month ago because it will likely have converted to nitrate by now. If the soil test indicates insufficient nitrogen, re-apply

nitrogen fertilizer, taking into account changes in yield potential.

If nitrogen deficiency is due to leaching below the reach of young roots or poor uptake because of water-saturated soils, then patience may be the best approach, "but yields could also be lost by being too patient," noted Jones.

If nitrogen leaches only a few inches below the young roots, then the roots will soon reach the necessary nitrogen if they are healthy. Nitrogen leached lower in the root zone is not necessarily a total loss. If the roots reach deep nitrogen sources near the time of flowering, the nitrogen boost can increase grain protein. However, in coarse or shallow soils, leached nitrogen may be beyond the depth of even mature roots.

A rescue treatment for nitrogen is to apply 10 to 20 units of nitrogen as 28 or 32 percent urea ammonium nitrate solutions (three to six gallons per acre). Ammonium-based products contain nitrogen that is immediately available, unlike urea.

Jones said treatment with urea ammonium nitrate or ammonium sulfate should help in all cases, except if nitrogen 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 nitrogen that has moved out of reach of shallow, young roots.

Sulfur deficiency can limit grain yields and protein because it is necessary for efficient nitrogen use. Soil testing is not reliable to determine sulfur sufficiency. Visual symptoms along with soil type and location in the landscape can help determine plant sulfur deficiency. Loam or more coarse-textured soils, especially on eroded ridgetops, are more susceptible to sulfur deficiency, particularly after high rainfall. Rescue treatment for sulfur is to apply three to five units of sulfur as granular ammonium sulfate (21-0-0-24) or as a liquid sulfur formulation.

If a crop is uniformly yellow from bottom to top, then it is hard to distinguish whether nitrogen or sulfur is lacking. In this case, Jones suggested producers apply ammonium sulfate which provides both nutrients.

Chloride is a mobile nutrient that advances plant maturity and improves overall disease resistance. With recent rains, it has likely leached out of the shallow root zone, especially of spring crops. If soil tests below 30 pounds chloride per acre in the top two feet or plant chloride levels in wheat at the boot stage are less than 0.12 percent chloride, then a yield response to chloride is likely.

A rescue treatment for chloride deficiency is approximately five pounds of chloride per acre as liquid or granular potassium chloride (potash; 0-0-60). This may accelerate kernel development rates and increase yield. Surface broadcast potash is ideally incorporated with irrigation or rain after application.

Yield response to chloride can occur over a wide range of environments and crop yield potentials. A large percentage of in-season applied chloride may be available to subsequent crops, especially under dryland conditions, because little is removed by the crop and leaching is generally infrequent.

Solutions can be sprayed on with a weed sprayer; however, yield loss from ground equipment can be one to three percent - with more damage on very wet fields. Consider aerial application if feasible.

With all foliar applications be aware of potential leaf burn. Streamer bars minimize burn especially if more than 25 pounds nitrogen per acre is applied. Jones cautioned that the risk of burn increases when herbicides, fungicides, surfactants, or sulfur are included in a mix with nitrogen. In these cases, don't exceed 15 pounds of nitrogen per acre if

applied with a flat fan.

Broadcast applications are best followed by half-inch of irrigation or rainfall within a couple of days to minimize nitrogen loss as ammonia gas, and to force nitrogen into the root zone. This is also true for foliar applications because only a small portion is absorbed through the leaf. The rest needs to be washed off and into the soil to be taken up by roots.

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; a 2011 presentation on mid-season nutrient catch-up; and related press releases. Nutrient deficiency symptoms are described in Nutrient Management Module No. 9.

All resources are available on Jones' website landresources.montana.edu/soilfertility.

Provided by Montana State University