Soil micronutrient deficiencies can affect hay quality

Forages are a significant component of ruminant livestock rations, but crude protein, fiber, digestibility and mineral content affect animal performance often requiring supplementation that leads to increased feed costs. These nutritive value components are often affected by the availability of minerals from the soil.

Mineral nutrients are categorized by how much is needed for plant growth. Nitrogen, phosphorus, potassium, calcium and magnesium are called macronutrients because they are needed from the soil by plants in greater amounts than iron, copper, zinc, sulfur and several others, which are called micronutrients. The availability of many nutrients in the soil is often affected by pH – the level of soil acidity (low pH) or alkalinity (high pH).

Cowpea and other annual forages, like sorghum forages, often exhibit micronutrient deficiencies in some of the high pH, high calcium, low phosphorus soils that are widespread in the southwestern USA. These deficiencies are often readily noticeable because they cause a yellowing of leaves and stunted growth. The degree of color change has been associated with reduced seed yield of edible dry beans, like black-eyed peas, which is a grain type of cowpea. Fields often have several different soil types and, for higher value crops, like corn and soybeans, precision agricultural technology has been developed using grid soil sampling and grain yield measurements to adjust fertilizer applications throughout the field to overcome nutrient deficiencies.

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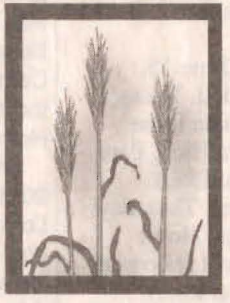

Supplementing the soil in this way to overcome non-uniform deficiencies for forage crops has not been feasible in the past due to the lower value of the crop; however, micronutrient deficiency symptoms may be a useful visual indicator of the nutritive value of cowpea and sorghum forage that can be used as a marketing tool.

An unirrigated study was conducted in 2008 and 2009 at New Mexico State University's Agricultural Science Center at Tucumcari in a field that included three soil types on which 'Iron and Clay' forage cowpea exhibited different levels of micronutrient deficiency. Soil sampling showed that while the soils had the same pH, calcium, phosphorus and zinc content, one of them had more plant available copper and all three were different for potassium and iron, all of which are necessary for plant growth. The same soil type, "good soil," had the highest potassium, iron, and copper. Cowpea forage grown on the three soil types also was analyzed to see if there were differences in forage nutritive value.

There were no differences among soil types for cowpea forage crude protein or fiber variables, except neutral detergent fiber digestibility such that cowpea forage grown in the good soil had higher fiber digestibility than cowpea forage grown in the other soils. The good soil also had a lower forage calcium concentration than the others and higher phosphorus content. The ratio of calcium to phosphorus in livestock diets needs to be between 2-to-1 and 1-to-1.

Consequently, the difference in that ratio of the cowpea forage grown on the various soils in this study would require different levels of phosphorus supplementation leading to increased costs for some rations. The difference in fiber digestibility due to soil type also may impact the relative forage quality and, consequently, the sale value of the forage. Whenever producers note color differences in standing cowpea or other forage, hay should be baled and stacked as separate lots, if possible. Nutritive value analysis by hay lot could then be used for least cost ration balancing or for marketing to maximize net returns from the field.

For more information about soil fertility for forage crops or hay sampling and quality analysis, contact your county Cooperative Extension Service office or visit the NMSU Cooperative Extension Service publications website at aces.nmsu.edu/pubs.

Leonard Lauriault and Mark Marsalis are forage agronomists at New Mexico State University's Agricultural Science Centers at Tucumcari and Clovis, respectively. Contact Lauriault at 461-1620 or lmlaur@nmsu.edu and Marsalis at 985-2292 marsalis@ad.nmsu.edu