Management Practices to Reduce Fertilizer Requirements for Celery in the Everglades Agricultural Area

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Celery is an important winter crop for south Florida growers, with approximately 2000 acres in production annually. Celery is grown from September through April on the muck soils of the Everglades Agricultural Area (EAA), which are rich in nitrogen but often low in essential phosphorus and potassium, as well as micronutrients. Thus, supplemental fertilization is essential for optimum production. Current IFAS recommended fertilizer rates range up to 260 lbs P/acre and 300 lbs K/acre, which maintains plant-available phosphorus and potassium at the desired levels of 20 lb P/acre and 200 lb K/ac. Nitrogen fertilizers are seldom applied because soil oxidation generally supplies celery’s requirements.
Current IFAS recommendations call for broadcasting dry fertilizer across fields because the extensive rooting system of celery is efficient at taking up available nutrients. Due to the long-term drainage of muck soils and subsequent oxidation and decreases with depth to bedrock, soil conditions have changed since current fertilizer recommendations were developed several decades ago. The primary results of changing soil conditions are decreases in nutrient availability, particularly phosphorus, to crops. Of primary concern are soil pH increases resulting from incorporation of bedrock limestone into surface soil by tillage, and by evapotranspiration, which deposits salts on the soil surface. The accumulated effect is that pH has increased to above 7.0 at many sites in the EAA at the same time calcium carbonate concentrations are increasing. Issues associated with high soil pH and calcium carbonate levels
include greater retention of phosphorus into forms that are not available to plants. Since phosphorus availability to plants is highest at a pH of approximately 6.0, and as availability decreases as pH increases, current IFAS recommendations may underestimate phosphorus requirements for celery. Thus, the current fertilizer rates and application methods may not be suitable for the changing soil conditions of the EAA. In light of current and future projected increases in fertilizer costs, it is necessary to focus on optimizing fertilizer-use efficiency to minimize input costs while maintaining yields. This also has the ancillary benefit of reducing potential adverse environmental effects associated with runoff of phosphorus and other nutrients from agricultural fields into drainage ditches and canals, and ultimately into Everglades wetlands.

New strategies are being developed to assist growers in optimizing nutrient management plans which supply enough nutrients to meet the demands of celery but which do not result in over-application. Updated fertilizer recommendations are being developed to determine if increases in phosphorus fertilizer requirements are necessary for maintaining optimal celery yields. In tandem with fertilization rates studies, different application methods hold promise for potentially reducing field fertilizer requirements, even in light of changing soil conditions.

One method to potentially reduce field phosphorus fertilization is seedling foliar fertilization at the pre-transplant stage. Seedlings established in flats are treated with overhead irrigation containing small quantities of fertilizer with the goal of enhancing nutrient uptake by seedlings and increasing nutrient accumulation in the rootball. The potential beneficial effects of seedling fertilization are that accumulated nutrients may carry over into the field and decrease field P requirements. However, several years of studies have shown that although seedling
fertilization significantly increases seedling growth and vigor, it does not appear to reduce field phosphorus requirements.

In contrast, the changing of fertilizer application methods in the field has shown promise in reducing input costs and fertilizer requirements while maintaining yields. Banding of fertilizers in narrow strips adjacent to rows has shown a marked improvement compared to broadcasting. Whereas broadcasting resulted in fertilizer placement across the entire field, banding placed fertilizer within a few inches of the transplanted celery. For the past two years, banding of phosphorus at one-half of the broadcasted rate produced an equivalent yield of celery grown under the current IFAS recommended broadcasted rate. So the emerging data suggest that P fertilizer requirements for celery may be cut in half with adoption of banded application methods.