

## Cabbage

The level of nitrogen fertility has more influence on the growth and yield of cabbage than any other single plant nutrient because it is the nutrient most often deficient in Arizona soils. With good management, a total of about 175 to 225 lbs. N per acre is usually needed for optimum production. Preplant soil analysis and leaf midrib analysis during the season can be very useful in monitoring the nitrogen status of the crop. Deficiencies of nitrogen at any time in the season are to be avoided, as yields will usually be reduced. Deficiencies after the initiation of head formation, called “folding,” are especially serious, as nitrogen applications after this stage may not completely correct the problem.

Fertilizer recommendations in this guide apply to all regular cabbage varieties grown for either fresh market or processing, and are based on a plant population of 25,000 to 30,000 plants per acre and a yield potential of 35 to 40 tons per acre. Rates may need to be adjusted for significantly different plant populations or yield goals. Somewhat different fertilizer rates may be needed for other varieties, such as Chinese cabbage and red cabbage.

### • Early season nitrogen

Preplant applications of 40 to 60 lbs. N per acre on fine-textured soils (clay loams and silty clay loams) and 0 to 40 lbs. N per acre on coarse-textured soils (sands and sandy loams) are generally required. Preplant applications of nitrogen on very sandy soils are usually inefficient because nitrogen is easily leached below the root zone of young plants. Use the lower rates if there is a high residual nitrogen level in the plow layer of soil (i.e. above 15 ppm  $\text{NO}_3\text{-N}$ ). About one-half of the total nitrogen applied to the crop should be applied during the first five to seven weeks after stand establishment.

### • Mid-season nitrogen

At the four- to six-leaf stage of growth (45 to 50 days after seeding), collection of leaf midrib samples for nitrate ( $\text{NO}_3\text{-N}$ ) analysis should begin. The thick midrib from the center of the youngest full-sized leaves should be separated from the leaf blade (Figure 28). Do not sample midribs from diseased, damaged or unrepresentative leaves. On older plants, sample midribs from the youngest full-



Figure 28. Begin sampling cabbage midribs at the 4- to 6-leaf stage. Collect the midribs from the youngest full-sized leaves as indicated above.

sized wrapper leaves. These are typically the “easiest” to sample. About 25 to 50 midribs per sample are adequate for analysis, depending upon the size of the leaves at the time of collection. The number of samples tested from each field depends on the uniformity of the field. Samples should be collected from uniform areas representing portions of a field that can be fertilized separately. Samples should be taken at one- to two-week intervals through heading. Samples should be placed in a paper bag and dried at about 150°F (65°C) or refrigerated as soon as possible and submitted to a laboratory for  $\text{NO}_3\text{-N}$  analysis.

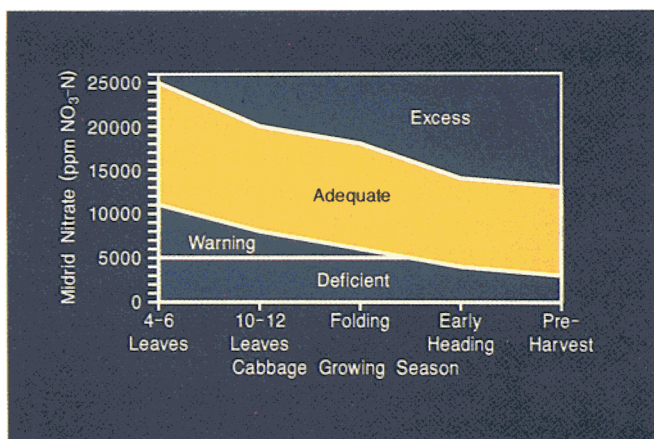
### • Interpretation of midrib nitrate levels

The midrib nitrogen level is normally high (with adequate soil fertility) early in the season during vegetative growth and declines as the season progresses. Desirable levels of nitrate-N are shown in Table 30 and Figure 29.

A timely application of nitrogen fertilizer can prevent or slow the decline of midrib nitrate. If the nitrate-N level is below 5,000 ppm prior to the “folding” stage, then application of a nitrate or urea source is recommended. These forms of N move readily in soil solution and are immediately available to the plant roots with the first irrigation after the fertilizer has been applied. This decreases the time necessary for recovery from a nitrogen deficiency. At higher levels of midrib nitrogen, the nitrogen source is of less importance because nitrification of

**Table 30.**  
Desirable levels of nitrate-nitrogen in cabbage midribs at various stages of growth.

| Stage of Cabbage Growth | Approximate Days After Planting | Desirable Levels of Midrib NO <sub>3</sub> -N |
|-------------------------|---------------------------------|---|
|                         |                                 | ppm   |
| 4 to 6 Leaves           | 45 - 50                         | 11,000  |
| 10 to 12 Leaves         | 60 - 65                         | 8,000   |
| Folding                 | 75 - 80                         | 6,000   |
| Early Heading           | 90 - 95                         | 4,000   |
| Pre-harvest             | 100 - 105                       | 3,000   |



**Figure 29.**  
Interpretation of nitrate-nitrogen in cabbage midribs at different stages of growth.

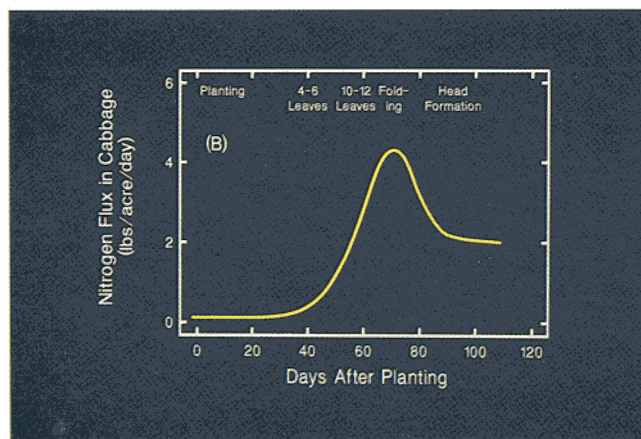
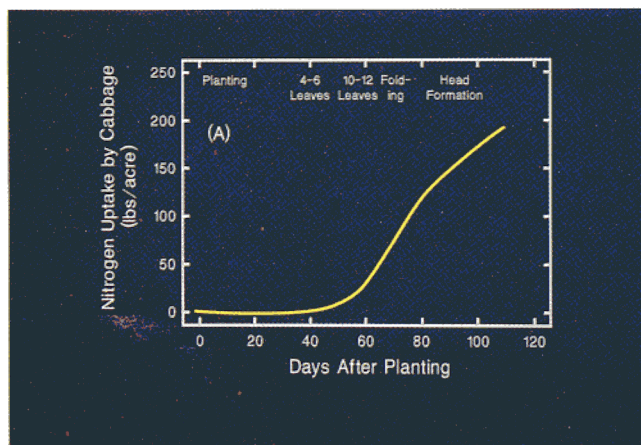
ammonium (NH<sub>4</sub>) sources can take place rapidly enough to permit the resulting NO<sub>3</sub> to be moved into the root zone to supply the needs of the plants. Caution should be used when applying ammonium sources of nitrogen such as anhydrous or aqua ammonia in order to avoid plant injury from ammonia toxicity, especially on very sandy soils.

- **Nutrient removal**

A harvest of 20 tons of cabbage heads per acre will contain about 185 lbs. N. The entire crop will contain about 220 lbs. N per acre.

- **Nitrogen uptake patterns**

Nitrogen uptake is very low prior to the 10 to 12 leaf stage. By the folding stage, nitrogen flux increases to a maximum of almost 6 lbs. per acre per day. Then because cabbage is harvested before the crop enters reproductive growth, nitrogen uptake remains moderately high until harvest time.



**Figure 30.**  
Cumulative seasonal nitrogen uptake (A) and daily nitrogen flux (B) patterns for Moran Hybrid cabbage at a yield level of 35 tons per acre.