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Revising the Fertilizer Strategy for Ornamental Cabbage

Devote some needed attention to fertilization of your ornamental cabbage and kale crops, and they won't have to suffer because of poinsettia growing demands and pansy shipments.

By James L. Gibson and Brian E. Whipker

The production requirements of ornamental cabbage and kale can easily be forgotten in the fall because care of the two other major crops, pansies and poinsettias, may take precedence. Production of pansies, poinsettias and ornamental cabbage and kale involves different fertilizer and plant growth regulator types and concentrations, as well as different consideration for outdoor vs. indoor production. Without a commitment to a strong management plan, growers can experience a multitude of production problems.

REALITY CHECK

Chaos begins as the pansy shipping season shifts into high gear. Pulling pansy orders along with maintaining daily poinsettia cultural requirements can be overwhelming, resulting in the ornamental cabbage and kale crop falling by the wayside. On the outdoor pad, clear water is applied to the flowering pansy crop because nutrient requirements decrease with the onset of flowering. Unfortunately, clear water may also be applied to the ornamental cabbage and kale crop, and consequently, nutrients are leached from the substrate. When temperatures drop to less than 55° F, tissue coloration in ornamental cabbage and kale intensifies, but nutrient deficiencies and lower leaf loss can be observed. This can place the entire crop in jeopardy, with the visual quality of the crop rapidly declining.

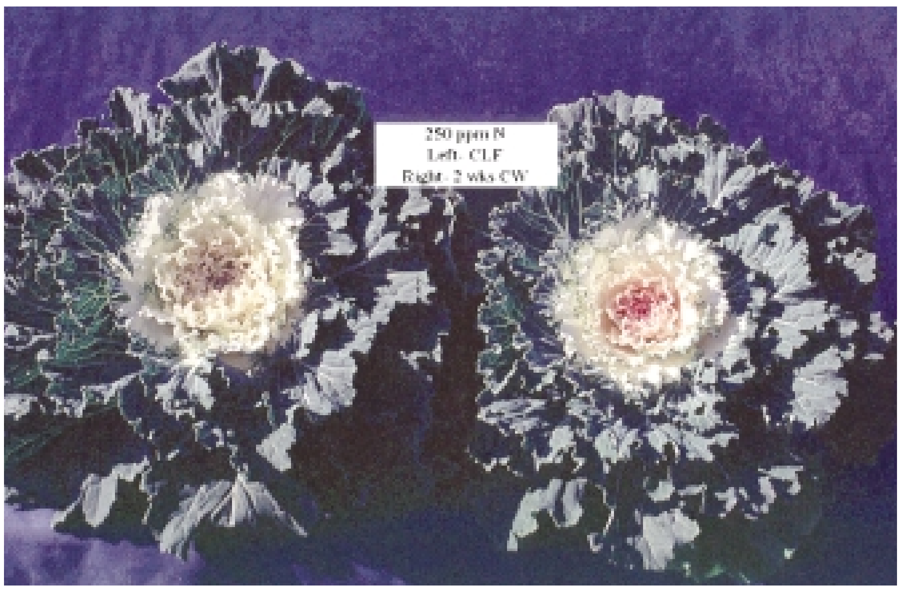
How can growers avoid production problems with minimum effort, achieve pansy shipping success and grow a quality poinsettia crop at the same time? North Carolina State University floriculture researchers have developed a new fertilization strategy for maintaining ornamental cabbage and kale plant quality that allows the grower to achieve good quality on these three crops simultaneously.

FERTILIZATION RESEARCH

Research on the effects of fertilization and discontinuing fertilization at coloration on ornamental cabbage was conducted at NC State University. Earlier recommendations suggested discontinuing fertilization upon coloration of the upper-central leaves and that applying excessive fertilization inhibits coloration. Coloration would occur, but lower leaf chlorosis would also quickly develop.

In 1999, the ornamental cabbage cultivar 'Osaka White' was fertilized with concentrations of nitrogen at 100, 150, 200 or 250 ppm on a continual basis until visible color was observed in the upper-central leaves. Plants were taller when fertilized at 200 or 250 ppm nitrogen than at 100 or 150 ppm, and fertilizing at 100 ppm produced stunted plants that expressed nitrogen deficiency symptoms (foliage upper-surface yellowing and under-surface purpling). Plant diameters were smaller with plants fertilized at 100 and 150 ppm nitrogen. Fertilizing at 150 ppm may be a more

Growers that induce coloration through clear water irrigation also induce nutrient deficiencies. (All photos courtesy of NC State University.)



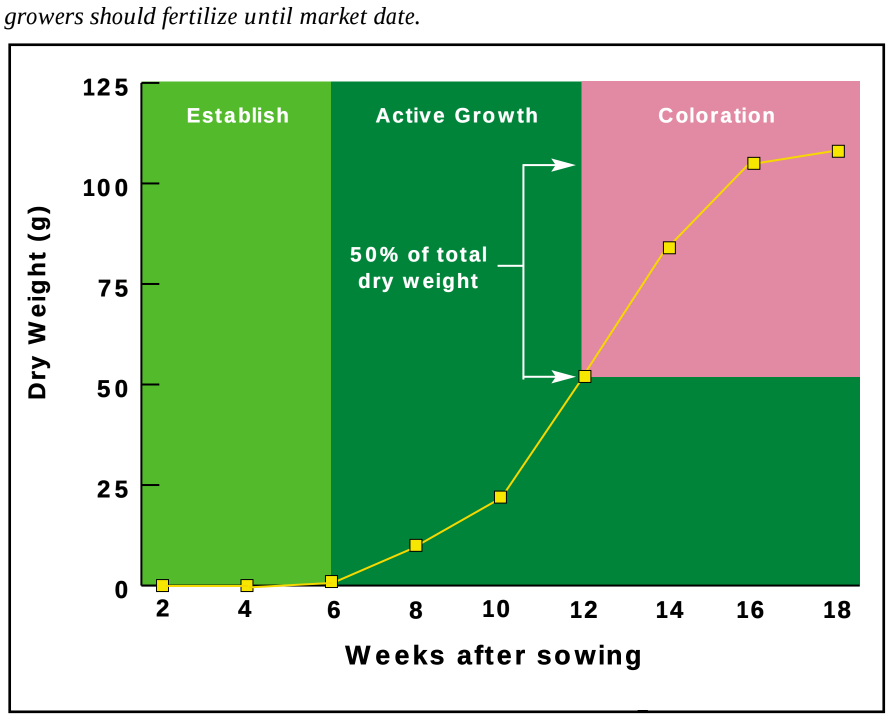
Above left: Research showed no difference between color diameters of fertilized plants (l) and plants that were subjected to clear water irrigation (r). Right: The IBDU rate used in the study, along with clear water irrigation, was not effective in maintaining an adequate EC value and preventing nutrient deficiencies.

appropriate concentration for wholesale growers that want to ship fuller plants. Color diameter of the upper-central leaves was not affected by nitrogen concentrations as high as 250 ppm for the cultivar Osaka White.

Within this study, a subgroup of Osaka White plants were subjected to clear water at visible color. Tissue nutrient concentrations, plant height and diameter, and color diameter were compared with the plants fertilized on a continual basis over a 6-week period. No differences in plant height, diameter or color diameter were observed for plants fertilized on a continual basis when compared to plants irrigated with clear water for two weeks. According to these results, continued fertilization of ornamental cabbage and kale was not detrimental to color development; however, discontinuing fertilization had detrimental consequences. Tissue nitrogen, phosphorus, potassium and calcium concentrations dropped below the adequate range within only two weeks after clear water irrigations began. Unfortunately, the strategy of discontinuing fertility leads to the increased incidence of mineral deficiencies, which mainly occur in ornamental cabbage on the market date or in the retail location.

After this study, researchers remained concerned about fertilizing ornamental cabbage and kale because the above study had been conducted on a white cultivar, which does not express anthocyanin, the pigment responsible for most of the red, pink, purple and blue colors

Fig. 1. Ornamental cabbage dry weight over time. Fifty percent of the total dry weight for ornamental cabbage and kale was measured during the coloration period; therefore, growers should fertilize until market date.



in plants. It is commonly observed that growers who reduce or discontinue fertilization may intensify the outer leaf color, especially in the red and pink cultivars. A follow-up study was conducted in the fall of 2000 to examine the effects of constant liquid fertilization and discontinued fertility at coloration on the cultivar 'Osaka Red'.

Seven weeks after potting, plants were either subjected to constant fertilization with a slow-release fertilizer, constant fertilization, clear water with a slow-release fertilizer or a clear water treatment. The slow-release fertilizer used was isobutylidene diurea (IBDU) (The Scotts Co., Marysville, Ohio), which delivers nutrients based on a reaction with water. IBDU may provide nutrition to plants in retail settings that primarily receive clear water irrigation. A slow-release fertilizer like Osmocote is temperature-dependent and would not work as well with late fall production of ornamental cabbage and kale. The rate of IBDU used was 1 Tbsp. per pot [12 grams (medium-high recommended rate for a 1-gallon container)].

Two weeks after treatments were initiated, electrical conductivity readings were below the recommended PourThru EC values of 1.0 mS per cm. for ornamental cabbage for all treatments providing tap water. The tap water-irrigated plants had more chlorotic lower leaves (an indication of nitrogen deficiency) than the plants on continuous feed. This difference was more distinct four weeks after initiation of clear water, with the tap water-irrigated plants having eight chlorotic leaves, compared to two chlorotic leaves on the continually fertilized plants. The most significant observation was that the color diameters of all treatments were similar two and four weeks after treatments were initiated.

Although 'Osaka Red' plants treated with clear water (r) produced more intensely colored foliage than the constant liquid fertilized plants (l), center color diameters were similar, and the clear water treated plants produced more chlorotic leaves.

Table 1. Fertilization schedule for ornamental cabbage

Weeks after potting	Fertilizer Treatment
0-2	50-150 ppm nitrogen calcium nitrate (Ca(NO3)2) and potassium nitrate (KNO3) until roots reach the bottom of the pot.
2-8	150-250 ppm nitrogen calcium nitrate (Ca(NO3)2) and potassium nitrate (KNO3) with periodic applications of 20-10-20 or 21-5-20, 1-2 applications of epsom salts at 1 lb per 100 gallons.
8-10	Maintain fertility levels at 150-200 ppm nitrogen for southern climates and reduce levels to 75-100 ppm nitrogen for northern climates.
10-14	Market plants and instruct retailers to apply a low fertilizer rate of 50-100 ppm nitrogen CLF (or 200 ppm weekly) to avoid nutrient deficiencies.

CONCLUSION

Normal fertilization practices for floricultural crops at visible flower bud suggest that fertilization be discontinued or reduced significantly because plants require less nutrients for growth during flowering. Flower bud development and visible pollen with ornamental cabbage does not occur until after a vernalization period, and during the time when coloration occurs, dry weight is still increasing and nutrient demand is still high. Therefore, ornamental cabbage should be considered an exception, and fertilization should be continued throughout the production season.

Plants that are lighter green or lose lower leaves may limit marketability. Dramatic decreases in nutrient concentrations will occur at market stage if plants are subjected to clear water irrigation prior to sale. The incidence of nutrient deficiencies will be magnified if growers sell “borderline” nutrient-deficient plants to retailers who do not fertilize at the point of purchase. In order for retail or wholesale growers to maximize sales, ornamental cabbage plants should be fertilized at 200 ppm nitrogen, so that if clear water irrigations are conducted, nutrient reserves will be greater in the substrate to provide proper fertility.

Please keep in mind that the research was conducted in a more southern climate, and the effects of temperature may have had an effect on nutrient demand late in the season. Nevertheless, northern growers should still maintain a fertility program on the crop until sales. Concentrations of nitrogen at 75-100 ppm are recommended.

FERTILIZER RECOMMENDATIONS

Fertilize plants with a balanced fertilizer of calcium nitrate ($Ca(NO_3)_2$) and potassium nitrate (KNO_3), with periodic applications of 20-10-20 or 21-5-20 (for phosphorus and micronutrients) and epsom salts [$MgSO_4 \cdot 7H_20$] (for magnesium and sulfur). High levels of NH4-N (ammoniacal-nitrogen) and/or urea in a fertilizer mix will stimulate stem elongation, resulting in the need for higher plant growth regulator rates. The percentage of NH4-N and urea should be less than 30 percent of the total nitrogen supply to avoid stretch. Refer to Table 1 for a suggested fertilization schedule for ornamental cabbage and kale. GPN

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