

## Cabbage Varieties and Quality

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### Presentation Summary

The amount of profit made from a cabbage crop depends on how well it meets market specifications. Cabbage crops are evaluated using numerous criteria, including head size, density, and internal quality, tissue color and flavor, and freedom from biological and physical contaminants. Cabbage varieties differ in a number of these factors. So, it can be useful to review cabbage crop quality standards and results from recent studies describing how well certain varieties meet them. It is not possible to completely describe these issues here, especially given the differences between fresh market and processing cabbage crops and markets. Basic issues related to the quality of both types of cabbage crops are discussed in this presentation.

**Defining Quality.** We are familiar with the concepts of quality as they apply to issues in our everyday life. For example, we've chosen favorite restaurants and makes of vehicles because they offer the quality we desire. Definitions of quality in the dictionary include "an inherent or distinguishing feature" and "degree or grade of excellence." These concepts apply to the business of growing and selling cabbage. Crops with positive distinguishing features are received more enthusiastically by the market or ranked as having a higher grade of excellence.

**Measuring Quality.** Just as horsepower is often used to measure the potential use of pickup trucks and tractors, cabbage crop quality is frequently measured using physical and sensory criteria. Although their importance tends to differ between fresh and processing markets, similar criteria are used to assess the quality of both types of cabbage. Important physical criteria of cabbage crop quality include: tissue color, core size, level of insect feeding- or disease-related damage and physiological disorders (e.g., tipburn), and head size and density. Crops should also contain a minimum amount of foreign material such as weeds, stems, and soil. The quality of a cabbage load also depends on how much of it is usable by the buyer. Detached leaves, partial heads, etc. reduce the usable amount of a load. Sensory criteria are especially important in fresh market crops and include tissue flavor, aroma, and texture. Finally, significant fresh (with minimal heat or chemical treatment) cabbage consumption and rising consumer concerns about food safety have come to impact the assessment of cabbage crop quality. In some cases, it has become important to estimate the potential that the crop may contain biological contaminants (e.g., *Listeria* or *E. coli* bacteria). At the least, following "Good Agricultural Practices (GAPs)," "Hazard Analysis and Critical Control Point (HACCP)" procedures, "Quality Assurance and

Control (QA/QC),” or related guidelines often requires that steps be taken to limit the potential for biological and physical contamination. As we continue our discussion with suggestions on how to manage cabbage crop quality, keep in mind that:

- crop quality is not an abstract term, it affects the bottom line, and
- cabbage quality is assessed using physical, sensory, and, increasingly, biological and production practice-oriented criteria.

**Managing Quality.** Knowing your market’s quality standards is the first step toward delivering a crop with the greatest profit potential. USDA quality standards are an excellent foundation and USDA inspections often are completed as an early step in assessing crop quality. USDA inspections are objective and they use accepted criteria. However, a growing number of buyers are beginning to employ criteria not found in the USDA standards in their assessment of crop quality. For example, more and more buyers appear interested in requiring evidence that the grower has followed a GAP-, HACCP-, or QA/QC-related plan in producing the crop. The bottom line is that there is a greater tendency among buyers to include criteria related to *how* the crop was produced and handled in their assessments of crop quality. With these plans, it may be necessary to furnish information regarding the use of crop protectants, sources and management of irrigation water, labor practices, and other issues. Of course, this is beyond simply asking, for example, how much tipburn is in the crop. It is true that satisfying GAP-, HACCP-, or QA/QC-related plans increases the grower’s workload and that doing so can be like trying to hit a moving target. However, thought of in a positive way, implementing these plans can help streamline your approach to overall crop quality management. In any case, meeting plan requirements may become the industry norm, so it may be prudent to become familiar with them earlier rather than later (often when it pays).

Using varieties with the greatest potential to produce a high quality crop is also very important. Cabbage varieties differ in their marketable yield potential, primarily due to differences in resistance or tolerance to environmental stresses, diseases and insects, and physical and sensory characteristics (e.g., head and core size, head color, density, flavor, texture). Your own experience and input from your market, other growers, consultants, and seed industry representatives should be taken into account when selecting varieties. It is also advisable to refer to locally-developed research-based information regarding the performance of cabbage varieties in your area. In 2000, a total of thirty-six genotypes of fresh market and processing cabbage were evaluated at the OSU Vegetable Crops Research Branch in Fremont on May 12 and June 30 (fresh market) and May 15 and July 6 (processing). Plot and head characteristics were recorded during development and at maturity. Heads of fresh market genotypes were also sent to The OSU Food Industries Center for evaluation. Tissue was also sampled for isothiocyanate analysis. Isothiocyanates are among the compounds which contribute to cabbage flavor. They are also thought to impact human health. The research plots were featured in the Vegetable Crops Research Branch Field Day in Fremont on 8/2/00. In the fresh market study, total and marketable yield and head weight, size, and density tended to be greater in the May versus June planting. However, the percent of the head’s volume taken up by the core tended to be slightly greater in the summer versus spring planting. Total and marketable yield averaged 40 and 38 ton/A in the spring, respectively, but 32 and 24 ton/A in the summer, respectively. Matsumo variety had the greatest marketable yield in the spring planting while SuperElite Hybrid had the greatest marketable yield in the summer planting. In the processing study, total and marketable yield and head weight tended to be greater in the May versus July planting.

However, head density tended to be slightly greater in the summer versus spring planting while head size was unaffected by planting date. Total and marketable yield averaged 38 and 37 ton/A in the spring, respectively, but 35 and 30 ton/A in the summer, respectively. Geronimo variety had the greatest marketable yield in the spring planting while HMX 0221 had the greatest marketable yield in the summer planting. This project is described completely in Horticulture and Crop Science Series Bulletin 705-2001, available from Matt Kleinhenz. When selecting varieties, remember that marketable yield is your concern but quality is the market's. It is increasingly difficult to profit from a high-tonnage, low quality crop.

Proper crop and soil management are also key to producing a high quality crop. Minimizing disease and insect pressure through using quality-assayed seed or transplants, scouting, and proper control strategies is important. Reduce low water stress through irrigation. Minimize high water stress through improving drainage -- for example, by tiling, selecting well-drained fields, and improving soil tilth. Follow good soil stewardship practices such as using cover crops, reducing tillage, and not working soil when it is wet. Apply fertilizers based on accurate, up-to-date soil tests and reliable recommendations. Excessive nitrogen application has negative consequences including delayed maturity, loose heads, and greater input costs.

Harvest and storage management affect your profit potential in at least two ways. First, your investment in the crop increases with each day that passes until you sell it. Therefore, you have more to lose if the crop doesn't turn out as you and your market would like. Second, crop quality is cumulative, a result of everything that happens to the crop until it is sold or delivered. Therefore, proper harvest and storage management are required to maintain the quality of the crop. Adjust and calibrate all machinery to minimize harvest damage. Time the harvest to minimize head splitting and the development of physiological defects and disease and insect damage. Keep field debris out of trucks and bins. Cool the crop as soon as possible (at the least, do not let it sit in the bulk truck in the sun). If storing the crop, follow reliable recommendations on maintaining appropriate storage atmosphere conditions (e.g., temperature, humidity). Overly warm and dry storage conditions speed declines in crop quality and weight.

**Summary.** Profit potential depends on being able supply the market with a high quality crop. This is more and more the case with cabbage as buyers seem to be increasing the number of criteria they use to assess the quality of cabbage crops. Currently familiar criteria include the amount of foreign material present, tissue color, core size, level of insect feeding- or disease-related damage and physiological disorders (e.g., tipburn), and head size and density. Fresh market crops can also be evaluated using sensory criteria, such as tissue flavor, aroma, and texture. New criteria for both fresh market and processing crops may include the potential that the crop may contain biological contaminants or to what extent it was produced using GAP-, HACCP, or QA/QC-related practices. It is important that growers be familiar with quality standards, including newly-developing ones, and take steps to meet them. This will likely require an increase in record-keeping. But, keeping accurate records is always a good idea as it can help know where improvements are needed. Proper variety selection and crop, soil, harvest, and storage management also help to achieve high crop quality and profit potential.