

Introduction

Blueberries are one of the most delicate and highly perishable fruits. Their climacteric physiological characteristics allow them to be harvested in a "just ripe" condition. The quality of fresh blueberries depends on their maturity and appearance (color, fruit size, freedom from defects and decay), firmness, and flavor (determined by amounts of sugars, organic acids, phenolics, and characteristic aromatic volatiles). The principal decay likely to affect blueberries during postharvest are gray mold (*Botrytis rot*), Anthracnose, and *Alternaria rot*. Even a small amount of infestation can quickly spread throughout an entire package.

The most important factors in attaining and maintaining good quality are harvesting at the "just ripe" stage, avoiding physical injuries during all handling steps, enforcing strict quality control procedures, prompt precooling, and providing proper temperature and relative humidity during transport and handling at destination.

Loss of quality, results in blueberries which are not acceptable to consumers. Quality decreases rapidly at ambient temperatures, therefore, proper temperature management is important in maintaining blueberry quality. Proper temperature management of blueberries begins with proper precooling (rapid removal of field heat) from field temperatures which can be higher than 30°C (86°F). Rapid removal of field heat is critical to retard deterioration of blueberries. For maximum quality retention, blueberries should be precooled to near -0.5 to 0°C (31 to 32°F) within 1 hour of harvest and maintained at -0.5 to 0°C (31 to 32°F) and 90 to 95% relative humidity throughout the marketing channels [7].¹ For commercial blueberry operations in Florida, this ideal is rarely achieved. The level of precooling achieved with Florida blueberries depends on various factors, including volume of blueberries handled, cooling and handling equipment availability and capability, economics, energy, and market conditions.

Blueberries are an important crop in the United States. Nationally, Florida follows Michigan, New Jersey, North Carolina, Georgia, Washington, and Oregon in fresh blueberries production with an average annual value of \$5 million for the last 5 years [3]. During the past 5 years, blueberry yields in Florida averaged about 3,000 pounds per acre with 6 million pounds packed off 2.1 thousand acres. Yields per acre should increase as the acreage

matures. Prices for fresh blueberries averaged over \$4.00 per pound between April 1 and May 20 (due to a favorable world market window). This normally falls to \$1.00 per pound after June 1.

Blueberry growers and packers in Florida are aware of the value of their crop and of the quality demands of consumers. Improvements in temperature management will allow them to produce higher quality blueberries. Most blueberries in Florida are room cooled although some operations use forced-air cooling (including evaporative cooling) in fiberboard flats stacked on pallets. Room cooling of blueberries is not an acceptable precooling method nor is reliance on refrigerated trucks during transit.

This publication presents quality parameters, handling and cooling requirements, cooling methods, and management guidelines for maintaining the quality of Florida blueberries. Studies conducted to establish the relationship between condensation and container design and the effects of new container designs on cooling rates of blueberries are discussed. Management guidelines or recommendations to the packinghouse operators concerning possible system performance improvements are presented, such as increasing resident time within the forced-air precooler to achieve better cooling or lowering the cold room temperature to prevent warming of precooled blueberries.

Quality parameters

The United States grade standards for blueberries are based on the following quality factors: maturity, color, size, and freedom from defect and decay [8]. Florida shippers might not use U.S. grades for shipping, but these, or similar grades, are used for inspection purposes at destination. Therefore, all growers should be aware of the grade specifications. If the blueberries do not meet the grade standards when they are picked, it is impossible for them to make grade at destination. For hand-harvested operations, it is important that a system be developed by which each container of fruit harvested is inspected and weighed in the field to make sure it meets quality standards before the picker is credited. For machine-harvested operations, it is important that immature and overmature berries, damaged berries and trash be eliminated on the sorting line.

¹Numbers in brackets refer to cited references