

THE APPLE AND CHERRY INDUSTRY OF CHILE

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INTRODUCTION

Chile became one of the largest fresh fruit country-producers with 46% of total Southern Hemisphere fruit trade. The production has been concentrated on export of fresh, safe and high quality fruit with very little processing and with a poor domestic consumption rate (60 kg per capita). Chile extends over 4,200 km from the Atacama desert area to the rainy and humid southern part of the hemisphere. The fruit production is concentrated from Santiago (33° south) to Chillan (37° south latitude), with a total of 520,782 acres.

The main crops are table grape and apple with 20% and 18.9% from the total area respectively. Chilean fruit income accounts for almost 6% of total Chilean exportation and 13.9% of total labor force is concentrated under this industry. The market exports change along the season and depends on the rate of currency exchange, world stocks of fruit species such as apple, pear and kiwifruit, fruit quality and the supply volume.

The characteristic of Chilean apples and cherry industry will be discussed in terms of preharvest technology of fruit production and postharvest aspects of fruit quality. Special analysis will be focused on weakness and strength of the industry in relation to commercial requirements of main Chilean export market.

CLIMATE CONDITION OF FRUIT PRODUCTION

The main apple and cherry production area of Chile is concentrated in the VI Region. Climate of this area is characterized by a dry summer with an accumulation of 600 to 1,000 chilling hours (less than 7 °C) during winter. The greatest variations occur along the east and west sides of the valley because of the mountains and ocean influences. Heat hour accumulation starts from September and reaches a maximum between 1,600 and 1,800 hours on April. The average of rain, described as a historical of eight years (from 1991 to 1998), was 200 mm in the driest year (1998) and 1,000 mm (1997 and 1992) in the rainy ones. The maximum temperatures have been 30 °C in December and the average minimum temperature was 2 °C in June. The maximum rate of evapotranspiration averaged 7 to 10 mm/day, during December and January.

CHARACTERISTICS OF CHILEAN APPLE PRODUCTION AND EXPORTATION

The total of Chilean fruit production reached 3,3 million of ton on year 2000, with almost one million concentrated on apple. Apple production is located mainly in the VI and VII regions and represents almost 35% of total Southern Hemisphere and 31% of total Chilean fresh fruit exportation. The main markets are Latin American (37%), Europe (33%), Far and Middle East (16%) and USA and Canada (13%), with a total of 483,074 ton (2000-2001 season).

The traditional Red Delicious apple includes Starkrimson, and the most planted Oregon Spur variety, whose production has decreased in the last years in favor of new apple varieties such as Royal Gala (Figure 1). However, still remain a total of 130,000 ton of traditional red apple that has to be exported if minimum quality is achieved. The main limitation of traditional red varieties is the poor red color development related to achievement of optimum physiological maturity with the high red color required from the market every season. Softening and mealy texture are the main limitation to store these varieties longer than six months.

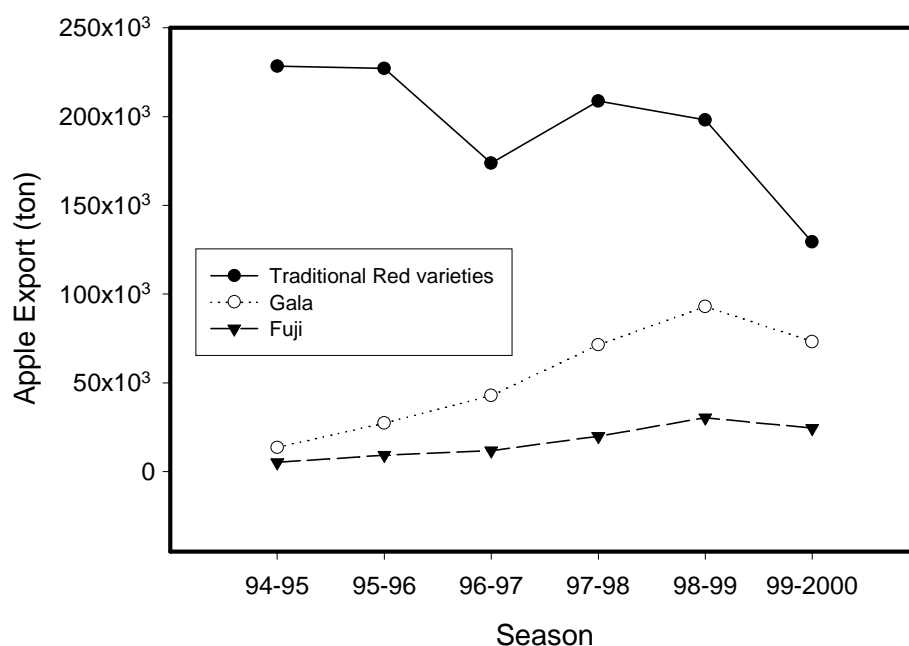


Figure 1. Evolution of traditional Red Delicious, Fuji and Royal Gals apple export from Chile.

Red apple is exported mainly to European and Latin American countries. In the season 2000, USA market imported 10% of red apple and the main variety was Gala. Otherwise green apple, Granny Smith is the main variety exported to that market.

The average apple income is related with fruit size and percentage and intensity of red color. Fruit sizes 70 to 80 can be sold three times higher than sizes 135 to 165, and a premium of US\$2 for full red color can be obtained.

The main limitation of the Chilean apple business is related with production of high quality fruit. In the case of old plantings of Oregon Spur, low density is the average situation. Poor vegetative growth and low production per surface area reduce the opportunity for this variety, besides poor red color intensity and lack of color uniformity.

Fuji apples have been exported to Taiwan with good price, but poor percentage of exportation is the main characteristic due to poor color, sunburn and lenticel cracking. The poor adaptation of Fuji clone under Chilean condition has restricted the future opportunity for this variety.

The best performance of new varieties has been obtained with Gala apple under Seedling or MM 106 rootstock.

In summary, the climate condition of apple growing area results in poor color development, high risk of calcium related disorders and sunburn damage on the fruit. These limitations have been very critical for the introduction and adaptation of new varieties such as Braeburn and even Fuji. The risk of Bitter pit has produced great commercial damage to the apple industry not only to very sensitive varieties such as Granny Smith but also to resistant ones such as Gala.

Lenticel cracking on the surface of Fuji apple has become an important problem in some years and orchards. This skin problem appears mainly on more mature fruit associated with humid harvest condition, the damage increases during storage and after fruit processing by the packing line.

CHARACTERISTIC OF CHILEAN CHERRY EXPORTATION

Sweet cherry has been one of the most planted species in recent years. In the period of 1990 to 1998 the surface area of cherry increased 98%. The main variety marketed is Bing but many others are exported under the same name. Considering the later, the evolution of exportation is described on Figure 2.

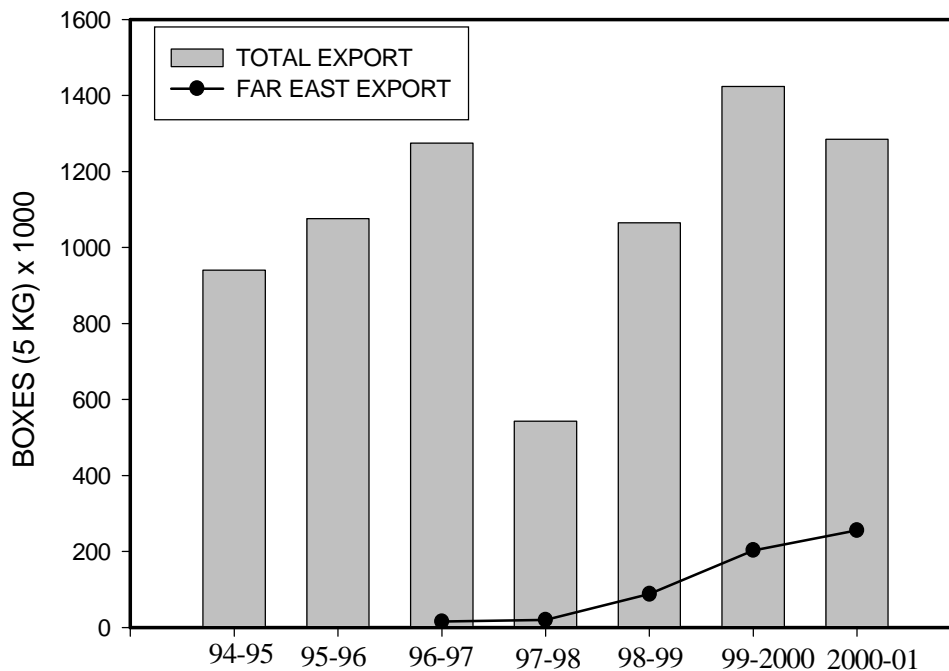


Figure 2. Evolution of Chilean cherry export.

The total exportation was 1.5 million boxes (5 kg) in 2001; sixty percent was exported to USA and Latin American countries. Brazil accounts for almost 80% of the total exportation to the later group of countries (Figure 3). Far East (Taiwan and Hong Kong) has become a new opportunity for cherry business and with the introduction of modified atmosphere packaging technology the exportation by sea has avoided the high cost of air transportation. Large, firm and sweet cherry is preferred in this market and therefore Bing is the lowest risk variety to withstand the 40 to 45 days transportation time.

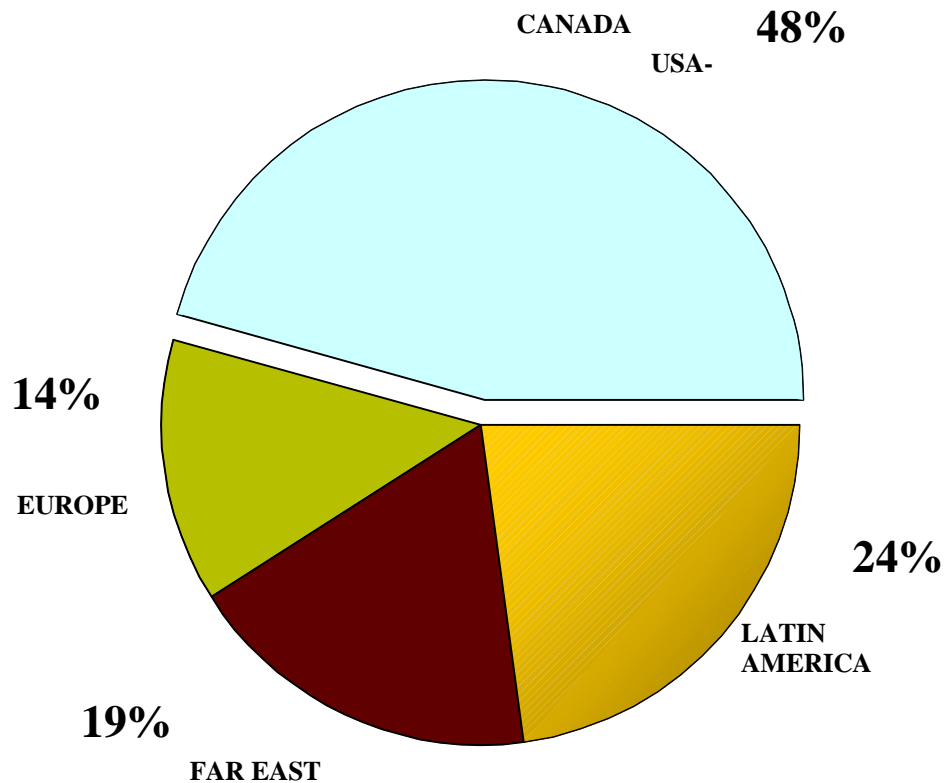


Figure 3. Main export market for cherry produced by Chile.

During the 2002 season, Chile started the exportation to Japan by air fly with a total of 50,000 boxes, using the quarantine protocol of methyl bromide fumigation. Bing is the only variety accepted at this time in this market.

Production Areas

Chilean cherry production has been changing during the last period of 10 years from a concentrated number of varieties with low yield per hectare to the introduction of new self-fertile ones with a broad period of harvest. The new area also is moving from the rainy south area to the dry north zone.

Cherry is planted from Santiago to Chillan with a total of 5,000 ha; the main area of production remains concentrated from Rancagua (VI Region, north area), to Curico (VII Region South area). The earliest cherries come from the north area (Santiago to San Fernando). Burlat is the earliest variety; however the softening and small size of the fruit restrict the commercialization to domestic market only. Bing and Van varieties are harvested for export and they are shipped to USA and Europe by air to achieve the early market before Christmas time.

Curico is the oldest and most important Chilean cherry production area. The early production comes from the coast part where new earlier varieties are in commercial evaluation such as Brooks, Summit, and Santana.

Later production come from the cooler zone located to east of Curicó city. Freeze damage during spring and rain fruit damage during harvest are the main limitations of this area however high accumulation of chilling unit during autumn and winter assure high potential of flowering and fruit quality.

In general, the main advantage and limitation of cherry production can be summarized as follows:

Limitations

- High sensitivity to bacterial cancer.
- High potential for tree decline.
- Mixing of varieties in the Bing boxes.
- High potential for pitting damage.

Advantage

- High potential to grow high quality fruit in relation to sugar content, acidity and fruit size.
- New area of fruit production with improved technology on tree management.

CHALLENGES AND RESEARCH OPPORTUNITY

Pitting

Physical damage on the fruit during harvest and handling operations develops different symptom on the surface of the fruit describe under the pitting terminology.

Ongoing research tries to describe the symptoms in relation to where and when the physical damage occurs. A detailed description of symptoms has allowed the identification of direct causes of pitting such as contact of fruit with boxes, pedicel and bruising compression damage produced by pickers. A survey including different growers permitted to find the cause of the pitting symptom and therefore specific recommendations are given to the growers for the harvest operation.

More accurate research needs to be done to learn how to segregate pitting sensitive fruit and how to improve fruit resistance to physical damage.

Modified Atmosphere Packaging

Modified atmosphere packaging (MAP) technology becomes an important operation on sweet cherry export to long distant markets. A summary of the operation is described in Figure 4. Because of the importance of MAP on fruit quality and the Chilean cherry business a bag was developed to achieve the requirement of modified technology. A self-generated atmosphere heat sealed bag was developed as an alternative to the vacuum seal bag to speed fruit packaging. The main results obtained with MAP bag are:

- Reduction of decay when the concentration of CO₂ is higher than 10%.
- Reduction of darkening of red color and stem browning development even with 5% of CO₂ concentration inside the bag.
- High quality fruit is required to store the fruit for 40 days (Asian market transportation) under MAP.

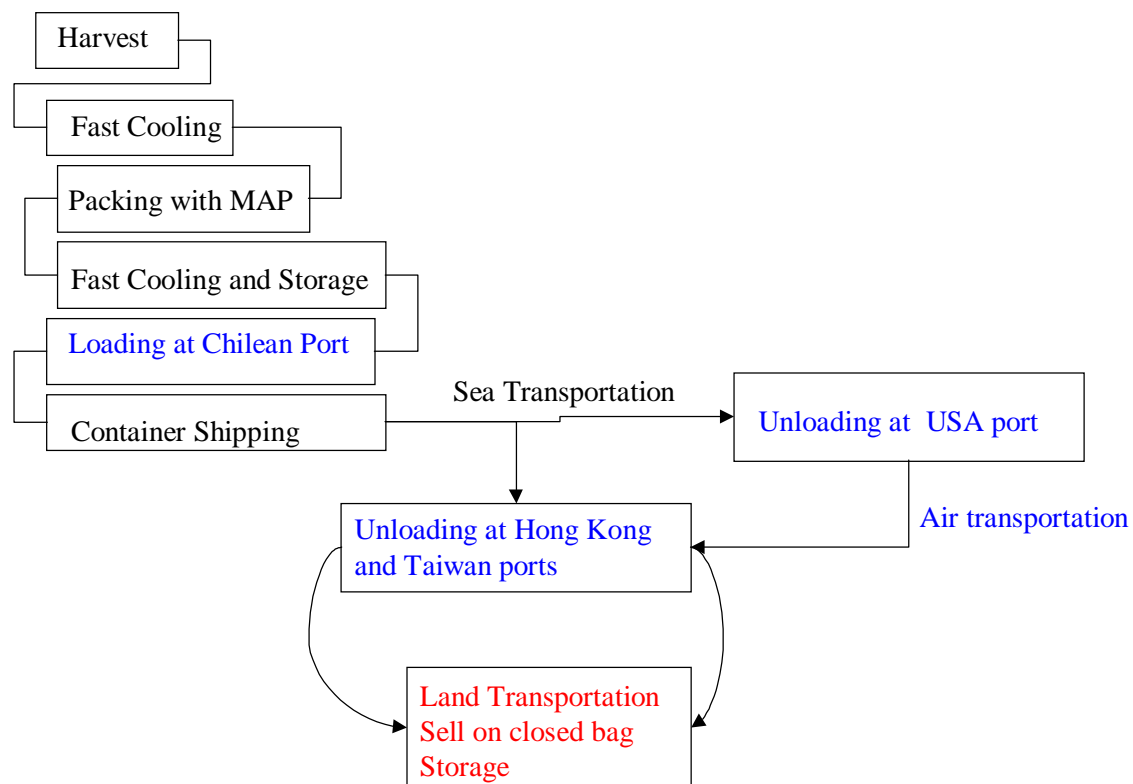


Figure 4. Representation of Chilean cherry export to Asian market by modified atmosphere packaging (MAP).