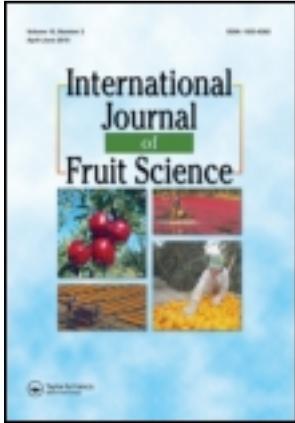


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## Strawberry Production in Brazil and South America

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*This article describes the strawberry industry in Brazil and South America. The strawberries produced in all South American countries are for the fresh market and sold locally, however, there is a modest amount of fruit exported to Europe. The estimated annual area for strawberry planting is about 11,884 hectares and fruit production is 318,686 metric tons. Argentina and Brazil are the most important strawberry producers in South America. Specialized nursery industries in Argentina and Chile supply plants to nearly all countries in South America.*

**KEYWORDS** *Fragaria, frigo plants*

### INTRODUCTION

This article briefly describes the strawberry industry in Brazil and in South America. Brazil, Argentina, and Chile are responsible for most of the continent's strawberry production, whereas production in Venezuela, Peru, Paraguay, Uruguay, Bolivia, Colombia, and Ecuador is less developed (Table 1).

In the last 10 years, there has been a significant increase in strawberry production (Table 1) in countries, such as Brazil, Argentina, and Chile. Increased acreage and improved production technology have contributed to greater yields and improved product quality (Kirschbaum and Hancock, 2000; Gambardella and Pertuzè, 2006; Nacimiento, 2009; Vicente et al., 2009; Antunes et al., 2010; Gambardella, 2010). Currently, it is estimated

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**TABLE 1** Acreage Planted in Strawberry, Yield, and Strawberry Production in South America

Country	Year	Acreage (ha)	Yield (MT/ha)	Production (MT)
Argentina <sup>1,6</sup>	2009	950/1080	9.5/26.0	900/62,766
Bolivia <sup>1</sup>	2008	230	4.1	935
Brazil <sup>1,5</sup>	2009	370/3,500	7.5/30.0	2,800/105,000
Chile <sup>1,3</sup>	2008	1,546	25.9	40,000/60,861
Colombia <sup>1</sup>	2008	1,099	40.0	43,920
Ecuador <sup>1</sup>	2008	140	12.5	1,750
Paraguay <sup>1</sup>	2009	380	9.2	3,500
Peru <sup>1</sup>	2009	1,180	16.9	19,977
Uruguay <sup>2,4</sup>	2009	107	33.4	3,584
Venezuela <sup>1</sup>	2008	2,622	6.3	16,393
Total		8,624/11,884		133,759/318,686

Sources: <sup>1</sup><http://faostat.fao.org/site/567/DesktopDefault.aspx?PageID=567#ancor>; <sup>2</sup>MGAP: DIEA-DIGEGRA Encuestas Hortícolas, Sur y Litoral Norte, 2009; <sup>3</sup>Chile: Jorge Retamales (University of Talca) and Gambardella, 2010; <sup>4</sup>Uruguay: Gustavo Gimenez (INIA); <sup>5</sup>Antunes et al., 2010; <sup>6</sup>Kirschbaum and Hancock, 2000.

that South America produces about 318,686 metric tons of strawberry on 11,884 hectares.

Specialized nursery industries in Argentina and Chile supply plants to nearly all countries in South America (Table 2). Most of these nurseries are producing North American cultivars under intellectual property right agreements. On an annual basis, the Brazilian market is increasing importation of plants from foreign sources. However, it creates a huge dependence on external sources and, as a result, growers can only begin planting in late April, which is too late for growers in São Paulo and Minas Gerais that begin planting in March.

Camarosa strawberry is still the predominant cultivar in Brazil, but new cultivars with improved fruit quality have been introduced in Brazil (Table 2). Besides the North American cultivars, some countries, such as Uruguay, have started their own breeding program and have released cultivars, such as INIA Guenoa, INIA Yuri, and INIA Yvapiá (Vicente et al., 2009), that are better adapted to local growing conditions. Much of the strawberries produced in South American countries are consumed fresh locally. Some production is destined for processing, mainly frozen fruit with a small amount for juice (Table 2). Most growers use plant densities of 45,000 plants ha<sup>-1</sup> for open field and up to 200,000 plants ha<sup>-1</sup> in soilless production systems. Fresh plants are the main type of plant used by growers, regardless of origin.

## BRAZIL

The beginning of commercial strawberry cultivation in Brazil is not well known. However, strawberry culture began to expand in the 1960s with the release of the cultivar Campinas (de Castro, 2004), developed by the

**TABLE 2** Nurseries, Cultivars, Product Destination, Planting Density, and Type of Plant Utilized in Strawberry Production in Some Countries in South America

Country	Nursery	Main cultivar	Main product destination	Plants ha <sup>-1</sup>	Type of plants
Chile	One large nursery (Viveros Llahuén) that has the rights to propagate protected University of California cultivars. Several smaller ones (~12) propagate European or non-protected California cultivars	Camarosa	58% internal market as fresh; 34% exported frozen; 6% internal market frozen	55,000 to 60,000	Frigo plants in the Central Valley in summer; coastal areas use fresh plants in autumn
Uruguay	Five nurseries producing to local supply	INIA Guenoa, INIA Yuri, INIA Yvapitá, Camarosa, Aromas, Camino Real, Cristal	Fresh market 95%	In greenhouses and tunnels: ~66,000; Open field: 35,000 to 40,000	Fresh plants in protected crops and mainly frigo plants in open field
Brazil	One mother plant nursery (Multiplanta)	Oso Grande, Camarosa, Aromas, Albion, Festival, Camino Real, Campinas, Dover, Campdover, Aleluia	Fresh market 98%	45,000 to 80,000 in the open field; and up to 200,000 plants in soilless systems	Mainly fresh plants

*Source:* Uruguay: Gustavo Gimenez (INIA); Chile: Jorge Retamales (University of Talca) and Gambardella, (2010); Brazil: Luis E. C. Antunes (Embrapa).

Agronomic Institute of Campinas (IAC). Currently, there are approximately 3,500 hectares of strawberry in Brazil (Antunes and Reisser Júnior, 2007). The principal producing states are Rio Grande do Sul (RS), São Paulo (SP), and Minas Gerais (MG), but strawberry production is increasing in other regions and states, such as Santa Catarina (SC), Parana (PR), Espírito Santo (ES), Goiás (GO), and the Federal District (DF).

Strawberry breeding and research programs in Brazil were started in 1941 at the Agronomic Institute of Campinas (IAC). As a result, there has been a six-fold increase in productivity in the last six decades from the release of new clones, improved production techniques, and production of virus-free mother plants by tissue culture (de Castro, 2004). In 1950, a strawberry breeding program was also started at the Experimental Station of Cascata, currently Embrapa Temperate Climate. The main cultivars grown in the 1960s, 1970s, and 1980s were Campinas, Princesa Isabel, Jundiá, Piedade, Monte Alegre, and Guarani (from IAC), and Konvoy, Cascata, Konvoy-Cascata, BR 1, Vila Nova, Santa Clara, and Burkley (from Embrapa). Since 2009, there has been a unique strawberry breeding program in Brazil coordinated by Embrapa Temperate Climate that is developing cooperative programs with traditional institutions in the world to start a gene bank and to utilize local variability.

There is continual release of new strawberry cultivars in the international market. In Brazil, the introduction of new cultivars has been made through companies that import plants from Chilean and Argentine nurseries. Recently, new strawberry cultivars have been introduced in Brazil that originated from the USA (Florida and California) and Spain. It is important to evaluate the yield performance of new cultivars introduced before the growers plant them, since some cultivars might not be adapted to Brazilian conditions (Antunes et al., 2010).

### Plant Production

Brazilian strawberry growers plant about 175,000,000 fresh-dug plants annually, with 15% being imported from Chile and Argentina, and the remaining transplants produced by local nurseries (65%) or by individual growers (20%). Brazilian growers buy mother plants from tissue culture laboratories and cultivate them themselves directly in the open field. The plants obtained from the runners are planted by the strawberry growers to produce fruit. The mother plants are planted in September and October (spring) and the runners are harvested in March and April (early autumn), when they are shipped and planted to begin production in May. The regions with low temperatures during the summer are suited for nursery plant production, but in Brazil those locations are limited to small areas at 800 m elevation or more.

The planting season varies with the region, beginning in March in Minas Gerais and São Paulo and ending in May and June in Rio Grande do Sul. The

areas where the nurseries produce runners are not fumigated and no soil treatments are made.

Fresh plants are utilized for 99% of the new plantings, but, recently, growers have begun to use “frigo” plants from Chile and Argentina for planting in September for off-season production from January to May. In this off-season system, the main cultivars are the day neutrals Aromas and Albion.

### Cultivar Patterns and Production Systems

Brazilian consumers use quality criteria, such as appearance, color, size, weight, and freshness, when buying strawberries (Lunati, 2006). Different from other fruits, Brazilian strawberries are not identified as to cultivar name in the supermarket, which leaves consumers confused when choosing the product. The cultivar, Dover, was the main variety cultivated in the 1990s, but the introduction of new cultivars with high quality (sweeter and tastier) resulted in important changes in the production chain. The main cultivars now are Oso Grande (50%), Camarosa (30%), Albion (6%), Aromas (4%), and other cultivars (10%).

The main strawberry production system used in Brazil is the annual hill culture system with low tunnel, black plastic mulching, and drip irrigation. In regions, such as Minas Gerais and São Paulo, growers use the open field system because rain and frost are uncommon during the strawberry harvest season. In the last 5 years, there has been an increase in the use of soilless substrate systems. The planting density has also changed depending on the region or production system used by the growers, varying from 45,000 plants ha<sup>-1</sup> in southern Brazil to 80,000 plants ha<sup>-1</sup> in southeastern Brazil for open field production and up to 200,000 plants ha<sup>-1</sup> in the soilless system. Through the introduction of new cultivars and sustainable production systems, it is possible to produce 12 months out of the year. The harvest peak is concentrated from June (winter) to November (mid-spring) and prices paid to growers can be as low as US\$1.20 per kg. By producing fruit in the off-season, either at high elevations or in colder regions from January to March (summer), and by planting day-neutral cultivars (Aromas and Albion), growers can receive prices that are five-fold greater than in the summer. In Minas Gerais, some growers receive US\$8.00 per kg using soilless systems.

The estimated annual area for strawberry planting is about 3,500 ha, where 105,000 metric tons are produced with the fresh market being the major outlet for Brazilian strawberries (98%). The Brazilian strawberry export is modest. In 2004, a year that Brazilian exports were significant, 180 metric tons were exported (from just 6 hectares of production). The main markets were France (40%), Spain (12%), and Germany (6%). The Argentine market was the principal destination in the southern hemisphere.

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