

‘BRS Sarau’: A new late-ripening table peach cultivar with a wide climatic adaptation

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Abstract: ‘BRS Sarau’ is a highly productive peach cultivar widely adapted to the Southern and Southeast region of Brazil. It produces fruits of excellent flavor and shape, with attractive skin and flesh color, and its harvest starts near the Christmas holidays, when the demand for peaches is high.

Keywords: *Prunus persica*, breeding, fruit quality

INTRODUCTION

Peach (*Prunus persica* L. Batsch) is one of the most important temperate climate fruit species. The global area of peach was over 1.5 million ha in 2022, with a total production exceeding 26 million t. Over the last 60 years, the yield of peach orchards around the world has increased considerably, rising from 9.4 t ha⁻¹ in 1961 to 17.1 t ha⁻¹ in 2022 (FAOSTAT 2024). One of the factors that contributed to this increase was the development of more productive cultivars that are better adapted.

In 2022, Brazil was the 14th largest producer of peaches and nectarines, with more than 208,000 t and the 13th in cultivated area, with more than 15,000 ha (FAOSTAT 2024, IBGE 2024), of which 13,500 ha are located in the South region, and just over 2,000 ha in the Southeast region. Rio Grande do Sul (RS) is the largest producer, with 11,500 ha cultivated, being 6,500 ha for the production of table peaches (IBGE 2024) and around 5,000 ha for the production of canning peaches. In the Southeast region of Brazil, production is almost exclusively of table peaches.

Embrapa’s peach breeding program has a history that began before Embrapa, in 1963 (Corrêa et al. 2023). Although the priority was the development of cultivars for use in canneries in the early years, as it was located in a canning peach-producing region (Raseira and Franzon 2021), there has always been research to develop fresh market cultivars. In the early 2000s, this research line grew greatly in importance, mainly due to the partnership of several producers in the south and southeast of the country, as well as other national and international research institutions and universities.

This joint work, involving different segments of the production chain in the evaluation of the selections developed by the research, resulted in the release of table peach cultivars that gained the trust of producers and the preference of the national market. Among those cultivars are the recent releases, such as BRS Rubimel, BRS Kampai (Raseira et al. 2010), BRS Fascínio and BRS Regalo

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(Correa et al. 2023), BRS RubraMoore (Raseira et al. 2017) and BRS Serenata (Raseira et al. 2020), with BRS Regalo being the latest to mature, with fruit harvesting generally starting in the first half of December.

However, there is still demand for cultivars with earlier or later harvest season than those currently available. To meet part of this demand, in 2023, Embrapa released ‘BRS Sarau’, whose harvest starts in the last fifteen days of December, after the season of ‘Chimarrita’, ‘BRS Fascínio’ and ‘BRS Regalo’, and coinciding, in part, with the old cultivar Chiripá. This last cultivar, despite the recognized organoleptic quality of its fruits, is not broadly adapted and produces fruits of low firmness and little resistance to transport and handling (Raseira and Franzon 2014).

ORIGIN AND BREEDING METHOD

‘BRS Sarau’ was obtained by a controlled hybridization, performed in 2006, between Cascata 1056 and the cultivar Della Nona (Figure 1). Cascata 1056 was selected from a cross between Conserva 881 and the cultivar Eldorado. Conserva 881 originated from a hybridization of Conserva 594 and the cultivar Riograndense, whereas cultivar Eldorado was obtained from a cross between two cultivars of the same breeding program, ‘Gaudério’ and ‘Serrano’. All of these hybridizations were carried out at Embrapa Clima Temperado (31° 40’ 22” S, 52° 26’ 20” W, 57 m asl), Pelotas, RS, Brazil.

Cultivar Della Nona was a joint release of Embrapa and EPAGRI (SC), in 1992, due to its adaptation to the Midwest of Santa Catarina State (Raseira and Franzon 2014), which is a region of higher chilling accumulation than Pelotas. It was selected among the open-pollinated seedlings of a population originated from a cross between the old cultivar Delicioso (one of the foundation clones of the Pelotas’ program) and the American nectarine cultivar Nectared 5 (Figure 1).

In 2006, flowers of Cascata 1056 selection were emasculated and pollinated with pollen from the Della Nona cultivar. The cross was identified as C.2006-126. The fruits resulting from this cross were harvested when ripe and their seeds were extracted in the laboratory and disinfected in a thimerosal solution (0.15%), placed in a plastic bag with moistened germination paper, and refrigerated (4 ± 2 °C), until their radicle emergence started. At this point, they were sown in seedbeds and kept in a greenhouse until transplanting into the field during the winter of 2007. The seedlings were planted at high density (50 cm between plants and 5.5 m between rows), in the experimental field of Embrapa Clima Temperado. In 2009 and 2010, the first evaluations were performed and plant number 10 from the obtained population was selected, receiving the designation of Cascata 1693.

In the summer of 2010/11, this plant was budded, and in the winter of 2011, three of these clones were included in the Embrapa Clima Temperado collection, for further evaluations. Since this selection stood out among the different genotypes under evaluation due to its yield and fruit quality, in 2014 and 2015 three clones of Cascata 1693 were planted in observation units (OUs) in: Pinto Bandeira (lat 29° 08’ 05” S, long 51° 25’ 45” W, 637 m asl), in the Rio Grande do Sul

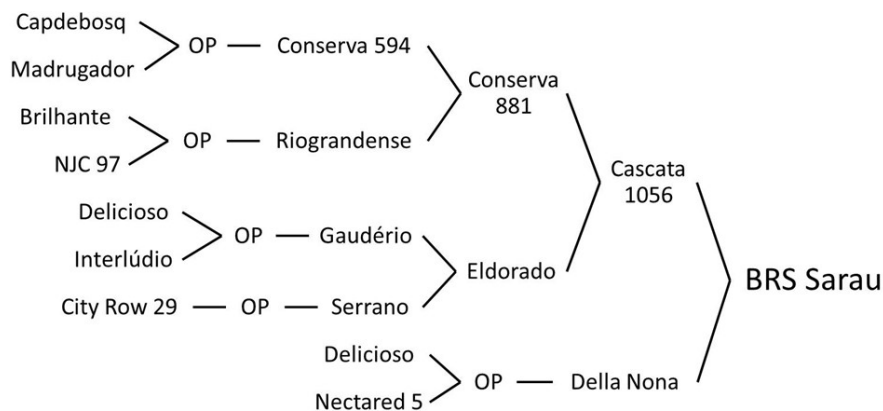


Figure 1. Genealogy of the peach cultivar BRS Sarau. OP = open pollination

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(RS) state; Petrolândia (lat 27° 28' 14" S, long 49° 36' 29" W, 458 m asl), Descanso (lat 26° 49' 54" S, long 53° 28' 14" W, 390 m asl), Videira (lat 27° 02' 17" S, long 51° 08' 00" W, 830 m asl) and Canoinhas (lat 26° 11' 25" S, long 50° 21' 55" W, 805 m asl), in the Santa Catarina (SC) state; Pato Branco (lat 26° 10' 34" S, long 52° 41' 24" W, 730 m asl) and Lapa (lat 25° 46' 51" S, long 49° 45' 42" W, 900 m asl), in the Paraná (PR) state; in Pilar do Sul (lat 23° 49' 24" S, long 47° 51' 40" W, 670 m asl) and Jarinu (lat 23° 10' 19" S, long 46° 39' 04" W, 846 m asl), in the São Paulo (SP) state; in Barbacena (lat 21° 14' 47" S, long 43° 42' 45" W, 1140 m asl), in the Minas Gerais (MG) state; and in Venda Nova do Imigrante (lat 20° 24' 44" S, long 41° 03' 59" W, 1160 m asl), in the Espírito Santo (ES) state.

CHARACTERISTICS OF 'BRS SARAU'

Plant

Plants of 'BRS Sarau' (Figure 2A) are productive, have medium to high vigor, and semi-vertical growth (similar to 'BRS Fascínio'). In Pelotas, full bloom generally occurs between the end of July and the first half of August (Table 1), but it varies depending on the growing region and climatic conditions of the year. This date coincides with those of other important commercial cultivars, such as 'BRS RubraMoore', and is about a month before that of the cultivar Chiripá, which ripens at a similar period but normally flowers in September. The flowers of 'BRS Sarau' are showy, with pink petals (Figure 2B).

'BRS Sarau' is a late-ripening cultivar, as its harvest generally begins (under the conditions of Pelotas, RS), in the second half of December, after the cultivars Chimarrita, BRS Regalo, and BRS Fascínio (Table 1). This coincides with the harvest of the old peach cultivar Chiripá, which generally begins between the last week of December and the first week of January, a few days after 'BRS Sarau'. However, harvesting of 'BRS Sarau' may occur up to 10 days earlier in the Southeast of Brazil, due to warmer climate conditions during the fruit development period.

The time of harvest is one of the advantages of the new cultivar, since there is an increased demand for fresh fruit for the Holidays at the end of year, and for this period there are few options of cultivars that are well adapted to the Brazilian climate. Furthermore, 'BRS Sarau' is productive. The yield of plants maintained at Embrapa Clima Temperado was 3 (which represents good production and requires little fruit thinning), on a scale 1 to 5 (Table 2). In the OUs, the average production varied between 20 and 30 t ha⁻¹, corresponding to degree 4, and could be higher, as seen in an OU located in Pilar do Sul, SP, where adult plants reached a production of 66 kg plant⁻¹, which corresponds to 45 t ha⁻¹, at a spacing of 2 m between plants and 7 m between rows.

In areas of high elevation, orchards that are not protected from prevailing winds may have problems with the incidence of *Xanthomonas arboricola* pv. *pruni* in the leaves and, in severe cases, as happened in a location in Pinto Bandeira, symptoms can extend to the fruits when weather conditions are highly favorable (temperatures between 24 °C and 33 °C and high humidity, mainly rain).

Fruits

The average fruit weight of 'BRS Sarau', evaluated in Pelotas, RS, is between 100 and 120 g (Table 2), with an average diameter between 5.6 cm and 6.2 cm. The fruits have globose or slightly oblong shape, with mostly smooth suture and a small or no tip (developed apex) (Figure 3).



Figure 2. A. 'BRS Sarau' plants grown in an Observation Unit in Videira, SC. B. Flowers of 'BRS Sarau' (Photos: Rodrigo C. Franzon).

The skin is greenish cream with a light red color on 30-40% of the fruit surface. The flesh is melting, white, firm, with a sweet flavor, slight astringency and low acidity, resulting in a very pleasant taste. Its freestone flesh is also visually attractive due to the accentuated red color around the stone (endocarp), which has an elliptical shape and red color. The total soluble solids content is generally greater than 13° Brix and can reach up to 17° Brix (Table 2).

Table 1. Comparison of the dates of full bloom and harvest initiation for 'BRS Sarau' and commercial cultivars evaluated at Embrapa Clima Temperado, Pelotas, RS

Cultivar*	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Average ¹
	Full bloom												
BRS Kampai	Jul/30	Jul/08	19/Jul	Jul/24	Jul/13	Jul/18	Aug/02	Jul/26	-	-	Jul/23	Aug/04	Jul/22 (c)
BRS Rubimel	Jul/31	Jul/27	20/jul	Jul/22	Jul/07	Jul/17	Aug/01	Aug/06	Jul/25	Jul/31	Jul/30	Aug/09	Jul/26 (c)
BRS Serenata	-	Aug/08	-	Aug/08	Aug/04	Aug/03	Aug/04	Sep/03	Aug/08	Aug/10	Aug/12	Aug/22	Aug/11(a)
BRS RubraMoore	Aug/07	Aug/05	Aug/01	Aug/06	Aug/04	Aug/05	-	Sep/02	Aug/06	Aug/09	Aug/05	Aug/10	Aug/08 (b)
Chimarrita	Aug/05	Aug/12	Aug/10	Aug/28	Jul/30	Aug/04/	Aug/15	Sep/04	-	Aug/03	Aug/05	Aug/22	Aug/12 (a)
BRS Fascínio	Aug/13	Aug/12	Aug/10	Aug/12	Aug/02	Jul/31	Aug/15	Sep/03	Aug/02	Aug/14	Aug/20	Aug/13	Aug/12 (a)
BRS Regalo	Aug/09	Aug/12	Aug/06	Aug/08	Aug/06	Aug/10	Aug/16	Aug/23	-	Aug/10	Aug/14	Aug/17	Aug/11 (a)
BRS Sarau	Aug/08	Jul/31	-	Aug/06	Jul/30	Jul/29	Aug/13	Aug/18	Aug/03	Aug/05	Aug/07	Aug/11	Aug/06 (b)
Harvest initiation													
BRS Kampai	Nov/27	Nov/05	Oct/31	Nov/13	Nov/16	Nov/27	Nov/14	Nov/11	-	-	Nov/09	Nov/15	Nov/13 (d)
BRS Rubimel	Nov/27	Nov/12	-	Nov/23	Nov/11	Oct/26	Nov/14	Nov/19	27/ Nov	Nov/18	Nov/18	Nov/21	Nov/16 (d)
BRS Serenata	-	Nov/26	Nov/10	Nov/13	Nov/18	Nov/06	-	Dec/09	29/ Nov	Nov/22	Nov/17	Nov/29	Nov/20 (c)
BRS RubraMoore	Nov/27	Nov/27	Nov/26	Nov/30	Nov/20	Dec/07	Dec/07	-	27/ Nov	Nov/29	Nov/21	Nov/27	Nov/28 (b)
Chimarrita	Nov/26	Dec/08	Dec/02	Nov/30	Nov/28	Nov/09	Dec/07	-	04/ Dec	Dec/01	Nov/23	Dec/12	Nov/30 (b)
BRS Fascínio	Dec/06	Dec/05	Dec/02	Nov/30	Dec/05	Nov/07	Dec/07	Dec/16	13/ Dec	Dec/01	Dec/06	Dec/08	Dec/03 (b)
BRS Regalo	Dec/06	Nov/26	Dec/02	Dec/07	Dec/05	Nov/16	Dec/07	-	13/ Dec	-	Dec/20	Dec/03	Dec/04 (b)
BRS Sarau	Dec/28	Dec/14	-	Dec/04	Dec/19	Nov/30	Dec/21	Dec/16	21/ Dec	Dec/20	-	Dec/21	Dec/16 (a)

* Under the conditions of Pelotas, RS, the flowering period of 'Chiripá' is generally in September, and fruit harvesting starts by last week of December or first week of January. Data of 'Chiripá' are not in the tables because they were recorded in the years before 2012. 'Chiripá' was released in 1975. - Data not available. ¹ For analysis, the year was considered as a repetition, and the average for each year is based on three plants. Dates followed by distinct letters differ statistically by the Scott-Knott test ($p \leq 0.05$). Statistical analysis of the means was performed using the Rbio software (Bhering, 2017). Prior to statistical analysis, the dates were converted to number of days after June 1st for full flowering, and after October 15th for beginning of harvest. For statistical analysis, the number of days has been transformed to square root.



Figure 3. Fruits of the cultivar BRS Sarau, produced in Pinto Bandeira, showing the globose shape, the skin color and the red flesh around a red stone (endocarp) (Photo: Paulo Lanzetta).

It is interesting to point out that the harvest of the cultivar Chiripá, which has a similar season to 'BRS Sarau', starts during the last ten days of December or the first ten days of January, at the same place. The fruits have an average weight between 90 and 120g and are very appreciated by the consumers due to their sweet taste. The total soluble solids content corresponds to 15 and 16 °Brix, but can reach 20 °Brix. However, the flesh is soft, susceptible to bruises and mechanical damage during handling and transport, and the plants have marginal adaptation. In years with chilling accumulation inferior to 400 hours, the yield is low. Given these limitations of 'Chiripá', 'BRS Sarau' represents an excellent option for the season.

Adaptation

In 2014, Cascata 1693 was tested outside Embrapa experimental field, in three plants per OUs installed in 11 locations (as mentioned above), between the 20° and 31° parallels of South latitude and at altitudes varying from 57 m asl, at the greatest latitude, up to 1160 m asl at the lowest latitude (just over 21° latitude). Later, the variety was also tested on a semi-commercial scale, with at least 20 plants, in Pinto Bandeira, RS, Pilar do Sul, SP, and Venda Nova do Imigrante, ES. Cascata 1693 stood out in all tests, except one, with very good adaptation and yield. The exception was in Pinto Bandeira, where the orchard was planted at the top of a hill without any wind protection. There was a problem with the incidence of *Xanthomonas* on the leaves and fruit. As this problem was not observed in any other location, 'BRS Sarau'

Table 2. Average fruit mass (g), soluble solids content – SS (°Brix) and degree of production of 'BRS Sarau' compared to other commercial cultivars evaluated at Embrapa Clima Temperado, in Pelotas, RS

Cultivar*	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Average ²
	Average fruit mass (g)												
BRS Kampai	87	107	120	165	118	163	158	-	84.6	143	129	88	124 a
BRS Rubimel	79	150	-	-	111	109	158	136	100	148	150	122	126 a
BRS Serenata	-	76	-	77	98	84.5	-	-	83	77.5	102	92	86 b
BRS RubraMoore	75	154	120	135	-	115	125	-	113	110	100.5	99.7	115 a
BRS Fascínio	105	88	-	154	145	153	122.5	-	121.5	150	135	107	128 a
BRS Regalo	100	140	120	115	120	90	142	-	120	-	92	66	111 a
Chimarrita	86	125	105	124	110	99	125	-	125	153	151	130	121 a
BRS Sarau	-	-	93	103	78*	105	135	119	110	-	126.5	111.5	109 a
	Total soluble solids content (°Brix)												
BRS Kampai	13.9	11.8	9.7	11.3	11.6	-	-	11.2	14	-	9.3	13.9	11.4 b
BRS Rubimel	14.7	13.7	11.8	10.7	12.2	14.4	14.9	13	11.5	15.8	11.5	10.2	12.9 a
BRS Serenata	-	11.3	10.8	8.1	10.3	9.3	-	13	-	-	12.9	11.4	10.9 b
BRS RubraMoore	14.7	13.6	11.8	10	11.9	14.4	14.9	17	12.5	15	12.7	12.4	13.4 a
BRS Fascínio	13.9	12.7	-	10.9	13.1	12.4	14	15	11.4	12.5	14.4	11.5	12.9 a
BRS Regalo	14	10.2	11.2	13.1	11	13.8	14	-	12	-	14.7	8.7	12.3 a
Chimarrita	-	-	12.0	12.2	12.0	11.8	14.0	-	12.7	12.7	12.3	11.7	12.4 a
BRS Sarau	-	13.8	13.8	10.8	13.6	15.1	12.7	17.5	10.3	-	14.3	11	13.3 a
	Degree of production												
BRS Kampai	4.5	1	2	4	3	1.5	1.5	2	3	-	1.5	-	2.4
BRS Rubimel	5	4	1.5	2	3	1	1.5	-	4.5	-	-	-	2.8
BRS Serenata	-	1.5	-	3.5	3	4.5	-	5	3	-	3.5	-	3.4
BRS RubraMoore	3.5	3	3	3.5	4	1.5	0.5	2.5	-	2	-	4	2.7
Chimarrita	5	2.5	4	2	3	2.5	3	-	3.5	-	-	-	3.2
BRS Fascínio	5	3.5	2	1	4	2.5	3	3	-	-	-	2.5	2.9
BRS Regalo	5	4.5	4.5	-	5	3.5	-	-	-	-	-	-	4.5
BRS Sarau	2	2.5	2	-	5	4	2	4	-	-	-	2.5	3.0

* Data for the Chiripá cultivar are not presented because they were recorded prior to 2012. - Data not available. * Fruit thinning was not carried out in 2016, a year in which the degree of production was 5, which means an excessive fruit load, resulting in small size.¹ Scale from 1 to 5, where 1 is very low production, 3 is good production and requires little fruit thinning, and 5 is excessive production, requiring heavy fruit thinning. ² For analysis, the year was considered as a repetition, and the average for each year is based on samples collected from three plants. Means followed by distinct letters differ statistically by the Scott-Knott test ($p \leq 0.05$). Statistical analysis of the means was performed using the Rbio software (Bhering 2017).

should be grown in locations protected from winds, either due to the topography of the land or the use of windbreaks, once the spread occurs through water droplets carried by the wind (Ueno 2022).

The chilling requirement of 'BRS Sarau' is estimated to be 250 to 350 chilling hours (temperature ≤ 7.2 °C). However, with the use of chemical agents for dormancy break or for uniform flowering, this cultivar can be planted in locations with lower cold accumulation with excellent results, as has been observed in the Southeast region of Brazil.

REGISTER AND AVAILABILITY OF PLANTS

'BRS Sarau' was registered under number 49128 in the National Cultivar Registry (RNC) of the Brazilian Ministry of Agriculture (Ministério da Agricultura e Pecuária - MAPA), on 12/20/2021. EMBRAPA licensed nurseries, officially registered in the National Seed and Seedling Registry (RENASEM), through Public Offer Notice 15/2023 of plants of the cultivar. The list of the licensed nurseries to produce and sell plants of 'BRS Sarau' can be found at: Pêssego BRS Sarau - Embrapa Portal (<https://www.embrapa.br/busca-de-solucoes-tecnicas/-/produto-servico/10133/pessego-brs-sarau>).

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DATA AVAILABILITY

The datasets generated and/or analyzed during the current research are available from the corresponding author upon reasonable request.

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