‘Aguedilla’ Strawberry

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Abstract. Aguedilla is a short-day strawberry (*Fragaria × ananassa* Duch.) cultivar obtained by the Spanish public breeding program (Agreement CC01-0008-F1). ‘Aguedilla’ produces excellent extra-early, early, mid-season, and late-season large-sized, wedge-shaped fruit, and a low percentage of second quality fruit. An agronomic and sensorial characterization of this new cultivar, in comparison with the well-adapted cultivars ‘Camarosa’, ‘Medina’, and ‘Ventana’, was undertaken during the 2002–03 and 2003–04 crop seasons.

Despite the noteworthy position of Huelva, situated on the southwest coast of Spain, as a strawberry (*Fragaria × ananassa* Duch.) producing region in Europe, few local cultivars are grown; >85% of the cultivars in this area have been released by the University of California. However, since 1990, the growing economic and social significance of strawberry production has led public and private institutions in Spain to increase breeding efforts in an attempt to obtain new cultivars that are well-adapted to the growing conditions in Huelva and other areas of Spain. The short-day cultivars so far released by the Spanish public breeding program include ‘Andana’, ‘Carisma’, ‘Marina’, and ‘Medina’ (Bartual et al., 1997, 2002, 2004; López-Aranda et al., 2004, 2005).

‘Aguedilla’ is a new short-day cultivar recently released jointly by several Spanish public institutions, including the Spanish National

Agricultural Research Institute (INIA), The Andalusian Government (Junta de Andalucía) and the Instituto Valenciano de Investigaciones Agrarias (IVIA), as well as the private partners Fresas Nuevos Materiales S.A. (FNM) and the Asociación Española de Viveristas de Plantas de Fresa (AEVPF).

‘Aguedilla’ is noted for its high early and overall fruit yields; its comparatively higher

yield at the beginning and middle of the season, make it competitive with other cultivars currently used in the Huelva production area. ‘Aguedilla’ also shows excellent qualities for the fresh fruit market and adapts well to different agro-environments.

The name ‘Aguedilla’ comes from the well-known book *Platero y yo* (*Platero and I*) by the 1956 Nobel laureate for literature, Juan Ramón Jiménez, who was born in the strawberry production area of Moguer (Huelva). In this book, ‘Aguedilla’ is a poor, mad woman who gives out fruit and flowers (Jiménez, 1917).

Origin

‘Aguedilla’ was first selected in 1998 as 1-566, from a cross between ‘Camarosa’ and the IVIA breeding line RB-67-35 (‘Cartuno’ × ‘Vilanova’), produced in 1997, on the basis of their performance under local conditions. The female parent ‘Camarosa’ (U.S. Plant Patent no. 8708), released from the University of California (Voth et al., 1994), is a vigorous, early, short-day variety with a high production of large to very large firm fruit throughout most of its fruiting cycle. It is also very well-adapted to the Huelva area. ‘Aguedilla’ was propagated for performance evaluations at high-elevation nurseries in Castille-Leon, northeast Spain (900 to 1200 m altitude). Its clones were later evaluated together with other well-adapted cultivars, in a public experimental field at the strawberry production area of Moguer (Huelva).

Description

‘Aguedilla’ is a short-day cultivar. This cultivar has been described following the UPOV guidelines (UPOV, 1995). The plant is vigorous, with a globose to flat-globose growth habit, and a tendency to produce runners with low to medium anthocyanin coloration and medium pubescence. The leaves are slightly concave and very weakly blistering, with three medium-green glossy leaflets. The

Fig. 1. ‘Aguedilla’ strawberries.

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terminal leaflet is longer than its width, with an acute to obtuse base and crenate margins. Inflorescences are produced on long peduncles and are positioned at the foliage level. Flower size is medium and the calyx diameter is similar to the corolla. The corolla has five white petals longer than their width and which do not overlap. The berries (Fig 1), which have a regular wedge shape, are large, dark red on the outside, with medium-red flesh and a fairly conspicuous internal cavity. The fruit surface is even and achenes are inserted below the surface. The calyx is firmly attached to the fruit and its diameter is similar to that of the fruit. The fruit is tasty and pleasantly aromatic. Postharvest testing showed that 'Aguedilla' has a good shelf life, similar to 'Camarosa', a standard cultivar grown in southwestern Spain (data not shown). 'Aguedilla' is a productive cultivar with very high early and total yields of first quality fruit. Fruit ripening occurs early in the season.

Isozyme characterization of 'Aguedilla' through polyacrylamide gel electrophoresis (PAGE) with glucose-6-phosphate isomerase (PGI), leucyl aminopeptidase (LAP), and phosphoglucosomutase (PGM) isozyme systems (Gálvez et al., 2002) gave the following banding patterns according to nomenclature by Bringham et al. (1981): PGI:A2, PGM, C3-C4, and LAP:B3.

Performance

During the crop seasons 2002–03 and 2003–04, fruit production (Table 1) and quality (Table 2) of 'Aguedilla' were compared to three other well-adapted strawberry cultivars ('Camarosa', 'Medina' and 'Ventana') at the 'El Cebollar' public experimental field in the strawberry production area of Moguer. To reduce the presence of soil pathogens, the soil was solarized and biofumigated (Medina-Mínguez, 2002) before planting. During the last week of October of each year, plants were planted in three completely randomized plots of 70 plants each on two-row raised beds covered with black plastic. Plants were spaced 0.25×0.30 m apart. In mid-November plants were covered with large plastic (150 μ m) tunnels (6.6 m wide $\times$ 3.5 m high $\times$ 70 m long). Marketable (first plus second quality; both no misshapen fruit of ≥ 17 g and among 10 to 17 g respectively) fruit were harvested and weighed, once or twice a week, starting in early January. Individual fruit weight was calculated by dividing the total yield by the total number of harvested fruit. Three fruit per plot were evaluated three times throughout the cropping season (mid February, mid March, and mid May) for external and internal color, internal cavity size, firmness, and content of soluble solids. Color and cavity size were subjectively rated on a visual scale

(Table 2). Fruit firmness was determined using a penetrometer with a 3.5 mm tip, and the soluble solid content was measured using a refractometer (Domínguez et al., 2004). Data were subjected to analysis of variance using Statistix 8.0 software (Analytical Software, Tallahassee, Fla.) and means were separated at the 0.05 level using Fisher's least significant difference test or the Kruskal-Wallis comparison test (for subjective data). The percentage of second quality fruit was arcsine transformed prior to statistical analysis.

The yield and fruit quality of 'Aguedilla' in replicated trials are documented in Tables 1 and 2, respectively. 'Aguedilla' had similar early and total yields to other adapted cultivars. At the end of the two trial harvest periods, 'Aguedilla' produced an average of 853.8 and 978.2 g/plant, respectively, and a low percentage of second quality fruit. During the crop season 2002–03 the average fruit size was significantly smaller than 'Medina' but the same size as 'Camarosa' and 'Ventana'. During the second trial period, fruit size was the same size as for 'Medina'. Fully mature 'Aguedilla' fruit were medium red on the outside and orange-red to red on the inside, similar to the other cultivars. The size of the internal cavity in the fruit was quite conspicuous. The fruit firmness of 'Aguedilla' ranged from 316.1 to 367.4 g mm⁻¹ deflection. Firmness was lower than in fruit from 'Camarosa' during the 2002–03 test, but similar to all cultivars during the 2003–04 experimental period. The soluble solid content of 'Aguedilla' was similar to that of the other cultivars, and significantly higher than that of 'Medina' in the 2003–04 experiment.

'Aguedilla' and 'Camarosa' were also compared in a demonstration trial at Moguer during the 2003–04 season. In this experiment, a higher number of plants (165 of each cultivar) without replication was evaluated. Results indicated that both 'Camarosa' and 'Aguedilla' had a long harvest period and high total yield (1284 and 1335 g/plant, respectively). 'Aguedilla' had a higher yield at the beginning and middle of the season whilst at the end of the season 'Camarosa' had a higher yield (data not shown).

Resistance tests against *Phytophthora cactorum* (Lebert & Cohn), *Verticillium dahliae* Kleb. *Sphaerotheca macularis* Walls ex Fr. and *Colletotrichum acutatum* Simmonds indicated that 'Aguedilla' has a similar resistance as 'Camarosa' to all these pathogens and significantly more resistance to *P. cactorum* and *S. macularis* than 'Ventana' (De Cal et al., 2004).

Availability

The Andalusian Government (Junta de Andalucía), IVIA, INIA, AEVPF and FNM have jointly applied for an inscription in the Register of Commercial Strawberry Varieties (Spanish Plant Variety Office, application number 20030258) and for a Community Plant Variety Right (CPVO) in the EU territory. Parties interested in propagating this cultivar should contact Fresas Nuevos Materiales S.A., C/Chimborazo 26–3°C, 21006 Huelva, Spain; e-mail arefoyo@fresasnm.com.

Table 1. Fruit production of 'Aguedilla' vs. standard strawberry cultivars grown at Huelva, Spain, during the crop seasons 2002–03 and 2003–04.

Cultivar	Early yield ^a		Total yield		Wt/fruit (g/fruit)
	Marketable (g/plant)	Second quality (%)	Marketable (g/plant)	Second quality (%)	
2002–03					
Aguedilla	438 a ^b	5 b	854 a	14 a	26.2 bc
Camarosa	409 a	11 a	820 a	19 a	23.6 c
Medina	403 a	3 b	797 a	9 b	29.4 a
Ventana	453 a	9 a	874 a	15 a	26.4 b
2003–04					
Aguedilla	422 ab	6 b	978 a	10 b	29.1 a
Camarosa	383 ab	11 a	929 a	12 ab	25.6 ab
Medina	458 a	6 b	876 ab	9 b	29.2 a
Ventana	346 b	14 a	753 b	14 a	23.9 b

^aEarly yield = up to end of March.

^bWithin columns, means followed by different letters are significantly different at $P \leq 0.05$, as determined by Fisher's least significant difference test.

Table 2. Fruit quality of 'Aguedilla' vs. standard strawberry cultivars grown at Huelva (Spain) during the crop seasons 2002–03 and 2003–04.

Cultivar	External color ^a	Internal color ^a	Internal cavity size ^b	Firmness (g·mm ⁻¹)	Total sugar (°Brix)
2002–03					
Aguedilla	6.1 a ^x	5.0 a ^x	5.2 a ^x	367 b ^w	7.1 a ^w
Camarosa	5.8 a	5.4 a	5.4 a	414 a	7.3 a
Medina	5.4 a	4.6 a	3.4 b	338 c	7.0 a
Ventana	5.9 a	4.6 a	4.3 ab	357 bc	7.2 a
2003–04					
Aguedilla	6.4 ab	5.2 a	4.8 a	316 ab	7.4 a
Camarosa	6.7 a	5.4 a	4.1 a	345 a	7.8 a
Medina	5.6 b	3.9 a	3.4 a	293 b	6.8 b
Ventana	6.3ab	4.3 a	3.9 a	316 ab	7.7 a

^aRated on a scale from 1 to 9, where 1 = light red and 9 = deep red.

^bRated on a scale from 1 to 9, where 1 = absent and 9 = large internal cavity.

^xWithin columns, means followed by different letters are significantly different at $P \leq 0.05$, as determined by the Kruskal-Wallis comparison test.

^wWithin columns, means followed by different letters are significantly different at $P \leq 0.05$, as determined by Fisher's least significant difference test.

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