'Medina' Strawberry

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Additional index words. *Fragaria × ananassa*, fruit breeding, cultivar

Abstract. Public and private institutions in Spain are increasing strawberry (*Fragaria × ananassa* Duch.) breeding efforts to obtain new strawberry cultivars well-adapted to growing conditions in Huelva and other Spanish areas, such as Valencia on the eastern Spanish coast. The new 'Medina' is a short-day cultivar that is remarkable for its high production of first quality fruits, and large fruits. 'Medina' has also an appropriate harvest calendar for the economic interest of the Huelva area.

Public and private institutions in Spain are increasing strawberry (*Fragaria × ananassa* Duch.) breeding efforts to obtain new strawberry cultivars well-adapted to growing conditions in Huelva and other Spanish areas, such as Valencia on the eastern Spanish coast (Bartual et al., 1997, 2002; López-Aranda and Bartual, 2001). Among those, the Spanish National Agricultural Research Institute (INIA), the Andalusian Government (Junta de Andalucía), the Instituto Valenciano Investigaciones Agrarias (IVIA), and Viveros California, S.L., have been involved in a plant breeding program to obtain and release new cultivars with high yield, early or extra-early production, large fruit size, easy picking, and high fruit quality. One of the results from this breeding program is 'Medina'. The new 'Medina' is a short-day cultivar that is remarkable for its high production of first quality fruits, and large fruits. 'Medina' has also an appropriate harvest calendar for the economic interest of the Huelva area.

This new cultivar was named 'Medina' in memory of Antonio Medina Lama, who introduced in 1964 new technologies and varieties from California allowing the economical and social development of the strawberry in Huelva.

Origin

'Medina' strawberry was selected in 1994 from a 'Z-45' × 'Parker' cross (Fig. 1) made in I.F.A.P.A.–C.I.F.A. (Málaga), and tested as

selection 4-129. The female parent 'Z-45' is a hybrid between the Israeli selection I-104 and 'Vilanova', an early Spanish cultivar developed by I.V.I.A. (Valencia) and released in 1990 (Bartual, 1992). 'Parker', a very firm variety developed by the University of California, was used as the male parent.

Since 1995, 'Medina' was propagated at high-elevation nurseries in Arévalo at Avila, northeast Spain (900 m altitude), and its clones were evaluated in a public field at Moguer, (Huelva).

Description

'Medina' is a short-day strawberry cultivar. Plants are vigorous and compact, with globose growth habit and tendency to produce numerous runners with low anthocyanin coloration and weakly expressed pubescence. The leaves are concave and weakly blistering with three green to dark-green glossy leaflets. The terminal leaflet is equal in length and width with an acute 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 than the corolla. The corolla has five white petals, as long as broad, that overlap. Fruits are moderately firm, mostly large conical-bi-conical in shape, and slightly longer than broad. Fruit size is very large (>25 g) and constant throughout the fruiting season, except during the last month when it decreases. External color of fully mature fruit is red and slightly glossy (Fig. 2). The flesh color is orange red to red, and the internal cavity is fairly conspicuous. The fruit surface is even and achenes are inserted below the surface. The calyx is firmly attached to the fruits and is slightly larger than the diameter

of the fruit. The fruit has long pedicels, which make harvesting easier.

'Medina' is a productive cultivar with a high total yield and first quality fruit production. Flowering and ripening occur early in the season. An outstanding aspect of 'Medina' is its low tendency to form misshapen fruits.

Isozyme characterization of 'Medina' through polyacrylamide gel electrophoresis (PAGE) with glucose-6-phosphate isomerase (PGI), leucyl aminopeptidase (LAP) and phosphoglucosmutase (PGM) isozyme systems gave the following banding patterns (according to nomenclature by Bringham et al. 1981) - PGI: A3; PGM: C3; and LAP: B1-B2.

Performance

Fruit production and quality of 'Medina' was compared to eight other strawberry cultivars at four sites, Moguer, Cartaya, Lucena del Puerto, and Almonte, in Spain's Huelva region. To reduce the presence of soil pathogens, soil at Moguer was solarized plus biofumigated (Medina-Mínguez, 2002) prior to planting, while soil at the other sites were fumigated with 50% methyl bromide and 50% chloropicrin at a rate of 40 g·m⁻². At the end of October 2002, each cultivar was planted in three completely randomized plots of 100 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 by large plastic tunnels (6.6 m wide × 3.5 m high × 70 m long) at Moguer and small plastic tunnels (0.7 m wide × 0.6 m high × 70 m long) at the other sites. Marketable fruits were harvested and weighed, one to two times per week, starting in early January. Individual fruit weight was calculated (at Moguer only) by dividing the total yield by the total number of harvested fruit. Three to six fruit per plot were evaluated at each harvest for external and internal color, internal cavity size, firmness, and (only at Moguer) soluble solids content. Color and cavity size were subjectively rated on a visual scale (Table 1). Fruit firmness was determined using a penetrometer with a 3.5-mm tip, and soluble solid content was measured

Fig. 1. Pedigree of 'Medina' strawberry.

Fig. 2. Fruit of 'Medina' strawberry.

Received for publication 24 June 2004. Accepted for publication 2 Sept. 2004. The research was funded by INIA Research Projects Nos. SC94-033 and SC98-035.

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Table 1. Marketable yield and fruit quality of 'Medina' and eight other strawberry cultivars grown at four locations in Huelva, Spain, during 2002–03.

Location	Cultivar	Marketable yield (g/plant)	Second quality yield (%)	Individual fruit wt (g/fruit)	External fruit color ^z	Internal fruit color ^z	Internal cavity size ^y	Soluble solid (°Brix)	Fruit firmness (g·mm ⁻¹)
Moguer	Candonga	783 a ^x	10.8 b ^x	23.2 de ^x	5.4 ^w	3.8 ab ^w	3.2 b ^w	9.4 ab ^x	428 a ^x
	Ventana	777 a	14.6 a	27.5 ab	6.0	4.6 ab	3.9 ab	7.2 b	377 c
	Camarosa	776 a	15.4 a	26.0 bc	6.3	5.4 ab	5.2 ab	8.3 ab	447 a
	Carisma	734 a	15.2 a	25.0 cd	5.6	2.8 b	4.1 ab	7.7 ab	423 ab
	Naiad	709 a	13.9 a	25.0 c	6.1	5.4 ab	5.9 a	8.8 ab	374 cd
	Medina	685 a	7.7 c	28.3 a	5.6	3.9 ab	4.3 ab	7.6 ab	347 d
	Chiflón	664 a	10.5 b	24.5 cde	5.7	3.9 ab	5.0 ab	9.8 ab	348 d
	C. Real	439 b	15.3 a	23.0 e	6.4	6.6 a	5.2 ab	7.2 b	399 bc
	Tudnew	410 b	14.0 a	25.0 c	6.3	5.4 ab	3.9 ab	10.3 a	429 a
Cartaya	Candonga	842 b	6.7 ab	---	5.3	5.2	4.6 ab	---	535 a
	Ventana	1090 a	5.6 ab	---	5.7	5.7	4.3 ab	---	448 bc
	Camarosa	947 b	5.5 ab	---	6.1	5.9	5.2 ab	---	446 bc
	Carisma	757 cd	6.1 ab	---	5.3	4.1	5.4 ab	---	486 ab
	Naiad	768 cd	7.4 ab	---	5.7	4.8	6.1 a	---	456 bc
	Medina	801 c	4.8 bc	---	5.2	5.0	3.7 b	---	460 bc
	Chiflón	758 cd	8.9 a	---	6.0	6.1	5.0 ab	---	404 c
	C. Real	692 d	2.6 c	---	6.7	6.8	5.7 ab	---	428 bc
	Tudnew	478 e	8.9 a	---	6.6	6.8	4.6 ab	---	454 bc
L. Puerto	Candonga	956 bc	5.7 cd	---	5.3	4.9	5.0	---	385 abc
	Ventana	1232 a	6.6 cd	---	5.9	4.6	5.0	---	388 abc
	Camarosa	1087 ab	8.4 bc	---	6.4	3.9	4.1	---	430 a
	Carisma	1032 abc	12.0 b	---	6.1	3.7	5.0	---	381 bc
	Naiad	938 bc	9.1 bc	---	5.9	4.6	4.8	---	388 abc
	Medina	891 bc	5.9 cd	---	5.9	4.6	4.6	---	402 abc
	Chiflón	965 bc	5.7 cd	---	5.6	4.0	5.2	---	367 c
	C. Real	819 c	4.1 d	---	6.4	4.3	5.0	---	422 ab
	Tudnew	270 d	21.3 a	---	6.0	4.1	4.8	---	429 a
Almonte	Candonga	717 ab	6.6 a	-	5.6	3.7	4.8	---	367 ab
	Ventana	812 a	5.8 a	---	5.7	3.9	5.0	---	347 abc
	Camarosa	730 ab	5.9 a	---	6.4	4.8	4.8	---	381 a
	Carisma	713 ab	7.8 a	---	5.9	3.2	5.2	---	379 a
	Naiad	730 ab	5.9 a	---	6.0	3.7	5.2	---	356 abc
	Medina	832 a	5.8 a	---	5.7	3.3	5.0	---	332 bc
	Chiflón	651 b	7.4 a	---	5.9	3.9	4.8	---	322 c
	C. Real	723 ab	8.7 a	---	6.7	5.0	5.2	---	372 ab
	Tudnew	640 b	7.1 a	---	6.0	4.1	4.8	---	349 abc

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

^yRated on a scale from 1 to 9, where 1 = absent and 9 = large internal cavity along the fruit.

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

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

using a refractometer. Data from each site 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). Percentage of second quality fruit was arcsine transformed before statistical analysis.

The performance of 'Medina' in replicated trials is documented in Table 1. 'Medina' had similar yields to other adapted cultivars at the four sites. It produced an average of 802 g per plant and a remarkably low percentage of second quality fruit. Its average fruit size was significantly larger than all other cultivars except 'Ventana'. 'Medina' fully mature fruit displayed external medium red color, while internal color tended to be more variable ranging from orange red to red. Internal cavity in the fruit was fairly conspicuous. Its size was the same than the size of other cultivars, but significantly larger than 'Candonga' at Moguer, and 'Naiad' at Cartaya. The soluble solid content of 'Medina' was similar to those for the others cultivars. 'Medina' fruit firmness ranged from 332 to 460 g·mm⁻¹ of deflection, a halfway value among firmness observed in fruit from other cultivars.

'Medina' performance was more specifically compared with 'Camarosa' in a complete randomized block design with three replications at Moguer in 1999–2000 and 2000–01. In 1999–2000 'Medina' showed higher marketable yield ($P < 0.05$) and lower percentage of second quality fruit yield ($P < 0.05$) than those of 'Camarosa', while in 2000–01 marketable yield and percentage of second quality fruit yield were statistically similar between 'Medina' and 'Camarosa' over the course of the fruiting season (data not shown).

Susceptibility of 'Medina' to powdery mildew (*Sphaerotheca macularis* Walls ex Fr.) and to the two-spotted spider mite (*Tetranychus urticae* Koch) was low at each field site during growing seasons, and 'Medina' appears to be less susceptible to *Verticillium* sp. and *Phytophthora cactorum* (Lebert & Cohn) Schröter than 'Camarosa'.

Availability

Junta de Andalucía, IVIA, INIA, and Viveros California, S.L. have jointly applied for an inscription in the Register of Strawberry Commercial Varieties (Spanish Plant Variety Office, application number 2002/364) and for a Community Plant Variety Right (CPVO) in

the EU territory. Parties interested in propagating this cultivar should contact Viveros California, S.L., Paseo de las Delicias 5-4°, 41001 Sevilla, Spain.

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