Romina and Cristina: two new strawberry varieties for the European and USA market

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The strawberry breeding program of Marche Polytechnic University (Ancona, IT) started in 1993 thanks to the contribution of the national project supported by the Italian Ministry of Agriculture. In 20 years of breeding and evaluation activities were released 4 cultivars showing interesting agronomic characteristics associated with high adaptability to open field cultivation in climatic conditions from the mid Adriatic to the Center-North of Europe and with high tolerance to limestone and clay type soils as well as to the major strawberry diseases. The first 2 cultivars ('Adria' and 'Sveva') were released in 2003 (Capocasa et al., 2004), both showing interesting agronomic characteristics associated with high adaptability to not fumigated soil and to different culture conditions. Two new varieties ('Romina' and 'Cristina') were released in 2011 and their major traits are following described.

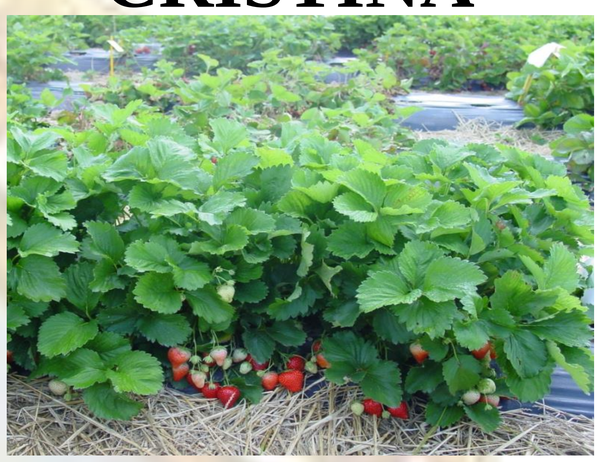
The propagation license of all varieties is given to following two companies: Hargreaves Plant (Master License) and Newfruit (Exclusive License for Italy and Poland).

ROMINA

EU - File number 2011/1275
June bearing variety, with high adaptability to not fumigated soil. Very early ripening. Fruit conic or bi-conic shape. Good sweet taste (high sugar and low acidity). High firmness and shelf life. High fruit nutritional quality determined by high polyphenol, anthocyanin, vitamin C and Folate contents (Tulipani et al., 2008).

The varieties were selected at the "P. Rosati" Experimental Farm (43°31'N 13°36'E. 46 m altitude), on non-fumigated soil, having the following main characteristics: pH 7.9, active calcium 9% and texture composed at 40% clay, 25% sand and 35% silt. Experimental plots (1 repetition for first level selections – 4 repetitions for advanced selections) are consisting of 10 plants growing in standard cultivation conditions with plastic film mulched double row (30 cm distance between plants, 1.5 m between rows), on raised bed, with drip irrigation. After the release the varieties were tested at least in 10 different locations in centre and north of Europe.

CRISTINA



EU - File number 2011/1274)
June bearing variety, with high adaptability to not fumigated soil. Very late ripening (Florence time).
Very high productivity. Large Fruit (35 g FW) of conical shape. Good taste.

CVS	N° years	Precocity Index	Berry Weight (g)	Commercial/plant (g)	Total Yield/plant (g)	% Waste/T. Yield	Sugar Content (°Brix)	Tritatable Acidity (meqNaOH/100g)	Penetrometer (g/N) star probe 6mm	Total Antioxidant Content TAC (mmolTE/kg FW)	TPH (mgGA/kg FW)	ACY (mgPEL-3-GLU/kg FW)	VIT C mg Ascorbic Acid/100 g FW	Folic Acid ug/100g	Total flavonols	Ellagic Acid	5-methyltetraidrofolic acid ug/100g	folicic acid calcium salt hydrate ug/100g
Romina	3	137	18,1	638	831	23,1	7,7	10,1	494	13,5	1474	427	38,5	40	58,7	18,5	6,84	122,8
ADRIA	3	151	30,3	1110	1451	23,6	6,4	11,2	427	17,0	1591	289	40,1	19	30,8	19,2	5,29	23,6
SVEVA	3	153	23,1	539	767	29,8	6,8	13,4	396	21,6	2177	385	37,7	21	38,3	32,1	7,79	106,1
CRISTINA	3	154	33,4	910	1094	16,9	7,6	11,2	310	12,9	1140	249	46,7		56,7	29,3	5,89	237,9

Production, sensorial and nutritional quality of Ancona's 4 varieties (average value years 2010-2011-2012). IP: precocity index. FW: fresh weight. TP: total production (g/plant). M%T: marketable fruit over total production (%). SS: soluble solids (°Brix). TA: total acidity (mEq NaOH/100g). TAC: Total antioxidant capacity (mmolTE/kgFw); TPH: Total Phenol content (mg GA/kg FW); ACY: Antocyanin content (Pel-3-Glu mg/Kg).

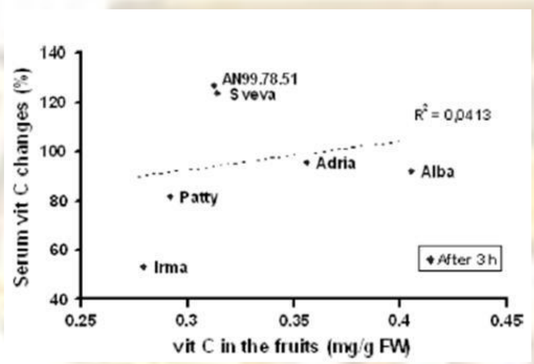
The new out coming varieties 'Cristina' and 'Romina' are of interest for their early (Romina) and late (Cristina) production and also for their fruit quality, while 'Romina ' also differs for high content of nutritional bioactive compounds and fruit shelf-life. In general, all this material is also combining high adaptability to non fumigated and chalky soil. The main nutritional traits of 'Romina' are the high contents of vitamin C (in 100g of fresh fruit there is 33% of daily demand for the male diet) and folates (in 100g of fresh fruit there is 10% of daily demand for the male diet). Tests performed on volunteers showed the high capacity of 'Romina' fruit to increase serum accumulation of vitamin C. Furthermore, 'Romina' fruit are rich in flavonols (Diamanti et al., 2014). The high concentration of flavonols and other phytochemicals can be responsible of the higher colour stability of pasteurized puree from 'Romina' fruit.

Table 1. Folic acid and vitamin C content of UPM varieties and relative RDA for adults (men/women).

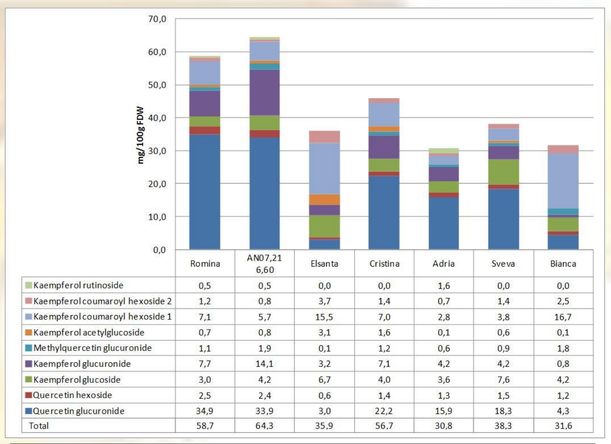
Genotype	Folic Acid (µg/100 g FW)	RDA* Folic acid	Vitamin C (mg/100g FW)	RDA* Vitamin C
SVEVA	21	5%	30	33%
ADRIA	19	5%	38	42%
ROMINA	40	10%	31	33%

*Office of dietary supplements, National institute of health, (http://ods.od.nih.gov/)

For vitamin C 'Romina' and the other 2 varieties could be claimed for a 'significant amount' of recommended daily allowance in 100 g (the minimum is 15%).

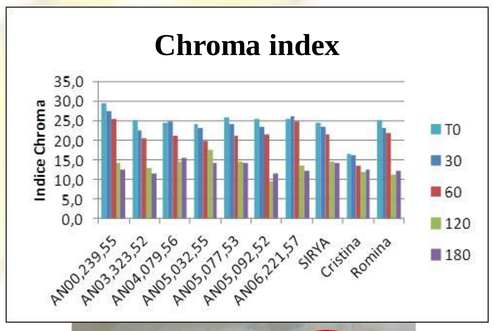


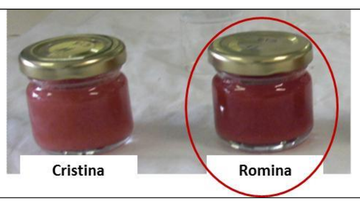
'Romina' (here as AN99.78.51) high content of vitamin C has been proven able to increase vitamin C content of blood serum of volunteers fed with 500g of fresh strawberries.



	Romina	AN07.21 6,60	Elsanta	Cristina	Adria	Sveva	Bianca
Kaempferol rutinoside	0,5	0,5	0,0	0,0	1,6	0,0	0,0
Kaempferol coumaroyl hexoside 2	1,2	0,8	3,7	1,4	0,7	1,4	2,5
Kaempferol coumaroyl hexoside 1	7,1	5,7	15,5	7,0	2,8	3,8	16,7
Kaempferol acetylglucoside	0,7	0,8	3,1	1,6	0,1	0,6	0,1
Methylquercetin glucuronide	1,1	1,9	0,1	1,2	0,6	0,9	1,8
Kaempferol glucuronide	7,7	14,1	3,2	7,1	4,2	4,2	0,8
Kaempferol glucoside	3,0	4,2	6,7	4,0	3,6	7,6	4,2
Quercetin hexoside	2,5	2,4	0,6	1,4	1,3	1,5	1,2
Quercetin glucuronide	34,9	33,9	3,0	22,2	15,9	18,3	4,3
Total	58,7	64,3	35,9	56,7	30,8	38,3	31,6

'Romina' fruit is rich of other flavonols (mainly quercitine) well know for their role in human health. Data from JHI – UK.





Color stability of 'Romina' purée after 180 days of refrigeration storage.

CONCLUSIONS

Thanks to the collaboration started with Hargreaves Plants (UK) and Newfruit (IT), 'Romina' and 'Cristina' are now commercially grown for late and very late production in different strawberry cultivation areas of Central and Northern EU countries. In the future they will also be introduced into the US market following their recent protection with plant patents under the US patent system.

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