



Identification and bio-agronomical study of seven biotypes of Azarole (*Crataegus azarolus* L.)



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Materials and methods

The present study aims at observing and identifying both botanical and bio-agronomical differences existing among seven ecotypes of Azarole (*Crataegus azarolus* L.) which are to be found in the province of Bari. Prospecting studies (1981-82) were carried out in order to identify the local biotypes of the above mentioned province.

In 1984 the most significant biotypes, grafted onto local Hawthorn (*Crataegus oxyacantha* L.), were planted in the Agricultural Experimental Station "P. Martucci", connected to the Department of Plant Production Science - University of Bari. The biotypes studied were given the names of their places of origin. The description of both botanical and bio-agronomical peculiarities was carried out thanks to the observation, the measurement and a multiannual determination of parameters which took into consideration branches, foliage, flowers and fruits.

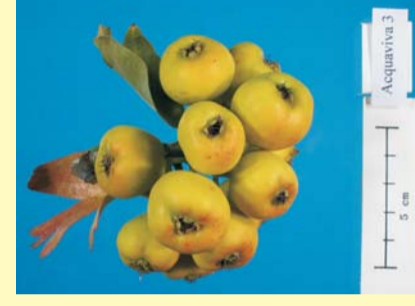
The three samples observed were all placed at medium height and consisted of both fruiting and vegetative branches; they were ranked on the basis of their colour, density of their lenticels and occurrence of thorns. The leaves were analysed following the diagram represented in figure 1. A group of 20 inflorescences was estimated by number of flowers, shape of the petals, occurrence of lower extremities of the petals, width of the corolla, colour of petals and sepals and number of styles. Furthermore a phenogram of the blossoming process was drawn for each biotype (tab.1).

During the years 2003/2004 the fruit set percentage by open and self-pollination was verified by bagging 3 fruiting branches. At ripening time, the pomological characteristics of the fruits were observed on 50 pomes per ecotype. Eventually, the content of soluble solids (°Brix) and the Titrable Acidity (gr/L of pomalous acid) were determined.

Results: here follow the descriptive tables of the seven ecotypes analysed in the present study.

ACQUAVIVA 3

Fruit set = 68.8% by open pollination; 30.3% by self-pollination. Ripening time: first ten days of August. Soluble Solids 7.20 °Brix; Titrable Acidity (pomalous acid) = 0.89 gr/L.



- Fruit**
Shape: globoid.
Equatorial section: oval.
Longitudinal section: asymmetrical.
Fruit peel: smooth surface without russetting and lenticels; yellow-greenish background colour, red-striated on its overexposed part to the sun.
Stalk: medium.
Stalk cavity: existing, but only slightly marked.
Flesh colour: white.
Fruit size: average height 2.2 cm; width 2.39 cm; thickness 1.98 cm; flesh thickness 0.6 cm; average weight 6.07 gr., 2-3 seeds per fruit.

- Flower**
Average number of flowers per umbel: 15; average corolla width: 2.27 cm with 3 styles per flower. White petals presenting lower extremities; yellow-greenish sepals.



- Leaf**
Continuous margin of the first lobe, average length of the leaf stalk = 0.97 cm for the foliage of the fruiting branches and = 1.37 cm for the leaves of the vegetative ones. Average width of the foliage of fruiting branches = 4.40 cm and larger foliage = 5.43 cm on the vegetative ones. Length of the entire leaf of the fruiting branches = 6.37 cm and = 9.10 cm on vegetative branches. Length/width ratio of the first leaf lobe = 2.18 on fruiting branches and = 3.18 on vegetative branches.



- One-year shoots:** silky and light brown after lignification; medium quantity of white lenticels.

CORATO

Fruit set = 73.30% by open pollination; 55.80% by self-pollination. Ripening time: last ten days of August. Soluble solids 16.5 °Brix; Titrable Acidity (pomalous acid) 1.2 gr/L.



- Fruit**
Shape: globoid.
Equatorial section: circular.
Longitudinal section: asymmetrical.
Fruit peel: rough surface without russetting and lenticels; background colour light yellow.
Pedicel: short.
Pedicel Cavity: existing and marked.
Flesh colour: white.
Fruit size: average height 2.16 cm; width 2.34 cm; thickness 1.97 cm; flesh thickness 0.71 cm; average weight 8.53 gr., 2 seeds per fruit.

- Flower**
Average number of flowers per umbel 12; average corolla width 1.83 cm and 2-3 styles per flower. Yellow-greenish petals presenting lower extremities; white sepals.



- Leaf**
Continuous margin of the first lobe, average length of the leaf stalk = 0.70 cm for the foliage of the fruiting branches and = 0.87 cm for the leaves of the vegetative ones. Average width of the leaves = 4.20 cm for both vegetative and fruiting branches. Foliage length on the fruiting branches = 6.70 cm and = 8.50 cm on the vegetative ones. Length/width ratio of the first leaf lobe = 2.69 on fruiting branches and = 3.22 on the vegetative ones.



- One-year shoots:** silky and light brown after lignification; unremarkable quantity of whitish hazel-brown lenticels.

SANTERAMO 3

Fruit set = 74.60% by open pollination; 46.40% by self-pollination. Ripening time: first ten days of September; Soluble solids 15.60 °Brix. Titrable Acidity (pomalous acid) 1.2 gr/L.



- Fruit**
Forma: subglobose
Equatorial section: oval.
Longitudinal section: symmetrical.
Fruit peel: smooth surface presenting russetting near the calyx cavity; occurrence of unremarkable lenticels; background colour greenish yellow, red-striated on its overexposed part to the sun.
Stalk: medium.
Stalk cavity: not existing.
Flesh colour: white.
Fruit size: average height 2.33 cm; width 2.35 cm; thickness 1.77 cm; flesh thickness 0.63 cm; average weight 7.09 gr., 2 seeds per fruit.

- Flower**
Average number of flowers per umbel 14; average corolla width 2.18 cm and 2-3 styles per flower. White petals with lower extremities, greenish-yellow sepals.



- Leaf**
Irregular margin of the first lobe with two denticles, average length of the leaf stalk = 0.87 cm for the foliage of the fruiting branches and = 1.23 cm for the leaves of the vegetative ones. Average width of the foliage of fruiting branches = 5.07 cm and = 5.80 cm on the vegetative ones. Length = 6.97 cm for the foliage on the fruiting branches and = 10.13 cm for leaves on the vegetative ones. Length/width ratio of the first leaf lobe = 2.99 for the foliage of the fruiting branches and = 2.94 for those of the vegetative ones.



- One-year shoots:** very silky and light brown after lignification; low number of whitish hazel-brown lenticels.

MODUGNO 1

Fruit set = by open pollination 65.30% and = 64.20% by self-pollination. Ripening time: last ten days of August. Soluble solids 12.00 °Brix. Titrable Acidity (pomalous acid) 1.3 gr/L.

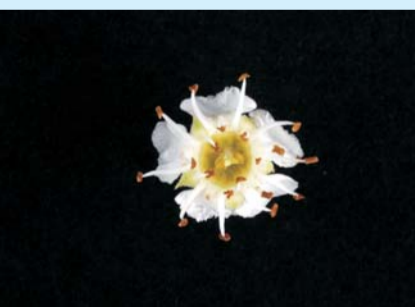


- Fruit**
Shape: subglobose.
Equatorial section: slightly marked pentagonal shape.
Longitudinal section: symmetrical.
Fruit peel: smooth surface presenting russetting near the calyx cavity; absence of lenticels; background colour greenish yellow, red-striated in its overexposed part to the sun.
Stalk: medium.
Stalk cavity: not existing.
Flesh colour: white.
Fruit size: average height 1.78 cm; width 1.85 cm; thickness 1.67 cm; flesh thickness 0.56 cm; average weight 7.86 gr., 2-3 seeds per fruit.

- Flower**
Average number of flowers per umbel 12, corolla width 1.87 cm and 2-3 styles per flower. Greenish yellow petals presenting lower extremities; white sepals.



- Leaf**
Continuous margin of the first lobe; average length of the leaf stalk = 1.67 cm for the foliage of the fruiting branches and = 0.70 cm for the leaves of the vegetative ones. Average width of the foliage of fruiting branches = 6.27 cm and = 4.10 cm on the vegetative ones. Length of the entire leaf = 10.27 cm on fruiting branches and = 7.37 cm on the vegetative ones. Length/width ratio of the first leaf lobe = 2.94 in the fruiting branches and = 3.15 in the vegetative ones.



- One-year shoots:** silky and light brown after lignification; medium-low number of whitish hazel-brown lenticels.

MODUGNO 2

Fruit set = 32.90% by open pollination and = 20.80% by self-pollination. Ripening time: second ten-days of September. Soluble solids 18.0 °Brix. Titrable Acidity (pomalous acid) = 0.26 gr/L.

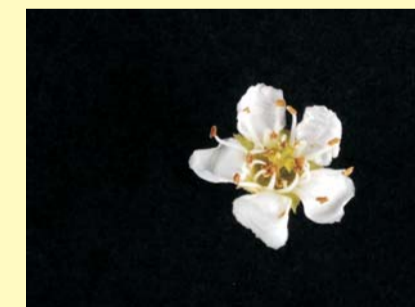


- Fruit**
Shape: globoid.
Equatorial section: circular.
Longitudinal section: symmetrical.
Fruit peel: smooth surface presenting russetting and absence of lenticels; background colour greenish yellow.
Stalk: long.
Stalk cavity: existing, but only slightly marked.
Flesh colour: white.
Fruit size: average height 2.22 cm; width 2.74 cm; thickness 2.23 cm; flesh thickness 0.77 cm; average weight 6.62 gr., 2-4 seeds per fruit.

- Flower**
Average number of flowers per umbel 12; width of the corolla 1.96 cm and 2-3 styles per flower. White petals presenting lower extremities; greenish yellow sepals.



- Leaf**
Continuous margin of the first lobe; average length of the leaf stalk = 1.68 cm for the foliage on the fruiting branches and = 0.70 cm on the vegetative ones. Average width of the leaves on the fruiting branches = 4.12 cm and = 6.10 cm for those of the vegetative ones. Length of the entire leaf = 7.57 cm for the foliage of the fruiting branches and = 10.37 cm for those on the vegetative ones. Length/width ratio of the first leaf lobe = 1.94 in the foliage of the fruiting branches and = 1.75 in the vegetative ones.



- One-year shoots:** slightly silky and light brown after lignification, unremarkable number of whitish hazel-brown lenticels.

SANTERAMO 2

Fruit set = 56.00% by open pollination; 7.80% by self-pollination. Ripening time: last ten days of September. Soluble solids 10.60 °Brix. Titrable Acidity (pomalous acid) = 0.93 gr/L.



- Fruit**
Shape: globoid.
Equatorial section: oval.
Longitudinal section: symmetrical.
Fruit peel: smooth surface presenting russetting and absence of lenticels; background colour light yellow, orange-striated in its overexposed part to the sun.
Stalk: medium.
Stalk cavity: existing.
Flesh colour: white.
Fruit size: average height 2.19 cm; width 2.19 cm; thickness 1.99 cm; flesh thickness 0.83 cm; average weight 11.70 gr., 2 seeds per fruit.

- Flower**
Average number of flowers per umbel 14, corolla width 2.16 cm, 2 styles per flower. White petals presenting lower extremities, greenish-yellow sepals.



- Leaf**
Continuous margin of the first lobe, average length of the leaf stalk = 0.75 cm for the foliage of the fruiting branches and = 1.05 cm for those on the vegetative ones. Average width of the leaves on the fruiting branches = 4.80 cm and = 4.20 cm on the vegetative ones. Length of the entire leaf of the fruiting branches = 7.20 cm and = 7.80 cm for the vegetative ones. Length/width ratio of the first leaf lobe = 4.10 for the leaves of the fruiting branches and = 3.5 for the vegetative ones.



- One-year shoots:** silky and light brown after lignification. Medium-high number of whitish hazel-brown lenticels.

SANTERAMO 1

Fruit set = 27.70% by open pollination and = 11.30% by self-pollination. Ripening time: first ten days of September. Soluble solids 12.20 °Brix. Titrable Acidity (pomalous acid) 0.46 gr/L.

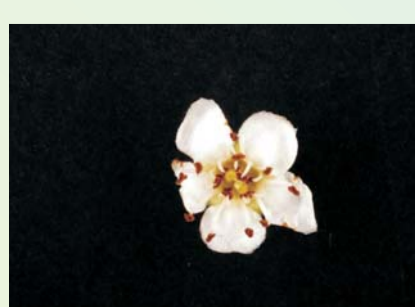
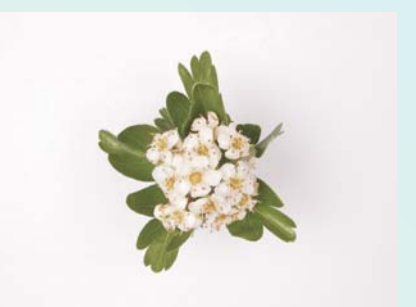


- Fruit**
Shape: globoid.
Equatorial section: circular.
Longitudinal section: symmetrical.
Fruit peel: rough surface without russetting and lenticels; background colour greenish-yellow with an orange foreground shade covering 50-60% of the whole surface.
Stalk: medium.
Stalk cavity: existing, but only slightly marked.
Flesh colour: white.
Fruit size: average height 1.71 cm; width 1.87 cm; thickness 1.80 cm; flesh thickness 0.59 cm; average weight 5.57 gr., 2 seeds per fruit.

- Flower**
Average number of flowers per umbel 14, corolla width 2.05 cm, 2 styles per flower. White petals presenting lower extremities; greenish yellow sepals.

- Leaf**
Continuous margin of the first lobe, average length of the leaf stalk = 0.52 cm for the foliage of the fruiting branches and = 1.50 cm for those on the vegetative ones. Average width of the leaves on the fruiting branches = 4.10 cm and = 3.80 cm for the leaves on vegetative ones. Length of the entire leaf of the fruiting branches = 6.40 cm and = 9.10 cm on the vegetative ones. Length/width ratio of the first leaf lobe = 2.06 in the foliage of the fruiting branches and = 2.80 on the vegetative ones.

- One-year shoots:** silky and light brown after lignification; medium-low number of whitish hazel-brown lenticels.



Tab.1: fenogrammi di fioritura dei biotipi in studio

ecotipo	Aprile							Maggio							Durata giorni 5-80% (n)
	15	20	25	30	05	10	15	20	25	30	05	10	15		
Acquaviva 3															8
Corato															7
Santeramo 3															12
Modugno 1															10
Modugno 2															9
Santeramo 2															6
Santeramo 1															10