ANNALS OF THE UNIVERSITY OF CRAIOVA

Series: ✓*Biology*
✓*Horticulture*
✓*Food products processing technology*
✓*Environmental engineering*

Vol. XXX (LXVI) - 2025

ALMOND CULTIVARS RELEASED AT RESEARCH STATION FOR FRUIT GROWING CONSTANȚA

Gavat Corina[1, 2]*, Nistor Mihaela[1], Miron Liliana[2], Lămureanu Gheorghe[1], Stroe Traian Ciprian[2]

[1]Research Station for Fruit Growing Constanta, No. 25 Pepinerei Street, 907300, Valu lui Traian, Constanța, Romania

[2]Ovidius University Constanta, Campus, No. 1 University Alley, Building B, Constanta, Romania

* *Correspondence author. E-mail*: corina_gavat@yahoo.com

Keywords*: Prunus amygdalus, kernel, phenology, yields, total lipids (%)*

ABSTRACT

The aim of this work was to highlight as 'Veronica' and 'Mirela' cultivars released at Research Station for Fruit Growing Constanta (RSFG Constanta) are corresponding to the current climatic conditions and they can assure the market requirements. There were studied including the main phenophases, the yield per tree, the average weight of the fruit, the percentage of core/shell, total lipids, etc. The control was the 'Ferragnes' that is widely used in the world as one of the main cultivars. It seems as planting almonds in south-eastern part of Romania is a very reasonable alternative culture, due to the following aspects: the temperatures of the last fifteen days of March are normally suitable for the processes of pollination; spring and summer temperatures are suitable for tree growth and fruit ripening. It is very important to highlight that there are late flowering new cultivars that reduce the risk of frost. 'Veronica' and 'Mirela' enrich and diversify the assortment; they have late flowering, early fruit ripening from the 3rd decade of August- the 1st decade of September and, from the 1st and 2nd decade of September respectively and good yields.

INTRODUCTION

The almond tree is among the oldest cultivated fruit trees around the world (Cociu, 1954). Highly appreciated in many countries of the world, it is cultivated primarily for its fruits, whose sweet core contains protein substances, fatty substances, carbohydrates, vitamins, minerals, etc. (Gradzie & Gomez, 2012), beneficial for human health. Almond kernels are highly valued for their nutritional properties and can be consumed raw, roasted, or incorporated into a variety of recipes (Gradziel, 2009). They are generally regarded as a healthy snack, rich in unsaturated fats, protein, and vitamins, and are associated with positive effects on metabolic health. Additionally, almonds are naturally salt-free and low in sugar (https://www.almonds.com/why-almonds/health-benefits/nutritional-facts).

Globally, in 2023 the area occupied by almond trees was 2,322,067 ha, and the production shelled almonds recorded 3,513,970.31 tons (source: https://www.fao.org/faostat/en/#data/QCL).

The main producing countries are the USA (world leader, produces 2 million tons of almonds annually), followed by Spain, Australia, Turkey, Italy, Morocco, etc.

Genetic variability is increasingly recognized as a key factor in almond breeding. Recent efforts have focused on identifying and utilizing this diversity to improve traits such as disease resistance, drought tolerance, and kernel quality (Dicentra et al., 2023). Cross-pollination and seed propagation have generated substantial variability, evidenced by over 700 selected cultivars (López et al., 2006). To reduce dependence on cross-pollination, self-compatible cultivars like “Florida” and “Alaska” have been developed through traditional hybridization, enhancing genetic diversity and adaptability to diverse climates.

In Romania, the cultivation area of almonds is the same as that of the vine, peach and apricot, with good cultivation conditions in the south-east, south and south-west of the country, in areas where the average annual temperature does not fall below $+9^0$C. Although neglected in the last decades, currently, farmers can also consider almonds as a profitable crop, the kernel being resistant to storage and the core having a high selling price on the domestic and foreign markets.

At RSFG Constanța, the study of this species began in the 1970s-1980s, with results being obtained regarding the suitability of certain almond cultivars in Dobrogea (Cociu V., 1992; Cociu V. et al., 2003), then the germplasm was moved to RSFG Oradea. The germplasm of this species, predominantly composed of local biotypes, served as the foundation for an extensive breeding program at RSFG Oradea initiated after 1980 by V. Scheau. The program focused on developing self-compatible cultivars with large fruits and a kernel yield exceeding 40 %. This effort led to the release of twelve cultivars, including Sandi, Sabina, Ana, April, Nico, among others (Scheau V., 2007). In 2007, following the collaboration between the two research stations, at RSFG Constanța, the almond collection was regrafted and currently there are over 110 genotypes, with 5 trees each. In order to relaunch the almond culture in the area, taking into account the growing interest of orchard owners in this species, during 2014–2021, demonstration lots were made, with newly obtained high-performing cultivars, with superior quality fruit.

The aim of this work was to highlight the Veronica and Mirela cultivars that correspond to the current climatic conditions and that can satisfy the market requirements. They were studied under the names ‘Autofertil 1’ and ‘Autofertil 2’ in 1998 and 2001 respectively, being recorded at ISTIS in 2018. The two varieties diversify the current range and stand out for the quality of their large, thin-kernel and full-bodied fruit.

MATERIAL AND METHODS

Fruit trees and morpho-physical fruit characteristics: both almond cultivars were studied from the point of view of development of the main phenophases, the production per tree, the average weight of a fruit, the percentage of core/shell, resistance to cracking. The ‘Ferragnes’ cultivar originating from France, was used as a control, being self-fertile, with late flowering, often found in almond plantations. Each one was characterized according to the UPOV descriptors (TG 56/4 of 20.10.2011). The fruit, 30 of each cultivar/variety were harvested at optimal maturity, the measurements being made with the help of the electronic calliper.

Biochemical fruit analysis: in order to assess the nutritional value of the almond varieties, analysis was made regarding the determination of the dry substance by the gravimetric method (Bușuricu F., 2008), of the ash content (mineral substances) by calcination and of the total amount of lipids (g%) through the Soxhlet method. The fruit was analysed 24 hours after harvesting.

RESULTS AND DISCUSSIONS

'Veronica' cultivar- origin: obtained at RSFG Constanta through individual selection from the hybrids field, resulting from free pollination. Cultivar name under evaluation was **'**Autofertil 1'.

The tree is of low-medium vigor, with the tendency that the canopy branches do not follow the direction given following the annual cutting, with medium-sized annual branches, with less numerous sprouts and weak intensity of anthocyanin pigmentation.

Blossoming is medium (25.03-05.04), abundant every year; the flower of the fifth type, is of medium size, the petal shape is medium elliptical, with weak edge undulation; the number of stamens: medium (18), strong anthocyanin coloration of the filaments; the stigma is small, positioned higher in relation to the anthers; the time of budding of vegetative buds in relation to the time of the beginning of blossoming is simultaneous; natural fertility is 67 %. Recommended pollinators: 'Mirela', 'April', 'Tuono', 'Supernova'.

The fruit shape is oval, pointed towards the tip, convex on the dorsal side; the mesocarp is grey-green, with fine and dense hairs, cracks easily along the stitch; the endocarp is oval shaped and has a pointed tip, it is smooth, thin, with very weak resistance to cracking; the core is oval shaped, with a pointed tip (fig. 1, a), medium sized (2.2 g), pearly white, crispy, with sweet and smooth taste, with thin skin, adherent, lightly colored, peeling yield of 50 %; the dry matter content was 96.36 % and the ash content of 3.82 %; total lipids (g %): 47.21.

Fruit ripening period: early, second decade of August-first decade of September (fig. 1, b).

Figure 1.a 'Veronica' cultivar

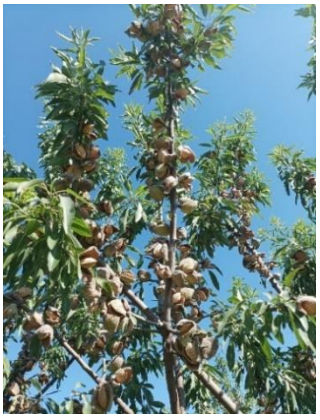

Figure 1.b Fruit branch, 'Veronica', 2024

'Mirela' cultivar- origin: obtained by selection from a local population in Constanta; registered at ISTIS for approval in 2016. Cultivar name under evaluation was **'**Autofertil 2'.

The tree is of medium vigour, with a slightly open habit, with dense foliage, with medium-thick and medium-length shoots, with few early ones. The anthocyanin pigmentation of the annual branches is very weak. The distribution of flower buds is predominantly on one-year branches. Average flowering (30.03-06.04), abundant every year; natural fertility 65 %.

The flower is medium-sized, with medium-elliptical light pink petals, with a faint edge curl; the position of the stigma relative to the stamens is higher.

The fruit has an elliptical shape with an obtuse tip, it is large; the mesocarp is grey-green, with dense pubescence (fig. 2 a); the endocarp is thin, with medium resistance to breaking, with pores of different sizes, strong hull (fig. 4); the size of the core is medium-large (2.5 g), perfectly filling the cavity of the fruit, white, with a sweet, aromatic, fine taste, with a thin skin, light in colour, the roughness of the surface is weak; double kernels 0 %, shelling yield 52 %. The dry matter content was 96.36 % and the ash content 3.82 %; total lipids (g %): 47.21.

Fruit ripening period: early, second decade of August-first decade of September (fig. 2 b).

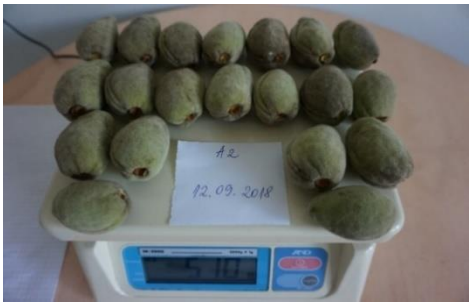

Figure 2 a 'Mirela' cultivar;

Figure 2 b Kernels of three almond cultivars studied

Both cultivars behave very well against specific diseases: *Taphrina deformans* and *Coryneum beijerinckii*.

The recommended rootstocks are Tomis 1, or GF 677 and the planting distance is 4m/4m (625 trees/ha) or 4/3 m (833 trees/ha).

CONCLUSIONS

The early ripening of the fruits of the two varieties allows a good preparation of the tree for the winter; the fruit production is high, approx. 12-15 kg for ten-year-old trees, at the density of 625 trees returning 9375 kg of fruit/ha.

Planting almonds on irrigated land in Dobrogea is, apparently, a very reasonable cultivation alternative, due to the following aspects: the temperatures of the last fifteen days of March are normally suitable to carry out pollination processes, the growth of the pollen tube, the fertilization and fruit formation.

Spring and summer temperatures are suitable for the tree growth and fruit ripening. Blossoming on the same tree, within the same cultivar, is very spaced, so that a large number of flowers escape the negative impact of the low temperatures which sometimes occur in spring.

Annually, from the two varieties of almonds, trees are grafted in the biological category *Certificate*, which can be sold to lovers of this species for the establishment of orchards.

The areas cultivated with almonds have a growing tendency and we hope for the revitalization of this species, which has numerous advantages, so that the varieties obtained at RSFG Constanța can be used by a large number of beneficiaries.

ACKNOWLEDGMENT

This work has been partially conceived in the framework of the project ADER 6.1.2/20.07.2023.

REFERENCES

Cociu V. et al., 2003. Nuciferous crops. Ed. Ceres, Bucharest.

Cociu V., Ionescu Pr., 1992. Contributions to the improvement of the almond assortment for the conditions in Dobrogea. Scientifical Papers ISFG Pitești-Mărăcineni, volume XV. Ed. Agricultural technology, pp. 77-89.

Cociu, 1954. The almond. Ed. Agro-Silvică de Stat, Bucharest, pp. 101.

Federico Dicenta, Teresa Cremades, Jesús López-Alcolea, Manuel Rubio, Pedro José Martínez-García, Raquel Sánchez-Pérez, Pedro Martínez-Gómez and José Egea, 2023. 'Florida' and 'Alaska': Two New Self-compatible Soft-shelled Almonds from CEBAS-CSIC. Hort Science, Vol. 58, no. 4, pp. 433–435. https://journals.ashs.org/hortsci/view/journals/hortsci/58/4/article-p433.xml.

Gradzie and Gomez, 2012. Gradzie and Gomez, 2012. https://www.researchgate.net/publication/278319687_Almond_Breeding.

Gradziel T., 2009. Almond breeding in book Breeding Plantation Tree Crops: Temperate Species. https://adpcollege.ac.in/online/attendence/lib/1629381244.pdf.

López M., Vargas F.J., Batlle I., 2006. Self-(in)compatibility almond genotypes: A review. Euphytica, 150 (2006), pp. 1-16.

Șcheau V., 2007. Three Decades of Almond Breeding at RSFG Oradea. *Scientific Papers of RIFG Pitești*, vol. XXIII, pp. 65-73.

***2011, International Union for the Protection of New Varieties of Plants. Guidelines for the conduct of tests for distinctness, uniformity and stability, Almond, TG 56/4 of 20.10.2011. https://www.upov.int/edocs/tgdocs/en/tg056.pdf.

***https://www.almonds.com/why-almonds/health-benefits/nutritional-facts

***https://www.fao.org/faostat/en/ #data/QCL