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The Argentinean experience in the cultivation of 1000 ha of pomegranates (5 provinces) Test of varieties and management of crop

M.F. Zavala and F. Cozza

Tikagroup SRL, Suipacha 531, C1008AAK Ciudad de Buenos Aires (Argentina)

Abstract. In the year 2007 the commercial pomegranate plantation at scale started in Argentina destined for exportation. At present, the pomegranate project has 1000 hectares implanted in different latitudes, in provinces such as Salta, San Juan, Córdoba, Entre Ríos and Formosa, where the nursery is located. The Genetics is Israeli in its origin for the open varieties like Wonderful clones 100 and 101, Acco and, other varieties have Royalty such as Emek, Kamel, Shany Yonay and Shir; the first two varieties are the ones that are commercially planted in greater proportions. The crops are managed with densities of 416 plants per hectare, with drip irrigation and fertirrigation and plastic mulching over the line. The fertilization used is basically N, P and K. The plants are pruned and are shaped as an open vase multitrunk without trellising systems. The expected time for harvest is March April at its peak. This year 2011 the first commercial harvests have started.

Keywords. Argentina – Pomegranate – Varieties – Crop – Genetics – Israel.

I – Pomegranates in Argentina. current situation

There are pomegranate plants scattered across the country, implanted by European settlers. But it was at the end of the 90's that the first commercial plantations started.

At the beginning of 2007 Tikagroup is created in order to give advice to and support agricultural and agroindustrial investments, focusing especially on pomegranates. In order to do this, Tikagroup produces and multiplies different varieties of pomegranates in their nursery in Formosa, with vegetal material of Israeli origin. Pioneers in the production of pomegranates at great scale in Argentina, Tikagroup gives advice from the selection of the farm or field to the placement of the product in the market. In this way, Tikagroup has developed and promoted the production in order to export premium quality fruit to the Northern hemisphere in counter season. At present, the pomegranate project has 1000 hectares implanted in different latitudes, in provinces such as Salta, San Juan, Córdoba, Entre Ríos and Formosa, where the nursery is located.

II – Management of the crop

All the projects carry out studies of resources and a comprehensive planning prior to the setting up of the farms, including a survey of topography, soils, water supply, provision of energy, access roads and, subsequently, planning of the units of production in terms of drainage, roads, windbreakers, systems of irrigation and planting. There is drip irrigation with 1 lateral per line with non compensating emitters with rates of 2 lt/ hour of nominal output and an irrigation rate, which depending on the area, goes at the top between 7 and 9 mm/day, fertirrigation is used, water supply from underground wells with pressure and volume controllers, mulching on the lines and all the technology rendered appropriate and convenient for the best production according to cost/benefit and profitability. The planting is carried out both in spring as in autumn with 1-year-old-plants in pots of 6 lts and they are pruned as soon as they are implanted or

before that in the nursery. The formation of the tree chosen is multi trunk without trellising in an open vase system with 4-6 principal branches and at least two layers of production, keeping the plant for manual harvest. The spacing chosen is 6 x 4 and 6 x 3 that is equivalent to densities of 416 and 555 plants per hectare. The production of plants is done under strict health standards, quality and certifications. The commercial varieties at scale so far are Wonderful and Acco.

The crop is fertilized using liquid or solid fertilizers mainly to incorporate them through drip irrigation. The fertilization has to be based on the size of the tree, variety and objective (vegetal or fruit), applying the basic elements which are nitrogen (N), phosphorus (P) and potassium (K). In mature plantations (base): nitrogen (N): 180-200 un; phosphorus (P): 40-60 un; potassium (K): 360-400 um; ratio: N / K: 1 / 1.7-2.

Weed control: this operation is very important in most of the areas. It is based on the use of mulching on the line to keep it clean without using herbicides and, on the use of herbicides on the laterals of the mulching and mechanical control between lines.

Control of pests and diseases: in Argentina there is no incidence of important pests or diseases. Still in some areas there are aphids, whiteflies and scale insects from other fruit trees. There are few plants with *Phytophtora* after a year of planting affecting a small proportion. As prevention, metalaxil was applied in the irrigation system, and mainly humic and fulvic acids are supplied to improve the root system and the affected plants are eliminated and replaced. With regards to pests, only leaf-cutter ants are detected chlorpiriphos and fipronil used. Besides this, it is necessary to control the Mediterranean fruit fly as it is a host species and in Argentina there are only two areas declared free of it; and then, a comprehensive pest control will be carried out with monitoring and application of the required pesticides when reaching damage thresholds.

Pruning: it is of upmost importance for the forming of the tree to prune the trees as explained above in an open vase multi trunk system so the following stops are carried out: pruning for the formation of the trees during the first years, pruning for renovation, pruning to thin cracked fruits, green or summer pruning to allow the light to penetrate and removal of suckers at the base of the neck.

Harvest: the tree starts producing after the third vegetative cycle, i.e. fourth calendar year, and it enters the cycle of productive period at year 6. The expected estimated yields are: at the 4th year 15 tons; at the 5th 25 tons; at the 6th 35 tons. The harvest has been verified for March April, but it is expected to be from the beginning of March till the end of April depending on areas and varieties.

III – Projects, places, planted surfaces

Gross area 1100 hectares – Net area 950 hectares:

(i) Salta – Dragones: 500 ha base 300 ha planted (250 ha planted in 2009; 50 ha planted in September 2011). Next 250 ha in following years.

(ii) Córdoba – Cruz del Eje: 500 ha base with 300 ha planted **(**90 ha planted in 2009; 100 ha planted in 2010, and 80 ha in 2011). In this province there are two neighboring projects next to the main productive units of 25 ha and 5 ha, respectively.

(iii) San Juan – Retamito – Campo Grande del Acequión: 375 net ha**.** In this place there are 4 projects of implanted pomegranates. 95 ha planted in 2008, 65 ha planted in 2009 and 175 hs planted in 2010.

(iv) Entre Ríos – Concordia: 15 ha. In this area smaller pilot project was started comprising 15 ha; 5 ha planted in April 2010 and 10 ha in 2011.

In 2011 the first commercial harvests of pomegranates took place in Argentina. Several

analyses were performed on the pomegranate juice which showed very good qualities; average degrees brix (14 to 20 ºbrix) and acidity between 18-22; and soluble solids: 175. Anyway, these results are expected to improve as the fruit is still young.

Varieties. The production of *pomegranate* plants is carried out with material coming from Israel, identified and certified by ARO (Agricultural Research Organization), Institute Vulcani, under the inspection of SENASA:

(i) Registered open varieties: Wonderful, Acco, Hercovitz (116).

(ii) Registered varieties with Royalty: Emek, Kamel, Shany Yonay, Shir.

IV – Tests

1. Garden of introduction

In the different areas a series of tests were carried out with several varieties. The aim was to evaluate the performance of all the varieties mentioned above.

ACCO **–** Early red cultivar. Peel color: red to pink. Uniformly spread all over the peel and it appears very early in the fruit development. It gets its total color before the arils ripen and the fruit reaches its final size. Low sensitivity to sunstrokes. Aril color: dark red. Soft seeds, big arils, high juice content, suitable for the extraction of arils. Ripening date in Israel: second half of August. Thin peel. Taste: sweet, no sourness. Size of fruits: 350-450 grams. Yield: 30 ton/ha.

®*EMEK* **–** Early cultivar Registered variety (patent). Full red peel color. It gets full color before the arils reach the final size. Low sensitivity to sunstrokes. Aril color: red. Soft seeds, big arils, high juice content. Hardness of seed: medium. Ripening date in Israel: beginning of August (early – Israel). Peel thickness: medium. Size of fruits: 450-600 grams.

®*KAMEL* **–** Registered variety (patent). Late red cultivar very similar to "Wonderful". The color of the peal is dark full red, very strong and uniform that appears very early in fruit development. It is not sensitive to sunstroke. Size of arils: big. Aril color: dark red. Medium seed softness. Hardness of ripe seeds is medium. Ripening date in Israel: mid to end of September. Peel thickness: medium. Taste: sour-sweet. High content of juice. Size of fruits: 500-800 grams.

®*SHANI YONAY* **–** Registered variety (patent). More polygonal and flatter than the Akko variety. Size of fruits: 350-500 grams, it ripens during the second half of August. Peel color: full red, it gets full color before the arils ripe and the fruit reaches the final size. Low sensitivity to sunstroke. Soft seeds, big arils, high juice content.

116- (HERCOVITZ) **–** Mid season red cultivar. Aril color: red. Medium softness of seeds. Ripening date in Israel: mid September. Peel thickness: medium. Taste: sour-sweet. Size of fruits: 450-600 grams.

WONDERFUL **–** Late variety. It ripens in mid- October. Size of fruits: 500-800 grams. Peel color: dark red, yet not full. Sensitive to sunstroke. The arils are dark red. They are tangy; hardness of ripe seeds is medium. It is the most popular variety in Israel and in USA. It is the favorite and most well- known variety among consumers.

Several clones are introduced, but only a few of them have top quality.

2. Development of phenological stages in pomegranate varieties. Test taken as example: Cruz del Eje (Córdoba)

Apart from the commercial varieties on the farm, Wonderful and Acco, a garden of introduction

was set up where 6 additional varieties were implanted. The outstanding points from the phonological stages are taken into consideration:

Sprouting: after wintertime, in the middle of August, the temperature started to rise. From 8/19 to 8/28 sprouting occurred and the differentiation of leaves started, being Wonderful the first, and Shani (8/26) and Emek (8/28) the last ones. The period of sprouting includes 4 sub-periods: - coming out of the first leaves (D), division of leaves (D2), growing of leaves (D3) and enlargement of internodes (D4). According to the tests, this period lasts around 45 days in all varieties and results in the flowering (F), although the incidence of new sprouts is not stopped during the vegetative period.

Flowering (F): the coming out of buds is around the second half of September, from 9/16 for Wonderful; 9/21 for 116, Acco, Shany and, at the end of September for Kamel and Emek. The flowering encompasses several stages-types: coming out of buds (E), swollen calyx (E2), opening of calyx (E3) and open flower (F). Said state takes places between 10/05 (Wonderful) and 10/12 (Shany), and lasts from 7 to 20 days. Four flowerings could be clearly observed during the green period, the most important ones in terms of production took place between October and the middle of November.

Fruit set: From the second fortnight and up to the end of October, the fruit set (H) takes place, the varieties Wonderful and Shany are the earliest, then 116 and the last ones, Acco and Kamel. This stage takes between 20 and 30 days, leading to the development of the fruit(J).