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The Pomegranate, *Punica granatum* L.: sustainability and improvement of biodiversity in Apulia, Italy

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Abstract. Nowadays the name and the image of pomegranate are widely used: it can be found as a name in several commercial activities such as banks, agritouristic farms, cultural and sporting associations; its presence in different commercial brands symbolizes "abundance". The plant is used for decorating the landscape and the aesthetics of ancient and modern villas, as well as in the dyeing industry and, since ancient times, has been celebrated by Orazio and Virgilio; this plant has been revalued from a pharmaceutical and nutritional point of view (in the Mediterranean diet). Thanks to its nutritional properties and high value of vitamins and antioxidants, it can be included among the nutraceutical products such as citrus fruit and actinidia (for the content in Vitamin C), almonds and other dried fruit (for the presence of Omega 3) and the olive oil (in the prevention of the cardio-vascular diseases).

Keywords. Food – Nutraceutical – History – Culture.

I – History and spread

Pomegranate is native to Persia and Afghanistan, spontaneously grows from South Caucasus to Punjab and is widely cultivated in Far East and in the Mediterranean countries. Rich in history and romance, the fruit has been always used in different ways; it has been described in the Egyptian mythology and art, praised in the Old Testament of the Bible and in the Babylonian Talmud and was brought by the caravans of the desert because it was refreshing and bracing. It spread in Central and Southern Asia, from India to Iran, in the 1st century a.C. and in 1416 has been reported as growing. It has been widely cultivated in all India, even in dry areas of South-eastern Asia, in Malaysia, in Eastern India and tropical Africa.

The most important growing regions are Egypt, China, Afghanistan, Pakistan, Bangladesh, Iran, Iraq, India, Burma and Saudi Arabia. There are some commercial orchards in Israel, in the coastal plain and the Jordan Valley. Currently, in many other Mediterranean countries, it represents a highly successful cultivation, particularly in Spain and Turkey. The latter hosted the first International Congress ISHS on Pomegranate in 2006.

The pomegranate tree gave the name to the city of Granada. It is a legendary tree with an ancient tradition since, for thousands of years, has been synonymous with fertility for all cultures that have been seduced by its fruits, rich in attractive red seeds, as an expression of life plenty. Not by chance, the fifteenth and sixteenth centuries painters often put a pomegranate in the hand of Child Jesus, referring to the new life brought by Christ. In Coptic art the pomegranate tree is present as symbol of resurrection; in ancient Greece, this plant was sacred to Juno (wife of Jupiter) and Venus (goddess of love); Roman brides used pomegranate branches to weave their hair; in Asian tradition, its broken fruit represents abundance and good luck. The considerable number of its seeds inspired many legends: in Vietnam the fruit breaks in two parts and brings hundred babies, the Turkish brides let it fall on the ground since it's known that they will have as many babies as the number of seeds which came out from the broken fruit. In

Dalmatia, according to the tradition, the groom has to transfer a pomegranate tree from the garden of his father-in-law to his own garden. According to an Indian belief, pomegranate juice counteracts infertility, while in the language of flowers it expresses ardent love. Very rich in vitamins, since thousands of years is a source of salvation for the people of arid areas of Asia and is considered as the king of the fruits because of its particular crown shaped petiole. In ancient times, it was highly regarded for its therapeutic properties; 4000 years ago, Egyptians knew the vermicide properties of the root of pomegranate (Seeram *et al.*, 2006). In Europe, at the beginning of nineteenth century, the bark of the root was widely used to fight tapeworm; indeed, the modern analysis has confirmed the presence of highly effective alkaloids against tapeworms.

II – Description and use

Pomegranate (*Punica granatum* L.) belongs to the Puniceae family, which includes only one gender and two species. Its stem can reach five meters height, is very branchy and twisted, with red-grey bark and thorny branches. The leaves are deciduous, oblong, mostly opposite, stiff and shiny. The scarlet flowers blossom at the ends of the branches, from May to July. The fruit is a large leathery berry, round and yellow-orange, divided in 7-15 internal cavities, in which the seeds are placed, enveloped in a sour or sweet pulp, juicy and transparent (the aril). As for many fruit species, pomegranate varieties differ in their taste, ranging from sweet to sour and this is related directly to the quality and quantity of the organic acids and sugars in the fruit. The fruit ripening occurs in the fall. Pomegranate is often grown as an ornamental species in gardens and terraces in warmer regions, its fruits and flowers are used to decorate tables and dishes. Nevertheless, this plant deserves greater attention: its fruits are rich in vitamin A and B, have antioxidant properties (Gil *et al.*, 2000) and contain anticarcinogenic, antimicrobial, antiviral and antiatherosclerotic. Recently the pomegranate juice has been taken into consideration for its cardio-vascular benefits. The fruit contains plenty of tannin, which has astringent properties. Other than being effective against tapeworms, pomegranate is cooling, diuretic and tonic. The bark of the fruit, rich in tannin, is still used in North Africa and Orient for tanning leather. From dry peel a good colour can be obtained: a distinctive yellow-green which has been even found in some Egyptian tombs. If some iron is present, this colour turns into a suitable black paint to make ink, and the flowers, as well, can be used to prepare a red ink. The fruit, other than being an uncommon dessert, can be the main element for some gourmet jellies, refreshing drinks, sorbets and jams. Pomegranate juice can be used for the preparation of sweets and meat dishes. Lately, several research institutions in various Mediterranean countries characterized pomegranate germplasm collections both from a morphological and a biochemical point of view (Muleo *et al.*, 2008). The parameters considered for the varietal assessment are: productivity, ripening period, seed internal tegument consistency, fruit size, pulp and peel colour, juice acidity, total sugars (Brix), resistance to biotic and abiotic stress and antioxidant capacity. Great importance is given to ornamental varieties. Indeed, flowering pomegranate varieties include many double flower varieties, suitable for growing in pots, with white, yellow, orange or dappled flowers.

III – Pomegranate in Apulia

Scarce information is available about the genotypes present in Apulia region (Italy). In particular, national data of 2009 indicate only 8 hectares cultivated to pomegranate and no hectares officially result under cultivation in the region (ISTAT, 2010), nevertheless, thanks to the pedo-climatic conditions, pomegranate could be an interesting and promising crop (Ferrara *et al.*, 2011). With appropriate economic supports which promote neglected species, as expected by the recent EU legislation, pomegranate in Apulia may occupy a wider area, restoring marginal lands (marshes and brackish) that are not occupied by more popular crops in the region. An advisable task could be the recovery of ecotypes, distributed throughout the

Apulia territory (according to a first phase of land exploration), which over the years have been naturally diversified (often deriving from seedlings) and whose spread in different areas was and still is made at household and company level, for several uses (food, ornamental in villas, gardens, botanical gardens and to decorate typical regional farms). In the past, pomegranate was cultivated in some wet areas of Apulia for commercial purposes, related both to food and industrial uses, in particular dyeing activity (Russo, 2009). One example is from Massafra, a village in the province of Taranto; here is a street named "via delle concerie" (literally "street of the tanneries") in memory of the dyeing activity for different types of tanning (textiles, leathers, etc.). Lately the interest for this species has increased, because of its various attitudes (fresh consumption, ornamental, agro-industrial, pharmaceutical, cosmetic and nutraceutical): a more effective application of the EU rules which provide for each Italian region a reference office for the protection of biodiversity across the territory, will ensure greater protection for this neglected species. The preservation of pomegranate biodiversity in Apulia has interesting cultivation perspectives, because of the rich genetic variability; the enhancement of biodiversity could determine an economic interest both for the product as fresh consumption, that Italy imports from Spain, and the use as an ornamental plant, since in the regional germplasm different ecotypes have been identified, some characterised by small fruit, others by very big fruit, as well as bigger flowers and different plant sizes ideal for ornamental use. Research funded by CNR is ongoing and soon there will be the phases of collection and storage extra situ of regional biodiversity, for its morph-qualitative characterization and to point out possible homonyms and synonyms.

IV – Future perspectives

In several countries the production has increased, as well as the spread, because of its positive aspects, but it needs to be supported by innovative bio-agricultural technologies. Genetic improvement, agronomic management and suitable post-harvest techniques play an important role, as well as the processes of extraction of the edible part; the application of appropriate packaging techniques is required in order to keep intact the quality of the product. Recently EU, in community projects and in national operational programs regarding food and health themes, stressed the importance on nutraceutical aspects of food products; pomegranate, thanks to both its nutritive and antioxidant value (because of the content in vitamine C), can be fully included among the nutraceutic fruits.

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