Article

Processed Products of Pomegranate

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Keywords: Pomegranate, *Punica granatum*, processed products, fruit juice, concentrate and beverage, wine, syrup and jelly, anar rub (pomegranate jam), anardana.

IPC code; Int.cl.[7]— A23L1/06, A23L2/02, A23B9/02

Introduction

The pomegranate has been grown since biblical times for its delicious fruit and as ornamental garden plant for its red, orange or, occasionally, creamy-yellow flowers. The pomegranate (***Punica granatum* Linn**.) belongs to the *Punicaceae* family and is one of the oldest known edible fruits. It is also known as Chinese apple or Apple of Carthage (Hindi—*Anar*) and has been cultivated extensively in Mediterranean countries (Tunisia, Turkey, Israel, Egypt, Spain and Morocco), Iran, Afghanistan, India and to some extent in the U.S. (California), China, Japan and Russia (LaRue, 1980; Onur & Kaska, 1985). A native to Iran (Persia), it is found from Kanniyakumari to Kashmir, but is cultivated commercially only in Maharashtra. Small-scale plantations are also seen in Gujarat, Rajasthan, Karnataka, Tamil Nadu, Andhra Pradesh, Uttar Pradesh, Punjab and Haryana (Patil & Karale, 1990).

In India, pomegranate is considered as a crop of the arid and semi-arid regions because it withstands different soil and climatic stresses. It thrives best under hot dry summer and cold winter provided irrigation facilities are available. The tree requires hot and dry climate during fruit development and ripening (Patil & Karale, 1990). It cannot produce sweet fruits unless the temperature is high for a sufficiently long period. Humid climate lowers the quality of fruits and increases incidence of fungal diseases (Llacer *et al*, 1994). The pomegranate tree is deciduous in areas of low winter temperature and an evergreen or partially deciduous in tropical and subtropical conditions. The pomegranate tree can withstand low temperatures in the winter and is drought and salt-tolerant. As pomegranate is hardy in nature having wide adaptability, low maintenance cost with huge returns.

The plants grow as dwarf types about 90 cm tall to plants that may reach 3 m in height. Leaves slender glossy 2.5 cm to 7.5 cm long, reddish or bronzy when they unfold in spring and turn yellow in late fall. There are single-flowered varieties, with one row of petals, as well as double-flowered ones, with numerous overlapping petals (Mars, 1994). Blossoms range from 4 cm to10 cm across and are made of thick, fleshy petals. Double-flowering varieties bloom for several months in summer, but in general do not bear fruit (Morton, 1987). All varieties tolerate great heat and grow well in alkaline soils also. Pomegranates need sun for the best bloom and fruit.

The fruit, a false berry about the size of a large orange, is filled with shiny red seeds encased in an edible, orange-red pulp. Fruits with hard seeds aren't good to eat, so cultivars that produce soft-seeded fruits are preferred. The fruit is consumed fresh or can be processed into juice, syrup, jams, jelly or even wine.

Processed products

Pomegranate fruits being rich source of minerals, vitamins and nutrients (Table 1) finds wide application in traditional Asian medicines both in Ayurvedic and Unani systems. *Charak*, the great medical physician of ancient India has prescribed a large number of formulations using almost every part of

this plant in the treatment of dysentery, diarrhoea, stomachache, inflammations, tapeworm, hyrnenole-tidosis, dyspepsia, bronchitis and cardiac disorders (Wlth India — Raw Materials, 1969). These therapeutic properties are reported to be due to presence of betulic and uroslic acids and different alkaloids, viz. pseudopelletierine, pelletierine and some other basic compounds (Singh *et al*, 1990). A number of processed products can be manufactured by processing the fruits, which can be preserved for future use.

Table 1 : Chemical and Mineral Composition of Pomegranate fruits

Constituent	Edible fruits	
	Fresh	Dry weight basis
Moisture (%)	78	19
Protein (%)	1.6	7.27
Total sugars (%)	14.6	66.36
Ascorbic acid (mg/1000g)	16.0	72.73
Ash (%)	0.7	3.18
Acidity (%)	0.58	2.64
Minerals (mg/100g)		
Calcium	10	45
Phosphorus	70	318
Magnesium	44	200
Potassium	133	604
Sodium	0.90	4.09
Iron	1.79	8.14
Zinc	0.82	3.73
Manganese	0.77	3.50
Copper	0.34	1.55

Source: Chavan *et al*, 1995

The fruit is mainly used as an ingredient in cooling and refrigerant mixtures and in the preparation of juice, concentrates, condiment (powders and tablets) and pastes (*avaleha*) (Saxena *et al*, 1984).

Fruit juice

Pomegranate juice makes a delicious drink. On whole fruit basis the juice yield is about 42% while from grains the yield is about 70% (Phadnis, 1974). The juice can be extracted by using a spiral-type screw press without crushing the seeds. The juice is clarified by heating in a flash pasteuriser at 79-82°C cooling, settling for 24 hours racking up and filtering or decanting. The clear juice can be preserved by heat treatment or by using chemicals (600 ppm sodium benzoate). The use of sulphur dioxide is banned for pomegranate due to loss of colour by bleaching action of SO_2. After heating at 80°C it is filled into bottles while still hot. The bottles are crown corked and pasteurized at 80°C for 30 minutes (Saxena *et al*, 1984).

The juice is highly nutritious and is recommended for patients suffering from gastric troubles. It contains 16.2%TSS and 0.35% acidity; total sugars, 12.93; reducing sugars, 12.65 and non-reducing sugars, 0.28% and 9.23mg/100g ascorbic acid (Dhumal, 1984).

Concentrate and beverage

Fruit juice concentrates, singly or in blended form, are products with great potential on account of their wide acceptability in fruit based beverages. The beverages prepared from pomegranate are highly refreshing and nutritious. A technology has been identified using Bentolite at 1.0-1.5 g/litre and gelatin at 0.05g/litre as clarifying agents giving better results than milk, charcoal or casein (Gabuniya *et al,* 1984). The prepared beverage using this technology is excellent in taste and has attractive red colour due to high retention of anthocyanins. The anthocyanins reported in pomegranate are having antioxidant properties.

Wine

For preparations of wine, the whole fruits are pressed without crushing or juice may be extracted from pomegranate grains, which gives a yield of 76 to 85% (Adsule & Patil, 1995). Sugar is added to the juice to bring it to 22-23° Brix. Potassium meta-bisulphite is added to the juice to prevent the growth of undesirable microorganisms. The juice is fermented with starter wine yeast and the wine is aged and finished in the same manner as the red grape wine. If a sweet table wine is desired sugar is added to 8-10° Brix. The wine is flash pasteurized at 60°C, bottled hot and sealed. Fortifying the sweetened wine to about 20% alcohol can make wine like port.

Syrup and Jelly

A syrup of 60° Brix with an added acidity of 1.5% as citric acid has a bright purplish-red colour and a delightful taste and flavour. It was preserved by pasteurization or by adding sodium benzoate. An attractive jelly can be prepared from pomegranate juice (Phadnis, 1974). Preparation of jelly on a small-scale from sweet-sour pomegranates from 'Ganesh' variety also has given very good results (Adsule *et al*, 1992).

***Anar rub* (pomegranate jam)**

A product known as *anar rub* with fairly good keeping quality can be made by concentrating pomegranate juice, and heating the mixture on a slow fire for a long period. The finished product has a thick consistency and contains 70-75% TSS (Siddappa & Bhatia, 1954). *Anar rub* can be stored for one year and it is utilized as a jam, which can be enjoyed with bread, etc.

Anardana

One of the major problems in pomegranate fruits is cracking at maturity leading to huge economic loss to farmers. The traditional utilization of these fruits lies in drying the seeds of these cracked fruits to yield a value added by-product known as *anardana* used as acidulent and condiment in Indian curries and also used in Ayurvedic and Unani medicines (Wlth India — Raw Materials, 1969). The use of cross flow drier has been recommended to get a uniform, hygienic good quality product *anardana*. The dried product *anardana* contains more acid (5.8-15.4%), total sugars (9.3-17.5%) and crude fiber as compared to fresh fruit, viz. acid (4.1-5.3%), total sugars (8.3%) and crude fiber (2.5%) (Singh *et al*, 1990).

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