POMEGRANATE PRODUCTION PROTOCOL

JoSME, 2022

CONTEXTS

Preface

This Protocol has been prepared in the framework of the project "Enhancement of Jordanian SMEs inclusiveness, competitiveness and sustainable innovation"- JoSME, funded by the Italian Cooperation and implemented by CIHEAM Bari.
This protocol provides guidance of entrepreneurs as producers (individual and/or gathered in associations and cooperatives), packers, traders, exporters involved in the pomegranates chain. The aim of this protocol is to provide indications about the management of the pomegranate to achieve quality and safety of the produce in order to enhance added value in the domestic and international markets.

1. Introduction

Common name	Scientific name	Family name	Variety
Pomegranate	*Punica granatum* L.	Punicaceae	Local

Pomegranate tree (Punica granatum L.) is one of the oldest known edible fruit trees and its capable of growing in different agro-climates zones ranging from tropical to temperate regions of the world. It is native in the region from Iran to northern India but have been cultivated since ancient times throughout the entire Mediterranean region of Asia, Africa and Europe. It is estimated that the domestication process of pomegranate started somewhere in the Neolithic era (Levin 2006a; Still 2006).

The leading producers globally are India and China followed by Iran, Turkey, Afghanistan, the US, Iraq, Pakistan, Syria and Spain.

The world surface dedicated to the cultivation of pomegranate trees is more than 300,000 ha and world production is probably higher than 3,000,000 t. The main production countries are India, Iran, Turkey, China and the USA, where more than 76 % of the world's production is being produced (Melgarejo-Sánchez, P et all, 2015).

In Jordan, the pomegranate plantation extends north from 200 meters below sea level to the rift valley, inland, heights and the wider parts of Eastern Badia. The cultivation is concentrated in the Governorates of Irbid, Ajloun, Tafileh, and Balqa with over 25 varieties in taste ranging from sweet seedless to sour-sweet, to sour. Currently in Jordan Pomegranates are planted on about 858 hectares with a production of 9,500 tons (2020 - DOS). Pomegranate is composed of peel and arils with seeds. The edible portion (arils) is about 45-61 % of the total fruit weight which includes about 60-85 % juice and 15-25 % seeds; peel forms 33-40 % of the fruit. The arils in improved varieties are bold, fleshy and very juicy. However, the taste of the pulp varies from sweet and aromatic to sour and insipid.

2. Soil and Climate

Pomegranate is categorized to be grown within a wide range of soils from sandy soil to sandy loam soil. Deep, well-drained sandy loams with good moisture and nutrient-holding capacity are the best soils for pomegranate cultivation. It is not recommended to plant in salty (saline) or alkaline soils. Pomegranates can stand moderate flooding. It is essential to have full sunlight nearly all day long. Trees that do not receive at least 6-8 hours of direct sunlight each day will produce long thin branches with few flowers and fruits. Light soil with a pH range of 6.5 to 7.0 is highly suitable for its cultivation; however, Pomegranate can stand a pH of up to 8.5 under correct management practices. Fruit quality and color development are good in

light soils but poor in heavy soils. It stands for salinity up to 6.00 dSm^{-1} and sodicity up to 6.8 ESP (*Waskar, 2006*). The cultivation of this fruit is successful in the arid ecosystem as it can withstand the dry climate and adverse soil conditions prevailing in the arid ecosystem. It can grow well even in marginal lands with poor fertility and shallow depth. Arid soils are poor in organic matter and nutrients content, therefore proper management of soil health, and nutrients supply is required to get high yield (*Sachin Surosheet all, 2011*).

According to (Chandra et all, 2010), although pomegranate grows well in tropical and subtropical regions, it has wider adaptability as it grows in semi-arid and temperate regions due to its strong nature. However, the main cultivation of pomegranate is related to the northern hemisphere. Interestingly, the best quality fruits are produced in arid regions. Depending on the variety and genotypes, Pomegranate is normally grown as deciduous tree in temperate areas, also as an evergreen tree or partially deciduous in tropical and subtropical conditions.

3. Varieties

Pomegranate varieties can be classified according to their sweetness (sugar contents) into three categories:

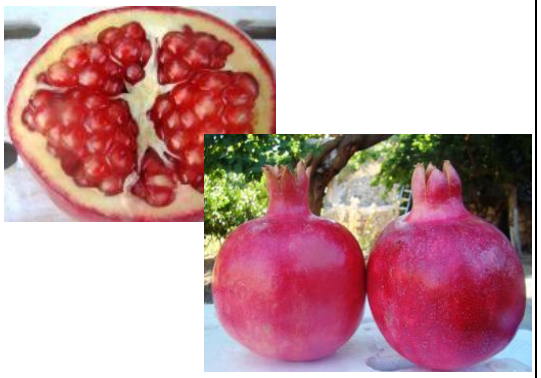
- **Sweet varieties**: sugar content from 16 % to 22 %; acidity from 0.1 % to 4.2 %;
- **Sweet sour mix varieties**: sugar content from 12% to 16%; acidity from 4.2% to 6%.
- **Sour varieties**: sugar content from 8% to 15%; acidity from 6% to 9%.

According to names, there are many varieties in Jordan (local and imported) as detailed in the following tables.

Table 1 - Exotic variety

Exotic Variety	Origin	Fruit characteristics	Ripening date	Notes
Wonderful	USA	Medium to large Fruit size, both peels and seeds are red in color, fairly soft, good for juicing	End of September to early November	Planted mainly in commercial plantings, high demand for worldwide.
Molar	Spain	Resembles Khudari local variety. Uneven reddishness in color, soft seeded, sweet with distinct flavor	mid-September to early November	Demanded by the European market
Hicanznar	Turkey	Medium size red fruits	Early October	Exported to European countries

Table 2: Local varieties

Variety	Spreading areas in Jordan	Production capacity Kg/tree	Average fruit weight (g)	Fruit characteristics	Picture	maturity date
Khudari	Bani Kenaneh Wadi abuziyad, ziglab	100	400 - 700 g (may reach 1500 g)	Uneven reddishness color, soft seeded, sweet with distinct flavor		End of September to early November
Mawardi	Wadi Alrayan Wadi abuziyad, ziglab	80 - 120	250 - 400 g	Color yellow with slight reddishness, seeds dark reddish very soft sweet good for juicing.		Mid November
Ergabi	Rimemeen and Mafraq	70 - 80	400 - 500 g	Red skin and seeds, good for juicing		End of September to early November

Ziglabi	Wadi abuziyad, ziglab	70 -100	300 -700 gm	Red skin and red seeds, sweet in taste		Early August
Sen Al sheikh	Wadi Al Rajeb	No data	300 - 500 g	Fruit color, pink		Early July
Alaswad	Bani Kenaneh and Kufarat	50 - 60	400-500 g	Dark skin and red ruby seeds		End of November
Shawashi	Bani Kenaneh and Kufarat	60 - 70	400-500 g	Fruit color red with sweet sour taste		End of September to early November

4. Propagation

Pomegranate is mainly propagated vegetatively through hard wood cutting as commercially. Air-layering maybe used but as common as hard wood cutting. Main concerns of hard wood cuttings and air layers is carrying dormant infections of challenging diseases such as nematodes, bacterial blight and wilt, which introduce disease inoculums in new orchards. It is very important for new propagated pomegranate shrubs to be free of diseases, pests and other pathogenic agents, so using tissue culture could be a promising propagation method owing to uniform condition and free from insect, pest and diseases.

Standardization of grafting technique and identification of suitable rootstock can play important role in mitigating abiotic stresses, particularly drought, salinity and high temperature in arid regions. Under mist conditions, pomegranate can be propagated either by hardwood and/or semi-hardwood cuttings. However, semi-hardwood cutting can give better results than hardwood cutting. Semi-hardwood cuttings of 6-12 months old, 20-25 cm length with a pencil thickness perform best.

Pruned wood during the winter season can be used, which gives a high success rate. July is the best time for planting cutting under the mist system, however, cutting can be planted during February (at the end of the rest period). Flower and fruit-producing lateral branches should not be used for making cuttings. Dip lower part of stem cuttings for 5 minutes in a solution of 2,500 ppm Indole Butyric Acid (IBA) for inducing roots (*Saroj et al., 2008*). New fibrous roots system will be induced after this treatment. Such root system is essential for the better establishment of plants under field conditions. Cuttings are planted in a mixture of peat moss and sand/ perlite (3:1) or cocopeat mixed with sand or cocopeat alone for faster rooting in the mist chamber. Sanitizing the cutting terminal is advised before planting with allowed fungicides to prevent surface infestations. Well rooted cuttings should be transferred after 45 -60 days to nursery bags containing sand: soil (1:1). Before transplanting in the field, the plants are kept in shade for 7-10 days for hardening which gives higher survival of plants. Some farmers are directly planting cutting into nursery bags filled with soil, but the success percentage is lower in this way.

4.1 Air - layering

From healthy tree, upright branches of 0.8-1.5 cm diameter from are selected, girdled 2-3 cm in length and rooting hormone (IBA 2000-3000 ppm) is applied on the upper part of the cut. The moist rooting medium (sphagnum moss) is wrapped over the cut portion using the desirable size of polythene strip and both the ends of the polythene strip are tied with coir/jute thread or string. The type of media used for layering plays role in the rooting and survival of layers. In general, sphagnum moss is used as a substrate for air-layering. Alternative media option of soil, sand and cow dung manure in a 2:1:1 proportion has also been reported as suitable media for the preparation of air layers. In general, rooting takes place between 30-40 days and well-rooted layers are detached from the mother plants within 75-90 days. These air-layers after 70-80 per cent defoliation can be planted in the nursery or polythene bags containing soil, and sand. The optimum time for air-layering is June-August. Well-developed layered plants should be used for the establishment of pomegranate orchards.

4.2 Tissue Culture

The other way of propagation is tissue culture (TC). TC propagation method is considered highly successful in most of the high value crops and has wide-ranging scope in pomegranate trees. TC can only be carried out inside the laboratories to avoid any contamination of the culture media. The TC method also is very operative when there is a farming demand of pomegranate quality planting material, for which bulk multiplication of pomegranate through TC is required. Plants produced through TC are free from any kind of infections and produce true to type seedlings. In pomegranate cultivation; nematodes, wilt and blight major challenging diseases and tissue culture provide disease free planting material for the extension of pomegranate to non-traditional areas of the hot arid region. However, TC is a costly and highly skill-requiring technique. Intensive care is required for tissue-cultured plants to harvest their full potential in terms of yield and quality. TC technique requires high initial cost, intensive care and skilled manpower. There is also need for proper standardization of the package of practices for the commercial cultivation of TC raised plants.

4.3 Plant suckers

Plant suckers are new young branches growing on the mother plant's main branches or at the crown areas. A plant sucker should be detached from the mother plant with a part of the stem to enhance the rooting surface. A plant sucker length should be 60-70 cm.

4.4 Propagation nursery consideration at the establishment.

The following considerations have to be taken care during the propagation of the plants in the nursery:

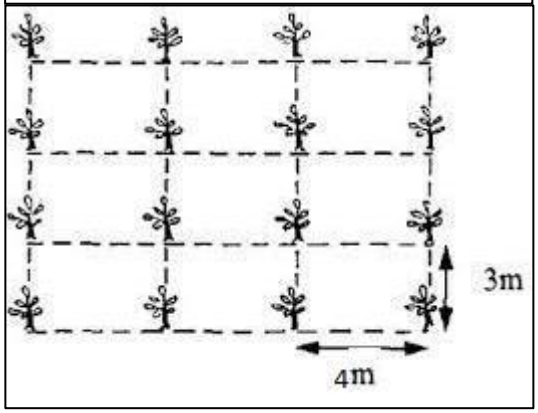
- ✓ The mother plants (stocks) should be certified by a certified authority for maintaining their varietal identity;
- ✓ The progeny orchards should use mother plants free from nematodes, bacterial blight and wilt. This progeny orchard is used to collect planting material hardwood cuttings/ tissue culture explants for commercial production;
- ✓ Propagating material has to be monitored frequently and tested through diagnostic tools recommended for the detection of diseases;
- ✓ The used soil or soil substitutes should be sterilized through solarization or authorized chemicals (if available). Soil solarization can be done by covering moist soil with thick transparent polyethylene sheets for 5-6 weeks during the hottest summer months (April to September). It kills most of the diseases, pests and destroys weed seeds;
- ✓ Apply bordeaux paste (10%) to the cut ends of the mother, progeny plant and air-layered cuttings;
- ✓ Nursery output plants need to be checked regularly for possible infection of diseases and pests like bacterial blight, wilt, fruit spots and rot, termite, mites, thrips and root-knot nematode.

5. Establishment of new Orchard

Establishment of an orchard is long term investment and hence needs thorough planning. Well drained land, flat or with moderate slope up to (3-5%) should be selected for establishment of an orchard. A well laid out internal network of main, cross roads and paths is essential for efficient movement of workers and machinery. The farm should have adequate irrigation facilities. A provision of fencing and wind break should be made along with the farm boundary. Two to three years before planting of pomegranate, suitable wind break (single or double rows) is recommended to be established along the boundary. However, windbreak row(s) facing the east direction should not grow very tall.

As far as the planting system is concerned, square or rectangular planting systems are adopted in pomegranate orchard cultivations. A pit digging size of 1 m x 1 m x 1 m or 0.75 m x 0.75 m x 0.75 m is recommended at planting, and pits are dug about a month prior to disinfection by intense solar radiation. Transplanting should be done during the spring season (February-March) depending on the availability of irrigation water. Planting distance depends upon soil and climatic conditions, variety and ease of intercultural operation for weeding, hoeing, drip system installation and mechanization etc. In general, 4 x 3 m (833 plants/ha), is optimum for some cultivars; others require space until about 5 x 4 m.

Figure 1: Pomegranate planting distance & orchard planning for some varieties



Support should be provided to young plants to keep the plant straight and avoid the breakage of shoots by winds in arid regions. Use 50-80 cm long wood sticks and tie the main branches with strings. Wooden sticks should be treated with pesticides such as fipronil 2 ml/liter for termite protection if required.

Canopy of a tree states to the physical structure including the stem, branches, twigs and leaves. However, the canopy density is measured by the number and size of leaves. Moreover, canopy architecture has significant impact on fruit production which is depending on the number, length and orientation of branches and shoots. The canopy management of any tree is a prerequisite practice for optimum fruiting and quality fruit production, which deals with the development and care of their structure in relation to size and shape. The elementary idea of canopy management is to operate the tree vigour and use maximum available light and temperature to increase productivity, fruit quality and also to minimize the adverse effects of the weather. Pomegranate is a light-loving plant thus enough light should be available in the tree canopy for quality fruit production. Forming practice starts after 6-8 months to develop a structural framework and lasts up to 2-3 years after planting. The lowest branch should be allowed to develop at 30-40 cm above the ground with single-stem or multi-stem forming. In arid regions, multiple stem forming (3-5 stems) system is advised to bypass losses of stems/plants by termite attack which is a severe problem in hot arid regions at the initial stage of orchard development. Pruning is done twice a year to remove dried twigs, branches and maintain a balance between vegetative and reproductive growth. Major pruning is practiced just after harvest in winter and light pruning is done at flower regulation during May-June.

6. Tree growth and structure

Pomegranate is considered as shrub or small tree that starts to develop many stems and has a bushy presence. Depending on variety and climatic conditions, pomegranate can grow up to 5 m but, in some particular conditions, it grows up to 7 m. Most of the varieties are deciduous and in Jordan, some varieties are evergreen or partially deciduous. The young branches from the vegetative growth of the recent years are numerous and thin. In general, 3-4 previous growth flush, resulting in a drift of the young bearing wood to the outsides of the tree canopy. Over the time large trees with increased shading inside the canopy are formed which allows most of the fruits to appear on the tops and outsides. The density and orientation of plants have impact on light penetration in the orchard. The closer the planting, the poorer will be light penetration. Strong-bearing branches tend to produce larger fruits and they also transport water and nutrients more efficiently throughout the tree. Thus, pruning should aim to encourage new strong growth. The tree exhibits apical dominance, consequently the top bud suppresses the shooting of buds below it. Therefore, tip pruning is needed, especially in pre-bearing trees (1-2 years). The best time to prune is normally after harvest and before bud break. Pomegranate has spreading and erect tree structures for these, pruning styles will vary. When the crop load is heavy, the branches and limbs tend to break more easily by a strong wind. Overall the tree branches tend to be longer, thinner and more flexible. Thus, attempts should be made to shorten these branches and fruiting should be encouraged inside the tree. The tree usually tends to produce strong, vigorous upright water shoots having thorns. These shoots are generally unproductive and should be removed as early as possible. However, sometimes these water shoots/sprouts can be used effectively to replace old unproductive structural limbs while rejuvenating trees. However, after severe pruning and nutrient application, the trees produce more suckers from the stem at ground level which need to be removed regularly.

7. Flowering and fruiting behavior

The flowers maybe solitary (single) or in grouped forms (two or three) at the end of each branch. Insects and wind carry out cross-pollination to increase fruit sets. Flowering time varies according to geographical areas and cultivars. The time span between the start of the flower bud elongation and anthesis varies between 14 to 28 days depending on the variety and climatic conditions. In Jordan flowering starts in mid-March and continues till June depending on cultivars and geographical areas. Pomegranate flowers continuously under arid and semi-arid climatic conditions and bear small crops irregularly at different periods of the year, which may not be desirable commercially.

At a pomegranate tree, three kinds of flowers could be found, hermaphrodite (bisexual), male and intermediate forms occur on the same tree. The calyx of the hermaphrodites is urceolate (pitcher-like) with a broad, well-developed ovary. Male flowers are smaller with a campanulate (bell-shaped) calyx and a rudimentary ovary. The intermediate forms exhibit various degrees of ovary degeneration. Fruits arising from such flowers drop early or, if they reach maturity, are misshaped. Hermaphrodite flowers are usually homostylous or pin-eyed (i.e. the stigmas are on the same level or higher than the anthers) and male flowers are thrum-eyed (i.e. the stigmas are beneath the level of the anthers).

Figure 2: Male, Hermaphrodite/Bisexual and Intermediate flowers

8. Nutrient Management

By default, pomegranate grows well in soils of low fertility, both quantity and quality can be enhanced by proper amount of nutritional amendments. However, healthy soil is mandatory for plant growth, fruit yield and quality sustainable production. In fact, balanced nutrition supply is required to the young and bearing trees for better growth and optimum fruit production. Most of the root system is distributed within top 50-60 cm of soil and within 1 m of the stem. Accordingly, nutrients maybe up taken in the rhizosphere, so application of nutrients should take place to the root zone depending upon the age of the tree. In order to produce 30 tons of pomegranate fruits, trees consume in general 33 kgs of N, 6 kgs P, 52 kgs K, 13.6 kgs Ca, 2.0 kgs Mg, 4.4 kgs S, 55 g Fe, 28.5 g Mn, 78 g Zn and 38.8 g Cu. Thus, replenishment of these nutrients in soil is of paramount significance for sustainable production. Both macro and micro-nutrients are needed for proper growth, development and productivity of pomegranate, when grown as a commercial crop.

According to (Sheikh, M.K,2006), leaf nutrient standards have been developed for pomegranate trees which may be useful for the growers. Even nutrient deficiency symptoms can be diagnosed by observing the deficiency symptoms on leaves. And thus, after leaf analysis, nutrients may be supplied to the trees either through soil or foliar sprays. Now, the trend is also developing to apply soluble fertilizers (fertigation) through drip irrigation system which is the need of hour as fertigation has some advantages like it improves availability of nutrients and their uptakes by roots, the application is restricted to the wetted area where root activity is most intensive, loss of nutrients by leaching is minimum, soil compacting is prevented, weed population is reduced and labor and fertilizer cost is minimized. It has been reported that up to 75 per cent of recommended rate of fertilizers on 20-40 per cent wetted area basis can be given through fertigation. After harvesting, pruning and nutrients adding should be done with the aim to encourage vegetative growth that will help the accumulation of sufficient reserve material in the plant system for better flowering, fruiting and development of the fruit in the next season.

9. Water Management

In arid and semi-arid regions pomegranate is grown with limited irrigation facilities. However, these trees require regular irrigation to get optimal yield and fruit quality. In commercial production, irrigation should be scheduled as per the requirement of crop growth stage. The most sensitive phase of a plant growth cycle occurs during pollination, fruit set and development. Further water deficits, at fruit maturity and ripening

stages results in fruit cracking and such fruits become unsuitable for the fresh market. The water requirement of plants depends on age, season, location and management practices. Drip irrigation has great potential due to high water use efficiency. Drip irrigation system with 2-4 adjustable drippers per plant should be installed depending upon age of the tree. Even fertilizers and chemicals can be applied through drip irrigation. Excess irrigation should be avoided which may increase wilt and nematode problems in the orchards. Covering the soil with inorganic or organic mulches during dry months after the rainy season conserves soil moisture and saves irrigation water, creating favorable conditions for plant growth and development. As regular irrigation is given in pomegranate which encourages weeds growth, it's very essential to eliminate weeds that compete with trees for water and nutrients. At the same time, weeds consider a suitable host and habitat for a wide range of pests that could attack pomegranate trees. Meanwhile, weeds between trees will also reduce the efficiency of spraying trees. Organic or synthesized mulch may be used to conserve soil moisture and weed control. Using mulch reduces up to 20-25% of water consumption and also could reduce 20 % of weed population density. Regular hand weeding is required especially after applying fertilizers. On the other side, several herbicides could be useful for weed control between trees. Farmers should be careful while using herbicides to avoid herbicide injuries, so proper care should be taken during using herbicides doses and applications.

10. Common pest and diseases and their management

10.1 - Aphids - Green aphids could appear on foliage, buds, flowers and fruits (Fig. AA). Sticky honey like semi-solid substance found on leaves which gives sooty mold and honeydew appearance. If the presence is detected , spray with approved pesticides when new shoots emerge. Desuckering as soon as possible is very effective in reducing aphid infestation.

Figure 3: Aphids

10.2 - Pomegranate moth is considered one of the most harmful pests attacking pomegranate and cause a lot of loss. The adults lay their eggs on the buds and fruit peels, then eggs hatches and larvae start entering inside the fruit looking for food and continue their life cycle producing more generations.

Figure 4: Pomegranate Moth, larva stage

Using registered pesticides for adult stages and insect growth regulator is recommended to control this pest.

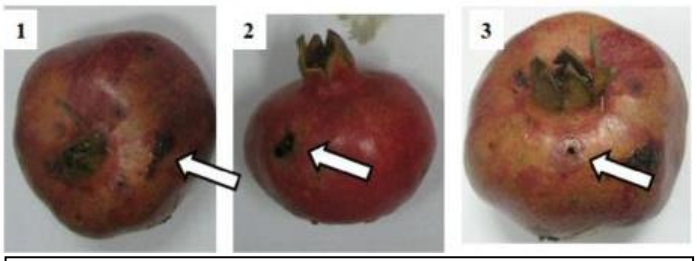


Figure 5: Infected pomegranate fruits by moths

10.3 - Mealy bugs are small, soft-bodied insects attacking fruits and their stalk on plant. Both nymphs and adults cause considerable damage by sucking the sap from the leaves, flowers and fruits, which resulted in yellowing of leaves and shedding of flowers and tender fruits. So, the market value of such fruits is reduced. It is polyphagous and has a very wide range of host plants. It is found throughout the year, though it is less active during winter. Pomegranate leaves show curling symptoms. Heavy black sooty mould may develop on the honeydew like droplets which in turn hinders the photosynthetic activity of the plant resulting in stunted growth. The infestation may lead to fruit drop. Spraying registered pesticides is recommended to control mealy bugs and avoid sooty moulds formations.

Figure 6: Pomegranate mealy bug

11. Sustainable pest management

The approach to the pest management should take into consideration the reduction or totally exclusion of usage of pesticides through the application of the IPM or Organic Agriculture methods.

11.1 Organic production

It is a comprehensive system of farm management and food production based on the interaction between best practices in environmental and climate action, a high level of biodiversity, the preservation of natural resources and the application of strict animal welfare criteria and rigorous production standards that meet the preferences of a growing number of consumers for products made with natural substances and processes totally excluding chemicals. Organic production therefore responds to the growing demand for food produced by means and methods that contribute to the protection of the environment and biodiversity, animal welfare and rural development. Any farmer applying for the method has to provide certifying his activities/products under an approved Certification Body (third independent party) against a specific law/Regulation (in case of export to European countries according to EU Reg. 848/2018).

11.2 Integrated Pest Management

It is defined as the careful consideration of all available methods of plant protection and the subsequent integration of all appropriate measures to discourage the development of pest populations. The use of plant protection products and other forms of intervention are maintained at levels that are economically and ecologically justified while reducing or minimizing risks to human health and the environment.
When using chemical pesticides, the choice of plant protection products must be very careful. First of all, only those approved for the crop and the target must be chosen, then toxicity (for the environment, users and consumers) and residuality of the individual pesticides used must be taken into account in addition to the aspects just mentioned, also in relation to the maximum residue limits imposed in the countries of production and export.

11.3 Pesticides limits in the export countries

Before exporting the product to a foreign country, it is necessary to be aware of the regulations in force concerning the use of chemicals and maximum permitted residues. In particular, a maximum residue limit is set for each plant protection product approved for use on the crop. It is, therefore, necessary to check, by means of multi-residual laboratory analyses, whether or not the production complies with this established limit.
Conversely, if a plant protection product has been withdrawn or not approved in the country to which it is intended to be exported, it will have a predefined maximum limit of 0.01 mg/kg, which is equal to the lower limit of analytical quantification. In practice, there should be no traces of that substance on the product to be marketed.
Useful information can be checked on the official EU pesticide database, in the case of exports to European countries, or on the FAO pesticide database for all those countries that do not have their own regulations.

https://food.ec.europa.eu/plants/pesticides/eu-pesticides-database_en
https://www.fao.org/fao-who-codexalimentarius/codex-texts/dbs/pestres/commodities-detail/en/?c_id=254

Codex standard for pesticide maximum residue levels (MRLs) in food and feed which is amended each year by the Codex Committee on Pesticide Residues (CCPR).

Active Ingredients allowed in EU countries on Pomegranate: type, safety period and EU MRLs

Active Ingredient	Organic	Type	Safety Period (d)	MRL (ppm)	Keys
Acido pelargonico		H P	3		A = Acaricides
Bacillus amyloliquefaciens FZB24	🐞	F			B = Biological auxiliaries
Beer	🐞	L			C = Adjuvants
Boscalid		F	7	2,00	H = Herbicides
Coniothyrium minitans	🐞	F			F = Fungicides
Dazomet		H F I N		0,01	I = Insecticides
Eugenole	🐞	F	2		L = Limacides
Fludioxonil		F		3,00	M = Pheromones
Diammonium Phosfate	🐞	V			N = Nematocides
Iron phosfate	🐞	L			P = Phytoregulators
Geraniole	🐞	F N	2		V = Various
Glyphosate		D		0,1	Approved for Organic 🐞
Metam-potassium		D F I N		0,01	
Metam-sodium		D F I N		0,01	
NAA		P	7	0,06	
Mineral paraffin oil	🐞	A C I	20		
Paecilomyces lilacinus - 251	🐞	N			
Potassium salts of fatty acids	🐞	A I			
Spinosad	🐞	I	7	0,02	
Talcum powder E553B		V			
Timole	🐞	F N	2		
Trichoderma asperellum	🐞	F			
Trichoderma atroviride ceppo T11	🐞	F	3		
Sulfur	🐞	A F	5		

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