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# ***Best Practices for POMEGRANATE Production and Marketing in Afghanistan***

Aimed at farmers, extension workers, exporters and members of the business community, the guide offers tips on cultivation, harvesting and marketing techniques to improve sales of Afghan produce on international export markets.

Produced by the USAID-funded  
Commercial Horticulture and Agricultural Marketing Program  
[www.CHAMP.af](http://www.CHAMP.af)



Ministry of Agriculture,  
Irrigation and Livestock

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## QUICK-START GUIDE

# Pomegranates

*Afghanistan is the cradle of world pomegranate production, with a long and ancient history in international exports. Afghan pomegranates are seeing a surge in global demand as a result of newly discovered health benefits. The country is home to many unique, high quality pomegranate varieties renowned for their sweetness and juiciness.*

## Regions and Varieties

Pomegranates are grown throughout Afghanistan, thriving on the country's hot summers and cool winters. The southern province of Kandahar is the cradle of Afghan pomegranate production, with commercial exports produced in Zabul, Farah and Balkh provinces as well.

Afghanistan has 79 varieties of pomegranates, the most popular export variety being the Kandahari. It produces large fruit (>79mm) weighing >300g, with hard seeds and dark red juice. This variety is grown mainly in Kandahar, Zabul, Uruzgan, Helmand, Farah and Nimroz provinces. There are several niche market orientated varieties with the main three being: Tashkughani (grown in Balkh province), Tagabi Danadar (grown in Kapisa province) and Tagabi Bedana, a soft-seeded variety grown almost exclusively in Tagab district of Kapisa province.

## Producing for Export

### *Cultivation*

- Plant only improved varieties that are of a high quality and disease-free.
- Plant new orchards with a high planting density (4m x 4m) and a north/south orientation of the rows.
- Add a 3- to 4-inch layer of mulch around the tree to keep the ground free of weeds that compete with the tree for nutrients. Keep the mulch several inches from the tree trunk to prevent trunk rot.
- Ensure proper canopy pruning to allow optimal sunlight penetration.
- Prune excess branches and buds to maximize plant energy reaching the fruit and thin out less developed or diseased fruit.
- Irrigation management is vital for plant health and to prevent fruit cracking. Pomegranates should receive moisture every 4-7 days to prevent water stress.
- Fertilize regularly for plant health and vigorous growth.
- Apply integrated pest management to achieve optimal yields.



## QUICK-START GUIDE

### ***Harvesting***

- Fruit should be checked for color and sweetness (brix) before harvest. Harvest ideally should be at a minimum range of between 18-20° brix.
- Harvest early in the morning so fruit is at its coolest core temperature. Stop harvesting once ambient temperature exceeds 20°C.
- Fruit to be clipped with very short stem, not pulled from tree.
- Transfer harvested fruit to reusable field crates and keep out of the sun.

### ***Post-harvest Handling***

- Deliver fruit to packing house within 24 hours of harvest with crates identifying farm and date harvested unless the product is to be field packed.
- Wash fruit and sanitize with chlorine (100-200ppm).
- Grade and sort as per market specifications.
- To increase shelf life, treat with a recommended fungicide (depending on market) and then wax.
- Fruit may be inserted into plastic sleeves to prevent damage during shipment.
- Further process options include aril (seed) extraction for sale as ready-to-eat product or juicing. Waste can be used for making essential oil, tannins for leather or for livestock feed.

## **Packaging and Shipping Requirements**

### ***For Subcontinent and Local Wholesale markets***

- 9 kg plastic crate
- 16 kg carton

### ***For Supermarket and High Value Export Markets***

- 4.5 kg cardboard tray with plastic inserts
- 3.5 kg plastic crate
- Extra Class and Class 1 to customer requirements

<b>Grade</b>	<b>Requirements</b>	<b>Tolerance</b>
<b>Extra Class</b>	Must have shape and coloring typical of the variety. Must be free of defects that affect appearance, quality and presentation.	5% by number or weight
<b>Class I</b>	Same as above, but with allowances for slight defects in shape, coloring and appearance. Scratches and other blemishes not to exceed 5% of total surface area.	10% by number or weight
<b>Class II</b>	Pomegranates do not qualify for inclusion in higher classes but satisfy minimum requirements. May have defects in shape, coloring and appearance. Scratches and blemishes not to exceed 10% of surface area.	10% by number or weight



## POMEGRANATE SIZING GUIDE

Sizing Code	Minimum Weight	Minimum Diameter	Count per 4.5kg Tray
PRINCE	500 grams	100 mm	8 -10
A	400 grams	90 mm	12
B	350 grams	80 mm	14
C	300 grams	70 mm	16
D	250 grams	60 mm	18 - 20
E	200 grams	50 mm	22 - 25

### **Labelling**

Identity: Commodity, variety, size (grade description)  
Responsibility: Grower, packer, province, country  
Quantity: Weight, count (number of fruit in carton)

### **Cold Storage**

- Pre-cool to 7°C. Maintain 90-95% relative humidity.
- Apply a controlled atmosphere of 5% oxygen + 15% carbon dioxide if in storage for longer than 3 months.
- Maintain cold chain throughout shipping.

### **Ground + Sea Freight**

- Ground and sea freight is the most economical method for shipping pomegranate.
- Care has to be taken that it is shipped in refrigerated containers to maintain the cold chain and that a temperature recording device is placed onboard to ensure a record is kept.

### **Air Freight**

*(from Kabul and Kandahar)*

- Several vendors are available for block space agreements when shipping large volumes.
- Maintain cold chain by using a refrigerated container or wrapping in thermal blankets
- Do not allow fruit to be exposed to sun or high indoor temperatures.

## **Target Markets**

### **Local and Regional Markets**

*(Afghanistan, Peshawar and Quetta)*

- Similar requirements as local markets
- Bulk or 16kg packages can be shipped unrefrigerated
- Low input, low return with much of the product being re-exported to other countries under non-Afghan branding.

### **India**

- Indian market generally looks for soft-seeded varieties of pomegranates, though Afghan pomegranates are in seasonal demand.



## QUICK-START GUIDE

- Best prices paid for quality size, color and grading of the fruit. Consistent grading and sorting essential for top prices.
- A grade delivers a significant premium, especially later in the season when Indian supply is low.

### ***Europe***

- Premium market.
- Fruit must be large, carefully graded and free of defects for maximum return.
- Longer distance requires greater attention to cold chain maintenance.

### ***UAE***

- Strong competition in UAE market, but premium paid for high grading standards.
- Higher demand for Afghan pomegranates graded size B, C and D.

### ***Supermarkets and Channel Importers***

- Require top-quality fruit with a well planned and consistent supply.
- Preference for 4.5kg pkgs of well graded and consistent sized fruit.
- Premium price paid for larger sizes (Prince, A and B).
- Branding as 'Kandahari' associated with premium product.

# Part I

## Cultivation

### Introduction

The pomegranate (*Punica granatum* L.) is one of the oldest known edible fruits in the world. Pomegranates are cultivated extensively in Mediterranean countries (Tunisia, Turkey, Israel, Egypt, Spain, and Morocco), Afghanistan, India, Iran and to some extent the United States (California), China, Japan, and Russia.

In Afghanistan, approximately 8,000 hectares of land are given to pomegranate production, with a total annual production of nearly 180,000 metric tons (MT).

### Climatic Requirement

Pomegranates are grown throughout Afghanistan, thriving on the country's hot summers and cool winters. Most of the commercial pomegranate growing areas in Afghanistan are situated between 700-1500m above sea level. Elevation is the main restriction in production, with 'Bedana' produced at 1,000 – 1,300m elevation and 'Kandahari' produced at elevations from 550 -1000m. The pomegranate tree favors limy, slightly alkaline, calcareous and wet soils. The trees have a low winter chilling requirement of 200-400 hours.

### Botanical Characteristics

Pomegranate trees can grow up to 8m high, but are more commonly grown as a bushy shrub. The leaves are deciduous, usually glossy and dark green. The plant usually has spines (thorns) along its branches. Pomegranates become less vigorous after about 15 years. The pomegranate is self-pollinated as well as cross-pollinated by insects. Cross-pollination increases the fruit set.



*First flowering on a two-year-old pomegranate tree*

The pomegranate may begin to bear fruit after one year, but more commonly in 2 1/2 to 3 years.

Under suitable conditions the fruit should be ready for picking 5 to 7 months after bloom. Most trees bear full fruits beginning the fourth year and continue to do so for about 25-30 years. Pomegranate trees can live for 200 years.

The pomegranate fruit is nearly round, 6 to 12 cm wide with a hard, leathery skin. Surface color varies among commercial cultivars from yellow with a crimson cheek to solid brownish-red, pinks and also deep red. The edible portion is the bright-red pulp (aril) surrounding the individual seed. The interior is separated by membranous walls into compartments.

### Regions and Varieties

The southern province of Kandahar is the cradle of Afghan pomegranate production, with commercial exports produced in Zabul, Helmand, Farah, Nimroz, Kapisa, and Balkh provinces as well. Afghanistan is home to a wide variety of cultivars. Major varieties include:

- **Sor Kandahari** - found in and around Kandahar. It is circular and red in color with a slightly sour taste. The fruit has an average weight of about 233 grams.
- **Mykosh** - found in Kapisa. It has a brownish, protuberant shape, bulging out slightly at the sides. The taste has an even balance of sweet and sour and the fruit has an average weight of 189 grams.
- **Tashkorghani** - found in Nangarhar and Balkh. These pomegranates are circular and brownish red in color. They have a sour flavor and average about 243 grams per fruit.
- **Post Ghasab** - found in Samangan. The fruit is circular and pink in color with a moderate taste. The fruit weighs an average of 257 grams.
- **Khog Kandahari** - found in Nangarhar and Kandahar. It has a circular shape and a red-yellow color. The fruit is sweet and weighs about 234 grams.
- **Bedana** - found in Kapisa. It is a sweet, seedless variety with a high export potential, weighing about 230 grams.

For a complete list of pomegranate varieties, see Annex 1.

## Orchard Establishment

### Variety Selection

Plant only improved varieties that are high in quality and disease-free. Varieties of new plantings should be chosen based on:

- Suitability for growing zone
- Even ripening
- Good color
- Suitable size of fruit
- Fruits with small and fleshy seeds
- Predictable market demand and performance



*Highest quality saplings can be sourced from member nurseries of the Afghanistan National Nursery Grower Organization (ANNGO)*

### Site Selection and Preparation of Land

Choose land with abundant access to water (through rain or irrigation). Winter temperatures should not drop below -15 °C. Do not plant in low areas where cold air is trapped by surrounding hills or vegetation. If frost occurs in spring just before or during bloom, the whole crop can be destroyed. Soil should be well-drained fertile sandy loam/alluvial with good moisture and nutrient-holding capacity. Do not plant in salty (saline) or alkaline soils. Plant new orchards with north/south orientation of the rows for better exposure to sunlight. This will help trees bloom later and reduce the danger of frost at early stages of growth.

Pomegranates can tolerate moderate flooding. Full sunlight nearly all day long is essential; without at least 6-8 hours of direct sunlight each day the trees will produce long thin branches with little fruit. Summers should be fairly dry; areas of heavy summer rainfall will



result in fruit that is soft and will rot easily in storage. To maintain dormancy in winter, do not fertilize or prune in late summer or fall. Keep the ground around the tree as clean and free from weeds as possible. Make sure the ground is firm, moist and exposed to sunlight by removing ground cover or keeping it low and not cultivating the soil during cold months.

### **Propagation and Planting**

Pomegranates may be propagated by means of hardwood or softwood cuttings rather than planting seeds. Trees grown from seeds are often of unpredictable quality and variety. Cuttings root easily and bear fruit after 2-3 years. Softwood cuttings made late in the growing season can be rooted in nursery beds or greenhouses. Cuttings are taken in winter from the branches of trees at least one year old, cut into pieces 20-25cm long with a diameter roughly that of a pencil. Rooting is improved by application of 300 - 5000 ppm IBA



*A pomegranate cutting is placed 2/3 into the soil and its upper branches pruned to allow for more growth.*

(Indole-3-Butyric Acid), a growth regulator used to promote root formation of plant clippings and to reduce transplant shock.

Cuttings should be taken in late dormant season before any bud expansion occurs (February or March) and placed vertically in sterile soil. The leaves should be removed and the cuttings inserted about two-thirds their length into the soil. Grafting is generally not recommended; pomegranate cuttings root easily, facilitating the spread of desirable clones. Cuttings may be left in nursery rows for 1 to 2 years; a single year in the nursery bed is most often adequate before permanent planting in an orchard.

If planting bare-root, dig a hole only as large as necessary to accommodate the root system. Do not add fertilizer or compost. Use of 50g of phosphobacterium and 150g of vesicular arbuscular mycorrhiza at the time of planting will promote better root growth and

establishment. Water new trees once weekly in hot weather, less often in winter.

Plant the tree so that the topmost major root is even with the soil line. Prune away any damaged roots. Planting should be done in late winter, approximately 2-3 weeks before sprouting. In lowland areas trees can be planted in early winter after leaf shedding.

The trunks of newly planted trees are susceptible to damage from too much sunlight exposure. When injured, the bark can be infested by borer insects. Painting the trunk with white latex paint diluted to half strength will help improve protection to overexposure and pests. Paint the entire trunk, including the dormant buds.

### **Soil Preparation and Fertilization**

Prepare soil thoroughly by plowing, tilling or spading before planting. Remove all weeds. Incorporate lime and organic matter such as well rotted manure or compost into the top 25cm of soil before planting.

Pomegranates do not usually develop many nutrient deficiencies, but adequate nitrogen is helpful to optimize growth and development of newly planted trees. Urea is a good source of nitrogen and should be applied during winter and/or spring for timely release of nutrients.

Apply at a rate of 20-55 kg per hectare. Note: the level of nitrogen fertilization has more of an influence on the growth, yield, and quality of pomegranates than of overall plant nutrition.

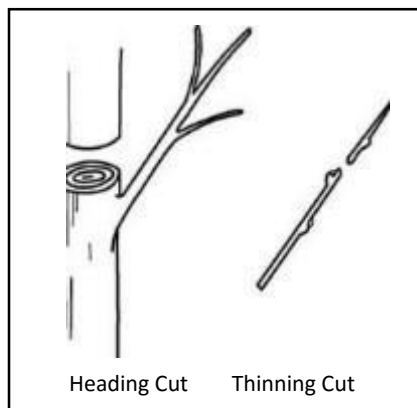
## Planting Density

In a crowded orchard, fruit will mostly set at the top of the trees leaving it susceptible to poor color development and ineffective application of pre-harvest sprays. Pomegranates should be planted 3-4 meters apart and 4-5 meters between rows, depending on the local climate; in low altitudes where the summers are hot, trees should be planted closer together to afford protection from the sun.

## Pruning

Proper pruning and thinning of fruit provides better sun protection and larger fruit yields. Each tree has a limited capacity to supply nutrients to foliage and fruit. With adequate pruning and thinning of underdeveloped or poor quality fruit, those nutrients can be more beneficial to a smaller number of fruit, producing better yields.

Trees should have three to five lateral branches as opposed to the conventional 12 or 15. Trees should be pruned to maintain a height that provides easy access to fruit on top branches. (Taller trees do not provide more fruit.) Trees harvested by ladder should be no



more than 5m in height. Prune older trees more heavily than younger trees so that they are reinvigorated.

Remember that fruit will form mostly on the outer part of the canopy where light penetration is best.

Pruning should take place in early spring, when danger of freezing is past, but before full bloom takes place. In areas with late frost, delay pruning until after bloom. Prune the top portion more heavily than the bottom, as this is where most vegetative growth occurs.

Two types of pruning cuts are used. **Heading cuts** are used when cutting a limb back to a stub. This cut usually results in vigorous new growth just below the cut. **Thinning cuts** take place mid-branch. This cut allows for more light penetration but does not typically result in more vigorous growth. Except when trees are newly planted, most cuts should be thinning cuts.

## Thinning

Too many fruit on the tree will lead to reduced fruit size overall. It can also result in fewer buds the following season. Trees should be thinned 2-3 weeks after flowering. Thin out fruit that grows in clusters, as these clusters form an ideal habitation for insects. Thin out undersized and damaged fruit as well.

## Irrigation

Pomegranates require approximately the same water as citrus trees – approximately 125-125cm of rainfall annually. In areas where rainfall is sporadic or rare, orchards should be watered every 7-10 days, with more frequent irrigation for light to medium soil. Excess water must be able to drain away to avoid waterlogging the root zone.

Watering young trees is more important than fertilizing, as these trees have a limited root system and less ability to carry water to the plant. Watering is most critical during the first year of the orchard. Optimum moisture is needed in the upper soil layer where most of the

roots are located, especially during leaf expansion, fruit set and fruit enlargement.

Avoid frequent shallow irrigation. This encourages a shallow root system and can lead to wood rot. Opt instead for a deep soaking every 7-10 days. Trees with yellow, dropping leaves or root rot have received too much water, while trees with yellow leaves and small fruit have received too little.

To test the moisture of the soil, take a handful of soil 30cm below the surface and clench it in your fist. If the soil holds its shape when the hand is unclenched, the soil is sufficiently moist. If the soil crumbles, the soil is too dry.

### **Weed Control**

Weed control is critical, as weeds compete for water and nutrients in an orchard. Weeds are also a potential host for pests. Weeds can be controlled by intercropping between rows, mowing or the application of a weed controlling chemical. Pre-emergent weed killers should be used only after germination. Glyphosate can be used throughout the growing season. In Afghanistan, fruit growers typically use mechanical means of control, i.e. softening the soil and removing the weeds with a shovel or tractor.

### **Winter Dormancy**

The following practices will keep pomegranate trees dormant in winter and ensure an optimal harvest:

- Retarding plant growth until autumn by withholding irrigation and nitrogenous fertilizers. This will hasten growth the following season.
- No late summer or fall pruning.
- Maintaining regular irrigation especially in late summer.
- Painting tree trunks with lime solution.
- Keeping soil bare. Grass, weeds, and straw mulch prevent heat from entering the soil during the day, so less energy is stored for release at night.

### **Fertilization**

Nitrogen, phosphorous and potassium are the major nutrients required for proper pomegranate growth. Nitrogen (urea) should be applied by hand during the first two years, the amount increasing each year up to the fourth year. Trees can be given 56-113 grams of nitrogen during the first two springs. After that, little fertilizer is needed (although the plants respond favorably to a mulch of rotted manure or other compost).

The application of chemical inputs such as chelated zinc in soil and boric acid foliar sprays can reduce fruit cracking and improve yield in the orchard by thickening the husk and making it less susceptible to environmental fluctuations such as cold snaps and unplanned irrigation through rainfall. Warning: over-fertilization will lead to fruit drops.

After harvest and when the trees have lost their leaves, 300g of urea and 250g of diammonium phosphate (DAP) fertilizer should be applied, with plenty of irrigation afterward. A second application of 300g urea can be applied after leaves return in the spring.

In Afghanistan, farmers apply farmyard manure to pomegranates in the fall. Each tree receives around 11kg of well decomposed manure and 250-300g of urea, 125g of triple

super phosphate and 125g of potassium sulfate for saplings 1-5 years old up. Trees older than five years should receive 30-50kg of farmyard manure with 1-1.5kg of urea, 500g triple super phosphate or DAP and 500g of potassium sulfate.

The application of broad spectrum fungicides as part of an integrated pest management system will inhibit infestations by mold, a key cause of post-harvest losses.

## Maturity

Color is the main criterion for determining harvest readiness. This can be difficult to determine with certain varieties where color can differ greatly, as shown in the illustration



*“Kandahari” pomegranates are harvested in Arghandab, Kandahar Province.*

below. Harvest staff must be trained to understand clearly what quality and size is being sought and ensuring they do not damage the trees or the fruit. Fruit is generally considered ripe when it makes a metallic sound when flicked with the finger.

Once the pomegranate reaches the deepest hue associated with its particular cultivar, it is ready to be picked. This usually coincides with the full opening of the calyx (crown) at the base of the fruit. Note that the fruit does not ripen further once picked. Harvesting too early will result in a poor quality being delivered with reduced brix

(sweetness) levels.

Trees within an orchard may ripen at different times. Fruit within the same tree may also ripen unevenly. Optimum yields are generally achieved during the sixth year, but trees can begin providing good yields as early as their second or third year of bloom. Because the trees have a long period of blooming there is a tendency for fruit to ripen unevenly. Care must be taken to harvest fruit selectively over the full harvest period. This will provide a natural thinning process and provide better quality and size later in the harvest.

## INSECT PESTS AND DISEASE

**Carob Moth** – The carob moth is a major pest found in Afghan orchards. During the spring, the female moths lay eggs on the stamen of the flower. After hatching, larvae enter and feed on the fruit. The infected fruit either rots and drops, or it may remain on the tree until the end of the season, providing food for three generations of moths.



Carob moth can be remedied by cleaning and removing the mass of stamens after flowering to deter egg laying. Application of bacillus thuringiensis (BT) early in the season can kill larvae before they can migrate from the stamens to the interior of the fruit. Pheromone dispensers can be placed in an orchard to disrupt moth mating. Assafoetida oil (“devil’s dung”) can be used to disrupt female egg laying. Use an equal part of oil and ethanol applied to a woolen fabric and inserted into a polycarbonate tube that hangs from each tree, changing monthly. Note that infested fruit should be removed from the orchard and destroyed.

**Aphids** – Aphids are common to pomegranate orchards and generally controlled by natural predation. When colonies get out of control, however, the pest can decimate an orchard. Often aphids are limited to only certain parts of a tree, which should then be removed and destroyed to limit migration to other parts of the tree or orchard. Spraying with water once a week using an insecticidal soap will dislodge the aphids from the leaves and prevent them from reattaching. Chemical remedies include dimethoate, monocrotophos and cypermethrin.



## OTHER FRUIT DAMAGE

**Fruit Cracking** – This is a disorder where the surface of the pomegranate shows deep cracks. It is generally caused by moisture stress brought on by heavy irrigation/rainfall in late summer after a long dry period. Fruit of an unusual shape, such as kidney- and heart-



shaped fruit, are also subject to cracking as the deep stem cavity acts as a reservoir for water. Cracked fruits are generally unsalable but can be used for processing as juice if they have not been affected by fungus. Note that cracked fruit can be stored for only a short period of time.

Avoid fruit cracking by using varieties that are more resistant to cracks, such as Pand Post, Sor Double Posti of Farah and the thick-skin Kandahari. Irrigate at regular intervals, especially during the dry months.

Fruit cracking is often the result of deficient micronutrients, such as boron. Apply boron as a foliage spray at 2g per liter while fruit is in its enlargement stage. Harvest fruit a few days just prior to its full maturity. Plant a windbreak around the orchard to avoid night and day temperature fluctuation. Distributing organic mulch over the root system will help conserve water and reduce evaporation.

**Sun Scald** – Pomegranates grow in hot, dry areas, and fruit that grows too close to the crown or to the outside of the tree can often be subject to sun scald. The surface of the fruit that faces the afternoon sun will turn a brown or bronze color and may crack. This most often occurs when the tree is pruned in an open canopy shape, allowing too much sunlight to penetrate the inner part of the tree.



Avoid heavy pruning and ensure that the tree has adequate growth to allow sufficient leaf growth to protect the tree. Use adequate fertilization to maximize leaf growth. Kaolin (a clay-based powder) has been found to reduce the incidence of sun scald. Spray kaolin over the canopy and fruit three times during the growing season at two-week intervals (one spray of 5% and two at 2.5%).

**Low Fruit Set** – If conditions in an orchard are too humid during the flowering period, the flowers may not set and the fruit output will be reduced. This is often caused by a poorly designed orchard with inadequate air circulation. Ideal orchard layouts feature open areas free from shade with a gentle slope to promote natural air drainage.

**Internal Breakdown** – Often a healthy looking fruit will reveal soft, discolored or mushy arils inside. The arils are soft and creamy brown and thereby unfit for consumption. This often occurs because fruit has been left on the tree too long after maturity. This can be avoided by punctual harvesting of the fruit at or slightly before maturity.

**Root Rot** – Stem or root rot occurs when trees are over-watered and do not have proper drainage.

**Fruit Scratching** – When trees have not been properly pruned, branches can scrape the fruit, causing cosmetic damage or rind breakage. This can be avoided by good pruning practices and thinning the fruit so that it is well spaced.

**Rind Blackening** – This develops on immature fruit in storage that has been harvested too early.



*Cracked and diseased fruit can account for losses of 50% to 85% when adequate orchard management techniques have not been followed.*

## Harvest

Harvest early in the morning to get the fruit at its lowest core temperature. This will require less energy to precool the product before packing and storing. Fruit should be picked by



*Pomegranates should be picked by hand and not swatted from the limbs with sticks.*

hand and carefully handled. Despite the pomegranate's tough exterior, they scratch and bruise easily, decreasing their commercial value. Fruit should be clipped with pruning shears close to the attachment point so that the stem does not cause damage to other fruits during packing.

Do not leave unwanted fruit lying on the ground in the orchard. This will provide sanctuary for pathogens to survive over winter and re-infect the orchard. Using harvest bags can reduce the amount of impact and crushing injuries, and frees up both hands for clipping.

If using plastic harvest crates for field harvesting, line them with plastic to protect the pomegranates from being scratched by the rough surfaces of the crate. Avoid field packing into wooden boxes as they are difficult to clean and can harbour pathogens that will transfer from one load to the next.

Any external scratch on the rind of the pomegranate allows an entry point for infection by pathogens which will manifest during storage. It will also cause increased moisture loss due to the rind being compromised. Poor quality or damaged fruit can be used for juice processing or animal feed. The husks can also be dried and utilized for winter fuel. Any detritus remaining in the orchard should be removed and burnt.

## Field Packing

Fruit should be fully dry before packing. Pack in a clean, shady area. Wash the fruit with chlorinated water at 200ppm (20ml per litre). If packing in the field, dampen the area around the packing site or use a clean tarpaulin to prevent dust from blowing onto the clean product.

Apply a fungicide such as fludioxinal to prevent mold regrowth. If shipping to select international markets, care should be taken to ensure that the pesticide concentration is not too high. Ensure the fruit is kept as cold as possible and is shipped under controlled conditions at the earliest opportunity.

Once fruit has been harvested, the temperature of the fruit must be reduced as quickly as possible. The three pre-cooling methods discussed below are effective means of reducing the temperature so that the fruit enters a state of dormancy, extending its shelf life.

### IMMERSION PRE-COOLING



Immersion pre-cooling is most effective when combined with the cleaning process. Dehydration is reduced compared to evaporative or mechanical cooling. By using water cooled to target storage temperature of 6° C to clean the product, faster cooling results are achieved than either mechanical or evaporative methods. It is up to 60% more effective than air cooling as water draws off the heat faster than air due to direct contact. Less moisture loss means more weight which means more money at the end of the day.

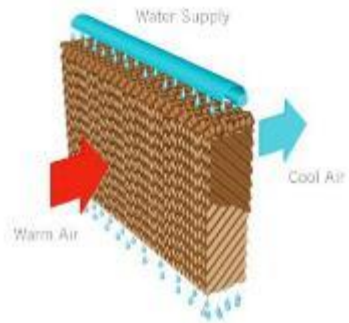
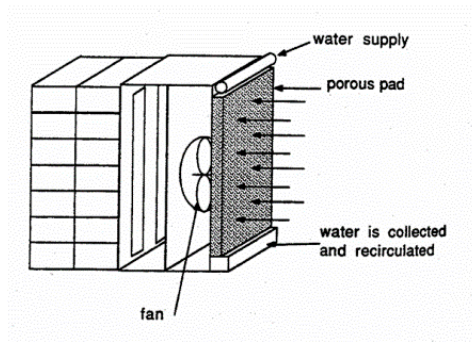
The water must be sanitary and not re-circulated or it will need chemical treatment, such as chlorine at 10ml to 1 litre. Using ice that is made with salt as brine will enable more effectively reduced temperatures as the freezing point is lower than pure water.

### EVAPORATIVE PRE-COOLING

When air moves over a wet surface it causes evaporation of the water. During this process there is a transfer of heat from the surface to the passing air along with the moisture. The rate of evaporative cooling can be increased by using a fan to accelerate the air movement causing more rapid cooling. This is additionally beneficial as it raises the relative humidity in the area being cooled thus resulting in less moisture loss from the fruit.



*To prevent the mature fruit from breaking, pomegranates should be carefully handled and not allowed to drop on the ground.*

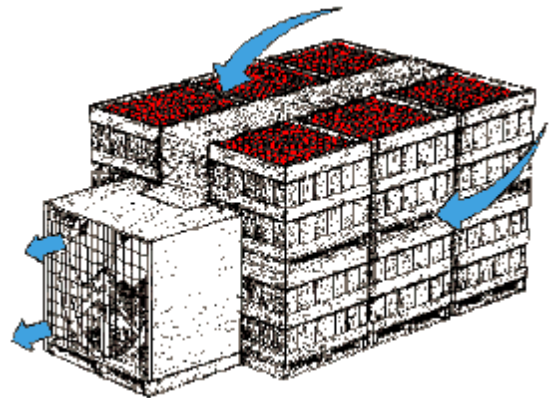


## MECHANICAL PRE-COOLING

Mechanical pre-cooling uses high-speed cooled air to reduce temperature of the product. This can be achieved utilizing specially designed pre-coolers, refrigerated containers or creating forced air tunnels in cold rooms. When utilizing forced air/mechanical cooling it is important to maintain a high relative humidity (>90%) as the air will strip moisture from the product.

Reaching this core temperature in the shortest possible time is important to retaining quality and extending shelf life of the fruit. (At 95% relative humidity, the fruit can be kept only 2 months at 41° F (5° C)).

If access to electricity and infrastructure are constraints, the use of a refrigerated shipping container powered by a generator is an affordable alternative. The cooling is not as rapid but will enable the temperature to be drawn down and maintained until transportation. The shipping container can also be used as a fumigation chamber for broad spectrum fungicides and pesticides.





## Part 2

# Post-Harvest Handling

### Sizing and Grading

Pomegranate sizing is based on diameter and weight. The table below shows the international sizing standards:

Sizing Code	Minimum Weight	Minimum Diameter
PRINCE	500 grams	100 mm
A	400 grams	90 mm
B	350 grams	80 mm
C	300 grams	70 mm
D	250 grams	60 mm
E	200 grams	50 mm

In Afghanistan, because of the lack of facilities equipped for mechanical sizing, it is done using a template through which the pomegranate is passed by hand.



Grading is dependent on the following quality parameters.

Grade	Requirements	Tolerance
<b>Extra Class</b>	Must have shape and coloring typical of the variety. Must be free of defects that affect appearance, quality and presentation.	5% by number or weight
<b>Class I</b>	Same as above, but with allowances for slight defects in shape, coloring and appearance. Scratches and other blemishes not to exceed 5% of total surface area.	10% by number or weight
<b>Class II</b>	Pomegranates do not qualify for inclusion in higher classes but satisfy minimum requirements. May have defects in shape, coloring and appearance. Scratches and blemishes not to exceed 10% of surface area.	10% by number or weight

Factors such as sunburn, external scratches and other defects like insect damage can reduce the grade of the fruit even though the size is good. This is why good agricultural practises should be followed with especial attention to post-harvest handling as any damage caused cannot be repaired by packing.

## Packing

The materials you choose to pack with are driven by the client's needs. Most pomegranates are shipped in a variety of cardboard boxes, but one-way plastic shipping crates are now becoming popular.

When negotiating with clients, establish whether they want mixed grade product or a specific grade. What weight do you intend to pack per box? Ensure that the packing will protect against the following:

- Compression during stacking. The box must be strong enough for the number of cartons you want to stack on a pallet.
- The box must be able to accept rough manual handling.
- The box and packaging must protect the fruit from vibration during transit.
- The box must be able to withstand the impact of being dropped or thrown.
- The packaging must provide protection against contamination.

In Afghanistan the product is often packed in mixed grades with used cartons before being shipped across the border. This should be avoided.



When packing, ensure that the fruits are separated from each other to prevent them from knocking together. The common local practice is to use shredded paper or old newspapers. This creates problems as the paper is usually contaminated and will cause the fruit to spoil.

Foam netting or specially shaped inserts can be used, though this increases packing cost and must be factored in when calculating sales price.



**Bad packing**



**Good packing**



## Sanitation and Post-Harvest Treatments

Fruit brought in from the field is likely to bring dirt or pathogenic organisms such as mold spores. Fruit should therefore be cleaned/sanitized. Prior to packing pomegranates for shipping, clean fruit with chlorinated water at 100 - 200ppm to kill any pathogens.

Ensure that the fruit is completely dry, as any residual moisture will allow for regrowth of dormant pathogens, especially in the calyx. Treatment with an antifungal agent such as fludioxinil will help prevent regrowth of mold. (Many countries have restrictions on the residue levels of this chemical, so ensure the levels are not above 4 parts per million.)

Waxing the fruit extends shelf life by reducing moisture loss and inhibiting respiration of the fruit. An anti-fungal treatment can be incorporated in the wax, ensuring that the levels are below 4ppm. When there is no access to waxing equipment, an alternative is wrapping the fruit in Saran/cling wrap after sanitation.



Untreated



Waxed



Wrapped

## Transportation and Storage

Store pomegranates at 7°C with a relative humidity of approximately 93%. Storing pomegranates at this temperature and then shipping at a different temperature will result in quality problems and spoilage.

When shipping the fruit, keep in a continuously regulated environment to avoid problems with weight loss and pathogen regeneration. While few cold storage facilities in Afghanistan can provide this level of consistent temperature and humidity, the use of refrigerated shipping containers can maintain a closed environment where the relative humidity will balance out.

Do not store pomegranate at 5°C or lower as it will result in husk scald which destroys the aesthetics of the fruit and can result in rejection at point of receipt.



*Husk scald*

## Pomegranate Processing

Pomegranates can be used in more ways than simply as a whole fruit. The arils can be extracted and sold as a high value item with a reduction in shipping weight.

When the arils are extracted the husk and seeds can be used to produce tannin for leather, essential oils for the cosmetic industry, or feed for animals. Aril extraction allows shipping only the edible part of the fruit. This can provide up to two weeks' shelf life and enable access by air to high-end supermarket chains.

Omaid Bahar Fruit Processing in Kabul uses C Grade and damaged pomegranates to produce fruit concentrate. (Visit <http://www.omaidbahar.com> for more information.) Pomegranates can also be used to make jams and jellies as well as high-value syrup concentrates used as condiments.

## Part 3

# Target Markets for Pomegranate Export

*Below are the specific market requirements for successfully importing pomegranates into Pakistan, India, UAE and the Middle East, and other overseas markets (Europe, Central Asia, Canada and Australasia).*

## Pakistan

Pakistan offers opportunities for Afghan exporters looking for market opportunities within easy shipping distance from Afghanistan. Returns, however, are lower than other international markets. Pakistan imports Afghan pomegranates both for home consumption and for resale to other overseas markets.

### **Regional Markets**

#### ***Peshawar and Quetta***

- These traditional markets have similar requirements to local markets.
- Supply is generally in bulk or 16kg boxes of mixed grade product shipped unrefrigerated.
- There is a low level of input, thus low returns to the exporter, with much of the product being transhipped or re-exported.
- Many Pakistani traders purchase entire pomegranate orchards direct from the farmers leading to high yield losses.

#### ***Islamabad, Lahore and Karachi***

- These markets offer opportunities for higher returns.
- They are run by wholesale commission agents who generally monopolise trade in certain products.
- The usual packaging is in 16kg cardboard packaging with mixed grades.

### **Supermarkets**

- Supermarket sales opportunities include Metro Cash & Carry, Hyperstar (Carrefour), Al Fatah and Chase-up Shopping.
- Vendor registration and relationship management is required.
- There are good opportunities for well graded, staged supply. Packaging from 3.5 to 16kg is acceptable with negotiation.

## India

The Indian market traditionally prefers soft seeded varieties of pomegranates, although there is a recognition and premium price paid for Afghan pomegranates. The premium is based on size, color and grading of the fruit. Therefore consistent grading and sorting will deliver good returns, with A grade delivering a significant premium, especially later in the season.

### **Fees**

There are no customs duties on fresh fruits. The following customs clearance fees are assessed at the Wagah border crossing (ground shipments) or at the airport:

Ground shipments:

- Fresh fruit: 5-8 Rs per kilo
- Dried fruit: 40-45 Rs per kilo

Air shipments:

- Fresh fruit: 30-35 Rs per kilo (incl. 11 Rs handling fee) for shipments up to 2 MT. For more than 2 MT, the fee is 20-22 Rs.
- Dried fruit: apx 100 Rs per kilo (incl. 11 Rs handling fee) up to 2 MT. For more than 2 MT, the fee is 80-85 Rs.

The boxes must be labeled with the following information:

- Product name
- Package weight (net and gross)
- Date packed
- Date of expiration (“Best before [date]”)
- Importer and exporter name, address (in India and Afghanistan), phone number and/or point of dispatch



*Packaging for export should be in sturdy, colorful boxes showing the province of origin and other identifying information.*

### **Documentation**

A quality certificate is required for all products. This can be obtained from the Export Promotion Agency for Raisins, Fresh Fruit, Dry Fruit and Vegetables. A phytosanitary certificate for all products is required as well as a declaration form showing that the produce has been tested and is free from contaminants. This can be obtained from the MAIL Quarantine Dept. If additional tests are required, this will be mentioned on the import permit issued by the Indian government.

Other documents:

- South Asia Free Trade Agreement certificate of the origin country
- Invoice
- Waybill (if shipped by air)
- Product/package list

All documents must be scanned and sent to the importer before dispatch of the consignment.

### **Wholesale markets**

Delhi is home to India's largest wholesale market and has a large number of commission agents available. For a list of reputable agents, please contact the CHAMP New Delhi Trade Office, below.

There are many other large wholesale markets worth exploring in India, including Mumbai, Kolkata, Bangalore and Chennai. Commission Agents traditionally work on a 10% commission, though there are often a number of handling fees that should be discussed in advance before consigning produce.

The wholesale markets will accept any form of graded and sorted pomegranates, but a premium of up to 50% is paid for larger sizes of pomegranates. Packaging can be in traditional 16kg cartons, though this can often result in compression damage. A well graded, treated and cold-chain managed 4.5kg tray will attract premium prices later in the harvest season, when local supplies have diminished.

### **Facilitated Trade**

CHAMP operates a New Delhi Trade Office through the Afghan Business Centre (ABC). The trade office can link Afghan exporters with Indian buyers, commission agents, supermarkets, and importers. It can coordinate the export of fruits with Afghan exporters and coach the traders in the requirements of Indian fruit markets and coordinate with Indian brokers in order to release the shipments from Indian customs authorities (air customs, border customs and inland customs).

The trade office will also provide transportation arrangements in order to deliver the cargo from customs to the importers' warehouse or cold storage, while overseeing commission agents during sales. It will provide sales reports to the exporter, including shipment conditions after arriving at the market. It will also document the quality of the produce by taking pictures and providing recommendations to exporters for future shipments.

The trade office will coordinate with importers to release or transfer the pre-negotiated payments, providing specific transaction details. It can also coordinate lodging arrangements for Afghan exporters during their visits to India and assist them with language barriers.

This service, provided with a small service fee, assists in making the market transactions more transparent and reduces barriers to new entrants in the Indian market.

### **Channel Importers**

There are a number of larger wholesale businesses, some with a national footprint. These businesses can offer a strong link to many of the major Indian customers, including supermarkets. These businesses are actively looking for consistent supplies of Afghan pomegranates to complete the 12-month supply chain for their customers.

These channel importers are looking for higher quality and predictable supplies to integrate into their customers' supply chains. They may have a higher cost of doing business, but will often return more consistent and higher prices. Contact the New Delhi Trade Office for more information.

***For more information on exporting to India, contact:***

**CHAMP New Delhi Trade Office  
Attn: Nasrat Zaki  
+91 (0) 8130 977 386  
nasrat.zaki@abcpltd.in  
www.abcpltd.in**

## **Supermarkets**

Pomegranates are competitively sought by supermarkets in India, with many retail chains showing interest in Afghan pomegranates. These supermarkets require not only a high standard of grading and packing, but also significantly higher levels of sophistication in building lasting relationships with exporters.

To deal directly with supermarkets, exporters must invest extensive effort into planning for the seasonal supply. The first step is gaining vendor registration through meetings and showing samples while communicating potential supply windows. If the quality, price and supply windows match up, then a relationship can be established.

Supermarket customers require a variety of sizes and grades of pomegranate depending on their individual market dynamics and the volume of fruit that needs to be sold. With planned timing and good communication, volumes can grow to be very significant.

Supermarkets will embrace quality branded products and pay a premium, especially with the addition of promotional branding and point-of-sale material. Larger volumes of smaller sized pomegranates can also be channelled into this market with good planning.

Packaging requirement must be negotiated with each supermarket. Premium fruit should be packed in single-layer trays (4.5kg cardboard tray with insert). Ideally, fruit should be in perfect condition, with waxing if possible, to assist in the extension of shelf life and aesthetics of the product.



*While plastic sleeves are more labor intensive, they ensure that the fruit arrives at its destination unbruised, bringing a higher return.*

## **UAE and Middle East**

The Dubai market has a consistently strong demand for Afghan pomegranates. Afghan pomegranates have good brand recognition, although there is strong competition from a number of other countries. Premium pricing is paid based on size, color and grading of the fruit. Consistent grading and sorting will deliver good returns, with B, C and D grade being in high demand in the market.

### **Fees**

There are no customs duties on fresh or dried fruits. Each shipment will be assessed a municipality charge of 50 AED. Approximately one-third of shipments are inspected by customs agents. When a shipment is inspected, the shipment is assessed 150 AED.

Fresh and dried fruits must be packed in a completely white box labeled with the product name, weight, origin, shipper and destination. For fresh fruits, this box must be registered each year for a fee of 300 AED.

### **Wholesale markets**

Dubai is the largest wholesale market in the region and has a large number of commission agents available. For a list of reputable agents, please contact the CHAMP Dubai Trade



Office.

Commission Agents traditionally work on a 10% commission, though there may be a number of handling fees that can push the commission above 14%. These should be discussed in advance before consigning produce.

The wholesale markets will accept any form of graded and sorted pomegranates, though a premium of up to 50% is paid for larger sizes. Packaging can be in traditional 16kg cartons, though these may lead to damage due to compression injuries. A well graded, treated and cold chain managed 4.5kg tray will attract top prices later in the season when other sources of pomegranates have diminished.

### ***Facilitated Trade***

In Dubai, CHAMP operates a trade office that facilitates sales of Afghan products, conducts promotion activities, arranges business-to-business meetings and facilitates proper documentation for the export of products from Afghanistan. The Dubai Trade Office also focuses on acting as an interface between Afghan traders and businesses in the Dubai market.

The trade office can coordinate the export of fruits with Afghan exporters and coach them in the requirements of UAE fruit markets. They can also coordinate with UAE brokers to release shipments from UAE customs authorities. The trade office will also provide transportation arrangements in order to deliver the cargo from customs to the importers' warehouse or cold storage, while overseeing commission agents during sales. It will provide sales reports to the exporter, including shipment conditions after arriving at the market. It will also document the quality of the produce by taking pictures and providing their recommendations to exporters for future shipments.

The trade office can coordinate with importers to release or transfer payments by providing specific transaction details. It will also coordinate lodging accommodations with Afghan exporters during their visits to Dubai. This service, provided with a small service fee, assists in making the market transactions more transparent and reduces barriers to new entrants in the UAE market.

### ***Supermarkets***

Pomegranates are sought by many supermarkets in the UAE, with many retail chains actively seeking Afghan pomegranates for their customers. The supermarkets require not only a high standard of grading and packing, but also significantly higher levels of sophistication in building relationships with exporters.

To deal directly with supermarkets, exporters must invest extensive effort into planning for the seasonal supply. The first step is gaining vendor registration through meetings and showing samples while communicating potential supply windows. If the quality, price and supply windows match up, then a relationship can be established.

***For more information on  
exporting to the UAE, contact:***

**CHAMP Dubai Trade Office  
Attn: Zabihullah Sadat  
+971 (0) 52 68 57 573  
zabihullah.sadat@afgradeuae.com  
www.afgradeuae.com**

Supermarket customers require a variety of sizes and grades of pomegranate depending on their individual market dynamics and the volume of fruit that needs to be sold. With planned timing and good communication, volumes can grow to be very significant.

Supermarkets will embrace quality branded products and pay a premium, especially with the addition of promotional branding and point-of-sale material. Larger volumes of smaller sized pomegranates can also be channelled into this market with good planning.

Packaging requirement must be negotiated with each supermarket. Premium fruit should be packed in single-layer trays (4.5kg cardboard tray with insert). Ideally, fruit should be in perfect condition, with waxing if possible, to assist in the extension of shelf life and aesthetics of the product.

## **Other Markets:**

### **Europe, Central Asia, Canada and Australasia**

Afghan pomegranates have a strong international reputation and good brand recognition, although there is strong competition from a number of other countries. Premium prices are based on size, color and grading of the fruit. The largest and best graded pomegranates will often attract a premium price that is required to make the extra effort worthwhile. There may also be secondary markets for fruit processed into juice.

Because of the extra distance and time to these markets, extra effort needs to be placed on post-harvest treatments, including waxing to reduce dehydration and cold chain maintenance. Because of the time, distance and cost to get to these markets, demand should be created in advance and a partnership developed with the channel importer to develop a transaction that is profitable for each party and which will mitigate the risks involved.

The ideal packaging for these markets is single layer trays, either 4.5kg cardboard trays with inserts or 3.5kg single-use shipping crates. The use of the crate will reduce impact and compaction injuries in transit and allow for fruit to be shipped successfully at higher humidity with reduced dehydration.

## Annex 1 – Major Pomegranate Varieties of Afghanistan

#	Variety	Province	District	Production Area (ha)
1	Bedana	Kapisa	Tagab	350
		Kandahar	Kandahar	5,000
		Nangarhar	Sherzad	80
2	Bum	Kandahar	Arghandab	2,000
3	Danadar	Kapisa	Tagab	2,000
4	Kabutak	Balkh	Khulm	1,000
5	Kandahari	Balkh	Khulm	3,000
		Nangarhar	Sherzad	100
6	Manayi Sur	Kandahar	Kandahar	500
7	May Khosh	Sari Pul	Sari Pul	50
		Nangarhar	Sherzad	50
8	May Khosh Spin	Kapisa	Tagab	1,500
9	Nazek Post	Kandahar	Kandahar	3,000
10	Pand Post	Farah		2,000
		Kandahar	Kandahar	6,000
11	Sherinak	Balkh	Khulm	800
12	Sor Doubl Posti	Kandahar	Arghandab	4,000
13	Sor Khog	Kandahar	Kandahar	5,000
14	Sor Zod Ras	Kandahar	Kandahar	300
15	Sorkhak	Balkh	Khulm	350
16	Spin Khog	Kandahar	Kandahar	1,000
17	Spin Trush	Kandahar	Kandahar	800
18	Tashkurghani	Balkh	Khulm	200
19	Tor	Kandahar	Kandahar	800
20	Turosha Shinki	Kapisa	Tagab	500
21	Zer Anar	Balkh	Khulm	400
22	Soin Ghar	Farah		1,000
Total				41,780

Source: Glozer, K., & Ferguson, L. (2008). Pomegranate production in Afghanistan. U.C. Davis College of Agricultural & Environmental Sciences, 32.

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