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Best Practices for APRICOT 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.

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www.CHAMP.af



Ministry of Agriculture,
Irrigation and Livestock

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Apricots

QUICK-START GUIDE

With their bright yellow color, size and rich flavor, Afghan apricots are highly sought in regional markets. Apricots are found in areas with cold winters. The tree is slightly more cold-resistant than the peach, tolerating winter temperatures as cold as -30°C . In Afghanistan, the limiting factors in apricot culture are: (1) spring frosts, which can destroy the crop, and (2) lack of water. The return per hectare is higher than that of most staple crops, which has encouraged farmers to plant more apricots than ever before. Apricots are marketed either fresh or dry.

Regions and Varieties

Apricots are grown in both the lowland plains of Kandahar and Nangarhar as well as higher elevations such as Wardak, Kabul, Kapisa, Ghazni and Herat. The chilling requirement of lowland varieties is from 400-700 chill hours, while highland varieties need 800-1200 chill hours. (One chill hour is an hour at or below 7°C .) Fruit matures at temperatures from $35-42^{\circ}\text{C}$ in the lowland plains and $25-35^{\circ}\text{C}$ in colder highland areas. There are several varieties grown in Afghanistan, though the main commercial varieties for export and fresh sales are Ameri and Qaisi, as well as Charmaghzi and Tomcot which are grown in warmer areas such as Jalalabad. Afghan apricots are well known internationally for their high brix levels and unique flavor intensity.

Producing for Export

Cultivation

- Grower should choose a variety that is adapted for the altitude of the orchard, with chilling requirements and cold-hardiness suitable for the elevation.
- Most varieties need at least 150 frost-free days from bloom to fruit maturity.
- Apricots can be grown on their own roots as seedlings, or grafted onto peach or plum rootstocks. Many orchards in Afghanistan may have wild seedlings mixed with cultivated varieties. Seedlings show wide productivity variability from year to year, while trees budded onto rootstocks are less variable.
- Deep, well-drained sandy loams with good moisture and nutrient-holding capacity are the best soils for cultivation.
- A 3- to 4-inch layer of mulch around the tree will keep the ground free of vegetation that would compete with the tree for nutrients. Mulch should be several inches from the tree trunk to prevent rot.
- Fruit thinning is recommended for optimal yields and quality as it reduces the burden on the tree from underdeveloped or damaged fruit. It also ensures a crop the following year, as the tree is accustomed to having fruit removed during the growth cycle and will therefore set better.
- Pruning, integrated pest management and appropriate fertilization are critical to good orchard management. Apricots grow best with an open vase form.

Harvesting

- Fruit maturity is determined by flesh firmness, brix and size. One method of determining ripeness is the wring test. The apricot is cut along the suture line and twisted. If any flesh clings to the stone it is immature.
- The fruit must be harvested when mature but not fully ripe, as it will continue to ripen in storage.
- Fruit should be harvested by hand into cloth bags to prevent damage. When plucked, a long stem should be retained to prevent pathogenic infection where the stem meets the fruit.
- Cloth bags are emptied into lined harvest crates and transferred to the packing area.
- Reduce the temperature of the fruit as soon as possible to achieve a viable shelf life.

Post-Harvest Handling

- Apricots must be chilled as soon as possible to a temperature of between 0.5 °C - 2 °C. Stone fruit held at an ambient temperature of 32 °C will deteriorate faster in an hour than at 4 °C in a day and 0 °C in a week.
- Immersion cooling in water is 60% more effective in drawing down temperature than forced-air cooling.
- Fruit should be sanitized with chlorinated water at 100ppm. Depending on the market, the inclusion of fungicides such as fludioxinil can be introduced. (In some markets these fungicides are regulated, so care must be taken not to exceed limits set by those markets.)
- When the product is packed it can additionally be treated with 1-methylcyclopropene to retard respiration and extend shelf life.
- Ethylene scavengers such as activated carbon or potassium permanganate air filters can help prevent ethylene build-up and improve shelf life.

Packaging and Shipping Requirements

Labelling

Identity: Commodity, variety, size (grade description)
Responsibility: Exporter, packer, province, country
Quantity: Weight, number of packages if not bulk packed.

Cold Storage

- Ideal storage temperature for apricots is between 0 °C and 2 °C. Lower temperatures will induce chilling injuries.
- Storage areas should have a relative humidity above 90% and good ventilation to avoid ethylene build-up.
- With the use of 1-methylcyclopropene treatment, temperatures of 5 ° - 7 ° C can be tolerated and shelf life can be extended by up to two weeks.
- If 1-methylcyclopropene is not available, ethylene scrubbers (potassium permanganate or activated charcoal) are recommended.

Ground + Sea Freight

- Ground and sea freight is generally avoided unless the route takes less than 3-4 days. The product may arrive at the destination fully ripe without meaningful shelf life remaining.
- This could be a viable route into Pakistan, but typical delays in freight forwarding from Karachi have resulted in major losses to local traders

trying to access India or the UAE.

Air Freight

- Air freight is available on a daily basis with at least 2 MT reserve. Bi-weekly freightliners out of Kabul can accommodate 20 MT.
- Freight needs to be kept at target temperature or protected by thermal blankets. Constant monitoring at the point of dispatch and receipt is vital, with careful coordination between the two.

Target Markets

India

- Afghan apricots are starting to be recognized by the Indian market, especially later in the season when local varieties are scarce.
- Apricots bound for India should be pre-packed into clamshells to allow branding and product differentiation.

Pakistan

- Yields are similar to domestic market: low input, low return.
- Mainly supplied in 20kg bulk packaging.

Central Asia

- High demand in early season, with preference for 5kg and clamshell packs.
- Longer distance requires greater attention to cold chain maintenance.

UAE

- Good demand for the full range of Afghan apricots (airfreight).
- Pre-packed into clamshells or 5kg export pack.
- Strong competition from international suppliers. Pricing depends on packing and good physical appearance of product.

For more information, visit CHAMP.af

Part I

Cultivation

Introduction

Apricots are deciduous plants that have been cultivated for many decades in Afghanistan as a high-value crop. Apricot production has spread throughout the country, and consequently a large number of local varieties are cultivated. Apricots are sold both as fresh and dried fruit as well as for making juice. In Afghanistan, the total annual production of apricots is nearly 83,500 metric tons (MT).

Climatic Requirements

Climate refers to the meteorological conditions, including temperature, wind and precipitation that characteristically prevail in a particular region. Apricot trees are grown in temperate zones and require 300 - 800 chilling hours (temperature below 7^o C.) during the winter dormant period.

Apricot trees need sufficient water for survival and good drainage; apricots respond negatively to waterlogged soil and thrive on well-drained loam soils. A minimum soil depth of about 1.5 m. is recommended. The apricot has medium resistance to high pH and salinity.

Botanical Characteristics

The apricot (*Prunus armeniaca*) is a stone fruit growing mostly in temperate climates. It is deciduous in nature and belongs to the Rosacea family. It has a spreading canopy and grows from 3-10 meters high depending on rootstock and training system. It is self-pollinated, flowering in March and ripening in June. The trees bear fruit on the second year of planting but require five years to reach peak production. The fruit can be ovate, oblique or circular in shape and is typically yellow-green with red stripes. Apricots are propagated by grafting and budding on desired rootstocks.

Regions and Varieties

The main production areas of commercial varieties (Ameri & Shakarpara) are Wardak, Ghazni, Logar, Bamiyan, Zabul, Uruzgan, Herat, Helmand, and Balkh provinces. Other varieties like Badami, Charmaghzi, Qaisi, Roghani, Peer Naqshi, Saqi, Goldcot, Ambercot, Patterson, Pincot are grown throughout the country.

Apricot cultivars common to Afghanistan are Ameri-276, Ameri-278, Ameri Kalan-365, Ameri Sorkh - 328, Ameri 822, Shakarpara 250, Shakarpara Sorkh 372, Qaisi 741, Qaisi 741, Peer Naqshi 292 and Saqi 5004. Among them, Ameri and Shakarpara are the two main varieties for export and commercial purposes. The Ameri variety is marketed both fresh and dry while the Shakarpara is only grown for drying purposes. Apricots start flowering in March – April and ripen in June–July, depending on the variety and area of production.

Orchard Establishment

Variety Selection

Plant only improved varieties that are high 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
- Predictable market demand and market performance
- Resistance to diseases and pests

Always procure saplings from a reliable nursery (such as members of the Afghan National Nursery Growers' Organization). This will ensure that saplings are of a uniform variety and quality.

Site Selection and Preparation of Land

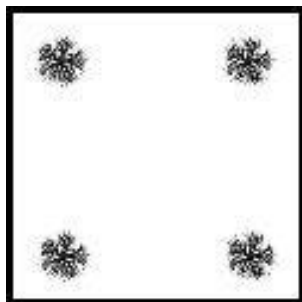
Select land with permanent access to water throughout the year and which is well-drained, deep and fertile. Plant new orchards with a north/south orientation of the rows for better exposure to sunlight. This will help trees bloom later and reduce the danger of frost at early stages of growth.

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. 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.

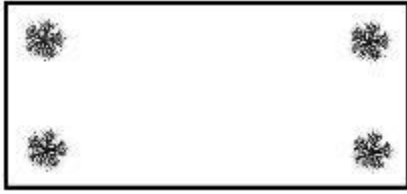
Propagation and Planting

After selection of the site and location, the land should be thoroughly ploughed, levelled and made fertile with well decomposed manure. Levelling is important for efficient irrigation and preventing soil erosion. In the hills, the land should be divided into terraces depending upon the topography of the land and the levelling done within the terraces. Terracing protects the land from erosion. Fertility of the soil is important for growing apricots. If the soil is poor, plow in green manure so as to improve the soil's physical and chemical conditions before planting.

Any method of layout should aim at providing optimum number of trees per hectare. Adequate space for proper development of the trees and ensuring convenience in orchard cultural practices is essential. The most common layout systems used in Afghanistan are square and rectangular systems.



Square system: This is the most common system used in Afghanistan. Trees are planted on each corner of a square at a distance of 5x5 or 6x6 meter apart from one another. The central area between the four trees may be used to raise fodder crops or vegetables, such as clover or mong bean. This system permits intercropping and cultivation in two directions. (Avoid planting cereal crops in the central area, as they compete for nutrients and leave the trees weak.)



Rectangular system: In this system, trees are planted on each corner of a rectangle. The most common distances between plant to plant and row to row are 5m and 6m, respectively. A total of 65-70 saplings are required for one jerib (2,000 sq. meter) of land.

As the distance between any two rows is more than the distance between any two trees in a row, there is no equal distribution of space per tree. The wider space available between rows of trees permits easy orchard management operations and the use of mechanical aids, such as tractors sprayers.

Soil Preparation and Fertilization

After selecting the site, the land should be thoroughly ploughed, levelled and enriched with well-decomposed farmyard manure. Levelling is important for efficient irrigation and preventing soil erosion. In the hills, the land should be divided into level terraces oriented to the topography of the land to protect the soil from erosion. If the soil is poor, plow in 10-12 inches of green manure into the soil to improve its physical and chemical condition before planting.

After the orchard is laid out, dig a hole of 1m x 1m x 1m, depending the soil type and hardpan. Put the upper half of the soil to one side and use it at the bottom of the hole when the saplings are planted (the topsoil is more fertile than the bottom soil).

Fertilization of apricot trees depends on analysing soil fertility and signs of nutrient deficiency. In Afghanistan urea fertilizer is applied at an amount of 100-500 grams, depending on age of the tree, soil texture and availability of water.

Pruning

Pruning is the selective removal of branches and shoots. Pruning helps form a better canopy to protect the fruit from excess sunlight. Pruning also eliminates unproductive, dead, broken or damaged/diseased branches and creates space for light penetration and air circulation. It makes trees easier to spray and harvest, increases the output and quality of the fruit and enhances flowering and fruiting.

Prune apricots after harvest in late summer, depending on location and climate of the area. The open center system of pruning apricot allows sunlight to reach all parts of the tree. Light pruning can be done throughout the growing season to remove broken and diseased branches, water sprouts and root suckers.

Training of trees creates a canopy by leaving only three to five branches during the first two years of planting. Apply Bordeaux or fungicide paste on the cut portion of branches and limbs to promote healing of the wounds.

Thinning

Apricots generally set more fruit than they are capable of carrying to full maturity. Fruit removes excess fruits to improve the size and color of fruit, reduce the risk of limb breakage and promote regular flower production the following year.

The proper time for thinning apricots is 40-45 days after full bloom or when the fruit is the size of a berry (about $\frac{3}{4}$ - 1 inch in diameter). Trees that are thinned too late will suffer from smaller fruit size and diminished quality.

Fruits can be thinned through different methods depending on the size of orchard, availability of labor and tools (i.e. hand thinning, pole thinning, mechanical thinning and chemical thinning). Hand thinning is the most common method used in Afghanistan.

Fruit can be thinned in two ways: size thinning (removing small fruits) and space thinning (selective removal of dense fruits so that the fruit is distributed uniformly along the branches).

Irrigation

Water is an essential component of plant tissue, influencing and controlling the growth and development of trees. Water is absorbed by the roots from the soil, and nutrients dissolved in water are taken to all parts of the plant through the process of translocation. Plants utilize water in a variety of processes such as transpiration, cell division and photosynthesis. An adequate water supply during the growth stage has a direct bearing on fruit quality and yield.

With water in short supply in the summer months, efficient irrigation and water management is essential for a productive crop. Irrigation scheduling should be based on knowing the moisture content in the soil, the growth stage of the plant, air temperature, wind speed, rainfall and appearance of the leaves. Soil moisture can be measured by a number of methods such as tensiometers, neutron moisture probes, gypsum blocks or a soil probe. To test the moisture of the soil by hand, take a handful of soil 30cm below the surface and clench it in your fist (Fig. A). If the soil holds its shape when the hand is unclenched (Fig. B), the soil is sufficiently moist. If the soil crumbles (Fig. C), the soil is too dry.



A.

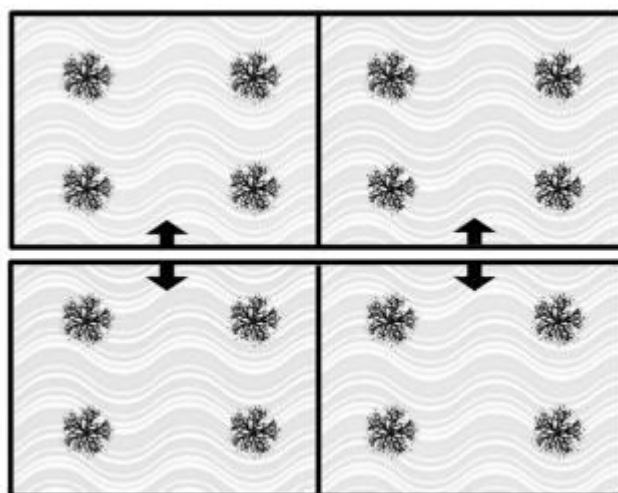
B.

C.

The amount of water for irrigation depends on water holding capacity of the soil, the amount of rainfall and the rate of transpiration of the trees. Seven irrigation methods are outlined below.

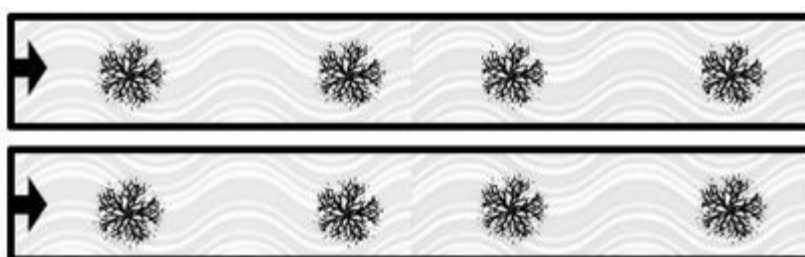
Flood Irrigation

This type of irrigation is used in areas where the surface is flat and local water sources are sufficient to irrigate the trees. Water enters a square enclosed area and irrigates a group of trees. While cheaper and easier than other methods of irrigation, flood irrigation results in high water loss through evaporation and leaching.



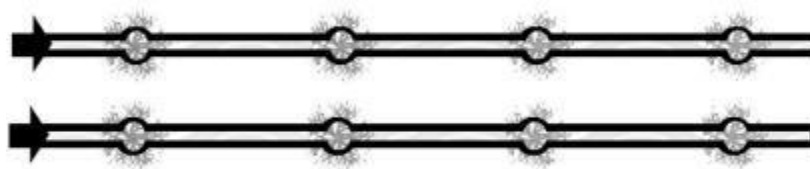
Furrow Irrigation (Channel System)

In this method, trees are planted in long parallel channels connected to a water source. The water flows from one end of the channel to the other. Several channels can get water simultaneously depending on the capacity of the water source.



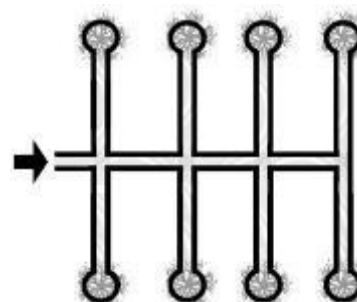
Basin Irrigation

Basin irrigation is similar to the channel system, except that the channel linking the trees is smaller, with rings circling each tree. Basins are made around each tree -- 50cm radius the first year, increasing to 1m or larger as the tree canopy grows and the tree's water needs increase. One disadvantage of this method is that manure and fertilizer tends to accumulate in the trees at the end of the line.



Modified Basin Irrigation

This is the most popular and efficient method of orchards on level ground. A central water channel feeds pairs of trees branching on either side. As above, small basins are prepared around each tree – 50cm radius the first year, increasing to 1m or larger as the tree's size and water needs increase. This system uses less water and does not move nutrients from one tree to another. Weeds can be more easily controlled, as water does not reach outlying areas beyond the channel. The



disadvantage is the labor and cost involved in preparing each of the circular basins, extending them as the tree grows and cleaning debris from the central channels.

Weed Control

Weeds can greatly out-compete trees for nutrients, especially nitrogen. Fertilizer is drawn away from the tree and absorbed by weeds. Weeds divert much of the water that is crucial to the tree during the hot summer months. Weeds are also a potential host for pests. Weeds can be controlled by intercropping between rows, mowing or 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 & Chilling Requirement

The chilling requirement is the minimum period of cold weather after which fruit-bearing trees will blossom. Trees that lack a minimum number of “chill hours” will often experience delayed or substandard foliation, flowering and fruiting. One chilling unit is equal to one hour of exposure of the tree to chilling temperature. Apricot trees require 300 - 800 chilling hours (generally a temperature below 7⁰ C.) during the winter dormant period.

Fertilization

Like all other living organisms, apricot trees need nutrients to grow and thrive. They require sixteen essential elements for growth and normal functioning, which fall under macronutrients and micronutrients.

Macronutrients. These are the elements which plants require in relatively large amounts, such as nitrogen (promotes green leaves and foliage growth), phosphorus (stimulates healthy root growth and the formation of flowers, seeds and fruit), and potassium (required for proper development of flowers and fruit). Secondary macronutrients, which are needed in smaller amounts, include calcium, magnesium, and sulphur. (See Annex 2).

Micronutrients. These are the elements that plants need in relatively small amounts, such as boron, chlorine, copper, iron, manganese, molybdenum, zinc, and nickel. (See Annex 3).

When developing mineral nutrient management programs for tree fruits, it is important to consider the nutrient demand-supply relationship throughout the season. Early season canopy development and fruit growth require large amounts of nitrogen, while fruit quality development and adequate cold hardiness later in the season require only a minimum supply of nitrogen.

Like other crops, apricot trees require some nutrients in the form of chemical fertilizer. Soil and leaves should be analyzed in order to determine the right quantity of fertilizer. Agriculture experts in Afghanistan recommend 100g-1kg urea fertilizer per tree, depending on the age and soil texture during the growth stage. Fertilizer is applied by a variety of methods, such as broadcasting by hand, side dress (applying fertilizer below the canopy but away from the trunk), band placement (applying in bands down the row) and foliar spray. Well decomposed manure or compost is also a good source of different minerals and nutrients. (Care should be taken not to apply fresh animal manure into the soil, as it will damage the trees.)

Maturity

The maturity of apricots can be determined a number of ways, such as color, firmness, brix (sugar level), and acid level. The firmness and brix is measured using a determined using a penetrometer and refractometer, respectively.



Color is the first indication of fruit maturity in apricots. As apricots tend to ripen unevenly in an orchard, multiple harvests may be necessary to achieve optimum yield. When using fruit color as a determinant for maturity, the farmer needs to be familiar with the developmental stages of his particular variety. Apricots picked too soon may suffer from bitter taste and discoloration; those harvested too late will not be appropriate for storage or long-distance transportation.

A **wring test** is the second method of testing apricot ripeness. The apricot is cut in half along the axis and the two halves are then rotated in different directions. If there is no adhesion of flesh on the stone, the fruit is ready to pick.

Size and shape are the third indication of apricot maturity and ripeness. When the shoulders of the fruit are fully developed, the fruit is generally considered ripe. Sizing rings can be used to determine readiness for harvest. Firmness can be checked with a penetrometer.

When testing brix percentage using a refractometer, brix is measured in degrees, with 1 degree of brix equal to 1 gram of sucrose in a 100gm solution. The refractometer has to be calibrated with sterile water before use and cleaned after each use so as not to bias results. Temperature of the fruit should be around 20° C. Newer handheld refractometers have been developed which automatically adjust to the temperature of the sample. Average sugar level for mature apricots is 14.3°.

Common Diseases and Pests

Apricot trees pose a tempting target for a wide variety of pests. Pest management is thus a critical component of good orchard practice.

Shot Hole

Shot hole (coryneum blight) is one of the most common pests affecting stone fruits. Most apricot varieties are extremely susceptible to shot hole, and farmers must be vigilant in treating the disease, which can wipe out an entire orchard. The disease appears as scattered brown spots (lesions) on the leaves which enlarge to cover the entire leaf blade. It then spreads to buds, blossoms, twigs, shoots and fruits. As the lesions enlarge they take on the appearance of gunshot holes in the foliage, enlarging until the leaves drop. This places stress on a tree and inhibits its ability to produce. Fruit is usually affected with spotting on the upper surface which becomes rough in texture.



Shot hole can be prevented by application of dormant winter oil and Bordeaux mixture, heavily diluted, and through the pruning and destruction of infected tissues, twigs and

branches. Copper sulphate and copper oxychloride is recommended in cases of severe infection. The solution should be applied in the fall starting at 50% leaf drop to protect newly forming buds. Spray with DNOC (1%) or nitrafen (3%) before bud swelling, cuperson (.5%) until flowering and cuprosan or zeneb (.5%) after flowering.

Gummosis

Gummosis is a disease observed in stone fruits and citrus. Trees infected with gummosis discharge sap from wounds in the trunk and branches of the tree. Gummosis can be caused by mechanical injury during pruning, environmental stress, adverse soil and nutrition or disease and pest infestation. *Cytospora canker* is one of the fungal causes of gummosis, which is indistinguishable from insect damage and mechanical injuries. Gummosis first appears as blisters of 1-6 mm on young bark. These raised areas are due to an abnormal growth of plant cells.



Gummosis can be avoided by taking care not to damage trees with garden equipment and machinery. Fungal spores enter the tree through injured tissues, germinate and penetrate the tissue. Farmers should take special care during winter. Trees should be planted in well-drained soil, and cultivars should be carefully selected to match the conditions of the particular growing area.

Aphids

Aphids are small sap-sucking insects that attack the green tissues of plants. Several species are particularly virulent with regard to apricots, such as hop aphids, mealy plum aphids and thistle aphids. Aphids feed on plants by injecting their needle-like mouth parts into the tissue and sucking out the plant juice. Aphids can be green, black, pink or of mixed color.

Aphids have many natural enemies such as lady beetles, lacewings, syrphid flies, predaceous midge larvae, and predatory bugs, which can often keep aphid populations under control if they are not disturbed by broad-spectrum insecticide treatments.

The aphid overwinters in the egg stage on water sprouts and terminals. Eggs tend to be concentrated on a few trees in a planting. Hatching begins as buds open in spring. Aphids feed on flower parts and then move to growing shoots. Females produce many generations during the summer and disperse throughout the orchard and to other orchards. Males appear in the fall and mate with the females that then lay overwintering eggs.



The symptoms of aphids are seen in leaves, fruits and shoots. Leaves are curled downward and sticky with honeydew secreted by the aphids. Honeydew may also drip onto the fruit causing russet spots and black sooty mold.

Apricot growers should monitor their trees carefully for the earliest onset of aphids. A few colonies can rapidly infest the entire tree. Examine ten fruit clusters from the inner canopy of each ten trees. Treatment is suggested if 30% of the terminals are infested and natural enemies are not present.

Apricot growers should plant aphid-resistant rootstocks, if available. For both green and rosy aphids, sticky bands may be placed around the trees to trap ants and increase the number of natural aphid predators. Avoiding excessive nitrogen application will limit aphid populations by reducing succulent growth that is attractive to aphids.

Natural predators (ladybird beetles, lacewings, syrphid flies and predatory midges) and parasitic wasps are usually capable of controlling aphids. Avoid using pesticides toxic to these beneficial insects once they appear on the trees.

An application of dormant oil will kill many overwintering aphid eggs and will not affect aphid predators. Apply Alias, Admire, Assail, Thiodan, Thionex or Malathion if few predators are present and fruit damage appears imminent. Sprays applied before this level of aphid infestation may destroy beneficial insects and result in the need for additional sprays. Some farmers use a preparation made from a 2-3% mixture of soap or a safe detergent with water sprayed on leaves.

Pest and Disease Management

Pest and disease management is critical for preventing wide scale damage to apricot orchards. These methods of orchard management can be divided into mechanical or cultural methods (such as pruning), chemical control (pesticides) and biological control (use of natural predators).

Dormant spray is one of the most common ways of preventing infestations of certain insects, mites and diseases affecting apricots. Late winter or early spring is the best time to apply dormant spray. These sprays include the following:

Winter oils are simple combinations of oils used for prevention and control of a variety of pests and diseases. They work by desiccating or smothering eggs and larvae. These oils are available in the local market under such names as dormant oil, mral oil, narrow range oil, petroleum oil, vegetable oil and horticultural oil. Some farmers prepare a mixture consisting of 100 liters of water, 3 liters of mustard oil, 1kg of fermentation soda and 50g of detergent, spraying it on the trees during the dormant period.

Bordeaux mixture is the most widely used copper fungicide in Afghanistan, effective in controlling many fungi and bacterial diseases. It can be used as a disinfectant in young saplings before planting in orchards. The most effective application period is during the dormant season (Jan-Mar). The mixture can be prepared from copper sulphate, quick lime and water in a ratio of (2:2:250), respectively. Dissolve the copper sulphate in 125 liters of water in a non-metallic vessel. Empty 2kg of quick lime in another vessel (such as a wooden barrel or earthen pitcher) and slowly add the remaining 125 liters of water. Pour the two mixtures into a third vessel, stirring constantly with a wooden stick. Strain this liquid through a cloth or burlap sack before pouring into the spray tank.

Harvest

Fruit should be removed from the tree with the stem intact if the intention is to store or ship it long distances. Use of harvest bags can reduce the amount of impact and crushing, and also frees up both hands for handling.

If using plastic harvest crates for field harvesting, line them with plastic to protect the apricots from being scratched by the rough



surfaces of the crate. Any external scratch or impact on the fruit allows an ingress point for pathogens and causes increased moisture loss. Avoid using wood as it is difficult to clean and can harbour pathogens that will transfer from one load to the next.

Never leave poor quality fruit lying in the orchard. This can provide an opportunity for fungal infections and other pathogens to propagate over winter, causing new infections in the following season. Damaged fruit can be used for composting, juice processing or animal feed.

Harvest early in the morning so that the fruit is at its lowest core temperature. Fruit can then be packed and stored with minimal precooling. When packing in the field, dampen the area around the packing site to prevent dust from blowing onto the clean fruit. Where possible, lay a tarpaulin under a shaded area for packing and ensure that it is kept clean.

Where possible, use chlorinated water at 200ppm (20ml per litre) to wash the fruit.

Part 2

Post-Harvest Handling

Pre-cooling

Fruit should be pre-cooled before shipping the fruits to cold storage and putting in refrigerated containers; sudden changes in temperature will cause the fruit to be damaged.

Immersion Pre-cooling

Immersing newly harvested apricots in cold water is the most effective method of pre-cooling as it can be combined with the cleaning process and use of shelf life extension chemicals.



Heat is transferred evenly from a solid to a liquid when immersed, and the contact with water will not cause dehydration as is often the case with evaporative or mechanical cooling. It is up to 60% more effective than air cooling, as water draws off the heat faster than air due to direct contact.

Use water that is cooled to your target temperature for storage of between 0.5^o and 2^o C to cool and clean the product. The water should be sanitary, not re-circulated, or it will need chlorine treatment. The apricots should not spend an excessive amount of time in the water as they may absorb liquid leading to post-harvest disorders.

Evaporative Pre-Cooling

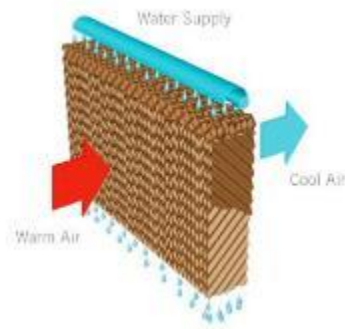
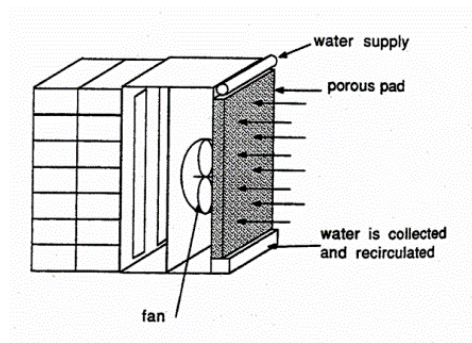
When air moves over a wet surface it causes evaporation of the water. During this process there is a transfer of heat from the surface to the passing air along with the moisture. The rate of evaporative cooling can be increased by using a fan to accelerate the air movement for more rapid cooling. This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

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^o F (5^o C).

If access to electricity and infrastructure are constraints, the use of a refrigerated shipping container powered by a generator provides 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.



Post-harvest treatments

Although fresh apricots have a very short shelf life and cannot be stored for long periods of time, there are a number of ways of extending the shelf life by both preventing post-harvest disorders and retarding the factors that lead to premature aging.

Fungicides can be used either as a dip or through fumigation. The limitations of fungicides is that many export markets test for these chemicals and will reject shipments when residues exceed certain tolerances. The use of 1- methylcyclopropene (1- MCP) as either a fumigant or a dip halts the activity of ethylene receptors in the fruit, thus slowing the ripening process and extending the shelf life of the product.

Sorting and grading

Proper sorting and grading is essential for reaching highest market prices. Below are some of the international export standards based on the United Nations Economic Commission for Europe (UNECE), complying with the Organization for Economic Cooperation and Development (OECD) requirements.

1. **Intact:** The apricots should not be cracked or damaged by mechanical injuries.
2. **Sound:** Produce should not show signs of rot or deterioration such as to make it unfit for consumption.
3. **Clean:** Fruit is mostly free of any visible foreign matter.
4. **Damage from Pests:** Fruit is free from damage caused by pests affecting the flesh.
5. **Moisture:** Free of abnormal external moisture.
6. **Odors:** Free of any foreign smell and/or taste.

At present, the sizing and grading of stone fruits is poorly managed in Afghanistan. It is a common practice to have second and third quality apricots packed in the sides and bottom of crates with the fourth grade in the middle and the top loaded with the best quality. This is a direct result of the orchard being harvested only once by the traders and not the farmers. Once the farmer receives his 20% down payment he has no interest in the quality of the fruit or the yield from the orchard. Low-paid pickers are brought in with little or no training and the resultant losses at the retail end are often substantial for the wholesaler who has to sort, repack and dispose of low-quality fruit. When care is taken to harvest over a period of time with skilled labor, some 40% of yield losses can be prevented.

Grading is dependent upon the following quality parameters. (For all classes, a tolerance of 10% of apricots deviating up to 3 mm from the size indicated is allowed.)

| Grade Designation | Grade Requirements | Grade Tolerances |
|--------------------|---|--|
| Extra Class | <p>Apricots in this class must be of superior quality. They must be characteristic of the variety, allowing for the district in which the fruit is grown. The flesh must be perfectly sound. They must be free from defects, with the exception of very slight superficial defects, provided these do not affect the general appearance of the produce, the quality, the keeping quality and presentation in the package.</p> | <p>A total tolerance of 5%, by number or weight, of apricots not satisfying the requirements of the class but meeting those of Class I is allowed. Within this tolerance not more than 0.5% may consist of produce satisfying the requirements of Class II quality.</p> |
| Class I | <p>Apricots in this class must be of good quality. They must be characteristic of the variety. The flesh must be perfectly sound. The following slight defects may be allowed, provided they do not affect the general appearance of the produce, the quality, the keeping quality and the presentation in the package:</p> <ul style="list-style-type: none"> • Slight defect in shape • Slight defect in development • Slight pressure marks not more than 1 cm² of total surface area • Slight skin defects, including slight healed cracks, which must not extend over more than 1 cm in length • 10% of the surface area for russetting | <p>A total tolerance of 10%, by number or weight, of apricots not satisfying the requirements of the class but meeting those of Class II is allowed. Within this tolerance not more than 1% in total may consist of produce satisfying neither the requirements of Class II quality nor the minimum requirements, or of produce affected by decay.</p> |
| Class II | <p>This class includes apricots that do not qualify for inclusion in the higher classes but satisfy the minimum requirements specified above. The flesh must be free from major defects. The following defects may be allowed, provided the apricots retain their essential characteristics as regards the quality, the keeping quality and presentation:</p> <ul style="list-style-type: none"> • Defects in shape • Defects in development, including split stones, provided the fruit is closed and the flesh is sound and not discoloured • Bruising not more than 1 cm² of the total surface area • Skin defects, including slight healed cracks, which must not extend over more than 2 cm in length • 15% of the total surface area for russetting | <p>A total tolerance of 10%, by number or weight, of apricots satisfying neither the requirements of the class nor the minimum requirements is allowed. Within this tolerance not more than 2% in total may consist of produce affected by decay. Within this tolerance, fruit split at the stalk cavity and fruit with split stones are allowed.</p> |

Part 3

Target Markets for Apricot Export

Below are the specific market requirements for successfully importing apricots 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 apricots both for home consumption and for resale to other overseas markets.

Regional Markets

Peshawar and Quetta

- These traditional markets have similar requirements to local Afghan markets.
- Supply is generally in 7 kg cardboard boxes of two layers 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 apricot 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 monopolize trade in certain products.
- The usual packaging is in 7kg cardboard packaging with mixed grades. The product is shipped unrefrigerated to Islamabad and Lahore, though due to potentially long transit times, apricots are often shipped in refrigerated containers or by air from Peshawar to Karachi.

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 supplies of fruit. Packaging in 3.5-4.5kg clam shells (6-8 x 700g in a cardboard master box) and two layers of 7kg cardboard boxes is acceptable.

India

The Indian market traditionally prefers Afghan apricots compared to those imported from other countries. Afghan apricots face minimum competition from apricots imported from Turkey and other locations. Afghan apricot exporters are generally able to comply with Indian market requirements (quality, sorting, grading and packaging) which is essential for generating a higher return.

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 apricots: 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 apricots (natural and sulfur-dried): 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

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 and for apricots an additional declaration form must show that the produce has been tested and is free from contaminants. This can be obtained from the MAIL Quarantine Department. If additional tests are required, this will be noted 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/packaging list
- Country of Origin

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, listed below.

There are many other large wholesale markets worth exploring in India, including Mumbai, Kolkata, Bangalore and Chennai. Commission agents traditionally work on a 6-10% negotiable commission, plus 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 apricots, but a premium is paid for well processed apricots. Packaging can be in traditional 7kg cardboard boxes but 6-8 clam shells in a master box is preferred.

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, coach the traders in the requirements of Indian fruit markets and co-ordinate 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' warehouses or cold storage facilities, 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 apricots to complete the 12-month supply chain for their customers. However, apricots can only be stored for a maximum period of 2-3 months.

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

Apricots are competitively sought by supermarkets in India, with many retail chains showing interest in Afghan apricots. 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 apricot 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 apricots can also be channelled into this market with good planning.

Packaging requirements must be negotiated with each supermarket. Premium fruit should be packed in clamshells or two layers inside a cardboard box (7kg). Ideally, fruit should be in highest quality condition.

UAE and Middle East

The Dubai market has a consistently strong demand for Afghan apricots, but only when they have been properly processed, sorted, cleaned, graded and packaged according to the highest standards. Premium pricing is paid based on size, color, grading and packaging of the fruit. Consistent grading and sorting will deliver good returns, with A and B 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 an 8-10% negotiable 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 graded and sorted apricots of different qualities, though a premium is paid for highest quality fruit. Packaging can be in 7kg cardboard boxes but 6-8 clam shells in a cardboard master box will attract premium prices.

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' warehouses or cold storage facilities, 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

Apricots are sought by many supermarkets in the UAE, with many retail chains actively seeking Afghan apricots 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.

Supermarket customers require a variety of sizes and grades of apricot 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 apricots can also be channelled into this market with good planning. Packaging requirements must be negotiated with each supermarket. Packing in clamshells is highly preferred.

For more information on exporting to the UAE, contact:

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

Other Markets

Europe, Central Asia, Canada and Australasia

Afghan apricots have rarely had much success being exported beyond the immediate region (India, Pakistan and UAE) but have a strong potential if properly sorted, graded, cleaned and packaged. Premium prices are based on size, color and grading of the fruit. The largest and best graded apricots 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 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 six clamshells of 700g in a cardboard master box. The use of clamshells is now internationally preferred, will reduce impact and compaction injuries in transit and allow fruit to be shipped successfully at higher humidity with reduced dehydration.

Annex 1 – Apricot Crop Calendar for Afghanistan

| Activities | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Dormant period | Yellow | Yellow | | | | | | | | | | |
| Flowering period | | | Yellow | | | | | | | | | |
| Pre-harvest | | | | Yellow | Yellow | | | | | | | |
| Harvest | | | | | | Yellow | Yellow | | | | | |
| Post-harvest | | | | | | | | Yellow | Yellow | Yellow | | |
| Leaf fall | | | | | | | | | | | Yellow | Yellow |

Annex 2 – Macronutrient Deficiencies and Excess

| Nutrient | Function | Symptoms of Deficiency | Symptoms of Excess |
|-----------------------|---|--|--|
| Nitrogen (N) | Important for many growth and development processes. A constituent of proteins, enzymes, and chlorophyll (needed for photosynthesis). | Slow growth, stunting, and yellow-green color; more pronounced in older tissue; tips and margins turn brown; premature death. | Excessive vegetative growth, dark green color, excessive transpiration, reduced yield; delayed maturity; few fruits. |
| Phosphorus (P) | Stimulates early growth and root formation; promotes seed, fruit, and flower formation | Slow growth, stunting, and purplish or dark green color on foliage; dying leaf tips; delayed maturity; poor fruit or seed development. | Excess can interfere with micronutrient absorption; may mimic Zinc (Zn) deficiency. |
| Potassium (K) | Proper growth of fruits and flowers, ensuring good size, color and quantity. | Slow growth; leaf tip and marginal burn (starts on more mature leaves); weak stalks; small fruit and shrivelled seeds. | Light green foliage; tendency for Calcium and Magnesium symptoms to appear. |
| Calcium (Ca) | Essential part of cell wall structure, must be present for formation of new cells. Adequate in most San Diego soils. | Reduced terminal growth of shoots (buds) and roots, resulting in plant death. | Interferes with micronutrient availability. |
| Magnesium (Mg) | Essential for photosynthesis | Leaves curl upward along margins; marginal yellowing with green “Christmas tree” pattern along mid-ribs of leaves. | Interferes with Calcium uptake. |
| Sulfur (S) | Responsible for characteristic odors of plants such as garlic and onion | Reduced growth, delayed maturity. Light green to yellowish foliage on leaves; small spindly plants. | Not known. |

Annex 3 – Micronutrient Deficiencies and Excess

| Nutrient | Function | Symptoms of Deficiency | Symptoms of Excess |
|------------------------|---|--|--|
| Iron (Fe) | Required for formation of chlorophyll in plant cells. | Yellow-green color, but veins remain green; twig dieback; reduced growth, and death in severe cases. | Mimics phosphorus, manganese deficiency. |
| Manganese (Mn) | Assists iron in chlorophyll formation and serves as activator for enzymes in growth process. | Yellow-green color of young leaves, but no sharp distinction between veins and interveinal areas as with iron. | Mimics iron deficiency; loss of foliage color, bronzing of leaf margins, necrotic areas. |
| Zinc (Zn) | Important plant growth regulator; essential in root and plant growth. | Yellow-green color, but veins remain green; decrease in stem length; rosetting of terminal leaves; reduced fruit bud formation; twig dieback after first year. | Not known. |
| Boron | Regulates metabolism of carbohydrates in plants. Critical for new growth in plants, flower pollination, fertilization, fruit set. | Death of terminal growth; thickened, curled, wilted leaves; Reduced flowering. | Rare except in inland deserts with high boron-contaminated water. |
| Copper (Cu) | Activator of enzymes in plants. | Stunted growth; dieback of terminal shoots in trees; death of leaf tips. | Reduced growth. |
| Chlorine (Cl) | Required for photosynthesis and root growth. | Very rare; wilting followed by yellow-green color; leaf bronzing. | Poor growth; marginal leaf necrosis. |
| Molybdenum (Mo) | Required by plants for the utilization of nitrogen. Plants cannot transform nitrate nitrogen into amino acids without molybdenum. | Stunting; reduced yield; lack of vigor; marginal scorching; cupping, rolling of leaves. | Not known. |
| Nickel (Ni) | Needed to complete the life cycle of the plant and viable seed. | Leaf tip necrosis | Induces iron and zinc deficiency; interveinal yellowing. |

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