Mango manual

info@sawie.net
Tel +9230450115
Website: sawie.net
14/4, 3 Gillani Park, Shadab Colony, Ferozepur Road Lahore, Pakistan

Disclaimer:

This document is to present the topic and give a general thought and data on the said matter. Albeit, the material mentioned for this archive depends on information/data assembled from different solid sources; in any case, it is based upon specific suppositions, which may contrast from one case to another. Due care and constancy has been taken to aggregate this record, the contained data may differ because of any adjustment of any of the concerned factors, and the real outcomes may vary generously from the introduced data.

You should assume that everything you see or read in this document is protected by copyright unless otherwise stated and may only be used according to these Terms and Conditions. Images and text are either the property of, or used with permission by, SAWiE. The use of these images or text by anyone, is prohibited unless specifically permitted by these Terms and Conditions.

THANK YOU!

This is to formally thank to all those who are contributing their services, dedication, and assistance to SAWIE, and we are extremely grateful to all of you for this kind gesture. What we're doing couldn't have been possible without your guidance, intelligence, and enlightenment. We're eagerly looking forward to making this relationship stronger and stronger with every passing day, and your presence in this organization means the world to us.

SAWIE wishes you all the possible luck in every aspect of your life.

Table of Contents

Introduction

- Mango holds an exclusive place in the fruits because of its sweet and flavorful taste. Mango is also known as the “King of Fruits” in Asia.
- Pakistan is widely known for mango production because Pakistan produces unique flavored mango fruit without stringy fibrous tissue.
- In Pakistan, Mango (*Mangifera Indica L.* Family *Anacardiaceae*) stands at the second position among the major crops of Pakistan.
- In the most recent era, it is cultivated on an area of 42, 1000 hectares producing a total yield of about 17 lac tones. In Pakistan, the average production of mango is about 109 mounds per hectares. But this average production has been paused for some previous years.
- The area for mango cultivation is increased but the production is still compromised and slow.
- Mango is highly valuable concerning nutrition. It consists of ample amounts of fiber, Vitamin A, Vitamin C, phosphorus, and other micronutrients.
- Pakistan is also one of the big exporters of mango and produces about 5.86% of the world’s mangoes. In this way, it is the third-largest mango producer in the world.
- Pakistan exports mango not only to the Middle East but also to the UK and other European markets. It is expected that the export will rise up to 50% making route to other countries like Germany, Japan, China, and Hong Kong.

Commercial varieties of mango

- In Pakistan, more than 100 types of mangoes are grown. Out of these 100 kinds, about 50 are mostly cultivated. But out of these mostly cultivated ones, there are a few special kinds that hold an exclusive place in the market and give a huge profit. However, the leading commercial

varieties of the mangoes are as follows:

Provinces	Varieties
Sindh	Sindhri, Gulabkhas, Swarnarice, Baganpalli, Collector, Neelum
Punjab	Malda, Langra, Aman Duseri, Anwar Ratol, Samer Bahisht, Fajri Kalan and Sensation
Baluchistan	Lengra and Samer Bahisht
KPK	Sindhri and Banganpalli

Profitable varieties in Pakistan:

- According to the government of Punjab, some specific varieties are demanded more in the market and give farmers more profit than the others. So, Punjab Govt. advises the farmers to cultivate the following varieties to earn good money:

1. Dosehri
2. Yakta
3. Sensation
4. Malda
5. Sindhri
6. Chaunsa
7. Langra
8. Anwar Ratol
9. Samer Bahisht (Chaunsa)
10. Fajri
11. Chaunsa Safed (Late)
12. Ratol No 12

Hybrid varieties

- MRS
- Aalishan MRS
- Rohan MRS
- Hasaan
- Royal White

Major mango producing districts of Pakistan

Provinces	Districts
Punjab	Multan, Bahawalpur, Muzaffar garh, and Rahim Yar Khan
Sindh	Mirpur Khas, Hyderabad, and Thatta
NWFP	Peshawar and Mardan
Baluchistan	Sibi, Dera Bughti, Nasirabad, Jafferabad, Dolan, Jhal Magsi, Lasbela, Turbat, Panjgoor, Gawadar

- Sindh has a little different climate than Punjab. That's why Sindh gets warmer one month before than Punjab. This gives the privilege to Sindh to grow early varieties of mango. However, Punjab is still receiving popularity for late varieties and extending the market period.

Climate:

- Several ecological conditions need to be considered before planting the mango orchard. These are:
- Mango should be planted in elevations ranging from 200 to 300 meters.
- The range for best-growing temperature for mango is 15 ℃ to 40℃. Low temperatures are dangerous for mango production.
- Very cold and hot winds can damage the trees highly. But young plants need extra protection from the frost and hot winds.
- A warm and moist climate is suitable for mango cultivation. Mango can be cultivated in rainfed areas but the quality will be highly affected and production will be low.

Soil:

- Mango should be planted in well-drained soils, deep and fertile soils. However, a wide range of soils can support mango production.
- For checking the drainage capacity of the soil, dig a pit of 3 meters high and 3 meters wide.
- Then, put water in it. Let the water be absorbed for 24 to 48 hours. If the water gets absorbed in the soil, it is suitable for mango cultivation.
- But if the water is still present there then the drainage capacity of the soil is low and will affect the tree health and fruit quality.
- Waterlogged, saline and sandy soils are not suitable for mango plantations.

Land selection:

- The selection of land is a very important task and must be done carefully. Mango roots penetrate deep into the ground about 15 to 20 feet but 5 to 7 feet depth is more important. For the better and effective absorption of nutrients, a system of roots is present in the upper 2 feet of the ground. That's why, before cultivating plant orchards, soil samples from different sites of the orchard should be checked in the laboratory.
- It's better to select such type of land which doesn't t have any large stone, hard crust, or soil up to 6 feet. Such lands can be used to get good production of mango by utilizing advanced technologies. But it is difficult to get high production from such lands with traditional farming techniques.

Propagation of mango:

- Propagation of mango plants is done by the grafting method on local seedlings.
- The right age of nursery plants for transplanting is 1.5 to 2 years. However, the best time for transplanting is the spring (Feb/March) and autumn (Sep/Oct) seasons. Mango trees usually produce flowers in Feb & March. The time to start bearing for the mango plant is 4 to 5 years.

- However, the time of full bearing for the mango plant is 6 to 7 years. A single mango tree can have an economic bearing life of up to 30 to 50 years.

Planting systems:

- There are two systems for planting mango orchards;
    1. Square system
    2. Rectangular system
- But the square system is the most accepted one.

Square system:

- In this system mango young plants are planted at the corners of the square and the row to row and plant to plant distance is kept equal.
- The main advantage of the square system is that there's a wide distance between the plants. This greater distance makes it easier to plough in the field.
- Moreover, other farming tasks can also be easily performed.

Rectangular system:

- But if the regular pruning is done, then the rectangular system is more beneficial in getting high mango production per hectare.
- In a rectangular system, east to west distance is larger while north to west distance is kept shorter. In today's world, high production per hectare is getting popular.
- Through this rectangular system, not only per hectare production is increased but also the fruit quality. Moreover, the production expenditures are also reduced.
- That's why it is recommended to keep more plants per hectare about 15 × 15 or 194 plants.

Planting orchard and time:

- Mango plants are usually cultivated in the spring season i.e. February & March and the autumn season i.e. September & October. The mango batch cultivated in the spring season proves to be more successful.
- The best time considered for mango plantation is the time of spring before bearing and the last of autumn. A planting system should be installed in the orchard two months before the transplantation of mango plants. After marking the plant spots, 3×3×3 feet pits should be dug by placing a planting board and marking the pit from front and back.
- While digging the pits, the above 1 feet soil should be kept on the side and the lower two feet of soil should be spread in the field. For about 7 to 10 days, the planting pits should be kept open so that all the harmful insects and microbes die.
- Then, pits should be properly filled with a mixture that should be prepared by mixing bhal soil, animals waste and side kept 1 feet soil.
- While filling the pits, the surface should be kept 3 to 4 inches high so that during irrigation the pits don't go down the ground.

- After moisturizing the soil, cultivate the mango plants in the pits with the help of a planting board and properly press the soil around the plant.
- Once the soil gets moist, with the help of hoe close all the cracks.

Selection of mango stock:

- Keep in mind, before selecting the stock plants, make sure that all the grafted Desi stocks are healthy, of reasonable age, kind and height. It's better to choose medium-height plants. Because taller plants are at the risk of being dry.
- After grafting, the age of the plant should be 1 to 1.5 years.
- For different mango varieties, the distance is kept 30 to 40 feet. In this way, 27 to 48 plants can be cultivated in one hectare.
- Always plant more than one mango varieties and in different fields.

Irrigation:

- The annual crop water demand for a mango plant is 500 to 750 mm. But the water supply depends on age, variety, nourishment, land type, and weather conditions.
- Normal irrigation must be assured from the time of flowering to the fruit-bearing.
- Plants with fruits should not be irrigated during October and November. This causes vegetative growth of the plant to occur on time.
- The irrigation interval for young plants must be 7 days.
- Similarly, for mature plants in winter and summer, irrigation intervals must be 15 to 20 and 8 to 10 days respectively.
- However, after fruit formation, a reduction in irrigation can cause huge damage to the fruit and trees. Because of it, the size of the fruit remains small.

Time	Month	Irrigation interval
At flowering time	**February to March**	Once in a month
From flower formation to the onset of rains	**April to end June**	At least three times a month
Rainy season /spring	**July to August**	One or two times a month
Autumn	**September to October**	No irrigation
Winter	**November to January**	Irrigate to protect against cold
Frosting		Low irrigation on frosting days

Pruning:

- Mango trees usually attain the dome shape and providing shade to the main trunk. For mango plants, pruning is not usually done. But after fruit harvesting, the diseased, desiccated, broken and weak twigs should be pruned off or cut down.
- Burn the diseased twigs or bury them in the ground. Cut those branches also that touch the

ground as it not only facilitates the mealybug to climb up but also hampers ploughing and hoeing process.

- To revive the orchard, it is advised to remove 15 to 20% of the old wood every 3 to 4 years. After each year, prune the trees and do spray fungicide on the plants.

Fertilizer recommendations

- Fertilization and manuring are very important for the life and health of a plant orchard. For a mango plant orchard to be healthy and long-lasting, fertilization should be done in the following ways;
- Farmyard manure is full of nutrients and is healthful for the plants. It should be supplied at the rate of 10-30 kg/young plant and 80-100 kg/fully grown tree.
- In the period from December to January i.e. before flowering, 3 to 4 kg SSP, 2 to 3 kg Potassium Sulphate, and 2 to 3 kg urea should be applied.
- After fruits setting in March/April, apply urea in two equal doses i.e. each dose for 2 to 3 kg.

Diseases and pest management:

- Mango Plant is affected by two types of diseases contagious (biotic) and non-contagious (abiotic). These diseases reduce the yield of plants. Biotic diseases are caused by pathogens. These pathogens enter plants and fruits from external wounds. On the other hand, plant damage caused by any natural disaster or environmental factors is called non-contagious (Abiotic) disease. About 30% yield of mango damage annually. Which have been victims of a pathogen or any natural disasters.

    1. Anthracnose
    2. Mildew
    3. Bark splitting
    4. Dieback
    5. Twig blight
    6. Gummosis
    7. MSDS (Mango Sudden Death Syndrome)

- The above diseases are caused by insects, pathogens (Bacteria and Viruses), and natural disasters.

Anthracnose:

- Anthracnose is a fungal disease that is caused by ***Colletotrichum gloeosporioides.*** This young plant disease lasts almost all year round. Moisture from the rains exacerbates the disease. Due to which the newly emerging flowers, stems, and branches of the plant get black marks.
- Dark spots begin to form on young flowers and plant pencils. And because the attack is more powerful the whole plant rotten and drops off.
- Pre-harvest and post-harvest controls both are effective management techniques to control Anthracnose.
    - **Pre-Harvest Controls:** Fungicides sprays are much more effective in pre-harvest control strategies. This protects the stems, leaves, and flowers from rotting.
    - After Harvest fruit should be stored immediately in cool and well-ventilated chambers.
    - **Post-Harvest Controls:** Avoid immature harvesting. And store harvested fruit at 25 to 30 degrees centigrade temperature to ripe. Use authorized chemicals to ripe harvested fruit.

Mildew (powdery mildew):

- Powdery Mildew is a fungal disease caused by ***Oidium mangiferae.*** This deadly disease destroys about 20% of the yield annually. This contagious disease can sometimes destroy a complete plant. It is a huge loss for a farmer.
- White powdery appearance on leaves, pencils, young flowers, and stems are a common symptom of Mildew. Leaves of plants change their color in a purplish shade. At severe attack brown and dry leaves drop off. It spreads at high temperatures, almost on every species of mongo.
- Bio-fungicides and chemical sprays can reduce the spread of this disease. Bacillus Licheniformis is the most common bio-pesticide used to reduce the risk of Mildew. It is an effective pre-harvesting strategy.
    - Severe mildew attacks can be treated with chemical fungicides containing sulfur, carbonic acid, aliphatic petroleum, and ascorbic acid.

Bark splitting:

- It is a non-contagious disease caused by extreme weather conditions. A mango tree can withstand 25 degrees to 30 degrees Fahrenheit, below this temperature plant bark may crack. Dry weather can also cause deep long cracks on the bark.
- Deep longitudinal cracks appear on the bark with gum pockets. The leaf becomes yellowish and drops off.
- Copper sulfate and Copper Oxychloride are very common sprays used to treat Bark splitting. Bordeaux paste is also effective.

Die back:

- The disease, which starts from the roots of plants in hard salts, destroys all species of mango. The disease is not only abiotic but also spreads through the attack of *Lasiodiplodia theobromae* and *Natrassia mangiferae* pathogens.
- Drying up twigs and leaves starts from October to November. Rolling, wilting, drop off, and drying of leaves and twigs are the common symptoms of this disease. Drying starts from the top.
- Infected leaves and twigs should be pruned. Copper-containing sprays are used as fungicides to control pathogens. The soil is dug up to nine inches from the root and replaced by canal split and other recommended fertilizers.

Twig blight:

- Physical damage, high temperature, injury, and insect attack can cause twig blight disease in mango trees. It is a biotic disease that turns contagious at severity. Following pathogens can attack these injuries:
    - Lasiodiplodia theobromae
    - Nattrassia mangiferae
    - Colletotrichum gloeosporioides
- In this disease, the leaf falls and a black necrotic area appears on the twig. Young leaves start to dry and drop off.
- Prune and destroy damaged leaves and twigs. Copper and Foliar sprays show good results to control Twig blight disease.

Gummosis:

- 30 to 40 % of the crop-destroying disease is found in both sandy and normal growing soil. ***Lasiodiplodia theobromae*** can also attack an injured part of a plant. Injuries, high temperature, sun scorch, water stress, nutrient deficiency, high humidity, physical damage are the common causes of gummosis.
    - Some common symptoms for gummosis are given below:
    - Profuse oozing of gum on the affected area
    - Bark and large branches are also affected.
    - Gummosis is very common in bark splitting.
    - Droplets of gum fall down on the stem and bark.
- Copper-based fungicides sprays are commonly used to treat gummosis.
    - Cleaned bark portion and covered with copper-based fungicides paste.
    - 500 g copper sulfide in sandy soil shows good results.

MSDS (Mango Sudden Death Syndrome):

- The disease, which has caused significant damage to the mango crop since 1997, is a fungal infection. Improper watering systems and root wounds can spread the disease.
- Wilting, Cankers development over, vascular discoloration and gum exclusion from the stem are the common symptoms of this disease. Wilted, dry, and curly leaves are also noticeable in mango trees. It destroys the whole plant within days so that it is called Mango sudden death syndrome.
- For the early detection of MSDS scientists divided it into 5 stages:
    - 0 stage No Disease
    - 1 and 2 stage < 50 % disease severity
    - 3 and 4 stage > 50 % disease severity
    - 5 stage Dead & totally wilted plants
    - Soil solarization and fungicides are recommended before the 3rd to 5th stage.
    - Within one week the infected portion should be scratched. And pasted by Thiophanate methyl or 250kg/lite Carbendazim.
    - Gypsum, phosphorus, and potash application show good results.
    - Fungicides should be sprayed.

Pests of mango:

Hooper:

- Hoppers destroy tender parts of the plant. And punctures them heavily. It is a wedged-shaped nymph and the adult drops down the fruit.
- It causes curling and dying of plants. It is intensified by the growth of the sooty mold. And it causes a loss to the farmer. Sometimes these hoppers can destroy an entire orchard.
- Overcrowding and overlapping of plants should be avoided. Cleanliness and removal of weeds are also effective. Nimbecidine and Azadirachtin sprays are also effective. And some biopesticides should be used to reduce the attack of hoppers.

Mealy bug:

- The mealybug lives in the bark of tree trunks and young stems. It affects the fruit setting and drops the fruit. It releases an adhesive, which increases the chances of fungal infections.
- They lay their eggs in October, so flooding orchards with water is effective this month.
- Soil solarization is a natural management technique.

- Spray carbosulfan and Dimethoate also have good effects.
- As we know, mango is also eaten fresh and used in preserved farms. Therefore, it is very important to maintain the test and quality.

Harvesting of mango:

- Mango fruit is ready for harvesting once it is matured and fully ripened. The main indicator of the mature fruit is the natural drop of mango fruit from the trees.
- The ripening time for different mango varieties is different. The varieties which are cultivated in Sindh start ripening from May to June.
- While in Punjab, ripening begins from June and goes up to mid-August.
- In KPK, the harvest is late or prolong that facilitates extending the period of mango availability. The expected yield for mangoes is about 40 to 100 kg/tree.

Storage and packing:

- Storage and packaging are really important for maintaining the quality and pleasurable look of the product during transport.
- Packaging material should be such that it provides enough protection to the fruit from insects.
- Moreover, the packaging should be done in such a way that it provides convenience in handling the mango fruit and selling it.
- It must attract the consumer to increase the sale and provide information to the consumer about the product inside the pack.
- For packing fresh mango, plastic crates are highly recommended as they provide enough protection against damage by pressure.
- Bamboo baskets can also be used but shouldn't be overloaded as can cause compression damage to fruits.
- If using cartons, then they must be equipped with a vertical divider in the center and ventilation holes to prevent heat buildup.

References:

https://www.pakissan.com/english/allabout/orchards/mango.shtml
http://www.agripunjab.gov.pk/
https://www.bakhabarkissan.com/
https://www.pakagrifarming.com/