

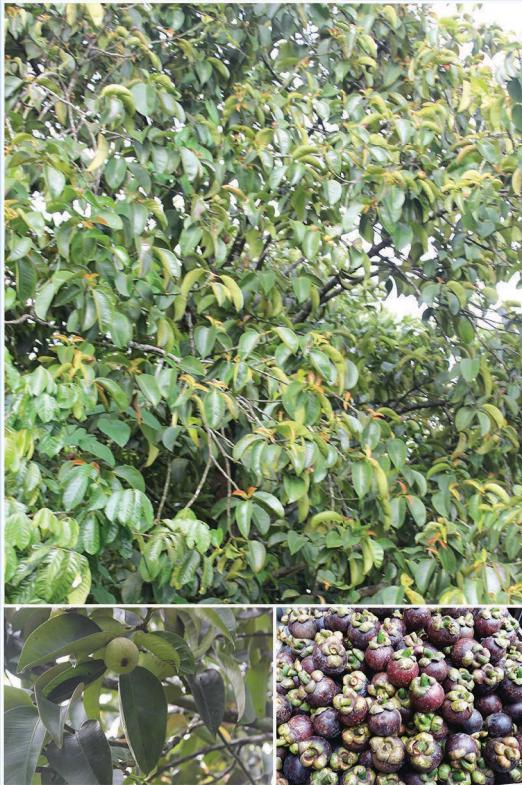
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Mangosteen *Garcinia mangostana L.*



Department of Environment and Natural Resources
ECOSYSTEMS RESEARCH AND DEVELOPMENT BUREAU
College, Laguna 4031

cover photos by C. A. Luna and M. V. Cambay, TTD

*G*arcinia mangostana L. commonly known as mangosteen is one of the most delicious and best flavored fruits in the world. It is also one of the most praised tropical fruits due to its nutritive value and numerous amazing health benefits. In Asia, it is prized for its exceptional appearance as well as for its unique flavor. It is also regarded as the “Queen of Fruits”. It is a seasonal fruit that has great export market as it gains universal appeal because of the quality in color, shape and flavor of its fruit. In the French Caribbean, it is referred to as “Fruit of the Gods”. It is also the national fruit of Thailand. The genus of this tree was named after the French botanist Laurent Garcin (1683-1751) who first described this species in 1734, while mangostana came from the Malay manggisutan.

Due to the proliferation of health problems and expensive cost of medicines even in generic form, people are trying to find health solutions through the use of alternative herbal medicines and consumption of antioxidant food supplements to help address human needs for optimal nutrition to fight free radicals that damage healthy cells. It also aims to boost the body's immune system so as to have strong defense from illnesses. Considering the significant contributions that can be derived from various medicinal forest trees such as *G. mangostana*, it is important that the public should be aware of the health benefits that this species can offer to us and more importantly how this species can be propagated and planted to establish more plantations and supply its increasing demand in the market.

The information provided in this brochure will serve as a guide for farmers, nursery and plantation owners, researchers, students and others who are interested to plant as well as utilize this xanthone-rich fruit tree species.

FOREWORD



SOFIO B. QUINTANA, PhD, CESO III

Director

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MANGOSTEEN

Garcinia mangostana L.



Mangosteen tree at Ato Belen's Farm, Brgy. San Juan, San Pablo City, Laguna. Photo by YA Bacod

Compiled by
Marita Welgas-Briz

MANGOSTEEN

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Compiled by
Marita Welgas-Briz

Common Name	Mangosteen
Local Name	Mangis or mangostan (Philippines) Manggis (Indonesia, Malaysia) Mangkhut (Laos, Thailand) Mang cut (Vietnam)
Scientific Name	<i>Garcinia mangostana</i> L.

Taxonomic Classification

Kingdom	:	Plantae
Division	:	Magnoliophyta
Class	:	Magnoliopsida
Order	:	Malpighiales
Family	:	Clusiaceae (former Guttiferae)
Genus	:	<i>Garcinia</i>
Species	:	<i>Garcinia mangostana</i> L.

Description	<i>Garcinia mangostana</i> L. or commonly known as mangosteen is a tropical evergreen and slow-growing tree. It has a pyramidal crown and can attain a height of around 6 to 25 meters with a dark-brown to nearly black flaking bark. Its inner bark exudes a yellow, gummy, bitter latex.
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yellowish-green and dull underneath are 9-25 cm long with conspicuous, pale midrib and around 13 cm wide. New leaves are rosy.

The fleshy flowers are around 4-5 cm wide, may be male or hermaphrodite on the same tree. The edible round fruit is a berry, around 3.4 to 7.5 cm in diameter is capped by the prominent calyx at the stem end. It is smooth, tough/leathery, dark-purple to red-purple with 6 to 10mm rind that is red in cross section and purplish white inside. The fruit has 4 to 8 triangular segments of snowy white, juicy, soft flesh which are actually the arils of the seeds. The taste of the fragrant fleshy mangosteen fruit is exquisite and unique, with both sweet and tangy flavor. The fruit contains 1 to 5 fully developed seeds which are ovoid-oblong and somewhat flattened around 2.5 cm long at 1.6 cm wide that cling to the flesh but may also be seedless. Mangosteen has recalcitrant seeds which must be kept moist to remain viable until germination.



Unripe mangosteen fruit and leaves. Photo by CA Luna

Uses

G. mangostana L. fruit is one of the most esteemed fruits in the family. Because of its nutritive value and the presence of some compounds that offer numerous health benefits, mangosteen is a very popular fruit and is regarded as the “Queen of fruits”. The fruit is the greatest source of the powerful xanthones which have several benefits including its anti-inflammatory properties, anti-allergic and anticonvulsants, among others. Xanthones are biologically active, natural chemical substances that can be found only in few tropical plants. These are potent antioxidants that provide a variety of health benefits. The mangosteen contains more than three (3) dozens xanthones. Accordingly, results of laboratory experiments revealed that xanthones found in mangosteen are beneficial against inflammation, bacteria, fungus, histamine causing allergies, cancer and others. One of the leading nutritional supplements in the markets today is the Mangosteen Xantone, popularly known as MX3 where 3 stands for vitality, relief and protection, a Philippine-made product manufactured in an ISO certified laboratory. It contains an antioxidant property extracted from the pericarp of *G. mangostana*. There are other dietary supplements made using mangosteen.

The fruit is usually eaten fresh. The very light and soft pulp has an exquisite flavor. It can also be canned, frozen or processed into jam and syrup, and sweetened, preserved, and made into candies. In the Philippines, the leaves, bark and rind can be used to make a decoction to treat dysentery, diarrhea and urinary disorders. The leaves and bark can also be used as astringent to treat aphtha or thrush. They can also be used as a febrifuge or antipyretic. Leaf infusion can also be applied to treat wounds.

The pulp and seed can be boiled with sugar to make an excellent preserve or topping for ice cream or sherbet. The seeds have delicious nutty flavor. The mangosteen rind or pericarp is effective in treating chronic intestinal catarrh. The rind also contains 7-15% tannin which is used to tan leather and dye fabric. Root decoction is also used to have regular menstruation. The wood can be used for making cabinets, furnitures, fence and building materials.

Photos of half-opened mangosteen fruit and mangosteen fruits sold in the market. Photos by M. V. Cambay, TTD



Table 1 Nutritional components of the fruit/100 g edible portion (SMIARC, 2004)

Components	Nutritional Value
Moisture (%)	79.7
Energy (calories)	34.0
Protein (g)	0.6
Fat (g)	1.0
Carbohydrates (g)	5.6
Fiber (g)	5.1
Ash (g)	0.1
Calcium (mg)	7.0
Magnesium (mg)	13.0
Phosphorous (mg)	13.0
Sodium (mg)	7.0
Potassium (mg)	45.0
Iron (g)	1.0
Vitamin B1(g)	0.03
Vitamin B2 (g)	0.03
Niacin (g)	0.3
Ascorbic Acid (g)	4.2

(Source: http://bpia.dfa.gov.ph/bpi/images/Production_guide/pdf/MANGOSTEEN.pdf)

Origin and Distribution

G. mangostana is native to Indonesia and Malaysia. It is considered exotic in Australia, Cuba, Dominica, Ecuador, Gabon, Ghana, Guatemala, Honduras, India, Jamaica, Liberia, Myanmar, Philippines, Puerto Rico, Singapore, Sri Lanka, Thailand, Trinidad and Tobago, United States of America, Vietnam and Zanzibar.

In the Philippines, the important producing areas are located in Sulu archipelago and several provinces in Mindanao such as Zamboanga del Norte, Davao del Norte, Misamis Occidental, Davao City and Agusan Del Sur.

Ecological Status

Habitat and Ecology

G. mangostana thrives in deep, fertile and slightly acidic clay loam rich in organic matter. It prefers soil with pH ranging from 5.5 - 6.8. The species grows well in tropical areas with abundant regular rainfall or those areas with heavy to uniformly distributed rainfall of 1,200 mm or more without prolonged dry periods. The tree needs a short dry spell of 15-30 days for flower induction. It grows in areas with optimum temperature ranging from 25-35°C and relative humidity of more than 80%. It is usually associated in areas with low elevation i.e, less than 500 meters above sea level. However, it can also be planted in higher elevation but with slower growth rate.

Propagation

Preparation of Planting Materials

Sexual Propagation

Seeds for germination should be extracted from fully ripened fruits. In order to obtain high

germination rate, these newly extracted seeds must be sown as soon as possible. Sowing is usually done in seedbed using a mixture of sand and soil with a ratio of 3:1 by volume. The sowing medium must be moisture-retentive but well-drained. Seeds are sown 5-10 mm in depth at 2-3 cm apart. Sown seeds must be covered with fine sand. Germination will take place more or less 30 days after sowing. Then, while the cotyledon is still attached to the seedlings, they are pricked/placed in the polyethylene bag with the same mixture. Watering of seedlings must be done regularly. To minimize the maintenance expenses in the field since young seedlings require utmost care, the seedlings are outplanted after 24-36 months.

Asexual Propagation

Cleft grafting is a commonly used method of asexual propagation.

Steps in Cleft Grafting

1. Get a two-year-old healthy rootstock propagated from seeds;
2. Cut off the shoot then make a vertical cut measuring 2.0 - 2.5 cm down the middle of the stub to make a V-shaped opening for the scion.
3. Get 6-12 cm scion from another plant with stem size approximately the same as of the rootstock;
4. Cut the basal end of the scion into gently sloping wedge around 2 cm long;
5. Insert the scion onto the opening of the rootstocks; and

Plantation Establishment, Maintenance, and Protection

6. Wrap the completed graft with grafting tape then cover it with a clear polyethylene plastic.

1. Clear the area by underbrushing and removing plants with their roots. Plow the area by harrowing and rotovation to attain the desired tilth or soil condition for sowing seeds. Since high organic matter in the soil is recommended, organic matter should be applied into the planting area 1-2 months before planting;
2. Staking is done at a distance of 8-10 meters between rows and between hills. Dig planting holes with a minimum size of 12x12x12 inches. At the initial stage, wooden sticks can be used to support the seedlings;
3. Field planting should be done at the onset of the rainy season. It is important to provide shade to the newly planted seedlings. Shade should be maintained within 1 to 2 years then gradually reduced until the seedlings are exposed to full sunlight;
4. Weeding should be done regularly. To conserve moisture, irrigate and mulch the seedlings with coconut husk or grasses particularly during the dry period. To provide shade, intercropping mangosteen seedlings with short duration crop such as banana can be done;
5. Pruning is done for mangosteen trees which are 8 to 10 years or more to stimulate fruit-bearing. However, for non-bearing trees, pruning is not necessary but removal of broken or dead branches should be conducted;

6. Application of nitrogenous fertilizer should be done to produce faster vegetative growth. It can be applied in a ring around the base at the edge of the canopy.

Table 2 The following rate of fertilizer application for Mangosteen are recommended (ATI-FTC, Tupi, South Cotabato)

Age of Trees (year)	Kg. Tree/Year of Commercial Fertilizer		
	45-0-0	14-14-14	0-0-60
1	0.22	0.35	-
2	0.44	0.70	-
3	0.56	1.40	-
4	-	2.80	-
5	-	3.60	-
6	-	4.20	0.30
7	-	5.70	0.30
8	-	7.10	0.30
9 above	-	8.50	0.50

In order to enhance growth, produce off-season fruits and increase the mangosteen yield, foliar application can also be done with the use of Sulfur - calcium oxide/quicklime (SQL) within the range of 1:55 concentration in 19 ppm to 1:35 concentration in 30 ppm coupled with regular NPK fertilizer. This should be done before flowering, during fruit development, maturation. After harvest, application also significantly enhances mangosteen growth.

7. Regular watering is important especially during fruit growth and development.



Mangosteen seedlings at Ato Belen's Farm, Brgy. San Juan, San Pablo City, Laguna. Photo by YA Bacod

Harvesting and Postharvest Handling

A. Maturity indices

Fruits are ripe when the fruit color changes from green to pinkish or to reddish-purple, no latex in the skin and the flesh can be removed easily from the flesh. Accordingly, the fruit usually ripens around 113-119 days from flower opening.

B. Harvesting Methods

Fruits can be harvested by handpicking or with the use of a long pole with a net at the end.

C. Postharvest Handling

Mechanical damage of mangosteen fruits should be minimized through careful handling and avoiding compression. Growers should know and understand proper methods how to harvest, pack, store and transport for a high quality product. Harvested fruits can be transported to the packing house or simple shed which can be made from locally available materials to prepare or pack the fruits before being transported to the market.

- a.) Sorting - Remove immature, over-mature, damaged fruits and foreign matter;
- b.) Grading - Fruits are sorted according to quality and size, such as 1.) small (16-18 fruits/kg), 2.) medium (12 - 14 fruits/kg) and 3.) large (8-10 fruits/kg).
- c.) Packing - The selected good quality fruits should be packed using wooden crates or corrugated cartons.

D. Storage

Mangosteen fruits can be stored in a place with cold temperature of around 8-10°C for 8 weeks.

Pest and Diseases and their Control Measures

Mangosteen does not suffer from serious attacks of major pests and diseases. The following are insect pests and diseases and their control measures:

Table 3 Insect Pests and Diseases of Mangosteen and their Control Measures

Insect Pests	Damage	Control Measures
1. Thrips	Thrips prefer to feed on the tender, young plant tissue such as flower buds, opening blooms and unopened leaves.	Spray Dimethoate 2-3 times at weekly intervals.
2. Tussock Caterpillar (<i>Eupterote favia</i>)	Larval stage eats young leaves	Spray Malathion or Fenvalerate
3. Mites	Attack the fruit surface, deface the fruits with small bites	Spray Profenefos or Acrezid
4. Mealy bugs	Attack on young flushes and fruits	Spray Carbaryl or Dimethoate
Diseases		
1. Sooty molds	Attack on young leaves	Improve aeration and sunlight penetration by pruning overlapping branches to reduce infection. Spray with common fungicides
2. Anthracnose	Leaves	Spray with common fungicides
3. Bacterial Leaf Sheath	Leaves	Spray with common fungicides

Gummosis is a major physiological disorder found in mangosteen as evidenced by the oozing of latex as yellow spots on the fruit surfaces or skin. Accordingly, physical damage to the latex vessel can be caused by sucking insects, strong winds and rough harvesting or handling. Those fruits which are exposed to strong sun may also exude latex.

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Mangosteen tree at Ato Belen's Farm, Brgy. San Juan, San Pablo City, Laguna. Photo by YA Bacod

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Common Name	Mangosteen
Local Name	Mangis or mangostan (Philippines) Manggis (Indonesia, Malaysia) Mangkhut (Laos, Thailand) Mang cut (Vietnam)
Scientific Name	<i>Garcinia mangostana</i> L.

Taxonomic Classification

Kingdom	:	Plantae
Division	:	Magnoliophyta
Class	:	Magnoliopsida
Order	:	Malpighiales
Family	:	Clusiaceae (former Guttiferae)
Genus	:	Garcinia
Species	:	<i>Garcinia mangostana</i> L.

Description	<i>Garcinia mangostana</i> L. or commonly known as mangosteen is a tropical evergreen and slow-growing tree. It has a pyramidal crown and can attain a height of around 6 to 25 meters with a dark-brown to nearly black flaking bark. Its inner bark exudes a yellow, gummy, bitter latex.
	The leaves are opposite, short-stalked, ovate-oblong or elliptic. The leathery leaves which are dark green, glossy above and

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yellowish-green and dull underneath are 9-25 cm long with conspicuous, pale midrib and around 13 cm wide. New leaves are rosy.

The fleshy flowers are around 4-5 cm wide, may be male or hermaphrodite on the same tree. The edible round fruit is a berry, around 3.4 to 7.5 cm in diameter is capped by the prominent calyx at the stem end. It is smooth, tough/leathery, dark-purple to red-purple with 6 to 10mm rind that is red in cross section and purplish white inside. The fruit has 4 to 8 triangular segments of snowy white, juicy, soft flesh which are actually the arils of the seeds. The taste of the fragrant fleshy mangosteen fruit is exquisite and unique, with both sweet and tangy flavor. The fruit contains 1 to 5 fully developed seeds which are ovoid-oblong and somewhat flattened around 2.5 cm long at 1.6 cm wide that cling to the flesh but may also be seedless. Mangosteen has recalcitrant seeds which must be kept moist to remain viable until germination.



Unripe mangosteen fruit and leaves. Photo by CA Luna

Uses

G. mangostana L. fruit is one of the most esteemed fruits in the family. Because of its nutritive value and the presence of some compounds that offer numerous health benefits, mangosteen is a very popular fruit and is regarded as the “Queen of fruits”. The fruit is the greatest source of the powerful xanthones which have several benefits including its anti-inflammatory properties, anti-allergic and anticonvulsants, among others. Xanthones are biologically active, natural chemical substances that can be found only in few tropical plants. These are potent antioxidants that provide a variety of health benefits. The mangosteen contains more than three (3) dozens xanthones. Accordingly, results of laboratory experiments revealed that xanthones found in mangosteen are beneficial against inflammation, bacteria, fungus, histamine causing allergies, cancer and others. One of the leading nutritional supplements in the markets today is the Mangosteen Xantone, popularly known as MX3 where 3 stands for vitality, relief and protection, a Philippine-made product manufactured in an ISO certified laboratory. It contains an antioxidant property extracted from the pericarp of *G. mangostana*. There are other dietary supplements made using mangosteen.

The fruit is usually eaten fresh. The very light and soft pulp has an exquisite flavor. It can also be canned, frozen or processed into jam and syrup, and sweetened, preserved, and made into candies. In the Philippines, the leaves, bark and rind can be used to make a decoction to treat dysentery, diarrhea and urinary disorders. The leaves and bark can also be used as astringent to treat aphtha or thrush. They can also be used as a febrifuge or antipyretic. Leaf infusion can also be applied to treat wounds.

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Photos of half-opened mangosteen fruit and mangosteen fruits sold in the market. Photos by M. V. Cambay, TTD



Table 1 Nutritional components of the fruit/100 g edible portion (SMIARC, 2004)

Components	Nutritional Value
Moisture (%)	79.7
Energy (calories)	34.0
Protein (g)	0.6
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Carbohydrates (g)	5.6
Fiber (g)	5.1
Ash (g)	0.1
Calcium (mg)	7.0
Magnesium (mg)	13.0
Phosphorous (mg)	13.0
Sodium (mg)	7.0
Potassium (mg)	45.0
Iron (g)	1.0
Vitamin B1(g)	0.03
Vitamin B2 (g)	0.03
Niacin (g)	0.3
Ascorbic Acid (g)	4.2

(Source: http://bpia.dfa.gov.ph/bpi/images/Production_guide/pdf/MANGOSTEEN.pdf)

Origin and Distribution

G. mangostana is native to Indonesia and Malaysia. It is considered exotic in Australia, Cuba, Dominica, Ecuador, Gabon, Ghana, Guatemala, Honduras, India, Jamaica, Liberia, Myanmar, Philippines, Puerto Rico, Singapore, Sri Lanka, Thailand, Trinidad and Tobago, United States of America, Vietnam and Zanzibar.

In the Philippines, the important producing areas are located in Sulu archipelago and several provinces in Mindanao such as Zamboanga del Norte, Davao del Norte, Misamis Occidental, Davao City and Agusan Del Sur.

Ecological Status

Habitat and Ecology

G. mangostana thrives in deep, fertile and slightly acidic clay loam rich in organic matter. It prefers soil with pH ranging from 5.5 - 6.8. The species grows well in tropical areas with abundant regular rainfall or those areas with heavy to uniformly distributed rainfall of 1,200 mm or more without prolonged dry periods. The tree needs a short dry spell of 15-30 days for flower induction. It grows in areas with optimum temperature ranging from 25-35°C and relative humidity of more than 80%. It is usually associated in areas with low elevation i.e, less than 500 meters above sea level. However, it can also be planted in higher elevation but with slower growth rate.

Propagation

Preparation of Planting Materials

Sexual Propagation

Seeds for germination should be extracted from fully ripened fruits. In order to obtain high

germination rate, these newly extracted seeds must be sown as soon as possible. Sowing is usually done in seedbed using a mixture of sand and soil with a ratio of 3:1 by volume. The sowing medium must be moisture-retentive but well-drained. Seeds are sown 5-10 mm in depth at 2-3 cm apart. Sown seeds must be covered with fine sand. Germination will take place more or less 30 days after sowing. Then, while the cotyledon is still attached to the seedlings, they are pricked/placed in the polyethylene bag with the same mixture. Watering of seedlings must be done regularly. To minimize the maintenance expenses in the field since young seedlings require utmost care, the seedlings are outplanted after 24-36 months.

Asexual Propagation

Cleft grafting is a commonly used method of asexual propagation.

Steps in Cleft Grafting

1. Get a two-year-old healthy rootstock propagated from seeds;
2. Cut off the shoot then make a vertical cut measuring 2.0 - 2.5 cm down the middle of the stub to make a V-shaped opening for the scion.
3. Get 6-12 cm scion from another plant with stem size approximately the same as of the rootstock;
4. Cut the basal end of the scion into gently sloping wedge around 2 cm long;
5. Insert the scion onto the opening of the rootstocks; and

Plantation Establishment, Maintenance, and Protection

6. Wrap the completed graft with grafting tape then cover it with a clear polyethylene plastic.

1. Clear the area by underbrushing and removing plants with their roots. Plow the area by harrowing and rotovation to attain the desired tilth or soil condition for sowing seeds. Since high organic matter in the soil is recommended, organic matter should be applied into the planting area 1-2 months before planting;
2. Staking is done at a distance of 8-10 meters between rows and between hills. Dig planting holes with a minimum size of 12x12x12 inches. At the initial stage, wooden sticks can be used to support the seedlings;
3. Field planting should be done at the onset of the rainy season. It is important to provide shade to the newly planted seedlings. Shade should be maintained within 1 to 2 years then gradually reduced until the seedlings are exposed to full sunlight;
4. Weeding should be done regularly. To conserve moisture, irrigate and mulch the seedlings with coconut husk or grasses particularly during the dry period. To provide shade, intercropping mangosteen seedlings with short duration crop such as banana can be done;
5. Pruning is done for mangosteen trees which are 8 to 10 years or more to stimulate fruit-bearing. However, for non-bearing trees, pruning is not necessary but removal of broken or dead branches should be conducted;

6. Application of nitrogenous fertilizer should be done to produce faster vegetative growth. It can be applied in a ring around the base at the edge of the canopy.

Table 2 The following rate of fertilizer application for Mangosteen are recommended (ATI-FTC, Tupi, South Cotabato)

Age of Trees (year)	Kg. Tree/Year of Commercial Fertilizer		
	45-0-0	14-14-14	0-0-60
1	0.22	0.35	-
2	0.44	0.70	-
3	0.56	1.40	-
4	-	2.80	-
5	-	3.60	-
6	-	4.20	0.30
7	-	5.70	0.30
8	-	7.10	0.30
9 above	-	8.50	0.50

In order to enhance growth, produce off-season fruits and increase the mangosteen yield, foliar application can also be done with the use of Sulfur - calcium oxide/quicklime (SQL) within the range of 1:55 concentration in 19 ppm to 1:35 concentration in 30 ppm coupled with regular NPK fertilizer. This should be done before flowering, during fruit development, maturation. After harvest, application also significantly enhances mangosteen growth.

7. Regular watering is important especially during fruit growth and development.



Mangosteen seedlings at Ato Belen's Farm, Brgy. San Juan, San Pablo City, Laguna. Photo by YA Bacod

Harvesting and Postharvest Handling

A. Maturity indices

Fruits are ripe when the fruit color changes from green to pinkish or to reddish-purple, no latex in the skin and the flesh can be removed easily from the flesh. Accordingly, the fruit usually ripens around 113-119 days from flower opening.

B. Harvesting Methods

Fruits can be harvested by handpicking or with the use of a long pole with a net at the end.

C. Postharvest Handling

Mechanical damage of mangosteen fruits should be minimized through careful handling and avoiding compression. Growers should know and understand proper methods how to harvest, pack, store and transport for a high quality product. Harvested fruits can be transported to the packing house or simple shed which can be made from locally available materials to prepare or pack the fruits before being transported to the market.

- a.) Sorting - Remove immature, over-mature, damaged fruits and foreign matter;
- b.) Grading - Fruits are sorted according to quality and size, such as 1.) small (16-18 fruits/kg), 2.) medium (12 - 14 fruits/kg) and 3.) large (8-10 fruits/kg).
- c.) Packing - The selected good quality fruits should be packed using wooden crates or corrugated cartons.

D. Storage

Mangosteen fruits can be stored in a place with cold temperature of around 8-10°C for 8 weeks.

Pest and Diseases and their Control Measures

Mangosteen does not suffer from serious attacks of major pests and diseases. The following are insect pests and diseases and their control measures:

Table 3 Insect Pests and Diseases of Mangosteen and their Control Measures

Insect Pests	Damage	Control Measures
1. Thrips	Thrips prefer to feed on the tender, young plant tissue such as flower buds, opening blooms and unopened leaves.	Spray Dimethoate 2-3 times at weekly intervals.
2. Tussock Caterpillar (<i>Eupterote favia</i>)	Larval stage eats young leaves	Spray Malathion or Fenvalerate
3. Mites	Attack the fruit surface, deface the fruits with small bites	Spray Profenefos or Acrezid
4. Mealy bugs	Attack on young flushes and fruits	Spray Carbaryl or Dimethoate
Diseases		
1. Sooty molds	Attack on young leaves	Improve aeration and sunlight penetration by pruning overlapping branches to reduce infection. Spray with common fungicides
2. Anthracnose	Leaves	Spray with common fungicides
3. Bacterial Leaf Sheath	Leaves	Spray with common fungicides

Gummosis is a major physiological disorder found in mangosteen as evidenced by the oozing of latex as yellow spots on the fruit surfaces or skin. Accordingly, physical damage to the latex vessel can be caused by sucking insects, strong winds and rough harvesting or handling. Those fruits which are exposed to strong sun may also exude latex.

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Mangosteen tree at Ato Belen's Farm, Brgy. San Juan, San Pablo City, Laguna. Photo by YA Bacod

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