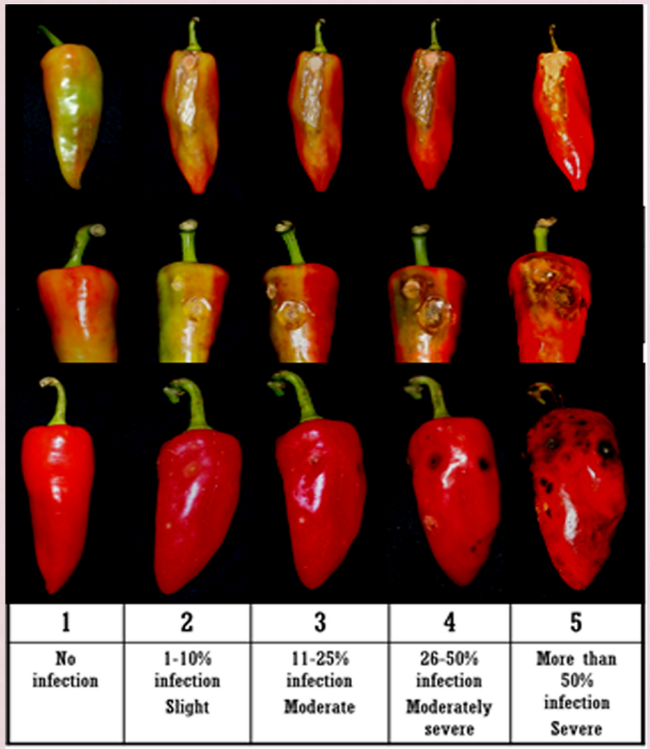
Decay development during holding and storage:



1	2	3	4	5
No infection	1-10% infection Slight	11-25% infection Moderate	26-50% infection Moderately severe	More than 50% infection Severe

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November 2016 Extension Leaflet. 3

SWEET PEPPER

QUALITY INDICES, DEFECTS AND DISEASES

SWEET PEPPER

Commercially mature sweet peppers show unform shape, size and color typical of the variety with fresh green calyx or stem. It is also firm and are free from defects such as cracks, decay and sunscalding. It continues to metabolize after harvest. Physical, chemical, physiological, and pathological changes transform the freshly harvested produce into a produce of lower quality.

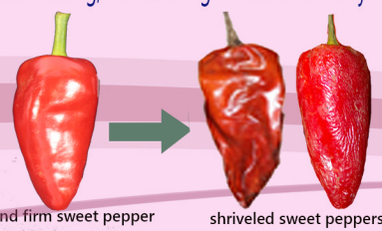
After harvest, sweet pepper visual quality declines...

excellent quality | very good | good; limit of saleability | fair; useable but not saleable | poor

its color changes...

mature green | breaker (1-10% orange/ light red) | turning (11-50% orange/ light red) | orange | light red | full red

Sweet pepper fruit undergoes shriveling over time. Stressors include dry environment, pests and viruses. To prevent fast shriveling, maintain high relative humidity and cool temperature during storage.



fresh and firm sweet pepper | shriveled sweet peppers

COMMON DEFECTS & DISEASES

Blossom End Rot

Associated with environmental stress disorders and calcium deficiency. Avoid moisture stress during growth and/or reduce transpiration in the crop. Calcium nitrate may be applied during production.

Sunscald

Soft, tan lesions on the fruit that developed after direct exposure to sunlight. Place harvested fruits in an area with floating covers where there is shade.

Anthracnose

Sunken, circular spots which develop black rings. Prevented by applying fungicides before symptoms appear.

Fruit Cracks, Fruit Splitting, and Poorly Formed Fruit

split fruit | deformed | cracked fruit

These defects can be attributed to poor environmental conditions while growing. Cracking and splitting can occur after harvest during packing, transporting and handling. Consistent and optimized growing environment and proper postharvest handling are the best ways to prevent these defects.

Bacterial Rot

Caused by bacterial *(Xanthomonas)* infection resulting to fomation of lesions, water-soaked areas, and rotten appearance to the leaves and fruit. Remove infected fruit from the basket to prevent spreading of disease.

Corking

Scarring that appears on the surface o of the pepper caused by the inability of the skin to keep up with the fast growth of the fruit.

Decayed stem

Decayed stem in sweet pepper affects the overall visual quality of the fruit. Moist, discolored (dark green or brown), and disintegrated tissues can be obsereved. When seen, remove immediately.

Insect Damage

Pests that attack on sweet pepper which may cause damage include aphids, caterpillars, worms and plant bugs. They feed on the fruit resulting to holes and rotting. Viruses may be spread through these pests.

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Commission on Higher Education-
Higher Education Regional Research Center (Region XI)

April 2016 Extension Leaflet. 4

SWEET PEPPER

APPROPRIATE POSTHARVEST HANDLING

(*Capsicum annuum* L.)

Sweet pepper is a cool-season crop that is a member of the Solanaceae family. Its most notable feature is its flavor, which can be sweet and pungent. This crop is available all-year round.

GOOD QUALITY SWEET PEPPER

Physical Quality:

> Commerciall mature (80-100 days after planting)
> Mature green color
> Smooth, shiny and firm skin
>4-6 inches in length
> Well-formed
>Clean, free from decay, physical injury and defects

Chemical Quality:

>Minimum TSS - 6.56% Brix
> Minimum TA - 0.56%
> pH - 5.35-5.72
> Moisture content - 88-90%

SWEET PEPPER QUALITY MAINTENANCE

HARVESTING

Harvesting should take place at the optimal stage of maturity (after 80-100 days from planting) during the cooler parts of the day. Some are harvested while still green.

REDUCING FRUIT TEMPERATURE

Sweet peppers should be immediately placed in a cool area to reduce fruit temperature and water loss. It can be placed under the shade after harvest or in a precooler (i.e. evaporative cooler) if available.

SORTING

Sweet peppers exhibiting rotting, mold growth,serious bruising, severe malformation, scarring and blossom end deterioration should be sorted out and considered as non-marketable. Sorting according to size and color is also recommended.

CLEANING

To remove dirt and other materials, sweet peppers should be washed with water and immediately dried. Household bleach (5.25% sodium hypochlorite) at 200ppm (2.91 tsp/gal) may be added to the wash water to disinfect the crop.

PACKAGING

Farmers usually use sacks or baskets to contain sweet peppers for transit to the market. It is recommended to sort peppers into size and color and pack them accordingly in layers in a 4 to 9 kg carton to avoid injury.

TRANSPORTING

Sweet peppers should be packed in containers that are placed on top of the pile in the vehicle. Produce should be transported during the coolest part of the day. Produce should not be stepped or sat on.

STORAGE

Store sweet peppers at 7-12 °C and 90-95% relative humidity. Temperatures above 12 °C encourage ripening and spreading of bacterial soft rot while below 7 °C causes chilling injury. Under favorable conditions, sweet peppers last until 3-5 weeks. Under ambient conditions (25-29 °C, 60-85 % RH), sweet pepers can be kept for 7-14 days.

FILM WRAPPING

Film wrapping helps reduce shrinkage modities on package atmosphere resulting in longer storage and shelf life.

EVAPORATIVE COOLING

Evaporative cooling is a cheap alternative to refrigeration. Up to 4.8 °C and 28% Relative Humidity were achieved with an evaporative cooler. This prolonged shelf-life from 3 to 6 days.

REPERENSIYA:

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November 2017 Extension Leaflet No. 4.1

ATSAL

PAG-ATIMAN HUMAN SA PAG-ANI

(*Capsicum annuum* L.)

Ang atsal mopabor itanom sa mabugnaw na klima sa tuig ug usa ka miyembro sa Solanaceae nga pamilya. Ang timailhan ani nga tanom mao ang iyang lasa nga tam-ison ug isog na baho. Kini nga tanom anaa tibuok tuig.

DEKALIDAD NA ATSAL

Pisikal nga kalidad:
- > Komersyal na kaguwangon (80-100 ka adlaw gikan sa pagtanom)
- > Green ug color nga guwang
- > Hamis ug hugot nga panit
- >4-6 pulgada na katas-on
- > Maayong porma
- >Limpyo, walay mga lata, bun-og ug uban pang depekto

Kemikal na kalidad:
- >Pinakaubos na TSS - 6.56 ºBrix
- >Pinakaubos na TA - 0.56%
- >pH - 5.35-5.72
- >Tubig sa unod - 88-90%

PAGMENTENAR SA KALIDAD SA ATSAL

PAG-ANI

Ang pag-ani buhaton lang sa saktong guwang (80-100 ka adlaw gikan sa pagtanom) ug pagahimuon sa mabugnaw na parte mianang adlawa. Pwede sad anihon ang guwang na green pa ug kolor.

PAGPAUBOS SA TEMPERATURA SA PRUTAS

Kinahanglan ibutang dayon sa mabugnaw nga lugar ang atsal para moubos ang temperatura sa prutas ug malikayan ang pag-gaan o pagkupos. Pwede kini ibutang sa landong human pag-ani o sa precooler (i.e. evaporative cooler) kung aduna..

PAGPINILIAY

Ang mga atsal na nagpakita ug kalata, gitubuan ug molds, grabeng bun-og, daot ug porma, naay peklat o uwat ug pagkalata sa pongango kinahanglan pilian ug dili na iapil sa pagmarket. Girekomenda usab ang pagpili sumala sa kadak-on ug kolor.

PAGLIMPYO

Para makuha ang mga hugaw ug uban pang namilit sa atsal, kinahanglan hugasan kini ug tubig unya paughon. Pwede usab butangan ang tubig panghugas ug pangbalay nga bleach (5.25% sodium hypochlorite) nga 200ppm (2.91 ka kutsarita kada gallon) para malimpyohan ang atsal.

PAGPUTOS

Ang mag-uuma kasagaran nagagamit sa sako ug basket para sudlan sa atsal inig hatud sa merkado. Girekomenda ang pagpili saumala sa kadak-on ug kolor unya putson kini sa karton sa timbang na 4-9 kg lamang para malikayan ang bun-og.

PAGBIYAHE

Ang atsal kinahanglan putson ug ibutang sa kontener adto sa taas nga pile sa sakyanan. Ibyahe lang ang atsal sa mabugnaw nga oras sa adlaw. Ayaw tamaki o lingkuri ang karton o putos sa atsal.

PAGPUNDO O PAGTAGO

Pundoha ang atsal sa temperatura nga 7-12 ºC og 90-95% relative humidity (RH). Ang kainit sobra sa 12 ºC nagapadali sa paghinog ug pagdaghan sa bacterial soft rot, pero ang ubos 7 ºC maoy hinungdan sa chilling injury. Kung pabor nga kondisyon, ang atsal dili pa malata hangtud 3-5 ka semana. Pero ubos sa normal o temperatura sa kwarto (25-29 ºC, 60-85 % RH), ang kinabuhi sa atsal mokabat lang ug 7-14 ka adlaw.

PAGPUTOS GAMIT ANG FILM

Ang pagputos sa atsal gamit ang film makapaminos sa pagkupos nga moresulta sa dugay nga pagkadaot ug taas-taas nga kinabuhi.

EVAPORATIVE COOLING

Ang evaporative cooling usa ka barato nga pamaagi ug alternatibo sa paggamit ug ref nga katuyuan mao ang pagpabugnaw o pagkuha sa kainit sa prutas. Ang evaporative cooler makapa -ubos sa temperatura ngadto sa 4.8 ºC ug 28 %RH. Kini makapataas sa kinabuhi sa atsal gikan sa 3-6 ka adlaw.

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TOMATO POSTHARVEST HANDLING

Extension Leaflet No. 5
October 2016

Tomato is *an important high value crop in the world. It is a* warm season crop which is available all year round. Its economical importance is attributed to its nutritional and culinary value. Carotenoid, lycopene, vitamin E and vitamin C contents of tomato are reported to be cancer preventive

Commercially Mature Tomato

Chemical quality

Total soluble solids
3.5 to 6.0%
pH 4.0 to 4.3
Titratable acidity
0.28 to 0.40%

Physical quality

Fruit must be clean
Free from blemishes, defects and diseases
Well-formed

Harvesting

Tomato should be harvested during early morning after 73-75 days from planting.

(Intact calyx results in longer shelf life) It must be immediately stored in a shaded area. Lined container must be used during harvest.

Cleaning

Wipe with cloth moistened with 200 ppm sodium hypochlorite. Constantly replace cloth with a fresh one.

Packing

Tomato must be packed according to size. It must be arranged properly in a well ventilated wooden crate. Do not under or over pack.

Sorting

Sort tomato according to size, maturity and quality. Tomatoes with defects and diseases should be sorted out

Transportation

Tomato should be protected from heat by covering the truck with a white canvass and transporitng it during the cool part of the day.

Storage

Storage life of tomato is up to 15 days. Tomato should be stored in shaded area. Store tomato according maturity or color slow down ripening. To extend storage life, tomato should be stored at a temperature of 13- 15°C and a relative humidity of 90-95%%

Market display

Do not dispplay the produce in direct sunlight. Display the tomato according to maturity or color to slow down ripening.

To prolong storage life , tomato should be re-packed in a polyethylene bag wrapped in a piece of paper or tissue paper

Reperensiya:

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PAG-ATIMAN SA KAMATIS HUMAN SA PAG-ANI

Extension Leaflet No. 5.1
November 2017

Ang **Kamatis** usa ka importante na tanom nga taas ug balur sa tibuok nasud. Mopabor ang kamatis kung itanom og ting-init pero pwede sya itanom bisan unsang higayuna sa tuig. Ang presyo miani gibase sa iyang nutrisyonal ug importansya isip panakot sa paglu-to. Ang carotenoid, lycopene, bitamina E ug C nga naa sa kamatis gireport nga makaprebentar sa sakit nga cancer.

Kemikal na Kalidad

cvs. Superwhite Pope and Diamante

- Total soluble solids 3.5 to 5.0% ° Brix
- pH 4.0 to 4.3
- Titratable acidity 1.5 to 8.0%

Pisikal na Kalidad

Commercially mature

- Ang prutas o bunga kinahanglan limpyo
- Walay daot-daot sa panit
- Walay mga depekto o sakit
- Piskay ug porma

Pag-ani

Ang kamatis kinahanglan anihon sayo sa buntag. Kasagaran na variety sa ka-matis pwede anihon 70-125 ka adlaw gikan pagtanom. Mas maayo kung adunay pongango aron dugay madaot. Kinahanglan ibu-tang kini sa landong nga lugar. Gamit pud ug kontener nga naay hapin inig pag-ani.

Paglimpyo

Pahiri ug trapo nga gibasa sa 3.94 kutsarita kada galon nga sodium hypochlorite (i.e.. Clorox). Ilisan kanunay ug limpyo nga trapo kung hugaw na kini. Kung walay trapo pwede rapud hugasan ang kamatis sa tubig nga adunay sodium hypochlorite .

Pagpiniliay

Gamit ug lamesa para sa pag-pili ug paglahi-lahi sa mga ka-matis sa nagkalain nga ka-dak-on, kaguwangon ug kali-dad. Ang kamatis na adunay depekto ug mga sakit kinah-anglan ilabay.

Pagputos

Ang kamatis putson basi sa kadak-on. Ang bunga kinah-anglan ihumpid pagmaayo sa kahoy nga crate nga naay ka-hungawan. Ayaw putsa nga kulang sa timbang o sobra-sobra na .

Pagbyahe

Ang kamatis dapat dili mabu-lad sa init sa adlaw, mao kina-hanglan tabunan kini ug ba-ga-on nga panapton nga puti ug kolor unya ibyahe sa bugnaw o landong nga oras mianang adlawa.

Pagpundo o Pagtago

Ang kinabuhi sa kamatis kung itago sa temperatura sa usa ka kwarto, moabot ug 15 ka adlaw depende sa kaguwangon o pag-amuma. Kinahanglan itago sa landong nga lugar ang kamatis. Ipundo kini sumala sa kaguwangon o kolor para dili madali paghinog. Para motaas ang kinabuhi o dugay madaot ang kamatis kinahanglan ipundo sa lugar na 10-15°C na temperatura ug kaumogon o "humidity" na 90-95%..

Pagdisplay sa Merkado

Ayaw itapok ang kamatis direk-ta sa init sa adlaw. Ilahi-lahi ang kamatis base sa kolor or kagu-wangon aron dugay muhinog. Ayaw itapok ang kamatis sa mga prutas na kusog magpa-gawas ug ethylene sama sa saging ug passion fruit. Pwede pud iputos and kamatis sa sel-yado na plastic (i.e. polyeth-ylene bag) na adunay ginag-may-gagmay na buslot aron mutaas ang kinabuhi.

INSECT DAMAGRE	CAUSES/DESCRIPTION
Cloudy spot	- Feeding of stink bugs (*Pentatomids spp*) causes irregular yellow or whitish spots
Thrips damage	- Feeding of thrips on tomato skin causes 'flecking' while laying of eggs causes 'dimpling'

Cloudy spot

Thrips damage

HANDLING DEFECT	CAUSES/DESCRIPTION
Physical injury	- Results from improper handling and storage of fruit
Bruise	- Results from dropping or compression of fruit during improper handling

Physical injury

Bruise

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TOMATO POSTHARVEST QUALITY, DEFECTS AND DISEASES

January 2017
Extension Leaflet No. 6

Tomato is a perishable crop. It easily deteriorates. To maintain good quality, the storage conditions of tomato should be at 10-15°C and 90-95% relative humidity. It must also be handled properly and stored away from high ethylene producing crop.

VISUAL QUALITY

1- Excellent, fresh | 2- Very good | 3- Good (limit of saleability) | 4- Fair (limit of usability) | 5- Poor

RIPENING STAGE

1- Mature green

2- Breaker, definite break in color but < 10%of surface

3- Turning, more green than yellow, orange, pink or red

4- More yellow, orange, pink ot red than green

5- Yellow, orange, pink ore red than green

6- Full red

DEGREE OF DECAY

1- No infection

2- Slight, 1-10% infection

3- Moderate, 11-25% ingection

4- Moderately severe, 26-50% infection

5- Severe, more than 50%

PREHARVEST DEFECTS	CAUSES/DESCRIPTION
Zipper scar	- longitudinal scar runs from the stem to the blossom end of tomato, formed when the anther attaches to the ovary wall of the developing fruit.
Puffiness	- Light weight fruit in relation to irregular size, caused by unfavorable conditions during fruit development
Misshapen	- Abnormal shape caused by lower temperature during fruit deveoplment
Yellow shoulder	- Yellow color near the stem end due to incomplete ripening associated with improper fertilization and high temperature
Fruit nose	- Deformity in fruit shape, improper division of fruit cells during development that lead to extra fruit locule
Catface	- Malformation at the blossom end with dark firm streaks or scars, results from the abnormalities of cell growth during fruit development
Gray wall	- Uneven ripening of fruit with patches of gray or yellowish tissue, associated with inadequate fertilizer and high temperature
Rain check	- Tiny linear or concentric cracks around the shoulder, develops when fruit are exposed to heavy rain after long dry period
Sunscald	- Yellowish or whitish tissue, develops when fruit are exposed directly to extreme heat of sun

Zipper

Puffiness

Misshapen

Yellow shoulder

Fruit Nose

Catface

Gray Wall

Rain Check

Sunscald

INFECTION/DISORDER	CAUSAL ORGANISM/CAUSES
Rhizopus rot	- *Rhizopus stolonifer* , initially a water soak area which developed into soft lesion with nest of mold
Anthracnose	- *Colletotrichum sp.*, visible in ripe fruit, sunken lesion with dark spot in the center
Early blight	- *Alternaria solani*, dark brown, concentric sunken spots at the stem end
Soft rot	- *Pectobacterium carotovorum subsp. carotovorum* , slimy mass which become dry and shriveled during storage
Sour rot	- *Geotrichum candidum*, lesion begins at the stem end with white fungal growth and sour odor.
Black mold	- *Alternaria alternata*, black lesion near the stem end
Gray mold	- *Botrytis cinerea*, cluster of grayish green to brown, develop from cracks in sckin
Single virus streak	-Tomato mosaic tobamovirus , raised brown streaks or spots
Blossom end rot	- A physiological disorder, resulted from calcium deficiency and fluctuation in water supply, visible as a water soaked spot which becomes large, darken and sunken

Rhizopus Rot

Anthracnose

Early blight

Soft Rot

Sour rot

Black mold

Double virus streak

Gray mold

Blossom end rot

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CHINESE CABBAGE POSTHARVEST HANDLING

Extension Leaflet No. 7
January 2017

CHINESE CABBAGE

(Brassica rapa subsp. pekinensis)

Chinese cabbage is a shallow-rooted, annual and cool-season crop. It is considered as one of the most valuable crop in East Asia. Various problems are encountered in Chinese cabbage production such as diseases, pests and unstable environmental conditions. Hence, it is impotant to practice appropriate postharvest handling to maintain good quality of produce.

Commercially mature

2 Kinds of Chinese Cabbage

Distinct compact head

Non-distinct compact head

- Freshly harvested
- 60-65 days from planting
- Clean, firm
- Well-developed head
- Free from disease, pest
- Free from physical damage

Harvesting and Handling

- Harvest at the commercially mature stage. Heads are firm. Cut with one sweep using a sharp and clean knife. Leave 4 to 5 wrapper outer leaves .
- Place the cut head on the plant from which it was cut (not on the ground). Collect the harvested heads using lined bamboo baskets. Put in area covered with canvas and not on the ground. The place should also be well shaded.

Alum treatment

- Spray with 10% alum (*tawas*,10g dissolved in water until it reaches 1L) on butt-end until dripping wet. Best done during rainy season.

Packing

- After alum treatment, air-dry then individually wrap the Chinese cabbage head with newspaper.
- Pack the upper part of the cabbage head facing the other head. Do not underpack.

Re-trimming

- Remove wrapper leaves and undesirable parts. Do not overtrim.

Transporting

- Transport the produce during the coolest part of the day Transport the produce using a close container or cover with canvas when using an open truck

Market display

- Remove undesirable leaves. Do not overtrim. Display on a clean table in a shaded area.

Quality Maintenance

- Handle crops in the shade
- Postharvest diseases can be reduced by:
  - Proper sanitation in the field, at harvest and during handling
- Store at 2-4°C, 98-100% RH

- Soft rot can be reduced by application of 10% alum preferably within 24 hrs from harvest.

Without Alum

With 10% alum

Quality of Chinese cabbage sprayed with 10% alum after 3 days from treament.

- Chinese cabbage, an ethylene sensitive crop, should not be stored together with high-ethylene producing crops like banana and passion fruit to avoid yellowing (Cantwell and Suslow, 2002).

- Be careful not to inflict physical damage. It increases moisture loss by as much as 3-4 times than that of undamaged produce. Rough handling should be avoided during transport.

- For wholesale, wrap with newspaper and pack in plastic films or bags.

GOOD QUALITY CHINESE CABBAGE

Distinct compact head

Non-distinct compact head

-Fresh, leaves are turgid
-Well formed compact head
-Well-trimmed, free from damaged and wilted leaves
-Clean, free from blemish or dirt
-Free from damage and diseases

2 KINDS CHINESE CABBAGE

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CHINESE CABBAGE

POSTHARVEST QUALITY, DEFECTS AND DISEASES

Extension Leaflet No. 8
January 2017

CHINESE CABBAGE
(Brassica rapa subsp. pekinensis)

Chinese cabbage is a shallow-rooted, annual and cool-season crop. This crop is considered as one of the most valuable crop in East Asia. Chinese cabbage is a good source of Vitamin C and calcium. Like most leafy vegetables, this crop is highly perishable. To maintain good quality of Chinese cabbage, proper postharvest handling and management must be practiced.

VISUAL QUALITY

1	2	3	4	5
Excellent, fresh	Very good	Good, limit of saleability if trimmed	Fair, usable but not saleable	Poor

DEGREE OF DECAY

1	2	3	4	5
No decay (% surface area	1-5% decay	6-10% decay	11-15% decay	>16% decay

DEFECTS AND DISEASES

Petiole spotting
also called as “Gomasho” and “Black speck”; occurs in the field, develops during storage, associated with excessive nitrogen and phosphorus

Yellowing
Related to low sugar content Younger leaves have more sugar content than older leaves.

Wilting
When temperature is high or relative humidity is low

Overly trimmed
Excessive trimming due to severe wilting or damge in leaves.

Undeveloped head
Caused by excessive nitrogen; feeding of insect on young leaves

Deformed head
Deformation may result from feeding of insect

Petiole damage
Damaged or cracked leaves usually caused by mechanical stress

Mosaic virus
Caused by turnip mosaic virus; results in necrotic, deformed and stunted heads

Alternaria leaf spot
Caused by *Alternaria brassicae* and *Alternaria brassicicola* that cause black or brown lesions with bull’s eye appearance.

Diamond back moth damage
Caused by *Plutella xylostella;* feeding of larvae result in complete removal of leaf tissue except veins

Bruise
Caused by mishandling and rough handling of produce

Soft rot
Caused by a bacteria, *Pectobacterium carotovorum*, that causes decay . Evident as slimy , soft, water lesions and has a foul-odor.

Insect damage
Feeding of insect causes holes in leaves

GOOD QUALITY MANGO FRUIT

HARVEST QUALITY

- Commercially mature fruit (115-125 days after flowering)
- Green with bloom
- Well formed
- Clean, free from physical damage, blemishes, insect and sap injury

RIPE MANGO

- Bright yellow
- Pleasant aroma
- Clean, free from diseases and physical injury and blemishes

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Extension Leaflet No. 9
February 2017

MANGO POSTHARVEST HANDLING

MANGO FRUIT (*Mangifera indica*), a climacteric fruit, undergoes ripening after harvest. Ripening converts it into one that is edible and acceptable in the market. Mango (var. Carabao) fruit is tagged as the best mango in the world for its unique taste and aroma.To ensure that the country is producing premium quality for domestic and international market, postharvest losses should be minimized through appropriate handling of fruit.

APPROPRIATE POSTHARVEST HANDLING



HARVESTING

Mango fruit should be harvested after 110-120 day from flowering. To minimize bruising, use picking tools and place fruit in a plastic crate. It should be immediately stored in shaded area or cover it with a canvas to avoid heat from sunlight.


SORTING

Sort fruit according to quality. Diseased or defected fruit should be discarded. Sorting should be done under a shaded area.


PACKING

Use rigid carton boxes with paper liners for packing. Packing should be done in a shaded area.

TRANSPORTATION

Transport mango fruit during the coolest part of the day. Delivery truck should be covered with a canvas. Do not over stacked the boxes.


RIPENING

T reduce adverse effect of extreme high temperature on mango quality, ripen fruit using calcium carbide for 48 hours Make sure that the mangoes are tightly packed and sealed in a bamboo basket.


STORAGE

During ripening, bamboo baskets with mangoes should be stored in a shaded area. After ripening, fruit should be placed in a clean container. It should be stored in a low temperature room (18-22^{0}C) to maintain good quality of fruit.


MARKET DISPLAY

Mangoes should be displayed away from the heat of the sun. Separately display good quality fruit from diseased one.

MANGO QUALITY MAINTENANCE

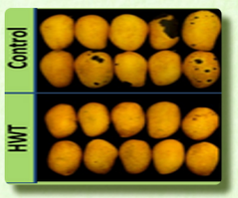


LATEX CONTROL

Fruit should be harvested during afternoon (1:00 PM onwards) in which latex production is low.
Harvest fruit with atttach pedicel (10 cm) to avoid exudation of sap. Re-cut pedicel at the abscission or base and subsequently keep fruit upside to allow latex flow from away from the fruit's surface. Immediately wash fruit with water to remove latex.


FLOTATION METHOD WITH SODIUM HYPOCHLORITE

Flotation method is a reliable way to determine maturity of fruit wherein mature fruit sink while immature fruit float. The addition of sodium hypochlorite can help reduce development of disease.

HOT WATER TREATMENT

Hot water treatment is a cost efficient way to maintain and prolong shelf life of mango fruit. It can effectively prevent disease development, wash latex, pesticide residues and dirt adhering to fruit which cannot be removed by ordinary washing.

MANGGA NA NINDOT NA KALIDAD

KALIDAD SA ABOT

- Komersyal na kaguwangon sa prutas (115-125 ka adlaw human sa pagbulak)
- Piskay pagkaberde na kolor
- Sakto sa porma ug kadak-on
- Limpyo, walay mga daot sa panit (gumikan sa insekto o duga o tagok)

RIPE MANGO

- Hayag na pagkadilaw
- Humot
- Limpyo, walay mga sakit, daot ug bun-og

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Extension Leaflet No. 9.1
November 2017

PAG-ATIMAN HUMAN SA PAG-ANI SA MANGGA

MANGGA

(*Mangifera indica*), 'climacteric' na prutas, mupadayon sa paghinog human sa pag-ani. Ang paghinog timailhan nga makaon ang prutas ug mahalin sa merkado. Ang mangga (var. Carabao) nailhan na sa ubang nasod tungod sa iyang espesyal nga kalami ug kahumot. Aron masigurado na kalidad na mangga ang ginabaligya sa ubang nasud, kinahanglan maminosan ang mga 'reject' na mangga sa paggamit sa mga angay teknolohiya sa pagdumala sa prutas.



PAG-ANI

Ang mangga kinahanglan mapupo 115-125 ka adlaw gikan sa pagpamulak. Paggamit ug sungkit unya ibutang sa mga 'plastic crates' o bakat (bamboo basket) nga naay hapin ang mga mangga aron maminosan ang pagkabun-og. Ayaw ibulad sa init sa adlaw ang mga prutas, ipondo sa landong na lugar.


LATEX CONTROL

Kinahanglan hapon muani (1:00 PM og paghapon) kun diin gamai ang produksyon sa duga. Gikan sa punuan, mas maayo na taas ang pakaputol sa pungango (mga 10 cm) aron malikayan ang pagkasunog gumikan sa pagkabulit sa kaugalingong duga. Putdan ug balik ang pongango pinapuok unya ituwad ang prutas para makatulo ang duga ug dili muadto sa panit. Hugasan gyud ang prutas para mawala ang mga duga o tagok nga mitapot sa prutas.


PALUTAW NA PAMAAGI

Ang pagpalutaw sa prutas kay usa sa mga gikasaligan nga pamaagi sa pagdeterminar o pag-ila sa kaguwangon, kung diin ang guwang mu-unlod unya ang hilaw molutaw sa 1% asinon nga solusyon (10g/10L tubig or 2 kutsarita nga asin sa 10 L na tubig). Ang pagpapuno ug sodium hypochlorite (i.e. Clorox) makatabang sa pagpaminos sa pagdaghan sa sakit.


PAGPINILIAY

Pilian ang prutas depende sa kalidad. Ang dauton na prutas kinahanglan ilahi. Ang pagpiniliay kinahanglan buhaton sa landong na lugar.


PAGPUTOS

Gamit og lig-on na mga karton o 'plastic crates' nga kasudlan. Buhaton gihapon kini sa landong na lugar.


PAGBIYAHE

Ilbyahe ang mangga sa bugnaw na oras mianang adlawa. Ang sakyanan o 'delivery truck' kinanhanglan koberan ug bagaon na panapton nga puti og kolor.


PAGHUMOL SA INIT NA TUBIG

Ang paghumol sa init na tubig (52-55°C sulod sa 10 ka minutos) usa ka barato na pamaagi sa pagmentinar og pagpataas sa kinabuhi sa mangga. Epektibo kini sa pagpahunong sa pagdaghan o pagkanap sa sakit, paghugas sa duga, lugdang sa pestisidyo ug mga buling nga namilit sa prutas nga gahi tangtangon sa normal nga paghugas.


PAGPAHINOG

Para malikayan ang dili maayo nga epekto sa taas na temperatura ngadto sa kalidad sa mangga, pahinuga kini gamit ang kalburo sulod lang sa 48 ka oras imbis 72 oras. Siguroha nga naputos pagmaayo ang mga mangga sa basket na kawayan inig pagpahinog gamit ang kalburo.


PAGTAGO

Sa pagpahinog, ang mga basket nga naay mangga kinahanglan itago sa landong na lugar. Inig kahinog, ang mga prutas ibalhin sa laing limpyo na sudlanan. Itago ang prutas sa usa ka kwarto na ubos og temperatura (12°C) para mamentinar ang maayong kalidad.


PAGDISPLAY SA MERKADO

Ang pagdisplay sa mangga kinahanglan dili ma-initan o mabulad sa adlaw. Ilahi pagdisplay ang maayong kalidad na prutas gikan sa may mga sakit.

SOME SURFACE DEFECTS

Bruised fruit

Shriveled fruit

Scarred and discolored fruit

Hole from eggplant fruit borer

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Australian Centre for International Agricultural Research
Project HORT/2012/098

December 2016 Extension Leaflet No. 10

EGGPLANT

APPROPRIATE POSTHARVEST HANDLING

Eggplant (*Solanum melongena* L.) is a solanaceous crop widely grown throughout the tropical, sub-tropical and warm temperate areas of the world. It is one of the most important vegetables in the Philippines. Like other fresh produce, eggplants are highly perishable and cannot be stored long at ambient conditions. Proper postharvest handling help reduce the rapid deterioration of produce after harvesting.

CHARACTERISTICS OF A GOOD QUALITY FRUIT

- has reached its optimum size
- its seeds have not enlarged and hardened
- smooth surface
- shiny,vivid color (dark purple for purple types)
- springs back when gently pressed with the pad of the thumb
- has fresh green calyx
- free from growth or handling defects and decay

MATURE FRUIT

Commercially mature fruit is shiny,dark, purple color and firm.

OVERMATURE FRUIT

Overmature fruit have dull color with developed seeds. Fruit is slightly bitter.

HARVESTING

Time of Harvest

Harvest at cooler times of the day to minimize product heat. Do not harvest during wet conditions to minimize product spoilage.

Harvesting Methods

Carefully lay down picked fruit on a newspaper-lined container such as plastic crates or bamboo baskets. Harvest and handle eggplants carefully. Use appropriate picking tools such as knife, nipper scissors or pruning shears to minimize physical injury and maintain quality. Clean harvesting tools and materials before and after use.

POSTHARVEST HANDLING

Handle eggplants carefully and do postharvest operations under shaded conditions.

Cleaning

Wipe with a soft clean cloth to remove dirt, if any. Put produce on clean containers. When fruit are extremely dirty, wash briefly with water. Add 1.45 tsp household bleach (5.25% sodium hypochlorite) to 1 gallon of water to sanitize the crop. Air dry in a cool and well-ventilated area.

Sorting

Sort fruit according to quality and size. Use a sorting table or a ground cover when sorting. Remove fruit with diseases. The covering for the ground may consist of canvass or tarpaulin material.

Packing

Pack in sturdy containers such as plastic crates and carton boxes. When using bamboo baskets, line with newspaper pieces or banana leaves. Do not overpack or underpack.

Cold storage

Store at around 12-15°C with 90-95% RH. Place intact eggplant in plastic bags with pin-prick or puncher-size perforations to maintain freshness.

Storage in very low temperature results in chilling injury. Chilling injury symptoms include surface pitting, flesh/seed browning and calyx discoloration.

surface pitting

seed browning

calyx discoloration

Evaporative Cooler

Use an evaporative cooler to reduce moisture loss of the crop. Visible signs of water loss are reduction of surface gloss, shriveling, spongy flesh and calyx

Shelf life is improved by 3 days when an evaporative cooler is used in June under Davao City conditions.

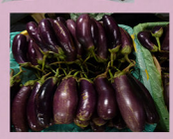
Transporting

Eggplants should be transported during the coolest part of the day. Protect the crop from the heat of the sun by covering the truck with a white canvas material.

Retail Display

Eggplants should not be placed in close proximity to ginger as odors from this produce maybe absorbed by eggplants.

Wrap fruit with plastic to maintain freshness.



Unsa ang mga benepisyo sa *FOOD PROCESSING?*

1. Mabawasan ang masayang na pagkaon
2. Madungagan ang *nutritional value* sa pagkaon
3. Pwede kini pangdungag sa kita.
4. Pwede sad kini pangdungag sa konsumo.

Mga prinsipyo sa *food processing*

Kinahanglan i-kontrol ang FATTOM kay mao kini ang makapadaghan sa mikrobyo.

F	A	T	T	O	M
Fat	Acidity	Time	Temperature	Oxygen	Moisture

1. Wad-on ang tubig *(removal of moisture)*
   e.g: flours, powders, chips

2. Paaslumon ang pagkaon *control acidity)*
   e.g: jams, kimchi

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Pagdugang ug Bili sa mga Gulay ug Prutas

Recipes

Extension Leaflet no. 11 | March 2018

Squash Flour

Sangkap ug materyales

Kalabasa

Kutsilyo

Tadtaran

Galingan/*Grinder* (pwede *coffee grinder, blender, miller*)

Oven o *food dehydrator*

Paagi:

1. Limpyohan ug hugasan ang kalabasa
2. Pikasa ug hiwa-i og pinagagmay, pinanipis o *cubes*. Ayaw i-apil ang mga liso.
3. Ibutang sa food dehydrator o oven (60°C for 4-5 hrs) o ibulad sa init sa adlaw hantud sa mauga ug kagumkom.
4. Igaling sa grinder (coffee grinder/blender/miller) hantod ma-pino
5. Ibutang sa garapon o plastic na sudlanan.

Sweet potato flour

Sangkap ug materyales

Sweet potato o *kamote*

Kutsilyo

Tadtaran

Galingan/*Grinder* (pwede *coffee grinder, blender, miller*)

Oven o *food dehydrator*

Paagi:

1. Limpyohan ug hugasan ang kamote
2. Panitan ang kamote
3. Hiwai kini og pinanipis
4. Ibutang sa food dehydrator o oven (60°C for 4-5 hrs) o ibulad sa init sa adlaw hantud sa mauga og kagumkom.
5. Igaling sa grinder (coffee grinder/blender/miller) hantod ma-pino
6. Ibutang sa garapon o plastic na sudlanan.

Malunggay powder

Sangkap ug materyales

Malunggay

Galingan/*Grinder* (pwede *coffee grinder, blender, miller*)

Kalaha

Stove

Paagi:

1. Hugasan ang malunggay
2. Ibitay kini sa gawas sa sulod sa 3 ka-adlaw arun mauga sa hangin .
3. I-gisa kini sa kalaha sa sulod sa 2-3 mins ug i-halo kini kanunay arun mas mapa-uga pa.
4. Ibulag ang dahon sa *stalk* (tugkay) sa malunggay
5. Igaling sa grinder (coffee grinder/blender/miller) hantod ma-pino
6. Ibutang sa garapon o plastic na sudlanan.

Chili powder or *Dumang*

Sangkap ug materyales

Siling labuyo

Galingan/*Grinder* (pwede *coffee grinder, blender, miller*)

Oven

Paagi:

1. Limpyohan ug hugasan ang sili
2. Kuhaa ang pungango
3. Ibutang sa oven (60°C for 4-5 hrs) o ibulad sa init sa adlaw hantud sa mauga og kagumkom.
4. Igaling sa grinder (coffee grinder/blender/miller) hantod ma-pino
5. Ibutang sa garapon o plastic na sudlanan.

Tomato Jam

Sangkap ug materyales

500 g kamatis

1 cup asukal

1 *tablespoon* calamansi juice

Kaldero

Stove

Paagi:

1. Limpyohan ug hiwa-i ang mga kamatis
2. Igaling kini sa blender hantod mahimong likido (*puree)*
3. Ihalo ang *tomato puree*, asukal, ug calamansi juice sa kaldero
4. Pabukali ang *puree* sa sulod sa 1 min
5. Ibutang sa *low heat* ang stove sa sulod sa 30-45 min hantod sa mulapot.
6. Pabugnawi kini, ibutang sa garapon ug isulod sa *refrigerator*.

Banana chips

Sangkap ug materyales

Hilaw na saging

Mantika

Kutsilyo

Tadtaran

Stove

Paagi:

1. Panitan ang saging paghuman hugasan
2. Hiwa-i og pinanipis.

   Kung mahilig sa tam-is, pwede haluan ug asukal ang nakahiwa na saging
3. Iprito ang saging sa init na mantika (*deep fry)*
4. Kung kini *crispy* na, ihaon kini sa mantika ug patulu-i.

BENEPISYO SA FOODPROSSESING

- Bawas sa sobra
- Dagdag sustansya
- Dagdag kita
- Konsumo

Prinsipyo sa food processing

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Kinahanglan i-kontrol ang FATTOM kay mao kini ang makapadaghan sa mikrobyo

F	A	T	T	O	M
Fat	Acidity	Time	Temperature	O_2	Moisture

1. Wad-on ang tubig (removal of moisture)
   e.g: flours, powders, chips

2. Paaslumon ang pagkaon control acidity)
   e.g: jams, kimchi

University of the Philippines Mindanao

Applied Horticultural Research

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Pagdugang ug bili sa mga gulay ug prutas

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Extension Leaflet No. 12
April 2018

Sweet potato and Squash flour (Alternatibo nga mga harina)

1. Hugasan, panitan, ug hiwai ang produkto.

Kalabasa

Kamote

2. Ipa-uga gamit ning klase-klaseng pamaagi:

- Ibulad sa init (3-4 ka-adlaw)
- Isulod sa oven (60°C for 4-5 ka-oras)
- Isulod sa *food dehydrator* (12 ka-oras)

3. Igaling sa *grinder* hantod sa ma-pino.

Coffee Grinder

Blender

4. Ibutang sa garapon o plastik nga sudlanan ug itago sa uga ug bugnaw nga lugar.

GLUTEN-FREE ang laing tawag sa mga alternatibo nga harina nga dili gikan sa *wheat.*

LIMITASYON SA MGA ALTERNATIBO NGA HARINA

Wala'y *gluten* kining mga alternatibo nga harina. Ang *gluten* mao'y nagatabang og pa-alsa sa mga tinapay, maong importante ang *gluten* sa paghatag og struktura sa mga *baked products.* Busa, mas maayo nga gamiton kining mga alternatibo nga harina sa mga plat ug gahi nga produkto, sama sa *crackers,* ug *cookies*

Mini Sweet Potato Flour Flat Cake

Mga sangkap:

- 3 *tbsp.* kamote *flour*
- 1 itlog
- 1-2 *tsp* asukal (brown or white)
- 1/2 *tbsp. coconut oil*
- 1/2 *tbsp. coconut milk* o gata
- 1 *tsp* apple cider vinegar o calamansi juice

Paagi:

1. Ipa-init daan ang *oven* sa 177°C.
2. Ibutang sa *bowl* ang harina, asukal, coconut oil, ug itlog. Pasagdi kini sa sulod sa 10 ka-minutos human ihalo.
3. Ihalo ang apple cider vinegar o calamansi juice ug ang gata sa *batter*. I-ukay kini og tarong
4. Ibutang sa *pan* ang *batter* ug iporma kini og pina-*flat* nga lingin.
5. Isulod kini sa *oven* og i-*bake* sa sulod sa 18-20 ka-minutos.

Malunggay powder

1

Ibutang sa patag na lamesa ang malunggay sa sulod sa 3 ka-adlaw aron mauga sa hangin

2

Ihiwalay ang dahon sa tugkay

3

I-gisa kini sa kalaha sa sulod sa 2-3 ka-minutos ug i-halo kanunay arun mas mapa-uga pa.

4

Igaling sa kini sa *blender* hantod ma-pino.

5

Ibutang sa garapon o plastik na sudlanan

Chili powder (Dumang)

1

Paghuman og limpyo, kuhaa ang pungango (*calyx)* sa sili.

2

Ibutang sa oven (60°C sa sulod sa 4-5 ka-oras) o ibulad sa init hantud sa mauga ug kagumkom.

3

Inig kauga, igaling sa grinder hantod ma-pino. Ibutang sa garapon o plastik na sudlanan.

BENEPISYO SA FOODPROSSESING

- Bawas sa sobra
- Dagdag sustansya
- Dagdag kita
- Konsumo

PRINSIPYO SA FOOD PROCESSING

Kinahanglan i-kontrol ang FATTOM kay mao kini ang makapadaghan sa mikrobyo.

F	A	T	T	O	M
Fat	Acidity	Time	Temperature	O_2	Moisture

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ACIDIFIED FOODS

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Pamaagi sa pagkontrol sa FATTOM:

1. Wad-on ang tubig (removal of moisture)
   e.g: flours, powders, chips

2. Paaslumon ang pagkaon control acidity)
   e.g: jams, kimchi

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Kimchi

1. 
Limpyohi ug pikasi og pinakwadrado ang *Chinese cabbage*. Butanga og 5-6 *tsp. n*a asin ug ihulom sa sulod sa 4-5 ka-oras

2. 
Hugasa ang *Chinese cabbage* gamit ang nag-agas nga tubig inig human og hulom sa asin.

3. 
Isagol ang tanan lamas: 1 bumbay, 1/2 carrots, 3 *tbsp.* chilli powder, 3 ahos, 1/2 luy-a, 2 *tsp.* asukal, ug 3-4 *tsp* patis.

4. 
Isulod tanan sa usa ka garapon

5. 
Ibilin na nakasirado ug itago og 4-5 ka-adlaw hangtod sa magamos (*fermentation)* sa *room temperature*.

BENEPISYO SA KIMCHI

Tungod sa taas nga *acidity* sa kimchi, mapugngan ang pagtubo sa mga mikrobyo, pwera sa *Lactobacillus,* na nagatabang na mapa-*enhance* ang lasa ug *nutritive value* sa kimchi.

Tomato Jam

1. 
I-galing sa blender ang 500 g nga kamatis hantod kini mahimong *puree* o likido

2. 
Isala ang likido aron matanggal ang mga liso ug ibutang kini sa init na kalaha.

3. 
Ihalo ang 1 cup asukal

4. 
Ihalo ang 1 *tbsp.* calamansi juice

5. 
Pabukali ang *puree* sa sulod sa isa ka minutos. Ibutang sa *low heat* ang stove sa sulod sa 30-45 ka minutos

6. 
Kung lapot na ang *puree* ug kung katunga na lang ang nabilin, andam na kini na i-haon sa kalaha.

Canning Tomato Jam

1. 
Ilunod sa nagbukal nga tubig ang garapon ug ang taklob sa sulod sa 10 ka minutos.

2. 
Ihaon ang garapon og ikulob sa uga nga tela hantod sa ma-uga.

3. 
Isulod sa garapon ang *Tomato jam*. Ayaw kini punu-a. Kinhanglan naa'y 1/4 *inch* nga *headspace*.

4. 
Isirado ang garapon. Kinahanglan dili sobra ang kaguot sa pag-sira aron ma-*sterilize* ang hangin sa sulod sa garapon.

5. 
Ilunod ang garapon nga naa'y *Tomato jam* sa nagabukal nga tubig sa sulod sa 10 ka-minutos.

6. 
Ihaon ang garapon pagkahuman. Mahibal-an nga naka *vacuum seal* ang garapon kung dili mu-piti o *pop* ang taklob pag kini pisliton.

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- Bawas sa sobra
- Dagdag sustansya
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Pamaagi sa pagkontrol sa F A T T O M:

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   e.g: flours, powders, chips

2. Paaslumon ang pagkaon (control acidity)
   e.g: jams, kimchi

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FRIED FOODS

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Extension Leaflet No. 14 | April 2018

Banana chips

1. 
   Iprepara ang hilaw na saging (Cardava). Kinahanglan hilaw ang gamiton kay taas ang ilang *starch content*
2. 
   Tanggala ang panit
3. 
   Hiwai ang saging og pinanipis
4. 
   Ilunod kini sa init na mantika ug iprito hantod sa mukagumkom

Unsa'y mahitabo samtang gina-prito ang pagkaon?

Tungod sa init nga mantika (176°C), mapagawas ang *moisture* o tubig sa pagkaon. Gikan sa sentro sa pagkaon, muadto kini sa ibabaw na naga resulta sa *crust*. Tungod sa kainit, naa pa'y laing *reactions* na mahitabo sa pagkaon na makapahatag ini og lasa ug kolor.

Sweet potato fries

1. 
   Panitan ang kamote
2. 
   Hiwai ang kamote
3. 
   Painiti ang mantika sa kalaha.
4. 
   Ilunod ang kamote sa init na mantika.
5. 
   Iprito kini sa sulod sa 14 ka-minutos o hantod kini mahimong "golden brown"
6. 
   Ihaon ang kamote sa mantika ug patulo-i.

Toasted squash seeds

1. 
   Hugasi ang liso sa kalabasa
2. 
   Ibutang kini sa init na kalaha aron ma-uga. Ukaya kini kanunay aron dili mapa-ig.
3. 
   Dungagi og 1tbsp nga manitka ang kalaha aron maluto ang liso. Ukaya kanunay.
4. 
   Tabuni ang kalaha pag magsugod na og piti-piti (*pop*) ang liso.
5. 
   Ihaon ang mga liso hantod mahimong "brown" ang mga gilid.

Importansya sa tama nga temperatura sa mantika

Kung sobra ka init ang mantika, mapa-ig ang pagkaon ug dili kini maluto og tarong. Kung sobra ka bugnaw ang mantika, mas mahimong mantikaon ang pagkaon (*oily*).

Minimising risk

Microbial

- Remove livestock (pigs, carabao) from the orchard 45 days before harvest so that there is no fresh manure on the ground during harvest
- Don't apply chemical sprays within two days of harvest unless the water is drinking quality
- Don't let mangoes touch the ground – harvest into baskets or crates and leave fruit bagged until transfer to a clean packing area
- Ensure the packing area is clean – wash the floor if packing inside a structure, or put down clean tarpaulins if packing outside
- Provide toilet facilities for workers, and make sure toilet waste does not flow into the orchard
- Make sure harvest workers wash their hands after going to the toilet
- Don't let sick workers handle the mangoes
- Control rats and mice in the orchard and packing area
- Keep harvesting equipment clean
- Use clean, drinking quality water if washing fruit

Chemical

- ALWAYS read the label and apply according to the instructions
- Never apply two products together that have the same active ingredient
- Don't use products that have passed their expiry date
- If the orchard is near other farms or orchards, discuss spray drift with your neighbors and work out how to minimise contact with the mangoes
- Don't mix incompatible products together in spray tanks
- Make sure chemical application equipment is clean before use
- Don't use contaminated water for spray applications
- Wash out chemical application equipment outside the orchard
- Don't apply chemicals closer to harvest than stated on the label, and observe withholding periods
- Avoid accidental contact between mango fruit and non-spray chemicals eg fruit fly bait, potassium nitrate, paclobutrazol
- Store chemicals securely in original, labelled containers with insecticides and fungicides kept separate, and dispose of empty containers safely
- If using baits to kill rats and mice, make sure they are secure and well separated from the mango packing area
- Don't wash fruit in products that are not registered for that purpose, such as hair shampoo or pre-harvest fungicides
- Only pack mangoes into clean crates or boxes

Physical

- Keep the orchard and the packing area clean and free of rubbish
- Use picking baskets that are clean and smooth
- Make sure all staples are removed when de-bagging fruit
- Ask workers packing fruit to tie back long hair and remove loose jewelry
- If workers cut themselves, make sure the wound is covered but also that Band-Aids do not come loose
- Check mangoes are free of insects and spiders (eg scale), fruit fly stings and physical contaminants (eg wood or ash)

Keeping records

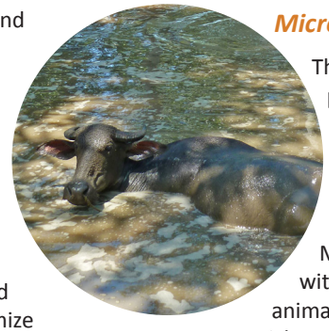
Keeping good records is not only important for food safety, it's good business practice. Records demonstrate to your customers that you have done everything possible to make sure your mangoes are safe to eat. If a consumer does get sick, records can show that your mangoes are unlikely to be the source of their illness.

The most important records relate to spray applications. Every time a chemical is applied (including flower inducers and fertilisers) it should be written down. As a minimum, the record should include:

- Date
- Product / products applied
- Concentration and Total used per tree
- Weather at the time of application (temperature, rain, wind speed and wind direction)
- Name and signature of applicator

What is food safety?

Everybody knows that mangoes are **good** to eat. However, they also need to be **safe** to eat. That means they are clean and free of germs, toxins or contaminants that could make people sick.



If mangoes have not been grown, picked and packed so as to keep them clean and safe, the impacts can be severe. These include sickness, death, legal penalties and loss of market as customers stop buying mangoes.

Supermarkets and export markets are increasingly demanding evidence that mangoes are safe to eat. Farmers need to show that they have thought about food safety and have practices in place to minimize risk.

How do I make sure my mangoes are safe to eat?

Mangoes are generally considered “low risk” because they don’t touch the soil and the skin is not eaten. However, this does not mean contamination cannot occur.

Anyone involved in growing, harvesting or packing mangoes should develop a **food safety plan**. This can be quite simple. It needs to include an assessment of risks, actions to minimise risk, and records to demonstrate that these actions have been done.

Evaluating risk

Risk depends on both the **likelihood** of contamination occurring, and the **consequences** if it did occur. A “risk assessment” is used to identify microbial, chemical and physical hazards and decide what is most important. If contamination is likely and the effects of that contamination are severe, then it is extremely important to find ways to reduce risk.

For example, mangoes can be contaminated with germs (bacteria) if they contact soil where animals have been living. Germs can spread from the skin to the flesh when the mango is cut, then grow on the moist flesh.

If contaminated mangoes are prepared in advance and not refrigerated, the person eating them could get very sick, and even die.

What are food safety hazards?

Hazards are anything that can affect the safety of the mangoes. They are divided into three categories: microbial, chemical and physical.

Microbial hazards

There are many bacteria and viruses that can make people sick. Bacteria such as *Salmonella*, *Listeria* and *Escherichia coli* can cause symptoms such as fever, diarrhea and vomiting. They can cause miscarriages and even death if infection is severe.

Mangoes can be directly contaminated with human pathogens through contact with animal manure, sewage, or workers who are sick and/or have poor hygiene. Human pathogens can also contaminate fruit indirectly if the fruit is sprayed or washed with contaminated water.

Microbes are the most common food safety hazards, and also often have the most serious effects on human health.

Chemical hazards

Pesticides used to control insects and diseases can stay on mangoes after harvest. Heavy metals like lead (from fuel) and cadmium (from some fertilisers) can also contaminate mangoes. A large dose of pesticide can have immediate, major effects on human health. Even low levels can have long-term effects.

Maximum Residue Limits (MRL’s) define the highest allowed residues of different chemicals on mangoes. They are set by Government agencies. If chemicals are used as described by the label, then the MRL should not be exceeded.

Mangoes cannot be sold if they contain chemical residues higher than the relevant MRL. If there is no MRL for a specific chemical, then no residues are allowed.

Physical hazards

Physical hazards include items like glass, metal staples, insect grubs and hair. Whereas food safety incidents related to chemical and microbial hazards can affect many people, physical hazards usually affect a much smaller group. They are most often a problem in packaged or processed foods, as they can be eaten accidentally. They are unlikely to affect a whole mango, as physical hazards can usually be seen and removed.

Example of a mango risk assessment table...

Type	Source of Risk	What could happen	Likelihood of it happening	Outcome if it did happen	Priority
Microbial	Contaminated water used to wash mangoes	Mango skin contaminated with bacteria that make people sick	Medium	Severe - many people become sick	**High**
Microbial	Sick workers handle mangoes	Mango skin contaminated with bacteria that make people sick	Medium	Severe - many people become sick	**High**
Chemical	Pesticides not applied using label instructions	High residue levels on fruit, MRL is exceeded	High	Severe - people may get sick, fruit can’t be sold	**High**
Physical	Staple used in bagging gets stuck in fruit	Metal staple in mango flesh	Low	Medium - one person potentially affected	**Medium**
Physical	Fruit fly lays eggs in mature mango	Fruit contains maggots when sold	High	Low - price is reduced but mango is still safe to eat	**Low**