

9. PLANTATION CROPS

9.1 Disease management

Disease	Symptoms and damage	Management
ARECANUT		
Fruit-rot (Koleroga/ Mahali) <i>Phytophthora</i> <i>arecae</i> / <i>P.</i> <i>meadii</i>	Water-soaked lesions appear below the calyx. Later, the lesions spread on to the surface of the nut giving the nut a dark green colour. Infected nuts are shed, usually without calyx. Losses are heavy when control measures are not taken.	The disease can be controlled and prevented by spraying with 1% Bordeaux mixture on bunches at the onset of south-west monsoon and thereafter at 45 days interval. When the monsoon prolongs, a third spray is necessary. Spraying should be done on clear sunny days. Alternatively, the bunches can be covered with 200- gauge polythene sheet allowing proper aeration.
Bud-rot <i>P. arecae</i> <i>P. meadii</i>	Spindle withers and droops. Spindle base rots culminating in the death of bud. The disease is fatal and affects spindle, leaves and apical bud. The disease is common during rainy season.	Cut and remove the rotten tissue and burn. Apply Bordeaux paste (10%) and cover it with polythene sheet. The disease can be prevented by prophylactic spray of Bordeaux mixture (1%) during pre- and post-monsoon period.
Ganoderma foot or anabe disease <i>Ganoderma lucidum</i>	Yellowing of outer whorl of leaves, which gradually extend to inner whorls. The leaves show wilting symptoms and one-by-one droop down. The affected stems at the base show brownish patches with gummy exudation. The infected roots are discoloured, become brittle and dry. The development of inflorescence is arrested. The nuts already formed are shed. The leaves shed one-by-one and the weakened crown topples leaving a bare trunk. The fruit body of the fungus (anabe) appears at the base of the stem after the death of the palm. About 10% palms are affected in Assam.	The affected palms in the early stages may be root fed with 125ml of 1.5% Calixin at quarterly interval. The basins of the affected palms may be drenched with 10.15% Calixin at quarterly interval. All the affected palms may be given 2kg of neem cake/palm. The stem of all diseased palms should be removed along with roots and burnt. Palms in different stages of disease should be isolated from healthy palms by digging trenches of 30cm width and 60cm depth. The health of the palms may be improved by applying the normal dose of NPK fertilizers and organics. Repeated ploughing, water stagnation and closer spacing may be avoided in the affected gardens.

Disease	Symptoms and damages	Management
Yellow leaf disease (cause not yet known)	Characteristic yellowing of leaves which starts from the tip and progresses inwards. Vein banding is seen. The kernel of the affected nuts show discolouration and turn blackish. Root tips become dark and rot. The crown size reduces and yield is decreased. The disease is debilitating and is prevalent in parts of Karnataka, Kerala and Tamil Nadu. About 80% of the palms become diseased within 4 years from the appearance of the first symptom. About 50% yield is reduced over a period of 3 years.	This disease is not amenable to control by the conventional plant-protection measures. Yield of the affected palms can be increased by adopting improved management practices. Regular fertilizer application @ 100: 160: 140 NPK palm/year along with 12kg of green leaf is mandatory. Providing irrigation during summer and drainage during rainy season improves the condition of the diseased palm. In the mildly infected areas, removal of diseased palms to prevent disease-spread is advocated.
Inflorescence die-back and button shedding <i>Colletotrichum gloeosporioides</i>	Yellowing and drying of rachis from the tip downwards. Shedding of the female flowers and buttons and complete drying of the inflorescence are the typical symptoms. The disease affects the female flowers and developing buttons, leading to the reduction in the yield. It is prevalent in Kerala and Karnataka and is severe during February–May.	The disease can be controlled by spraying of Dithane Z-78 (0.4%) or Dithane M-45 (0.3%) twice. The first spraying should be done at the time of opening of female flowers and the second after 20 days. The affected inflorescence should be removed and burnt.
Leaf-blight <i>Phyllostica arecae</i> , <i>Colletotrichum gloeosporioides</i>	Circular brown spots on older leaves, appear and coalesce to form blighted areas. The disease affects old leaves and reduces the photosynthetic area.	Cut and remove the severely affected leaves. Spray Dithane M-45 (0.3%) on foliage. Repeat the spray after 20–25 days.

CASHEW NUT

Inflorescence blight <i>Gloeosporium mangiferae</i> / <i>Phomopsis anacardii</i> / <i>Fusarium</i> sp.	Drying of floral branches. Minute water-soaked lesions are discernible in early stages. Gummy exudation can be seen at the lesion site. The lesions turn pinkish-brown and coalesce to form bigger lesions. The disease is mainly associated with tea mosquito damage. The fungi aggravate the damage.	Protect cashew trees from tea mosquito by spraying Endosulfan (0.05.)
Die back or pank disease <i>Corticium salmonicolor</i> (<i>Pellicularia salmonicolor</i>)	Affected branches show white of pinkish growth on bark. The fungus penetrates into deeper tissues, causing gradual death of shoots from apex downwards. Towards the end of the monsoon, the fungus appears on the bark as white threads initially which later on turn pinkish.	Prune affected branches well below the site of infection and protect the cut surface with Bordeaux paste (10%). The disease can be prevented by giving prophylactic sprays of Bordeaux (1%) twice in May–June and October.

Disease	Symptoms and damages	Management
Damping-off seedlings <i>Fusarium</i> spp <i>Phythium</i> spp <i>Phytophthora palmivora</i> spp <i>Cylindrocladium scoparium</i>	<p>The fungi attack either root or collar region of the tender seedlings. In case of <i>P. palmivora</i> attack, affected seedlings become pale, showing water-soaked girdles of dark tissues around the stem and seedlings droop and die. In case of <i>C. scoparium</i> wilting and withering of seedlings and presence of necrotic lesions leading to rotting of underground parts occur. The disease occur in the nursery stage, causing mortality of seedlings.</p>	<p>Provision of adequate drainage in the nursery bags is necessary. Soil drenching with 1% Bordeaux mixture is recommended.</p>
Anthracnose <i>Colletotrichum gloeosporioides</i>	<p>Reddish brown, shiny, water-soaked lesions along with resinous exudation.</p>	<p>Remove affected parts of the plant and spray Bordeaux mixture (1%).</p>

COCOA

Black-pod <i>Phytophthora palmivora</i>	<p>Infection appears as a chocolate-brown spot on fruits of all ages, which later spreads and covers the entire surface of the pods. As the disease advances, whitish growth of the fungus is seen on the affected pods. Later, the pods turn black. The internal tissues as well as beans are discoloured. The disease is common during rainy season.</p>	<p>The disease can be controlled and prevented by spraying with 1% Bordeaux mixture at the onset of south-west monsoon and thereafter at least twice during the monsoon season at 45 days interval. Removal and destruction of infected pods should be carried out regularly. Overcrowding of branches should be avoided by regular pruning.</p>
Canker <i>Phytophthora palmivora</i>	<p>The canker appears either on the main trunk or fan branches. Initially greyish-brown water-soaked lesions appear on the bark. Later, reddish-brown liquid oozes from these lesions which later dry up to form rusty deposits. The tissues beneath the lesions shows reddish-brown discolouration due to rotting. When the cankers girdle the main stem or branches, die-back symptoms appear and ultimately the tree dies. The main trunk and branches are affected. In severe cases the tree may die.</p>	<p>Remove infected tissues and apply Bordeaux paste (10%). All the infected fruits should be removed and destroyed. Provide good drainage in the garden.</p>
Charcoal pod-rot <i>Botryodiplodia theobromae</i>	<p>The infection appears as black or brown spot. The affected pods turn black and remain on the tree as mummified fruits. The internal tissues are rotten and the beans turn black. This disease is known to</p>	<p>Spraying of 1% Bordeaux mixture on fruits is recommended to control the disease. Rodent and insect damage should be controlled.</p>

Disease	Symptoms and damages	Management
	occur throughout the year but severe during summer. Pods of all ages are susceptible.	
White thread blight <i>Marasmius scandens</i>	The white mycelial threads of the fungus spread longitudinally along the surface of the young stem and branches. The infection is also seen on leaves and petiole which turn brown and shed. The disease is observed in certain areas of Kerala and Karnataka.	Remove and burn affected parts, and brush with Bordeaux paste (10%).
Vascular streak die- back <i>Oncobasidium theobromae</i>	The first visible symptom is yellowing of a single leaf in the second or third flush from the tip of twigs with characteristic green islets. Such infected leaves fall prematurely and leaves above and below that also develop similar symptoms. The brown streaking of the wood originating from the scars of fallen leaves in sun coupled with the presence of the fungus in the xylem tissues. Finally the whole plant dries eventhough most of the affected leaves remain attached to the plant. The disease is reported from Kerala.	Regular pruning of infected branches 30cm below the last spot of visible streak and stem painting with Propiconazole helps reduce the spread of this disease.
Pink disease <i>Pellicularia salmonicolor</i>	Pinkish powdery coating is seen on the stem. The affected trees show wilting of shoots and shedding of leaves and twigs leading to the drying up of the entire branch. The disease is of sporadic occurrence.	

COCONUT

Root wilt <i>Phytoplasma</i>	Abnormal bending or ribbing of leaflets (flaccidity), general yellowing, necrosis of leaflets are the symptoms. Inflorescence necrosis, shedding of immature nuts, poor quality copra, thinner husk and less firm shell are also noticed. The disease is not fatal but causes a steady decline. Leaves, inflorescence and nuts are affected. It is prevalent in all the districts in Kerala and also in the adjoining districts of Kanyakumari and Coimbatore. Its incidence ranges from 1.52 to 75.6% leading to an annual loss of 968 million nuts.	No curative measures are available. However, measures of prevention of its spread and improving the yield of affected palms through better management practices are available. In Kerala and Tamil Nadu, total eradication of all diseased palms should be taken up to check its spread. In the heavily diseased areas of southern Kerala, eradication of severely affected uneconomic palms and all diseased palms in pre-bearing age should be done and replantings should be done with the progenies/hybrids of
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Leaf-rot <i>Colletotrichum gloeosporioides</i> <i>Exserohilum rostratum</i>	<p>Leaf spots appear initially in the spindle and later coalesce. The disease generally occurs superimposed on root wilt affected palms. Spindle leaves are affected and as a result photosynthetic area is reduced drastically leading to the reduction in yield.</p>	<p>disease-free CGD and WCT palms. Controlling leaf-rot disease through phytosanitation and application of Contaf/ Dithane M-45 in the affected area; application of balanced dose of NPK fertilizers and magnesium sulphate, providing irrigation and adopting mixed/ intercropping are recommended management practices.</p> <p>Cut and remove affected spindle and 1-2 successive leaves. Pour 300ml of fungicidal solution containing 2ml of Hexaconazole (Contaf 5%) or 3 g Mancozeb (Dithane M-45) into spindle well during April-May and October-November. Apply a mixture containing 50g of Folidol dust (Methyl parathion 2%) and 200 of sand around the base of the spindle during April-May and October-November.</p>
Bud-rot <i>Phytophthora palmivora</i> <i>P. katsurae</i>	<p>The disease is characterized by withering of spindle drooping and yellowing 1-2 young leaves, rotting of soft tissues of the tender leaf base and emission of foul odour. The leaves wither, turn yellow and dry from the inner whorl. The bud is damaged leading to the death of the palm. Spindle leaves, and bud are affected. The disease is fatal. The disease is sporadic but occasionally epidemics are reported. The disease is common during rainy season.</p>	<p>This can be prevented by prophylactic spray of Bordeaux mixture (1%) during pre-and post-monsoon periods. The curative measures include removal of the rotten tissues, brushing with Bordeaux paste (10%) and covering with a polythene sheet. For dwarf varieties, which are sensitive to copper fungicides, Dithane M-45 may be used to cure and prevent the disease.</p>
Basal stem-rot (Thanjavur wilt/ Ganoderma wilt) <i>Ganoderma lucidum/ G.applanatum</i>	<p>Withering followed by yellowing and drooping of outer whorl leaves, root decay and bole rot, appearance of bleeding patches at the base of the stem gradual extension of drooping and drying to middle and inner whorl leaves are characteristic symptoms. The palm dies within 6 months to 2 years. The disease is fatal and affects roots, stem and crown. It is severe in Tamil Nadu, Andhra Pradesh and Karnataka. About 0.6-4.9% incidence is recorded from Tamil Nadu.</p>	<p>Palms in the advanced stages should be cut and removed along with root and bole. Palms in the early and middle stages of disease should be isolated from the healthy palms by taking trenches of 1 m deep and 30cm width to prevent disease spread. Repeated ploughing, closer spacing, flood irrigation, and poor drainage should be avoided. Application of balanced dose of NPK fertilizers and neem cake (5kg/palm/year) is</p>

Disease	Symptoms and damages	Management
Stem bleeding <i>Thielaviopsis</i> <i>(Ceratosomella)</i> <i>paradoxa</i>	<p>Exudation of reddish-brown liquid through cracks on the trunk at the base of the palm is the initial symptom. Inner cortical tissues show discolouration and rotting. The bleeding patches gradually extend upwards and cover the entire stem in the advanced stages. Later, the stem tapers and leaves turn yellow. In advanced stages, insects like <i>Diocalandra</i> and <i>Xyleborus</i> weevils infect the stem and cause further damage. Yield of the affected palm is reduced. The disease occurs in all coconut-growing areas of the country.</p>	<p>necessary in addition to 50kg organic manures. The diseased palms may be treated with Aureofungin solution @ 1.3 + 1g copper sulphate in 100ml of water through root feeding thrice a year (July, October and November). Root feeding with 5% Calixin is also equally effective. Soil drenching with 1% Bordeaux mixture should be done in root zones of the affected palms. If insect attack on the affected stem is seen, swabbing with Sevin (10% WP) may be done. Seedlings should not be transported from the infected area to healthy ones.</p>
Fruit- rot or nut fall <i>Phytophthora</i> <i>palmivora</i>	<p>Water-soaked lesions appear along the calyx. Lesions expand and turn brown. Shedding of affected buttons and immature nuts takes place. The disease affects nuts leading to decline in the yield.</p>	<p>Chisel out the bleeding patches to remove the affected tissues completely. Swab with 5% Tridemorph (Calixin) followed by coal tar application, a day later. Root feeding with 100ml of 5% Calixin solution thrice a year (June, September and January). Apply balanced dose of NPK fertilizers and neem cake @ 5kg/palm/year along with 50kg organic matter. Avoid water stagnation during rainy season and provide irrigation during summer. Swab with Carbaryl (10%), when insect attack occurs.</p> <p>Spray 1% Bordeaux mixture on affected bunches. For dwarfs spray 0.3% Dithane M-45 (Mancozeb). Collect shed nuts and burn them. Prophylactic spraying during pre- and post-monsoon period with 1% Bordeaux mixture or 0.3% Dithane M-45 to prevent the disease should be given in disease prone areas.</p>

Disease	Symptoms and damages	Management
Grey leaf-spot/ leaf blight <i>Pestalotia palmarum</i>	Minute yellow spots with grey margins appear on the leaves of outer whorl. The centre of the spots turn greyish and spots coalesce together to form large necrotic patches. The disease affects leaves.	Remove severely affected leaves and burn them. Spray foliage with 1% Bordeaux mixture or 0.3% Dithane M-45 (Mancozeb). Apply potassic fertilizers

COFFEE

Leaf rust
Hemileia vastatrix

Yellow to orange spots develop on lower surface of leaves with powdery mass of uredospores. Pear-shaped teliospores unseen from January to April. Severe attack results in defoliation, die-back, debility and crop loss up to 70%, if timely control measures are not taken up.

Three sprays of Bordeaux mixture 0.5% (1kg CuSO₄: 1kg. CaO:200 litres of water), i.e. pre-blossom (February–March), pre-monsoon (May–June) and post-monsoon (September–October) or 3 sprays of Pantvax 0.3% (300ml/200 l to water), i.e. pre-monsoon (May–June), mid-monsoon (July–August), post-monsoon (September–October) or two sprays of Bayleton 0.02% a.i.(160g/200 l), i.e. pre-monsoon (May–June), post-monsoon (September–October)

Black rot
Koleroga noxia

Blackening and subsequent rotting of young leaves, berries and shoots. Diseased leaves get detached from branches and hang out by means of slimy fungal strands. Affected plants show gradual yellowing and thinning of foliage, followed by defoliation, wilting and eventual death.

Maintain thin overhead shade in centre of the bushes for permitting free passage of air and sunlight to reduce incidence. Handle the affected plants to remove the diseased leaves and berries, to keep the bush clean, to prevent secondary spread of disease. Spray endemic blocks with 1.0% Bordeaux mixture before the onset of south-west monsoon and also during break in monsoon (July–August). or spray endemic blocks with Bavistin 0.03% a.i. (120g/200 litre water) just before the onset of south-west monsoon and also during July–August at the time of clear break in monsoon.

Brown root disease
Fomes noxius

Also known as 'stump rot,' is mostly associated with rotting stumps of shade trees in the plantation. Disease spreads by means of root control. Internal portion of root shows dark brown to black wavy lines.

Isolate the affected plants with 60cm deep and 30cm wide trenches, Uproot the affected coffee plants along with the root system and burn them. Add agricultural lime @ 1–2kg to soil after uprooting the plants and fallow the land for 6 months before planting.

Disease	Symptoms and damages	Management
Red root <i>Poria hypolateritia</i>	It infects shade trees such as silver oak, followed by adjacent coffee plants. Root system shows red encrustation covered by soil and gravel. The rhizomorph appears deep red in colour.	Uproot the shade trees along with stumps whenever, it is followed, to avoid root diseases in future. Drench the soil with Bavistin 0.4% @ 3 litres/plant (24g/3 litres of water) or Vitavax 75 WP 0.3% 3 litres/plant (12g/3 litres of water) in the initial stage of wilting.
Black root <i>Rosellina arcuata</i>	Black fungal rhizomorphs or black woolly mycelium are seen on the affected roots. On stem near the ground level, fan-shaped fungal mats with pellet like fructation are also seen.	Soil application of biocontrol agent <i>Trichoderma</i> in the affected block is useful in reducing the disease incidence.
Santaverry root <i>Fusarium oxysporum</i> f. sp. <i>coffae</i>	Sudden wilting, yellowing of leaves followed by defoliation and death of aerial parts. A transverse section of the root shows brown to pinkish discolouration. Scrapping of the bark of the stem near the ground level reveals discolouration.	Uproot the dead and dying plants and burn them. Treat the affected blocks with well-decomposed organic manure @ 10–15kg per plant to improve soil fertility. Maintain adequate overhead shade. Apply balanced nutrients and follow good cultural operations to maintain the vigour of the plants. Lime the soil to raise the soil pH, if it is highly acidic (below 5.5 pH). Use grafted plants (robusta rootstock and Arbica scion) for planting or replanting in the affected block. Drench the soil with Bavistin 0.4% @ 3 litres/plant (24g/3 litres of water) in the initial stage of wilting. Soil application of biocontrol agent <i>Trichoderma</i> is useful in reducing the disease incidence.
Anthracnose <i>Colletotrichum gleosporoides</i> Manifests in 3 forms: (i) Summer die-back or twig die-back.	Yellowing or blighting of any leaf on the green wood, yellowing, necrosis of nodes and internodes towards the tip. Twigs wilt and defoliate, die forward towards the apex and depict a die back appearance. Floral buds on the infected branches fail to open.	Prune badly affected plants in February-March. Protect the plant by spraying 0.5% Bordeaux mixture in February–March (pre-blossom), April–May (pre-monsoon) and September–October (post-monsoon). Maintain adequate over head shade and leaf mulch around the plants to conserve soil moisture during dry weather. Apply balanced nutrients to maintain the vigour of the plants.

Disease	Symptoms and damages	Management
(ii) Brown blight of leaves	Initially round brown necrotic spots appear on the leaves. Two or more such spots may coalesce and the entire leaf or a portion of it may look blighted. Fructations (acervuli) of the fungus are visible as black dots on both the surfaces of the affected portion of the leaf.	Maintain good overhead shade to avoid sun scalding of leaves. Spray 0.5% Bordeaux mixture to protect the leaves during post monsoon.
(iii) Stalk rot of berries and leaves	Necrosis of nodes and internodes from the junction of brown wood towards the apex followed by berry drop and defoliations. Generally the rotting stalk remains in the branch while the berries are shed.	Spray 0.5% Bordeaux mixture in May-June giving a good coverage of branches and stalk of berries. Improve drainage by cleaning the cradle pits and trenches during monsoon period.
Berry blotch <i>Cercospora coffeicola</i>	Dark brown, irregular, slightly sunken necrotic spots, on the exposed surface of the green berries. Affected tissue turns brown to black, shrivels, dries up and sticks fast to the parchment.	Maintain good overhead shade to avoid sun scorching of berries. Spray the crop with 1.0% Bordeaux mixture when the initial incidence is observed.
Brown eye spot <i>Cercospora coffeicola</i>	Circular necrotic spots on leaves with a dark brown margin and light brown or pale centre. Necrotic spots increase in size and the central portion turns light grey due to sporulation by the fungus and affected portion collapse leaving holes at the centre (short-hole). Affected leaves turn yellow and premature defoliation of such leaves takes place.	In the nursery, maintain filtered pandal shade to avoid exposure of seedlings to direct sunlight. In the field young plants should be protected by hutting. Provide adequate mulch to conserve soil moisture. Protect the plants in the nursery, by spraying organic fungicides, such as Captan or Dithane M-45 or Zirdine at 0.4% or Foltaf (Captafol) 80 WP at 0.3% a.i. (3.75g/litre of water in 30-day interval). Copper fungicides should not be used to protect the plants in the nursery to avoid Kondli disorder.
Collar-rot or damping-off <i>Rhizoctonia solani</i>	In pre-emergence damping-off, the fungus infects the embryo and endosperm resulting in rotting of seeds and failure to germinate. In post-emergence damping-off, the fungus infects the collar region of the seedlings resulting in brownish discolouration leading to rotting of tissues.	Prepare raised seed-beds, adding dried and sieved jungle soil, compost sand (6:2:1) to provide good drainage of excess water from seed-beds. Avoid excessive watering. Avoid over-crowding of seedlings by proper spacing of seeds while sowing. Provide filtered overhead shade using coir mats. Remove and destroy the affected seedlings.

Disease	Symptoms and damages	Management
		Spray organic fungicides such as Captan or Dithane M-45 @ 0.4% or Bavistin 50 WP @ 0.05% a.i. Treat coffee seeds with Bavistin 50 WP @ 1g/kg or Vitavax 75 WP @ 0.66g/kg before sowing.

OIL PALM

Spear-rot <i>Phytoplasma</i>	Yellowing of youngest whorl of leaves is the initial visible symptom. Yellowing starts at the leaf tip, spreads along the margins, later turns brown and dries up. Water-soaked lesions appear on the spear and rotting sets in. The rotten tissues emit foul smell. With the advancement of disease, leaf size is reduced, stem tapers and inflorescences abort. The yield is reduced drastically in Kerala.	Since no control measure is available, roguing of the diseased palms prevents its spread.
Fruit rot <i>Marasmiium palmivorus</i>	Fruits are not developed. The tips of underdeveloped fruits turn black and later become necrotic. Bunch failure is not frequent in 3-10 years old palms. It is reported in Kerala and Andamans.	Since lack of pollination is the major cause for bunch failure, assisted pollination is to be resorted to. After cleaning, spray the bunches with Bavistin (0.2%).
Bud-rot <i>Ermima</i> sp.	Rotting of spindle and the affected spindle can be easily pulled off. The disease is reported in Kerala, Karnataka and Andhra Pradesh.	Clean the affected tissues and drench the crown with Carbendazim (0.1%)

RUBBER

Abnormal leaf fall <i>Phytophthora palmivora</i> <i>P. meadii</i> <i>P. nicotianae</i>	First the fruits rot followed by premature leaf fall. Heavy defoliation and loss of yield occur.	Prophylactic spraying of foliage prior to the onset of monsoon with Bordeaux mixture or oil-based Copper oxychloride. A second application may be done 10-15 days after the first application.
Shoot-rot <i>Phytophthora palmivora</i> <i>P. meadii</i>	Occurs during south-west monsoon. Rotting of tender green shoots. More damaging in nursery and young plants in the field.	Prophylactic spraying as above for mature trees. For young plants spray with copper fungicides before the onset of monsoon and repeated spraying during the dry periods of the monsoon. A suitable sticking agent also could be used (eg. Teepol etc.)

Disease	Symptoms and damages	Management
Powdery mildew <i>Oidium heveae</i>	Mostly seen on newly formed tender flush during refoiliation (January–March). Ashy coating is seen in tender leaves which later curl and crinkle. Eventually leaves fall and die-back occur. Mature leaves show white patches later which become necrotic. Leaf fall and die-back of young shoots retards growth in young plants.	Dusting with sulphur @ 11–14kg, 325 mesh fine sulphur dust/ha for a few times during the dry spells of monsoon. Dusting should be done during early morning hours.
Secondary leaf fall <i>Gloeosporium alborubrum</i>	Tips of tender leaves show many spots, dry up become distorted and eventually fall. Seen during April to October. Leaf fall and loss of yield. Retards growth of young plants.	Spraying with copper fungicides is warranted. Provide good soil drainage.
Bird's-eye spot <i>Drechslera heveae</i>	A hot weather disease, more damaging for nursery and young plants in the field. Small necrotic spots with dark/brown margins appear on the leaves. Defoliation and die-back. Retards growth in young plants	Repeat spraying of Bordaeux mixture or Dithane M-45 0.2% or Bavistin 0.02%. Shading the nursery reduces the severity
Leaf-spot <i>Corynespora cassicola</i>	Occure during November–May. Large leaf spots with brown margin and pale center. Defoliation.	As above
Pink disease <i>Corticium salmonicolor</i>	Occurs from June to November. More damaging in 2–12 years old plants. Seat of infection is the fork region where white or pink cobweb mycelial growth appear with streaks of latex oozing out of the lesions. Rotting, drying up and cracking of the affected bark. Distal portion of the branches dry and dry leaves stick to the dead branches. Retardation of growth particularly in the early years.	Frequent tree inspection from June–October and application of Bordaeux paste on the affected bark up to 30cm above and below the infected region. In advanced cases do as above first, then scrape the bark and repeat the application again. Dried branches should be pruned.
Patch canker or bark canker <i>Phytophthora palmivora</i> , <i>P. medi</i> and <i>Pythium vexans</i>	Occurs on the tapping panel region or anywhere on the stem or roots during wet season. A swelling develops which bursts the bark open and an amber coloured liquid oozes out often with a foul smell. Slight discolouration of wood beneath the bark. Loss of tapping panel due to infection.	Scrape the affected bark and wash the wound with Dithane M-45 0.75%. After it dries up, apply any wound dressing compound.

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Black stripe or black thread or black rot <i>Phytophthora palmivora</i>	Occurs during rainy season. Localized rotting and drying on the bark with deep vertical black lines running downwards into the tapping panel. Reduces yield	Disinfect tapping panel at weekly interval by brushing with Dithane M-45 0.375% during rainy season, if tapping is done. Scrape the infected tissue and apply the same and when it dries up, apply a wound dressing compound.
Dry rot, stump rot, collar rot or charcoal rot <i>Ustilina deusta</i>	A wound parasite during wet season affecting roots, collar, trunk and branches. Lesion exude latex. Affected bark and wood become stiff and powdery. Affected branches/trees are killed. Loss of branches/trees.	Scrape-off the affected bark and wood and apply a wound dressing compound 0.02% containing Thiride 0.75% or Hexaconazole for root infection
TEA		
Blister blight (fungus)	Presence of blisters on young shoots	Application of Copper oxychloride (COC) + Hexaconazole COC + Propiconazole COC + Bitertanol
Grey blight (fungus)	Presence of oval or circular grey spots on mature leaves	Application of Mancozeb or Carbendazim
Red rust (alga)	Rusty patches on stems. Presence of variegated and bleached shoots on stems; circular orange encrustation on leaves	Improve soil fertility. Apply Copper oxychloride
Wood rot (fungus)	Tissue of stems crumbles to powder	Remove infected tissues
Red root (fungus)	Reddish mycelial strands on root surface. Root becomes spongy	Uproot the bushes and fumigate the soil
Brown root (fungus)	Heavy soil encrustation on roots Presence of tawny brown mycelium. Soft wood of roots. Honey comb like reticulation on affected roots	Uproot the bushes and fumigate the soil
Xylaria root disease (fungus)	Presence of black ribbon like fungal hyphae on roots. Necrosis of feeder roots	Uproot the bushes and fumigate the soil
Charcoal stump root (fungus)	Irregular black double lines on roots; white (or) cream coloured and fan shaped mycelium on roots	Uproot the bushes and fumigate the soil
Black root (fungus)	Dark strands of woody mycelium and white star shaped mycelium on wood surface	Uproot the bushes and fumigate the soil