



# Black Tea

## Production guideline



agriculture,  
forestry & fisheries

Department:  
Agriculture, Forestry and Fisheries  
REPUBLIC OF SOUTH AFRICA





## **Black Tea**

### **Production guideline**



2016

Design and layout by  
Directorate Communication Services

Compiled by  
Directorate Plant Production

Private Bag X144,  
Pretoria 0001

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# PART I: GENERAL ASPECTS

## 1. Classification.



Botanical name: *Camellia sinensis*

Common names: Tea plant, Black Tea

There are four types of teas namely: Black tea, Oolong tea, green tea and white tea and all four types are made from leaves of the shrub (or small tree) called *Camellia sinensis*. Two principal varieties of the species used are the small-leaved Chinese

variety plant (*C. sinensis subsp. sinensis*), used for most other types of teas, and the large-leaved Assamese plant (*C. sinensis subsp. assamica*), which was traditionally mainly used for black tea, although in recent years, some green and white tea have been produced.

Black tea is a type of tea that is more oxidised than oolong, green and white teas and it is generally stronger in flavour than the less oxidized teas. Black tea retains its flavour for several years and has a longer shelf life compared to other teas. For this reason, it is the world's most popular and traded variety.

*Camellia* is a genus of flowering plants in the family *Theaceae*. Tea is the most important non-alcoholic beverage in the world. It is grown for a hot drink made from its leaves. It is appreciated for its stimulant properties and health benefits

## 2. Origin and distribution

Black teas originated in China, where they are known as red tea, but now come from many growing regions throughout the world. South Asia, along with China and Kenya, produce the majority of the black tea, globally. Because of their large size, China and India have great diversity in climatic conditions, allowing them to produce an assortment of leaves at different locations and elevation.

Black tea was the first type of tea to be introduced to Europe and the Middle East. Its commercial success in the West led to large scale production in China. Black tea production spread from China to other countries. Over time, black tea production spread to India, Sri Lanka and Kenya, and later in Indonesia, Vietnam, Thailand, Rwanda, Brazil and elsewhere.

Tea was introduced to Africa for the first time in 1687 at the Cape of Hope and later in 1851 at the Botanical Gardens of Durban in Natal. Here, the crop was grown on a few hundred hectares after the failure of the coffee crop, which was destroyed by rust in 1877. It is in Malawi, however, that as of 1891, the first large-plantations were established. Tea cultivation in eastern Africa started during the 1920s.

### 3. Production levels

#### 3.1 South Africa

In 1870 South Africa had about 2000 ha of black tea planted in Natal. This enterprise, however, disappeared from the scene mainly because preference was given to sugar production and also because of a lack of technical expertise.

Black tea production in South Africa started to increase in 2003, and at the same time attained a peak at approximately 7149 tons. Between 2004 and 2007, black tea production experienced a steep decline to very low levels of production of approximately 433 tons in 2005. Production of black tea came to a substantial decline in December 2005 when Sapekoe stopped its operations owing to high minimum wages for farm workers and no protection against tea imports from the Southern African Development Community (SADC). High production costs structure (electricity, nitrogen, fertiliser, diesel and wages), the strong rand against the US Dollar and UK Pound Sterling, and land claims (loss of title deed by Sapekoe-Pty Ltd) also led to very low levels of black tea production in South Africa. In 2008/09 a substantial increase in domestic production of black tea was experienced owing to government efforts in resuscitating tea plantations in major tea producing provinces.

Between 2006 and 2008, the gross value of production for black tea experienced some slow increases until there was a substantial increase in 2009 of about 1743 tons. In 2010 and 2011, the gross value of production for black tea saw an increase of about 1647 and 1795 tons respectively. The black tea production in South Africa experienced a decline in 2012 to lower levels of about 870 tons. On average, approximately 2097, 50 tons of black tea is produced locally (in South Africa) each year.

Table 1: Tea estates in the Republic of South Africa during 2015

Estate	Province	Size (ha)	Status
Tshivhase Sapekoe	Limpopo	577	Producing
Mukumbani Sapekoe		504	Producing
Grenshoek Sapekoe		451	Not producing
Middelkop Sapekoe		501	Not producing
Outgrowers		100	Not producing



Estate	Province	Size (ha)	Status
Ngome Sapekoe	Kwazulu-Natal	500	Not producing
Richmond Sapekoe		522	Not producing
Ntingwe		395	Producing
Magwa	Eastern Cape	1784	Producing
Majola		385	Producing
Paddock		225	Not Producing
Senteeko	Mpumalanga	550	Not Producing
Gradely		75	Production
Total		6569	

Judging from the tea estates listed on the table above, it is very clear that only six of the twelve tea estates are currently under production while the rest have ceased their operations. Only two tea estates in the Vhembe region of the Limpopo Province are still in production while in the Kwazulu-Natal Province Ntingwe is the only one still producing tea. The Eastern Cape Province is left with two tea estates while in the Mpumalanga Province only one tea estate is under production.

Ntingwe Tea Estate was established in 1987 by the Ithala Development Finance Corp. It covers 425 ha and has an annual production of about 800 tons of black and 40 tons of green tea, of which about 60 % is exported to buyers in Britain, China and Japan.

### 3.2 Internationally

Through July 2014 global black tea production is estimated at 871,91 million kilograms (mkg) compared with 891,69 mkg during the same period in 2013 harvest, a decline of 2,22 %. Kenya, the world's largest producer of black tea reported a second year decline owing to reduced rainfall during the critical spring months and cooler summer temperatures for the second flush harvest. Production was down 0.44 mkg to 225,18 mkg. Sri Lanka produced 172,17 mkg during the first half of the year which is 0.08 mkg less than 2013, according to reports compiled by tea boards in these countries and published in the Hindu Business Line. "Of the 19,78 mkg shortage, as much as 17,83 mkg has happened in India. Here again, North India accounted for the bulk of shortage. North Indian production declined by 22,27 mkg, while South India's output rose by 4,44 mkg. Collectively, India produced 380,93 mkg against last year's 398,76 mkg," Rajesh Gupta of Global Tea Digest said. In Kenya, Kericho county was most affected with production declining by 13,1% to 36,12 million kilos from 41,55 mkg in 2013.

## 4. Major production areas in South Africa

Black tea is in Limpopo (Vhembe region), Kwazulu-Natal (Nkandla), Eastern Cape (Lusikisiki) and Mpumalanga (Noordkaapriver) provinces.

## 5. Cultivars

Tea is broadly divided into two groups/cultivars, China teas *Camellia sinensis* var *sinensis* and Indian teas *Camellia Sinensis* var *assamica*.

The Chinese tea plant is a hardy bush that can survive colder temperatures and drought. It is known for its long, productive lifespan - some of these bushes have been known to produce tea for 100 years or more. The Chinese tea bush, which can grow to a height of 6 m, has relatively small and narrow leaves. Its leaves are used to produce green tea and China black tea.

The Assam tea tree isn't as hardy as the Chinese variety larger, rather droopy, leathery leaves, which are used to make Assam (Indian) black tea. It can't survive frost and drought, but it does love heavy rains and monsoon-type conditions. This plant can reach a height of 30 m or more.

## 6. Description

### 6.1 Mature plant

*Camellia sinensis* is an evergreen plant that grows mainly in tropical and subtropical climates. A tea plant will grow into a tree of up to 16 m tall if left undisturbed, however; cultivated plants are generally pruned to waist height for ease of plucking. As a cultivated evergreen plant, tea is usually trimmed to below 1,83 m in height. Nonetheless, if left to grow wild, the bush can reach 8,14 m green.

### LEAVES



The leaves are dark green and usually 5 to 10 cm long and 2 to 5 cm wide. The leaves vary considerably in size and shape, according to the variety, but are leathery, alternate and generally elliptical or lanceolate, with a toothed margin. The young leaves are hairy and older leaves become glabrous. Oil glands occur in the substance of the leaf and contain an essential oil to which the

flavour of tea is largely due. The under surface of the young leaves is thickly covered with fine hairs that entirely disappear with advancing age.

## FLOWERS

The flowers are white with yellow centre, 2,4 to 4 cm in diameter, with 7 or 8 petals. The colours of the flowers vary from white through pink colours to red; truly yellow flowers are found only in South China and Vietnam. *Camellia* flowers throughout the genus are characterised by a dense bouquet of conspicuous yellow stamens, often contrasting with the petal colours. The plants are slow-growing and produce white flowers in the autumn.

## STEM

The plant has strong thick yellow stamens that appear solitary or two or three together on short branchlets in the leaf axils.

## ROOTS

Tea plants from seedlings have a strong taproot with a dense network of feeder roots. Most of feeder roots are located in the top 30 cm of soil. Taproots reach a depth of 1,5 to 3 m and provide good anchorage for plants. The rooting habit of leaf cuttings is as much a clonal characteristics as are yield, type of leaf, resistance to disease and so on. The bushes in a new clearing, which die under drought conditions, are often horizontal rooters.

## FRUITS

The fruits are 2 to 3 cm in diameter, brownish-green in colour when mature and contain 1 to 4 spherical or flattened brown seeds. The fruit ripens in 9 to 12 months, after which the seeds fall to the ground.

### *6.2 Essential part*

Young leaves, from which the tea beverage is produced.

## 7. Climatic requirements

### *7.1 Temperature*

Tea plants grow well in tropical and subtropical climates. Temperature plays an important part in the growth and yield of tea. Average temperatures below 12 to 13 °C and above 30 °C delay the development of the shoots to be plucked. The ideal mean annual temperature is thought to lie between 18 and 20 °C. The hours of sunlight are important and the amount should be at least five hours a day. The tea crop has rather specific agro-climatic requirements that are only available in tropical and subtropical climates. A relative humidity of 80 to 90 % is favourable

during the growth period of tea plants, below 50 %, shoot growth is inhibited and below 40 % growth is affected adversely.

## 7.2 Water

Tea plant grows well in areas where annual rainfall varies from 1 150 to 6 000 mm. Regular watering is essential as the roots of the tea become established, approximately two times a week is usually sufficient. During the active growth period, the tea plant should be watered plentifully.

## 8. Soil requirements

Tea is grown on a wide range of soils. Tea should be grown in a well-drained, sandy soil that is slightly on the acidic side. Tea shrubs require fertile acidic mountain soil around pH 4,5 to 5,5 which are deep (at least 2 m), well structured, with a high level of minerals and a well-developed humus-containing horizon, red soil with a loamy texture (i.e. a clay content of 20 to 45 %). Dystrophic (highly leached) soils that commonly occur in valleys and areas with a rainfall in excess of 1000 mm per annum are highly suitable for tea. Good internal drainage is absolutely essential for suitable tea soil. The best, however, is a light; friable loam with porous sub-soil which permits a free percolation of water, for tea is highly intolerant to stagnant water. In general, the most suitable soils are slightly acidic with no calcium. The presence of iron in sub-soil is desirable. Tea grows best on acid soils (pH 4,5 to 5,5), which are deep (at least 2 m), well-structured and with a high level of minerals. Tea is grown on hillsides.

# PART II: CULTIVATION PRACTICES

## 1. Propagation

Tea plants are propagated from seed and rooted leaf cuttings; about 4 to 12 years are needed for a plant to bear seed and about three years before a new plant is ready for harvesting. Most of the existing tea plantings in South Africa were established from seed. The seed came mostly from selected plants grown for seed purposes. The seeds are relatively easy to grow.

Propagation by means of cuttings from selected clones gives better results since vegetable material is true-to-type and will therefore perform exactly like the mother plants, which is not true of seedlings. Cuttings usually consist of a single internode plus one leaf, but they can also consist of two internodes and two leaves. These cuttings are planted directly into plastic sleeves and placed under a high-humidity plastic tent. The cuttings root easily and can be transplanted in the field after six to nine months. Leaf cuttings are also used to establish new tea plantations.

## 2. Soil preparation

Depending on the soil cover (forest or savanna), clearing begins one or two years before the plantation is established. All plants and roots have to be removed to prevent the spread of root rot. The forest or savanna should not be burned as this destroys the humus and impoverishes the soil. Any plant debris can be burned away from the field and the ashes then spread out on the soil.

Before ploughing, perennial weeds have to be eradicated by spraying with recommended herbicide. The soil is ploughed, once or twice to a depth of 20 to 40 cm, using a disc plough or furrow plough or even a hoe or a fork on peasant plantations. It is then harrowed to break up the clods and to level the field.

## 3. Planting

Tea is planted as soon as land preparation is completed. The ideal time to plant *Camellia sinensis* in the garden is in early fall or spring, but summer time is good enough if the plants are kept moist. In general, planting is completed by end-May/June in draughty areas and by September to early November in other places. The newly planted tea fields are then adequately mulched. Seeds should be soaked in warm water for 24 hours before sowing.

Plantings should be established in single rows, 1,50 x 1,75 m apart. Seedlings six to twelve months old may be transplanted with a ball of earth, while much older seedlings can be planted bare-rooted, cutting the stem 10 cm from the soil level. Seedlings can be planted 1,2 m apart in a sunny to partially shaded spot in sandy soil with a pH of 5 to 6. Single-internode cuttings, should be cut above a node with an axillary bud, inserted in the soil at an angle so that the subtending leaf rests on the medium, take well. Hedge plantings in rows about 1,5 m apart spaced 60 cm apart in the row give better initial yields and may facilitate mechanical harvesting.

### 3.1 Planting density

New plantings in South Africa consist of between 13 000 and 14 000 plants per ha (a planting distance of about 1,50 x 0,50 m).

## 4. Fertilisation

The quantity of fertiliser to be applied will depend on the age and yield of the tea plants, as well as on soil fertility and soil analytical report. Periodic analysis of leaf tissue nutrients should be conducted to monitor the health of the plants, once a plantation has been established. During the first 5 to 6 years of growth, tea plants need 40 to 200kg/ha/year of N. Application of P and K is given at 50 % of the amount of phosphate. The plants should be fertilised just as new foliage

growth begins to emerge in spring, and again in early summer using a commercial fertiliser that is recommended as suitable for *camellias*. The plants should be always well watered before applying fertiliser and dry plant should not be fertilised. Tea plants should not be fertilised during the winter months. Mulch is applied around the bushes to encourage healthy growth, and in the spring feed the plants with a controlled-release fertiliser. The bushes are watered during long dry spells. Tea plantations are usually fertilised two to three times per year.

In order to obtain a profitable yield, organic and especially chemical fertiliser should be applied. It is chemical fertiliser which is the key to higher tea yields. It is applied as ammonium sulphate, a mixture of single fertilisers (urea, superphosphate, potassium chloride) or as a compound fertiliser with an NPK ratio of 20–10–10 or 25–5–5. For young tea, application of fertilisers should be split in two to four applications and for adult tea, usually in two applications.

Fertilisers are applied during the rainy season either over the foliage, in a circle around young tea plants or in the interrows. Application, which is carried out by hand, should be as uniform as possible.

## 5. Irrigation

Irrigation may be necessary in the field to mitigate the effects of a severely dry season, to reduce mortality after planting. The amount of water required should be decided in relation to the water deficiency and calculated case-to-case based on the soil's effective reserves and evapotranspiration. Mostly, sprinkler does irrigation and leads to an appreciable increase in tea production. In regions with an annual precipitation of less than 1,150 mm (South Africa), irrigation is necessary to achieve an economically viable yield. Regular irrigation will encourage new growth.

## 6. Weed control

Good ground preparation gives *camellia* plants a good foundation, so it's a good idea to spend time in advance of planting, removing all perennial weeds, incorporating well-rotted organic matter in an area about 1 meter square and a spades depth for each plant.

To combat weeds, a number of techniques have been put into practice on tea plantations. The most direct is clean weeding either by hand or cultivation implementation. This usually involves carrying the weeds off the land and burning them, because an uprooted weed can either re-establish itself in rainy weather, or ripen and disseminate its seed in dry intervals. Weeding should be done by hand until the canopy closes and shade out weeds.

## 7. Pest control

Damage by various organisms, few mite and insect species to the tea plants have already been observed in South Africa. New growth is of the utmost importance in tea production since the two top leaves and the growth tip are picked for processing.

### 7.1 Mites

These creatures are very small and can usually only be seen under a hand lens or a magnifying glass.

#### **RED SPIDER MITE** (*Oligonychus coffeae*)

##### **Symptoms**

This mites attack the foliage in the hot dry season. The larvae and adults spider feed on the upper surface of well-developed leaves. Infested leaves are, at first, reddish in colour and then turn bronze or coppery-brown as the attack spreads; finally, they wither and drop. In heavily infested fields, the maintenance foliage is sparse and there is an appreciable loss in yield. Periods of dry heat are favourable to the egg-laying and development of the red spider mite.

##### **Control**

Several heavy showers will eradicate the infestations. Spraying with recommended pesticides is useful, to be effective, spraying should begin as soon as the first symptoms appear.

#### **SCARLET MITE** (*Brevipalpus sp.*)

##### **Symptoms**

Feeds on the lower surface of the leaves near the petiole, lead in the event of a prolonged attack, to premature defoliation.

##### **Control**

Application of recommended pesticide is an effective control measure, as long as it reaches the underside of the leaves.

#### **PURPLE TEA MITE** (*Calacarus carinatus*)

Its body is purple with fine white ridges. Under favourable conditions, development from egg to adult takes about nine days. Infestation becomes visible around March and gradually increases to reach a population peak from August to September.

These mites are very small and difficult to discern with the naked eye.

### Symptoms

Purple mites attack mature leaves in hot dry weather. If the attack is severe, it leads to defoliation, particularly of the young tea bushes.

### Control

Recommended pesticides are sometimes used to bring a severe attack under control.

### **YELLOW MITES** (*Polyphagotarsonemus latus*)

#### Symptoms

These kinds of mites attack young leaves on a mature plant. Infested young leaves are curled inwards and on the lower surface they develop brown corky lesions between the main veins.

#### Control

The severity of the attacks can be reduced by decreasing the shading in the nursery and by hard plucking in the field. Recommended chemicals can be used.

## 7.2 Insects

### **MOSQUITO BUGS** (*Helopeltis schoutedeni* or *H. orophila*)

#### Symptoms

Mosquito bugs can cause considerable crop losses. The nymphs and adults feed on the leaves and young shoots thereby sucking the sap. Brownish spots appear, leaves and shoots shrivel up, dry and drop.

#### Control

Spraying with registered chemicals will control mosquito bugs.

### **BLACK TEA THRIPS** (*Heliothrips haemorrhoidalis*)

#### Symptoms

Outbreak of black tea thrips are associated with prolonged drought, they suck the cell sap of mature and young leaves. The new leaves remain small, become cupped and the margins are brown and cracked. The growing shoots are stunted with shortened internodes and defoliation often occurs. The underside of the affected leaves become silvery with black spots, the excreta of the insect.

#### Control

The pest can be controlled by timing the prune so that the tea is fully recovered by the beginning of the thrip season.



### **YELLOW THRIPS** (*Scirtothrips sp.*)

Yellow thrips is a tiny whitish-yellow insect, which lives hidden inside the pekoe leaves and on the young leaves and tender shoots.

#### **Symptoms**

On infested leaves, on either side of the main vein, one or several dotted lines appear. If the attack is severe, the leaves barely develop, they are likely to curve inwards and turn brown at the edges.

#### **Control**

The severity of an attack can be reduced by carrying out a few fine pluckings as soon as the symptoms appear. Spraying registered/recommended chemicals is effective in case of infestations in the nursery, especially on young tea plants and on regrowing foliage after pruning.

### **SCALE INSECTS** (*Coccus sp.*)

#### **Symptoms**

Infest leaves and shoots of young plants. These insects dig their rostrum into the plant tissue to suck the sap. This leads to deformation of the affected plants parts, which decay. Soft scales secrete honeydew, which attracts ants and favours the development of sooty mould.

#### **Control**

Registered or recommended chemicals may be used.

### **CATERPILLARS** (*Tortrix dinota*, *Parasa spp.* And *Niphadolepis alianta*)

#### **Symptoms**

Caterpillars may cause irregularly serious damage to young fields.

#### **Control**

Spraying with registered chemicals is effective to control severe attacks.

### **GRASSHOPPERS** (*Brachytrypes achatinus*)

#### **Symptoms**

Grasshoppers can cause considerable losses in young tea fields. They attack the young shoots and leaves, often leaving nothing more than bare skeleton.

## Control

Spraying with registered chemicals is useful.

## TERMITES

### Symptoms

Termites dig galleries in the trunk or ringbark the collar of the plant.

### Control

The use of recommended chemicals that involves watering the plants and the soil underneath with them.

## CUTWORMS (*Agrotis segetum*) and CRICKET (*Brachytrupes membranaceus*)

### Symptoms

Cutworms and cricket cause damage during the night in newly planted tea estates by gnawing or severing the stems at ground level.

### Control

The use of pesticides in the evening is an effective method of controlling pests.

## 7.3 Nematodes

Little is known about nematode damage to tea in South Africa. Surveys are now being undertaken in the plantations to identify harmful nematodes. Nematode damage is synonymous with tea production in the traditional tea countries abroad. The best-known harmful nematode species in tea are the root-knot nematode (*Meloidogyne incognita*) and the lesion nematode (*Pratylenchus loosi*). The root-knot nematode is wide-spread on numerous crops in South Africa. Both species were found on tea in the area of Thohoyandou, but the exact species has not yet been identified. Spiral nematodes (*Helicotylenchus* spp.) also occur commonly on tea at Thohoyandou.

### Control

A good standard of phyto-sanitation in nurseries is the first step in nematode control. Tea producers are advised to fumigate the soil used in containers with methyl bromide. Water used in the nursery should preferably come from a primary source such as a borehole or a spring.

## 8. Disease control

Diseases affect the aerial parts, especially the roots of tea, which is partially susceptible to root rots.

## ROOT DISEASES

Root diseases occur especially where tea has been planted after forest clearing. They destroy the roots, thereby restricting the intake of water and nutrients. Growth is disrupted, the foliage wilts and the plants die.

### ARMILLARIA ROOT ROT

This is caused by a fungus, *Armillaria mellea*, and the disease can be recognised by the appearance of longitudinal and radial cracks at the collar, the base of the trunk and in the roots. Found between the bark and the wood and around the roots, the fungus develops thick, white, palmate patches that are easily detachable. Sometimes, the fungus produces black rhizomorphs which may spread through the soil.

### COLLAR ROT

Is caused by *Rosellinia* spp., is very much localised and limited to only a few plants. This fungus produces a white to grey mycelial veil on the surface of the collar and turns dark grey to black as it ages. On the roots, the fungus has the same appearance, but with a white border and loose masses of black hyphae. Tea reacts to this rot by a proliferation of bark at collar level and the formation of many adventitious roots.

### CHARCOAL ROT

Is caused by fungus *Ustilina deusta*, which develops under the bark as a whitish growth. The wood becomes covered in fine blackish double lines. At a more advanced stage, thin and flat toadstools appear on the collar or the trunk.

Root rot are difficult to control and only preventive measures and phytosanitary rounds can avoid infection. When the land is being cleared, the trees must be uprooted and removed from the field together with all their roots. They are uprooted, complete with taproot and lateral roots, as should their immediate neighbours, and burned outside the field. The uprooted areas are then planted with Guatemala grass (*Tripsacum laxum*) before being replanted with rooted cuttings.

### ROOT SPLITTING DISEASE (*Armillaria mellea* (Fr.)(Vahl)

#### Symptoms

- The presence of longitudinal cracks in the bark at the collar of the affected bush or tree.
- The sudden browning and death of foliage.

- The wood eventually rots to a denatured wet pulp.

#### **Control**

By uprooting and burning the affected bush/tree.

#### **RED ROOT DISEASE** (*Poria hypolateritia* (Berk)

##### **Symptoms**

- They give the root a speckled appearance. Red root disease forms a complete smooth sheath and later hardens into ropes or plates of a distinct colour.
- The fungus destroyed all structural characteristics; leaving a formless wet pulp.

##### **Control**

- The root needs careful washing or scraping.
- By uprooting and burning of the affected bush.

#### **BROWN ROT DISEASE** (*Fomes noxius* (Murr.)

##### **Symptoms**

The adherence of a sheath of earth and gravel ground the entire root, which is not easy to remove by washing.

##### **Control**

Complete eradication of the affected bush and burning are usually sufficient to control the spread of infection.

#### **TRUNK AND BRANCH DISEASES**

Trunk and branch canker, caused by *Phomopsis theae*, is usually rampant after a prolonged drought and affects young clonal tea plants that are susceptible to this disease. The bark is gradually destroyed and a callus forms. The successive pruning of tea favours the development of branch diseases. These diseases reduce the vitality of the frame and lead to a fall in yield.

Pink disease occurs on tea, particularly in very humid regions. It is caused by *Pellicularia salmonicolor* (*Corticium salmonicolor*). The inside of the branch bark becomes covered in a white-pinkish mycelial crust and the bark cracks. Affected branches gradually dry up and the leaves turn yellow and fall. In addition, the branched often have cankers.

### **Control**

Disease control is by spraying with a recommended chemicals. Cultural practices, which contribute towards reducing water stress, will limit the development of the disease. It is also advisable to cut damaged branches and trunks and to burn them.

### **CAMELLIA DIEBACK AND CANKER** (*Glomerella cingulata*)

#### **Symptoms**

Leaves suddenly turning yellow and wilting, branch tips dying, gray blotches on bark and stem which develop into sunken areas (cankers), cankers girdling the stem, parts of plant above cankers losing vigour, wilting and dying, symptoms more pronounced during hot, dry weather.

#### **Control**

Plant in well draining, acidic soils; remove diseased twigs by cutting several inches below cankered areas and disinfecting tools between cuts, apply appropriate protective fungicides during periods of wet weather or natural leaf drop to protect leaf scars from infection.

### **CAMELLIA FLOWER BLIGHT** (*Ciborinia camelliae*)

#### **Symptoms**

Small, brown, irregular-shaped spots on the flower petals, whole flower turning brown and flowers dropping from plant.

#### **Control**

Remove all infected flowers from plants, remove all crop debris from around plants, soil wets with appropriate fungicides can help to reduce the intensity of the disease.

### **TEA YELLOW DISEASE**

#### **Symptoms**

- Mottling of the leaves.
- The network of veins remains green while the rest of the leaf gradually loses its chlorophyll and turns yellow.
- The leaf size diminishes, the internodes are shortened and a general stunting of vegetative growth is apparent.
- As the leaves reach a stage of severe chlorosis, the edges tend to roll inwards,

become necrotic and turn brown: the leaf tip is severely affected in the same manner.

- The leaves as a whole become brittle and easily broken as the symptoms develop and they drop off.
- The terminal buds dies and die-back of the shoot sets in.

#### **Control**

Using sulphate of ammonia can control tea yellow disease. In affected areas application of sulphate of ammonia must be made as soon as plants are put out into the field. A teaspoonful of ammonium sulphate per plant at planting time is in general an adequate control.

#### **TEA SCALE** (*Fiorinia theae*)

##### **Symptoms**

Pale yellow spots on leaves, entire leaves yellowing, leaves turning brown and dropping prematurely, reduced flower size; adult insect is an oblong shape with a ridge down the center parallel to the sides, the scale is initially bright yellow in colour but darkens to a dark brown, insects are mainly found on the undersides of leaves.

##### **Control**

Light infestations can be scraped off the plant and destroyed or infested leaves can be hand-picked; appropriate insecticides can be applied but are only effective against scales that are actively crawling.

#### **TEA APHID** (*Toxoptera aurantii*)

##### **Symptoms**

Small soft bodied insects on underside of leaves and/or stems of plant; usually green or yellow in colour, but may be pink, brown, red or black depending on species and host plant; if aphid infestation is heavy it may cause leaves to yellow and/or distorted, necrotic spots on leaves and/or stunted shoots; aphids secrete a sticky, sugary substance called honeydew which encourages the growth of sooty mold on the plants.

##### **Control**

If aphid population is limited to just a few leaves or shoots then the infestation can be pruned out to provide control; check transplants for aphids before planting, use tolerant varieties if available, sturdy plants can be sprayed with a strong jet of water to knock aphids from leaves; insecticides are generally only required to treat aphids if the infestation is very high.

## 9. Other cultivation practices

### PRUNING

Pruning should be maintained throughout the life of the plantation to keep the plant a manageable size and maintain productivity. Tea bushes are pruned every 3 to 4 years at a height of 4 to 5 cm above the point of last pruning. This type of pruning is called light pruning. The main purpose is to renew the wood, regulate the distribution of new shoots, reduce pests and disease and maintain a good frame height. Pruning is best carried out when the plants are dormant where possible. If trees do not have a dormant period then they should be pruned in winter or after the dry period depending on geographic location. Pruning should be done on December to mid-January for mature tea and the end of January to early February for young tea using slashing knife. For the tea plant to produce plenty of leaves, every five or ten years, it will require pruning to keep the plant in healthy condition.

## 10. Harvesting

### *10.1 Harvest maturity*

Camellia plants usually have a rapid growth rate. Typically they will grow about 30 cm per year until mature, although this does vary depending on their variety and geographical location. When the plant is harvested for tea, the shoot and two to three leaves are harvested every 8 to 10 days. These buds/shoot and leaves are called 'flushes'. A plant will grow a new flush every 7 to 15 days during the growing season. The tea spring leaf tip is valued the most. Camellia sinensis usually will produce an abundant crop twice a year, once in the spring and again in the summer. Harvesting can be done every 7 to 15 days during these periods, until the plant no longer produces new growth.

It could take a full two to three years from germination until a plant is fully matured and capable of producing tea to drink. Once a tea plant has reached maturity, its leaves can be harvested for many years.

### *10.2 Harvesting methods*

#### HAND PICKING

Tea shrubs in production are selectively picked by hand. The best quality dry tea is obtained by fine picking (tip leaf or "pekoe" plus two young leaves). Usually, the tip (bud) and the first two to three leaves are harvested for processing. This hand picking is repeated every one to two weeks. Tea plants are picked by hand by grasping the plant between thumb and forefinger, so as not to damage the plant. The leaves should be large enough, but not too old for them to be picked. Just the top two leaves and the bud are picked for the best black teas.

## **MACHINE PICKING**

Machine picking is not selective. The quality of the end product is nevertheless acceptable and can be improved by making adjustments to the processing plant and by planting better cultivars.

# **PART III: POST-HARVEST HANDLING**

## **1. Sorting**



The cooled, dry tea is then screened according to size and the dust is simultaneously blown out. Thus dried, the leaves are sorted into various grades of black tea. The sorters, subject to a vibrating movement, consist of several sieves with mesh sizes of 0,5 to 1,5 mm. During the sorting process, the moisture content of the tea recovers to 5 to 6 %, which is the norm if the tea is not to lose its flavour during storage. After sorting, the tea is packed and transported to the market.

## **2. Processing**

The tea leaves are allowed to completely oxidise. The leaves are then processed as follows:

### **WITHERING**

Withering begins at the harvesting stage and aims to make the leaves more pliable so that they can be rolled without breaking. For this step the leaves are spread out in a thin layer on large tray in warm air for up to 18 to 20 hours, or until the moisture content has been reduced to about 55 to 70 %. The tea leaf is then soft and pliable and ready for the next stage.

### **ROLLING**

The leaves are then rolled lengthwise to break the leaf cells and release the essential oils, which give the tea its distinctive flavour.

### **OXIDATION**

The leaf begins to develop a recognisable aroma and flavour of black tea, darkening in colour. The leaves are broken up following rolling, and spread out in thin layers in cool, humid air and left to oxidise for 20 to 30 minutes or more, depending on climate and air temperature.



## **FERMENTATION**

This is the time to transform the tea leaves into black tea. Unlike the withering stage, fermentation involves humidifying the leaves. To do this, the leaves are placed in thin layers on cement, glass or aluminium trays to avoid all forms of contamination. The fermentation stage is crucial because it determines the quality of the tea. The fermentation time varies between 1 and 3 hours, depending on the prevailing temperature.

## **DRYING**

The leaves picked from the tea plant are spread out over mats for vaporization in the sun. Another method for drying the leaves is by blowing currents of warm air over them. In the drying phase the leaves lose about 60 % of their moisture. An additional drying stage is crucial to stopping the oxidation process. At the end of this process a long-lasting, stable product is produced.

## **3. Grading**

Black tea is usually graded on one of four scales of quality. Whole leaf teas are highest quality followed by broken leaves, fanning, and dusts. Whole leaf teas are produced with little or no alteration to the tea leaf. This results in a finished product with a coarser texture than that of bagged teas. Whole leaf teas are widely considered the most valuable, especially if they contain leaf tips. Broken leaves are commonly sold as medium grade loose teas. Smaller broken varieties may be included in tea bags. Fannings are usually small particles of tea left over from the production of larger tea varieties, but are occasionally manufactured specifically for use in bagged teas. Dusts are the finest particles of tea left over from production of the above varieties, and are often used for tea bags with very fast, very harsh brews. Fannings and dust are useful in bagged teas because the greater surface area of the many particles allows for a fast, complete diffusion of the tea into the water. Fannings and dusts usually have a darker colour, lack of sweetness, and stronger flavour when brewed.

## **4. Packing**

The sorted tea is packed into 45 kg cartons for marketing. Before packing, each grade of tea has to be homogenised on leaving the silo. Tea destined for export is packed in multilayered paper bags. To prevent absorption of moisture, they are lined with an airtight seal. This packing method is replacing that of plywood chests lined aluminium foil, which has become too expensive.

Tea can be packed as tea bags, loose tea, compressed tea, instant tea as well as bottle and canned tea. The tea leaves are packaged loosely in a canister, paper

bag or other containers such as a tea chest. Some whole teas, such as rolled gunpowder tea leaves, which resist crumbling, are sometimes vacuum packed for freshness in aluminised packaging for storage and retail. Compressed tea is produced for convenience in transport, storage, and ageing. It can usually be stored longer without spoilage than loose leaf tea. Instant tea, both hot and cold, is an alternative to the brewed products. Canned tea is sold, prepared and ready to drink. The tea is then processed and packed in government factories.

## **5. Storage**

Black tea typically stays fresh and retains its flavor longer than green or white teas. A typical black tea, properly stored in a dark, airtight container, can be stored for two years or more with little difference in flavour.

Storage conditions and type determine the shelf life of tea. Black tea is greater than green tea. Tea is then stored in air-tight tin boxes or cans or in silos until they are packed. Loose tea can be stored in tightly sealed glass containers in a cool, dark cupboard for two weeks. Stored tea should be prevented from direct sunlight.

## **6. Transport**

Transportation of leaf from the field requires that the leaf be loosely packed so that sufficient air is in contact with the leaf to absorb the evaporation of water. When black tea is transported to and from storage facilities it should be protected from contamination and weather damage by covering it with plastic sheet. Transport vehicles of black tea should be in a sanitary condition.

## **7. Marketing**

There are tea markets in all the areas where the commodity is produced. Pure Ntingwe tea is currently sold under the estate's name in tea bags marked Zulu Tea, while Yorkshire Gold, a blend of Ntingwe tea and other varieties, is a second retail blend sold in overseas markets. Since 2004, the tea has also been sold locally at Woolworths under the Ntingwe Estate brand name.

Locally, Woolworths sells tea under the brand Ntingwe Tea. This estate's tea is rated among the five best teas in the world, according to Taylor's of Harrogate, which markets it in Britain. The Tshivhase tea is branded as midi. The brand is currently only available in selected stores in Limpopo. South Africa exported black tea to the African region, Americas, Asia, Europe and Oceania.

## PART IV: PRODUCTION SCHEDULES

ACTIVITIES	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
Soil sampling												
Soil preparation												
Planting												
Fertilization												
Irrigation												
Pest control												
Disease control												
Weed control												
Pruning												
Leaf sampling												
Harvesting												
Marketing												

## PART V: UTILISATION

Black tea is a product made from the *Camellia sinensis* plant. The aged leaves and stems are used to make medicine. Black tea is used for improving mental alertness as well as learning, memory and information processing skills. It is also used for treating headache and low blood pressure; preventing heart disease, including “hardening of the arteries” (atherosclerosis) and heart attack; preventing Parkinson’s disease and reducing the risk of stomach and colon cancer, lung cancer, ovarian cancer, and breast cancer. It is also used for type 2 diabetes, stomach disorders, vomiting, diarrhea, and as a diuretic to increase urine flow. Some people use black tea for preventing tooth decay and kidney stones. In combination with various other products, black tea is used for weight loss.

In foods, black tea is consumed as a hot or cold beverage. Dried and cured leaves are used widely as beverage, which has a stimulant effect because of caffeine. The seeds can be used to make tea oil.

## PART VI: REFERENCE

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