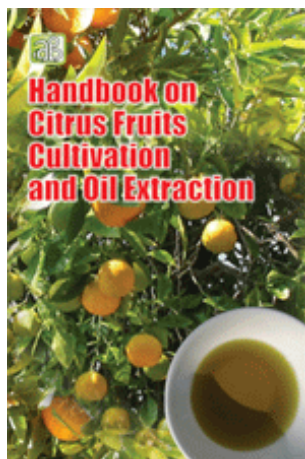


# Handbook on Citrus Fruits Cultivation and Oil Extraction



**Author:** NPCS Board of Consultants & Engineers

**Format:** Paperback

**ISBN:** 9788178331256

**Code:** NI223

**Pages:** 544

**Price:** Rs. 1,575.00 US\$ 150.00

**Publisher:** Asia Pacific Business Press Inc.

Usually ships within **5** days

Citrus fruits are produced all around the world. They contain healthy nutrition content that works wonders for the body. Citrus fruits act as a fabulous source of vitamin C and a wide range of essential nutrients required by the body. India only represents a mere 4% of global citrus fruit production. But now a day, there is a rise in its cultivation. This rise in citrus production is mainly due to the increase in cultivation areas & the change in consumer preferences towards more health & convenience food consumption & the rising incomes. Citrus fruits have long been valued as part of a nutritious and tasty diet. The flavours provided by citrus are among the most preferred in the world, and it is increasingly evident that citrus not only tastes good, but is also good for people. It is well established that citrus and citrus products are a rich source of vitamins, minerals and dietary fiber (non starch polysaccharides) that are essential for normal growth and development and overall nutritional well being. However, it is now beginning to be appreciated that these and other biologically active, non nutrient compounds found in citrus and other plants (phytochemicals) can also help to reduce the risk of many chronic diseases. Appropriate dietary guidelines and recommendations that encourage the consumption of citrus fruit and their products can lead to widespread nutritional benefits across the population. All citrus fruit is acid fruit. The acid fruits are the most detoxifying fruits and excellent foods. Lemon oil is obtained from the fruits of citrus Limonum, Risso (Rutaceae). Although the majority of commercially available essential oils are extracted from the original botanical material by use of steam distillation, most citrus essential oils are extracted by pressing the rinds of the citrus fruits. The oil of sweet orange is obtained from the fruits of citrus Aurantium Risso and the oil of bitter orange from fruits of citrus Bigaradia Risso (Aurantiaceae). Orange Essential Oil is energizing and is usually well loved by men, women and children. Citrus fruit oils are cheaper than most other essential oils. Lemon or sweet orange oils that are obtained as by products of the citrus industry are even cheaper.

Some of the fundamentals of the book are botanical classification, classification of genus citrus, criteria for citrus classification, information on important citrus fruits, subgenus fucitrus (edible citrus fruits), citrus cultivation, citrus fruits, kinnow mandarin, citrus fruit breeding, soil inspection for citrus family, nutrition for citrus world, proper harvesting of citrus, post harvesting of citrus fruits, etc.

This handbook on citrus fruits provides relevant information on most citrus crops, the basics of citriculture & production, pre & post harvest management, picking, storage etc. Selected topics on oil extraction of citrus fruits are also given to provide knowledge of the techniques used. This book will be helpful for technocrats,

farmers, research scholar, institutions etc.

## Contents

### Contents

#### 1. Botanical Classification

Classification of Genus Citrus

Criteria for Citrus Classification

Different Classification

Subgenus Eucitrus (10 Species)

Subgenus 2. Papeda (6 Species)

Subgenera 1. Archicitrus (5 Sections, 98 Species)

Subgenera 2. Meta Citrus (3 Sections, 46 Species)

Others of Somewhat Doubtful Classification

Information on Important Citrus Fruits

Subgenus Fucitrus (Edible Citrus Fruits)

Acid Group

Citrus Medica Linn. (Citron)

Citrus Lemon Burm (Lemon)

Citrus Aurantifolia Swingle (Acid Lime)

Citrus Latifolia Tanaka (Tahiti or Persian Lime)

Citrus Limettioides Tanaka (Sweet Lime)

Citrus Jambhiri Lush (Rough Lemon; Jambiri)

Citrus Limetta Risso (Limetta of the Mediterranean)

Citrus Karna Raff (Kharna Khatta)

Citrus Limonia Osbeck (Rangpur Lime)

Citrus Pennivesiculata Tanaka (Gajanimma)

Orange Group

Citrus Aurantium Linn (Sour, Bigarade or Senville Orange)

Citrus Sinensis Osbeck (Sweet Orange)

Citrus Myrtifolia Raffinesque

Citrus Bergemia Risso (Bargmot Orange)

Citrus Natsudaoides Hayata

Pumelo-Grapefruit Group

Mandarin Group

Citrus Reticulate Blance (loose skinned orange or Santra of India)

Citrus Unshiu M (Satsuma Mandarin)

Citrus Deliciosa Tenore

Citrus Nobilis Loureio (King Mandarin)

Citrus Reshni Tanaka (Spice Mandarin)

Citrus Medurensis Lou (Calamondin)

Citrus Madaraspata Tanaka

Subgenus Papeda : (Inedible Citrus Fruits)

Eupapeda Citrus

Citrus Macroptera (Metanewsian Papeda)

Papeda Citrus

Citrus Ichangensis

Citrus latipes (Khasi Papeda)

Kumquats

Fortunella Margarita Swingle (Nagami or Oval Kumquat)

Fortunella Japonica Swingle (Marumi or Round Kumquat)

Fortunella Crassiflora Swingle (Meiwa Kumquat)  
Fortunella Bindsii Swingle (Hong Kong wild Kumquat)  
Poncirus Trifoliata L. (Trifoliata Orange)  
Citrus Relatives  
Aegle Marmelos Linn. (Bael)  
Feronia Limonia (Linn) Swingle (Wood apple)

## 2. Citrus Cultivation

Sweet Oranges  
Citrus Sinensis Osbeck  
Batavian  
Hamlin  
Jaffa  
Malta Blood Red  
Mosambi  
Pineapple  
Sathgudi  
Shamouti  
Valencia Late  
Washington Navel Oranges  
Mandarin Oranges  
Citrus Reticulata B.  
Calamondin (Citrus Madurensis Lou)  
Cleopatra (Spice Tangerine) C. reshni T.  
Coorg Orange  
Dancy Tangerine  
Desi Mandarin (Pathankot)  
Khasi Orange  
King Mandarin  
Kinnow Mandarin  
Nagpur Santra  
Satsuma Orange (C. unshiu M.)  
Temple Mandarin  
Lemon C. limon Burm  
Eureka Lemon  
Lisbon Lemon  
Lucknowseedless  
Hill Lemon (Galgal) C. pseudolimon Tanaka  
Malta Lemon  
Meyer Lemon  
Napali Oblong  
Villafranca  
Lime  
Acid Lime (Citrus aurantifolia Swingle)  
Tahiti (Persian) Lime (C latifolia Tanaka)  
Rangpur Lime (Citrus Limonia Osbeck)  
Sweet Lime (Citrus Limettioides Tanaka)  
Pummelo (C. Grandis Osbeck)  
Nagpur (Chakotra)  
Grapefruit (C. Paradisi Macf)  
Duncan  
Foster  
Marsh Seedless

Ruby  
Shaharanpur Special  
Thompson (Pink Marsh)  
Citrus Hybrids  
Inter Generic Hybrids  
Hybrids of Poncirus  
Citranges  
Citrangequats (Cit)rus O(range) Kum(quats)  
Citrangedins (cit)rus O(range) Calomon (din)  
Citrangors  
Cleitranges  
Citrumelos  
Hybrids of Fortunella  
Procimequat (Pro(to)C(itrus—L)imequat.  
(Fortunella japomica—C.aurantifolia, Cv.â€”Mexican)—F.hindsii.  
Limequats (C. aurantifolia—F. japonica)  
Orangequats. (C. reticulata Cv. satsuma—F. japonica—F. morgarita Cv. meiwa)  
Hybrids of Genus Eremocitrus  
Intrgeneric Hybrids

### 3. Citrus Fruits

Sweet Orange

Climate

Soil

Cultivars

Mosambi

Blood Red Malta

Sathgudi

Pineapple

Washington Navel

Jaffa

Shamouti

Valencia Late

Hamlin

Batavian

Propagation

Raising of Seedlings for Rootstock

Budding

Planting

Manure and Fertilizers

Irrigation

Interculture and Intercropping

Training and Pruning

Bahar Treatment

Fruit Drop

Physiological Fruit Drop

Control Measures

Pathological Fruit Drop

Control Measures

Harvesting

Yield

Post Harvesting Handling and Storage

#### 4. Mandarin

Uses  
Climate  
Soil  
Varieties  
Nagpur Santra  
Khasi Orange (Mandarin)  
Coorg Orange  
Desi Mandarin (Pathankot)  
Other Varieties  
Propagation  
Manure and Fertilizers  
Yield  
Post Harvest Handling and Storage

#### 5. Kinnow Mandarin

Uses  
Climate  
Soil  
Propagation  
Planting  
Manures and Fertilizers  
Irrigation  
Interculture and Intercropping  
Flowering and Fruiting  
Harvesting  
Yield  
Post Harvest Handling and Storage

#### 6. Sour Lime

Uses  
Climate  
Soil  
Types/Varieties of Lime  
Kagzi Lime  
Chakradhar Lime  
Rangpur Lime (*Citrus limonia* Osbeck)  
Taheti (Persian) Lime (*C. latifolia* Tanaka)  
Propagation  
Raising of Seedlings  
Planting  
Manure and Fertilizers  
Irrigation  
Interculture and Intercropping  
Training and Pruning  
Flowering and Fruiting  
Harvesting  
Postharvest Handling and Storage

#### 7. Sweet Lime

Uses  
Climate  
Soil

Varieties  
Mitha Chikna  
Propagation  
Planting  
Manures and Fertilizers  
Irrigation  
Training and Pruning  
Flowering and Fruiting  
Harvesting  
Yield  
Handling and Storage

## 8. Lemon

Uses  
Climate  
Soil  
Varieties  
Eureka  
Lisbon Lemon  
Villafranca  
Lucknow Seedless  
Nepali Oblong  
Baramasi  
Kagzi Kalam  
Hill Lemon. (Galgal) *C. pseudolemon* Tanaka  
Meyer Lemon  
Pat Lemon  
Italian Lemon  
Rajamunday Lemon  
European Lemon  
Ponderosa Lemon or Japanese Lemon  
Malta Lemon  
Propagation  
Planting  
Irrigation  
Manure and Fertilizers  
Training and Pruning  
Improvement in Yield  
Harvesting  
Yield  
Post Harvest Handling and Storage

## 9. Grapefruit

Uses  
Climate  
Soil  
Varieties  
Marsh Feedless  
Duncan  
Foster  
Saharanpur Special  
Ruby  
Thompson (Pink Marsh)

Triumph  
Propagation  
Planting  
Irrigation  
Training and Pruning  
Flowering and Fruiting  
Harvesting  
Yield  
Post-harvest Handling and Storage

## 10. Pummelo

Uses  
Climate  
Soil  
Varieties  
Propagation  
Planting  
Cultural Practices  
Harvesting and Yield  
Insect-pests of Citrus Fruits  
Lemon Butterfly (*Papilio demoleus* Linn)  
Control Measures  
Citrus Leaf Miner (*Phylloenistis Citrella* Stainton)  
Control Measures  
Citrus Psylla (*Diaphornia Citri* Kuwayma)  
Control Measures  
Whiteflies  
Control Measures  
Control Measures  
Aphids  
Control Measures  
Mites  
Control Measures  
Scale Insects  
Control Measures  
Nematodes  
Control Measures  
Stem and Bark Borers (*Indarbela Tetraonis* Moore and *I. qudrinotata* Walker)  
Control Measures  
Fruit Sucking Moths (*Ophideres* spp).  
Control Measures  
Fruit Flies (*Daccus* spp).  
Diseases of Citrus Fruits  
Gummosis (*Photophthora* spp, *Diplodia Natalensis* Pole Evans)  
Control Measures  
Ganoderma Root Rot (*Ganoderma Lucidum* Karst)  
Control Measures  
Pink Disease (*Pellicularia Salmonicolour* Dastur)  
Control Measures  
Powdery Mildew (*Acrosporium Tingitaninum* Subr).  
Control Measures  
Anthracnose (*Colletotrichum Gloeosporioides* and *Gloeosporium Limethicolum* Clausen)  
Control Measures

Twig Blight (Diplodia and Fusarium spp.)  
Control Measures  
Citrus Canker (Xanthomonas Citri Dowsan)  
Control Measures  
Tristeza Virus Disease (Corium Vialoris)  
Control Measures  
Xyloporosis  
Control Measures  
Psorosis  
Control Measures  
Exocortis or Scalybutt  
Control Measures  
Citrus Greening  
Control Measures  
Dendrophthoe  
Control Measures  
Fruit Cracking  
Control Measures  
Citrus Decline  
Control Measures  
Granulation  
Control Measures  
Fruit Drop  
Control Measures  
Alternate Bearing  
Control Measures

## 11. Citrus Fruit Breeding

Aims of Citrus Breeding  
Related to Fruit Characters  
Related to Tree Characters  
Related to Rootstocks  
Problems in Citrus Breeding  
Time  
Polyembryony  
Sterility  
Breeding Method  
Introduction  
Selection  
Hybridization  
Mutation Breeding  
Choice of the Procedure  
Cytogenetics  
Blossom Biology in Citrus  
Blooming Period  
Flower Bud Differentiation  
Flower Bud Development  
Inflorescence  
Sex Ratio  
Anthesis  
Dehiscence  
Stigma Receptivity  
Storage, Longevity and Fertility of Pollen



Pollen Germination  
Pollination and Fecundation  
Fruit Development  
Technique of Hybridization  
Structure of the Citrus Flower  
Calyx  
Corolla  
Stamens  
Pistil  
Selection of Parents  
Selection of Seed Parent Trees, Branches and Flowers  
Bagging the Flowers  
Emasculation  
Pollination  
Fruit Set

## 12. Suitable Climate

Influence of Climatic Factors  
Temperature  
Relative Humidity  
Rainfall  
Winds  
Altitude  
Climatic Requirements of Different Citrus Species  
Sweet Oranges (*Citrus Sinensis* Osbeck)  
Mandarin Oranges (*Citrus Reticulata* Blanco)  
Acid Lime (*Citrus Aurantifolia* Swingle)  
Sweet Lime (*Citrus Limettioides* Tanaka)  
Lemon (*Citrus Limon* B)  
Grapefruit (*Citrus Paradisi* Macf)  
Pummelo (*Citrus Grandis* Osbeck)  
Climate in Different Regions of India

## 13. Type of Soil

Water Drainage  
Depth of the Soil  
Nature of the Subsoil  
Soil-reaction  
Salts  
Type and Fertility of the Soil  
Soils Requirement of Different Citrus Species  
Citrus Soils of India  
Citrus Soils of Elsewhere  
Work Done in India  
Citrus Breeding in U.S.A.  
Tangelos (Tangerine × Grapefruit)  
Citranges (*Poncirus Trifoliata* × *Citrus Sinensis*)  
Citrangequats (Citrange × Kumquat)  
Limequats (Mexican Lime × Kumquat)  
Hybrid acid Citrus fruit  
Mandarin Types  
Citrus Breeding in U.S.S.R.  
Citrus Breeding in Other Countries

## New Approaches in Citrus Breeding in India

### 14. Making an Orchard

Selection Of Site

Spacing

Preparation of the Site

Layout

Selection of Varieties

Digging and Filling of Pits

Planting Season

Planting

Care of Young Plants

### 15. Cultivation of an Orchard

History

Cultivation

Greenhouse

Orchard House and its Management

Composts, Potting Methods, and Containers

Bark Preparation

Feeding of Orchard Plants

Outdoor Cultivation of Orchards

Growing Orchards in Outdoor Beds

Vegetative Propagation

Raising of Orchards from Seeds

Care of Seedling

Shoot Tip or Meristem Culture

Differentiation of Flower Buds and Induction of Flowering

Resting

Method of Hybridisation

Storing Pollen

Procedure for Pollination

After Pollination

Diseases and Pests

Control Measures for Fungal Diseases

Viral Diseases and their Control

Insect Pests and their Control

### 16. Propagation of Citrus Fruits

Seed Propagation

Seed storage

Seed Bed

Sowing Time

Sowing

Germination

Shade

Nursery Bed

Care of the Young Seedlings

Asexual Propagation

Budding

Preparation of Stock Seedling

Collection of Budwood

Storage of Budwood

Method of Operation  
Height of the Budding  
Lopping  
Care of Young Budlings in the Nursery  
Digging of Budlings  
Transporting  
Budwood Certification Programmes  
Cuttings  
Layering  
Grafting  
Top-Working  
Purchasing of Seedlings or Budlings  
Care of Plants on Arrival from the Nursery  
Propagation of Different Citrus Species  
Bud Variation  
Causes of Bud Variations  
Classification of Variations  
Significance of Bud Variation  
Bud Selection  
Bud Selection Methods  
Nucellar Embryony  
Origin and Development of Nucellar Embryos  
Factors Affecting the Polyembryony  
Identification  
Inheritance of Nuclear Embryony  
Nucellar Embryony in Citrus Species and Cultivars  
Strongly Polyembryonic  
Weakly Polyembryonic  
Number of Embryos Per Seed  
Number of Nucellar Seedlings Per Seed  
Horticultural Significance  
Significance of Nucellar Embryony in Citrus Breeding  
Nucellar Embryony and Heterozygosity  
Drawback of Nucellar Seedlings  
Performance of Nucellar Lines  
In Vitro Culture of Nucellar Embryos

#### 17. Budded Roots

Qualities of a Good Rootstock  
Citrus Rootstocks in India  
Citrus Rootstocks of the World  
Rootstock Trials in India  
Punjab  
Uttar Pradesh  
Assam  
Andhra Pradesh  
Maharashtra  
Karnataka  
Tamil Nadu  
Characteristics of Rootstocks  
Cleopatra Mandarin: Citrus Reshni T.  
Troyer Citrange  
Citrus Sinensis — Poncirus Trifoliata

Swingle Citrumelo  
Duncan Grapefruit — Trifoliate Orange  
Stock and Scion Relationships in Citrus  
Effect of Root stock on Vigour of the Scion  
Effect on Precocity  
Effect on Productivity and Yield  
Effect on Fruit Size, Colour and Quality  
Effect on Winter Hardiness  
Effect on Nutrition  
Effect on Disease Resistance  
Effect of the Scion on Rootstock  
Effect of Interstocks

#### CITRUS ROOTSTOCK PROBLEMS

Stionic Failures

Viruses

Diseases

Nematodes

Salts

#### 18. Cutting of Weak/Neglected Parts

Pruning of Young and Pre-bearing Plants

Pruning Bearing Trees

Pruning Older Trees

Pruning Neglected Trees

Pruning Overgrown Trees

Hedging

Root Pruning

Pruning Time

Wound Protection

Pruning Different Citrus Species

Pruning Problems

#### 19. Soil Inspection for Citrus Family

Soil Tillage

Different Soil Management Practices

#### 20. Inter Cultivation

Choice of Intercrops in India

Intercropping in Other Countries

#### 21. Nutrition for Citrus World

Mineral Nutrition

Nitrogen

Phosphorus

Potassium

Calcium

Magnesium

Sulphur

Zinc

Iron

Copper

Manganese

Boron

Molybdenum  
Combined Nutritional Sprays  
Factors Governing the Nutrition  
Nutrient Elements Balance  
Manuring and Fertilization  
Manuring of Young and Pre-bearing Trees  
Manuring Bearing Trees  
Time of Application  
Methods of Application  
Foliar Analysis  
Soil Vs. Foliar Analysis  
The Concept of Foliar Analysis  
Factors Affecting Mineral Composition of Leaves  
Methods of Leaf Sampling  
Preliminary Survey of Orchard and Selection of Initial Sampling Technique  
Methods of Analysis  
Leaf Analysis Standards  
Interpretation of the Leaf Standards of Different Elements

## 22. Control Irrigation

Irrigation Requirement of Citrus Trees  
Time and Frequency of Irrigation  
Quality of Irrigation Water  
Systems of Irrigation  
Basin System  
Furrow System  
Flood Irrigation System  
Check System  
Sprinkler Irrigation  
Advantages  
Disadvantages  
Drip- or Trickle-irrigation  
Advantages  
Disadvantages  
Pitcher System  
Sub-surface Irrigation  
Irrigation to Young and Pre-Bearing Trees  
Irrigation to Bearing Trees

## 23. Unwanted Weed Removal

Control  
Weed Control in Nurseries  
Weed Control in the Main Field  
Herbicidal Effects  
Phytotoxic Effects  
Other Effects

## 24. Proper Harvesting of Citrus

Picking Time  
Methods of Picking  
Handling  
Grading  
Packing

## Marketing

25. Oil of Bergamot

26. Oil of Lemon

27. Oil of Mandarin

28. Oil of Orange

29. Study of Orange Essential Oils  
Analysis by Infrared Spectroscopy

30. Study of Orange Essential Oils  
Chemical Modifications During Aging

31. Citrus Carotenoids (I) The Structure of Citranaxanthin, a New Carotenoid Ketone  
Experimental  
Isolation of Citranaxanthin I  
Anal. Calcd.  
Alkali Cleavage of Citra anaxanthin (I).  
Reduction of Citranaxanthin  
Citranaxanthin (I)  
Anal. Caled.

32. Citrus Carotenoids (II) The Structure of Reticulataxanthin

33. Factors Direct Fruit Variety

Climatic Factors

Temperature

Water

Nutritional Factors

Nitrogen

Phosphorus

Potassium

Magnesium

Manganese

Copper

Boron

Rootstock Effects

Fruit Size

Colour of Rind

Juice

Total Soluble Solids

Total Acidity

Ascorbic Acid Content

34. Post Harvesting of Citrus Fruits

Degreening

Pre-harvest Treatment

Post-harvest Application

Storage

Waxing

Polyethylene Covers  
Growth Regulators  
Cold Storage  
Controlling Moulds in Storage

### 35. New Problems for Citrus Family

Alternate Bearing  
Factors Affecting Alternate Bearing  
Control  
Resting Treatment  
Choice of Bahar  
Granulation  
Analogy of Granulation  
Physico-chemical Characteristics of Granulated Fruits  
Incidence and Progress of Granulation  
Factors Affecting Granulation  
Humidity  
Temperature  
Light  
Tree age  
Tree health  
Tree Vigour  
Tree Aspect  
Tree Variation  
Fruit Size  
Rootstock  
Varietal Susceptibility  
Control Measures  
Irrigation  
Effect of Time Sprays  
Effect of Growth Regulators  
Nutritional Sprays  
Citrus Decline  
Symptoms  
Factors Responsible for Citrus Decline  
Soil Factors  
Nutritional Factors  
Rootstock Factors  
Orchard Management Factors  
Insect-pests  
Nematodes  
Fungal Diseases  
Viruses  
Control Measures  
Fruit Drop  
Retarding or Inhibiting Factors  
Accelerating or Initiating Factors  
Temperature  
Water  
Insect Pests and Diseases  
Physiological Factors  
Nitrogen  
Carbohydrates

Auxins  
Embryo Development  
Control of Fruit Drop  
Mandarins  
Sweet Oranges  
Grapefruit  
Lemons

### 36. Use of Plant Growth Regulators

2,4-Dichlorophenoxy Acetic Acid (2,4-D)  
2,4,5-Trichlorophenoxyacetic Acid (2,4,5-T)  
Naphthalene Acetic Acid (NAA)  
Gibberellins  
Cytokinins  
Growth Retardants  
Ethylene  
Limitations

### 37. Serious Diseases of Citrus

#### Diseases Caused by Fungi

Gummosis

Symptoms

Etiology and Spread of Disease

Varietal Susceptibility

Control Measures

Preventive Measures

Curative Measures

Diplodia Gummosis

Symptoms

Spread

Control

Ganoderma Root Rot

Symptoms

Control

Pink disease

Symptoms

Control

Powdery Mildew

Symptoms

Etiology and Spread

Control

Felt Disease

Symptoms

Etiology and Spread

Varietal Susceptibility

Control

Anthracnose

Symptoms

Etiology and Spread

Control Measures

Scab

Symptoms

Etiology and Spread



Varietal Susceptibility  
Control  
Dry Root-rot  
Symptoms  
Etiology  
Control  
Armillariella Root-rot  
Symptoms  
Control  
Sooty Mould  
Symptoms  
Damage  
Etiology and Spread  
Control  
Melanose  
Symptoms  
Etiology and Spread  
Control  
Twig Blight  
Etiology  
Symptoms  
Control  
Leaf Fall and Fruit-rot  
Symptoms  
Etiology  
Control  
Sphaeropsis Knots  
Limb Breakage  
Greasy Spot  
Nursery Diseases  
Diseases Caused by Bacteria  
Citrus Canker  
Symptoms  
Etiology and Spread  
Varietal Resistance  
Control  
Citrus Blast  
Bacterial Root Rot  
Diseases Caused by Viruses  
Diseases Affecting Certain Stionic Combinations  
Tristeza or Quick Decline  
Symptoms  
Etiology  
Transmission of the Virus  
Varietal Susceptibility  
Control  
Saving the Existing Infected Orchards  
Avoiding Losses in New Citrus Plantings  
Xyloporosis  
Symptoms  
Virus Diseases Occurring Irrespective of Rootstocks  
Psorosis  
Symptoms

Etiology  
Control  
Stubborn Disease  
Symptoms  
Etiology  
Diseases Caused by Viroids  
Exocortis or Scalybutt  
Other Miscellaneous Virus Diseases  
Budunion Crease  
Citrus Mosaic  
Infectious Variegation  
Yellow-Corky Veins  
Blastomania  
Leaf-curl-disease  
Other Virus-Like Disorders  
Creeping Stem  
Bark Eruptions  
Woody Galls  
Young Tree Decline  
Gummy Pitting  
Tatter Leafâ€™ Citrange Stunt Complex  
Citrus Mosaic, Navel Infections Mottling and Natsudaiddai dwarf  
Citrus Greening  
Symptoms  
Etiology  
Transmission  
Varietal Susceptibility  
Control  
Phanerogamic Parasites  
Dendrophthoe (Loranthus)  
Cassytha  
Physiological Disorders  
Foam Disease  
Symptoms  
Cause  
Fruit Splitting  
Symptoms  
Cause  
Control  
Endoxerosis  
Symptoms  
Cause  
Control  
Creasing (Puffiness)  
Rough Fruit Disorder  
Market for Storage Diseases  
Penicillium Moulds  
Alternaria Rot  
Black Core Rot  
Diplodia-Stem-end Rot  
Aspergillus Rot  
Miscellaneous Diseases

## 38. Important Pests of Citrus

Introduction

Root Pests

Stem and Trunk Pests

Borers

*Chloridolum Alemene* Thomson

*Monohamus Versteegi* Nitzema (Trunk Borer)

Stein and Bark Borers (*Indarbela* Spp.)

Damage by Borers

Control

Foliage Pests

Lemon Butterfly (*Papilio Demoleus* Linn.)

Papilionidae : Lepidoptera.

Distribution

Host Plants

Life History

Damage

Control

Citrus Leaf-Miner: (*Phyllocnistis Citrelia* Stainton) (Phyllocnistidae: Lepidoptera).

Distribution

Host Plants

Life History

Damage

Control

Citrus Psylla: *Diaphornia Citri* Kuwayama

Distribution

Host Plants

Life-history

Damage

Control

Whiteflies (*Aleurocanthus* Spp, *Dialeurodes* Spp)

Distribution

Host Plants

Life History

Damage

Control

Weevils: (*Myllocerus Discolor* BOH)

Mealy Bugs : *Pseudococcus* Spp (*Pseudococcidae* : Hemiptera)

Distribution

Host Plants

Life History

Damage

Control

Aphids: Hemiptera Aphididae

Distribution

Host Plants

Life History

Damage

Control

Thrips: (*Scirtothrips* spp, *Heliethrips* spp)

Distribution

Host Plants

Damage

Life History  
Control  
Scale Insects: (Coccidae: Homoptera)  
Damage  
Armoured Scales  
Unarmoured or Soft Scales  
Spread  
Control  
Mites: (Tetranychidae: Acarina)  
Distribution  
Life History  
Damage  
Citrus Rust Mite: Phyllocoptruta Oleivorus Ashm  
Six-spotted Mite : Tetranychus Sexmaculatus Riley  
Control  
Minor Pests  
Hairy Caterpillars Euprotctis Fraterna M  
The Citrus Leaf-roller (Psorosticha Zizyphi Staintor)  
Orange Hair Streak: (Taraucus Theophrastus)  
A Grass Hopper : Poekilocerus Pictus Fab  
Cricket: Braehytrypes Portentosus Light  
Longhorn Beetle: Oberea Mangalorensis  
Flower Pests  
Citrus Flower Moth : Prays Citri Milliers  
Cacoecia Epicyrta Meyrick  
Blossom Midge Sayneura Citri G & P  
Fruit Pests  
Fruit Sucking Moths (Noctuididae : Lepidoptera)  
Calpe Emarginata  
Distribution  
Host Plants  
Life History  
Damage  
Control  
Fruit Flies  
Distribution  
Host Plants  
Life History  
Damage  
Control  
Fruit Sucking Bugs  
Distribution and Host Plants  
Life History  
Damage  
Control  
Citrus Rind Borer: Prays Endocarpi Meyrick.  
General Control Measures

### 39. Nematodes of Citrus

Citrus Root Nematode  
Tylenchulus Semipenetrans Cobb. 1913  
Host Range  
Control Measures

Cultural Control  
Biological Control  
Resistant Rootstocks  
Reniform Nematode (Rotylenchulus Reimformis)  
Burrowing Nematode (Radopholus Similies)  
The Lesion Nematode (Pratylenchus Coffeae)  
Root-knot Nematode (Meloidogyne Africana)  
The Lance Nematode (Hoplolaimus Indicus)  
Poncirus  
Fortunella (Kumquats)  
Citrus

## About NIIR

**NIIR PROJECT CONSULTANCY SERVICES (NPCS)** is a reliable name in the industrial world for offering integrated technical consultancy services. NPCS is manned by engineers, planners, specialists, financial experts, economic analysts and design specialists with extensive experience in the related industries.

Our various services are: Detailed Project Report, Business Plan for Manufacturing Plant, Start-up Ideas, Business Ideas for Entrepreneurs, Start up Business Opportunities, entrepreneurship projects, Successful Business Plan, Industry Trends, Market Research, Manufacturing Process, Machinery, Raw Materials, project report, Cost and Revenue, Pre-feasibility study for Profitable Manufacturing Business, Project Identification, Project Feasibility and Market Study, Identification of Profitable Industrial Project Opportunities, Business Opportunities, Investment Opportunities for Most Profitable Business in India, Manufacturing Business Ideas, Preparation of Project Profile, Pre-Investment and Pre-Feasibility Study, Market Research Study, Preparation of Techno-Economic Feasibility Report, Identification and Section of Plant, Process, Equipment, General Guidance, Startup Help, Technical and Commercial Counseling for setting up new industrial project and Most Profitable Small Scale Business.

NPCS also publishes various process technology, technical, reference, self employment and startup books, directory, business and industry database, bankable detailed project report, market research report on various industries, small scale industry and profit making business. Besides being used by manufacturers, industrialists and entrepreneurs, our publications are also used by professionals including project engineers, information services bureau, consultants and project consultancy firms as one of the input in their research.

---

**NIIR PROJECT CONSULTANCY SERVICES** , 106-E, Kamla Nagar, New Delhi-110007, India. **Email:** [npcs.india@gmail.com](mailto:npcs.india@gmail.com) **Website:** [NIIR.org](http://NIIR.org)

Wed, 18 Oct 2017 11:41:02 +0530