Chapter - I

Introduction
INTRODUCTION

Citrus fruits are members of Rutaceae family (sub family; Aurantoidaea, Tribe-Citrae & sub tribe-Citrinae) which contain more than a thousand species, found in the tropical region of Africa, South East Asia and Australia. These are native of Cochin, China, the Malaya Archipelago and adjoining parts of Asia. Evergreen trees or shrubs, normally spiny but sometimes absent; leaves thick, leathery; dotted with translucent oil cells, unifoliate, the petioles usually winged, generally articulated with lamina; flowers auxillary, solitary or in clusters or in small terminal cymes, bisexual; white or white with purplish pink tinge on the outer surface of the petals, scented, calyx small, cupped; petals usually five, imbricated, thick dotted with oil glands; stamens numerous (15-60) polyadelpous united in bundles; ovary compound, 8-16 celled and mounted on a thick angular disc, style usually deciduous, fruit a partitioned berry (hesperidium), globose, subglobose or oblong pointed, usually orange coloured, small to large in size, rind of varying thickness, dotted with numerous oil glands; pulp consist of juice vesicles covered by a papery and leathery skin, seeds few to many, oval or oblong, either mono-embryonic or polyembryonic.

Citrus fruits have a prominent place among popular and extensively grown tropical and subtropical fruits. Citrus fruits possess greater adaptability to different climatic conditions, so are grown with equal success in tropical, subtropical and even in some favorable parts of the temperate regions of the world. Their wholesome nature, multifold nutritional and medicinal values have made them so important. They are available throughout the year. They are not only delicious and refreshing to eat, but also provide vitamins, minerals and many other essential substances which are required for human health. They are especially important for growing children and are an important source of vitamin C. Their importance in diet is well proven now. Citrus fruits are commonly
consumed as fresh, particularly mandarins, sweet oranges, pummelo and grape fruit. Lemons and limes being acidic, are not generally consumed as fresh but are mostly used flavoring vegetable dishes, fish, meat and salads. They also make delicious and refreshing cold drinks. Mandarins and sweet oranges are also used in the preparation of squashes, cordials. Limes are mainly used in the preparation of pickles. In the orient pummelos are used primarily for culinary and medicinal purpose (Rajput and Haribabu, 1999).

Out of total fruit cultivation area (6383 Th. ha.) in India in 2010-11, citrus occupies third position (846.0 Th. ha. and 13.3%) after banana and mango. In comparison to total national fruit production (74878 Th. ha.), citrus is placed in third position (7464.0 Th. ha. 10%) after banana (39.8%) and mango (20.3%). Similarly the national productivity (11.7 MT/ha) of fruits is higher than citrus (8.8MT./ha). Further Madhya Pradesh ranks fourth position (10.7%) after Andhra Pradesh (24.2%), Maharashtra (18.9%) and Punjab (12.1%) in relation to area (45 Th. ha.) and production (798.5 Th. MT.) but in productivity (17.7MT./ha) it ranks third position.

Similar to other citrus growing states, efforts are being made to increase the area, production and productivity of citrus in Madhya Pradesh. Malwa is enriched with soil fertility and favorable climatic conditions for citrus cultivation but unfortunately having very less area, production and productivity. A number of factors like diseases, weeds, nematodes, nutritional requirement and insect pests, affects production directly or indirectly, but insect pests are the major biotic factors having adverse effect on plant growth and quality production.

A number of insect pests species cause infestation on various species of citrus, but in relation to foliage incidence, following insect pests causes severe infestation which adversely affects the plant growth and yield:
<table>
<thead>
<tr>
<th>Citrus psylla</th>
<th><em>Diaphorina citri</em> Kuwayama</th>
<th>Psyllidae</th>
<th>Hemiptera</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whitefly</td>
<td><em>Dialeurodes citri</em> (Ashmead)</td>
<td>Aleyrodidae</td>
<td>Hemiptera</td>
</tr>
<tr>
<td>Blackfly</td>
<td><em>Aleurocanthus woglumi</em> Ashby</td>
<td>Aleyrodidae</td>
<td>Hemiptera</td>
</tr>
<tr>
<td>Leaf miner</td>
<td><em>Phyllocnistis citrella</em> Stainton</td>
<td>Phyllocnistidae</td>
<td>Lepidoptera</td>
</tr>
<tr>
<td>Butterfly</td>
<td><em>Papilio demoleus</em> Linnaeus</td>
<td>Papilionidae</td>
<td>Lepidoptera</td>
</tr>
<tr>
<td>Fruit sucking moth</td>
<td><em>Ophideres</em> spp.</td>
<td>Noctuidae</td>
<td>Lepidoptera</td>
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</tbody>
</table>

**INFESTATION**

**Citrus psylla:** Due to sucking of cell sap by nymphs and adults on young leaves, twigs and flower buds, plants wilt and die. Nymphs secrete a drop of thick fluid on which fungus develop and adversely affects the photosynthesis and ultimately growth.

**Whitefly and Blackfly:** Both nymphs and adults suck the cell sap from leaves which curl over and fall off. Due to honey dew secretion, fungus sooty mould is developed and interferes with photosynthesis.

**Leaf miner:** Only larvae causes damage by making zig-zag silvery mines in young leaves. The injured epidermis of leaves, takes the shape of twisted galleries. On older leaves brownish patches are formed which serve as foci of infection for citrus canker and finally photosynthesis and growth is interfered.

**Citrus butterfly:** Only caterpillar causes damage by eating leaves from the margin and inwards to mid rib. In case of severe infestation plants may be defoliated. Heavily attacked plants bear no fruits.

**Fruit sucking moth:** Adult moths punctures the fruits for sucking juice where bacterial and fungal infection takes place. Ultimately fruits turn yellow, drop off the tree and apparently look like a premature fruits.

Due to infestation of these pests plant growth, fruit yield and fruit quality is adversely affected and ultimately value is decreased. Viewing the overall present situation of insect
pests occurrence on citrus in Malwa region, this research has been planned to assess the production losses, adverse effect on plant growth, biological studies and meteorological causation with insect pests severity which can help in developing a strategy for pest management and increasing the citrus fruit production.

Objectives:

1. To assess the seasonal foliage losses, adverse effect on plant growth and yield losses due to attack of insect pests.

2. To study the seasonal biology of major insect pests of citrus.

3. To study the economics of citrus cultivation after insect pests infestation.

4. To study the meteorological causation with insect pests severity.