Major insect-pests and diseases of major fruits available in Nepal:

Introduction:

The kingdom of Nepal is a small and totally land locked mountainous country in South Asia. It is situated between 26°22' and 30°27' north latitude and 80°4’ and 88°12’ east longitude. It is surrounded by India to the East, South and West and by the Tibetan region of China to the North. The shape of the country is somewhat rectangular measuring 880 km from East to West and 130 to 240 km in width. The total geographical area of the country is 147,181 square km. The total cultivable area is 3.96 million hectares of which 2.97 million ha are under cultivation. The irrigated area is only 26% of the total cultivated land; the rest depends largely on monsoon rain, 80% of which is received during June to September.

Nepal is a predominantly agricultural country. Agriculture is the lead sector for the national economy and accounts for about 36% of the GDP. About 66% of the population are engaged in agriculture. The Nepalese hill economy is characterized by typical subsistence agriculture based on cereal crops, and is practiced on terraces of often very steep slopes which are subjected to a great loss of top soil by erosion during heavy rain. Hilly soil is generally acidic and with poor nutrient content, especially nitrogen. The fruit crop cultivation is still not commercialized in the hilly region. In the Terai mainly cereal crop are cultivated and fruit crops are not generally preferred. In some terai district mango orchard has been established to make commercialized but due to different regions and problem of disease and insect pest it couldn’t well established.

Agro-ecological Classification and its Significance to Horticulture

The topography of Nepal is extremely variable ranging from 60-300 m above sea level (m a.s.l) in the southern plains to 8848 m.a.s.l. in the north, which is the highest point on earth (Mt. Everest). Big variation in altitude occurs within short distances due to which it enjoys all types of climates. Physiographically, the whole country can be divided into five zones

<table>
<thead>
<tr>
<th>Features</th>
<th>Terai</th>
<th>Siwaliks</th>
<th>Middle Mountains</th>
<th>High Mountains</th>
<th>High Himal</th>
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</thead>
<tbody>
<tr>
<td>Land Area (Million ha)</td>
<td>3.1 (44%)</td>
<td>2 (12.7%)</td>
<td>4.4 (29.5%)</td>
<td>2 (19.7%)</td>
<td>2.4 (23.7%)</td>
</tr>
<tr>
<td>Geology</td>
<td>Quaternary</td>
<td>Tertiary</td>
<td>Phyllite, quartzite</td>
<td>Gneiss,</td>
<td>Gneiss,</td>
</tr>
</tbody>
</table>
### Study on major insect-pests of fruits in Nepal

<table>
<thead>
<tr>
<th>Elevation</th>
<th>100-300 m</th>
<th>200 - 1500 m</th>
<th>800 - 2400 m. Relief 1500 m with isolated peaks to 2700 m</th>
<th>1000 - 4000 m High relief 3000 m from valley floor to ridges</th>
<th>2000 to 5000 m +</th>
</tr>
</thead>
<tbody>
<tr>
<td>Climate</td>
<td>Tropical</td>
<td>Tropical,</td>
<td>Subtropical, warm temperate (but tropical in lower river valleys; cool temperate on high ridges)</td>
<td>Warm to cool temperate, alpine</td>
<td>Alpine to arctic (snow 6 - 12 months)</td>
</tr>
<tr>
<td>Moisture Regime</td>
<td>Subhumid in FW+MWDR; humid in W+C and FDR</td>
<td>Subhumid in most of the area; humid in N-aspect of W+C=EDR and Dun Valleys</td>
<td>Humid; perhumid above 2000 m</td>
<td>Subhumid to perhumid</td>
<td>Semi arid behind Himal</td>
</tr>
<tr>
<td>Rainfall Intensity</td>
<td>High</td>
<td>High</td>
<td>Medium</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Horticultural crops</td>
<td>Mango, lychee, pineapple, jackfruit, potato, tomato</td>
<td>Mango, papaya, banana, potato</td>
<td>Mango, papaya, banana, orange, lime, lemon, peach plum, nectarine, persimmon, Asian pear, potato, cauliflower</td>
<td>Chestnut, walnut, apple, peach, plum, apricot, cherry, almonds, potato</td>
<td></td>
</tr>
</tbody>
</table>

**Note:**
- **EDR** = Eastern Development Region
- **CDR** = Central Development Region
- **WDR** = Western Development Region
- **MWDR** = Mid-Western Development Region
- **FWDR** = Far Western Development Region
The above table information reveals that Nepal is suitable for fruit cultivation but commercialization can’t be achieved well due to the reason that there is a lot of variation of land within the certain areas and there is due to very sloppy land some area couldn’t be used for cultivation. But in comparison with cereal crops we can cultivate the fruit crops in such land more successfully. So, in case of Nepal to utilize the land maximum we have to commercialize fruit cultivation to get more benefit from per unit area.

For the commercialization of fruit cultivation we can’t remake the natural physiographic formation but we can minimize the other main problem which is the major reason for reducing the product of fruit cultivation that is the disease and insect-pests. In Nepal many losses have been occurred due to this cause. If we could minimize this problem we could maximize the product indirectly.

**Major insect-pest of fruits of Nepal:**

<table>
<thead>
<tr>
<th>SN</th>
<th>INSECT’S NAME</th>
<th>MAJOR SYMPTOMS</th>
<th>MANAGEMENT</th>
<th>REMARKS</th>
</tr>
</thead>
</table>
| **1** | Wolly aphid \* \* *Eriosoma lanigerum* | - They are fruit sucker  
- Produce honey dew like substances where sooty mold develops.  
- In severe infestation, the affected branches show knots like structure | - Agroservo oil can be used @ 5ml/lit of water  
- *Aphilinus mali* - a hymenopteron parasite also can be used to control | |
| **2** | San jose scale \* \* *Quadraspisidiotus perniciosus* | - Suck the sap from new succulent plant parts and plant shows yellowing coloration.  
- Develop honey dew and sooty mold in turn | - Use healthy saplings  
- Cutting the affected branches  
- Use of Agro-servo oil @ 5 ml/lit | |
| **3** | Apple stem borer \* \* *Zeuzera spp* | - Bore the stem of apple by larva  
- Release of saw dust where it has affected | - Use of 1-2 drops of the kerosene oil in each hole  
- Plugging the hole  
- Cutting the affected branches and pasting with Bordeaux mixture | |
<p>| <strong>4</strong> | Tent caterpillar | - Makes tent like webby | - Use neem based | |</p>
<table>
<thead>
<tr>
<th><strong>Malacoxoma indica</strong></th>
<th>Structure in twig and leaves</th>
<th>Pesticide</th>
<th>Damaging stage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>- Defoliation of leaves take place</td>
<td>- Collection of larva</td>
<td>-</td>
</tr>
<tr>
<td>5. Slug caterpillar</td>
<td>It eats the tender leaves voraciously</td>
<td>Use contact poison</td>
<td></td>
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<tr>
<td>Caina spp</td>
<td></td>
<td>- Collection of larva and pupa</td>
<td></td>
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**PLUM:**

1. Plum aphid  
*Brachycyclus helichrysi*  
Causes severe leaf distortion on the foliage of all types of plum during April to late May  
- Spray with thiacloprid shortly after bud burst

2. Plum Fruit Moth  
*Grapholita funebrana*  
- Pinkish white caterpillar and excrement pellets inside ripe fruits  
- Use of a pheromone plum moth trap  
- Spray with deltamethrin

3. Plum sawfly  
*Hoplocampa flava*  
- The young maggots which develop tunnel their way into the developing fruit. The only signs at this stage are the tiny holes left by the maggots.  
- Break the pest’s lifecycle at two points. First, in late winter and early Spring, gently loosen and turn the soil around the base of the tree

**WALLNUT:**

1. Walnut Caterpillar  
*Datana integerrima*  
Caterpillars can defoliate the trees and severely affect tree vigor, yield, and nut quality  
- The bacterial insecticide, *Bacillus thuringiensis*, is quite effective as a control agent  
- Remove and destroy masses of larvae when they are small.

**SUBLTROPICAL FRUITS:**

**CITRUS:**

1. Citrus sting bug  
*Rhynchocoris humeralis*  
Suck the juice from fruits so juice less fruit is observed, brown ring can be found at the site of infection  
- Hanging the carrion in citrus orchard attract the citrus stink bug  
- *Trissolcus priapus*- a parasitoids on citrus stink bug can be used
2. Citrus scale  
*Aonidiella aurantii*  
Suck the sap, Show die back symptoms at severity  
- Use of Agro-servo oil @500 ml/15 plants

3. Citrus aphid  
*Troxoptera citricida*  
Feed on plant part using their sucking mouthparts, yellowing of leaves, sooty mold develops  
- Use of lady bird beetle as natural predators  
- Use systematic type of pesticide  
Major cause of citrus decline in Nepal

4. Citrus stem borer  
*Stromatium barbatum*  
Releasing the saw dust excreta outside the hole  
- Use of kerosene oil inside the hole  
- Plugging the hole

5. Citrus mealy bug  
*Planococcus citri*  
Suck sap, secrete honey dew which in turn develop sooty mold  
- Use lady bird beetle and wasp as natural predators  
- Use Agro-servo oil @ 5 ml/lit of water

**BANANA:**

1. Banana pseudo-stem weevil  
*Odoiporus longicollis*  
Tunnel is seen from outside and even in small wind flow the pseudo-stem will fall  
- Use resistant variety: Robusta, William Hybrid  
- Well aeration  
- Use of aluminium phosphide @1 tab/stem

2. Banana rhizome weevil  
*Cosmopolites sordidus*  
Grub makes the tunnel inside the rhizome and rhizome starts to rot  
- Crop rotation  
- Use Umet granules pesticide @ 1-2 per pit  
Larva is the damaging stage

3. Leaf beetle  
*Nodostoma subcostatum*  
They chew the fruit and the leaves seriously from August to September  
- It can be controlled by clean cultivation and spraying of BHC @ 0.1%

**MANGO:**

1. Mango hopper  
*Idioscopus niveosparsus*  
Suck the sap and secrets honeydew and due to which sooty mold is develops and in sever condition wilting of leaves takes place  
- Use the light trap @ 1 trap/ha  
- Use the entomopathogenic fungi: *Metarhizium*  
- Use of systematic
<table>
<thead>
<tr>
<th>No.</th>
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<th>Description</th>
<th>Control Measures</th>
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</table>
| 2.  | Mango mealy bug *Drosicha mangifera* | Both nymph and adult suck the sap from tender parts and secrets honey dew and which inturn develop sooty mold in infected part | - Use the greasy band of about 10-15 cm wide in the tree trunk to prevent the migration of the female into the soil  
- Use systemic type of pesticide  
- Use 250 gm per tree of methyl parathion dust- 2% |
| 3.  | Mango fruit fly *Bactrocera dorsalis* | The maggots consume the internal tissue from where decaying takes place from which fruit drop takes place | - Complete field sanitation  
- Use of methyl-eugenol trap  
Maggots and adult are damaging stage |
| 4.  | Mango stem borer *Batocera rufomaculata* | Saw dust is seen just at the mouth of hole made by borer | - Use kerosene oil in the hole  
- Jerking the hole with the help of long stem  
- The larva is infected by a kind of entomopathogenic fungi which is *Metarrhizium anisopliae* |

**LITCHI:**

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| 1.  | Litchi bug *Tessaratoma papillosa* | Suck the fluid from the tender parts and in sever condition premature fruiting and fruit drop take place | - Use chloropyrivus @ 2ml/lit of water  
- Protection of hymenopteron parasitoids in nature because the bug is easily parasitoids by it |
| 2.  | Lichi leaf curl mite *Aceria litchi* | Attack the young leaves causing hairy blister like gall on the upper side of the leaves: the leaves become thickened, wrinkled and distorted | - Spray with sulphur or kerathane 0.12@ of 1-2 ml/lit of water |

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### GUAVA:

1. **Guava moth** *Argyresthia eugeniella*
   - Females penetrate guavas and lay their eggs inside the plant. In its larval form it tunnels through the guavas, damaging them.
   - Spray monocrotophos @ 1.25 lit/1250 liter water/ha

2. **Oriental fruit fly** *Dacus dorsalis*
   - The maggots feed on the pulp of fruit and cause brown rotten patches thus making them unfit for sale.
   - The affected part should be destroyed
   - Spray with malathion 0.1 % in combination with endrin 0.02%

3. **Scale insects** *Pulvinaria psidii*
   - Spraying 0.05% diazinon, parathion or malathion

### GRAPES:

1. **Grape vine flea beetle** *Sceledonta strigicollis*
   - The adult consumes the fresh leaves after pruning.
   - Spray with parathion 0.025%

2. **Ground beetle** *Gonocephalum depressum*
   - They suck the fruit juice from the grape fruit
   - Spray with 0.25 % BHC is recommended to control the diseases

3. **Leaf roller** *Sylepta tunalis*
   - They feed on green tissue in the early stage and eat up a large portion of leaf as they grow
   - Spray of endrin 0.02% /parathion 0.025%/ monocrotophos 0.04%

### Major diseases of fruits of Nepal:

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<tr>
<th>SN</th>
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<th>SYMPTOMS</th>
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<tbody>
<tr>
<td>1</td>
<td><em>Apple/Peach/Pear</em> DISEASES:</td>
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<tr>
<td>1</td>
<td><strong>TEMPERATE FRUIT’S DISEASES:</strong></td>
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<tr>
<td>1</td>
<td><strong>TROPICAL FRUIT’S DISEASE:</strong></td>
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<tr>
<td>1</td>
<td><strong>BANANA</strong></td>
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</table>
### 1. Pseudostem rot or Heart rot

*Fusarium*
*Gloeosporium*
*Botryodiplodia*
(fungal disease)

The inner leaves rot and die, and thus interfere with the emergence of new leaves. The rot gradually travels down towards the rhizome and prevents the emergence of inflorescence.

- **Prevention**: Sanitation, good drainage adequate spacing is recommended.
- **Control**: Timely spraying the plants with Bordeaux mixture is also helpful.

### 2. Black tip

*Helminthosporium torulosum*
(fungal disease)

Elongated spots with grey centres are produced on the leaf. The spots enlarge to form large patches, blighting portions of the leaf blade. It infects the fruit mostly at the tip, starting from the floral remnants.

- **Prevention**: The diseased fruits in a bunch must be removed.
- **Control**: Preventive sprays with fungicides yield good result.

### 3. Anthracnose

*Gloeosporium musarum*
(fungal disease)

Dark blotchy areas appear on the skin of the ripening fruit and enlarge rapidly.

- **Prevention**: Spraying with Bordeaux mixture, Dithane Z-78 or Difolaton (0.2%) gives good control.

### 4. Black finger

*Dothiorella gregaria*
(fungal disease)

It is the disease of young finger. Small raised pustules on the skin is seen. One or more finger may develop a jet black decay commencing at the tip and extending back until the whole fruit is affected.

- **Prevention**: Use the fungicide : salicylanilide

### 5. Moko disease

*Pseudomonas solanacearum*
(bacterial disease)

Development of the yellowish discoloration of the inner leaf lamina close to the petiole.

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**Reference:**

- Arya, Arun, 1993, *Tropical Fruits Diseases and pests*