Common Pest and diseases on *Cedrus libani* Forest in Lebanon

Entomology and Pathology of Lebanese Forests

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Outline

1. Introduction
2. Pests and requirements
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   2. Ecological conditions
   3. Agronomic conditions
3. Major *Cedrus libani* pests
Cedrus libani occurs in:

- Lebanon (approximately 1,700 ha)
- Syria (20,000 ha)
- Turkey within a large area in Southern Anatolia in particular in Taurus Mountain (150,000 ha) which has the densest cover.

Cedars of Lebanon, despite their relatively low density, are of great importance:

- In preserving the genetic diversity of the species
- Constitute the southernmost cedar population
- Primary source of ornamental cedars widespread globally

1. Introduction (2/3)

The Ministry of Environment and the Ministry of Agriculture in Lebanon have designated some of these cedars forests as protected areas:

- Three are natural forest reserves (Barouk, Ehden and Tannourine)
- One protected natural site: Al Quammoua area
- And the following sites are now protected forests: Barouk, Tannourine, Jaje, Quammoua, Sir El Dinniyeh and Sweisse
Lebanon has witnessed a proliferation of forest pests over the past years that have caused extensive damage to several forests.

The most serious and recent infestations were:

- **Pine processionary moth** that infested pine forests,
- **Cephalcia tannourinensis**, the Cedar web-spinning sawfly that infested and devastated cedar forests in Tannourine and Hadath El Jebbe (one of the largest cedar forests in Lebanon).

### 2. Pests and requirements (1/3)

**Environmental, Ecological and Agronomic Conditions are required**

#### 1. Environmental conditions

- **Temperature**: is probably the most important environmental factor influencing insect behavior, distribution, development, survival, and reproduction.
- **Soil**: A crop plant to resist or tolerate pests is tied to optimal physical, chemical and biological properties of soils.
- **Humidity**: have a direct and indirect effect on the insect behavior and spread.
2. Pests and requirements (2/3)

2. Ecological conditions

• Monocultures possess the necessary ecological conditions for out breaking pest populations.
• Absence of Natural enemies.
• Unhealthy tree/forest
• Reduction of diversity.

2. Pests and requirements (3/3)

3. Agronomic conditions

• Dense population restricts wind movement within plant canopy leading to high humidity build up. This creates congenial condition for pest multiplication.
• High Yielding Crop cultivars can provide improved conditions for pest colonisation, spread and rapid growth.
• Intensification- reduction of intervals between plantings of the same crop, or overlap of crops, which provides a continuous resource to pests.
• Fertilization with high ‘N’ contents.
• Pesticide usage - indirectly effect to Reduction of natural enemies
• Lack of rules, regulations and standards for Imported seeds, fertilizer, equipments Which imported with pests.
1. **The Gypsy Moth**

<table>
<thead>
<tr>
<th>Order:</th>
<th>Lepidoptera</th>
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<td>Family:</td>
<td>Lymantriidae</td>
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<td>Genus:</td>
<td>Lymantria</td>
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**Description**

**Eggs**
Grey, pellet-like eggs (ca 1 mm diam.) are laid in single clusters, or masses, from 80 to 1200 individuals. Egg masses are found mainly on trunks or lower branches, but also on rocks, walls, fences, etc.

**Larvae**
Males and females usually go through five and six instars, respectively. All instars are hairy but show considerable variation in their coloration. First instars are grey-black. Later instars are more colorful with black, yellow, blue and red patterns.

**Pupae**
Pupae are dark brown and matted with reddish hairs, and are attached to trunks, stones or other objects by silken threads. Male and female pupae are 2-3 cm and 3-4 cm long, respectively.

**Adults**
Sexes show sexual dimorphism. The male has a slender body and is grey-brown in colour, with dark wing markings. The wingspan is about 3-4 cm. Antennae are plumose and much longer than in the female. The female has a larger wingspan (4-7 cm) and body. Her wing colors are nearly all white with wavy, black bands across the forewing. Her abdomen is distended with an egg mass, and is white with yellowish hairs. Females produce a pheromone that attracts males for mating.
Life cycle

- **Eggs** hatch from late April through early May with most eggs hatching by mid-May.
- Small **first instar larvae** do not feed right after they hatch and can be dispersed by wind. **Young larvae feed on foliage and remain on host plants night and day.**
- In late **May** when about half-grown, **larvae change their behavior** and usually **feed in the trees at night**, and **move down to seek shelter in bark** crevices or other protected sites during the day.
- **Larvae** reach maturity from mid-June to early July.
- Migrating **caterpillars** are often a nuisance during the last two weeks of June.
- **Pupation** takes place during late June and early July.
- **Adults** start emerging in late June with peak emergence in mid-July.

**Damage**

This key pest is **indirectly** responsible for **causing mortality** of susceptible host trees. **Heavy defoliation** by the larval stage of this pest causes stress to infested host plants. **Secondary organisms** such as the two lined chestnut borer, *Agrilus bilineatus*, and shoestring root rot, *Armillaria* spp., **successfully attack stressed trees causing mortality.**

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**2. The Cedar Web-spinning Sawfly**

**Order**: Hymenoptera  
**Family**: Pamphiliidae  
**Genus**: Cephalcia  
**Species**: tannourinensis

**Morphology**

The adult has a flattened body, 7-11 mm long, with **long antennae** and **narrow wings** which are almost transparent and with dark venation. **The larva is green**, with **three pairs of legs on the thorax and a single pair of anal prolegs.**
Life cycle
The adults appear in April-June, each female placing about 50 eggs on the needles of new buds. As they open, the larvae feed on them and cause their browning. A larva may consume several needles. The mature larvae drop to the soil wherein they enter into one of two types of diapause: annual and for several years, determined by the soil moisture and temperature. The pest has one annual generation, but cannot survive in sandy soils or in peat.

Damage
This major pest of *C. libani*, causes needle browning, defoliation and tree decline. Heavily infested forests turn brown, looking as if burnt. In Lebanon the rate of attack came to 70-80%. Such heavy infestations may cause the death of cedars.

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*Order: Lepidoptera*
*Family: Tortricidae*
*Genus: Acleris*
*Species: A. undulana*

Description
*Acleris undulana* was described in the cedar forest of Asia Minor. Found on Cedrus libani and other cedrus species. It cause successive severe defoliations and it made the object of a different studies.
Life cycle

Aclecia undulana has one generation per year.

- Oviposition takes place in spring: **between mid May and mid June**

- The eggs are **glued** by the female in a kind of **bouquet** of about thirty specimens in general, **between the new needles** of the year that have just finished their growth.

- After some days of incubation (from 4 to 10 days), eggs give birth to larvae that pass through 5 **stages of development** before pupation:
  - **Caterpillars feed hidden** in a kind of **sheath** made by the larva by joining the new needles by silky threads
  - Only from the **fourth stage and during the fifth** that larvae can **feed without building true sheaths**.
  - During the **last stage**, the caterpillars consume the **old needles also**.

- **Pupation takes place in mid July**: pupae are localized in **sheaths of needles** either attacked or not and even in the bark crevices.

- The **adults** emerge at the **end of July** or at the beginning of August and **take shelter in cracks of trunks** or in the branches covered with lichens where they spend the **winter**.

During this very long period, females undergo an interruption in the development of their reproductive system, i.e. **ovarian diapause**. On the contrary, males appear ready to reproduce in fall, but will not **copulate** until the following **spring**, when females have finished their diapause.
Damage

An A. undulana caterpillar consumes 4 to 6 buds during its development, corresponding to 0.45 - 0.76 g of needles. Caterpillars also consume old needles of the previous year. The insect attacks the whole tree irrespective of its age and its site. From far away, damage is visible on a group of trees, by their yellow-brown colour due to the desiccated foliage. On branches, we can see the attacked needles gathered by silky threads in a kind of sheath. The dead needles strew the ground while some are still joined between them.

It is very difficult to control this insect because caterpillars are very well hidden between needles, in sheath inaccessible to chemical treatments. Control becomes possible when caterpillars feed in the open air during the 4th or the 5th stage.

Epinotia cedricida

Order: Lepidoptera
Family: Tortricidae
Genus: Epinotia
Species: E. cedricida

Description

- *Epinotia cedricida* is a species of moth of the *Tortricidae* family.
- Found in Morocco, Algeria, Lebanon and Turkey.
- Introduced species in Europe, where it has been recorded from south-eastern France, Spain and Austria.

The wingspan is 12–15 mm. Adults are on wing from June to August. The larvae feed on Cedrus species, including Cedrus atlantica and Cedrus libani.
Life cycle

• Only one generation per year.
• The eggs are laid separately in anfractuosities of the bark of branches or in the bouquets of needles.
• The larval development extends from mid September until April of the following year while passing through six stages.
  1. Stage 1 and 2: having just hatched begins by digging a hole in a needle situated on the outside crown of a bouquet of needles. It consumes parenchyma cells and bores a mine occupying only a part of the section of the needle.
  2. Stage 3 and 4: the mining occupies the totality of the needle. The caterpillars also build a tunnel of silk that constitutes a sort of shell that protects larvae from the bad weather.

  3. From the 4th stage and until the 5th, they gnaw needles outside, initially partly then more or less completely.

  4. Stage 6: Leave their shelter and consume a large number of needles. The development ends from the beginning of February until the end of May before the appearance of the new needles on the trees. Caterpillars then drop to the ground with a thread of silk, and pupate in a silky cocoon at some centimeters of depth in the litter. The emergence of adults takes place later, from mid July until the end of August.
Damage

The larvae consume needles of all ages; trees can be completely defoliated before the appearance of the new needles and thus cause extensive damage. The most damage is to 25-30 years old plantations. No preventive measures have been taken until now because they have been economically not justified.
**Cinara cedri**

Order: Hemiptera  
Suborder: Sternorrhyncha  
Family: Aphididae  
Genus: Cinara  
Species: Cinara cedri

**Description**

- Cinara cedri is probably native to the natural distribution range of the Lebanese cedar where its principal parasitoid was located.  
- The aphid forms small colonies on the twigs and small to large colonies on branches.

The apterae (wingless) forms of the large cedar aphid are dark gray in color; its body length reach up 3.8 mm; a pair of bracket longitudinal band on the body is rather conspicuous as well as its black siphunculi (special dorsal structures).

**Life cycle**

The aphid covered large compact colonies on:  
the twigs and the branches and even trunks (5-6 cm diameter)

- Populations start to build up early in the spring (February – March)  
- Reach high densities during the succeeding months  
- In mid-summer the populations decline and become quite rare although small colonies may be found by tracing ant activity on the trees.

**Damages**

The feeding involves secretion of large amount of honeydew which cover the foliage and the bark upon which dense layer of sooty mold (fungus) develops.

Trees may suffer more from the infestation which may lead to significant loss of needles.

The populations of C. cedri are still easily detected and responsible for the infrequently soiling (make dirty) of the lower branches canopy with honeydew, although the damage is limited.
Megastigmus schimitscheki

Order: Hymenoptera  
Family: Torymidae  
Genus: Megastigmus  
Species: Megastigmus schimitscheki

Description and damage

It is bound to the natural area of the C. libani in the East of the. It was accidentally introduced on C. atlantica in France in about 1994 where it causes very major damage. Such organisms are not easily surveyed because of their cryptic way of life, and their impact is thus difficult to estimate.

The insect damages is to the seeds and this may largely influence the reproductive ability and the natural regeneration of the tree.