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## Insect pest complex of apple nurseries in North Kashmir

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### Abstract

Studies were carried out during the year 2016-17 in apple nursery of Faculty of Agriculture Wadura. The purpose was to monitor insect pest complex of apple nursery. Fruit trees in Jammu and Kashmir like other plantations are facing many problems like varying climatic conditions, undulating topography, soil conditions and soil erosion. They are exposed to ravages of pests. These crops are prone to attack by pests which are one of the major limiting factors. Fourteen insect-pests of four different orders were recorded at the experimental site, among these 4 insects belonged to Hymenoptera (*Quadraspidiotus perniciosus*, *Aphis pomi*, *Anuraphis* spp, *Halyomorpha hayla*), 7 to Coleoptera (*Altica* spp, *Chaetocnema pulicaria*, *Melolontha furcicauda*, *Brahmina* spp *Holotrichia longipennis*, *Oryctes* spp, *Protaetia speciosa*) and 2 each to Lepidoptera (*Choristoneura roseceana*, *Rhopobota navena*) and Homoptera (*Typhlocyba pomaria*), respectively. Apart from these, 14 insect species 2 non-insect pests / mite species belonging to order 2 Acarina (*Panonychus ulmi*, *Tetranychus urticae*) were recorded from the site. All the parts of the plant like leaves flowers twigs and roots were damaged by foliage feeders while sucking insect pests sucked the plant sap. Among these San Jose scale and leaf rollers caused serious damage to the nurseries.

**Keywords:** Apple, pest complex, host range, nature of damage

### 1. Introduction

Apple (*Malus domestica* Borkh), is the commonly domesticated fruit tree in all temperate regions of the world. It belongs to the sub family Pomoideae and the family Rosacea and is grown in temperate and subtropical regions of the world. The apple is believed to have originated in the Caucasus Mountains of South western Asia (Kazakhstan and China) [7]. It has been cultivated in Southeast Asia and Europe from times immemorial and has been spread by man in all temperate belts of the world. The chief apple producing countries are U.S.A., Germany, France, Japan, Russia, Argentina, Turkey, Italy, Spain and China [7]. Lawrence has called Kashmir a fruit country in his famous book "The Valley of Kashmir" however, horticulture started in an organized form around 1865 when Ermus, Head gardener of Public Works Department in France, after a preliminary survey introduced some fruit plants at Chashma-shahi, Srinagar in 1875 [10].

It is estimated that annual world production of apple is more than 56 million tones and in India production of apple is more than 17 million tones. The major apple producing countries are USA (8.27%), Argentina (2.14%), China (23.82%), Turkey (4.19%), France (3.42%), Germany (2.50%), Italy (2.55%), Poland (3.74%), and Russia Fed (3.75%). India with world a production share of 2.36% ranks 11<sup>th</sup>. The major apple producing states include Jammu and Kashmir (80%), Himachal Pradesh (12.5%), Uttarakhand (6.0%), Arunachal Pradesh (1.4%). The area of apple in Jammu and Kashmir is (161773 ha) with annual production of 1966417 tones with productivity of 12.6 tons during (2015-16) District Baramulla ranks first in both area and production [1].

Apples grown in Kashmir holds the national and international pride for its delicacy, but fruit yield, fruit quality and even growth of the apple plants are directly influenced by a number of factors viz., insect pests, diseases, disorders etc. Among these factors, number of insect pests and diseases usually at all the stages of growth causing huge economic loss to growers as growers invest so much on pesticide applications. The most important pests attacking apple are, European red mite (*P. ulmi* Koch), two spotted spider mite (*T. urticae* Koch), San Jose scale (*Q. perniciosus* Comstock), woolly apple aphid (*E. lanigerum* Hausman),

hairy caterpillar (*L. obfuscata* Walker), apple stem borer (*A. sarta* Solsky), leaf roller (*A. pomivora* Meyrick & Blossom) and thrips (*Taenistrips rhalpal antennalis* Sumshar) [2]. Among these pests, San Jose scale and European red mite are key pests and cause huge economic losses. Besides these few non-insect pests viz. rodents and bear are also posing a threat in most of the apple growing areas.

With the intensification and monoculture of selective cultivars of apple there has been a considerable increase in insect pest infestation in the state. The pest complex of apple includes a wide range of species with diverse habits. Some are confined to apple and related deciduous fruits, viz., codling moth (*C. pomonella* Linn.), *E. lanigearum* Hausmann, whereas others have wide range of host plants, viz., *Q. perniciosus* Comstock, *L. obfuscata* Walker, (*S. nitidus* Solsky), *P. ulmi* Koch). The incidence of these pests varies from year to year and area to area because of changes in the factors influencing their population dynamics and dispersal. San Jose scale is one of the most destructive pests, which is regularly associated with an apple in Kashmir. About 150 species of agricultural pests and 70 species of causative agents of diseases are potentially dangerous for orchards [6].

## 2. Material and Methods

Insect pests of Apple nurseries located at Faculty of

Agriculture, Wadura were monitored during the year 2016-17. The immature stages of pests were collected for rearing in the laboratory. Collected insects were killed in ethyl estate, mounted with insect pins depending on size and labelled properly. They were preserved in boxes using naphthalene balls as repellent for identification. The present investigation, "Studies on insect pest complex of apple nurseries" was carried out at the Regional Research station and faculty of agriculture (RRS and FOA) Wadura (SKUAST-K). Different insect pests were observed at the experimental sites. Apple nurseries located at, (RRS and FOA) Wadura shall be surveyed for various insect pests and specimens shall be collected. Weekly observations shall be taken in the apple nursery to know the status of insect pest. Sap suckers shall be counted on per leaf basis, however San Jose scale shall be estimated on per cm length of twig. Ten plants shall be tagged and data regarding various pests shall be collected at weekly interval. Leaf damage for foliage feeders shall be calculated

$$\text{Damage percentage} = \frac{\text{No. of damaged plants}}{\text{Total number of plants}} \times 100$$

Estimation of pest population of soil borne insects shall be carried out by excavating soil at a dimension of 20x20x21cm<sup>3</sup>[13].

**Table 1:** Pest complex on apple nursery at Wadura during year 2016-17

| S. No | Common Name       | Scientific name   | Family: Order             | Nature of damage  | Host range  | Period of Prevalence | Peak period                       | Status |
|-------|-------------------|---|---------------------------|---|---|----------------------|-----------------------------------|--------|
| 1     | San Jose Scale    | <i>Quadraspidiotus perniciosus</i>  | Diaspididae; Hemiptera    | Nymphs and adult female suck sap from stem, and twigs                           | Polyphagous<br><i>Malus domestica</i> ,<br><i>Pyrus communis</i> ,<br><i>Prunus persica</i> , <i>P. domestica</i> , <i>P. avium</i> etc | April – November     | 1 <sup>st</sup> Fortnight of July | Major  |
| 2     | Leaf roller       | <i>Choristoneura roseceana</i><br><i>Rhopobota navena</i>   | Tortricidae; Lepidoptera  | Rolls leaves and feed inside at terminal portion                                | Polyphagous<br><i>Malus domestica</i> , <i>Pyrus communis</i> ,<br><i>Quercus robar</i>   | April – October      | 2 <sup>nd</sup> Fortnight of July | Major  |
| 3     | Flea beetle       | <i>Altica spp</i><br><i>Chaetocnema pulicaria</i>   | Chrysomelidae; Coleoptera | Feed on leaves making circular holes, leaving only leaf lamina intact           | Polyphagous<br><i>Rumex spp</i><br><i>Malus domestica</i><br><i>Brassica oleracea</i><br><i>Solnum lycopersicum</i> etc                 | April-October        | 1 <sup>st</sup> Fortnight of June | Minor  |
| 4     | Chaffer beetle    | <i>Melolontha furcicauda</i> ,<br><i>Brahmina spp</i> ,<br><i>Holotrichia longipennis</i> and<br><i>Oryctes spp</i> | Scarabaeidae; Coleoptera  | Grubs feed on roots destroy ing seedlings, adults feed on leaves                | Polyphagous<br><i>Malus domestica</i> , <i>Pyrus communis</i> ,<br><i>Prunus persica</i><br>Etc   | May – August         | 1 <sup>st</sup> Fortnight of June | Minor  |
| 5     | European red mite | <i>Panonychus ulmi</i>  | Tetranychidae; Acarina    | Suck leaves which result in brozing   | <i>Malus domestica</i><br><i>Pyrus communis</i> ,<br><i>Prunus persica</i> ,  | May-September        | 1 <sup>st</sup> Fortnight of June | Minor  |
| 6     | Two spotted mite  | <i>Tetranychus urticae</i>  | Tetranychidae Acarina     | Suck contents of plant, causing damage to leaves and flowers                    | <i>Malus domestica</i> , <i>Pyrus communis</i> ,<br><i>Prunus persica</i> ,<br><i>P. avium</i>  | May – August         | 1 <sup>st</sup> Fortnight of June | Minor  |
| 7     | Green aphid       | <i>Aphis pomi</i>   | Aphididae; Hemiptera      | Nymph and adults suck cell sap from tender leaves and terminal portion of plant | <i>Malus domestica</i> , <i>Pyrus communis</i> ,<br><i>Prunus avium</i>   | April – October      | 2 <sup>nd</sup> Fortnight of July | Minor  |
| 8     | Black aphid       | <i>Anuraphis spp</i>  | Aphididae; Hemiptera      | Nymph and adults suck cell sap from tender leaves and terminal portion of plant | <i>Malus domestica</i> , <i>Prunus persica</i><br><i>Prunus avium</i>   | April - November     | 2 <sup>nd</sup> Fortnight of July | Minor  |
| 9     | Apple hopper      | <i>Typhlocyba</i>   | Cicadellida;              | Nymph and adults  | <i>Malus domestica</i> , <i>Pyrus</i>   | April-               | 2 <sup>nd</sup> Fortnight         | Major  |

|    |                      |                            |                        |  |  |                 |                                     |       |
|----|----------------------|----------------------------|------------------------|--|--|-----------------|-------------------------------------|-------|
|    |                      | <i>pomaria</i>             | Homoptera              | suck cell sap from tender parts                  | <i>communis, Prunus persica, Prunus domestica</i>                        | September       | of June                             |       |
| 10 | Flower eating beetle | <i>Protaettia speciosa</i> | Cetonidae: Coleoptera  | Feed on leaves and flowers                       | <i>Malus domestica, Pyrus communis,</i>                                  | August          | 2 <sup>nd</sup> Fortnight of August | Minor |
| 11 | Stink bug            | <i>Halyomorpha hayla</i>   | Pentatomida: Hemiptera | Nymph and adults suck cell sap from tender parts | <i>Malus domestica, Pyrus communis, Prunus persica, Prunus domestica</i> | May – September | 2 <sup>nd</sup> Fortnight of July   | Minor |

### 3. Results and Discussion

Table 1 reveals that the nine insect-pests were recorded during year the 2016-17 on apple nurseries, among these 4 insects belonged to Hmiptera, 3 to Coleoptera and 1 each to Lepidoptera and Homoptera. Hemiptera includes (*Q. perniciosus*, *A. pomi*, *Anuraphis* spp, *Halyomorpha hayla*); Coleoptera includes (*Altica* spp, *C. pulicaria*, *M. furcicauda*, *Brahmina* spp *H. longipennis*, *Oryctes* spp, *P. speciosa*); Lepidoptera includes (*C. roseceana*, *R. navena*); Homoptera (*T. pomaria*). Apart from these, 9 insect pests 2 non-insect pests belonging to order 2 Acrina were recorded from the experimental site. Acrina includes (*Panonychus. ulmi*, *T. urticae*).

#### 3.1 Foliage feeding pests

**3.1.1 Chaffer beetles:** White grubs, members of the (Scarabaeidae: Coleoptera). The Pest becomes active from May to August. Peak period of activity was found during the first fort night of June. Grubs feed on the roots destroying seedlings and adults feed on leaves. (Under temperate climates like Kashmir, observed the grub activates during spring and within a couple of weeks the infestation results in the development of symptomatic yellow patches <sup>[14]</sup>).

**3.1.2 Flea beetles:** These beetles belong to (Chrysomelidae: Coleoptera). The Pest becomes active from April to October. Peak period of activity was found during the first fort night of June. These beetles feed on the leaves making circular holes, leaving only leaf lamina intact. Flea beetles nibble small round holes into leaves, decreasing assimilation surface and slowing down the growth of the plant <sup>[15]</sup>.

**3.1.3 Leaf roller:** These belong to (Tortricidae: Lepidoptera). The Pest becomes active from April to October. Peak period of activity was found during first fort night of July. Roll leaves and feed inside at terminal portion. In temperate region of Jammu and Kashmir, 64 species of tortricid moths have been reported (out of which only two are yet known to damage apple crop. These are codling moth, *C. pomonella* (Linnaeus), which occurs as severe problem in Ladakh region and Archips moth, *A. pomivora* Meyrick which appears sporadically in Kashmir valley <sup>[3]</sup> while as a Blackheaded fireworm, *Rhopobota naevana* (Hubner) is emerging as serious problem in apple orchards particularly on young plants.

**3.1.4 Flower eating beetle:** These beetles are the members of (Cetonidae: Coleoptera). The Pest becomes active from August - September. Peak period of activity was found during 2<sup>nd</sup> Fortnight of August. These beetles feed on leaves and flowers. Scarabeidae are found all over the world except in Antarctica <sup>[4]</sup>.

#### 3.2 Sap sucking pests

**3.2.1 San Jose scale:** Scales belong to (Diaspididae: Hemiptera). These scales become active from April –

November. Peak period of activity was found during 1<sup>st</sup> Fortnight of July. Damage is caused by nymphs and adult female. These suck sap from stem, and twigs. San Jose scale is a problem particularly in large, older trees where it is difficult to achieve good spray coverage, but young, unsprayed trees may also be vulnerable. The pest has become of increasing concern to the Northwest tree fruit industry due to the importance of exports, as phytosanitary regulations bar infested fruit from some countries. It is widely distributed in all the apple growing countries of the world. In India, it was introduced from France in 1906 and now has been recorded on more than 32 host plants <sup>[9]</sup>. It has spread to every continent except Antarctica. The pest prefers to feed on plants belonging to the family Rosaceae such as apple and pear but can survive on other fruits of the hilly region. Thus, more than 700 host plants have been recorded.

**3.2.2 Aphids:** Aphids belong to (Aphididae: Hemiptera). These scales become active from April – November. Peak period of activity was found during the 1<sup>st</sup> Fortnight of July. Activity of green aphids and black aphids was found during April –October and April –November respectively. Peak period of activity was found during the 1<sup>st</sup> Fortnight of July. Damage is caused by nymph and adults. These suck cell sap from the tender leaves and terminal portion of the plant. Apple trees can be infested with more than 15 aphid species. Among them, the green apple aphid (*Aphis pomi* (de Geer)) (Hemiptera, Aphididae), the rosy apple aphid (*Dysaphis plantaginea* Passerini)) (Hemiptera: Aphididae) and the wooly apple aphid (*Eriosoma lanigerum* (Haussmann)) (Hemiptera: Eriosomatidae) are considered to be serious pests of apple orchards worldwide <sup>[8]</sup>.

**3.2.3 Mites:** Mites are the members of (Tetranychidae: Acarina). European red mite becomes active from May – August, two spotted mite becomes active from May to August and peak period of activity of both mites was found during the 1<sup>st</sup> Fortnight of June. European red mite sucks leaves which result in bronzing. While two spotted mite as sucks contents of plant, causing damage to leaves and flowers. The mites feed on plant sap and unless they are crowded they will mostly be found alongside the veins on the underside of the leaves <sup>[5]</sup>.

**3.2.4 Stink bug:** These bugs belong to (Pentatomida: Hemiptera). The Pest becomes active from May - September. Peak period of activity was found during the 2<sup>nd</sup> Fortnight of July. These beetles feed on leaves and flowers. Feeding on apple early in the season causes a dimple on the surface of the fruit with a trail into the fruit flesh toward the seeds or calyx <sup>[12]</sup>.

**3.2.5 Apple hopper:** Hoppers belong to (Cicadellidae: Homoptera). The Pest becomes active from April- September. Peak period of activity was found during the 2<sup>nd</sup> Fortnight of June. Nymph and adults suck cell sap from tender parts.

Damage is caused by nymphs and adults removing chlorophyll and sap from the lower leaf surface which can affect fruit development and bud formation. Adults may be a nuisance if they are abundant at harvest as they can be inhaled by pickers. Leaf hopper feeding removes chlorophyll from palisade cells and may thus influence photosynthesis<sup>[3, 11]</sup>.

#### 4. Conclusion

From the above investigations it was observed that various pest species infested different parts including leaves, stem, twigs, flowers and roots. Among the pests studied, San Jose scale and leaf roller appeared as major pests in the nurseries hence, these pests need to be managed at an earliest for quality plantation. Apple leaf roller damaged the apical portion of the plant by breaking the apical dominance and lead to side branching ultimately infested plants become weak and the plants are prone to other diseases like dieback. Further investigations are needed in this regard so that apple growers and nursery growers would be able to produce a quality material to the market.

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