Prunus necrotic ringspot virus (Almond bud failure)

1. Identity

Preferred Scientific Name:

- *Prunus necrotic ringspot virus* (PNRSV)

Other Scientific Names:

- Cherry line pattern virus
- European plum line pattern virus
- Hop B virus
- Hop C virus
- North American plum line pattern virus
- Peach ringspot virus
- Plum (North American) line pattern virus
- Plum line pattern virus
- Prunus necrotic ringspot ilarvirus
- Prunus ringspot virus
- Rose Chlorotic mottle virus
- Rose line pattern virus
- Rose vein banding virus
- Rose yellow mosaic virus
- Rose yellow vein mosaic virus
- Sour cherry necrotic ringspot virus

Figure 1: rings on leaves of a rose infected with PNRSV. Photo courtesy of www1.biologie.uni-hamburg.de

Common Names:

- Almond bud failure

Taxonomic position: Domain: Virus **Group:** RNA viruses: **Higher classification:** Ilarvirus

Family: Bromoviridae

2. Hosts/Species affected

Commonly affected host plants include: *Begonia*, *Cucumis sativus* (Cucumber), H*umulus lupus* (Hop), Lilium (lily), *Malus domestica* (apple), Pelargoniums, *Prunus domestica* (Plum*), Prunus cerasus* (Sour Cherry), *Prunus dulcis* (almond), *Prunus persica*(Peach), Rosa (Roses) and *Rubus* (Blackberry, Raspberry).

3. Growth stages of host plants affected

Prunus Necrotic ringspot virus attacks during any of the following stages of plant growth: Seedling stage, Vegetative growing stage, flowering stage and the fruiting stage.

4. Biology and Ecology

PNRSV is transmitted through propagating materials such as seed, bud woods, rootstocks and grafted nursery materials. The virus is also transmitted via pollen where it is carried internally or externally on pollen grains (Cole et al., 1982; Hamilton et al., 1984; Digiaro and Savino, 1992; Aparicio et al., 1999b). Infected pollen is majorly the agent of transmission with pollinating insects such as honeybees greatly aiding the spread (George and Davidson, 1963; Davidson, 1976). In controlled environments such as greenhouses, PNRSV has been observed to be transmitted by Thrips (*Thrips tabaci & Frankliniella occidentalis*) carrying infected pollen (Greber et al., 1991, 1992).

PNRSV spread in the field and orchards can occur very fast. Disease incidence has been observed to increase from 2 to 78% in four years in a cherry orchard in New York State, USA (Klos and Parker 1960). Symptoms appear in two weeks to two years once infection occurs. On older and well established trees, the infection may remain latent. Symptoms vary in severity depending on age and conditions of planting. Symptoms develop best at temperatures of 20-24°C with shoot diebacks being more severe at higher temperatures.

5. Symptoms

PNRSV pathogenicity varies depending on the strains, isolates and biotypes. Pathogenicity ranges from very severe, to mild, to symptomless affecting leaves, shoots and fruits (Fulton, 1981; Németh, 1986; Desvignes, 1999). PNRSV also produces a variety of symptoms in different host species especially stone fruits or even within same species of host plant depending on the strain of the virus. Some strains do not produce visible symptoms they are detectable only by inoculation to woody indicator plants, serological tests or other molecular techniques. PNRSV infection initially causes shock, then chronic symptoms in most woody hosts.

Figure 2: Shot-hole symptoms on sweet cherry leaves. Photo courtesy of www.cabi.org/cpc/datasheet/42426

Symptoms exhibited by PNRSV are classified as chlorosis, necrosis, leaf deformity, stunting and shot holes. Chlorosis on leaves appear as patterns of rings, lines, bands, spots, mottles and mosaic. Necrosis occurs during the initial acute stage on buds, leaves, shoots, large branches and roots. Epinasty, twisting, rugosity and enations can also be seen on infected leaves. The entire plant or some portions also get stunted in growth.

6. Means of movement and dispersal

The virus is spread by pollinating insects within and between orchards. In long distances it is spread by infected propagative materials and nursery stocks (Hamilton, 1985; Garret et al., 1985; Mink, 1995). Specific commodities such as pollen and seed are also pathways of introduction in new areas.

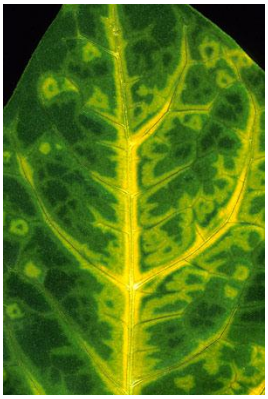

Figure 3: Symptoms of PNRSV on an infected Cowpea leaf (Cornel University).

7. Movement in Trade

Plant parts liable to carry the pathogen is trade include: Flowers, leaves, roots, seedlings, micro-propagated plants, stems, shoots, trunks, branches and true seeds including grain (CABI,2016). Movement in trade is common through plants for planting and cut-flowers.

8. Impact

The virus has been reported to cause yield losses of up to 95% in peaches (Wood et al., 1997). Growth and yield reduction of up to 60% has also been recorded in sour and sweet cherries (Hilsendengen, 1999).

9. Phytosanitary significance

Prunus necrotic ringspot virus (PNRSV) is currently regulated in Annex II AI (d).12 of Council Directive 2000/29/EC on plants of Rubus L., intended for planting. It is not regulated on any other host plants. However there are recommendations that PNRSV be listed as a Regulated Non-Quarantine Pest on other relevant host plants e.g. Prunus (EFSA, 2015).

10. Detection and inspection

Detection of PNRSV is through visual examination based on symptoms of the host plants during the shock phase. It may be difficult or impossible to detect in the field during chronic infection (Desvignes, 1999). In the laboratory, the virus can be diagnosed through the molecular based techniques such as Conventional PCR using degenerate primers.

11. Management

- Planting stock should be obtained from nurseries that have been subjected to virus based certification schemes.
- Tested nursery stock that is free from PNRSV should be used.
- Care should be taken such that infected pollen should not be introduced into healthy orchards during pollination
- Infected trees should be rogued and properly discarded
- Use of thermotherapy (24 to 32 days at 38°C) and/or apical meristem culture (Gella and Errea, 1998)

12. References

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