Strawberry Latent Ringspot Virus

a. Virus/pathogen name, including accepted acronyms and synonyms

Strawberry latent ringspot, SLRSV– Genus *Stralarivirus*, Family *Secoviridae*, Order *Picornavirales*.

b. Host range, including resistance or tolerance within the crop hosts, alternate hosts

SLRSV has a host range that exceeds 126 species belonging to 27 families. Hosts include strawberry, rubus spp., backberry and red raspberry, prunus spp., apricot, cherry, plum, peach and Japanese plum, blueberry, grapevine (*Vitis vinifera*), black and red Currant, mint, rose, impatiens (*Impatiens walleriana*) and pepino (*Solanum muricatum*). The virus infects, often without symptoms, a wide range of commonly used herbaceous test plants, such as *Chenopodium amaranticolor*, *Chenopodiumquinoa* and *Nicotiana tabacum*. *Cucumis sativus* is the best host for propagation and *Chenopodium murale* the most reliable local lesion host. *C. sativus* and *Petunia hybrida* are useful "bait" plants for use in nematode transmission experiments.

c. Symptoms on crop host including varietal differences with images of symptoms when available

SLRSV is often found in association with *Arabis mosaic virus* (ArMV), as they are both transmitted by the same nematode vector, *Xiphinema diversicaudatum*. Depending on the cultivar, these viruses may cause similar symptoms, such as stunting, failure to produce fruit and yellow speckling, mottling, downward curling, vein yellowing or yellow net symptoms in leaves. The symptoms on blackberry and raspberry are mostly yellowing and stunting, giving rise to the name “Raspberry yellow dwarf disease” used to describe red raspberry plants infected with these two viruses. Strawberry plants in the United States that are infected with SLRSV are symptomless, or when symptomatic, are infected with at least one additional virus. SLRSV cause chlorotic ringspots and stunting in Rosa species.

Usually no symptoms are observed in the herbaceous hosts, in *N. tabacum* and *P. hybrida* a symptomless systemic infection is generated, in *C. amaranticolor* and *C. quinoa* the symptoms (chlorotic local lesions and systemic chlorosis and necrosis, particularly in the tip leaves) are local and systemic. Isolates of this virus differ in virulence, and symptoms in most hosts are milder in hot weather. As with other nematode-borne virus diseases, outbreaks of ArMV and SLRSV occur in patches, due to the distribution of the vector nematodes in the soil. However, if the disease results from the planting infected stocks, the infected plants are of course distributed randomly throughout the crop.

d. Geographic distribution:

SLRSV is a European virus which has to a limited extent spread to other continents. It is present in Australia, Canada, Chile*, India, Lebanon, Mexico, New Zealand, North Africa (Egypt and Tunisia), Turkey, United States (California, Maryland, Nebraska, Ohio and Oregon) (Martin et al., 2004) and is present throughout Europe (Bulgaria, Poland, United Kingdom, France, Hungary, Italy, Switzerland).

* The paper is at best weak on evidence

e. Means of spread:

Natural transmission is by the nematode *Xiphinema diversicaudatum* and *Xiphinema coxi*. The virus particles adsorb to regions within the nematode esophagus and may be retained and able to be transmitted for long periods. SLRSV is known to be pollen and seed-transmitted in some hosts. This virus can also be spread through vegetatively propagated hardwood cuttings.

f. Recognized diagnostic tests with cited references:

SLRSV can be detected by serological tests such as enzyme-linked immunosorbent assays (ELISAs) (Fiore et al., 2008); antibodies are commercially available. These viruses have broad host ranges and can be detected by mechanical transmission to a number of herbaceous hosts (Stace-Smith, 1987). Also, full sequences have been obtained for these viruses, enabling their detection by reverse transcription polymerase chain reaction (RT-PCR) (Duarte et al., 2016, MacFarlane et al., 2015, Postman et al., 2004).

g. Sampling recommendations for each pathogen including timing and tissue to be sampled

Spring and early summer is the ideal time for sampling nepoviruses. Ideally, the samples should be taken from leaves that are symptomatic and young (3/4 expanded leaves). Sampling from different sites of the same plant increases chances of detection since the pathogen propagules are not evenly distributed within a plant. As this virus can be transmitted through pollen, precaution needs to be taken during flowering periods as pollen from infected material may land on SLRSV-free material which would test positive for the virus. A thorough wash with water before extraction is recommended

h. Management strategies for the pathogen and the vector(s) of the pathogen

The use of certified virus-tested planting material is highly recommended, the virus may be distributed in infected planting material especially because few or no symptoms are visible in tolerant cultivars or in the early stages of infection in sensitive cultivars. Fumigating soil with nematicides prior to planting and keeping the field weed free, is essential for removing potential reservoirs of the viruses. Also, maintaining a cover crop between rows helps minimizing soil movement in the field. This virus spread very slowly from an infection source and can be controlled by removing infected plants plus several additional plants

around the infection focus, taking care to remove as much of the root system as possible, followed by a spot treatment with a nematicide.

i. References

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j. Names of reviewers: Ioannis E. Tzanetakis, Robert R. Martin,

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