Blackberry Raspberry Necrosis Virus

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

Black raspberry necrosis virus, BRNV – Genus *Stromovirus,* Family *Secoviridae,* Order *Picornavirales*

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

BRNV was first described in raspberry plants in Canada in 1955 (Stace-Smith, 1955). Naturally it is restricted to infect only *Rubus* sp. (Halgren et al., 2007). Experimentaly it can infect several species such as *Chenopodium quinoa, C. amaranticolor, Spinacia oleracea, Nicotiana benthamiana, N. occidentalis, N. rustica, N. tabacum, Vigna unguiculata* and *Beta vulgaris* (Halgren et al., 2007; Jones and Murant, 1972)

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

BRNV in black raspberry causes chlorotic mottling, apical necrosis, accompanied with leaf deformation and plant decline (Halgren et al., 2007; Jones and Roberts, 1977). Some red raspberry cultivars are showing mild chlorotic spots on leaves; however most cultivars, such as Newburgh, Latham, St. Regis, Malling Enterprise, Malling Promise, Seedling G and Norflok Giant are symptomless. Inoculations onto *Chenopodium quinoa* and *C. amaranticolor* lead to small chlorotic local lesions on leaves, however most indicator plants are symptomless (Jones and Jennings, 1980; Stace-Smith, 1955).
Black raspberry decline (BRD) is an important disease of black raspberry, causing severe yield reduction and BRNV was often found in plants showing symptoms (Halgren et al., 2007). When present in mixed infections with *Raspberry bushy dwarf virus* in the red raspberry cultivar Lloyd George, BRNV causes raspberry bushy dwarf disease (Jones, 1979), whereas in mixed infections with *Rubus yellow net virus* and *Raspberry leaf mottle virus* causes raspberry mosaic disease (RMD) resulting in serious decline in plant vigor and productivity (Converse, 1987).

c. Geographic distribution:

BRNV is common in *Rubus* plants throughout Europe and North America (Jones and Murant, 1972; Sabanadzovic and Ghanem-Sabanadzovic, 2008; Stace-Smith, 1956).

e. Means of spread:

BRNV is spread by large raspberry aphid *Amphorophora agathonica* and green peach aphid *Myzus* persicae in North America in a non-persistent mode (Halgren et al., 2007), whereas in Europe the virus is spread by *Amphorophora idaei*. Mechanical transmission was achieved from *Rubus* spp. to *C. quinoa* and several others herbaceous species, but not from *C. quinoa* to *Rubus* spp. (Jones and Roberts, 1977; McGavin and MacFarlane, 2009). BRNV is graft transmissible between *Rubus* spp. (Stace-Smith, 1955)

f. Recognized diagnostic tests with cited references:

BRNV can be detected by reverse transcription polymerase chain reaction (RT-PCR) (Halgren et al., 2007; McGavin et al., 2010).

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

In previous studies BRNV was detected from young leaves showing symptoms during spring and early summer (McGavin et al., 2010). Sampling from different sites in the plant could increase the chance of detection.

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

The main way to control BRNV is the use of *Rubus* cultivars resistant to insect vectors as well as the use of certified plant material. Breeding for aphid resistance in some raspberry cultivars was achieved for both vectors, *A. agathonica* and *A. idaei* (Dossett and Finn, 2010; Schliephake, 2010). A recent study showed that BRNV was successfully eliminated from infected plants by thermotherapy (Cheong et al., 2014)

i. References

Cheong, E.J., Jeon, A.R., Kang, J.W., Mock, R., Kinard, G., Li, R., 2014. In vitro elimination of Black raspberry necrosis virus from black raspberry (Rubus occidentalis)-Short Communication. Hortic. Sci. 41, 95–99.

Converse, R.H., 1987. Virus diseases of small fruits. US Department of Agriculture, Agricultural Research Service.
Dossett, M., Finn, C.E., 2010. Identification of resistance to the large raspberry aphid in black raspberry. J. Am. Soc. Hortic. Sci. 135, 438–444.
Halgren, A., Tzanetakis, I.E., Martin, R.R., 2007. Identification, characterization, and detection of Black raspberry necrosis virus. Phytopathology 97, 44–50.
Jones, A.T., 1979. Some effects of latent virus infection in red raspberry, in: II International Symposium on Small Fruit Virus Diseases 95. pp. 63–70.
Jones, A.T., Jennings, D.L., 1980. Genetic control of the reactions of raspberry to black raspberry necrosis, raspberry leaf mottle and raspberry leaf spot viruses. Ann. Appl. Biol. 96, 59–65.
Jones, A.T., Murant, A.F., 1972. Some properties of a mechanically transmissible virus widespread in raspberry (Rubus idaeus) in Scotland. Plant Pathol. 21, 166–170.
Jones, A.T., Roberts, I.M., 1977. Rubus host range, symptomatology and ultrastructural effects of a British isolate of black raspberry necrosis virus. Ann. Appl. Biol. 86, 381–387.
McGavin, W.J., MacFarlane, S.A., 2009. Rubus chlorotic mottle virus, a new sobemovirus infecting raspberry and bramble. Virus Res. 139, 10–13.
McGavin, W.J., McMenemy, L.S., MacFarlane, S.A., 2010. The complete sequence of a UK strain of black raspberry necrosis virus. Arch. Virol. 155, 1897–1899.
Sabanadzovic, S., Ghanem-Sabanadzovic, N.A., 2008. First report of Black raspberry necrosis virus in Rubus canadensis in Tennessee. Plant Dis. 92, 1254–1254.
Schliephake, E., 2010. Aphid resistance in raspberry and feeding behaviour of Amphorophora idaei. J. Plant Dis. Prot. 117, 60–66.
Stace-Smith, R., 1956. Studies on Rubus virus diseases in British Columbia: III. Separation of components of Raspbery mosaic. Can. J. Bot. 34, 435–442.
Stace-Smith, R., 1955. Studies on Rubus virus diseases in British Columbia: II. Black raspberry necrosis. Can. J. Bot. 33, 314–322.

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