

Differential sets

Peronospora effusa (Pe) - Spinach

Downy mildew of spinach is caused by *Peronospora effusa* (Pe), formerly known as *Peronospora farinosa* f. sp. *spinaciae* (Pfs). Resistance to downy mildew in spinach is usually based on major genes that can be overcome by specific races of the pathogen. The number of races of Pe has increased substantially from five in 1996 to nineteen in 2021. All new races were evaluated by the International Working Group on Pe in spinach (IWGP) before denomination.

Spinach breeders and independent researchers collaborate within IWGP to denominate new races as soon as possible on the basis of proven relevance to the spinach industry. The use of a common set of differentials is crucial for this collaboration.

Researchers all over the world are invited to join the IWGP initiative and use the common host differential set to identify new isolates. A limited amount of seed of each differential can be obtained from Naktuinbouw in The Netherlands. Naktuinbouw can also deliver type-isolates of all denominated races, except type-isolate Pe: 9

	Viroflay	NIL 5	NIL 3	NIL 4	NIL 6	NIL 1	NIL 2	NIL 9	Caladonia	Meerkat	Hydrus	Yakalo
Pe: 1	+	-	-	-	-	-	-	-	-	-	-	-
Pe: 2	+	-	+	-	+	-	-	-	-	-	-	-
Pe: 3	+	+	-	-	-	-	-	-	-	-	-	-
Pe: 4	+	+	+	-	-	-	-	-	-	-	-	+
Pe: 5	+	+	-	+	-	-	-	-	-	-	-	-
Pe: 6	+	+	+	+	+	-	-	-	-	-	-	-
Pe: 7	+	+	+	+	-	-	-	-	-	-	-	-
Pe: 8	+	+	-	+	+	+	-	-	-	-	-	-
Pe: 9	+	+	-	+	+	-	-	-	-	-	-	-
Pe: 10	+	+	+	+	+	+	-	-	-	-	-	-
Pe: 11	+	+	-	+	-	-	+	-	-	-	-	-
Pe: 12	+	+	-	+	+	+	+	-	-	-	-	-
Pe: 13	+	+	+	+	-	(-)	+	-	-	-	-	-
Pe: 14	+	+	-	+	+	+	+	+	-	-	-	-
Pe: 15	+	+	+	-	-	-	-	+	+	-	-	-
Pe: 16	+	+	-	+	-	-	+	+	-	+	-	-
Pe: 17	+	+	+	+	+	+	+	+	+	(-)	-	-
Pe: 18	+	+	+	+	-	-	+	+	+	+	-	-
Pe: 19	+	+	-	+	+	+	+	+	-	+	+	-
Pe: 20	+	+	+	+	-	-	-	-	-	-	-	+

Update 1 May 2022: Pigeon is replaced by NIL 9 with Pe: 15 = susceptible

Update 13 May 2024: Denomination of Pe: 20 and addition of a new differential host cultivar: Yakalo.

Legend:

-	R	resistant
(-)	IR	intermediately resistant
+	S	susceptible

For more information you can consult the literature references or contact

- Diederik Smilde (d.smilde@naktuinbouw.nl),
- Jim Correll (jcorrell@uark.edu)
- Anne Königs (a.konigs@rijkszwaan.nl)
- Renan Venancio (renan.venancio@bayer.com) Chair IWGP

References

Feng, C., Correll, J. C., Kammeijer, K. E., and Koike, S. T. (2014) Identification of new races and deviating strains of the spinach downy mildew pathogen *Peronospora farinosa* f. sp. *spinaciae*. *Plant Disease* 98:145-152.

Feng, C., Saito, K., Liu, B., Manley, A., Kammeijer, K. E., Mauzey, S. J., Koike, S. T., Correll, J. C. (2018) New races and novel strains of the spinach downy mildew pathogen *Peronospora effusa*. *Plant Disease* 102(3): 613-618

Correll, J., du Toit, L., Koike, S., and van Ettehoven, K. (2015) Guidelines for Spinach Downy Mildew: *Peronospora farinosa* f. sp. *spinaciae* (Pfs), available at www.cppsi.org