Netherlands Food and Consumer Product Safety Authority
Ministry of Economic Affairs

National Plant Protection Organization, the Netherlands

Quick scan number: QS. Bac.2013.01

	Quick scan date: 8 June 2015	
1	What is the scientific name (if possible up to species level + author, also include (sub)family and order) and English/common name of the organism? *Add picture of organism/damage if available and publication allowed*.	*Pectobacterium carotovorum* subsp. *brasiliensis* subsp. *nov* (*Pcb*) (Duarte et al., 2004; Nabhan et al., 2012) or *Pectobacterium carotovorum* subsp. *brasiliense* (Onkendi and Moleleki 2014; Choi and Kim 2013). Common name: Bacterial stem rot, bacterial tuber rot and blackleg of potato.
2	What prompted this quick scan? *Organism detected in produce for import, export, in cultivation, nature, mentioned in publications, e.g. EPPO alert list, etc.*	*Pcb* was recently found in an experimental field of the inspection service NAK, Emmeloord (the Netherlands: NL) where seed potatoes had been planted (Nunes Leite et al., 2014; Information from NAK). The organism is not regulated in the EU within the context of Council directive 2000/29/EC[1]. However, it is a causal agent of potato blackleg and Council directive 2002/56/EC on the marketing of seed potatoes requires that the number of plants affected by blackleg must not exceed 2 and 4% in case of basic and certified seed potatoes, respectively. There is a number of publications referring to recent findings of this organism in different countries around the world (Duarte et al., 2004; Panda et al., 2012; Ngadze et al., 2012; De Boer et al., 2012; Nabhan et al., 2011).

[1] Council directive 2000/29/EC on protective measures against the introduction into the Community of organisms harmful to plants or plant products and against their spread within the Community.

3	What is the current area of distribution?	Detected previously in Brasil, United States, Canada, Peru, Germany, Japan, Israel, Syria, South Africa, Zimbabwe and more recently in New Zealand and Kenya (Duarte et al., 2004; Ma et al., 2007; Panda et al., 2012; Ngadze et al., 2012; De Boer et al., 2012, Nabhan et al., 2011; Nabhan et al., 2012; Onkendi and Moleleki 2014). In most of these cases, *Pcb* was identified as the major cause of potato blackleg. About 20% of the *P. carotovorum* isolates collected in Syria were identified as *Pcb* (Nabhan et al., 2011). Isolates previously isolated (2006-2009) from potato production areas where disease outbreaks occurred in Zimbabwe were identified as *Pcb*. In South Africa where *Pcb* occurs widespread in potato production regions, *Pcb* was the most common causal agent of soft rot and blackleg in the 2006/7 growing seasons. *Pcb* is likely to be an important component of the blackleg syndrome in New Zealand (Panda et al., 2012). It is important to note that the presence of *Pcb* in potato is not a totally new phenomenon. Most likely, *Pcb* has been present for many years before the subspecies was actually identified due to improved methodologies for recognition of unusual genotypes within the potato bacterial soft rot complex. De Boer et al (2012) demonstrated that among the *E. carotovora* isolates isolated in Europe during 1970-1985 a few were *Pcb* (1 from NL and 3 from Scotland). Besides from *Pcb*, various other (sub)species are currently recognized within the bacterial soft rot/blackleg complex in potato, e.g. *Pectobacterium atrosepticum*, *Pectobacterium carotovorum* subsp. *carotovorum* (Pcc) and *Dickeya* sp.
4	What are the host plants?	Potato (seed or table) but also *Capsicum annum* L., *Ornithogalum* spp., and *Daucus carota* subsp. *sativus* (Nabhan et al., 2012).
5	Does the organism cause any kind of plant damage in the current area of distribution and/or does the consignment demonstrate damage suspected to have been caused by this organism? *Yes/no + plant species on which damage has been reported + short description of symptoms.* *Please indicate also when the organism is otherwise harmful (e.g. predator, human/veterinary pathogen vector, etc.).*	Yes, the pathogen causes stem rotting of potato plants, soft rotting of potato tubers and blackleg. Most subspecies within the *P. carotovorum* complex do not cause blackleg but are able to infect potato stems through wounds caused by insects or machines (Duarte et al., 2004; De Boer et al., 2012; van der Merwe et al., 2010). The symptoms of such stem infections are different from those of blackleg in that they may turn into various shades of brown but do not become inky black, as it is common for the blackleg disease (De Boer et al., 2012). In New Zealand blackleg or tuber soft rot were observed on plants inoculated with *Pcb* whereas *Pcc* strains were unable to cause blackleg. *Pcb* is likely to be an important component of the blackleg syndrome in New Zealand. In Canada, however, most of the *Pcb* isolates were unable to cause blackleg symptoms but several were able to infect the stem through wounds.
6	Assess the probability of establishment in the Netherlands (NL) (i.e. the suitability of the environment for establishment). a. In greenhouses (low, medium, high) b. Outdoors (low, medium, high) c. Otherwise (e.g. storage facilities, human environment)	b. High probability of establishment of *Pcb* in the potato cultivation system (including seed potato production) with a high uncertainty. *Pcb* may have been present for many years before it was actually described. However, the uncertainty is high because there are no studies on the capacity of *Pcb* to survive and persist under field conditions in NL. It is not known if the findings of *Pcb* were due to use of infested seed potatoes or that *Pcb* actually survives in the field.
7	Assess the probability of establishment in the EU	Similar to 6. The organism has already been found in NL and other EU member states. It could enter

	(i.e. the suitability of the environment for establishment).	by trade of infested seed potatoes.
8	What are the possible pathways that can contribute to spread of the organism after introduction? How rapid is the organism expected to spread (by natural dispersal and human activity)?	Spread in the field: the capacity of *Pcb* to persist and spread in the field environment (e.g. with soil attached to machinery) has not been studied yet. Spread by seed potatoes: De Boer et al. (2012) demonstrated that *Pcb* occurs in the stolon attachment site of the progeny tubers developing on plants grown from inoculated seed tubers. In this way *Pcb* could be transmitted from one generation of potato production to the next.
9	Provide an assessment of the type and amount of direct and indirect damage (e.g. lower quality, lower production, export restrictions, threat to biodiversity, etc.) likely to occur if the organism would become established in NL and the EU, respectively?	Several bacterial (sub)species are known to cause blackleg, stem rot and/or bacterial tuber rot of potato of which *Pectobacterium atrosepticum*, *Pectobacterium carotovorum* subsp. *carotovorum* and *Dickeya* sp. are known to be present in NL. *Pcb* has only recently been identified in NL (see above). It is unknown if *Pcb* has established in the field in NL. It is uncertain if introduction and/or (further) spread of *Pcb* may increase incidence or severity of blackleg, stem rot and/or bacterial tuber rot syndrome of potato in NL.
10	Has the organism been detected on/in a product other than plants for planting (e.g. cut flowers, fruit, vegetables)? *If "no", go to question 12*	Yes, potato tubers
11	If the organism has been found on/in a product other than plants for planting (e.g. cut flowers, fruit, vegetables), what is the probability of introduction (entry + establishment)? *Only to be answered in case of an interception or a find.*	The organism has already been found in NL and other EU member states.
12	Additional remarks	
13	References	Nunes Leite L, De Haan EG, Krijger M, Kastelein P, van der Zouwen PS, van den Bovenkamp GW, Tebaldi ND, van der Wolf JM (2014). First report of potato blackleg caused by *Pectobacterium carotovorum* subsp. *brasiliensis* in the Netherlands. *New Disease Reports* 29, 24. Duarte V, De Boer SH, Ward LJ, de Oliveira AMR (2004). Characterization of atypical *Erwinia carotovora* strains causing blackleg of potato in Brazil. *Journal of Applied Microbiology* 96, 96:535. Ma B, Hibbing ME, Kim HS, Reedy RM, Yedidia I, Breuer Jane, Breuer Jeffrey, Glasner JD, Perna NT,

		Kelman A, Charkowski AO (2007). Host range and molecular phylogenies of the soft rot Enterobacterial genera *Pectobacterium* and *Dickeya*. *Phytopathology* 97, 1150-1163. Panda P., Fiers M.A.W.J., Armstrong K. and Pitman A.R. (2012). First report of blackleg and soft rot of potato caused by *Pectobacterium carotovorum* subsp. *brasiliensis* in New Zealand, *New Disease Reports* 26, 15. Pitman AR, Wright PJ, Galbraith MD, Harrow SA (2008). Biochemical and genetic diversity of pectolytic enterobacteria causing soft rot disease of potatoes in New Zealand. *Australasian Plant Pathology* 37, 559-568. Ngadze E, Brady CL, Coutinho TA and van der Waals JE (2012). Pectinolytic bacteria associated with potato soft rot and blackleg in South Africa and Zimbabwe. *European Journal of Plant Pathology* 134:533–549. De Boer SH, Li X and Ward LJ (2012) *Pectobacterium* spp. associated with Bacterial Stem Rot Syndrome of Potato in Canada, *Phytopathology* 102, 937-947. Nabhan S, De Boer SH, Maiss E and Wydra K (2012). Taxonomic relatedness between *Pectobacterium carotovorum* subsp*. carotovorum*, *Pectobacterium carotovorum* subsp. *odoriferum* and *Pectobacterium carotovorum* subsp. *brasiliensis* subsp. nov. *Journal of Applied Microbiology* 113, 904—913. Nabhan S, Wydra K., Linde M. and Debener T. (2011). The use of two complementary DNA assays, AFLP and MLSA, for epidemic and phylogenetic studies of pectolytic enterobacterial strains with focus on the heterogeneous species *Pectobacterium carotovorum*. *Plant Pathology* 61, 498–508. van der Merwe JJ, Coutinho TA, Korsten L and van der Waals JE (2010). *Pectobacterim carotovorum* subsp. *brasiliensis* causing blackleg on potatoes in South Africa. *European Journal of Plant Pathology* 126, 175–185. Onkendi E. M. and Moleleki L. N. (2014). Characterization of *Pectobacterium carotovorum* subsp. *carotovorum* and *brasiliense* from diseased potatoes in Kenya. *European Journal of Plant Pathology* 139, 557–566 Choi O and Kim J. (2013). *Pectobacterium carotovorum* subsp. *brasiliense* causing soft rot on paprika in Korea. *Journal of Phytopathology*, 161, 125–127.
14	**Conclusions**	*Pectobacterium carotovorum* subsp. *brasiliense* (*Pcb*) is a newly described species for the Netherlands although it may already have been present for many years before it was actually identified. *Pcb* has been reported from many different parts in the world. The pathogen causes stem rotting of potato plants, soft rotting of potato tubers and blackleg. In the Netherlands, several other bacterial (sub)species are known to be present which cause similar symptoms on potato, e.g. *Pectobacterium atrosepticum*, *Pectobacterium carotovorum* subsp. *carotovorum* (Pcc) and *Dickeya* sp. The (sub)species in the potato soft rot/blackleg complex may differ in ecological properties and the relative impact of each of the species may depend on environmental conditions. Currently, the additional impact of *Pcb* for potato production in the Netherlands is unknown.

		Pcb and the other bacterial (sub)species mentioned above are not regulated in the European Union within the context of Council directive 2000/29/EC. However, seed potatoes may only be traded if produced according to a certification system (Council directive 2002/56/EC). According to Council directive 2002/56/EC, the number of plants affected by blackleg must not exceed 2 and 4% in case of basic and certified seed potatoes, respectively.
15	**Follow-up measures**	No specific measures