EPPO Pest Risk Assessment for Potato latent virus

Stage 1: Initiation		
Identify pest This section examines the identity of the pest to ensure that the assessment is being performed on a real identifiable organism and that the biological and other information used in the assessment is relevant to the organism in question.		
1. Is the organism clearly a single taxonomic entity and can it be adequately distinguished from other entities of the same rank? *if yes Go to 3, if no Go to 2*	**Yes**	**Taxonomic position:** Virus **Family:** Not yet assigned **Genus:** *Carlavirus* **Species:** Potato latent virus **Acronym:** PotLV **Synonyms:** Red La Soda virus
2. Attempt to redefine the taxonomic entity so that the criteria under 1 are satisfied. Is this possible? *if yes Go to 3, if no Go to 22*	**NA**	

The PRA area The PRA area can be a complete country, several countries or part(s) of one or several countries.		
3. Clearly define the PRA area. Then go to 4		EPPO Region**.**

Earlier analysis The pest, or a very similar pest, may have been subjected to the PRA process before, nationally or internationally. This may partly or entirely replace the need for a new PRA.		
4. Does a relevant earlier PRA exist? *if yes Go to 5, if no Go to 7*	**No**	
5. Is the earlier PRA still entirely valid, or only partly valid (out of date, applied in different circumstances, for a similar but distinct pest)? if entirely valid End *if partly valid Go to 6, if not valid Go to 7*	**NA**	
6.Proceed with the assessment, but compare as much as possible with the earlier assessment. *Then go to 7*	**NA**	

Stage 2: Pest Risk Assessment

Section A: Pest categorization (qualitative criteria of a quarantine pest)

Geographical criteria This section considers the geographic distribution of the pest in the PRA area.		
7. Does the pest occur in the PRA area? *if yes Go to 8, if no Go to 9*	**No**	
8. Is the pest of limited distribution in the PRA area? Note: 'of limited distribution' means that the pest has not reached the limits of its potential range either in the field or in protected conditions; it is not limited to its present distribution by climatic conditions or host-plant distribution. There should be evidence that, without phytosanitary measures, the pest would be capable of additional spread. *if yes Go to 18, if no Go to 22*	**NA**	

Potential for establishment For the pest to establish, it must find a widely distributed host plant in the PRA area (do not consider plants which are accidental/very occasional hosts or recorded only under experimental conditions). If it requires a vector, a suitable species must be present or its native vector must be introduced. The pest must also find environmental conditions suitable for survival, multiplication and spread, either in the field or in protected conditions		
9. Does at least one host plant grow to a substantial extent in the PRA area, in the open, in protected conditions or both? *if yes Go to 10, if no Go to 22*	**Yes**	Potato (*Solanum tuberosum*).
10. Does the pest have to pass part of its life cycle on a host plant other than its major host (i.e. obligate alternate host plant)? *if yes Go to 11, if no Go to 12*	**No**	Unlikely from comparison with other carlaviruses e.g. *Potato virus S* (PVS) and *Potato virus M* (PVM).
11. Does the alternate host plant also occur in the same part of the PRA area as the major host plant ? *if yes Go to 12, if no Go to 22*	**NA**	
12. Does the pest require a vector (i.e. is vector transmission the only means of dispersal)? *if yes Go to 13, if no Go to 14*	**No**	Mechanically transmitted, but also transmitted by aphids e.g. *Myzus persicae*. (Jeffries 1998)

13. Is the vector (or a similar species which is known or suspected to be a vector) present in the PRA area or likely to be introduced. If in doubt, a separate assessment of the	**Yes**	Aphids e.g. *Myzus persicae.*

probability of introduction of the vector (in section B1) may be needed. *if yes Go to 14, if no Go to 22*		
14. Does the known geographical distribution of the pest include ecoclimatic zones comparable with those of the PRA area? *if yes Go to 18, if no Go to 15*	**Yes**	PotLV is known to be present in Peru (L Salazar, personnel communication) and parts of North America (Goth *et al* 1999). It is not known whether the virus occurs in other countries since no testing has been done for it.
15. Is it probable, nevertheless, that the pest could survive and thrive in a wider ecoclimatic zone that could include the PRA area? *if yes Go to 18, if no Go to 16*	**NA**	
16. Could the ecoclimatic requirements of the pest be found in protected conditions in the PRA area? *if yes Go to 17, if no Go to 22*	**NA**	
17. Is a host plant grown in protected conditions in the PRA area? *if yes Go to 18, if no Go to 22*	**NA**	

Potential economic importance Economic impact principally concerns direct damage to plants but may be aspects. The PRA area should also be allowed for. In deciding whether economically important damage or loss to plants may occur, it is necessary to consider whether climatic and cultural conditions in the PRA area are conducive to damage expression, which is not always the case even if both host and pest survive under these conditions. Note: when performing a PRA on a pest that is transmitted by a vector, consider also any possible damage that the vector may cause.		
18. With specific reference to the host plant(s) which occur(s) in the PRA area, and the parts of those plants which are damaged, does the pest in its present range cause significant damage or loss? *if yes Go to 21, if no Go to 19*	**Unknown**	No studies have been done on economic loss. PotLV has been found in a number of nuclear stock potato cultivar collections in North America (Goth *et al* 1999) and in a collection of native Andean cultivars in Peru (L Salazar, personnel communication).
19. Could the pest, nevertheless, cause significant damage or loss in the PRA area, considering ecoclimatic and other factors for damage expression? *if yes Go to 21, if no Go to 20*	**Possibly**	As above (18). PotLV does not appear to cause symptoms, therefore yield loss is presumed to be comparable to other viruses which are latent or produce few symptoms such as PVS to which PotLV is closely related. With PVS yield loss is cultivar dependent varying from 0-20% (Burton 1966, Mulcahy 1996).
20. Would the presence of the pest cause other negative economic impacts (social, environmental, loss of export markets)? *if yes Go to 21, if no Go to 22*	**Possibly**	This would depend on whether PotLV became listed as a quarantine pest by importing countries or a regulated non-quarantine pest by either the importing or exporting countries**.**

21. This pest could present a risk to the PRA area ***Go to section B***	**Yes**	

22. This pest does not qualify as a quarantine pest for the PRA area and the assessment can stop. However, if this is the first time that the decision-making scheme has directed you to this point, it may be worth returning to the question that led you here and continuing through the scheme in case the remaining questions strongly indicate categorization as a possible quarantine pest. In this latter case, seek a second opinion to decide whether the answers which led you to this point could be given a different reply.		

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Section B: Quantitative evaluation

The second part of the risk assessment process firstly estimates the probability of the pest being introduced into the PRA area (its entry and establishment) and secondly makes an assessment of the likely economic impact if that should happen. From these two aspects, it should be possible to consider the level of 'pest risk' presented by the pest; this can then be used in the pest risk management phase to decide whether it is necessary to take phytosanitary measures to prevent the introduction of the pest, or if the measures chosen are appropriate for the level of risk. The questions in this section require an evaluation from minimum probability or impact (1) to maximum probability or impact (9). This must be done by an expert who can make an estimate according to the information provided (following the format of the check-list of EPPO and also according to comparison with other pests. Answer as many of the following questions as possible, insofar as they are relevant to the pest concerned. If you cannot answer a particular question, do not give any score. Note whether this is because of lack of information or because the question is irrelevant to the pest concerned.

1. Probability of introduction

Introduction, as defined by the FAO Glossary of Phytosanitary Terms, is the **entry** of a pest resulting in its **establishment**.

Entry

1.1 How many pathways could the pest be carried on? (few = 1; many =9) List the pathways Note: a pathway can be any form of human activity that could transport the pest from a particular origin, e.g. plants and plant products moving in trade, any other traded commodity, containers and packing, ships, planes, trains, road transport, passengers, mail, etc. Note that similar means of pest transport from different origins can present greatly different probabilities of introduction, depending on the concentration of the pest in the area of origin. The pathways given should be only those already in operation, or proposed.	**3**	**Potatoes, *Solanum tuberosum*** and *Solanum* spp. related to potato. All plant parts except probably true potato seed (TPS). PotLV is unlikely to be transmitted by TPS since other carlaviruses are not transmitted in this way. **Breeding** (see Potato Standard for definition) **Seed** (see Potato Standard for definition) **Ware** (see Potato Standard for definition)

1.2 For each pathway, starting with the most important pathway identified above (i.e. that which carries the greatest trade or which is most likely to act as a means of introduction) and then in descending order of importance, answer questions 1.3 – 1.13. If one of the questions 1.3a, 1.5a, 1.7a or 1.12a is answered by 'no', the pathway could not act as a means of entry for the pest, and the scheme will return directly to this point, omitting later questions. Use expert judgement to decide how many pathways to consider. *Go to 1.3a*		
1.3a Could the pest be associated with the pathway at origin? Note: does the pest occur in the area of origin? Is the pest in a life stage which would be associated with commodities, containers, or conveyances? *if yes Go to 1.3b, if no Go to 1.2*	**Probably** **No/ unlikely** **Possibly** **Possibly** **Possibly** **Yes**	**<u>Breeding</u>** **microplants and tubers** Routine testing not done by exporting countries for this type of material. **true potato seed** **<u>Seed</u>** **microplants/microtubers** PotLV was first discovered in material from a nuclear stock collection. In North America all/some ? nuclear stock collectionsare now tested. **minitubers** **field grown tubers** The status of field grown crops is not known. **<u>Ware</u>**
1.3b How likely is the pest to be associated with the pathway at origin? (not likely = 1; very likely = 9)	**7** **4** **5** **6** **7**	**<u>Breeding</u>** **microplants and tubers** **<u>Seed</u>** **microplants/microtubers** PotLV was first discovered in material from a nuclear stock collection. In North America all/some ? nuclear stock collections now tested and has probably been eliminated. Position in other countries not known. **minitubers** **field grown tubers** **<u>Ware</u>**

1.4 Is the concentration of the pest on the pathway at origin likely to be high (not likely = 1; very likely = 9)	**5** **3** **4** **5** **6**	**<u>Breeding</u>** **microplants and tubers** **<u>Seed</u>** **microplants/microtubers** Virus was present in nuclear stock collections in North America and has probably been eliminated. **minitubers** **field grown tubers** **<u>Ware</u>**
1.5a Could the pest survive existing cultivation or commercial practices? Note: these are practices mainly in the country of origin, such as pesticide application, removal of substandard produce, kiln-drying of wood. *if yes Go to 1.5b, if no Go to 1.2*	**Yes**	
1.5b How likely is the pest to survive existing cultivation or commercial practices? (not likely = 1; very likely = 9)	**9** **2** **3** **7** **9**	**<u>Breeding</u>** **microplants and tubers** **<u>Seed</u>** **microplants/microtubers** Not likely from those organisations doing testing. **minitubers** Not likely from those organisations doing testing. **field grown tubers** PotLV will survive existing cultivation or commercial practices even within those organisations doing testing. **<u>Ware</u>** PotLV will survive existing cultivation or commercial practices**.**

1.6 How likely is the pest to survive or remain undetected during existing phytosanitary procedures? Note: existing phytosanitary measures (e.g. inspection, testing or treatments) are most probably being applied as a protection against other (quarantine) pests; the assessor should bear in mind that such measures could be removed in the future if the other pests were to be re-evaluated. The likelihood of detecting the pest during inspection or testing will depend on a number of factors including: ease of detection of the life stages which are likely to be present. Some stages are more readily detected than others, for example insect adults may be more obvious than eggs; location of the pest on the commodity - surface feeders are more readily detected than internal feeders; symptom expression - many diseases may be latent for long periods, at certain times of the year, or may be without symptoms in some hosts or cultivars and virulent in others; distinctiveness of symptoms - the symptoms might resemble those of other pests or sources of damage such as mechanical or cold injury; the intensity of the sampling and inspection regimes; distinguishing the pest from similar organisms. (not likely = 1; very likely = 9)	**9** **2** **3** **7** **9**	**<u>Breeding</u>** **microplants and tubers** No testing done prior to export. Few EPPO countries test for it in post-entry quarantine **<u>Seed</u>** **microplants/microtubers** Not likely from those exporting countries testing for PotLV. Few EPPO countries test nuclear stocks for PotLV. **minitubers** Not likely from those exporting organisations testing for PotLV. **field grown tubers** Virus infection does not cause symptoms in the growing crop or harvested tubers PotLV will survive existing cultivation or commercial practices even within those organisations doing testing. **<u>Ware</u>** PotLV will survive existing cultivation or commercial practices**.**
1.7a Could the pest survive in transit? Note: consideration should be given to: speed and conditions of transport; vulnerability of the life-stages likely to be transported; whether the life cycle is of sufficient duration to extend beyond time in transit; the number of individuals likely to be associated with a Consignment. Interception data can be used to estimate the ability of a pest to survive in transit. *if yes Go to 1.7b, if no Go to 1.2*	**Yes**	The virus is fully systemic within the plant and therefore can survive in tubers and microplants
1.7b How likely is the pest to survive in transit? (not likely = 1; very likely = 9)	**9**	**For all pathways**
1.8 Is the pest likely to multiply during transit? (not likely = 1; very likely = 9)	**1**	**For all pathways**

1.9 How large is movement along the pathway? Note: the volume of material being moved. (not large = 1; very large = 9)		Potato material is largely prohibited except through post-entry quarantine.
		Breeding
	5	**microplants and tubers** Relatively large quantities are received through quarantine from North America in comparison with other countries.
		Seed
	7	**microplants/microtubers** Relatively large quantities are received through quarantine from North America in comparison with other countries. Potentially large quantities could be imported for direct planting if prohibitions relaxed.
	7	**minitubers** Potentially large quantities could be imported if prohibitions relaxed.
	8	**field grown tubers** Several EPPO countries receive material from North America. Potentially large quantities could be imported if prohibitions relaxed.
	8	**Ware** Potentially large quantities could be imported if prohibitions relaxed.
1.10 How widely is the commodity to be distributed throughout the PRA area? Note: the more scattered the destinations, the more likely it is that the pest might find suitable habitats. (not widely = 1; very widely = 9)		**Breeding**
	7	**microplants and tubers** Potential to be widely distributed.
		Seed
	7	**microplants/microtubers** Potential to be widely distributed.
	7	**minitubers** Potential to be widely distrbuted.
	8	**field grown tubers** Potential to be widely distrbuted Several EPPO countries receive material from North America.
	9	**Ware** Potential to be widely distributed.

1.11 How widely spread in time is the arrival of different consignments? Note: introduction at many different times of the year will increase the probability that entry of the pest will occur at a life stage of the pest or the host suitable for establishment. (not widely = 1; very widely = 9)	**8** **8** **6** **6** **7**	**<u>Breeding</u>** **microplants and tubers** Potential to arrive at any time during year. **<u>Seed</u>** **microplants/microtubers** Potential to arrive at any time during year. **minitubers** Would probably arrive over a 6 month period. **field grown tubers** Would probably arrive over a 6 month period. **<u>Ware</u>** Would probably arrive over a 6-8 month period if prohibitions relaxed.
1.12a Could the pest transfer from the pathway to a suitable host? Note: consider innate dispersal mechanisms or the need for vectors, and how close the pathway on arrival is to suitable hosts. *if yes Go to 1.12b, if no Go to 1.2 ???*	**Yes**	The virus is aphid and mechanically transmissible. Vector(s) are indigenous to the EPPO region.
1.12b How likely is the pest to be able to transfer from the pathway to a suitable host? (not likely = 1; very likely = 9)	 **9** **9** **9** **9** **2**	Aphid vectors including *Myzus persicae* are present in all EPPO countries, so spread from an infected potato crop to healthy crops is very likely**.** **<u>Breeding</u>** **microplants and tubers** **<u>Seed</u>** **microplants/microtubers** **minitubers** **field grown tubers** **<u>Ware</u>** Unlikely unless planted.

1.13 Is the intended use of the commodity (e.g. processing, consumption, planting, disposal of waste) likely to aid introduction? Note: consider whether the intended use of the commodity would destroy the pest or whether the processing, planting or disposal might be done in the vicinity of suitable hosts. (not likely = 1; very likely = 9)	**7** **7** **7** **7** **3**	**<u>Breeding</u>** **microplants and tubers** If breeding material were not tested then PotLV could spread throughout the EPPO region. **<u>Seed</u>** **microplants/microtubers** **minitubers** **field grown tubers** If seed material were not tested then PotLV could spread throughout the EPPO Region **<u>Ware</u>** Reduced risk since not intended for planting although amateur gardeners may plant infected tubers

Establishment Note: Questions marked with an asterisk (*) are to be considered as more important than the others in the same section.

1.14 How many host-plant species are present in the PRA area? (one or very few = 1; many = 9)	**3**	Potato is the only natural host known so far but PotLV has been transmitted experimentally to *Chenopodium*, *Nicotiana* and *Physalis* spp. The virus has a wider experimental host range than the other potato infecting carlaviruses PVM and PVS. Most potato cultivars seem susceptible to infection by mechanical inoculation**.**
1.15 How extensive are the host plants in the PRA area? (rare = 1; widespread = 9)	**7**	
1.16 If an alternate host is needed to complete the life cycle, how extensive are such host plants in the PRA area? (rare = 1; widespread = 9)	**NA**	
1.17 * If a vector is needed for to dispersal, how likely is the pest to become associated with a suitable vector? Note: is the vector present in the PRA area, could it be introduced or could another vector be found? (not likely = 1; very likely = 9)	**7**	*Myzus persicae* and other aphids likely to transmit PotLV are present throughout the EPPO Region.
1.18 (Answer this question only if protected cultivation is important in the PRA area.) Has the pest been recorded on crops in protected conditions elsewhere? (no = 1; often = 9)	**NA**	
1.19 How likely are wild plants (i.e. plants not under cultivation, including weeds, volunteer plants, feral plants) to be significant in dispersal or maintenance of populations? (not likely = 1; very likely = 9)	?	Not known.
1.20 * How similar are the climatic conditions that would affect pest establishment in the PRA area and in the area of origin? Note: the climatic conditions in the PRA area to be considered may include those in protected cultivation. (not similar = 1; very similar = 9)	**9**	

1.21 How similar are other abiotic factors in the PRA area and in the area of origin? Note: the major abiotic factor to be considered is soil type; others are, for example, environmental pollution, topography/orography. (not similar = 1; very similar = 9)	**9**	
1.22 How likely is the pest to have competition from existing species in the PRA area for its ecological niche? (very likely = 1; not likely = 9)	**9**	
1.23 How likely is establishment to be prevented by natural enemies already present in the PRA area? (very likely = 1; not likely = 9)	**9**	
1.24 * If there are differences in the crop environment in the PRA area from that in the area of origin, are they likely to aid establishment? Note: factors that should be considered include time of year that the crop is grown, soil preparation, method of planting, irrigation, whether grown under protected conditions, surrounding crops, management during the growing season, time of harvest, method of harvest, etc. (not likely = 1; very likely = 9)	**NA**	
1.25 Are the control measures which are already used against other pests during the growing of the crop likely to prevent establishment of the pest? (very likely = 1; not likely = 9)	**6**	Naturally low aphid numbers and use of aphicides will help to prevent spread by aphids.
1.26 * Is the reproductive strategy of the pest and duration of life cycle likely to aid establishment? Note: consider characteristics which would enable the pest to reproduce effectively in a new environment, such as parthenogenesis/self-crossing, duration of the life cycle, number of generations per year, resting stage, etc.? (not likely = 1; very likely = 9)	**8**	Virus infects the plant systemically. PotLV is tuber borne. From comparison with closely related viruses, PotLV is unlikely to be transmitted through TPS.
1.27 How likely are relatively low populations of the pest to become established? (not likely = 1; very likely = 9)	**9**	Most likely to become established in ware potato crops.
1.28 How probable is it that the pest could be eradicated from the PRA area ? (very likely = 1; not likely = 9)	**9**	Unlikely if infected crops are grown for a number of years without detection**.**
1.29 How genetically adaptable is the pest? Note: is the species polymorphic, with, for example, subspecies, pathotypes? Is it known to have a high mutation rate? This genotypic (and phenotypic) variability facilitates the pest's ability to withstand environmental fluctuations, to adapt to a wider range of habitats, to develop pesticide resistance and to overcome host resistance. (not adaptable = 1; very adaptable = 9)	**NA**	

1.30 * How often has the pest been introduced into new areas outside its original range? Note: if this has happened even once before, it is important proof that the pest has the ability to pass through most of the steps in this section (i.e. association with the pathway at origin, survival in transit, transfer to the host at arrival and successful establishment). If it has occurred often, it suggests an aptitude for transfer and establishment. (never = 1; often = 9)	**6**	Infected tubers from the USA were planted in the UK after being being missed by post-entry quarantine tests. Fortuitously it was detected within one year of planting and the virus eradicated. It is not know whether it has been introduced elsewhere since the virus has only recently been described (Brattey *et al* 1995) and little testing has been undertaken except by the Canada, Peru, UK and the USA.

2. Economic impact assessment

Identify the potential hosts in the PRA area, noting whether wild or cultivated, field or glasshouse. Consider these in answering the following questions. When performing a PRA on a pest that is transmitted by a vector, consider also any possible damage that the vector may cause. According to the pest and host(s) concerned, it may be appropriate to consider all hosts together in answering the questions once, or else to answer the questions separately for specific hosts. Note that, for most pest/crop/area combinations, precise economic evaluations are lacking. In this section, therefore, expert judgement is asked to provide an evaluation of the likely scale of impact. Both long-term and short-term effects should be considered for all aspects of economic impact.

2.1 * How important is economic loss caused by the pest within its existing geographic range? (little importance = 1; very important = 9)	**3**	No economic loss reported but relevant studies have not been done. Yield loss may be comparable with other cultivars which produce few or no symptoms (eg PVS) where the yield loss may vary between 0-20% depending on cultivar.
2.2 How important is environmental damage caused by the pest within its existing geographic range? Note: environmental damage may be impact on ecosystem health, such as effects on endangered/threatened species, keystone species or biodiversity. (little importance = 1; very important = 9)	**NA**	
2.3 How important is social damage caused by the pest within its existing geographic range? Note: social effects could be, for example, damaging the livelihood of a proportion of the human population, or changing the habits of a proportion of the population (e.g. limiting the supply of a socially important food). (little importance = 1; very important = 9)	**1**	
2.4 * How extensive is the part of the PRA area likely to suffer damage from the pest? Note: the part of the PRA area likely to suffer damage is the endangered area, which can be defined ecoclimatically, geographically, by crop or by production system (e.g. protected cultivation). (very limited = 1; whole PRA area = 9)	**8**	All potato growing areas within the EPPO Region**.**
Spread potential is an important element in determining how fast economic impact is expressed and how readily a pest can be contained.		
2.5 * How rapidly is the pest liable to spread in the PRA area by natural means? (very slowly = 1; very rapidly = 9)	**5**	Spread would be faster in those countries or areas with higher aphid populations.

2.6 How rapidly is the pest liable to spread in the PRA area by human assistance? (very slowly = 1; very rapidly = 9)	**5**	By movement of infected seed potatoes and breeding material.
2.7 How likely is it that the spread of the pest could be contained within the PRA area? Note: consider the biological characteristics of the pest that might allow it to be contained in part of the PRA area; consider the practicality and costs of possible containment measures. (very likely = 1; not likely = 9)	**5**	Unlikely if action is not taken quickly on discovery of the pest.
2.8 * Considering the ecological conditions in the PRA area, how serious is the direct effect of the pest on crop yield and/or quality likely to be? Note: the ecological conditions in the PRA area may be adequate for pest survival but may not be suitable for significant damage on the host plant(s). Consider also effects on non-commercial crops, e.g. private gardens, amenity plantings. (not serious = 1; very serious = 9)	**2**	
2.9 How likely is the pest to have a significant effect on producer profits due to changes in production costs, yields, etc., in the PRA area. (not likely = 1; very likely = 9)	**3**	
2.10 How likely is the pest to have a significant effect on consumer demand in the PRA area? Note: consumer demand could be affected by loss in quality and/or increased prices. (not likely = 1; very likely = 9)	**1**	
2.11 How likely is the presence of the pest in the PRA area to affect export markets? Note: consider the extent of any phytosanitary measures likely to be imposed by trading partners. (not likely = 1; very likely = 9)	**6**	This would depend on whether PotLV is listed as a quarantine pest by importing countries.
2.12 How important would other costs resulting from introduction be? Note: costs to the government, such as research, advice, publicity, certification schemes; costs (or benefits) to the crop protection industry. (little importance = 1; very important = 9)	**7**	This would depend on whether PotLV were listed as a regulated quarantine or regulated non-quarantine pest. Such action would result in mandatory testing (PotLV does not produce symptoms) in the certification scheme and possibly survey work.
2.13 How important is the environmental damage likely to be in the PRA area? (little importance = 1; very important = 9)	**1**	
2.14 How important is the social damage likely to be in the PRA area? (little importance = 1; very important = 9)	**1**	
2.15 How probable is it that natural enemies, already present in the PRA area, will affect populations of the pest if introduced? (very likely = 1; not likely = 9)	**9**	
2.16 How easily can the pest be controlled? Note: difficulty of control can result from such factors as lack of effective plant protection products against this pest, occurrence of the pest in natural habitats or amenity land, simultaneous presence of more than one stage in the life cycle, absence of resistant cultivars). (easily = 1; with difficulty = 9)	**7**	PotLV could only be controlled through mandatory virus testing. Control of aphid vectors will help reduce virus spread.
2.17 How likely are control measures to disrupt existing biological or integrated systems for control of other pests? (not likely = 1; very likely = 9)	**1**	

2.18 How likely are control measures to have other undesirable side-effects (for example on human health or the environment)? (not likely = 1; very likely = 9)	**5**	There is the potential for increased aphicide usage.
2.19 Is the pest likely to develop resistance to plant protection products? (not likely = 1; very likely = 9)	**9**	The aphid vector(s) of the virus are developing resistance to many commercial products.
After completing this section, the assessor should comment on whether sufficient information exists to trust the answers given; or if he/she knows of other relevant factors that have not been considered in this evaluation.		There are difficulties in using this scheme in assessing a virus which may depend on a vector for field spread. Also because of its fairly recent discovery there is limited information on PotLV. The true distribution of the virus although thought to be confined to parts of North and South America can only be confirmed by virus testing.

PEST RISK ASSESSMENT
Potato latent virus

Summary of section B, Quantitative evaluation

No.	Question	Breeding	Seed			Ware
			Microplants Microtubers	Minitubers	Field grown	
	Entry					
1.1	How many pathways could the pest be carried on ?	3	3	3	3	3
1.3b	How likely is the pest to be associated with the pathway at origin ?	7	4	5	6	7
1.4	Is the concentration of the pest on the pathway at origin likely to be high ?	5	3	4	5	6
1.5b	How likely is the pest to survive existing cultivation or commercial practices ?	9	2	3	7	9
1.6	How likely is the pest to survive or remain undetected during existing phytosanitary procedures ?	9	2	3	7	9
1.7b	How likely is the pest to survive in transit ?	9	9	9	9	9
1.8	How likely is the pest to multiply during transit ?	1	1	1	1	1
1.9	How large is movement along the pathway ?	5	7	7	8	8
1.10	How widely is the commodity to be distributed through the PRA area ?	7	7	7	8	9
1.11	How widely spread in time is the arrival of different consignments ?	8	8	6	6	7
1.12b	How likely is the pest to be able to transfer from the pathway to a suitable host?	9	9	9	9	2
1.13	Is the intended use of the commodity likely to aid introduction ?	7	7	7	7	3
	Sum of entry potential =	79	62	64	76	73
	No. of questions answered =	12	12	12	12	12
	Mean of entry potential =	**6.58**	**5.12**	**5.33**	**6.33**	**6.08**

	Establishment and spread	**Score**
1.14	How many host plant species are present in the PRA area?	3
1.15	How extensive are the host plants in the PRA area?	7
1.16	If an alternate host is needed to complete the life cycle, how extensive are such host plants in the PRA area?	NA
1.17	If a vector is needed for dispersal, how likely is the pest to become associated with a suitable vector?	7
1.18	Has the pest been recorded on crops in protected conditions elsewhere?	NA
1.19	How likely are wild plants to be significant in dispersal or maintenance of populations?	?
1.20	How similar are the climatic conditions that would affect pest establishment in the PRA area and in the area of origin?	9
1.21	How similar are other abiotic factors in the PRA area and in the area of origin?	9
1.22	How likely is the pest to have competition from existing species in the PRA area for its ecological niche?	9
1.23	How likely is establishment to be prevented by natural enemies already present in the PRA area?	9
1.24	If there are differences in the crop environment in the PRA area to that in the area of origin, are they likely to aid establishment?	NA
1.25	Are the control measures which are already used against other pests during the growing of the crop likely to prevent establishment of the pest?	6

1.26	Is the reproductive strategy of the pest and duration of life cycle likely to aid establishment?	8
1.27	How likely are relatively low populations of the pest to become established?	9
1.28	How probable is it that the pest could be eradicated from the PRA area?	9
1.29	How genetically adaptable is the pest?	NA
1.30	How often has the pest been introduced into new areas outside its original range?	6
	Sum of establishment potential =	91
	No. of questions answered =	12
	Mean of establishment potential =	7.58

	Breeding	**Seed**			**Ware**
	Microplants and tubers	Microplants Minitubers	Minitubers	Field grown tubers	
Sum of entry and establishment potential =	170	153	155	167	164
No. questions answered =	24	24	24	24	24
Mean risk of entry and establishment =	**7.08**	**6.38**	**6.46**	**6.96**	**6.83**

	Economic Impact Assessment	**Score**
2.1	How important is economic loss caused by the pest within its existing geographic range?	3
2.2	How important is environmental damage caused by the pest within its existing geographic range?	NA
2.3	How important is social damage caused by the pest within its existing geographic range?	1
2.4	How extensive is the part of the PRA area likely to suffer damage from the pest?	8
2.5	How rapidly is the pest liable to spread in the PRA area by natural means?	5
2.6	How rapidly is the pest liable to spread in the PRA area by human assistance?	5
2.7	How likely is it that the spread of the pest could be contained within the PRA area?	5
2.8	Considering the ecological conditions in the PRA area, how serious is the direct effect of the pest on crop yield and/or quality likely to be?	2
2.9	How likely is the pest to have a significant effect on producer profits due to changes in production costs, yields etc. in the PRA area?	3
2.10	How likely is the pest to have a significant effect on consumer demand in the PRA area?	1
2.11	How likely is the presence of the pest in the PRA area to affect export markets?	6
2.12	How important would other costs resulting from introduction be?	7
2.13	How important is the environmental damage likely to be in the PRA area?	1
2.14	How important is the social damage likely to be in the PRA area?	1

2.15	How probable is it that natural enemies, already present in the PRA area, will affect populations of the pest if introduced?	9
2.16	How easily can the pest be controlled?	7
2.17	How likely are control measures to disrupt existing biological or integrated systems for control of other pests?	1
2.18	How likely are control measures to have other undesirable side-effects ?	5
2.19	Is the pest likely to develop resistance to plant protection products?	9
	Total economic risk =	79
	No. questions answered =	18
	Mean risk of economic impact =	4.39

Risk of introduction (mean of entry and establishment)= 6.38-7.08

Risk of economic impact = 4.39

3. Final evaluation

At the end of the procedure, the assessor will have at his disposal: (1) one or several sets of replies (1-to-9 scores) to questions 1.1-1.13, for one or several pathways (if no pathways have been retained, the probability of introduction will be zero); (2) one set of replies (1-to-9 scores) to questions 1.14-1.30; 3) one or several sets of replies (1-to-9 scores) to questions 2.1-2.19, for single, grouped or separate hosts (according to the manner of answering which has been chosen). The assessor should first consider the quality and quantity of the information used to answer the questions, and give an overall judgement of how reliable the pest risk assessment can be considered. If other relevant information is available that has not been considered, this should be noted. By the means of his choice, the assessor should attempt to make a separate estimate of the probability of introduction of the pest and its probable level of economic impact. As explained in the introduction, these estimates cannot, on the basis of the procedure used in the scheme, be expressed in absolute units. The numerical scores may be combined, weighted and averaged in appropriate ways that may enable the assessor who uses them consistently to make useful comparisons between pests, pathways and hosts. No particular mode of calculation is specifically recommended by EPPO. Certain questions have been identified as more important than others, and the assessor should take due account of this. The assessor may then combine his estimates of probability of introduction and probable economic impact to formulate a single estimate of pest risk. This may usefully be compared with one or several reference levels of risk to decide whether the pest should be considered to be a quarantine pest, so that phytosanitary measures should be taken against it. Finally, the scores given in answer to the different sections (particularly that on pathways) may be used again in pest risk management.

Conclusion

PotLV is not known to be present in the PRA area (the EPPO Region) and has the potential to cause some economic loss. However, because the virus has been described only fairly recently (Brattey *et al* 1995) there is relatively limited information on this virus. Prohibition (or limited trade) between North and South America and the EPPO region has limited the opportunity for introduction of the virus. However, if trade is permitted without the introduction of control measures there is a significant risk that the virus will be introduced and establish in the EPPO Region. Since transmission of PotLV may be similar to PVS, areas in the EPPO region particularly at risk from establishment and spread are those where control of PVS is already proving difficult. Most potato cultivars (including UK and North American cultivars) seem susceptible to infection although work done in the USA would suggest that many North American cultivars are resistant to infection. It is difficult to judge the true economic impact of this symptomless virus. Yield losses are presumed to be low because it causes no symptoms, However, PVS to which it is closely related also causes few or no symptoms and yet may cause yield losses of 0-20% depending on the cultivar

infected. If PotLV became established in the EPPO Region and the virus were listed as a quarantine pest by importing countries then there would be loss of export markets in those countries where PotLV is not known to occur. Further economic impact might be on certification schemes through the introduction of mandatory testing. On balance because the virus appears to be absent from the PRA area and there is the potential for economic loss, it is recommended that EPPO considers listing PotLV as an A1 pest.

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