	European and Mediterranean Plant Protection Organisation		
	Organisation Européenne et Méditerranéenne pour la Protection des Plantes		
			06-17702 FINAL
	Guidelines on Pest Risk Analysis		
	Lignes directrices pour l'analyse du risque phytosanitaire		
	Decision-support scheme for quarantine pests		
PEST RISK ANALYSIS FOR SOLANUM ELAEAGNIFOLIUM (CAV.)			
Pest risk analyst:			
EPPO Secretariat			
Draft 07 March 2006 (editorial modifications by EPPO Secretariat in 2006-07)			
Stage 1: Initiation			
1 What is the reason for performing the PRA?		Identification of a single pest	*Solanum elaeagnifolium* has been declared as an invasive plant in many countries.It is highly invasive in Morocco, Tunisia and Syria. It is present in Greece, Spain, Croatia, etc. and has just appeared in France. Several EPPO countries are still free from this plant.
2 Enter the name of the pest			*Solanum elaeagnifolium* (Cav.)
2A Indicate the type of the pest		plant	
2B Indicate the taxonomic position			Plantae – Solanaceae
3 Clearly define the PRA area			EPPO region
4 Does a relevant earlier PRA exist?		no	
Stage 2A: Pest Risk Assessment - Pest categorization			

5A If you are sure that the pest clearly presents a risk, or that in any case a full Pest Risk Assessment is required, you can omit this section and proceed directly to the main Pest Risk Assessment section.	Continue with Pest Categorization	
6 Does the name you have given for the organism correspond to a single taxonomic entity which can be adequately distinguished from other entities of the same rank?	yes	
8 Is the organism in its area of current distribution a known pest (or vector of a pest) of plants or plant products?	yes (the organism is considered to be a pest)	
10 Does the pest occur in the PRA area?	yes	
11 Is the pest widely distributed in the PRA area?	not widely distributed	
12 Does at least one host-plant species (for pests directly affecting plants) or one suitable habitat (for non parasitic plants) occur in the PRA area (outdoors, in protected cultivation or both)?	yes	
14 Does the known area of current distribution of the pest include ecoclimatic conditions comparable with those of the PRA area or sufficiently similar for the pest to survive and thrive (consider also protected conditions)?	yes	
15 Could the pest by itself, or acting as a vector, cause significant damage or loss to plants or other negative economic impacts (on the environment, on society, on export markets) ?	yes	

16 This pest could present a risk to the PRA area.		The plant is known to be very invasive in other parts of the world and even in the EPPO region. It has the potential to spread further in EPPO countries where it is already present and to be introduced other countries where it is not already recorded.
Section 2B: Pest Risk Assessment - Probability of introduction/spread and of potential economic consequences		
Note: If the most important pathway is intentional import, do not consider entry, but go directly to establishment. Spread from the intended habitat to the unintended habitat, which is a, whichant judgement for intentionally imported organisms, is covered by questions 1.33 and 1.35.	Continue with questions of entry	
1.2 Note down the relevant pathways, then estimate the total number of distinct pathways, by multiplying the number of relevant pathways by the number of relevant origins and the number of relevant end uses.	many	All the pathways are commodity pathways on which the plant is a contaminant (either as seed or plant parts) and is therefore unintentionally introduced: - consignments of seeds for planting The pest is thought to have been introduced into Morocco in 1944 by imports of seeds of cotton from North America. It is also though to have been introduced in Greece with Tobacco seeds (Yannitsaros *et al*., 1974). - consignments of cotton: to be further studied. - consignments of hay In South Africa, *S. elaeagnifolium* was thought to have been imported as a contaminant of pig fodder (Wassermann *et al.*, 1988) and hay. Infestations in South Australia are also linked to imports of contaminated hay from North America during the 1914 drought. Later infestations in Western Australia appeared from contaminated Sudan grass (*Sorghum sudanense*) introduced from eastern Australia (Heap and Carter, 1999). - maize for forage,

		- consignments of grain, - plants for plantings accompanied by soil or growing media In Morocco, a plant of *S. elaeagnifolium* grown from root fragment has been detected on *Cactus* potplants with growing media sold for ornamental purposes (Taleb personal communication, 2006). - Soil/growing medium (with organic matters) as a commodity - Soil as a contaminant (on used machinery and footwear), - containers and packaging, - livestock and manure are also pathways but are only relevant for national spread. This pathway has not been considered further in this analysis), - the plant could possibly be introduced in a country for ornamental purposes, but it has very rarely been the case until now. This pathway has not been considered further in this analysis).
al		**Consignments of seeds (for planting)**
1.4 Is the prevalence of the pest on the pathway at origin likely to be high, taking into account factors like the prevalence of the pest at origin, the life stages of the pest, the period of the year?	likely	The following consignments of seeds are susceptible of being contaminated: *- Zea mays,* *- Medicago sativa,* *- Triticum spp.,* *- Sorghum bicolor,* *- Gossypium spp.,* *- Hordeum indicum,* *- Sesamum indicum,* *- Nicotiana tabacum,* *Solanum elaeagnifolium* may strongly infest these crops. Seed production of *S. eleagnifolium* occurs from late spring to autumn. All crops mentioned above are harvested at a period when seeds of *S. eleagnifolium* are present. Seed lots can therefore be infested by seeds of *S. eleagnifolium*. . The seed lots may only be infested by seeds.

1.5 Is the prevalence of the pest on the pathway at origin likely to be high, taking into account factors like cultivation practices, treatment of consignments?	not likely	*S. elaeagnifolium* is not specifically listed in seed certification schemes and not all seeds are certified. Nevertheless, it is assumed that good production practices will prevent weed infestations. Seeds may also be rejected by seed companies based on weed seed content. Moreover, not all seeds are certified. (Kirkpatrick *et al.*, 2001). The seed is very small (between 2 and 3 mm) and may remain undetected as no specific requirements concerning this plant exist in seed certification programmes. In the US, tolerance levels for seeds of *S. eleagnifolium* in seed lots have been established (USA Noxious Weed Seeds Requirements). These levels vary from zero to 90 to 300 seeds per pound, depending on the states.
1.6 How large is the volume of the movement along the pathway?	no judgement	No specific data available.
1.7 How frequent is the movement along the pathway?	no judgement	No specific data available.
1.8 How likely is the pest to survive during transport /storage?	very likely	Seeds can remain viable for at least 10 years.
1.9 How likely is the pest to multiply/increase in prevalence during transport /storage?	Very unlikely	Seeds do not multiply.
1.10 How likely is the pest to survive or remain undetected during existing phytosanitary measures?	likely	There are few existing phytosanitary measures in EPPO member countries which could be appropriate for *S. eleagnifolium*. Seeds of *Gossypium* spp have to be acid-delinted if introduced in Spain and Greece (protected zones). After acid-delinting, seeds are sorted by cleaning and gravity grading. According to Lachichi *et al*. (2006), seeds have to be washed to facilitate germination. Acid-delinting has no detrimental effects on the seeds of cotton. There is no information on the effect of the Acide delinting on *S. elaeagnifolium* seed germination. *S. elaeagnifolium* is on the quarantine list of Belarus, and on the A1 lists of Russia and Ukraine. Importation of seeds of *S. elaeagnifolium* as a contaminant of seeds for sowing of crops is forbidden.
1.10A Is the pathway being considered a commodity pathway, or natural spread?	commodity pathway	

1.11 How widely is the commodity to be distributed throughout the PRA area?	widely	The 47 EPPO countries are likely to import seeds of cotton, maize, sorghum and wheat from abroad. Few tobacco seeds are likely to be introduced in countries in the south of the region.
1.12 Do consignments arrive at a suitable time of year for pest establishment?	yes	Seeds remain viable and germinate when conditions are favourable.
1.13 How likely is the pest to be able to transfer from the pathway to a suitable host or habitat?	very likely	Seeds are planted in fields, where the pest represents a threat.
1.14 How likely is the intended use of the commodity (e.g. processing, consumption, planting, disposal of waste, by-products) to aid transfer to a suitable host or habitat?	very likely	See 1.13
1.15 Do other pathways need to be considered?	yes (return to question 1.3 for next pathway)	
1.3 Describe this pathway		**- Hay, pig fodder (the main plant traded for this use is *Medicago sativa*)** **- *Sorghum sudanense***
1.4 Is the prevalence of the pest on the pathway at origin likely to be high, taking into account factors like the prevalence of the pest at origin, the life stages of the pest, the period of the year?	likely	*Medicago sativa* and *Sorghum sudanense* crops have been recorded as affected by the weed. Harvesting of these crops occurs when seeds and roots are present and able to germinate or regenerate.
1.5 Is the prevalence of the pest on the pathway at origin likely to be high, taking into account factors like cultivation practices, treatment of consignments?	Moderatly likely	Seeds (and possibly roots) of *S. eleagnifolium* are moderatly likely to be mixed with the crop harvest. - *Medicago sativa* is a spring crop and is harvested around July. While cutting *Medicago sativa*, it is moderatly probable that stems of *S. elaeagnifolium* with fruits are cut too as the pest is 80 cm tall. It is very likely to contain seeds. Fragments of roots could be present. - *Sorghum sudanense* is also a spring crop. It is therefore moderatly susceptible of containing seeds and fragments of roots of the pest.

1.6 How large is the volume of the movement along the pathway?	minimal	In FAOSTAT, there is no record concerning the import of hay (clover, lucerne,...). For "Hay unspecified", 35 015 tones were imported to the European Union in 2004, the importers being Austria (32 853), Norway (14,599), Finland (1 339) and Sweden (823). Palestine (occupied territories) imported 120 tonnes. It is nevertheless very unlikely that these commodities will be imported from North African countries. There is no data available for "sorghum as a forage"
1.7 How frequent is the movement along the pathway?	occasional	such imports are considered to be occasional
1.8 How likely is the pest to survive during transport /storage?	unlikely	Branches, seeds and roots could be contained in hay, but these 2 consignements are dried naturally and dessication would affect roots and seeds viability.
1.9 How likely is the pest to multiply/increase in prevalence during transport /storage?	unlikely	Neither seeds nor roots multiply.
1.10 How likely is the pest to survive or remain undetected during existing phytosanitary measures?	likely	There are no specific phytosanitary requirements for hay in most EPPO countries.
1.10A Is the pathway being considered a commodity pathway, or natural spread?	commodity pathway	
1.11 How widely is the commodity to be distributed throughout the PRA area?	moderately widely	According to FAOSTAT, hay is only imported to northern countries within the EU. Hay is a voluminous commodity which is usually traded locally.
1.12 Do consignments arrive at a suitable time of year for pest establishment?	yes	If the seed would be still viable, they would remain dormant and germinate at the appropriate moment. Sections of taproot may also regenerate if they would be viable.
1.13 How likely is the pest to be able to transfer from the pathway to a suitable host or habitat?	likely	Hay is stored in farms, near man-made sites, where the pest easily colonizes. Then, hay may be given to sheep in stables or in fields. It can then escape into fields. Moreover, the seeds are eaten by sheep and then excrated in the faeces. The digestive tract does not kill the seeds.
1.14 How likely is the intended use of the commodity (e.g. processing, consumption, planting, disposal of waste, by-products) to aid transfer to a suitable host or habitat?	likely	Regarding composting, animal manure may be composted by farmers, but it may also be directly spread onto fields. If the compost is appropriatly fermented,seed-viability will be reduced. However, if fermentation is not appropriate or manure is spread directly onto fields, weed seeds will survive. Studies indicate that 58% of seeds is still viable after passing through sheeps (Taleb, 2006).
1.15 Do other pathways need to be considered?	yes (return to question 1.3	

	for next pathway)	
1.3 Describe this pathway		**Maize for forage**
1.4 Is the prevalence of the pest on the pathway at origin likely to be high, taking into account factors like the prevalence of the pest at origin, the life stages of the pest, the period of the year?	likely	*Zea mays* for forage and sillage is planted around May and harvested around August. Its life stage matches with the fruiting of *S. elaeagnifolium*. While cuting the crop, it is possible to cut branches of the pest with berries containing hundreds of seeds. Only seeds are considered as able to contaminate this commodity as the maize for forage is not pulled out. Herbicides (and mechinal control) may limit the development of *S. elaeagnifolium*.
1.5 Is the prevalence of the pest on the pathway at origin likely to be high, taking into account factors like cultivation practices, treatment of consignments?	no judgement	More information is needed on the resistance of the seeds to fermentation of *Zea mays*.
1.6 How large is the volume of the movement along the pathway?	minimal	According to FAOSTAT, there are no imports of Maize for forage and sillage within the EPPO countries.
1.7 How frequent is the movement along the pathway?	very infrequent	No imports
1.8 How likely is the pest to survive during transport /storage?	no judgement	No imports. No data on the possible effects of fermentation on *S. elaeagnifolium* seeds.
1.9 How likely is the pest to multiply/increase in prevalence during transport /storage?	unlikely	Seeds do not multiply.
1.10 How likely is the pest to survive or remain undetected during existing phytosanitary measures?	likely	There are no measures for this consignment.
1.10A Is the pathway being considered a commodity pathway, or natural spread?	commodity pathway	
1.11 How widely is the commodity to be distributed throughout the PRA area?	very limited	No imports
1.12 Do consignments arrive at a suitable time of year for pest establishment?	no	No imports
1.15 Do other pathways need to be considered?	yes (return to question 1.3 for next pathway)	

1.3 Describe this pathway		**Consignment of grain** ***- Zea mays*** ***- Sorghum bicolor*** ***- Triticum spp.*** ***- Hordeum spp.*** ***- Sesamum indicum***
1.4 Is the prevalence of the pest on the pathway at origin likely to be high, taking into account factors like the prevalence of the pest at origin, the life stages of the pest, the period of the year?	very likely	*Zea mays* is harvested in November for the grain, plants with fruits can still be in the field at this moment of the year. *Sorghum bicolor* is a spring crop harvested in summer. It is very likely to being harvested with branches and seeds of *S. elaeagnifolium*. *Triticum aestivum*: For both winter and spring wheat, the crop is harvested in summer and it is therefore possible for seeds of *S. elaeagnifolium* to be present in the consignment. These 3 crops are considered as very affected by the pest. Abundancy of the pest in the fields can be high.
1.5 Is the prevalence of the pest on the pathway at origin likely to be high, taking into account factors like cultivation practices, treatment of consignments?	likely	Plant protectin products are used in these crops and are considered to provide a good protection against weeds in general. However, it is probable that some plants of the pest will remain in the field.
1.6 How large is the volume of the movement along the pathway?	major	**Maize**: In 2004, the EU (25) imported 12 926 000 tones of maize (Spain 2 750 000 tones, Netherlands 2 200 000 tones, Italy 1 500 000, Germany 1,380,294, the UK 1,282,900, Portugal 1,122,729...). A lot of maize is imported by the League of Arab states: Egypt 2,429,278, Algeria 1,790,349, Morocco 1,223,013, Saudi Arabia 1,581,119, the Syrian Arab Republic 854,891, Tunisia 723,304. Significant imports into other countries: Turkey 1,049,744, Israel 1,250,358, the Russian Federation 448,828, Belarus 211,824, Macedonia 61,813, Armenia 37,060. **Sorghum**: 808 000 tones in 2004 imported in the EU (25) (Italy, 388 000, Spain 268 000, Netherlands 51,215). The United Arab Emirates 9,647, Tunisia 2,466. **Wheat**: 23 222 000 tones in 2004 imported into the EU (25) (Italy 6 480 000, Spain 4 360 000 tones, Belgium 3 125 000, Netherlands 3,366,116...). Egypt 4,366,841, Yemen 1,548,696, Jordan 795,415, Algeria 5,034,447, Morocco 2,646,105, Tunisia 1,043,465, Republic of Azerbaijan, 1,157,294, the Russian Federation 1,364,102,

		Georgia 843,345, Ukraine 593,216, Israel 1,779,734.
1.7 How frequent is the movement along the pathway?	very often	/
1.8 How likely is the pest to survive during transport /storage?	very likely	Seeds can remain viable at least 10 years. Sections of taproot may maintain their viability for up to 15 months. The transport lasts a few days and will not altere the seeds and rhizomes.
1.9 How likely is the pest to multiply/increase in prevalence during transport /storage?	unlikely	Seeds do not multiply
1.10 How likely is the pest to survive or remain undetected during existing phytosanitary measures?	very likely	No specific requirements for such pathways
1.10A Is the pathway being considered a commodity pathway, or natural spread?	commodity pathway	
1.11 How widely is the commodity to be distributed throughout the PRA area?	widely	Almost all the EPPO countries import maize and wheat in huge quantities. Some EPPO countries import sorghum (see the main importers in 1.6).
1.12 Do consignments arrive at a suitable time of year for pest establishment?	yes	Whatever the period of arrival of the consignment, the seeds can remain viable.
1.13 How likely is the pest to be able to transfer from the pathway to a suitable host or habitat?	Moderatly likely	Grain is stored in silos where they can escape. Or they can also escape during transport. There are different end uses for grain: UNCERTAINTY **Maize**: The main use is animal feed, but it is also used for human food and industries. It can be given as it is or crushed. Sillage of humid grain is made, thus it has to be still humid and it is therefore processed just after harvested. Deshydrated maize is given to cattle too. It is used as human food and has to be processed and therefore cleaned. Industries extract starch and alcohol (for Whisky and Bourbon). **Wheat**: It is used for animal feeding and human food (flour). **Sorghum**: It is used for animal feeding and human food (flour). When processing is needed (human food), consignments of grain of maize, wheat and

		sorghum are transported to food industries. Seeds of *S. elaeagnifolium* are unlikely to escape to suitable habitats.
1.14 How likely is the intended use of the commodity (e.g. processing, consumption, planting, disposal of waste, by-products) to aid transfer to a suitable host or habitat?	moderately likely	In general, if the grain is processed, the seeds of *S. elaeagnifolium* are not likely to survive (kernels cleaned, mechanical cleaners remove weeds, seeds and other parts of plants, the kernels are then washed in a stream of water to take away stones and dirt and the grain is then crushed). These grains are not given to sheep. (Check for the secretariat)
1.15 Do other pathways need to be considered?	yes (return to question 1.3 for next pathway)	
1.3 Describe this pathway		**Plants for planting with growing media** **Ex: old trees of *Olea* imported from the South of Spain, the South of Italy and North Africa for an ornamental use in southern Europe (France, North of Spain and Italy).**
1.4 Is the prevalence of the pest on the pathway at origin likely to be high, taking into account factors like the prevalence of the pest at origin, the life stages of the pest, the period of the year?	very likely	Gardens and open areas are so infested in North Africa that land has had to be abandoned. Seeds and roots can contaminate the growing media. If nurseries are infested, growing media will be infested.
1.5 Is the prevalence of the pest on the pathway at origin likely to be high, taking into account factors like cultivation practices, treatment of consignments?	very likely	Irrigation and fertilization in nurseries is very favourable to *S. elaeagnifolium*. *S. elaeagnifolium* is quite resistant to phytosanitary products.
1.6 How large is the volume of the movement along the pathway?	major	There are no specific data but trade of ornamental plants is supposed to be major. According to AIPH 2005, EU imported 87 722 000 euros of ornamental plants from Spain in 2004, 28 541 000 from Israel, 1 060 000 from Morocco, 1 084 000 from Tunisia. EU imported 4 332 000 euros of fruit trees and shrubs in 2004, 62 000 from Israel, 82 000 from Morocco.
1.7 How frequent is the movement along the pathway?	frequent	It is supposed to be frequent.

1.8 How likely is the pest to survive during transport /storage?	likely	Seeds can remain viable at least 10 years. Sections of taproot may maintain their viability for up to 15 months. The transport lasts a few days and will not altere the seeds and rhizomes.
1.9 How likely is the pest to multiply/increase in prevalence during transport /storage?	unlikely	Seeds or roots do not multiply.
1.10 How likely is the pest to survive or remain undetected during existing phytosanitary measures?	very likely	Some measures are in place in the EPPO countries but they do not target *S. elaeagnifolium.* Seeds (2 to 3 mm) or fragments of roots (as small as 0.5 cm) are not visible in the growing media and they may remain undetected.
1.10A Is the pathway being considered a commodity pathway, or natural spread?	commodity pathway	
1.11 How widely is the commodity to be distributed throughout the PRA area?	very widely	Ornamental plants are distributed through the whole PRA. A wide variety of plants is traded and is adapted to the different conditions of the whole EPPO area.
1.12 Do consignments arrive at a suitable time of year for pest establishment?	yes	Seeds can wait till a suitable moment for germination and fragments of roots are viable for up to 15 months. If the plant is transplanted in autumn, it shall be planted the following spring or summer. The seeds or the roots will not germinate or regenerate before April. There are no phytosanitary measures available to detect the pest.
1.13 How likely is the pest to be able to transfer from the pathway to a suitable host or habitat?	very likely	Plants for planting will be planted in suitable habitats for the pest: in nature or in gardens, on road sides, in fields.
1.14 How likely is the intended use of the commodity (e.g. processing, consumption, planting, disposal of waste, by-products) to aid transfer to a suitable host or habitat?	very likely	See 1.13
1.15 Do other pathways need to be considered?	yes (return to question 1.3 for next pathway)	
1.3 Describe this pathway		**Soil/growing medium (with organic matters) as a commodity**

1.4 Is the prevalence of the pest on the pathway at origin likely to be high, taking into account factors like the prevalence of the pest at origin, the life stages of the pest, the period of the year?	very likely	In the infested area, the soil of nurseries, fields, gardens, road sides, pastures, waste lands,… can be infested with hundreds of small seeds and of small fragments (0.5 cm) of roots.
1.5 Is the prevalence of the pest on the pathway at origin likely to be high, taking into account factors like cultivation practices, treatment of consignments?	likely	Soil sterilization could kill the seeds and roots, but it is neither required nor done.
1.6 How large is the volume of the movement along the pathway?	no judgement	No data available.
1.7 How frequent is the movement along the pathway?	minimal	The Panel considered the trade of soil was limited.
1.8 How likely is the pest to survive during transport /storage?	very likely	Seeds can remain viable at least 10 years. Sections of taproot may maintain their viability for up to 15 months. The transport lasts a few days and will not altere the seeds and rhizomes.
1.9 How likely is the pest to multiply/increase in prevalence during transport /storage?	very unlikely	Seeds or roots do not multiply, but fragments of roots are able to develop during transport and possibly to be identified.
1.10 How likely is the pest to survive or remain undetected during existing phytosanitary measures?	very likely	EPPO EU Countries: Soil or growing media coming from Turkey, Belarus, Moldavia, Russia, Ukraine and third countries not belonging to continental Europe, other than Egypt, Israel, Libya, Morocco, Tunisia is prohibited of import in the EU. There are no specific requirements for soil or growing media coming from authorised countries (Egypt, Israel, Libya, Morocco, Tunisia, Switzerland, Norway, Croatia,..) In other EPPO countries, import of soil is prohibited. Seeds and roots can easily remain undetected as no attention is paid to this species. Seeds are very small. Roots can be very discrete and could be confused with soil.
1.10A Is the pathway being considered a commodity pathway, or natural spread?	commodity pathway	
1.11 How widely is the commodity to be distributed throughout the PRA area?	widely	Soil could be traded in the whole EPPO area.

1.12 Do consignments arrive at a suitable time of year for pest establishment?	yes	When soil arrives, seeds and roots can remain viable for several months and years.
1.13 How likely is the pest to be able to transfer from the pathway to a suitable host or habitat?	very likely	When soil is used for planting (but it is not always the case), it is intended to be transfered to suitable habitats such as gardens, road sides, nurseries, fields, natural or semi-natural areas... from which the species could later escape.
1.14 How likely is the intended use of the commodity (e.g. processing, consumption, planting, disposal of waste, by-products) to aid transfer to a suitable host or habitat?	/	Not relevant.
1.3 Describe this pathway		**Soil as a contaminant (on used machinery, footwear,…)**
1.4 Is the prevalence of the pest on the pathway at origin likely to be high, taking into account factors like the prevalence of the pest at origin, the life stages of the pest, the period of the year?	very likely	In the infested area, the soil of nurseries, fields, gardens, road sides, pastures, waste lands,… can be infested with hundreds of small seeds and of small fragments (0.5 cm) of roots. Seeds and small fragments of roots can easily and widely be dispersed by soil as a contaminant of agricultural machinery and tools, vehicles and travellers.
1.5 Is the prevalence of the pest on the pathway at origin likely to be high, taking into account factors like cultivation practices, treatment of consignments?	likely	It is assumed that there are rarely requirements for cleaning of agricultural used machinery nor tools and vehicles. If soil is removed from a contaminated place, so are the seeds and roots of the pest.
1.6 How large is the volume of the movement along the pathway?	no judgement	No data available.
1.7 How frequent is the movement along the pathway?	no judgement	No data available.
1.8 How likely is the pest to survive during transport /storage?	very likely	Seeds can remain viable at least 10 years. Sections of taproot may maintain their viability for up to 15 months. The transport lasts a few days and will not altere the seeds and rhizomes.
1.9 How likely is the pest to multiply/increase in prevalence during transport /storage?	very unlikely	Seeds or roots do not multiply.
1.10 How likely is the pest to survive or remain undetected during existing phytosanitary measures?	very likely	Few measures are in place for soil as a contaminant.

1.10A Is the pathway being considered a commodity pathway, or natural spread?	commodity pathway	
1.11 How widely is the commodity to be distributed throughout the PRA area?	widely	Machinery and travellers can go everywhere in the PRA area.
1.12 Do consignments arrive at a suitable time of year for pest establishment?	yes	Whatever the conditions of arrival, seeds and roots can remain viable for several months and years.
1.13 How likely is the pest to be able to transfer from the pathway to a suitable host or habitat?	very likely	Via used machinery which is intended to be used in fields is driven on roads. Fields and road sides are very suitable habitats for the plant. It can be introduced there and then spread very easily.
1.14 How likely is the intended use of the commodity (e.g. processing, consumption, planting, disposal of waste, by-products) to aid transfer to a suitable host or habitat?	very likely	See previous question.
1.3 Describe this pathway		**Containers and packing**
1.4 Is the prevalence of the pest on the pathway at origin likely to be high, taking into account factors like the prevalence of the pest at origin, the life stages of the pest, the period of the year?	moderatly likely	Containers and packing present in nurseries, orchards, places of production of vegetables could be contaminated by seeds or fragments of roots.
1.5 Is the prevalence of the pest on the pathway at origin likely to be high, taking into account factors like cultivation practices, treatment of consignments?	moderatly likely	It is assumed that containers and packing are neither cleaned nor inspected as it is not requested.
1.6 How large is the volume of the movement along the pathway?	major	Associated with many commodities.
1.7 How frequent is the movement along the pathway?	major	Associated with many commodities.
1.8 How likely is the pest to survive during transport /storage?	very likely	Seeds can remain viable at least 10 years in the soil. Sections of taproot may maintain their viability for up to 15 months. The transport lasts a few days and will not altere the seeds and rhizomes.
1.9 How likely is the pest to multiply/increase in prevalence during transport /storage?	unlikely	Seeds or roots do not multiply.

1.10 How likely is the pest to survive or remain undetected during existing phytosanitary measures?	very likely	There are no relevant phytosanitary measures for containers and packing. Seeds are very small and the very small fragments of roots will remain undetected.
1.10A Is the pathway being considered a commodity pathway, or natural spread?	commodity pathway	
1.11 How widely is the commodity to be distributed throughout the PRA area?	widely	All EPPO countries can be potential importers of material transported in containers and packing.
1.12 Do consignments arrive at a suitable time of year for pest establishment?	yes	Seeds can wait till the suitable moment for germination and fragments of roots are viable for up to 15 months.
1.13 How likely is the pest to be able to transfer from the pathway to a suitable host or habitat?	moderatly likely	If containers and packing are stored for several months in farms or nursery industries, the seeds could be dispersed by wind or water and germinate. Fragments of roots could regenerate if there is ground.
1.14 How likely is the intended use of the commodity (e.g. processing, consumption, planting, disposal of waste, by-products) to aid transfer to a suitable host or habitat?	moderatly likely	The pest could first settle in the surroundings of the containers and packing, produce roots and seeds and then colonize other habitats.
1.15 Do other pathways need to be considered?	no	

The overall probability of entry should be described and risks presented by different pathways should be identified.		The overall probability of entry of the plant is very likely. The plant has already been introduced in Italy, France, Spain, Greece,… - Consignments of seeds for sowing: very likely - Consignments of grain: moderately likely - Consignments of cotton: to be investigated further - Consignments of hay: unlikely - Maize for forage: unlikely as there is no movement along the pathway. - Plants for plantings accompanied by soil: very likely - Soil/growing medium (with organic matters) as a commodity: very likely - Soil as a contaminant on used machinery: very likely - Soil as a contaminant on footwear: moderatly likely - Containers and packaging: moderately likely
1.16 Specify the host plant species (for pests directly affecting plants) or suitable habitats (for non parasitic plants) present in the PRA area.		Suitable habitats: - man made habitats: road sides, waste lands, gardens, orchards,and the following crops (*Gossypium hirsutum* (Cotton), *Medicago sativa* (lucerne), *Sorghum bicolor* (common sorghum), *Triticum aestivum* (wheat), *Zea mays* (maize) and to a lesser extent *Arachis hypogaea* (groundnut), *Asparagus officinalis* (asparagus), *Beta vulgaris var. saccharifera* (sugar beet), *Citrus spp*., *Cucumis sativus* (cucumber), *Lycopersicon esculentum* (tomato), *Olea europaea subsp. europaea* (olive), *Prunus persica* (peach), *Solanum tuberosum* (potato), *Sorghum sudanense* (Sudan grass) and *Vitis vinifera* (grapevine).) - pastures and managed grassland, riversides and canalbanks.

1.17 How widely distributed are the host plants or suitable habitats in the PRA area? (specify)	widely	These habitats are very common.
1.18 If an alternate host is needed to complete the life cycle, how widespread are alternate host plants in the PRA area?	irrelevant	No alternate host needed.
1.19 Does the pest require other species for critical stages in its life cycle such as transmission, (e.g. vectors), growth (e.g. root symbionts), reproduction (e.g. pollinators) or spread (e.g. seed dispersers) ?	no	
1.19A Specify the area where host plants (for pests directly affecting plants) or suitable habitats (for non parasitic plants) are present (cf. QQ 1.16-1.19). This is the area for which the environment is to be assessed in this section. If this area is much smaller than the PRA area, this fact will be used in defining the endangered area.		Suitable habitats previously described are widespread in the whole EPPO area (roadsides, gardens, pastures,…) The cultivations cited (see 1.16) mainly occur in the southern part of the EPPO area.
1.20 How similar are the climatic conditions that would affect pest establishment, in the PRA area and in the area of current distribution?	moderately similar	The plant appears mostly in areas of relatively low annual rainfall (250-600 mm) (Parsons, 1981; Heap and Carter, 1999). Climate is the most limiting factor. The temperate area could also be at risk. The plant appears to be thermophillic. See annexe 1 of Climatic prediction
1.21 How similar are other abiotic factors that would affect pest establishment, in the PRA area and in the current area of distribution?	largely similar	Abiotic conditions such as soil do not really affect the plant repartition. In Australia the heaviest infestation have been noticed on sandy soils with low organic matter.
1.22 If protected cultivation is important in the PRA area, how often has the pest been recorded on crops in protected cultivation elsewhere?	no judgement	No record of infested protected cultivation has been reported.

1.23 How likely is establishment to be prevented by competition from existing species in the PRA area?	very unlikely	The plant is very competitive and forms monospecific stands replacing other species where it is invasive.
1.24 How likely is establishment to be prevented by natural enemies already present in the PRA area?	very unlikely	In North Africa, where the plant is very invasive and very widespread, no natural ennemies have been recorded. *S. elaeagnifolium* supports a diverse insect herbivorous fauna in its area of origin (Goeden, 1971), some of which have been tested as biological control agents notably in South Africa (Olckers and Zimmermann, 1991) and Australia (Wapshere, 1988). Two leaf-feeding beetles, *Leptinotarsa texana* and *Leptinotarsa defecta*, are established in South Africa following release in 1992, though only *L. texana* causes considerable damage, by reducing growth and fruit production (Hoffmann *et al*., 1998; Olckers *et al*., 1999).
1.25 To what extent is the managed environment in the PRA area favourable for establishment?	slightly favourable	The entire PRA area is slightly favourable. Outbreaks have already been found in Spain, France, Italy, Greece, Croatia,... The crop sown will be irrigated and fertilized, favouring the weed. Application of herbicides could completely destroy or partially limit the development of the pest. One plant, for instance at the limit of a field, could produce roots that could spread within a few years. Planting, fertilizing, watering the crops favour the germination or regeneration of *S. elaeagnifolium*.
1.26 How likely are existing control or husbandry measures to prevent establishment of the pest?	Very unlikely	The Panel considered that specific measure would be required to prevent establishment of the pest and that existing measure against other weeds would not be sufficient
1.27 How likely is it that the pest could be eradicated from the PRA area ?	unlikely	Eradication is possible for early infestations. Once the species covers large area, it is very difficult to eradicate, for example in North Africa. In Russia, contingency plans state that if an outbreak is detected, the field should be removed from production for 3 years. It has to be treated with Imazapyr 0.75 kg/ha of active matter at the 2-4 leaves stage. Then, perennial or winter wheat has to be sown in the field. Alternatively, the following measures can be implemented - ploughing during the year of detection and no crop the subsequent year together with a glyphosate treatment at 2.5-3 kg/ha of active matter at the 2-4 leaves stage, followed by 2 to 3 ploughing during the vegetative season.

		- Planting of perennials with a phytosanitary treatment.
1.28 How likely is the reproductive strategy of the pest and the duration of its life cycle to aid establishment?	very likely	The species is very competitive and resistant. Vegetative reproduction is very efficient. Fragments can remain viable for more than 15 months. Reproduction by seeds is less efficient as germination rate is very low and that there is a dormancy period. Neverheless, hundreds of seeds are produced in a plant and these seeds are viable for 10 years in the soil. Moreover, the plant has different life forms (geophyte, hemicryptophyte, chaméphyte and therophyte).
1.29 How likely are relatively small populations or populations of low genetic diversity to becomeestablished?	likely	Morphologically, *S. elaeagnifolium* is very polymorphic. It is particularly true for the size of the plant, shape of leaves and colour of the flowers. Caryological analysis shows that there is variability of the chromosome number among plants in Morocco, with a predominance of 2n=24 (Gmira *et al*., 1998). The huge Moroccan population of *S. elaeagnifolium* is thought to originate from a single introduction of seeds in 1944. Vegetative reproduction is very efficient.
1.30 How adaptable is the pest? Adaptability is:	moderate	The species is mainly limited to man-made habitats (orchards, fields,....), but penetrates into pastures and grasslands. Climatically, the species is thermophillic and is very well adapted to Mediterranean climates. It is also present in temperate climates (in North America, Australia).
1.31 How often has the pest been introduced into new areas outside its original area of distribution? (specify the instances, if possible)	very often	The plant is present in the 5 continents and in several countries where it is considered invasive. It is considered one of the worst weeds in the world (see EPPO Reporting Service 01/06 presenting its worldwide repartition).
1.32 Even if permanent establishment of the pest is unlikely, how likely are transient populations to occur in the PRA area through natural migration or entry through man's activities (including intentional release into the environment)?		Permanent establishment is possible.

1.33 How likely is the pest to spread rapidly in the PRA area by natural means?	moderately likely	Spread can occur both vegetatively from cut root sections, and via seeds. Small fragments of roots (0.5 cm) can regenerate. The fruit can float, and can be dispersed over long-distances along rivers, streams, especially during floods Although the plants die back in winter, ripe fruit are retained on dead branches and may be dispersed by wind. Dried plants may also blow like tumbleweeds, spreading seed along the way (Boyd *et al.* 1984). The plant can also spread in the dung of wild animals.
1.34 How likely is the pest to spread rapidly in the PRA area by human assistance?	very likely	Spread is possible via livestock and manure, via irrigation water, via agricultural machinery, via rooted nursery plants, via contaminated straw or seeds. Vehicles and tools used in agriculture, bulldozers and other earth-moving equipment can also spread the weed by transporting both seeds and sections of root. Soil and ornamental plants can be contaminated by fragments of roots or seeds of *S. elaeagnifolium*. . Seeds are also easily and widely dispersed by agricultural machinery and tools, vehicles, in bales of hay and alfalfa, and in the dung of livestock.
1.35 How likely is it that the spread of the pest could be contained within the PRA area?	unlikely	It is a difficult plant to contain because of spread mechanism.
The overall probability of introduction and spread should be described. The probability of introduction and spread may be expressed by comparison with PRAs on other pests.	high	Probability of introduction is high, considering all the pathways and all the countries where the plant is present and the fact that nothing is done to limit the spread of this pest from one country to another (except in Russia, Ukraine and Belarus). Probability of spread is high too, considering that the plant is dispersed both naturally and with human activities, the later one being the most efficient.
1.36 Based on the answers to questions 1.16 to 1.35 identify the part of the PRA where presence of host plants or suitable habitats and ecological factors favour the establishment and spread of the pest to define the endangered area.		The endangered area is considered to be the whole southern EPPO region. Habitats at risk are the man-made habitats (as receptors and facilitators of propagation of the plant), field crops (cotton fields, wheat, vegetables,..), orchards and pastures. The countries considered at risk are: Albania, Algeria, ,Bosnia and Herzegovina Bulgaria, Croatia, Cyprus, France, Georgia, Greece, Hungary, Israel, Italy, Jordan, Kazakhstan, Moldova, Malta, Morocco Portugal, Spain, Romania, Russia, Serbia and Montenegro, Slovenia, Tunisia, Turkey, Ukraine, Uzbekistan.
2.0 For the following questions, will you be considering all hosts/habitats together or specific case(s)?	all habitats	
Identify the host/habitat		Fields of crops, vegetables, orchards, pastures, gardens, road sides. Recreational areas, semi-natural areas such as canalsides.

2.1 How great a negative effect does the pest have on crop yield and/or quality to cultivated plants or on control costs within its current area of distribution?	major	*S. elaeagnifolium* competes for moisture and nutrients, The most serious crop losses have been recorded on *Gossypium hirsutum* (Cotton), *Medicago sativa* (lucerne), *Sorghum bicolor* (common sorghum), *Triticum aestivum* (wheat), *Zea mays* (maize). Other crop losses are reported but are less important. Crops concerned are *Arachis hypogaea* (groundnut), *Asparagus officinalis* (asparagus), *Beta vulgaris var. saccharifera* (sugar beet), *Citrus spp*. (citurs), *Cucumis sativus* (cucumber), *Lycopersicon esculentum* (tomato), *Olea europaea subsp. europaea* (olive), Prunus persica (peach), *Solanum tuberosum* (potato), *Sorghum sudanense* (Sudan grass) and *Vitis vinifera* (grapevine). In Morocco, losses of up to 47% in maize and 78% in cotton have been reported. In Australia, wheat losses varied from 12 to 50% (Cuthbertson, 1976) according to climatic conditions and weed density, but were highest at dry, sandy sites or during low rainfall years (Heap and Carter, 1999). In the USA, sorghum and cotton yield losses under optimal moisture regimes were 4-10% and 5-14%, respectively, (Robinson *et al.*, 1978), with 75% losses in cotton grown under semi-arid conditions. Besides plant losses: *The berries of S. elaeagnifolium are toxic to livestock, more particularly when mature (Burrows et al., 1981). Symptoms include excessive salivation, nasal discharge, respiratory complications, bloating, trembling and diarrhoea (Parsons, 1981). The plant affects horses, causes mortality to sheep (Molnar and McKenzie, 1976), while goats are apparently unaffected (Parsons, 1981; Wassermann et al., 1988).*

2.2 How great a negative effect is the pest likely to have on crop yield and/or quality in the PRA area?	major	The cultivations previously cited and present in the endangered are very likely to be infested. There are no or few cotton fields in the endengered area, but other affected crops are present. Agricultural land infested with *S. elaeagnifolium* loses considerable rental and resale value. In Morocco, the value of infested lands decreased by 25% (Gmira *et al*., 1998). In the USA, farms have been abandoned because of infestation (Parsons, 1981). *Gossypium hirsutum* (Cotton): the few cultivations in the EPPO area could be strongly affected (up to 78% of loss recorded in Morrocco) as Greece, Spain, Uzbekistan. *Medicago sativa* (lucerne): losses in yields are supposed to be major. *Zea mays*: 49,762,389 tons produced in EU in 2005, 13,226,000 tons in France, 10,622,000 tonnes in Italy. And 6,800,000 tons in Egypt, 224,130 tons in Morocco, 7,210,000 tons in Ukraine, 3,650,000 tons in the Russian Federation, the Republic of Moldova 1,200,000. In Morocco, losses are recorded to be up to 47%. *Triticum aestivum* (wheat): All the EPPO countries produce wheat. 124,216,489 tons were produced in the EU in 2005, of which 36,922,000 tons were producede in France. Bulgaria produces 670,000 tons, the Czech Republic 4,536,040, Denmark 4,826,013, the Russian Federation 45,500,000, Poland 8,556,248,… In Australia, wheat losses varied from 12 to 50% (Cuthbertson, 1976) according to climatic conditions. *Sorghum bicolor* (common sorghum): 524,264 tons produced in the EU in 2005: 268,000 tons in France, 221,264 tons in Italy. Russian Federation produced 45,500 tons. In the USA, sorghum losses under optimal moisture regimes were 5-14% (Robinson *et al.*, 1978) To a lesser extent, the following crops are affected: *Arachis hypogaea* (groundnut): 3,825 tons of groundnut in shell were produced in 2005, 2,000 tons in Greece, 1,750 tons in Cyprus. Egypt produced 190,000 tons,

		Morocco 49,400 tons. *Asparagus officinalis* (asparagus): 239,645 tons produced in 2005, 76,581 tons in Germany, 47,600 tons in Spain, 44,437 tons in Italy, 24,300 tons in France. Morocco produced 1,600 tons. *Beta vulgaris var. saccharifera* (sugar beet): 126,323,276 tons of sugar beets, 29,303,000 tons in France, 25,427,000 tons in Germany, 12,000,000 tons in Italy, 10,972,027 tons in Poland. Citrus spp.: 10,349,043 tons in the EU (total production) in 2005, 4,867,300 tons in Spain, 3,836,793 tons in Italy, 1,157,700 tons in Greece. Egypt produced 3,429,535 tons and Morocco 4,560,000 tons, the Russian Federation 21,520,000, Ukraine 16,360,000, Belarus 3,170,000. *Cucumis sativus* (cucumber): 2,052,720 tons of cucumbers and gherkins produced in the EU in 2005. 485,000 tons produced in Spain, 435,000 tons in the Netherlands, 259,000 tons in Poland. The Russian Federation produced 1,300,000 tons, Ukraine 700,000, Belarus 210,000, Egypt 600,000, Algeria 68,000, Morocco 40,000, Tunisia 37,000. *Lycopersicon esculentum* (tomato): 17,578,586 tons produced in the EU 2005, 7,814,899 tons in Italy, 4,473,573 tons in Spain, 1,175,000 tons in Portugal, 1,700,000 tons in Greece. Morocco produced 1,201,230tons, Tunisia 920,000, Algeria 880,000, Egypt 7,600,000, Jordan 408,396, the Russian Federation 1,980,000, Ukraine 1,200,000, Uzbekistan 1,200,000. *Olea europaea subsp. europaea* (olive): 10,354,494 tons of olives produced in the EU in 2005, 4,114,293 tons in Italy, 3,712,700 tons in Spain and 2,200,000 tons in Greece. Tunisia produced 700,000 tons, Morocco 450,000, Algeria 170,000. *Prunus persica* (peach): 4,155,064 tons of peaches and nectarines produced in the EU in 2005, 1,740,485 tons in Italy, 1,130,800 tons in Spain and 681,000 tons in Greece. Tunisia produced 92,000, Algeria 73,000, Morocco 54,390, the Russian Federation 55,000, Uzbekistan 45,000.

		Solanum tuberosum (potato): 59,605,504 tons produced in 2005 in the EU, 11,157,500 tons in Germany, 11,009,392 tons in Poland, 6,300,000 tons in the UK, 2,591,700 tons in Spain. The Russian Federation 36,400,000, Ukraine 19,300,000, Kazakhstan 2,300,000, Belarus 8,600,000, Algeria 1,800,000, Morocco 1,440,000, Tunisia 380,000. *Vitis vinifera* (grapevine): 26,774,304 tons of grapes were produced in 2005 in the EU, 9,256,814 tons in Italy, 6,787,000 tons in France and 5,879,800 tons in Spain. Morocco 267,000, Algeria 275,000, Tunisia 115,000, the Russian Federation 325,000, Moldova, Republic of600,000, Ukraine 500,000, Uzbekistan 500,000. *Sorghum sudanense* (Sudan grass) is also affected but is not quoted in FAOSTAT.
2.3 How great an increase in production costs (including control costs) is likely to be caused by the pest in the PRA area?	major	There is an increase in production costs due to the use of management methods (mechanical and chemical control + hand weeding). Existing mechanical or chemical control to manage other Solanaceae may affect *S. elaeagnifolium*. Same consequences on land value could occur in the endangered area.
2.4 How great a reduction in consumer demand is the pest likely to cause in the PRA area?	very unlikely	
2.5 How important is environmental damage caused by the pest within its current area of distribution?	moderate	Although *S. elaeagnifolium* is primarily associated with cultivated land, it may also invade adjoining areas (e.g. roadsides, river/canalsides). It may replace natural vegetation in areas of overgrazed rangeland and in heavily trampled areas around water holes. However, the environmental impacts are limited in comparison to the impacts on cultivated lands.

2.6 How important is the environmental damage likely to be in the PRA area (see note for question 2.5)?	moderate	Natural areas and lands could be threatened in the same way. In the south of France where the plant has been eradicated, the plant could have potentially invaded pastures hosting protected species.
2.7 How important is social damage caused by the pest within its current area of distribution?	moderate	Loss of agricultural land may result in social problem
2.8 How important is the social damage likely to be in the PRA area?	moderate	
2.9 How likely is the presence of the pest in the PRA area to cause losses in export markets?	moderately likely	The plant is associated with many traded pathways. Tunisia exports to EU 1945 000 euros of ornamental horticultural products (exscluding seeds), Morocco 3976 000. Very difficult to say if there will be export market losses.
2.9A As noted in the introduction to section 2, the evaluation of the following questions may not be necessary if any of the responses to questions 2.2, 2.3, 2.4, 2.6 or 2.8 is "major or massive" or "likely or very likely". In view of these resposes, is a detailed study of impacts required?	yes	
2.10 How easily can the pest be controlled in the PRA area?	with much difficulty	The plant is very difficult to eradicate (see question 1.26) and to control (according to the huge number of publications in North Africa).
2.11 How probable is it that natural enemies, already present in the PRA area, will suppress populations of the pest if introduced?	unlikely	Biological control has been undertaken in South Africa but the natural enemies are not present in the PRA area.
2.12 How likely are control measures to disrupt existing biological or integrated systems for control of other pests or to have negative effects on the environment?	moderately likely	One of the control methods consists of using herbicides. The use of herbicides can have a negative impact if done in semi-natural areas.
2.13 How important would other costs resulting from introduction be?	major	Costs of monitoring and costs of communication to the public in all the countries affected or at risk (at least 15 countries).

2.14 How likely is it that genetic traits can be carried to other species, modifying their genetic nature and making them more serious plant pests?	unlikely	There is no record on these elements.
2.15 How likely is the pest to act as a vector or host for other pests?	likely	In California, *S. elaeagnifolium* has been reported as a host of *Lettuce chlorosis virus* (McLain *et al.*, 1998) which is transmitted by *Bemisia tabaci*. It is also recorded as a secondary host of several pests, the most important being *Leptinotarsa decemlineata* (Hare, 1990), *Anthonomus eugenii* (Patrock and Schuster, 1992), *Globodera rostochiensis* and *Globodera pallida.* Moreover, Bouhachem *et al*. 2006 showed that *S. elaeagnifolium* can be a reservoir of PVY under natural conditions.
2.15A Do you wish to consider the questions 2.1 to 2.15 again for further hosts/habitats?	No	
2.16 Referring back to the conclusion on endangered area (1.36), identify the parts of the PRA area where the pest can establish and which are economically most at risk.		Fields of Lucerne, Maize, sorghum, wheat (latin name), vegetables, orchards, vineyards, waste lands, pastures, canalsides,... of the southern EPPO region.

2.16A Estimation of the probability of introduction of a pest and of its economic consequences involves many uncertainties. In particular, this estimation is an extrapolation from the situation where the pest occurs to the hypothetical situation in the PRA area. It is important to document the areas of uncertainty and the degree of uncertainty in the assessment, and to indicate where expert judgement has been used. This is necessary for transparency and may also be useful for identifying and prioritizing research needs. It should be noted that the assessment of the probability and consequences of environmental hazards of pests of uncultivated plants often involves greater uncertainty than for pests of cultivated plants. This is due to the lack of information, additional complexity associated with ecosystems, and variability associated with pests, hosts or habitats.		When performing the PRA the following uncertainties have been identified: - The distribution of the pest should be analyzed more precisely and a distinction should be made between areas where it is invasive and areas where it is present but not invasive. - The ability of the plant to colonize temperate climates. - The possibility for different Cotton commodities to act as a pathway. 2 other pathways have not been considered in this analysis: - Livestock - The plant could possibly be introduced into a country for ornamental purposes, but this has very rarely been the case until now
Evaluate the probability of entry and indicate the elements which make entry most likely or those that make it least likely. Identify the pathways in order of risk and compare their importance in practice.	Very likely	- Plants for plantings accompanied by soil: very likely - Soil/growing medium (with organic matters) as a commodity: very likely - Soil as a contaminant (on used machinery and footwear): very likely - Consignments of seeds for sowing: very likely. Management is not assessed for this pathway. - Consignments of grain: likely

		- Consignments of hay: very unlikely - Containers and packaging: likely - Consignments of cotton: need further investigation
Evaluate the probability of establishment, and indicate the elements which make establishment most likely or those that make it least likely. Specify which part of the PRA area presents the greatest risk of establishment.	likely	Establishment is likely and will be facilitated if fragments of roots are contaminating consignments, rather than seeds. Nevertheless, the plant entered and established in many countries by seeds. Establishment is mainly dependent on climate, habitat and human activities that will facilitate the spread of the plant. Human activities will greatly facilitate the establishment of the plant. Plants introduced in crop fields are more likely to spread than plant introduced in semi-natural habitats. Some herbicides used in these crops could limit its establishment and spread, other used in Solanceae crops might favour its establishment. Fertilization, irrigation and ploughing will facilitate its establishment, while use of machinery will help its spread to other suitable habitats.
List the most important potential economic impacts, and estimate how likely they are to arise in the PRA area. Specify which part of the PRA area is economically most at risk.		The most serious crop losses have been recorded in lucerne (Australia, South Africa, USA); cotton, *Sorghum bicolor* (common sorghum), *Zea mays* (maize) and *Arachis hypogaea* (groundnut) (Morocco, USA); wheat (Australia, Greece); and cultivated pastures (Australia, Greece, Morocco, USA). In Morocco, losses of up to 47% in maize and 78% in cotton have been reported. *Other affected crops* *S. elaeagnifolium* competes for moisture and nutrients, the most affected crops are *Gossypium hirsutum* (Cotton), *Medicago sativa* (lucerne), *Triticum aestivum* (wheat), and to a lesser extent, *Asparagus officinalis* (asparagus), *Beta vulgaris var. saccharifera* (sugar beet), *Citrus spp*. (citurs), *Cucumis sativus* (cucumber),

		Lycopersicon esculentum (tomato), *Olea europaea subsp. europaea* (olive), *Prunus persica* (peach), *Solanum tuberosum* (potato), *Sorghum sudanense* (Sudan grass) and *Vitis vinifera* (grapevine). *Gossypium hirsutum* (Cotton): the few cultivations in the EPPO area could be strongly affected (up to 78% of loss recorded in Morrocco) as Greece, Spain, Uzbekistan.
The risk assessor should give an overall conclusion on the pest risk assessment and an opinion as to whether the pest or pathway assessed is an appropriate candidate for stage 3 of the PRA: the selection of risk management options, and an estimation of the pest risk associated.		*Solanum elaeagnifolium* is very likely to spread further within the endangered area and cause major economic impacts considering all the crops affected by this pest. It would also have environmental effects.

Stage 3: Pest risk Management

3.1. Is the risk identified in the Pest Risk Assessment stage for all pest/pathway combination an acceptable risk?	no	
Pathway 1		**Seeds coming from countries where *S. elaeagnifolium* occurs** *- Zea mays* *- Medicago sativa* *- Triticum aestivum* *- Sorghum bicolor* *- Gossypium spp.* *- Nicotiana glauca*
3.2. Is the pathway that is being considered a commodity of plants and plant products?	yes	
3.10. Are there any existing phytosanitary measures applied on the pathway that could prevent the introduction of the pest	no	In most EPPO countries there are no measures applied regarding this plant except in the Russian Federation, Ukraine and Belarus, where *S. elaeagnifolium* is listed as a quarantine pest.
3.11. Can the pest be reliably detected by a visual inspection of a consignment at the time of export during transport/storage or at import?	yes	Although the seed is small (less than 1mm), it can be detected by a visual inspection.
3.12. Can the pest be reliably detected by testing (e.g. for pest plant, seeds in a consignment)?	no	
3.13. Can the pest be reliably detected during post-entry quarantine?	no	Not realistic.
3.14. Can the pest be effectively destroyed in the consignment by treatment (chemical, thermal, irradiation, physical)?	no	Any treatment could also have an effect on the seeds imported.
3.15. Does the pest occur only on certain parts of the plant or plant products (e.g. bark, flowers), which can be removed without reducing the value of the consignment? (This question is not relevant for pest plants)	no	Not relevant.

3.16. Can infestation of the consignment be reliably prevented by handling and packing methods?	yes	Sorting or cleaning of seeds to eliminate *S. elaeagnifolium* seeds. For instance, in the USA, the plant is prohibited or regulated under the 2006 State Noxious-Weed Seed Requirements, and when regulated, a certain amount of seeds per pound is tolerated.
3.17. Could consignments that may be infested be accepted without risk for certain end uses, limited distribution in the PRA area, or limited periods of entry, and can such limitations be applied in practice?	no	The only end use is planting which presents a risk.
3.18. Can infestation of the commodity be reliably prevented by treatment of the crop?	yes	Treatments (chemical and mechanical) exist for seeds for planting but treatments should ensure that the field is free from *S. elaeagnifolium*.
3.19. Can infestation of the commodity be reliably prevented by growing resistant cultivars? (This question is not relevant for pest plants)	no	Not relevant.
3.20. Can infestation of the commodity be reliably prevented by growing the crop in specified conditions (e.g. protected conditions, sterilized growing medium...)?	no	
3.21. Can infestation of the commodity be reliably prevented by harvesting only at certain times of the year, at specific crop ages or growth stages?	no	The fructification period is long (from the end of spring till autumn) and allows the pest to be present in consignments of seeds.
3.22. Can infestation of the commodity be reliably prevented by production in a certification scheme (i.e. official scheme for the production of healthy plants for planting)?	yes	Provided specific requirements for freedom of seeds of *S. elaeagnifolium* are included.
3.23. Is the pest of very low capacity for natural spread?	no	
3.24. Is the pest of low to medium capacity for natural spread?	yes	Pest-free place of production, Or pest-free area. Although the scheme does not allow for it, the Panel considered, pest freedom of the crop was a valid option for this pest.
3.25. Is the pest of medium capacity for natural spread?	no	
3.26. The pest is of medium to high capacity for natural spread		
3.27. Can pest freedom of the crop, place of production or an area be reliably guaranteed?	yes	

3.28. Are there effective measures that could be taken in the importing country (surveillance, eradication) to prevent establishment and/or economic or other impacts?	/	Internal surveillance of crops could detect the plant as it is a large plant (up to one metre high) with identifiable characters but eradication would be difficult if not detected immediately. Moreover, surveillance and eradication in all suitable habitats is not realistic.
3.29. Have any measures been identified during the present analysis that will reduce the risk of introduction of the pest?	yes	- Visual inspection of the consignment - Sorting of the seeds to eliminate *S. elaegnifolium* seeds - Treatment of the crop - Pest freedom of the crop, - Pest-free place of production, - Pest-free area - Surveillance, eradication
3.30. Taking each of the measures identified individually , does any measure on its own reduce the risk to an acceptable level?	yes	Pest freedom of the crop, Or Pest-free place of production, Or Pest-free area
3.31. For those measures that do not reduce the risk to an acceptable level, can two or more measures be combined to reduce the risk to an acceptable level?	yes	- Treatment of the crop should be complemented by a visual inspection of the crop to ensure that the field is free from *S. elaeagnifolium*. - Cleaning (by sieving or blowing) of the seeds to eliminate *S. elaeagnifolium* seeds complemented by a visual inspection of the consignment to ensure that it is free from the plant.
3.33. Estimate to what extent the measures (or combination of measures) being considered interfere with trade.		Requiring place of production freedom is a common measure for Plants for Planting but there are at the moment few requirements regarding seeds in most EPPO countries (Except for former USSR countries).
3.34. Estimate to what extent the measures (or combination of measures) being considered are cost-effective, or have undesirable social or environmental consequences.		The measures are cost effective for the importing countries as the eradication and management of the pest is difficult. There may also be substantial costs for the exporting country.
3.35. Have measures (or combination of measures) been identified that reduce the risk for this pathway, and do not unduly interfere with trade, are cost-effective and have no undesirable social or environmental consequences?	yes	Visual inspection of the crop with treatment of the crop to ensure freedom from the plant Or Cleaning (by sieving or blowing) of seeds to eliminate *S. elaeagnifolium* seeds coupled with visual inspection of the consignment. Or Pest freedom of the crop (inspection or treatment+inspection) Or Pest-free place of production, Or Pest-free area.
3.36. Envisage prohibiting the pathway		

3.37. Have all major pathways been analyzed (for a pest-initiated analysis)?	no	
Pathway 2		**Plants for planting with growing media attached coming from countries where *S. elaeagnifolium* occurs**
3.2. Is the pathway that is being considered a commodity of plants and plant products?	yes	
3.10. Are there any existing phytosanitary measures applied on the pathway that could prevent the introduction of the pest	no	General measures for plants for planting with growing medium attached from non-European countries exist in the EU but are not enough to prevent the introduction of *S. elaeagnifolium.*
3.11. Can the pest be reliably detected by a visual inspection of a consignment at the time of export during transport/storage or at import?	no	Some stages are not easily visible (small seeds, small fragments of roots).
3.12. Can the pest be reliably detected by testing (e.g. for pest plant, seeds in a consignment)?	no	Not relevant
3.13. Can the pest be reliably detected during post-entry quarantine?	no	Not realistic
3.14. Can the pest be effectively destroyed in the consignment by treatment (chemical, thermal, irradiation, physical)?	no	Any treatment could also have an effect on the consignment imported.
3.15. Does the pest occur only on certain parts of the plant or plant products (e.g. bark, flowers), which can be removed without reducing the value of the consignment? (This question is not relevant for pest plants)	no	The Panel considered that soil freedom will not be a sufficient measure as as root fragments of S. elaeagnifolium may remain mixted with the plant root system.
3.16. Can infestation of the consignment be reliably prevented by handling and packing methods?	no	Not relevant
3.17. Could consignments that may be infested be accepted without risk for certain end uses, limited distribution in the PRA area, or limited periods of entry, and can such limitations be applied in practice?	no	The only end use is planting.
3.18. Can infestation of the commodity be reliably prevented by treatment of the crop?	no	Treatment against fragments of roots is difficult.

3.19. Can infestation of the commodity be reliably prevented by growing resistant cultivars? (This question is not relevant for pest plants)	no	Not relevant
3.20. Can infestation of the commodity be reliably prevented by growing the crop in specified conditions (e.g. protected conditions, sterilized growing medium...)?	yes	If plants are grown in containers with sterilized growing medium.
3.21. Can infestation of the commodity be reliably prevented by harvesting only at certain times of the year, at specific crop ages or growth stages?	no	Not relevant
3.22. Can infestation of the commodity be reliably prevented by production in a certification scheme (i.e. official scheme for the production of healthy plants for planting)?	no	Not relevant
3.23. Is the pest of very low capacity for natural spread?	no	
3.24. Is the pest of low to medium capacity for natural spread?	yes	Pest-free place of production, Or Pest-free area
3.25. Is the pest of medium capacity for natural spread?	no	
3.26. The pest is of medium to high capacity for natural spread	no	
3.27. Can pest freedom of the crop, place of production or an area be reliably guaranteed?	yes	
3.28. Are there effective measures that could be taken in the importing country (surveillance, eradication) to prevent establishment and/or economic or other impacts?	/	Internal surveillance of crops could detect the plant as it is a big plant (up to one metre high) with identifiable characters but eradication would be difficult if not detected immediately. Moreover, surveillance and eradication in all suitable habitats is not realistic.
3.29. Have any measures been identified during the present analysis that will reduce the risk of introduction of the pest?	yes	Pest-free place of production Or pest-free area, Or plants grown in containers with sterilized growing medium or placed on shelves.
3.30. Taking each of the measures identified individually , does any measure on its own reduce the risk to an acceptable level?	yes	Pest-free place of production, Or pest-free area, Or plants grown in containers with sterilized growing medium or placed on shelves.
3.31. For those measures that do not reduce the risk to an acceptable level, can two or more measures be combined to reduce the risk to an acceptable level?		

3.33. Estimate to what extent the measures (or combination of measures) being considered interfere with trade.		Since requiring place of production freedom is a common measure for Plants for Planting, this should not interfere too much with trade.
3.34. Estimate to what extent the measures (or combination of measures) being considered are cost-effective, or have undesirable social or environmental consequences.		Difficult to estimate, but the plant is very difficult and costly to manage.
3.35. Have measures (or combination of measures) been identified that reduce the risk for this pathway, and do not unduly interfere with trade, are cost-effective and have no undesirable social or environmental consequences?	yes	Pest-free place of production Or pest-free area, Or plants grown in containers with sterilized growing medium or placed on shelves.
3.37. Have all major pathways been analyzed (for a pest-initiated analysis)?	no	
Pathway 3		**Soil/Growing medium (with organic matters) as a commodity coming from countries where *S. elaeagnifolium* occurs**
3.2. Is the pathway that is being considered a commodity of plants and plant products?	yes	
3.10. Are there any existing phytosanitary measures applied on the pathway that could prevent the introduction of the pest	yes	Import of soil and growing medium as a commodity is prohibited in many EPPO countries from non-European countries, but not from North African countries where the pest is widely distributed.
3.11. Can the pest be reliably detected by a visual inspection of a consignment at the time of export during transport/storage or at import?	no	
3.12. Can the pest be reliably detected by testing (e.g. for pest plant, seeds in a consignment)?	no	
3.13. Can the pest be reliably detected during post-entry quarantine?	no	Not relevant
3.14. Can the pest be effectively destroyed in the consignment by treatment (chemical, thermal, irradiation, physical)?	yes	Heat treatment or soil sterilization are possible against this pest.
3.15. Does the pest occur only on certain parts of the plant or plant products (e.g. bark, flowers), which can be removed without reducing the value of the consignment? (This question is not relevant for pest plants)	no	Not relevant
3.16. Can infestation of the consignment be reliably prevented by handling and packing methods?	no	Not relevant

3.17. Could consignments that may be infested be accepted without risk for certain end uses, limited distribution in the PRA area, or limited periods of entry, and can such limitations be applied in practice?	no	Not relevant
3.18. Can infestation of the commodity be reliably prevented by treatment of the crop?	no	Not relevant
3.19. Can infestation of the commodity be reliably prevented by growing resistant cultivars? (This question is not relevant for pest plants)	no	Not relevant
3.20. Can infestation of the commodity be reliably prevented by growing the crop in specified conditions (e.g. protected conditions, sterilized growing medium...)?	no	Not relevant
3.21. Can infestation of the commodity be reliably prevented by harvesting only at certain times of the year, at specific crop ages or growth stages?	no	Not relevant
3.22. Can infestation of the commodity be reliably prevented by production in a certification scheme (i.e. official scheme for the production of healthy plants for planting)?	no	Not relevant
3.23. Is the pest of very low capacity for natural spread?	no	
3.24. Is the pest of low to medium capacity for natural spread?	yes	Pest-free place of production, Or pest-free area, (Crop freedom for soil should be taken in the sense of Place of production freedom).
3.25. Is the pest of medium capacity for natural spread?	no	
3.26. The pest is of medium to high capacity for natural spread	no	
3.27. Can pest freedom of the crop, place of production or an area be reliably guaranteed?	yes	
3.28. Are there effective measures that could be taken in the importing country (surveillance, eradication) to prevent establishment and/or economic or other impacts?	no	
3.29. Have any measures been identified during the present analysis that will reduce the risk of introduction of the pest?	yes	Treatment of soil, Or pest-free place of production, Or pest-free area.

3.30. Taking each of the measures identified individually , does any measure on its own reduce the risk to an acceptable level?	yes	Treatment of soil, Or pest-free place of production, Or pest-free area.
3.33. Estimate to what extent the measures (or combination of measures) being considered interfere with trade.		Soil as a commodity is prohibited in many EPPO countries. Nevertheless importing of soil coming from Tunisia, Morocco, Lybia, Israel, Egypt is allowed in EU countries and there are no specific requirements for this commodity. Import of soil from these origins is probably limited and the impact on trade is not likely to be high.
3.34. Estimate to what extent the measures (or combination of measures) being considered are cost-effective, or have undesirable social or environmental consequences.		Difficult to estimate for soil as a commodity as it is prohibited from non-European countries in most EPPO member countries.
3.35. Have measures (or combination of measures) been identified that reduce the risk for this pathway, and do not unduly interfere with trade, are cost-effective and have no undesirable social or environmental consequences?	yes	Treatment of soil, Or pest-Free Place of Production, Or pest-free Area.
3.37. Have all major pathways been analyzed (for a pest-initiated analysis)?	no	
Pathway 4		**Soil as contaminant on machinery coming from countries where *S. elaeagnifolium* occurs**
3.2. Is the pathway that is being considered a commodity of plants and plant products?	no	
3.3. Is the pathway that is being considered the natural spread of the pest?	no	
3.8. Is the pathway that is being considered the entry with human travellers?	no	
3.9. Is the pathway being considered contaminated machinery or means of transport?	yes	Possible measures: cleaning or disinfection of used machinery/vehicles.
3.29. Have any measures been identified during the present analysis that will reduce the risk of introduction of the pest?	yes	Cleaning or disinfection of used machinery/vehicles.
3.30. Taking each of the measures identified individually , does any measure on its own reduce the risk to an acceptable level?	yes	Cleaning or disinfection of used machinery/vehicles.
3.33. Estimate to what extent the measures (or combination of measures) being considered interfere with trade.		Difficult to judge.

3.34. Estimate to what extent the measures (or combination of measures) being considered are cost-effective, or have undesirable social or environmental consequences.		Difficult to judge.
3.35. Have measures (or combination of measures) been identified that reduce the risk for this pathway, and do not unduly interfere with trade, are cost-effective and have no undesirable social or environmental consequences?	no	Cleaning or disinfection of used machinery/vehicles.
3.36. Envisage prohibiting the pathway		
3.37. Have all major pathways been analyzed (for a pest-initiated analysis)?	no	
Pathway 5		**Consignment of grain (*Zea mays*, *Sorghum bicolor*, *Triticum aestivum*) coming from countries where *S. elaeagnifolium* occurs**
3.2. Is the pathway that is being considered a commodity of plants and plant products?	yes	
3.10. Are there any existing phytosanitary measures applied on the pathway that could prevent the introduction of the pest	no	In most EPPO countries there are no measures applied regarding this plant except in the Russian Federation, Ukraine and Belarus, where *S. elaeagnifolium* is listed as a quarantine pest.
3.11. Can the pest be reliably detected by a visual inspection of a consignment at the time of export during transport/storage or at import?	no	Although the seed is small (less than 1mm), it can be detected by a visual inspection. However, in huge consignments, it would be very difficult.
3.12. Can the pest be reliably detected by testing (e.g. for pest plant, seeds in a consignment)?	no	
3.13. Can the pest be reliably detected during post-entry quarantine?	no	Not realistic
3.14. Can the pest be effectively destroyed in the consignment by treatment (chemical, thermal, irradiation, physical)?	no	Any treatment could also have an effect on the grain imported.
3.15. Does the pest occur only on certain parts of the plant or plant products (e.g. bark, flowers), which can be removed without reducing the value of the consignment? (This question is not relevant for pest plants)	no	Not relevant
3.16. Can infestation of the consignment be reliably prevented by handling and packing methods?	yes	Sorting and cleaning of grain to eliminate *S. elaeagnifolium* seeds and other contaminants.

3.17. Could consignments that may be infested be accepted without risk for certain end uses, limited distribution in the PRA area, or limited periods of entry, and can such limitations be applied in practice?	no	The risk of escape is during transport and storage.
3.18. Can infestation of the commodity be reliably prevented by treatment of the crop?	yes	Treatments (chemical and mechanical) exist for *Zea mays*, *Sorghum bicolor*, *Triticum aestivum* but treatments should ensure that the field is free from *S. elaeagnifolium*.
3.19. Can infestation of the commodity be reliably prevented by growing resistant cultivars? (This question is not relevant for pest plants)	no	Not relevant.
3.20. Can infestation of the commodity be reliably prevented by growing the crop in specified conditions (e.g. protected conditions, sterilized growing medium...)?	no	
3.21. Can infestation of the commodity be reliably prevented by harvesting only at certain times of the year, at specific crop ages or growth stages?	no	The fructification period is long and allows the pest to be present in consignments of seeds.
3.22. Can infestation of the commodity be reliably prevented by production in a certification scheme (i.e. official scheme for the production of healthy plants for planting)?	no	There is no certification scheme for grain.
3.23. Is the pest of very low capacity for natural spread?	no	
3.24. Is the pest of low to medium capacity for natural spread?	yes	Or pest-free place of production, Or pest-free area. Although the scheme does not allow for it, the Panel considered, pest freedom of the crop was a valid option for this pest.
3.25. Is the pest of medium capacity for natural spread?	no	
3.26. The pest is of medium to high capacity for natural spread		
3.27. Can pest freedom of the crop, place of production or an area be reliably guaranteed?	yes	
3.28. Are there effective measures that could be taken in the importing country (surveillance, eradication) to prevent establishment and/or economic or other impacts?	no	Internal surveillance of crops could detect the plant as it is a big plant (up to one metre high) with identifiable characters but eradication would be difficult if not detected immediately. Moreover, surveillance and eradication in all suitable habitats is not realistic.

3.29. Have any measures been identified during the present analysis that will reduce the risk of introduction of the pest?	yes	Visual inspection of the consignment Sorting and cleaning of the grain to eliminate *S. elaeagnifolium* seeds Treatment of the crop, Pest freedom of the crop, Pest-free place of production, Pest-free area,
3.30. Taking each of the measures identified individually , does any measure on its own reduce the risk to an acceptable level?	yes	Or pest freedom of the crop, Or pest-free place of production, Or pest-free area.
3.31. For those measures that do not reduce the risk to an acceptable level, can two or more measures be combined to reduce the risk to an acceptable level?	no	- Treatment of the crop should be complemented by a visual inspection to ensure that the field is free from *S. elaeagnifolium*. - Sorting and cleaning of seeds to eliminate *S. elaeagnifolium* seeds coupled with visual inspection of the consignment.
3.33. Estimate to what extent the measures (or combination of measures) being considered interfere with trade.		Requiring place of production freedom is a common measure for Plants for Planting but there are at the moment few requirements regarding seeds in most EPPO countries (Except for former USSR countries).
3.34. Estimate to what extent the measures (or combination of measures) being considered are cost-effective, or have undesirable social or environmental consequences.		The measures are cost effective for the importing countries as the eradication and management of the pest is difficult.
3.35. Have measures (or combination of measures) been identified that reduce the risk for this pathway, and do not unduly interfere with trade, are cost-effective and have no undesirable social or environmental consequences?	yes	Cleaning of seeds to eliminate *S. elaeagnifolium* seeds coupled with visual inspection of the consignment Treatment of the crop and inspection to ensure freedom from the plant Pest freedom of the crop, Pest-free place of production, Pest-free area
3.36. Envisage prohibiting the pathway		
3.37. Have all major pathways been analyzed (for a pest-initiated analysis)?	no	
Pathway 6		**Containers and packing coming from countries where *S. elaeganifolium* occurs**
3.2. Is the pathway that is being considered a commodity of plants and plant products?	yes	

3.10. Are there any existing phytosanitary measures applied on the pathway that could prevent the introduction of the pest	no	In most EPPO countries there are no measures applied regarding this plant except in the Russian Federation, Ukraine and Belarus, where *S. eleagnifolium* is listed as a quarantine pest.
3.11. Can the pest be reliably detected by a visual inspection of a consignment at the time of export during transport/storage or at import?	no	The seed is small (between 2 and 3 mm) and could possibly be identified, but fragments of roots are impossible to identify.
3.12. Can the pest be reliably detected by testing (e.g. for pest plant, seeds in a consignment)?	no	
3.13. Can the pest be reliably detected during post-entry quarantine?	no	Not realistic
3.14. Can the pest be effectively destroyed in the consignment by treatment (chemical, thermal, irradiation, physical)?	no	
3.15. Does the pest occur only on certain parts of the plant or plant products (e.g. bark, flowers), which can be removed without reducing the value of the consignment? (This question is not relevant for pest plants)	no	Not relevant
3.16. Can infestation of the consignment be reliably prevented by handling and packing methods?	no	Containers and packing would have to be cleaned for each consignment. It can be done by “kärcher” for plastic material.
3.17. Could consignments that may be infested be accepted without risk for certain end uses, limited distribution in the PRA area, or limited periods of entry, and can such limitations be applied in practice?	no	
3.18. Can infestation of the commodity be reliably prevented by treatment of the crop?	no	
3.19. Can infestation of the commodity be reliably prevented by growing resistant cultivars? (This question is not relevant for pest plants)	no	Not relevant.
3.20. Can infestation of the commodity be reliably prevented by growing the crop in specified conditions (e.g. protected conditions, sterilized growing medium...)?	no	

3.21. Can infestation of the commodity be reliably prevented by harvesting only at certain times of the year, at specific crop ages or growth stages?	no	Not relevant.
3.22. Can infestation of the commodity be reliably prevented by production in a certification scheme (i.e. official scheme for the production of healthy plants for planting)?	no	There is no known certification scheme for this commodity.
3.23. Is the pest of very low capacity for natural spread?	/	
3.24. Is the pest of low to medium capacity for natural spread?	/	
3.25. Is the pest of medium capacity for natural spread?	/	
3.26. The pest is of medium to high capacity for natural spread		
3.27. Can pest freedom of the crop, place of production or an area be reliably guaranteed?	yes	
3.28. Are there effective measures that could be taken in the importing country (surveillance, eradication) to prevent establishment and/or economic or other impacts?	no	Internal surveillance of crops could detect the plant as it is a big plant (up to one metre high) with identifiable characters but eradication would be difficult if not detected immediately. Moreover, surveillance and eradication in all suitable habitats is not realistic.
3.29. Have any measures been identified during the present analysis that will reduce the risk of introduction of the pest?	yes	The used of cleaning containers and packing material.
3.30. Taking each of the measures identified individually , does any measure on its own reduce the risk to an acceptable level?	yes	Cleaning of containers and packing for each consignment.
3.31. For those measures that do not reduce the risk to an acceptable level, can two or more measures be combined to reduce the risk to an acceptable level?	no	
3.33. Estimate to what extent the measures (or combination of measures) being considered interfere with trade.		No judgment. This measure could be helpful to prevent the entry of other pests.
3.34. Estimate to what extent the measures (or combination of measures) being considered are cost-effective, or have undesirable social or environmental consequences.		The measures are cost effective for the importing countries as the eradication and management of the pest is difficult.
3.35. Have measures (or combination of measures) been identified that reduce the risk for this pathway, and do not unduly interfere with trade, are cost-effective and have no undesirable social or environmental consequences?	yes	Cleaning of containers and packing for each consignment.

3.36. Envisage prohibiting the pathway		
3.37. Have all major pathways been analyzed (for a pest-initiated analysis)?	no	

Pathway 7		**Soil as contaminant on footwear**
3.2. Is the pathway that is being considered a commodity of plants and plant products?	no	
3.3. Is the pathway that is being considered the natural spread of the pest?	no	
3.8. Is the pathway that is being considered the entry with human travellers?	yes	Possible measures: inspection of human travellers, their luggage, publicity to enhance public awareness on pest risks, fines or incentives.
3.29. Have any measures been identified during the present analysis that will reduce the risk of introduction of the pest?	yes	As 3.8.
3.30. Taking each of the measures identified individually , does any measure on its own reduce the risk to an acceptable level?	yes	
3.33. Estimate to what extent the measures (or combination of measures) being considered interfere with trade.		Historically in Europe, inspection of travelers has never been recommended. Publicity to enhance public awareness seems feasible.
3.34. Estimate to what extent the measures (or combination of measures) being considered are cost-effective, or have undesirable social or environmental consequences.		Difficult to judge but assumed to be very expensive.
3.35. Have measures (or combination of measures) been identified that reduce the risk for this pathway, and do not unduly interfere with trade, are cost-effective and have no undesirable social or environmental consequences?	no	Inspection of travelers is not considered as a viable option but publicity to enhance public awareness on pest risks is a recommended measure.
3.36. Envisage prohibiting the pathway	no	
3.37. Have all major pathways been analyzed (for a pest-initiated analysis)?	yes	
3.40. Indicate the relative importance of pathways		Plants for plantings accompanied by soil: highest risk Soil/growing medium (with organic matters) as a commodity: highest risk Consignments of seeds for sowing: highest risk Soil as a contaminant on used machinery: highest risk Consignments of grain: medium to high risk

		Soil as a contaminant on footwear: medium to high risk Containers and packaging: medium to high risk Consignments of cotton: need further investigation
3.41. All the measures identified as being appropriate for each pathway or for the commodity can be considered for inclusion in phytosanitary regulations in order to offer a choice of different measures to trading partners.		
3.42. In addition to the measure(s) selected to be applied by the exporting country, a phytosanitary certificate (PC) may be required for certain commodities. The PC is an attestation by the exporting country that the requirements of the importing country have been fulfilled. In certain circumstances, an additional declaration on the PC may be needed (see EPPO Standard PM 1/1(2): Use of phytosanitary certificates)		
Conclusion of Pest Risk Management. **Summarize the conclusions of the Pest Risk Management stage. List all potential management options and indicate their effectiveness. Uncertainties should be identified.**		Measures have been identified for the following pathways: - Plants for planting with growing medium attached from countries where *S. elaeagnifolium* occurs. Infestation can be prevented if the plants are grown in a growing medium free from the pest. Pest-free place of production Pest-free area for *S. elaeagnifolium* - Soil/growing medium (with organic matter) as a commodity from countries where *S. elaeagnifolium* occurs Heat treatment or sterilisation of the soil Pest-free place of production for *S. elaeagnifolium* Pest-free area for *S. elaeagnifolium*. This means that the soil or growing medium has to be collected in a pest-free place of production or a pest-free area. - *S. elaeagnifolium* as a contaminant on machinery from countries where

		S. elaeagnifolium occurs Cleaning or disinfection of imported machinery or vehicles is recommended. - Seeds of *Gossypium spp., Hordeum indicum, Medicago sativa, Nicotiana tabacum, Sesamum indicum, Sorghum bicolor,Triticum spp., Zea mays* from countries where *S. elaeagnifolium* occurs Cleaning of seeds Crop freedom was Pest-free place of production Pest-free area - *S. elaeagnifolium* as contaminant on footwear where it occurs Publicity to enhance public awareness on pest risks - Consignment of grain *(Hordeum spp., Sesamum indicum, Sorghum bicolor, Triticum spp, Zea mays)* from countries where *S. elaeagnifolium* occurs Cleaning of grain Crop freedom Pest-free place of production Pest-free area - Containers and packaging Use of clean containers and packaging material

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Annexe 1

Climatic prediction for *Solanum elaeagnifolium*

Document prepared by the EPPO Secretariat and Richard Baker (CSL)

The CLIMEX model is a computer programme aiming at predicting the potential geographical distribution of an organism considering its climatic requirements. It is based on the hypothesis that climate is an essential factor for the establishment of a species in a country.

CLIMEX provides tools for predicting and mapping the potential distribution of an organism based on:

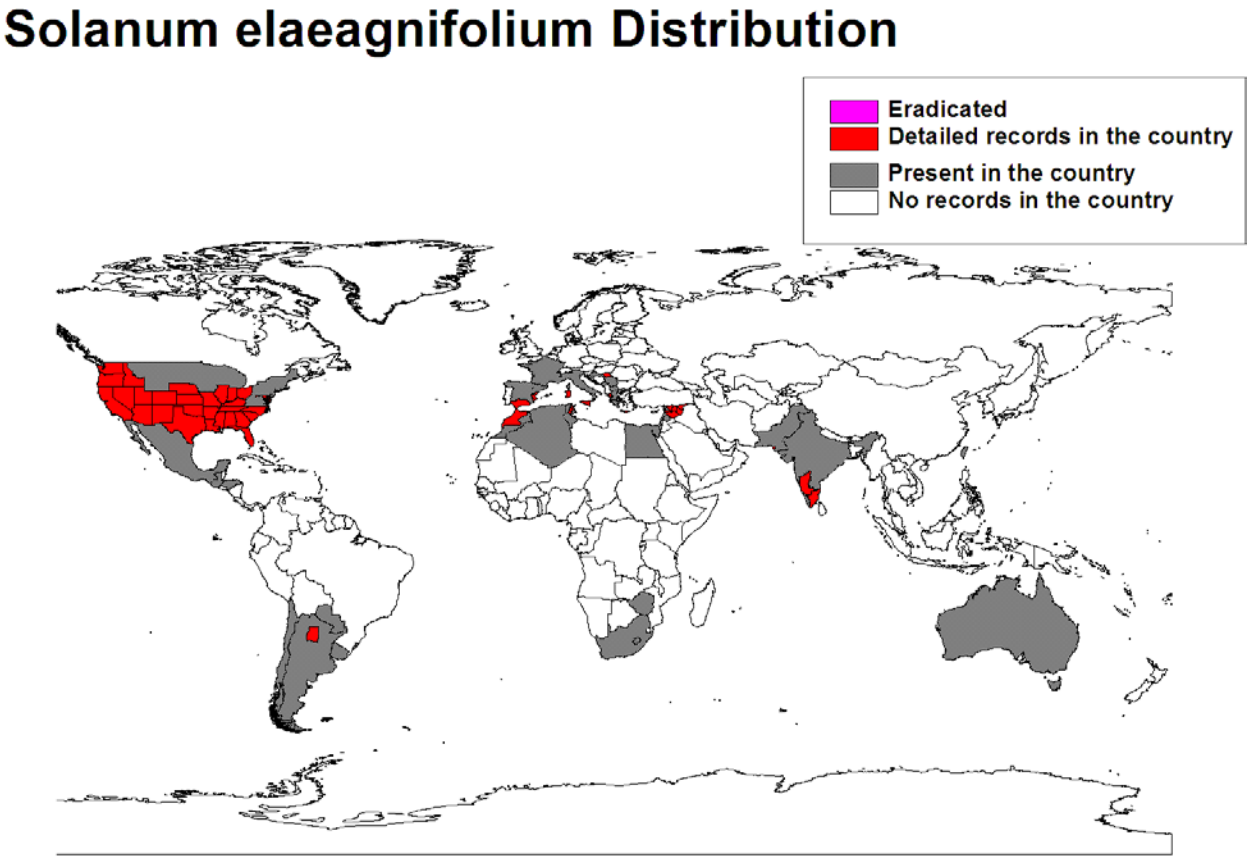
(a) climatic similarities between areas where the organism occurs and the areas under investigation (Match Index),

(b) a combination of the climate in the area where the organism occurs and the organism's climatic responses, obtained either by practical experimentation and research or through iterative use of CLIMEX (Ecoclimatic Index).

For *Solanum ealaeagnifloium*, a Match Index study has been undertaken.

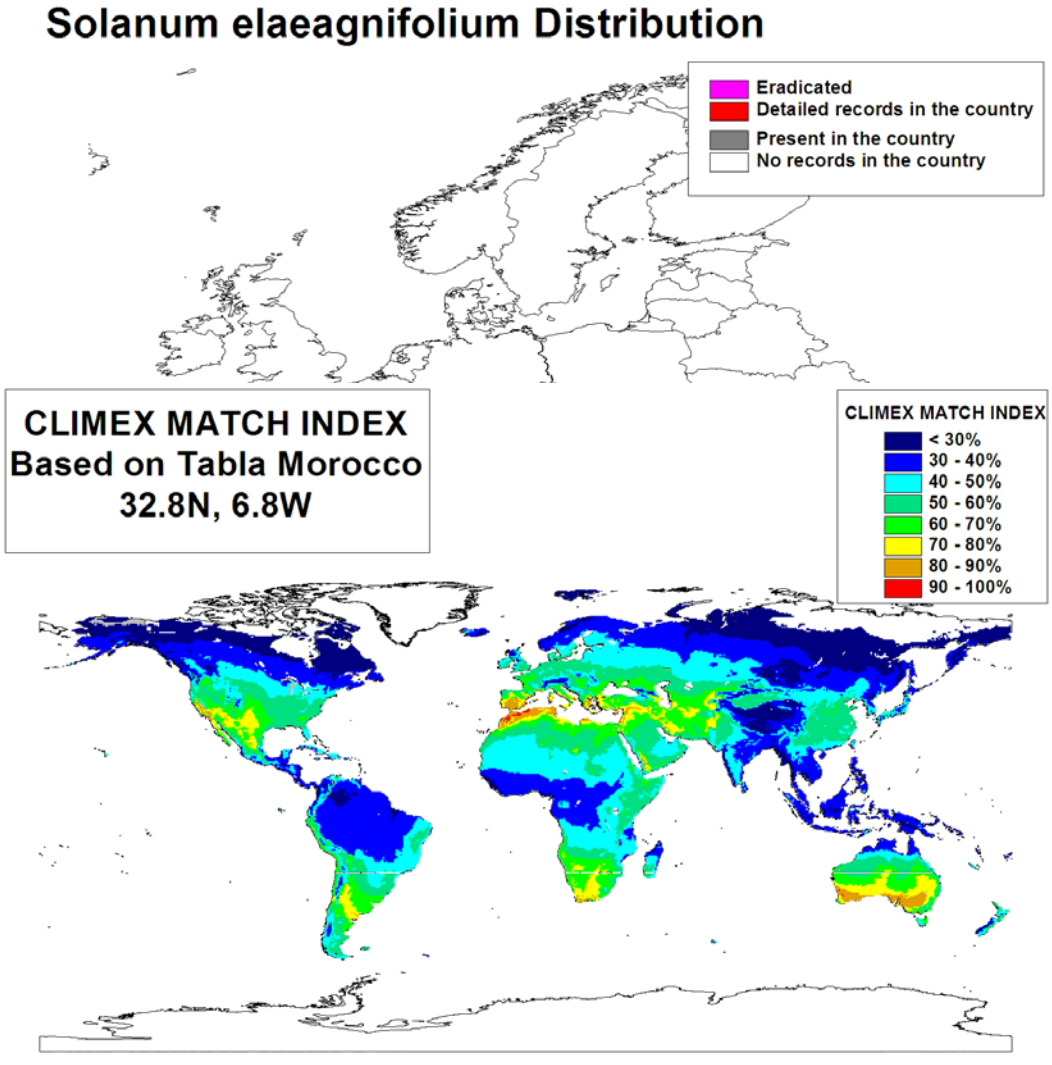
1. Geographical distribution of the species

a. in the world



b. In the EPPO region

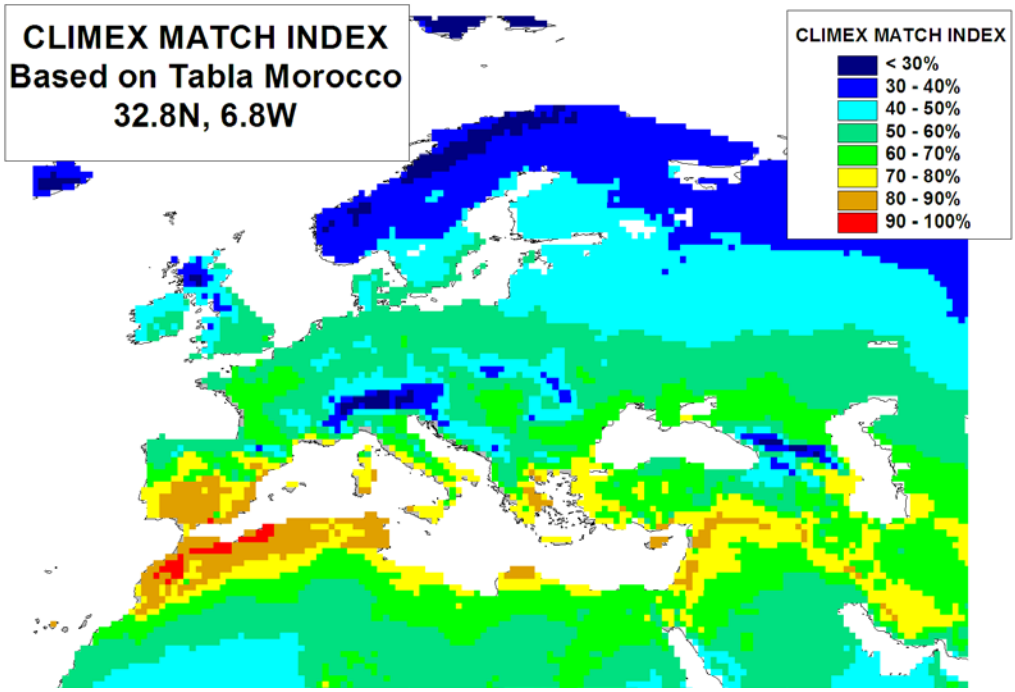
c. In the EPPO region



locality is

The distribution fits with North-America distribution.

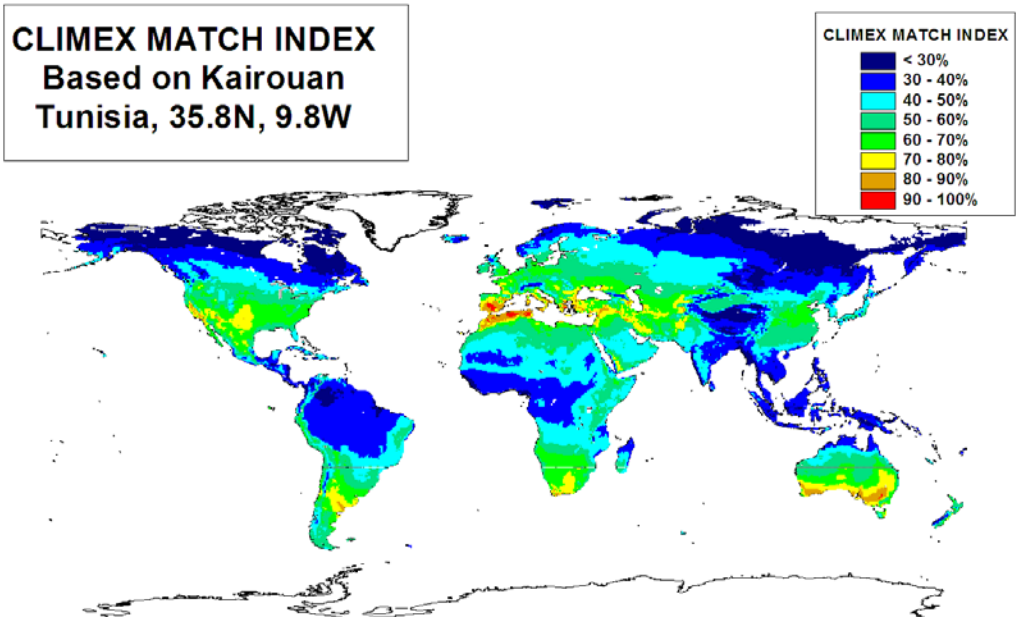
- for the EPPO region



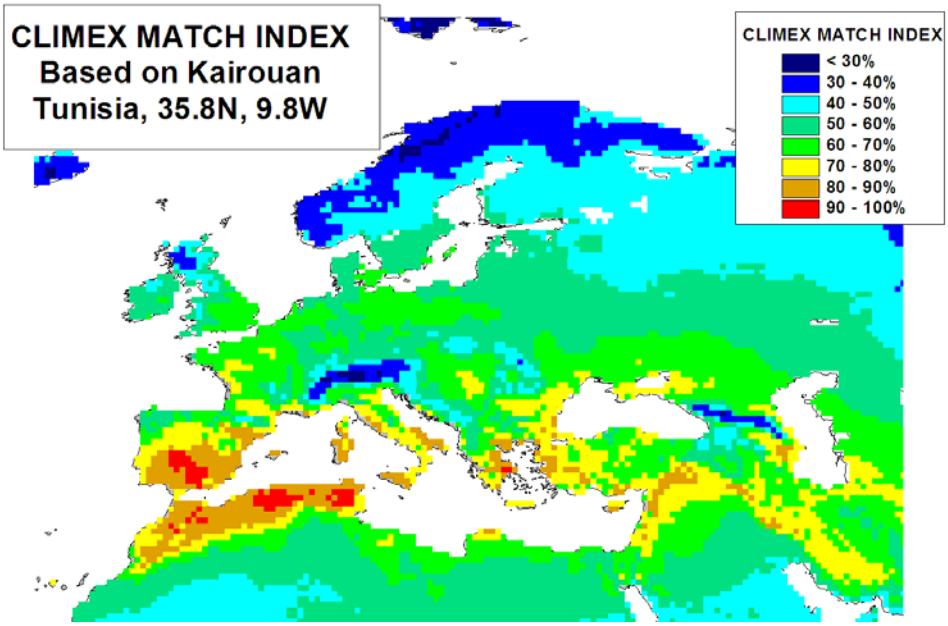
b. Based on Kairouan (Tunisia)

The species is alos known to be very invasive in Kairouan (Tunisia), a match Index is undertaken with this locality.

- for the world



- for the EPPO region



Conclusion

According to the Match index based on Tadla (Morocco) and Kairouan (Tunisia), the countries within the EPPO region having a climex match index up to 70% are considered to be largerly similar with the locations where the species invades and are therefore the most at risk: The countries considered at risk are: Albania, Algeria, Bosnia and Herzegovina Bulgaria, Croatia, Cyprus, France, Georgia, Greece, Hungary, Israel, Italy, Jordan, Kazakhstan, Moldova, Malta, Morocco Portugal, Spain, Romania, Russia, Serbia and Montenegro, Slovenia, Tunisia, Turkey, Ukraine, Uzbekistan.