

Information sheet 2.01

Inspection and trapping

This information sheet is a supporting document to Appendix A ('Standardised checklist of risk reduction options') of the Guidance of the EFSA Plant Health Panel on quantitative pest risk assessment.

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A. Description of the RRO

- **Inspection**

Inspection is defined as the 'official visual examination' of plants, plant products or other regulated articles to determine if pests are present and/or to determine compliance with phytosanitary regulations (ISPM 5, 2016). In this context 'visual' is defined as '...using the unaided eye, lens, stereoscope or microscope...'. 'Official' is defined as 'established, authorized or performed by a national plant protection organization' (ISPM 5, 2016). Testing is explicitly not part of 'visual examination' (ISPM 5, 2016). Laboratory testing is described as a separate RRO (RRO information sheet 2.02).

Visual examinations other than 'official', such as those performed by a producer to check if a chemical treatment of a crop or other control measure has been successful, are indispensable and should be an integral element of any control measure. An inspection is a special case of visual examination, i.e. an official verification of the condition of pest absence, which is aimed for or required by other RROs and to confirm the completion of such an RRO.

Depending on the RRO, pest absence may concern pests in consignments of plants, plant products or other commodities, or pests in growing plants and their environment. Growing plants may be present in natural areas and in places of production (farms, nurseries, etc.).

- **Sampling**

It is generally not feasible to inspect all units in a consignment or all growing plants in a place of production or natural area. Therefore inspection is often based on a sample (ISPM 31, 2008). Pest detection may be enhanced if the sampling method includes knowledge about pest biology and the preference of the pest for specific parts of the consignment or the production site or place. Sampling methods are described as a separate RRO (RRO information sheet 2.06).

- **Trapping**

The effectiveness of sampling and subsequent inspection to detect pests may be enhanced by including trapping and luring techniques (we need good references here). Depending on the target organism and the trap and lure type, critical factors for successful trapping are trap density, deployment and servicing (e.g. ISPM 26, 2015). Different kinds of traps have been developed, mainly to capture insect pests and insect vectors of other pests and, to a lesser extent, airborne fungal spores. The traps may be placed at places of production to aid inspection of growing plants, and at places for preparing and storing of consignments, to aid inspection of consignments (Epsky et al., 2008).

Trapping may be used for acquiring information on the density and distribution of pest populations in the field, allowing the choice of the most effective control method and then indirectly influencing the abundance of the pest at the place of production (Shelly et al., 2014).

In some cases, traps may be used as direct control measures to reduce the pest abundance in an infested area (e.g., mass trapping, lure and kill, lure and infect) or for preventing the entry of the organism in a pest free area thanks to a trap barrier (Epsky et al., 2008).

- **Inspection procedure for consignments**

The inspection can be carried out at different levels:

1. in packing houses for products intended to be traded: the inspection can be performed during packing operations or on the finished products prior to certification (phytosanitary certificate or plant passport);
2. at entry points of the EU territory: the inspections are realized on consignments to verify compliance with the requirements of the EU legal framework;
3. during transport of the commodities: the inspections may be performed on consignments during transport in both the region/country of origin and of destination;
4. at places of destination as designated by the NPPO of the importing country.

A sample from the consignment is taken by a qualified inspector as described in RRO information sheet 2.06. The inspector visually examines each unit in the sample until the pest or its symptoms have been detected, or until all sample units have been examined. At that point, the inspection may cease. However, additional sample units may be examined if additional information concerning the pest and the commodity is required (ISPM 23, 2005).

The sample may be further analysed by laboratory testing (RRO information sheet 2.02).

- **Inspection procedure for growing plants and their environment**

Inspection of growing plants and their environment is targeted at detection of pests or their symptoms on plants, in the soil, on farm equipment, in storage facilities, etc.

The inspection may be carried out for different situations, as related to the RRO for which the inspection is required and for which the conclusion of inspection must be formulated:

1. production sites, e.g. a field or a compartment of a greenhouse. Depending on the target pest, material to be inspected may include plants, soil, growing media and irrigation water;
2. places of production, e.g. a farm or a nursery consisting of multiple production sites and other facilities. In addition to the materials mentioned for production sites, material to be inspected may include farm machinery, tools, storage facilities and boxes;
3. geographical areas including places of production and natural (unmanaged) areas. Materials to be inspected, additional to those mentioned for places of production, may be surface water and consumer products (e.g. fruit) present or traded in the area.

A buffer zone may be included in all situations, when appropriate.

A sample of plants or other materials, relevant to the pest, is taken from the place or site of production or from selected sites in the area by a qualified inspector, as described in RRO information sheet 2.06. Plants in the sample may include growing plants in the field or field edges, seeds prior to planting or harvested products (EPPO, 2007). The inspector visually examines each unit in the sample until the pest or its symptoms have been detected, or until all sample units have been examined. At that point, the inspection may cease. However, additional sample units may be examined if additional information concerning the pest and the commodity is required.

The sample may be further analysed by laboratory testing (RRO information sheet 2.02).

B. Risk factors

Visual examinations, where possible in combination with trapping, are essential activities to identify the need for, and the effectiveness of, a control measure and should be included in the procedure of any control measure. Inspection, i.e. an 'official' visual examination, is a supporting measure and is always implemented in combination with another supporting measure for a phytosanitary purpose, but not with control measures. As a supporting measure, inspection does not have any direct effect on the risk factors addressed in a risk assessment. However, its execution is required to verify whether the condition of pest absence, which is aimed for or required by other supporting or phytosanitary measures, has been met.

Points where inspection may be combined with other RRO		In area of production	On crops at place of production	Pre-harvest treatment	Post-harvest	At import	At place of destination
Inspection of plants and/or their environment							
Combined with RROs	surveillance	X	x				
	pest free area	X	x				
	pest free production place		x				
	certification of plant reproductive material	X	x	x	x		x
	delimitation of buffer zones	X	x				
	phytosanitary certificate/ plant passport	X	x	x	-		
	certified and approved premises	X	x				x
	pest free plants for planting		x	x	-	-	-
Inspection of plants or other materials in consignments							
	pest free consignment				x		
	pest free plants for planting		-	-	x	x	X
	post-entry quarantine					x	X
	phytosanitary certificate/ plant passport	-	-	-	x		

C. Parameters to consider regarding effectiveness of the RRO

The effectiveness of inspection and trapping is determined by the factors presented in Table 2.

Table 2. Main parameters to take into consideration regarding the modulation of the efficacy of the RROs.

Parameters limiting the effectiveness	Effect
Non-specific symptoms	Reduction of probability of detection
Latent infection	Reduction of probability of detection
Environmental conditions	Reduction of probability of detection if inspections are conducted in a period not suitable for the observation of the pest or its symptoms
Sampling intensity	Probability of detection above a specified detection threshold is determined by the sample size and the sampling plan
	If trapping is used, probability of detection is determined by trap density, deployment and servicing
Pest distribution (random, clustered, homogeneous)	Probability of detection is determined by the sampling plan

There is some probability of pests remaining undetected when visual examination is used alone. The primary assumption for an effective inspection is that the pests of concern and/or its signs or symptoms are visually discernible and distinct enough to minimise the potential for confusion with non-pest organisms or conditions (Griffin, 1997). In addition, inspections should be performed when symptoms or signs of the pest are most obvious to maximize the detection effectiveness (EPPO, 2007). The effectiveness of inspection is limited by the sampling plan and sample size (EPPO, 2009), as presented in RRO information sheet 2.06.

In the case of inspections of growing plants and/or their environment, detectability is strongly influenced by the inspection platform (e.g. aerial, ground inspection), vegetation density, especially of adjacent healthy plants, and the characteristics and location of symptoms (Wardlaw et al., 2008). The use of preferred host plants (sentinel plants) and lures, and the inspection of all potential host plants in the area can increase the effectiveness of detection (DG SANTE, 2015). The inspection of growing crops is sometimes less reliable than inspection of harvested products (e.g. tubers) since foliar symptoms often occur late in the season. Symptoms may also be masked by symptoms of other diseases or general senescence of the foliage, or be unspecific. In addition, symptoms may be restricted to stunting or reduced production (e.g. tuber number). Furthermore, the expression of symptoms varies with initial inoculum density, environmental conditions and cultivar differences (van der Wolf et al., 2005). Field visual inspection effectiveness when used alone is especially low for detecting pest infestations (e.g. longhorn beetles) on trees at crown height (i.e. red palm weevil) (DG SANTE, 2015).

In the case of pest trapping, several factors influence the effectiveness of traps used, some of them related to the type of trap, their features, the cues associated, the location in the environment and the distribution of the pest organisms (Campbell et al., 2002; Epsky et al., 2008; Yang et al., 2014; Pal et al., 2015).

D. Applicability / feasibility of the RRO

Particular conditions occurring in the context of the field inspection, as high vegetation density or extent, may require an integrated methodology of inspection. It is for example the case for forestry surveillance on specific pests for which reliable inspections should include the combination of aerial and ground observations (Wardlaw et al., 2008).

Trapping cannot be applicable to all the pests or vectors. Its employment requires technical competences, equipment adapted to the targeted organism which may involve high costs for their purchase, implementation and follow-up.

E. Other RROs that may lead to similar effects

Laboratory tests can be carried out to verify the presence or absence of pests which cannot be detected by visual observation and when asymptomatic infections/infestations are possible (i.e. cryptic life cycle, early infestations).

F. Frequently occurring combinations of RROs that include this RRO

All control measures should include visual examination at one or more stages of their execution. Phytosanitary measures and other supporting measures require combination with This RRO, as presented under B. Risk factors.

G. Conclusion

Measure	Target	Area of application	Expected effect	Main technical limitations of use	RROs with similar effects / most often in combinations
Inspection of plants or other material in consignment, or during preparation of consignment	Consignments with plants or plant produce		Verification of pest freedom (or rejection)	Detectability Inspection intensity	Testing may be used in case of poor detectability; trapping may be used in the packing and storage houses
Inspection of growing plants and / or their environment (e.g. soil, farm machinery, tools)	Areas, production places or production sites with host plants		Verification of pest freedom (or eradication) of the area, production place, or production site	Detectability Inspection intensity	Testing and trapping may be used in case of poor detectability

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