

Risk Analysis and its Impact on Prevention and Control Measures of Economic Important Pests

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Abstract

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Analysis of risks from plant pests has been an important role of the European and Mediterranean Plant Protection Organization since its foundation in 1951. Pest Risk Analysis, with capital initial letters, often shortened to PRA, is a more recent activity. The Sanitary and Phytosanitary Agreement of the World Trade Organisation in 1995 required technical justification of phytosanitary measures on traded commodities. This necessitated the development of formal technical justification through Pest Risk Analysis. Three International Standards have been adopted describing how to conduct PRAs. EPPO Standards and computer tools provide more detailed guidance. There are currently two contrasting trends in the EPPO region with regard to pest risk analysis. On the one hand there are pressures to produce more quantitative PRAs making use of tools such as epidemiological spread models and climate matching. These can enable a more thorough comparison of costs and benefits of possible interventions. On the other hand there is also a need to respond rapidly to a wide range of emerging threats, using quick methods to screen large numbers of organisms. This can help plant health services to target regulation effectively against current risks and to give appropriate priority to each pest for phytosanitary inspections, surveillance, contingency plans and awareness raising campaigns.

The IPPC and EPPO

The International Plant Protection Convention (IPPC) was signed in 1951. Its preamble recognized 'the usefulness of international co-operation in controlling pests and diseases of plants and plant products and in preventing their introduction and spread across national boundaries'. In 1995 the IPPC was recognised under the Sanitary and Phytosanitary (SPS) Agreement of the World Trade Organization (WTO) as the body setting global standards in the area of plant health, alongside the International Office of Epizootics (for animal health) and the Codex Alimentarius Commission (for food safety). When the IPPC itself was revised in 1997, in the context of the new World Trade Organization rules, the extended preamble recognised that 'phytosanitary measures should be technically justified, transparent and should not be applied in such a way as to constitute either a means of arbitrary or unjustified discrimination or a disguised restriction, particularly on international trade'.

The European and Mediterranean Plant Protection Organization (EPPO) was also founded in 1951, when fifteen countries signed the original Convention. It now has 51 members, including almost all of Europe and countries around the Mediterranean and in Central Asia. It is funded by its members to gather and share information and develop through panels of experts regional EPPO Standards on phytosanitary regulations and on the efficacy of plant protection products. It also hosts the Euphresco research co-ordination network (<https://www.euphresco.net/>), and the

EU Minor Uses Co-ordination Facility
(<https://www.minoruses.eu/>).

The need for pest risk analysis

One of the functions set out in EPPO's 1951 Convention was to 'advise Member Governments on the technical, administrative and legislative measures necessary to prevent the introduction and spread of pests and diseases of plants and plant products.' This advice has always depended on an assessment of pest risks, and an analysis of the measures needed to reduce those risks. From 1978 onwards EPPO produced a series of datasheets on pests recommended for regulation. In 1992 these were revised and updated in the form of a book 'Quarantine Pests for Europe', with a second edition published in 1997 (6). Each of nearly 300 datasheets in the book included sections on hosts, geographical distribution, detection, means of dispersal, pest significance (including economic impact), and recommended phytosanitary measures. These datasheets were in fact short analyses of pest risk, with recommendations on management measures. Following the SPS agreement a more formal and elaborate process of 'Pest Risk Analysis' or PRA was developed. This form of PRA was intended not just to identify risks and recommend measures to manage those risks, but also to justify measures to trading partners who might otherwise regard the measures as 'disguised restrictions' on trade.

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The IPPC as amended in 1997 makes this clear in Article VI on Regulated Pests which starts:

‘Contracting parties may require phytosanitary measures for quarantine pests and regulated non-quarantine pests, provided that such measures are:

- (a) no more stringent than measures applied to the same pests, if present within the territory of the importing contracting party; and
- (b) limited to what is necessary to protect plant health and/or safeguard the intended use and can be technically justified’

Technical justification is defined as ‘justified on the basis of conclusions reached by using an appropriate pest risk analysis or, where applicable, another comparable examination and evaluation of available scientific information’.

The process of pest risk analysis

Pest risk analysis is defined as ‘the process of evaluating biological or other scientific and economic evidence to determine whether a pest should be regulated and the strength of any phytosanitary measures to be taken against it’.

The process of PRA was further elaborated in three International Standards for Phytosanitary Measures: ISPM 2, ISPM 11 and ISPM 21 (11, 12, 13). While contributing to the development of these ISPMs, EPPO was also developing regional standards to help risk assessors to address the elements in those International Standards through a logical sequence of questions. The relevant EPPO Standards are PM 5/1 - a checklist of information required for PRA (5), PM 5/2 - PRA on detection of a pest in an imported consignment (first adopted in 1992, and revised in 2001 (7), PM 5/3 - Decision support scheme for quarantine pests (first adopted in 1997, with the last version approved in 2011 (8) and PM 5/5 - Decision support scheme for an express PRA (9). These EPPO Standards and a computer assisted version of PM 5/3 (16) are available to download at www.eppo.int. As well as developing PRA methodology, in each year since 2006, EPPO has convened four or five Expert Working Groups to carry out PRAs on pests identified as a priority by member countries (3, 18). Each Expert Working Group takes place over a week, usually covering just one pest, or two related pests. The resulting drafts are then submitted to peer review. EWGs always include experts from the area where the pest occurs, with first-hand experience of the pest. Including the associated preparation and staff time, each PRA costs in the order of 10 - 20 000 Euros to produce. PRAs produced in this framework have been used to support the regulation of new pests (including invasive alien plants) by EPPO member countries.

The main elements of PRA are set out in ISPM 2, and are similar in all the different schemes used, whatever their level of complexity. The three stages are initiation, risk assessment and risk management. In the initiation stage the reasons for carrying out the PRA are stated, including the pathway, pest or combination of pathway and pest to be considered, and the geographical area for which the analysis

is being made. The assessment stage considers first the risks of entry, establishment and spread of the pest, and then the potential economic and environmental impacts. Finally the management stage identifies and compares appropriate phytosanitary measures which can be recommended to reduce the risks or impacts identified in the assessment.

‘Phytosanitary measures’ refers to legislation, regulations or official procedures. It is worth noting that if a pest is not regulated or is eventually deregulated, the information which has been gathered and analysed as part of the PRA process may be very valuable in the development of routine control practices by growers. This benefit of applying thorough PRA to newly introduced pests or potential pests, whether or not a regulatory approach is followed and whether or not it succeeds, should not be overlooked.

Regional PRA schemes

In 2008 a three year project, ‘PRATIQUE’, was funded under the EU’s FP 7 programme to enhance PRA schemes in the region, including through amendments to EPPO Standard PM 5/3 (1). This resulted in additional guidance for e.g. rating and mapping the suitability of the climate (10), and assessing environmental impact of the pest (17), as well as the reorganization of the questions for the risk management section. In 2010, the European Food Safety Authority (EFSA) Plant Health Panel started performing PRAs and adopted its guidance (4) which was largely based on the EPPO Standard PM 5/3 (version 4 from 2009). In 2015, the EFSA Plant Health Panel decided to review its guidance document and developed during two years a new pest risk assessment process based on a quantitative assessment of risk, as applied in other fields within EFSA’s remit (15). This new guidance has been tested on 8 case studies and has been sent for public consultation in February 2018, with the objective to adopt it in June 2018. This revised guidance includes a two tier approach to PRA, with a first tier (the ‘categorization’ part) based on expert knowledge and a second tier based on quantitative models. Uncertainty is expressed through the provision by risk assessors of quantile estimates of the probability distributions for the assessed variables and parameters. The quantitative assessment is based on comparisons between different scenarios, for example current regulation against a scenario where risk-reducing options are not applied. The guidance suggests use of models for assessing suitability of climate for establishment, and models of spread pathways. Under their proposed guidance the decision whether to carry out a second tier assessment would be made according to the needs of the risk manager and the availability of data and resources (14).

There are also examples of simpler approaches being taken in order to analyse large numbers of potential risks within a short timeframe and with limited resources. The EPPO PM 5/5 Standard is an express version of EPPO’s full PRA scheme (PM5/3) with a reduced number of questions to answer and shorter outputs. The PM 5/2 Standard was first developed before the full PRA scheme and can be used to assess risks when a pest which has not previously been subject to PRA is intercepted on a consignment. When a pest is found on imported perishable produce a decision on

whether to refuse entry or require treatment has to be made within hours or days, so the PM 5/2 scheme is necessarily simple and relies heavily on expert judgement.

To meet an urgent government request in 2012 for a comprehensive and up to date assessment of risks, the UK plant health service developed within just nine months a risk register for 668 pests taken mostly from EPPO lists (2). The risk register includes for each pest an assessment of the likelihood and impact of their introduction to the UK, with or without measures, an indication of the size of the sector which could be affected, and for those pests with a high residual risk score, recommendations for actions to further reduce the risk. Other countries in Europe have developed similar systems (21).

As another example of a rapid screening approach, EPPO has been working on a project to identify for 1400 pest/host combinations whether they would qualify for the status of Regulated Non Quarantine Pests in the EU (19). The methodology involves a group of experts in the particular crop sector answering a structured sequence of questions. Some decisions can be taken rapidly. In other cases a more in depth analysis is needed for those pest/host combinations for which the responses are borderline.

To avoid duplication of effort it is important for countries to be able to share information in PRAs, rapid assessments and risk registers. EPPO is currently developing a platform to enable this sharing of national assessments between member countries.

Discussion

In recent years there have been contradictory forces operating on the process of Pest Risk Analysis. On the one hand there is a demand for more scientifically robust and quantitative assessments, while on the other hand there is a continuing need to have available up to date assessments for all pests which may be found and reported to a National Plant Protection Organisation (NPPO).

The demand for more robust and quantitative assessments is driven by a need to justify measures to stakeholders. These include trading partners who have to meet requirements in order to export and want to know that those measures are proportionate and in line with international standards, growers within a country who have to take action to contain or eradicate outbreaks of quarantine pests, and finance ministries who need to be convinced that government expenditure on plant health measures is economically worthwhile. Such an analysis should ideally allow a statement such as 'there is a 95% confidence that by requiring imports to comply with the recommended measures and spending 100 000 Euros on surveys within the

country, the probability that this pest will establish in the next 10 years can be reduced from 40-60% to 5-10% thus avoiding an estimated 2-10 M Euros of crop damage over the next 20 years.' To reach such a clear quantitative conclusion requires a lot of supporting data, validated models, and the time and resources to apply those models to the pest in question. Economic models must take into account the additional complexity that in a market economy if a pest causes significant losses growers will choose different crops, and the affected crop may be produced more successfully elsewhere. Within the currently available resources a fully quantitative analysis along these lines is only ever likely to be possible for a few pests, as underlined by Gilioli *et al.* (15) and discussed during the joint EFSA-EPPO workshop on 'Modelling in Plant Health – how can models support risk assessment of plant pests and decision making?' (20).

The continuing need for more rapid forms of assessment, based on expert judgement, arises because National Plant Protection Organizations are regularly faced with decisions about the action to take on findings of pests for which there is no PRA, or for which the PRA is not up to date. These findings may be interceptions on imported consignments, or findings as a result of surveillance of crops and the environment within a country. As imports of plants and plant products into the EPPO region increases in quantity and variety, the probability of introducing new pests increases. In parallel surveillance improves and diagnostic methods become more sensitive. Consequently the number of such findings of new or unusual pests is likely to increase. Decisions need to be taken immediately, within days, if outbreaks are to be controlled before they spread, and interceptions are to be managed correctly. Either a rapid assessment method must be used after the pest is found, or a register of likely risks and agreed responses must be developed in advance and kept up to date as new information arises. In practice a mix of these two approaches is likely to be needed, since no system can predict all of the possible pests which might be found and for which advance assessments should be made.

In conclusion, there will continue to be contradictory pressures for more complex and quantitative PRAs and for simpler approaches which can be applied and updated for many different pests. Both approaches will have a role in addressing the needs of National Plant Protection Organizations and their stakeholders. Up to date information and expert recommendations on a wide range of pests will provide the basis for rapid action against new risks and on new findings. Where it is likely that measures will be challenged by trading partners or other stakeholders, where adequate data and resources are available, and when time pressures are less acute, more quantitative approaches may be useful and possible.

المخلص

وارد، مارتن و موريل سافرت. 2018. تحليل المخاطر وأثره في منع دخول الآفات المهمة إقتصادياً وتدابير مكافحتها. مجلة وقاية النبات العربية، (1)36: 45-49.

شكل تحليل المخاطر للآفات النباتية دور مهم للمنظمة الأوروبية والمتوسطية لوقاية النبات منذ إنشائها في العام 1951. فرضت اتفاقية الصحة والصحة النباتية لمنظمة التجارة العالمية في العام 1995 مبررات تقنية لتنفيذ تدابير صحية على السلع التي يتم الاتجار بها، وقد استوجب ذلك تطوير مبررات تقنية رسمية من خلال "تحليل مخاطر الآفات". تم تبني ثلاثة معايير دولية لتدابير الصحة النباتية تصف كيفية القيام بهذا التحليل. وفرت معايير المنظمة وأدوات الحاسوب الإلكترونية إرشادات مفصلة بهذا الخصوص. هناك حالياً إتجاهين متباينين بالنسبة لـ "تحليل مخاطر الآفات" في منطقة المنظمة الأوروبية والمتوسطية لوقاية النبات. من جهة هناك ضغوط لإنتاج طرق كمية أكثر لتحليل مخاطر الآفات باستخدام وسائل مثل نماذج الإنتشار البيئي ومطابقة المناخ، والتي تسمح بإجراء مقارنات أكثر دقة للتكاليف والفوائد لكل التدخلات الممكنة. من جهة أخرى، هناك حاجة لإستجابة سريعة لعدد كبير من التهديدات باستخدام طرائق سريعة لغربلة عدد كبير من الكائنات الحية. وهذا يساعد الجهات المسؤولة عن خدمات الصحة النباتية على تنفيذ الإجراءات القانونية بكفاءة عالية لمجابهة المخاطر الحالية وإعطاء الأولوية المناسبة لكل آفة حجرية من أجل القيام بالكشف الصحي، المسوحات وإنفاذ الخطط الطارئة وحملات زيادة الوعي.

عنوان المراسلة: مارتن وارد، المنظمة الأوروبية والمتوسطية لوقاية النبات، باريس، فرنسا، البريد الإلكتروني: martin.ward@eppo.int

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