Grant agreement N. 773139

DELIVERABLE N° 6.2
Title: Survey on the needs of users of the EPPO Database and exploitation of the data (results)

Valitest

Validation of diagnostic tests to support plant health

Due date:	Month 4
Actual submission date	28-02-2019 (Month 10)
Start date of the project	01-05-2018
Deliverable lead contractor (organization name)	EPPO
Participants (Partners short names)	All partners
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Level of dissemination	Public
Type of Deliverable	Report

Abstract:

The EPPO Database on Diagnostic expertise (http://dc.eppo.int/index.php) includes a specific section on validation (http://dc.eppo.int/validationlist.php). Laboratories can deposit online validation data that they have generated on specific tests and these can be made visible to all users of the database. The validation data can then be retrieved from the database in the form of a PDF file including the description of the test evaluated (pest x matrix x method) and the performance data related to the test (the information is presented in a harmonized format). There is currently no possibility to sort the data except by pest and method.

One of the objectives of VALITEST is to improve the searching capacity of the database to ensure optimal use. In order to evaluate the needs of users a survey was organized, and the results of this survey are presented in this deliverable. These results will be used to identify and plan future IT developments necessary to establish the new features of the validation section. The new version of the EPPO Database on diagnostic expertise will be launched at the end of the VALITEST project.

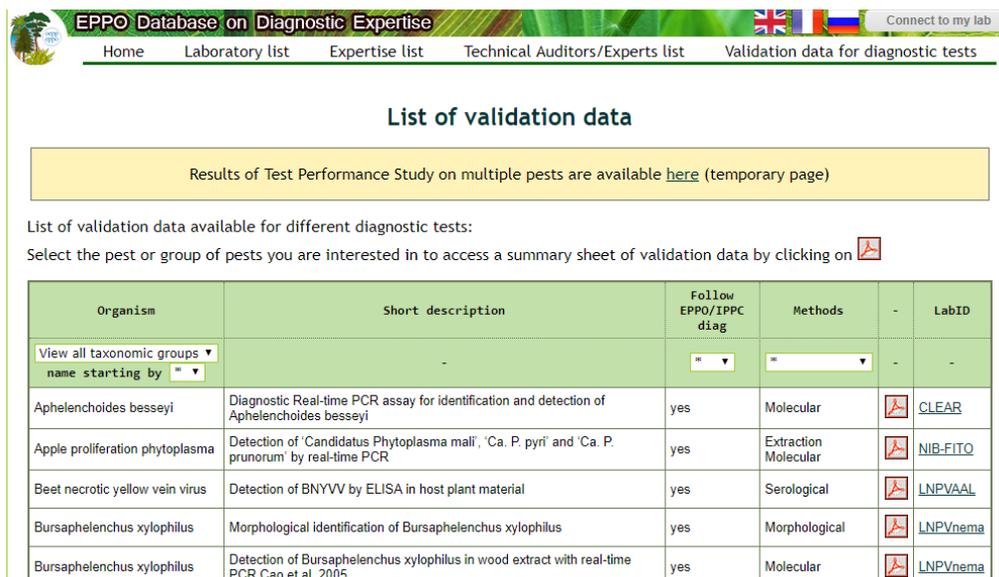EPPO and all partners + external consultation via the EPPO network.

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1. Purpose

The EPPO Database on Diagnostic expertise (http://dc.eppo.int/index.php) includes a specific section on validation (http://dc.eppo.int/validationlist.php). Laboratories can deposit online validation data that they have generated on specific tests and these can be made visible to all users of the database. The validation data can then be retrieved from the database in the form of a PDF file including the description of the test evaluated (pest x matrix x method) and the performance data related to the test (the information is presented in a harmonized format). There is currently no possibility to sort the data except by organism, whether the test follows EPPO/IPPC protocols and method (see screenshot below).

One of the objectives of VALITEST is to improve the searching capacity of the database to ensure optimal use. In order to evaluate the needs of users a survey was organized. The survey and its results are presented in this deliverable. They will be used in the next part of the project to redesign the EPPO database on Diagnostic expertise, in particular, the validation section. The objective will be to ensure that the database can be searched using criteria identified as important by respondents to the survey.

2. Scope

The results of the deliverable will be used to identify and plan future IT developments necessary to establish the new features of the validation section. The developments will be evaluated by the different partners during the project and the new version of the EPPO Database on diagnostic expertise will be launched at the end of the VALITEST project.

3. Methodology

The questionnaire was elaborated by the EPPO Secretariat in collaboration with the different work package leaders (the questionnaire is presented in Appendix 1). The questionnaire was sent to the experts registered in the EPPO Database on diagnostic expertise (573 experts) on the 16th of November 2018 and to industry contacts (20 contacts) on the 26th of November 2018. Reminders were sent and the deadline originally fixed on the 1st of January 2019 was extended to the 15th of January 2019.

The questionnaire was designed on Google forms. It was noted that not all experts can access google forms for security reasons. A message was consequently sent to provide the possibility to answer on a word document and the data was then included by the EPPO Secretariat (only 4 experts made use of this option).

179 responses were received corresponding to an answer rate of 36%.

Surveys organized by EPPO on diagnostic issues are usually directed to the laboratory not to individual experts. Consequently the answer rate cannot be compared with previous surveys organized by EPPO.

4. Results of the survey

4.1. Respondents / country 179 respondents from 31 countries

Country	responses
Italy	21
France - including Reunion Island (1)	17
Great Britain	15
Ukraine	14
Netherlands	14
Germany	13
Greece	9
Portugal	9
Spain	8
Belgium	6
Latvia	6
Slovenia	6
Switzerland	6
Russian Federation	5
Hungary	4
Austria	3
Bulgaria	3
Slovakia	3
Georgia	2
Ireland	2
Poland	2
Romania	2
Czech Republic	1
Denmark	1
Estonia	1
Finland	1
Israel	1
Lithuania	1
Norway	1
Turkey	1
United States	1

4.2. Category of respondents

Private laboratory
1.1%
Company manufacturing diagnostic kits
3.9%

Laboratory performing official plant pest diagnostics
95%

95%
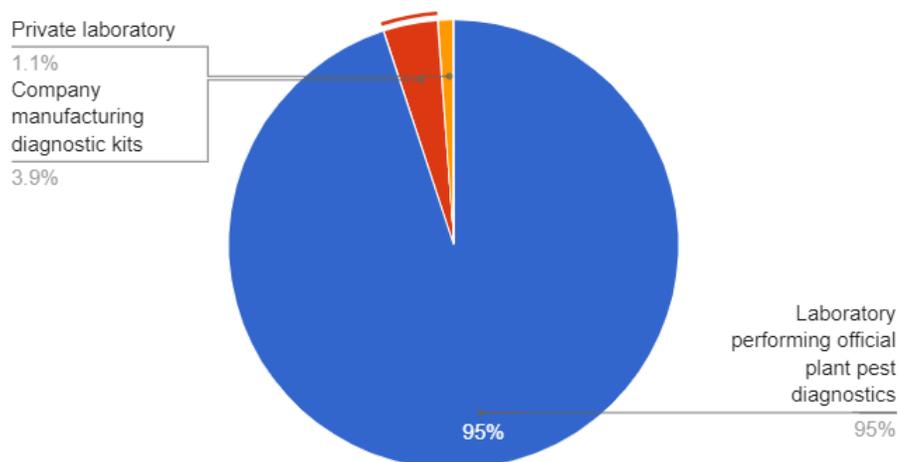
Most respondents are from laboratories performing official plant pest diagnostics, this corresponds to the majority of the recipients of the questionnaires.

4.3. Responses regarding the knowledge on the EPPO database on Diagnostic expertise
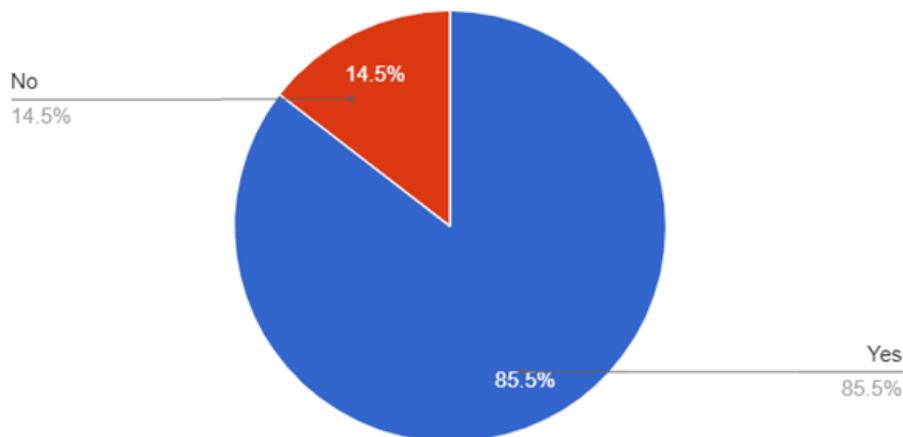
Most respondents were already familiar with the database. For those who responded that they were not familiar a link to the database was provided so that they could consult the database and continue answer the questionnaire.

4.4. Search terms for querying the database selected by experts

search terms for querying the database	N° (total 179)	Response percentage
Pest	175	97,77
Method (Molecular, serological, morphological...)	172	96,09
Test recommended in an EPPO or IPPC diagnostic protocol	131	73,18
Plant species evaluated	118	65,92
Type of samples (e.g. symptomatic/asymptomatic or both, isolated specimen)	102	56,98
Diagnostic specificity	91	50,84
Matrix evaluated	90	50,28
Diagnostic sensitivity	89	49,72
Analytical sensitivity	88	49,16
Interlaboratory comparison organized	85	47,49
Type of laboratory providing the validation data (e.g. reference laboratory, national laboratory, private laboratory, companies producing kits)	85	47,49
Analytical specificity - exclusivity	78	43,58
Reproducibility	78	43,58
Repeatability	75	41,90
Analytical specificity - inclusivity	73	40,78
Availability of a detailed validation report in addition to the information provided in the database	73	40,78
Test performed under accreditation	63	35,20
Date of the validation (report)	53	29,61
Language of the detailed validation report	43	24,02

Respondents were also given the possibility to provide free text suggestions the most relevant ones are presented below.

Availability of (standard) reference material, collection.
Detection/identification
Commercial kits validated
Terms that merit to be included and estimated for an accurate detection or diagnosis or for the selection of the most appropriate detection method: likelihood ratios for positives and negatives (predictive values), Accuracy
Estimation of post-test probability of infection, Estimated prevalence of the pathogen…
Name of test / reference of publication /
Methodology used for validation (according to PM7/098 or not, or adapted from)
Primer/probe name;
References

Some of the suggestions made here have also been identified by experts in their answer to question 3 (see section 4.5) such as whether the test is used for detection, identification or both.

The indication on how the validation was performed is already included in the current database and will be maintained.

Some of these additional suggestions will be reviewed during the project to evaluate the need to include them in the database.

4.5. Examples of combined queries which experts would like to be able to.

The respondents were asked to describe three combined queries they would like to be able to make. The responses were given in free text. The EPPO Secretariat harmonized the answers given in order to be able to identify type combined queries.

Using Cloud Words with Google Advanced Summary it is possible to provide an illustration of the combined queries that are more frequent than others. This is shown in figure 1 below with the size of the text reflecting the frequency.
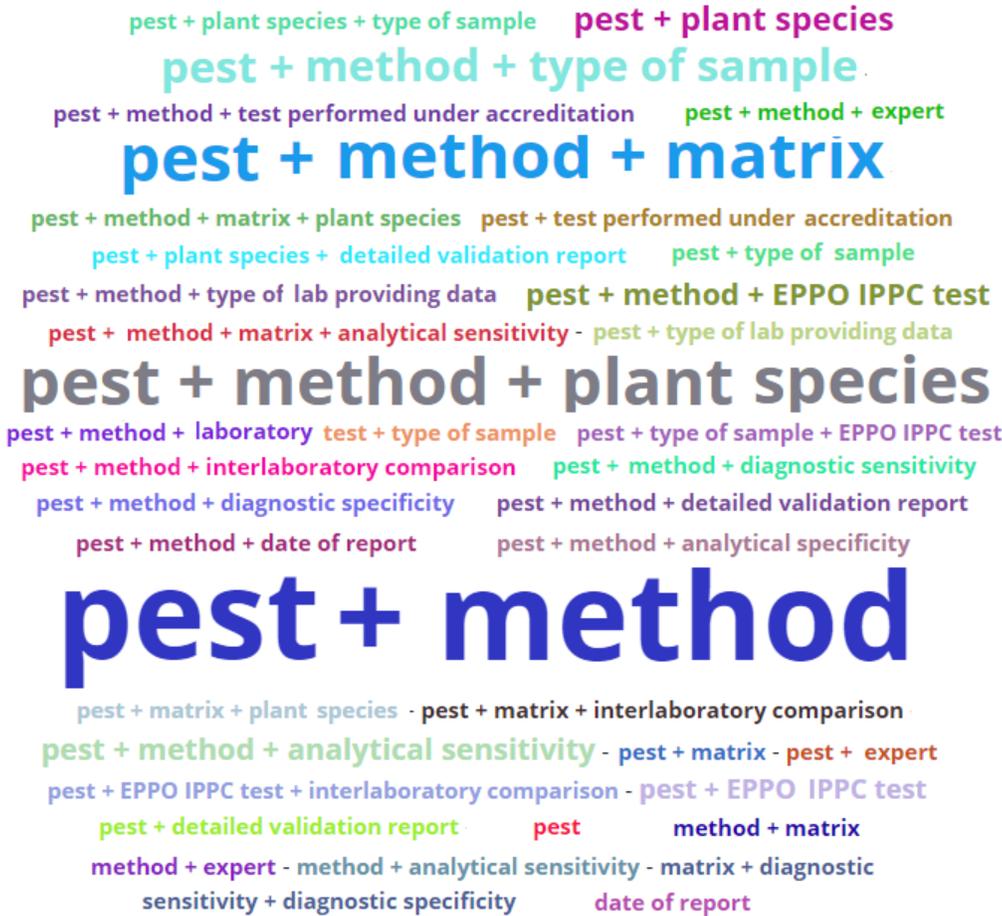
The number of occurrences (above 5) for specific combined queries is presented in the table below

Query	Nb occurrence
pest + method	41
pest + method + matrix	22
pest + method + plant species	22

pest + method + type of sample	15
pest + plant species	11
pest + method + analytical sensitivity	10
pest + method + EPPO IPPC test	10
pest + EPPO IPPC test	9
pest	6
pest + method + analytical specificity	6
pest + matrix	5
pest + method + laboratory	5

Other combined queries are presented in Appendix 2

Another visualization was made that helps to identify individual criteria that were cited as queries which experts would like to make and is shown below in figure 2
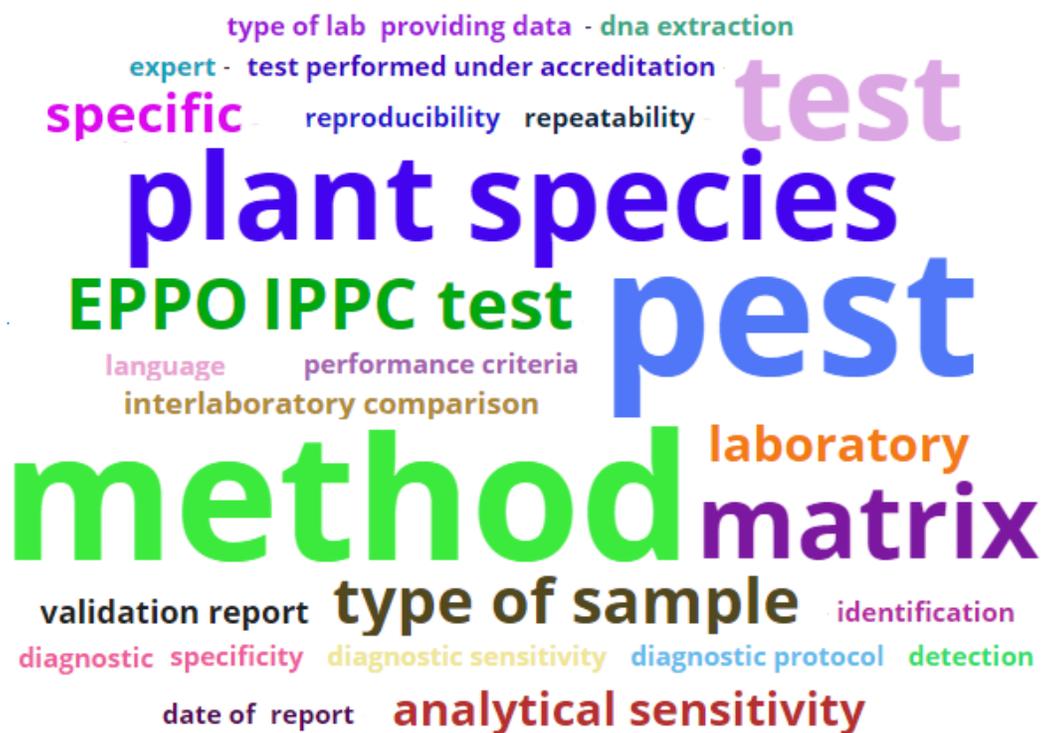
The number of occurrences above 10 are presented in the Table below

Criteria	Nb occurrence
pest	286
method	222
plant species	68
test	67
matrix	58
EPPO IPPC test	40
type of sample	36
laboratory	28
analytical sensitivity	26
validation report	18
interlaboratory comparison	17
test performed under accreditation	13
diagnostic sensitivity	12

Given the diversity of requests for queries, the EPPO Secretariat will endeavor to design a system that allows flexible queries to be made.

4.6. Responses on the need to search the data on tests including multiple pests (multiplexing) by all the pests that are targeted?

No
8.9%

No opinion
18.4%

8.9%

18.4%

72.6%

Yes
72.6%
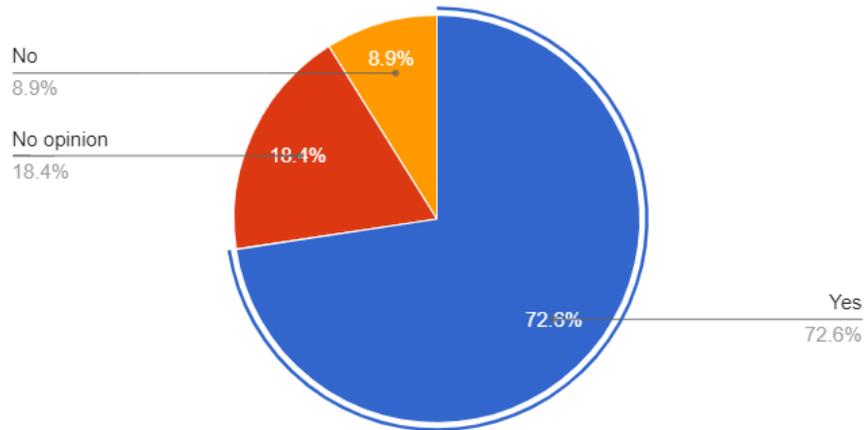
The EPPO Secretariat will design a system that allows multiple pest queries

4.7. Responses on the need to subdivide methods to enable sorting/screening of information

No
9.5%

No opinion
13.4%

9.5%

13.4%

77.1%

Yes
77.1%
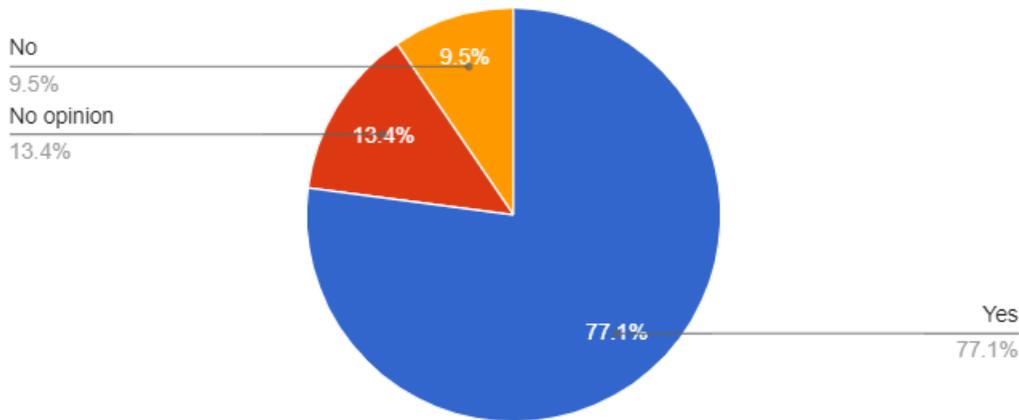
Methods will be subdivided

4.8. Responses on the need to search for companies which have kits mentioned in the database
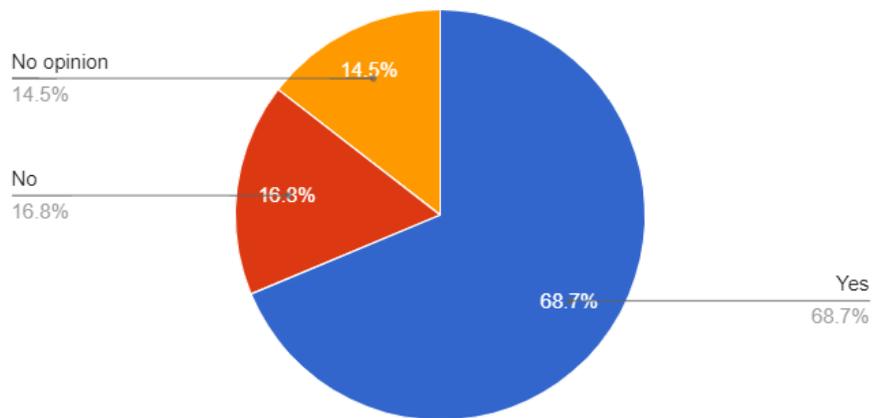
Search for company kits will included

4.9. Responses on the need to subdivide serological methods (e.g. into ELISA, IF, agglutination tests, other)
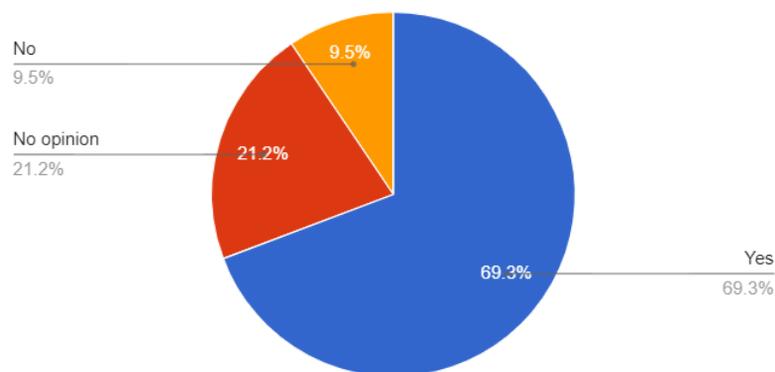
Serological methods will be subdivided

4.10. Responses on the need to subdivide ELISA into Indirect ELISA, DAS-ELISA, DASI-ELISA (also called TAS ELISA), PTA ELISA (direct and indirect), Tissue print-ELISA or Direct tissue blot immunoassay.
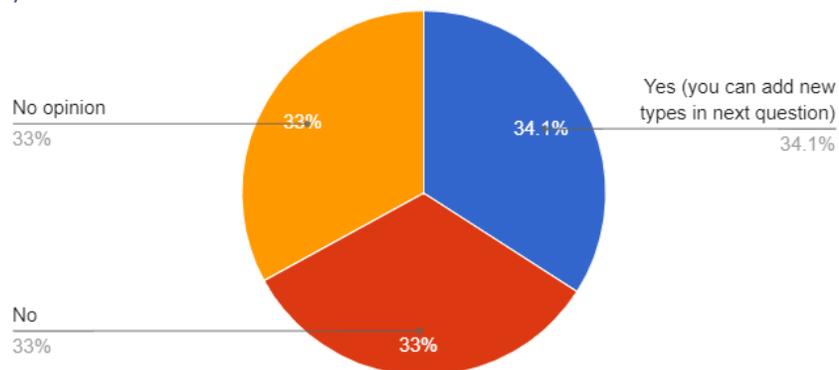
Further discussions will be organized to identify the need for ELISA methods to be subdivided

4.11.   Suggestions made for possible subdivisions of ELISA not mentioned in 4.10

Enrichment DASI-ELISA (2 occurrences)
FAST-ELISA (1 occurrence)
LFD (2 occurrences)
PCR-ELISA (e.g. Manceau et al. 2005, EPPO Bulletin, 35 55-60)

4.12.   Responses on the need to subdivide molecular methods into Conventional PCR, Conventional RT PCR, real-time PCR (qPCR), real-time RT PCR (RT qPCR), LAMP

No opinion 10.1%
No 11.2%
10.1%
11.2%
78.8%
Yes 78.8%
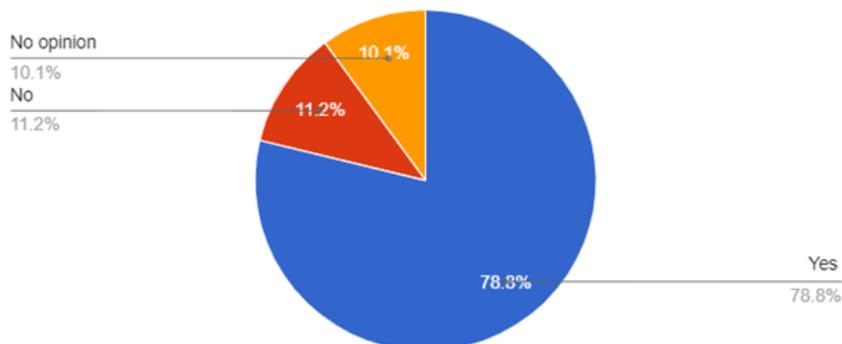
Molecular methods will be subdivided

4.13.   Suggestions made for possible subdivisions of molecular methods not mentioned in 4.12

NGS/HTS: 13 occurrences
Sequencing: 11 occurrences
Multiplex PCR: 8 occurrences
Nested PCR : 5 occurrences
MLST/MLSA : 3 occurrences
Digital droplet PCR : 3 occurrences
Isothermal amplification : 2 occurrences
PCR RFLP : 4 occurrences
FISH : 1 occurrence
DNA barcoding : 1 occurrence
Stemloop qPCR : 1 occurrence
PCR macroarray : 1 occurrence

Further discussions will be needed to establish a final list of molecular tests

4.14. Responses regarding the need to specify the nucleic acid extraction kit for molecular tests
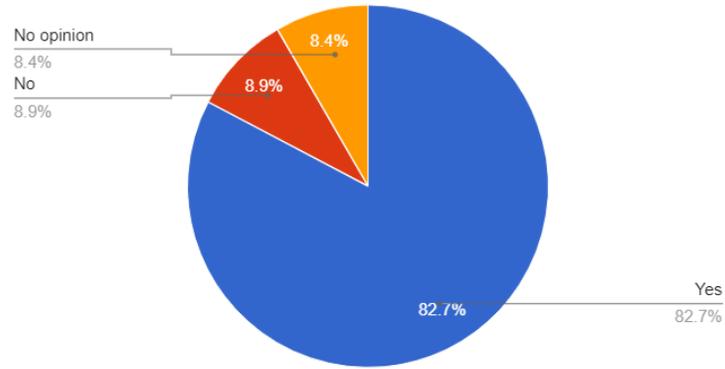
> *Extraction kits for molecular tests will be specified*

5. Conclusion and recommendations

Based on the survey results the type of data to be included in the validation section of the EPPO database has been identified and a system will be developed to allow flexible queries to be made. A redesign of the database will be prepared and evaluated both in the VALITEST project and in consultation with EPPO Panels on Diagnostics.

Appendix 1 SURVEY

Survey on the improvement of the validation section of the EPPO database on diagnostic expertise

In the framework of the EU funded project VALITEST (to know more about the project please consult https://www.valitest.eu/), EPPO is planning to improve the validation section of the EPPO Database on diagnostic expertise (http://dc.eppo.int/validationlist.php).

The data collected in this survey will be stored on EPPO servers for the duration of the Valitest Survey (up to April 2021). Any personal data will be anonymized when presenting the results in the project deliverables. Personal data communicated for the purpose of the survey will be handled in compliance with the EU General Data Protection Regulation nº 2016/679.
Right of rectification:
Should you require further information concerning the processing of your personal data or exercise your rights (e.g. access or rectify any inaccurate or incomplete data) please contact the following email address: hq@eppo.int
You have the right of recourse at any time to the Data Protection Officer at: dpo@eppo.int
Currently, information can be sorted by pest and by methods only and data is retrieved as a PDF file.
It has been flagged by different users that it would be beneficial to be able to use the data in the validation database in a more interactive way (e.g. compare the analytical sensitivity of all real-time PCR tests for pest X).
We are organizing this survey to know your needs regarding validation data and to identify in particular a list of criteria on which queries could be made. These criteria will then be used as meta data to be provided by the laboratories generating the validation data.
We would consequently appreciate it if you could answer this survey to help us to redesign and improve this section of the database. Please note that the survey focuses on test currently used for diagnostics (except barcoding).

SURVEY :

Q. Personal information:
Family name :
First name :
Institute/ company :
Email :
Category of respondent:
- ☐ Laboratory performing official plant pest diagnostics
- ☐ Private laboratory
- ☐ Company manufacturing diagnostic kits.

Q1 Are you familiar with the validation section of the EPPO database on Diagnostic expertise
- ☐ Yes
- ☐ No (consult http://dc.eppo.int/validationlist.php and please continue the survey)

Q2 Use the list below to identify search terms for querying the database (you can select as many criteria as you think are important)
- ☐ Pest
- ☐ Method (Molecular, serological, morphological...)
- ☐ Date of the validation (report)
- ☐ Test recommended in an EPPO or IPPC diagnostic protocol
- ☐ Plant species evaluated
- ☐ Matrix evaluated
- ☐ Type of samples (e.g. symptomatic/asymptomatic or both, isolated specimen)

☐ Analytical sensitivity
☐ Analytical specificity - exclusivity
☐ Analytical specificity - inclusivity
☐ Reproducibility
☐ Repeatability
☐ Diagnostic sensitivity
☐ Diagnostic specificity
☐ Interlaboratory comparison organized
☐ Availability of a detailed validation report in addition to the information provided in the database
☐ Language of the detailed validation report
☐ Test performed under accreditation
☐ Type of laboratory providing the validation data (e.g. reference laboratory, national laboratory, private laboratory, companies producing kits,)
☐ Any other criteria (free text) :

Q3 Provide 3 examples of combined queries you would like to be able to make in order for us to understand better how you would like to search data.
    3.1 :
    3.2 :
    3.3 :

Q4 Should the data on tests including multiple pests (multiplexing) be searchable by all the pests that are targeted?
    ☐ Yes   ☐ No

Q5 Regarding the methods do you consider that more information should be provided, and that the different methods should be further subdivided to enable sorting/screening of information (e.g. in addition to 'serological' add a further level including all different serological method: ELISA, IF, LFD...)?
    ☐ Yes   ☐ No

Q6 Should it be possible to search for companies which have kits mentioned in the database?
    ☐ Yes   ☐ No

Q7 Should serological methods be subdivided (e.g. into ELISA, IF, agglutination tests, other)
    ☐ Yes   ☐ No

Q8 For ELISA should the following types of test be separated :
Indirect ELISA, DAS-ELISA, DASI-ELISA (also called TAS ELISA), PTA ELISA (direct and indirect), Tissue print-ELISA or Direct tissue blot immunoassay
    ☐ Yes (you can add new types in next question)
    ☐ No
Q8bis For ELISA, if your previous answer is yes and if you consider that not all types of tests are given please add the new type of tests here :
Q9 For molecular methods should the following types of test be separated?
Conventional PCR, Conventional RT PCR, real-time PCR (qPCR), real-time RT PCR (RT qPCR), LAMP (free text can also be allowed if a test does not belong to any of the description).
    ☐ Yes (you can add new types in next question)
    ☐ No
Q9bis For molecular methods, if your previous answer is yes, and if you consider that not all types of tests are given please add the new type of tests here

Q10 For molecular tests should the nucleic acid extraction kit be specified?
    ☐ Yes   ☐ No

Appendix 2: list of combined queries with less than 5 occurrences

pest + method + detailed validation report : 4 occurrences
pest + method + type of lab providing data : 4 occurrences
pest + test performed under accreditation : 4 occurrences
pest + type of sample : 4 occurrences
pest + method + diagnostic sensitivity : 3 occurrences
pest + method + test performed under accreditation : 3 occurrences
date of report : 2 occurrences
matrix + diagnostic sensitivity + diagnostic specificity : 2 occurrences
method + analytical sensitivity : 2 occurrences
method + expert : 2 occurrences
method + matrix : 2 occurrences
pest + detailed validation report : 2 occurrences
pest + EPPO IPPC test + interlaboratory comparison : 2 occurrences
pest + expert : 2 occurrences
pest + matrix + interlaboratory comparison : 2 occurrences
pest + matrix + plant species : 2 occurrences
pest + method + date of report : 2 occurrences
pest + method + diagnostic specificity : 2 occurrences
pest + method + diagnostic specificity : 2 occurrences
pest + method + expert : 2 occurrences
pest + method + interlaboratory comparison : 2 occurrences
pest + method + matrix + analytical sensitivity : 2 occurrences
pest + method + matrix + plant species : 2 occurrences
pest + plant species + detailed validation report : 2 occurrences
pest + plant species + type of sample : 2 occurrences
pest + type of lab providing data : 2 occurrences
pest + type of sample + EPPO IPPC test : 2 occurrences
test + type of sample : 2 occurrences
accuracy of the detection technique (sensitivity, specificity, likelihood ratios for positives and negatives) : 1 occurrence
analytical specificity : 1 occurrence
data on the specificity and sensitivity of primers .... : 1 occurrence
detailed validation report : 1 occurrence
detecting phytophthora spp. in field samples (particularly with soilborne pahogens) we may have many false negatives regardless of the method used, how can we overcome this? : 1 occurrence
diagnostic tests for pest + host and geographic limitations for pest. : 1 occurrence
dna extraction + test : 1 occurrence
EPPO IPPC test : 1 occurrence
EPPO IPPC test + reproducibility + repeatability : 1 occurrence
extraction + validation report : 1 occurrence
insect + ctab + quickpick : 1 occurrence
internal pcr control included/validated + type of internal control : 1 occurrence
matrix + analytical sensitivity : 1 occurrence
matrix + plant species : 1 occurrence
method : 1 occurrence
method + analytical sensitivity + analytical specificity-exclusivity + analytical specificity-inclusivity + reproducibility + repeatability : 1 occurrence
method + analytical sensitivity + date of report : 1 occurrence
method bottleneck : 1 occurrence

method + diagnostic sensitivity : 1 occurrence
method + diagnostic sensitivity + diagnostic specifity : 1 occurrence
method + EPPO IPPC test + detailed validation report : 1 occurrence
method for the identification fungi on strawberries, diagnostics of quarantine species on planting material, primers
for identification of colletotrichum spp : 1 occurrence
method + interlaboratory comparison : 1 occurrence
method + interlaboratory comparison + detailed validation report : 1 occurrence
method + matrix + diagnostic specificity : 1 occurrence
method + matrix + plant species : 1 occurrence
method of expertise on a definite pest : 1 occurrence
method + performance criteria + proficiency test : 1 occurrence
method + plant species + diagnostic sensitivity : 1 occurrence
method + plant species + diagnostic specificity : 1 occurrence
method + plant species + EPPO IPPC test : 1 occurrence
method + plant species + laboratory : 1 occurrence
method + reproducibility : 1 occurrence
method + test + analytical sensitivity : 1 occurrence
method + type of sample : 1 occurrence
method x method : 1 occurrence
multiple pests : 1 occurrence
no opinion : 1 occurrence
pathogen + interlaboratory comparison : 1 occurrence
pest + analytical sensitivity : 1 occurrence
pest + analytical sensitivity + analytical specificity : 1 occurrence
pest + analytical sensitivity + reproducibility : 1 occurrence
pest + analytical specificity : 1 occurrence
pest + country : 1 occurrence
pest + country + expert : 1 occurrence
pest + diagnostic protocol : 1 occurrence
pest + EPPO IPPC test + analytical sensitivity : 1 occurrence
pest + EPPO IPPC test + detailed validation report : 1 occurrence
pest + EPPO IPPC test + expert : 1 occurrence
pest + EPPO IPPC test + plant species : 1 occurrence
pest + EPPO IPPC test + type of sample : 1 occurrence
pest + host plant : 1 occurrence
pest + interlaboratory comparison : 1 occurrence
pest + interlaboratory comparison + plant species : 1 occurrence
pest + laboratory + analytical sensivity + analytical specifity : 1 occurrence
pest + language : 1 occurrence
pest + matrix + detection : 1 occurrence
pest + matrix + EPPO IPPC test + laboratories : 1 occurrence
pest + matrix + identification : 1 occurrence
pest + matrix + method : 1 occurrence
pest + matrix + method + type of sample + type of lab providing data + EPPO IPPC test : 1 occurrence
pest + matrix + performance criteria : 1 occurrence
pest + matrix + test : 1 occurrence
pest + matrix + type of sample : 1 occurrence
pest + matrix + validation dna extraction + validation pcr : 1 occurrence
pest + method + analytical specificity + analytical sensitivity : 1 occurrence
pest + method + analytical specificity-inclusivity : 1 occurrence
pest + method + detailed validation report + interlaboratory comparison + EPPO IPPC test : 1 occurrence
pest + method + detailed validation report + language + date of report : 1 occurrence

pest + method + diagnostic specificity + diagnostic sensitivity : 1 occurrence
pest + method + indicator plants used + symptoms : 1 occurrence
pest + method + interlaboratory comparison + detailed validation report : 1 occurrence
pest + method + laboratory + language : 1 occurrence
pest + method + laboratory + language + analytical sensitivity + analytical specificity : 1 occurrence
pest + method + language : 1 occurrence
pest + method + matrix + analytical sensitivity + analytical specificity : 1 occurrence
pest + method + matrix + date of report : 1 occurrence
pest + method + matrix + plant species + analytical sensitivity + analytical specificity + reproducibility + repeatability + diagnostic sensitivity + diagnostic specificity + detailed validation report : 1 occurrence
pest + method + matrix + type of sample + EPPO IPPC test : 1 occurrence
pest + method + matrix + type of sample + interlaboratory comparison : 1 occurrence
pest + method + plant species + analytical specificity : 1 occurrence
pest + method + plant species + EPPO IPPC test + detailed validation report : 1 occurrence
pest + method + plant species + EPPO IPPC test + type of sample : 1 occurrence
pest + method + plant species + laboratory : 1 occurrence
pest + method + plant species + last 3 years : 1 occurrence
pest + method + plant species + test performed under accreditation : 1 occurrence
pest + method + plant species + type of sample : 1 occurrence
pest + method + provider : 1 occurrence
pest + method + report : 1 occurrence
pest + method + test recommended in an eppo or ippc diagnostic protocol : 1 occurrence
pest + method + type of sample + specific : 1 occurrence
pest + method + validation : 1 occurrence
pest + performance criteria + proficiency test : 1 occurrence
pest + plant species + diagnostic sensitivity + diagnostic specificity : 1 occurrence
pest + plant species + interlaboratory comparison : 1 occurrence
pest + plant species + performance criteria : 1 occurrence
pest + plant species + test performed under accreditation : 1 occurrence
pest + test + interlaboratory comparison : 1 occurrence
pest + test performed under accreditation + interlaboratory comparison : 1 occurrence
pest + type of sample + test performed under accreditation : 1 occurrence
plant diagnostics detection validation, plant pest diagnostics validation, detection method validation eppo : 1 occurrence
plant species : 1 occurrence
plant species + dna extraction : 1 occurrence
plant species + dna extraction + molecular test : 1 occurrence
plant species + EPPO IPPC test : 1 occurrence
primer probe name + analytical sensitivity + analytical specificity : 1 occurrence
process of validating the identification g.rostochiensis by morphometric method - criterias : 1 occurrence
reference collectible material : 1 occurrence
reference material for comparison results : 1 occurrence
test + test performed under accreditation + detailed validation report : 1 occurrence
type of lab providing data + test performed under accreditation : 1 occurrence
type of plants, laboratory test : 1 occurrence
type of sample + diagnostic sensitivity : 1 occurrence
vector + pest + method : 1 occurrence
what are the diagnostic method for x virus? : 1 occurrence
which company supplies kits of reagents for detecting the x virus? : 1 occurrence
within a diagnostic protocol for a pest, how many tests have been validated? : 1 occurrence

Appendix 3 list of criteria less than 10 occurrences

expert : 9 occurrences
diagnostic specificity : 9 occurrences
type of lab providing data : 9 occurrences
date of report : 7 occurrences
reproducibility : 5 occurrences
language : 5 occurrences
repeatability : 4 occurrences
identification : 4 occurrences
detection : 4 occurrences
performance criteria : 4 occurrences
dna extraction : 4 occurrences
diagnostic protocol : 3 occurrences
proficiency test : 2 occurrences
host plant : 2 occurrences
country : 2 occurrences
analytical specificity-inclusivity : 2 occurrences
pathogen + interlaboratory comparison : 1 occurrence
molecular test : 1 occurrence
plant diagnostics detection validation, plant pest diagnostics validation, detection method validation eppo : 1 occurrence
no opinion : 1 occurrence
multiple pests : 1 occurrence
primer probe name : 1 occurrence
process of validating the identification g.rostochiensis by morphometric method - criterias : 1 occurrence
method of expertise on a definite pest : 1 occurrence
reference collectible material : 1 occurrence
method for the identification fungi on strawberries, diagnostics of quarantine species on planting material, primers for identification of colletotrichum spp : 1 occurrence
method bottleneck : 1 occurrence
detailed validation report : 1 occurrence
symptoms : 1 occurrence
last 3 years : 1 occurrence
test recommended in an eppo or ippc diagnostic protocol : 1 occurrence
which company supplies kits of reagents for detecting the x virus? : 1 occurrence
within a diagnostic protocol for a pest, how many tests have been validated? : 1 occurrence
indicator plants used : 1 occurrence
analytical specificity-exclusivity : 1 occurrence
validation dna extraction : 1 occurrence
validation pcr : 1 occurrence
vector : 1 occurrence
what are the diagnostic method for x virus? : 1 occurrence
method x method : 1 occurrence
reference material for comparison results : 1 occurrence