LITERATURE SEARCH FOR ANNUAL POST MARKET ENVIRONMENTAL MONITORING REPORT OF MON 810 MAIZE

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1. INTRODUCTION

As part of the general surveillance requirements for MON 810 genetically modified (GM) maize products authorised in the European Union (EU) market under regulation (EC) No 1829/2003, Bayer Agriculture BVBA [1] has actively monitored peer-reviewed scientific literature related to MON 810 maize covering the time span between June 2018- May 2019.

The publications that resulted from this literature search have been analysed in detail according to the relevance to for the risk assessment of this product and are presented here.

The completeness literature search checklist (EFSA's Annex 2) is provided in **Annex I** below.

2. IDENTIFYING THE REVIEW QUESTION AND PURPOSE FOR UNDERTAKING THE LITERATURE SEARCH

This literature search has been conducted to address the review question "Does MON 810 maize derived food/feed products and the introduced insect protection trait have adverse effects on human and animal health and the environment?"

The purpose for undertaking this literature search is to ensure compliance with the 2017 EFSA explanatory note on literature searching for annual post-market environmental monitoring (PMEM) on GM maize products authorised in the EU under regulation (EC) No 1829/2003 (EFSA, 2017).

Key elements used for the review question are humans, animals, and/or the environment (= population), MON 810 maize, derived food/feed products and the introduced insect protection trait (= intervention/exposure), conventional counterpart or non-GM maize (= comparator), and adverse effect on human and animal health, and the environment (= outcomes). Accordingly, the eligibility criteria for assessing the relevance of studies for inclusion in the literature review are provided in **Table 1**.

[1] Hereafter, referenced as Bayer

Table 1. Eligibility/inclusion criteria to establish the relevance of retrieved studies

Key elements	Criteria
Population	Humans, animals and the environment (taking into account the scope of the application *i.e.* authorisation for all uses as any other maize, including the cultivation of MON 810 maize) are addressed as general protection goals.
Intervention/exposure	MON 810 maize, derived food/feed products and the introduced insect protection trait addressed in the study are identical or similar to those under scientific review by the EFSA.
Comparator	In case of a comparative study that uses the GM plant material as test material, eligible studies must report a non-GM maize as a comparator.
Outcomes	Adverse effects on human and animal health and the environment are addressed (taking into consideration the scope of the application).
Additional key elements	
Information/ data requirements, including source of studies data	The study potentially contributes to the knowledge of the risk assessment of MON 810 maize intended for all uses as any other maize, including cultivation. Original/primary data are presented in the study.

3. SEARCHING FOR IDENTIFYING RELEVANT STUDIES

The approach used to develop the search strategy follows the lumping method and a wide range of free-text terms and where available, controlled vocabulary to define search terms in accordance with the 2010 EFSA Guidance on application of systematic review methodology to food and feed safety assessments to support decision making (EFSA, 2010) and the 2017 EFSA Explanatory note on literature searching (EFSA, 2017).

3.1. Search terms and their combination

The intervention/exposure key elements were defined and translated into search terms. Based on the key elements of the review question, the search terms, the field and the Boolean operators used to combine them were defined as shown in **Table 2**. These search terms considered possible synonyms, related terms, abbreviations and truncations, old and new as well as lay and scientific terminologies, brand and generic names, and spelling variants. Where available, the search was also adapted to controlled vocabulary (subject indexing). The search terms were designed to give an excellent coverage and retrieve the broadest possible number of articles related to MON 810 maize.

Table 3 shows the translation of the intervention key elements into search terms and, when available, the reference publications used to test the search terms. The table includes lists of search terms that are representative of each key element based on the criteria described above and the free-text terms and spelling variants representative of the indicated search terms. As shown in the table, the free-text terms and spelling variants are used to build the search string in the Web of Science™ and EBSCOhost platforms. Where available, controlled vocabularies based on Descriptors which are also representative of the indicated search terms are used to build the search string in EBSCOhost platform. The search terms, free-text terms, controlled vocabularies and the search strings are updated upon identification of a new search term.

Table 2. List of search terms and Boolean operators used to search for MON 810 related publications

Set	Field	Search string	Key elements (Intervention/Exposure)
Web of Science™ platform			
#11	Combination	#10 OR #9 OR #7 *DocType=All document types; Language=All languages;*	
#10	Topic	#8 AND (#2 OR #1) *DocType=All document types; Language=All languages;*	The newly expressed proteins in GM organisms, including maize
#9	Combination	(TS=(MON810 OR "MON 810")) *DocType=All document types; Language=All languages;*	Event
#8	Topic	(TS=(Cry1Ab OR "Cry1 Ab" OR "Cry 1 Ab" OR "Cry 1Ab" OR CryIAb OR "CryI Ab" OR "Cry I Ab" OR "Cry IAb")) *DocType=All document types; Language=All languages;*	Newly expressed proteins
#7	Combination	#6 OR #5 *DocType=All document types; Language=All languages;*	GM maize displaying the introduced insect protection trait OR GM maize with the indicated trade names
#6	Combination	#4 AND #2 AND #1 *DocType=All document types; Language=All languages;*	GM maize with the indicated trade names
#5	Combination	#3 AND #2 AND #1 *DocType=All document types; Language=All languages;*	GM maize displaying the introduced insect protection trait
#4	Topic	(TS=(Yield Gard OR Yieldg* OR "Bt maize" OR "Bt corn")) *DocType=All document types; Language=All languages;*	Trade names
#3	Topic	(TS=((TOLERAN* OR RESISTAN* OR PROTEC*) NEAR/5 (borer* OR Lepidoptera OR Ostrinia OR Sesamia))) *DocType=All document types; Language=All languages;*	Introduced insect protection trait
#2	Topic	(TS=(maize* OR corn* OR "zea mays" OR "z mays")) *DocType=All document types; Language=All languages;*	Plant species
#1	Topic	(TS=(GMO* OR LMO* OR GM OR GE OR transgen*OR ((genetic* OR living OR biotech*) NEAR/5 (modif* OR transform* OR manipulat* OR improv* OR engineer* OR deriv*)))) *DocType=All document types; Language=All languages;*	GMO general

Set	Field	Search string	Key elements (Intervention/Exposure)
EBSCOhost platform *(All document types and all languages)*			
S13	Combination	S9 OR S11 OR S12	
S12	All Text	TX (MON810 OR "MON 810")	Events
S11	Combination	(S1 AND S10) OR (S2 AND S10)	The newly expressed proteins in GM organisms, including maize.
S10	All Text	TX (Cry1Ab OR "Cry1 Ab" OR "Cry 1 Ab" OR "Cry 1Ab" OR CryIAb OR "CryI Ab" OR "Cry I Ab" OR "Cry IAb")	Newly expressed proteins.
S9	Combination	S6 OR S8	GM maize displaying the introduced insect protection trait OR GM maize with the indicated trade names.
S8	Combination	S1 AND S2 AND S7	GM maize with the indicated trade name.
S7	All Text	TX (Yield Gard OR Yieldg* OR "Bt maize" OR "Bt corn")	Trade names
S6	Combination	S1 AND S2 AND S5	GM maize displaying the introduced insect protection trait.
S5	Combination	S3 AND S4	
S4	Descriptor	DE "Lepidoptera"	Controlled vocabularies (subject indexes) offered by the database for introduced insect protection trait.
S3	Descriptor	DE "insect control"	
S2	Descriptor	DE "Zea mays" OR DE "maize"	Controlled vocabularies (subject indexes) offered by the database for plant species. Note that the term '*corn*' is covered by the term 'maize'.
S1	Descriptor	DE "genetic engineering" OR DE "genetic transformation" OR DE "genetically engineered foods" OR DE "genetically engineered organisms"	Controlled vocabularies (subject indexes) offered by the database for GMO general term.

3.2. Limits applied

An advanced literature search was conducted in the Web of Science™ Core collection database using the Web of Science™ platform[2] and in the CAB Abstracts® database[3] using the EBSCOhost platform[4] (*see* section 3.6.1). Each platform enables searching in the specified electronic database by making use of pre-defined fields, set combinations based on Boolean operators or a combination of both[5,6].

[2] http://apps.webofknowledge.com/UA_GeneralSearch_input.do?product=UA&SID=X1sK9uHnF5WXHkLGpbw&search_mode=GeneralSearch - Accessed on 24 October 2019.
[3] http://support.ebsco.com/help/?int=ehost&lang=en&feature_id=Databases&TOC_ID=Always&SI=0&BU=0&GU=1&PS=0&ver=live&dbs=,lah - Accessed on 24 October 2019.
[4] https://help.ebsco.com/interfaces/EBSCOhost - Accessed on 24 October 2019.
[5] http://images.webofknowledge.com/WOKRS5251R3/help/WOS/hp_advanced_examples.html - Accessed on 24 October 2019.
[6] https://help.ebsco.com/interfaces/EBSCOhost/training_promotion/Advanced_Searching_EBSCOhost_Tutorial - Accessed on 24 October 2019.

The literature search strategy utilises the "Topic" (TS) field in Web of Science™ platform and the "TX" field in EBSCOhost platform which have the broadest coverage of search terms and enable comprehensive searching within a record[7,6] (*see* **Table 2**). In the case of the Web of Science™ Core collection database, the "TS" field searches for topic terms in the following fields within a record: Title, Abstracts, Author Keywords and Keywords Plus®. The Keywords Plus® facility maximises the possibility of retrieving relevant records in the advanced search[8]. In the case of the CAB Abstracts® database, the "TX" field searches for the search terms "*within the full text of all articles for your term*"[6].

In this literature search, the search strategy utilised also the controlled vocabulary (subject indexing) facility offered by the CAB Abstracts® database. Accordingly, the search string was refined by using the CAB Thesaurus-Descriptors field, which are assigned by subject specialists to CAB records to represent the content of the source documents. The Descriptor ("DE") field enables selection of one or more controlled terms from the CAB Thesaurus to add to the search query. More importantly, having a controlled vocabulary allows users to use only one term to search for a concept rather than using lots of terms[9]. The most relevant, broad and controlled search terms in the hierarchy of CAB Thesaurus terms that were listed as preferred terms by CAB for the search query were selected and added to the search string in combination with the "DE" field (*see* **Table 2**).

3.3. Language

The search terms and their combination are established in English; hence, the search is expected to result in a list of articles written in English and/or articles written in other languages with at least a title, abstract or keywords in English. Also, technical terms like proteins names, MON codes, Latin names, … are common in all languages and therefore, articles in all languages, as specified in **Table 2**, will be retrieved.

3.4. Time period

This literature search covered the reporting period from June 2018 until May 2019.

3.5. Reference studies

In accordance with the 2017 EFSA Explanatory note on literature searching (EFSA, 2017), a list of reference publications, complying with the eligibility/inclusion criteria, to test, fine-tune and validate the search strategy as part of the protocol development was used (**Table 3**).

[7] http://images.webofknowledge.com/WOKRS5251R3/help/WOS/hs_advanced_fieldtags.html - Accessed on 24 October 2019.
[8] http://clarivate.libguides.com/woscc/searchtips - Accessed on 24 October 2019.
[9] https://www.cabi.org/Uploads/CABI/publishing/training-materials/resources-by-interface/cab-direct-user-guides/advanced-searching-cab-abstracts.pdf - Accessed on 24 October 2019.

Table 3. Translation of intervention/exposure key elements into search terms for MON 810 literature search in the Web of Science™ Core Collection and CAB Abstracts® databases

Key elements		Search terms	Comments
GMO general			
	Reference publications	Not applicable.	This step is to focus the search on GM related papers. The search terms, free-text terms, controlled vocabularies and the search strings are updated upon identification of a new search term.
	Search terms	Genetically modified organism (GMO, GM); Living modified organism (LMO); biotechnology-derived organism (biotech-derived); Genetic engineering (GE); transgenesis (transgene); genetic transformation; genetic manipulation; genetic improvement.	
Web of science™ platform	*Search string based on free-text terms using the Topic (TS) field*	(TS=(GMO* OR LMO* OR GM OR GE OR transgen*OR ((genetic* OR living OR biotech*) NEAR/5 (modif* OR transform* OR manipulat* OR improv* OR engineer* OR deriv*))))	
	Truncations and spelling variants used and their meanings	GMO* = GMO, GMOs, GMO's GM = GM crop, GM plant, GM crops, GM plants GE = GE crop, GE plant, GE crops, GE plants LMO* = LMO, LMOs, LMO's Transgen* = transgene, transgenic, transgenesis Genetic* = genetic, genetically Biotech = biotech, biotechnology, biotechnological Modif* = modify, modified, modification Transform* = transform, transformed, transformation Manipulat* = manipulate, manipulated, manipulation Improv* = improve, improved, improvement Engineer* = engineer, engineered, engineering Deriv* = derive, derived	
EBSCOhost platform	*Search string based on controlled vocabularies using the Descriptors (DE) field*	DE "genetic engineering" OR DE "genetic transformation" OR DE "genetically engineered foods" OR DE "genetically engineered organisms"	

Key elements		Search terms	Comments
Crop name			
Reference publications		Not applicable.	This step is to focus the search on maize related papers. The search terms, free-text terms, controlled vocabularies and the search strings are updated upon identification of a new search term.
Search terms		Maize, corn, *Zea mays*, *Z mays*	
Web of science™ platform	*Search string based on free-text terms using the Topic (TS) field*	(TS=(maize* OR corn* OR "zea mays" OR "z mays"))	
	Truncations and spelling variants used and their meanings	Maize* = maize, maizes, maize's Corn* = corn, corns, corn's	
EBSCOhost platform	*Search string based on controlled vocabularies using the Descriptors (DE) field*	DE "Zea mays" OR DE "maize"	
Intended trait			
Reference publications		Castañera P, Farinós G, Ortego F and Andow D, 2016. Sixteen Years of Bt Maize in the EU Hotspot: Why Has Resistance Not Evolved? Plos One, 1-13. Farinós GP, Hernández-Crespo P, Ortego F and Castañera P, 2017. Monitoring of Sesamia nonagrioides resistance to MON 810 maize in the European Union: lessons from a long-term harmonized plan. Pest Management Science, 74, 557-568. Hammond BG, Dudek R, Lemen JK and Nemeth MA, 2006. Results of a 90-day safety assurance study with rats fed grain from corn borer-protected corn. Food and Chemical Toxicology, 44, 1092-1099. Thieme T, Buuk C, Gloyna K, Ortego F and Farinós G, 2017. Ten years of MON 810 resistance monitoring of field populations of Ostrinia nubilalis in Europe. Journal of Applied Entomology, 00, 1-9.	
Search terms		Protection against *Ostrinia spp*./ *Sessamia spp*./ corn borer/ lepidopteran insect pests	

Key elements		Search terms	Comments
Web of science™ platform	*Search string based on free-text terms using the Topic (TS) field*	(TS=((TOLERAN* OR RESISTAN* OR PROTEC*) NEAR/5 (borer* OR Lepidoptera OR Ostrinia OR Sesamia)))	
	Truncations and spelling variants used and their meanings	Toleran* = tolerance, tolerant Resistan* = resistance, resistant Protect* = protection, protected Borer* = borer, borers, borer's	
EBSCOhost platform	*Search string based on controlled vocabularies using the Descriptors (DE) field*	DE "Lepidoptera" DE "insect control"	
Trade names			
	Reference publications	Hammond BG, Dudek R, Lemen JK and Nemeth MA, 2006. Results of a 90-day safety assurance study with rats fed grain from corn borer-protected corn. Food and Chemical Toxicology, 44, 1092-1099.	
	Search terms	YieldGard, *Bt* maize, *Bt* corn	
Web of science™ platform	*Search string based on free-text terms using the Topic (TS) field*	(TS=("Yield Gard" OR Yieldg* OR "Bt maize" OR "Bt corn"))	
	Truncations and spelling variants used and their meanings	"Yield Gard" = Yield Gard Yieldg* = YieldGard	
EBSCOhost platform	*Search string based on free-text terms using the All Text (TX) field*	TX ("Yield Gard" OR Yieldg* OR "Bt maize" OR "Bt corn")	
	Truncations and spelling variants used and their meanings	"Yield Gard" = Yield Gard Yieldg* = YieldGard	

Key elements		Search terms	Comments
Newly expressed protein			
	Reference publications	Castañera P, Farinós G, Ortego F and Andow D, 2016. Sixteen Years of Bt Maize in the EU Hotspot: Why Has Resistance Not Evolved? Plos One, 1-13. Farinós GP, Hernández-Crespo P, Ortego F and Castañera P, 2017. Monitoring of Sesamia nonagrioides resistance to MON 810 maize in the European Union: lessons from a long-term harmonized plan. Pest Management Science, 74, 557-568. Hammond BG, Dudek R, Lemen JK and Nemeth MA, 2006. Results of a 90-day safety assurance study with rats fed grain from corn borer-protected corn. Food and Chemical Toxicology, 44, 1092-1099. Thieme T, Buuk C, Gloyna K, Ortego F and Farinós G, 2017. Ten years of MON 810 resistance monitoring of field populations of Ostrinia nubilalis in Europe. Journal of Applied Entomology, 00, 1-9.	
	Search terms	Cry1Ab	
Web of science™ platform	*Search string based on free-text terms using the Topic (TS) field*	(TS=(Cry1Ab OR "Cry1 Ab" OR "Cry 1 Ab" OR "Cry 1Ab" OR CryIAb OR "CryI Ab" OR "Cry I Ab" OR "Cry IAb"))	
	Truncations and spelling variants used and their meanings	The options shown in the search string above are spelling variants. Truncations are not applicable.	
EBSCOhost platform	*Search string based on free-text terms using the All Text (TX) field*	TX (Cry1Ab OR "Cry1 Ab" OR "Cry 1 Ab" OR "Cry 1Ab" OR CryIAb OR "CryI Ab" OR "Cry I Ab" OR "Cry IAb")	
	Truncations and spelling variants used and their meanings	The options shown in the search string above are spelling variants. Truncations are not applicable.	

Key elements		Search terms	Comments
Event			
	Reference publications	Castañera P, Farinós G, Ortego F and Andow D, 2016. Sixteen Years of Bt Maize in the EU Hotspot: Why Has Resistance Not Evolved? Plos One, 1-13. Farinós GP, Hernández-Crespo P, Ortego F and Castañera P, 2017. Monitoring of Sesamia nonagrioides resistance to MON 810 maize in the European Union: lessons from a long-term harmonized plan. Pest Management Science, 74, 557-568. Hammond BG, Dudek R, Lemen JK and Nemeth MA, 2006. Results of a 90-day safety assurance study with rats fed grain from corn borer-protected corn. Food and Chemical Toxicology, 44, 1092-1099. Thieme T, Buuk C, Gloyna K, Ortego F and Farinós G, 2017. Ten years of MON 810 resistance monitoring of field populations of Ostrinia nubilalis in Europe. Journal of Applied Entomology, 00, 1-9.	
	Search terms	MON 810	
Web of science™ platform	*Search string based on free-text terms using the Topic (TS) field*	(TS=(MON810 OR "MON 810"))	
	Truncations and spelling variants used and their meanings	The options shown in the search string above are spelling variants. Truncations are not applicable.	
EBSCOhost platform	*Search string based on free-text terms using the All Text (TX) field*	TX (MON810 OR "MON 810")	
	Truncations and spelling variants used and their meanings	The options shown in the search string above are spelling variants. Truncations are not applicable.	

3.6. Information sources

3.6.1. Electronic bibliographic databases

Based on the coverage and relevance of the journals included, Bayer selects the Web of Science™ Core Collection database[10] and the CAB Abstracts® database[11] for performing the literature searches. The advanced literature search was conducted using the Web of Science™ platform[4] for the Web of Science™ Core collection database and using the EBSCOhost platform[6] for the CAB Abstracts® database[3].

The Web of Science™ Core Collection database[10] includes literature captured under the following two catalogues: 1) the Science Citation Index Expanded (1995-present); and 2) the Conference Proceedings Citation Index- Science (1990-present). These catalogues offer a complete view of item from a journal, including original research articles, reviews, editorials, chronologies, conference proceedings, bulletins, monographs, and technical reports. This database is "*indisputably the largest citation database available, with over 1 billion cited reference connections indexed from high quality peer reviewed journals, books and proceedings. Each cited reference is meticulously indexed to ensure that it is searchable and attributes credit to the appropriate publication*"[10]. Further, The Web of Science™ Core Collection database is connected to Google Scholar to allow a seamless movement between the open web and the Web of Science™ Core Collection for the literature search[10].

The CAB Abstracts® database[11] includes literature capture under the CAB Abstracts (1972-present) catalogue. This catalogue offers a complete view of item from a journal, including original research articles, reviews, books, conference proceedings/ papers, correspondences, editorials, patents, thesis, reports, and bulletins on international agricultural literature, including plant protection, animal husbandry, animal and plant breeding, genetics, and nutrition.

All journals included in the two databases must go through a verification process and as a minimum requirement, non-English language journals must include English-language bibliographic information (title, abstract, keywords) and be peer-reviewed. In general, English is considered the universal language of science[12]. For this reason, the journals most important to the international research community will publish either full text or a minimum of bibliographic information in English, which is especially true in the scientific domain of natural sciences. Full text in English is highly desirable if the journal intends to serve an international community of researchers. Therefore, it is expected that even if there is a relevant article for the food and feed safety of GM plants in a language different than English, the article will include title/abstract/keywords in English, which will guarantee the retrievability of these articles when using keywords and keyword combinations in English.

Based on the above, the selected databases are, to our knowledge, comprehensive, multidisciplinary, conservative sources for literature searching and offer the broadest coverage to retrieve a largest breadth of possible relevant studies. Therefore, additional search sources are not deemed necessary.

[10] Web of Science Core Collection; https://clarivate.com/products/web-of-science/web-science-form/web-science-core-collection/ - Accessed on 24 October 2019.
[11] CABI CAB Abstracts® database; http://www.cabi.org/cab-direct/ - Accessed on 24 October 2019.
[12] Web of Science™; http://wokinfo.com/essays/journal-selection-process/ - Accessed on 24 October 2019.

3.6.2. Relevant key organisations

In accordance with the 2017 Explanatory note on literature searching (EFSA, 2017) and additional EFSA recommendations, the search in electronic bibliographic databases has been complemented with literature search in internet pages of relevant key organisations involved in the risk assessment of GM plants.

Of the 13 key organisations cited in the 2017 Explanatory note on literature searching (EFSA, 2017), nine[13] are involved in risk assessment of single GM maize products. Two of the remaining four (CIBIOGEM and Environment and Climate Change Canada) are not involved in GM risk assessment. The other two (OGTR and GEAC), for the time being, only assess GM cotton and oilseed rape. Therefore, the nine are the relevant key organisations for MON 810 and the internet search focused on these organisations.

For the selection of studies, all records concerning GMO applications and approvals published in the webpages of each relevant key organisation were screened based on 'limits applied' as shown in Table 4. Afterwards, all the records within the specified limits were assessed for their relevance to MON 810 and the results are presented in Section 5.1.2.

4. SELECTING STUDIES

Studies retrieved from the literature search were screened for their relevance first and then the selected ones were evaluated for their reliability through detailed assessments. Relevance to the search scope and scientific reliability were rigorously assessed by internal and external technical experts.

4.1. Process

The process of selecting relevant studies was undertaken in two stages:

- ***Rapid assessment*** for the relevance based on information in the title and abstract of the studies, to exclude publications that are obviously irrelevant.
- ***Detailed assessment*** of full-text document if required. Experts with a solid experience in the risk assessment of GM plants and experts with technical experience in the specific area of the selected publication performed this analysis. This stage was conducted to formally assess the identified studies (methodological quality) and the result has then been used to assess if the conclusions on the food/feed safety of the risk assessment, based on the comprehensive weight of evidence, are still valid.

4.2. Quality assurance

All publications that were identified by the search described in Section 3 have been screened by three different reviewers (one internal and two external experts) with solid experience in the risk assessment of GM plants.

[13] Internet pages of the relevant key organisations for MON 810 maize:
US EPA (https://www.epa.gov/environmental-topics/science-topics) - Accessed on 24 October 2019;
USDA (https://www.usda.gov/media) - Accessed on 24 October 2019;
US FDA (https://www.fda.gov/) - Accessed on 24 October 2019;
CFIA (http://www.inspection.gc.ca/eng/1297964599443/1297965645317) - Accessed on 24 October 2019;
Health Canada (https://www.canada.ca/en/health-canada.html) - Accessed on 24 October 2019;
FSANZ (http://www.foodstandards.gov.au/Pages/default.aspx) - Accessed on 24 October 2019;
CTNBio (http://ctnbio.mcti.gov.br/) - Accessed on 24 October 2019;
CONABIA(https://www.argentina.gob.ar/) - Accessed on 24 October 2019
Japan MAFF (http://www.maff.go.jp/e/) - Accessed on 24 October 2019.

In case of disagreements on eligibility for the inclusion of studies, the reviewers discuss together. If uncertainty remains, the study is *de facto* included for further consideration.

4.3. Eligibility/inclusion criteria to establish relevance

Taking into account i) the review question, ii) the scope of the application, *i.e.* authorisation of MON 810 maize for all uses as any other maize including cultivation in the EU and iii) the eligibility criteria to establish the relevance of retrieved studies, an assessment was conducted in order to conclude whether a certain publication was considered relevant or not. When a publication was considered relevant, the category the publication belongs to is indicated. The following is a non-exhaustive list of categories publications can belong to:

Food/Feed safety assessment

- Molecular characterisation
- Protein expression
- Crop composition
- Agronomic and phenotypic characteristics
- Toxicology - Animal feeding / *In vitro*
- Allergenicity of the protein or the whole food/feed
- Nutrition
- Protein/ DNA/ RNA fate in digestive tract

Environmental safety assessment

- Spillage and consequences thereof
- Non target organisms (NTO)
- Gene flow
- Protein/ DNA/ RNA fate in soil or in stream water
- Insect resistance management (IRM)
- Impact of management practices
- Ecology

It should be noted that the selection criteria are well defined and reassessed annually.

5. SUMMARISING AND REPORTING THE DATA, AND CONSIDERING THE IMPLICATIONS OF THE FINDINGS

5.1. Search outcomes

5.1.1. Outcomes of literature search in electronic bibliographic databases

The literature search was run using Web of Science™ Core Collection and the CAB Abstracts® databases on a monthly basis, covering the time span June 2018 - May 2019. As a result, 67 hits were identified using Web of Science™ Core Collection database while 142 hits were retrieved from the search conducted using the CAB Abstracts® database.

5.1.2. Outcomes of literature search in internet pages of relevant key organisations

The literature search in the internet pages of the relevant key organisations was conducted on 24 October 2019. The links to the results of the literature search and the summary of the retrieved data are shown in **Table 4**. There was no publication based on primary/original data that needed further assessment.

Table 4. Results of the literature search in internet pages of relevant key organisations for MON 810 maize

Relevant key organisations	Link to relevant information and summary of the retrieved data
US EPA	https://www.epa.gov/ingredients-used-pesticide-products/current-and-previously-registered-section-3-plant-incorporated – Accessed on 24 October 2019. The webpage dedicated to PIP registrations was checked. *Date of the most recent website update at the time of the search*: 24/10/2018 *Date span of the search*: 2018 – 2019 *Limits applied*: The list of PIP active ingredients registered was sorted by 'Year Registered' and those registered starting from 2018 were assessed. *Number of records retrieved matching the abovementioned criteria:* "1". *Number of relevant records or full-text documents retrieved*: The retrieved record is not relevant to MON 810.
USDA	https://www.aphis.usda.gov/aphis/ourfocus/biotechnology/permits-notifications-petitions/petitions/petition-status - Accessed on 24 October 2019. The webpage dedicated to petitions for determination of nonregulated status was checked. *Date of the most recent website update at the time of the search*: 26/09/2019 *Date span of the search*: 2018 – 2019 *Limits applied*: The list of the petitions was sorted by 'Effective Date' and those completed/ released starting from 01/01/2018 were assessed. *Number of records retrieved matching the abovementioned criteria:* "5". *Number of relevant records or full-text documents retrieved*: The retrieved records are not relevant to MON 810.
US FDA	https://www.accessdata.fda.gov/scripts/fdcc/?set=Biocon – Accessed on 24 October 2019. The webpage dedicated to biotechnology consultations on food from GE plant varieties was checked. *Date of the most recent website update at the time of the search*: 11/10/2019 *Date span of the search*: 2018 – 2019 *Limits applied*: The list of the consultations starting from the 'FDA Letter Date' of Jan 1, 2018 was assessed. *Number of records retrieved matching the abovementioned criteria:* "8". *Number of relevant records or full-text documents retrieved*: The retrieved records are not relevant to MON 810.

Relevant key organisations	Link to relevant information and summary of the retrieved data
CFIA	http://www.inspection.gc.ca/plants/plants-with-novel-traits/approved-under-review/decision-documents/eng/1303704378026/1303704484236 - Accessed on 24 October 2019. The webpage dedicated to decision documents – determination of environmental and livestock feed safety was checked. *Date of the most recent website update at the time of the search*: 28/05/2019 *Date span of the search*: 2018 – 2019 *Limits applied*: The list of decision documents starting from the DD No. = DD2018 was assessed. *Number of records retrieved matching the abovementioned criteria:* "2". *Number of relevant records or full-text documents retrieved*: The retrieved record is not relevant to MON 810.
Health Canada	https://www.canada.ca/en/health-canada/services/food-nutrition/genetically-modified-foods-other-novel-foods/approved-products.html - Accessed on 24 October 2019. The webpage dedicated to approved products of genetically modified (GM) foods and other novel foods was checked. *Date of the most recent website update at the time of the search*: 26/06/2019 *Date span of the search*: 2018 – 2019 *Limits applied*: The list of novel food decisions starting from the 'Decision Date' of 01/01/2018 was assessed. *Number of records retrieved matching the abovementioned criteria:* "7". *Number of relevant records or full-text documents retrieved*: The retrieved records are not relevant to MON 810.
FSANZ	http://www.foodstandards.gov.au/consumer/gmfood/applications/Pages/default.aspx - Accessed on 24 October 2019. The webpage dedicated to current GM applications and approvals was checked. *Date of the most recent website update at the time of the search*: August 2019 *Date span of the search*: 2018 – 2019 *Limits applied*: The list for GM applications and approvals with 'Status' approved or under assessment starting from 2018 was assessed. *Number of records retrieved matching the abovementioned criteria:* "5". *Number of relevant records or full-text documents retrieved*: The retrieved records are not relevant to MON 810.

Relevant key organisations	Link to relevant information and summary of the retrieved data
CTNBio	http://ctnbio.mcti.gov.br/liberacao-comercial#/liberacao-comercial/consultar-processo – Accessed on 24 October 2019. The webpage dedicated to commercial releases (= Liberações Comerciais) was checked. *Date of the most recent website update at the time of the search*: Not clear (several dates mentioned) *Date span of the search*: 2018 – 2019 *Limits applied*: The list of commercial releases for plants (= plantas) starting from 2018 was assessed. *Number of records retrieved matching the abovementioned criteria:* "13". *Number of relevant records or full-text documents retrieved*: The retrieved records are not relevant to MON 810.
CONABIA	https://www.argentina.gob.ar/agroindustria/alimentos-y-bioeconomia/ogm-comerciales – Accessed on 24 October 2019. The webpage of the national advisory commission on agricultural biotechnology (= Comisión Nacional Asesora de Biotecnología Agropecuaria) was checked. *Date of the most recent website update at the time of the search*: Not available *Date span of the search*: 2018 – 2019 *Limits applied*: The list of decision documents open for public comment was assessed. Note: decision documents are available for 60 days to allow the public to give comments and are removed afterwards. *Number of records retrieved matching the abovementioned criteria:* "18". *Number of relevant records or full-text documents retrieved*: The retrieved records are not relevant to MON 810.
MAFF	http://www.maff.go.jp/j/syouan/nouan/carta/torikumi/attach/pdf/index-189.pdf - Accessed on 24 October 2019. The webpage dedicated to list of approved genetically modified agricultural crops was checked. *Date of the most recent website update at the time of the search*: 30/05/2019 *Date span of the search*: 2018-2019 *Limits applied*: The list of GM agricultural crops with approval date ('承認日') starting from January 01, 2018 was assessed. *Number of records retrieved matching the abovementioned criteria:* "17". *Number of relevant records or full-text documents retrieved*: The retrieved records are not relevant to MON 810.

5.2. Results of the study selection process for electronic bibliographic databases

The results of the study selection process are provided in **Table 5**. The 21 relevant studies retrieved after detailed assessment of the full text document (ordered by category of information) are listed in **Table 6.** Excluded studies after detailed assessment of the full text documents for relevance are listed in **Table 7**. A copy of the full-text documents listed in **Table 6** are provided as pdf files in the references folder.

Table 5. Results of the study selection process.

Review question captured in the search	**Number of studies**	
	Web of Science™ Core Collection database	**CAB Abstracts® database**
Total number of *studies* retrieved after all searches of the scientific literature (excluding duplicates)	67	142
Number of *studies* excluded from the search results after rapid assessment for relevance	43	104
Total number of *full-text documents* assessed in detail (excluding duplicates)	55	
Number of *studies* excluded from further consideration after detailed assessment for relevance	33	
Total number of unobtainable/unclear studies	0	
Total number of relevant studies	21	

Table 6. Report of all relevant studies retrieved after detailed assessment of full-text documents for relevance: ordered by category of information.

Study (author(s) and year)	Title	Source
Food/Feed safety assessment		
Molecular characterisation		
Ben Ali *et al.* (2018)	Genetic and epigenetic characterization of the cry1Ab coding region and its 3′ flanking genomic region in MON 810 maize using next-generation sequencing.	European Food Research and Technology
Crop composition		
Corujo *et al.* (2019)	Use of omics analytical methods in the study of genetically modified maize varieties tested in 90 days feeding trials	Food Chemistry
Agronomic and phenotypic characteristics		
Silva *et al.* (2018)	Yield losses in transgenic Cry1Ab and non-Bt corn as assessed using a crop-life-table approach.	Journal of Economic Entomology
Toxicology- animal feeding and *in vitro*		
Tulinska *et al.* (2018)	Humoral and cellular immune response in Wistar Han RCC rats fed two genetically modified maize MON 810 varieties for 90 days (EU 7th Framework Programme project GRACE)	Archives of Toxicology
Chereau *et al.* (2018)	Rat feeding trials: a comprehensive assessment of contaminants in both genetically modified maize and resulting pellets	Food and Chemical Toxicology
Szymczyk *et al.* (2018)	Results of a 16-week safety assurance study with rats fed genetically modified Bt maize: effect on growth and health parameters	Journal of Veterinary Research
Coumoul *et al.* (2019)	The GMO90+Project: Absence of evidence for biologically meaningful effects of genetically modified maize-based diets on Wistar rats after 6-months feeding comparative trial	Toxicological Sciences
Sharbati *et al.* (2017)	Transcriptomic analysis of intestinal tissues from two 90-day feeding studies in rats using genetically modified MON 810 maize varieties.	Frontiers in Genetics

Study (author(s) and year)	Title	Source
Environmental safety assessment		
Ecology		
Lacatusu *et al.* (2010)	Research to determine the impact of Bt technology applied to maize MON 810 on soil quality	Scientific Papers - University of Agronomic Sciences and Veterinary Medicine Bucharest
Impact of management practices		
Ncube *et al.* (2018)	Fusarium ear rot and fumonisins in maize kernels when comparing a Bt hybrid with its non-Bt isohybrid and under conventional insecticide control of *Busseola fusca* infestations	Crop Protection
Insect Resistance Management		
Grimi *et al.* (2017)	Field-evolved resistance to Bt maize in sugarcane borer (*Diatraea saccharalis*) in Argentina.	Pest Management Science
Farinós *et al.* (2017)	Monitoring of *Sesamia nonagrioides* resistance to MON 810 maize in the European Union: lessons from a long-term harmonized plan.	Pest Management Science
Strydom *et al.* (2019)	Resistance status of *Busseola fusca* (Lepidoptera: Noctuidae) populations to single- and stacked-gene Bt maize in South Africa	Journal of Economic Entomology
Thieme *et al.* (2018)	Ten years of MON 810 resistance monitoring of field populations of *Ostrinia nubilalis* in Europe.	Journal of Applied Entomology
Spagnol *et al.* (2017)	The compatibility of transgenic corn with the *Trichogramma pretiosum* parasitoid.	Revista Brasileira de Milho e Sorgo
Frizzas *et al.* (2017)	Diversity of insects under the effect of Bt maize and insecticides.	Arquivos do Instituto Biológico (São Paulo)
Campos *et al.* (2018)	Indirect exposure to Bt maize through pig faeces causes behavioural changes in dung beetles	Journal of Applied Entomology
de Sousa *et al.* (2019)	Influence of Bt maize on diversity and composition of non-target arthropod species.	Journal of Agricultural Science
Zeng *et al.* (2019)	The influence of Bt maize cultivation on communities of Arbuscular	Frontiers in Microbiology

Study (author(s) and year)	Title	Source
	Mycorrhizal Fungi revealed by MiSeq sequencing	
Protein/DNA fate in soil or in stream water		
Liu *et al.* (2018)	Adsorption and desorption of Cry1Ab proteins on differently textured paddy soils	Pedosphere
Zhou *et al.* (2018)	Effect of soil organic matter on adsorption and insecticidal activity of toxins from *Bacillus thuringiensis*	Pedosphere

Table 7. **Report of studies excluded from the risk assessment after detailed assessment of full-text documents (classified by authors)**

Study Author(s)	Year	Title	Source	Reason(s) for exclusion
Devos, Y *et al.*	2018	Teosinte and maize x teosinte hybrid plants in Europe-Environmental risk assessment and management implications for genetically modified maize	Agriculture Ecosystems & Environment	It is not a safety study on MON 810
Walker, E et al.	2017	A spatio-temporal exposure-hazard model for assessing biological risk and impact	Risk Analysis	It is not a safety study on MON 810
Fatoretto, JC et al.	2017	Adaptive potential of fall armyworm (Lepidoptera: Noctuidae) limits Bt trait durability in Brazil.	Journal of Integrated Pest Management	It is not a safety study on MON 810
de Sousa, MF et al.	2017	Biology of *Trichogramma pretiosum* (Hymenoptera: Trichogrammatidae) fed transgenic maize pollen.	Florida Entomologist	The hybrid used to conduct the study is not MON 810
Sharma, HC and Dhillon, MK	2018	Bio-safety of Helicoverpa-resistant transgenic chickpea with *Bacillus thuringiensis* genes in the environment	Indian Journal of Agricultural Sciences	The hybrid used to conduct the study is not MON 810
Glenn, KC et al.	2017	Bringing new plant varieties to market: plant breeding and selection practices advance beneficial characteristics while minimizing unintended changes.	Crop Science	It is not a safety study on MON 810

Study Author(s)	Year	Title	Source	Reason(s) for exclusion
Alves, LRA et al.	2018	Differences in production costs' structures of conventional and genetically modified corn in Brazil, on the second crop: 2010/2011, 2013/2014 and 2014/2015.	Custos E @Gronegócio	It is not a safety study on MON 810
Zhang, S et al.	2019	Effects of non-genetically and genetically modified organism (maize-soybean) diet on growth performance, nutrient digestibility, carcass weight, and meat quality of broiler chicken	Asian-Australasian Journal of Animal Sciences	The hybrid used to conduct the study is not MON 810
Li ZhaoXia et al.	2018	Enhancing auxin accumulation in maize root tips improves root growth and dwarfs plant height.	Plant Biotechnology Journal	The hybrid used to conduct the study is not MON 810
van der Voet et al.	2019	Equivalence limit scaled differences for untargeted safety assessments: Comparative analyses to guard against unintended effects on the environment or human health of genetically modified maize	Food and Chemical Toxicology	It is not a safety study on MON 810
Zhao Man et al.	2018	Establishment of a dietary exposure assay for evaluating the toxicity of insecticidal compounds to *Apolygus lucorum* (Hemiptera: Miridae)	Environmental Pollution	It is not a safety study on MON 810
Nadal, A et al.	2018	Exposure of livestock to GM feeds: detectability and measurement.	Food and Chemical Toxicology	It is not a safety study on MON 810
Strobbe, S et al.	2018	From in planta function to vitamin-rich food crops: the ACE of biofortification.	Frontiers in Plant Science	It is not a safety study on MON 810
Smith, JL et al.	2018	*Fusarium graminearum* mycotoxins in maize associated with *Striacosta albicosta* (Lepidoptera: Noctuidae) injury.	Journal of Economic Entomology	The hybrid used to conduct the study is not MON 810

Study Author(s)	Year	Title	Source	Reason(s) for exclusion
de Vos, CJ and Swanenburg, M	2018	Health effects of feeding genetically modified (GM) crops to livestock animals: a review.	Food and Chemical Toxicology	It is not a safety study on MON 810
Zdziarski, I et al.	2018	Histopathological investigation of the stomach of rats fed a 60% genetically modified corn diet.	Food and Nutrition Sciences	The hybrid used to conduct the study is not MON 810
Hilbeck, A et al.	2018	Impact of antibiotics on efficacy of cry toxins produced in two different genetically modified Bt maize varieties in two Lepidopteran herbivore species, *Ostrinia nubilalis* and *Spodoptera littoralis*	Toxins	It is not a safety study on MON 810
Bibb, JL et al.	2018	Impact of corn earworm (Lepidoptera: Noctuidae) on field corn (Poales: Poaceae) yield and grain quality.	Journal of Economic Entomology	It is not a safety study on MON 810
El-Esawi, MA	2018	Introductory chapter: introduction to biotechnological approaches for maize improvement.	Maize Germplasm: Characterization and Genetic Approaches for Crop Improvement London: Intechopen	It is not a safety study on MON 810
Taylor, S and Krupke, C	2018	Measuring rootworm refuge function: *Diabrotica virgifera virgifera* emergence and mating in seed blend and strip refuges for Bacillus thuringiensis (Bt) maize.	Pest Management Science	It is not a safety study on MON 810

Study Author(s)	Year	Title	Source	Reason(s) for exclusion
Cappelle, K et al.	2019	Meta-effect of insect resistant maize on fumonisin B-1 in grain estimated by variance-weighted and replication-weighted analyses	World Mycotoxin Journal	The hybrid used to conduct the study is not MON 810
de Oliveira, CA et al.	2016	Microbial activity at "Várzea" and "Cerrado" soils cultivated with transgenic maize expressing Cry1Ab and Cry1F genes from *Bacillus thuringiensis*.	Boletim De Pesquisa E Desenvolvi-mento - Embrapa Milho E Sorgo	The hybrid used to conduct the study is not MON 810
Liu, MM et al.	2018	Molecular characterization and efficacy evaluation of a transgenic corn event for insect resistance and glyphosate tolerance	Journal of Zhejiang University-Science B	The hybrid used to conduct the study is not MON 810
Archibald, WR et al.	2019	Nebraska growers' and crop consultants' knowledge and implementation of integrated pest management of western bean cutworm.	Journal of Integrated Pest Management	The hybrid used to conduct the study is not MON 810
Oliveira, MR et al.	2018	Nutritional composition and aerobic stability of wheat and corn silages stored under different environmental conditions.	Londrina: Universidade Estadual De Londrina	The hybrid used to conduct the study is not MON 810
Yang, F et al.	2019	Occurrence and ear damage of *Helicoverpa zea* on transgenic *Bacillus thuringiensis* maize in the field in Texas, US and its susceptibility to Vip3A Protein	Toxins	The hybrid used to conduct the study is not MON 810
Gabriels, IJ et al.	2019	Optimizing the use of Zebrafish feeding trials for the safety evaluation of genetically modified crops	International Journal of Molecular	The hybrid used to conduct the study is not MON 810

Study Author(s)	Year	Title	Source	Reason(s) for exclusion
			Sciences	
Yu XiaoFen et al.	2018	Prospecting for microelement function and biosafety assessment of transgenic cereal plants.	Frontiers in Plant Science	It is not a safety study on MON 810
Rosca, I.	2010	Research regarding interaction of MON 810 biotech corn on the *Helicoverpa armigera* in Romania.	Scientific Papers - University of Agronomic Sciences and Veterinary Medicine Bucharest	It is not a safety study on MON 810
Zhu, CQ et al.	2019	Survival and effective dominance level of a Cry1A.105/Cry2Ab2-dual gene resistant population of *Spodoptera frugiperda* (JE Smith) on common pyramided Bt corn traits	Crop Protection	The hybrid used to conduct the study is not MON 810
Pena-Cardena, A et al.	2018	The C-terminal protoxin region of Bacillus thuringiensis Cry1Ab toxin has a functional role in binding to GPI-anchored receptors in the insect midgut	Journal of Biological Chemistry	It is not a safety study on MON 810
Brester, G et al.	2019	The influence of genetic modification technologies on U.S. and EU crop yields.	Journal of Agricultural and Resource Economics	It is not a safety study on MON 810
Buso, WHD and Borges e Silva, L	2017	Use of technology to increase the productivity of corn in Brazil.	Maize Germplasm: Characterization and Genetic Approaches for	It is not a safety study on MON 810

Study Author(s)	Year	Title	Source	Reason(s) for exclusion
			Crop Improvement London: Intechopen	

5.3. Implications of the retrieved relevant studies for the risk assessment

Table 8 reports the reliability and implications of all the relevant studies in the risk assessment of MON 810. The relevant studies did not identify any new information that would require further consideration in the risk assessment of MON 810 which found no adverse effects on human, animal health and the environment.

The literature search conducted by Bayer provides a comprehensive analysis of reliable scientific publications that are relevant to the food, feed, and environmental safety of MON 810. A systematic review would not add value to the risk assessment of this product.

Table 8. Report of the reliability and implications for the risk assessment of all relevant studies retrieved after detailed assessment of full-text documents for relevance: ordered by category of information.

Study author(s) and year	Reliability appraisal[1]	Implications for the risk assessment[2]
Molecular characterisation		
Ben Ali *et al.* (2018)	Low/Not reliable	None, because no new hazards, modified exposure, or new scientific uncertainties are reported
Crop composition		
Corujo *et al.* (2019)	Low	None, because no new hazards, modified exposure, or new scientific uncertainties are reported
Agronomic and phenotypic characteristics		
Silva *et al.* (2018)	Moderate	None, because no new hazards, modified exposure, or new scientific uncertainties are reported
Toxicology- animal feeding and in vitro		
Tulinska *et al.* (2018)	High	None, because no new hazards, modified exposure, or new scientific uncertainties are reported
Chereau *et al.* (2018)	High	None, because no new hazards, modified exposure, or new scientific uncertainties are reported
Szymczyk *et al.* (2018)	Moderate	None, because no new hazards, modified exposure, or new scientific uncertainties are reported
Coumoul *et al.* (2019)	Moderate	None, because no new hazards, modified exposure, or new scientific uncertainties are reported
Sharbati *et al.* (2017)	High	None, because no new hazards, modified exposure, or new scientific uncertainties are reported
Ecology		
Lacatusu *et al.* (2010)	Moderate	None, because no new hazards, modified exposure, or new scientific uncertainties are reported
Impact of management practices		
Ncube *et al.* (2018)	High	None, because no new hazards, modified exposure, or new scientific uncertainties are reported
Insect Resistance Management		
Grimi *et al.* (2017)	High	None, because no new hazards, modified exposure, or new scientific uncertainties are reported
Farinós *et al.* (2017)	High	None, because no new hazards, modified exposure, or new scientific uncertainties are reported
Strydom *et al.* (2019)	Low	None, because no new hazards, modified exposure, or new scientific uncertainties are reported
Thieme *et al.* (2018)	High	None, because no new hazards, modified exposure, or new scientific uncertainties are reported
Spagnol *et al.* (2017)	Moderate	None, because no new hazards, modified exposure, or new scientific uncertainties are reported
Frizzas *et al.*	Moderate	None, because no new hazards, modified exposure, or new

Study author(s) and year	Reliability appraisal[1]	Implications for the risk assessment[2]
(2017)		scientific uncertainties are reported
Campos *et al.* (2018)	Low/Not reliable	None, because no new hazards, modified exposure, or new scientific uncertainties are reported
de Sousa *et al.* (2019)	Not reliable[14]	None, because no new hazards, modified exposure, or new scientific uncertainties are reported
Zeng *et al.* (2019)	Moderate	None, because no new hazards, modified exposure, or new scientific uncertainties are reported
Protein/DNA fate in soil or in stream water		
Liu *et al.* (2018)	Low/Not reliable	None, because no new hazards, modified exposure, or new scientific uncertainties are reported
Zhou *et al.* (2018)	Low/Not reliable	None, because no new hazards, modified exposure, or new scientific uncertainties are reported

[1] **High** (use as key study); **Moderate** because the study reported is subject to some limitations (useable as key study depending on the limitations of the study); **Low** because the study reported is subject to several limitations (limited use or not useful; generally not to be used as key study, but depending on the limitations of the study, it may be useful in weight of evidence approaches or as supporting information); **Not reliable** because the study reported does not comply with minimum reliability criteria carrying a high level of uncertainty (not useful); **Not assignable** because no or insufficient information is reported in the study (EFSA, 2017).

[2] Identification of a new hazard, modified exposure, or new scientific uncertainty requiring further consideration in the risk assessment; **None**, because no new hazards, modified exposure, or new scientific uncertainties are reported; **None**, because the findings reported in the study are not reliable; Implications for risk assessment were previously considered by EFSA and/or its GMO Panel, and are therefore not addressed further here (EFSA, 2017).

[14] The article 'Influence of *Bt* Maize on Diversity and Composition of Non-target Arthropod Species' by de Sousa et al. 2019 evaluated the possible effects of *Bt* maize cultivars expressing Cry1Ab, Cry1A105+Cry2Ab2+Cry1F and Cry1A105+Cry2Ab2+Cry3Bb1 *Bt* proteins on insect diversity and species composition in the field. The authors concluded that the diversity of non-target arthropods is negatively affected by Cry1Ab protein with Cry1A105+Cry2Ab2+Cry1F proteins, and Cry1A105+Cry2Ab2+Cry3Bb1 proteins having no effect on arthropod species diversity and composition. However, we rate this paper as 'not reliable' due to poor experimental design and inappropriate analysis, lack of plausible hypothesis for risk, and inconclusive results. The pitfalls in this paper are given below.

1. Experimental design is not discussed in the article with components such as replication and treatment (plot or field) size being missing that fails to capture any variability in insect population in the study. For example, the abundance of *D. speciosa* seemed to differ substantially between adjacent fields with no coleopteran traits suggesting that natural variability was quite high. While the authors note that good agricultural practices for the regions were followed, no details regarding these practices including application of any pesticide treatments was not included. No hybrid pedigree information was provided by the authors so it is not possible to determine whether any germplasm-related effects are present.
2. All comparisons are descriptive with no statistical analysis showing any statistically significant differences between treatments to draw conclusive results. The modest reduction in diversity indices in the field of Cry1Ab-expressing maize is attributed to the increased abundance of lepidopteran pest species (*S. frugiperda*). Without providing evidence, the authors suggest the observed increase in these lepidopteran pests is due to resistance to the Cry1Ab protein. Regardless, it is not appropriate to evaluate the effects on diversity of non-target organisms by including abundance of pest species as effects of *Bt* proteins would be expected to affect the populations of these pest organisms. Such analysis should be focused to the non-target organisms outside the known activity range for a given *Bt* protein.
3. The conclusions drawn are very strong and are based on species diversity indices calculated once at the end of the season and species composition represented graphically over 15 weeks with no statistical analysis on any of the comparisons between treatments. Conclusions ignore weekly data on diversity indices that could have provided more insight into the pattern of species diversity over time and helped in drawing meaningful conclusions.

6. CONCLUSION

Taking into consideration all the above, Bayer confirms that this literature search, conducted in accordance with the 2017 EFSA explanatory note on literature searching (EFSA, 2017) and within the context of the general surveillance for the annual MON 810 post-market environmental monitoring in the EU, identified no relevant publications that would invalidate the initial conclusions of the MON 810 risk assessment. Therefore, the conclusions of the risk assessment as presented in the initial application remain unchanged. No adverse effects are to be expected from all uses as any other maize including cultivation of MON 810 in the EU.

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ANNEX I. CHECKLIST (ANNEX 2) - MON 810 LITERATURE SEARCH

Annex 2

Requirements/recommendations according to the Explanatory note to the guidance on literature searching conducted in the context of GMO applications for (renewed) market authorisation and annual post-market environmental monitoring reports on GMOs authorised in the EU market[1]

Completeness checklist

Specifying the application number, event(s), plant species, intended trait(s), and the scope of the application for which literature searching is performed
Application number:
Event(s): MON 810
Plant species: maize
Intended trait(s): ☐ Herbicide tolerance: ☒ Insect resistance: lepidopteran ☐ Others: …
Scope: ☒ Import/processing for food/feed uses ☒ Cultivation
Specifying the context in which literature searching is performed
☐ GMO applications for market authorisation submitted under Regulation (EC) No 1829/2003 *after* the Implementing Regulation (EU) No 503/2013 entered into force on 8 December 2013 → *Review type: Scoping review to substantiate decisions about the value of conducting full or "rapid" systematic literature reviews*
☐ GMO applications for market authorisation submitted under Regulation (EC) No 1829/2003 *before* the Implementing Regulation (EU) No 503/2013 entered into force on 8 December 2013 → *Review type: Extensive/systematic literature search*
☒ Annual PMEM reports on GMOs authorised in the EU market → *Review type: Extensive/systematic literature search*
☐ GMO applications for the renewed market authorisation of genetically modified (GM) food/feed authorised under Regulation (EC) No 1829/2003 → *Review type: Extensive/systematic literature search*
Specifying the context of literature searching
☒ Initial literature search
☐ Updated literature search requested by EFSA
☐ Revised literature search requested by EFSA

[1] EFSA (European Food Safety Authority), Devos Y, Guajardo IM, Glanville J and Waigmann E, 2017. Explanatory note on literature searching conducted in the context of GMO applications for (renewed) market authorisation and annual post-market environmental monitoring reports on GMOs authorised in the EU market. EFSA supporting publications 2017:EN-1207. 8 pp. doi:10.2903/sp.efsa.2017.EN-1207; http://onlinelibrary.wiley.com/doi/10.2903/sp.efsa.2017.EN-1207/pdf

Subject	Completeness Check (CC) performed by the applicant	Action required	Justification
Identifying review questions and clarifying their purpose			
Clarify the purpose for undertaking the literature review, and link it to the review question(s)	☒ Yes fully ☐ No ☐ Partially ☐ Unclear	☐ None ☐ Justification required	
Formulate clear, unambiguous and structured question(s)	☒ Yes fully ☐ No ☐ Partially ☐ Unclear	☐ None ☐ Justification required	
Identify and specify the key elements of the review question(s) based on the recommendations given in Section 3.1 of the Explanatory note	☒ Yes fully ☐ No ☐ Partially ☐ Unclear	☐ None ☐ Justification required	
Specify/report the eligibility/inclusion criteria for assessing the relevance of studies for inclusion in the literature review, using Table 1 of the Explanatory note	☒ Yes fully ☐ No ☐ Partially ☐ Unclear	☐ None ☐ Justification required	
Searching for/identifying relevant studies			
Describe clearly how the search strategy is constructed, and provide a scientific rationale for choices made in terms of search terms and their combination, using Appendix B of the Explanatory note	☒ Yes fully ☐ No ☐ Partially ☐ Unclear	☐ None ☐ Justification required	
Report and justify any limits applied to the search strategy	☒ Yes fully ☐ No ☐ Partially ☐ Unclear	☐ None ☐ Justification required	
Specify the language of the search	☒ Yes fully ☐ No ☐ Partially ☐ Unclear	☐ None ☐ Justification required	
Specify the time period of the search	☒ Yes fully ☐ No ☐ Partially ☐ Unclear	☐ None ☐ Justification required	
Use a subset of representative studies to refine the search and test its validity	☒ Yes fully ☐ No ☐ Partially ☐ Unclear	☐ None ☐ Justification required	
Search a minimum of *at least* two multi-disciplinary/large databases (e.g., Web of Science Core Collection, Scopus, CAB Abstracts, Medline)	☒ Yes fully ☐ No ☐ Partially ☐ Unclear	☐ None ☐ Justification required	

Consider searching specialist/subject-specific databases (e.g., Agricola) [facultative]	☒ Yes fully ☐ No ☐ Partially ☐ Unclear	☐ None ☐ Justification required	
Describe the information sources searched, and the reasons for their selection in terms of the coverage of the literature of interest	☒ Yes fully ☐ No ☐ Partially ☐ Unclear	☐ None ☐ Justification required	
Search internet pages of relevant key organisations delivering risk assessment guidelines and other risk assessment documents, using the examples given in Section 3.2.2.2 of the Explanatory note	☒ Yes fully ☐ No ☐ Partially ☐ Unclear	☐ None ☐ Justification required	
Search scientific literature by using general search engines such as GOOGLE Scholar, and checking and assessing the relevance of the first 200 to 300 results, if available [facultative]	☐ Yes fully ☒ No ☐ Partially ☐ Unclear	☐ None ☐ Justification required	Covered by Web of Science™ core collection database. The database is connected to Google Scholar to allow a seamless movement between the open web and the Web of Science™ Core Collection for the literature search.
Search web-based databases known to contain information specifically on effects of GMOs on human and animal health and the environment [facultative]	☐ Yes fully ☒ No ☐ Partially ☐ Unclear	☐ None ☐ Justification required	Covered by Web of Science™ core collection database and CAB Abstracts® database
Identify any additional relevant studies by checking the reference lists from recent reviews on relevant topics, methodological studies and scientific opinions from regulatory agencies involved in the risk assessment of GMOs	☐ Yes fully ☒ No ☐ Partially ☐ Unclear	☐ None ☐ Justification required	Web of Science™ core collection and and CAB Abstracts® databases known for their comprehensive coverage of scientific journals with high quality and peer reviewed articles, allowing for both broad and in-depth exploration of focused scientific areas
Hand-search key journals or assess journal contents pages [facultative]	☐ Yes fully ☒ No ☐ Partially ☐ Unclear	☐ None ☐ Justification required	Web of Science™ core collection database known for its comprehensive coverage of scientific journals with high quality and peer reviewed articles, allowing for both broad and in-depth exploration of focused scientific areas

Perform citation searching [facultative]	☐ Yes fully ☒ No ☐ Partially ☐ Unclear	☐ None ☐ Justification required	Web of Science™ core collection database known for its comprehensive coverage of scientific journals with high quality and peer reviewed articles, allowing for both broad and in-depth exploration of focused scientific areas
Selecting studies			
Select relevant studies in two stages (stage 1: *rapid assessment* for relevance based on information in the title and abstract of studies; stage 2: *detailed assessment* of full-text documents)	☒ Yes fully ☐ No ☐ Partially ☐ Unclear	☐ None ☐ Justification required	
Assess studies for their relevance by more than one reviewer at all stages of the screening process	☒ Yes fully ☐ No ☐ Partially ☐ Unclear	☐ None ☐ Justification required	
Ensure inter-reviewer agreement	☒ Yes fully ☐ No ☐ Partially ☐ Unclear	☐ None ☐ Justification required	
Document the process for resolving disagreements/discrepancies between reviewers during the screening process	☒ Yes fully ☐ No ☐ Partially ☐ Unclear	☐ None ☐ Justification required	
Classify for each category of information/data requirement: (1) Studies that might provide data for establishing or refining risk assessment parameters/conclusions, or supplementary information that might be relevant to the review question; and (2) studies for which relevance cannot be clearly determined, or which cannot be obtained as full-text documents	☒ Yes fully ☐ No ☐ Partially ☐ Unclear	☐ None ☐ Justification required	
Extracting of high level data from the relevant studies [only applicable to scoping reviews]			
Extract high level information from each relevant study to describe the overall volume, strength and direction of the evidence base	☐ Yes fully ☐ No ☐ Partially ☐ Unclear	☐ None ☐ Justification required	Not required in the context of literature search for PMEM
Describe variables for which information is extracted	☐ Yes fully ☐ No ☐ Partially ☐ Unclear	☐ None ☐ Justification required	Not required in the context of literature search for PMEM

Develop a data-charting form	☐ Yes fully ☐ No ☐ Partially ☐ Unclear	☐ None ☐ Justification required	Not required in the context of literature search for PMEM
Summarising and reporting the data, and considering the implications of the findings			
Provide report(s) that contain the following information/sections: • Title; • Authors of the review; • Summary: a brief summary indicating the purpose of the report, the methodology employed, and the results obtained; • Methods, which should contain: – A statement of the objective of the scoping review; – The review questions, along with a rationale clarifying the choices made; – The criteria for relevance with which decisions to select studies were made; – Information on and result of the reference study searches; • Search methods and outcomes, including a descriptive summary and rationale clarifying the choices made; • Results of the study identification and selection process, including a descriptive summary; • A narrative synthesis/summary of the relevant studies, describing their overall volume, strength and direction (only applicable for scoping reviews	☐ Yes fully ☐ No ☒ Partially ☐ Unclear	☐ None ☐ Justification required	Partially applicable in the context of literature search for PMEM

Provide the following information for each of the electronic bibliographic databases searched in a series of tables: • The bibliographic database name and the service provider used; • The justification for choosing the database; • The date on which the search was conducted; • The date of the most recent update of the database that was searched; • The date span of the search; • The complete search strategy or strategies used, including all the search terms, text-words (words in titles or abstracts), subject index headings (thesaurus terms or descriptors), and the relationship between the search terms (how they have been combined using Boolean operators); • Any limits applied to the search (e.g., study types, dates, languages); • The total number of records retrieved from the information source before and after removing duplicates	☒ Yes fully ☐ No ☐ Partially ☐ Unclear	☐ None ☐ Justification required	
If literature is found in information sources other than electronic bibliographic databases, then report the following information: • For a website (e.g., a conference or organisation website containing scientific literature): – The website name and the service publisher used (e.g., Author/Editor/Organisation's name and Title of the page); – A justification for choosing the source; – The URL (internet address);	☐ Yes fully ☒ No ☐ Partially ☐ Unclear	☐ None ☐ Justification required	Not applicable as Web of Science™ and EBSCOhost platforms are used

– The date on which the search was conducted; – The date of the most recent website update at the time it was searched; – The date span of the search; – The search terms used. Often a series of single searches will be carried out but if searches with combinations of terms are possible then these should also be reported; – Any limits applied to the search (e.g., study types); – The number of relevant records or full-text documents retrieved. • For journal tables of contents: – The journal name; – A justification for choosing the source; – The journal URL (internet address) or publisher; – The dates, volumes and issues searched; – The method of searching, e.g., scanning tables of contents for each issue, or using a search engine; – The search terms used (if any); – The number of relevant records or full-text documents retrieved. • For reference lists: – The bibliographic details of the documents whose reference lists were scanned; – The number of relevant bibliographic references retrieved			

Report the results of the selection process, using either Table 2 of the Explanatory note or a flowchart for each category of information/data requirement or group of information/data requirements searched, if appropriate	☒ Yes fully ☐ No ☐ Partially ☐ Unclear	☐ None ☐ Justification required	
Provide a list of the bibliographic references for all relevant studies, ordered by category of information/data requirement, recorded, using Table 3 of the Explanatory note	☒ Yes fully ☐ No ☐ Partially ☐ Unclear	☐ None ☐ Justification required	
Provide a list of the bibliographic references for all excluded studies after detailed assessment of full-text documents for relevance, with justification for their exclusion, recorded, using Table 4 of the Explanatory note	☒ Yes fully ☐ No ☐ Partially ☐ Unclear	☐ None ☐ Justification required	
Provide a list of the bibliographic references for all unobtainable/unclear studies, recorded, using Table 5 of the Explanatory note	☐ Yes fully ☐ No ☐ Partially ☐ Unclear	☐ None ☐ Justification required	Not applicable as there are no such studies
Provide copies of the full-text documents listed in Table 3 of the Explanatory note	☒ Yes fully ☐ No ☐ Partially ☐ Unclear	☐ None ☐ Justification required	
Translate relevant full-text documents in non-EU languages into English	☒ Yes fully ☐ No ☐ Partially ☐ Unclear	☐ None ☐ Justification required	
Present a narrative synthesis/summary of the relevant studies describing their overall volume, strength and direction per main category of information/data requirements, using Table 6 of the Explanatory note [only applicable to scoping reviews]	☐ Yes fully ☐ No ☐ Partially ☐ Unclear	☐ None ☐ Justification required	Not required in the context of literature search for PMEM
Determine whether a systematic literature review is of value [only applicable to scoping reviews]	☐ Yes fully ☐ No ☐ Partially ☐ Unclear	☐ None ☐ Justification required	Not required in the context of literature search for PMEM
Discuss the implications of each study that is clearly relevant to the risk assessment of the GMO under consideration, for each of the relevant categories of information/data requirements, using Table 7 of the Explanatory note	☒ Yes fully ☐ No ☐ Partially ☐ Unclear	☐ None ☐ Justification required	