Title

Summary of the Literature Review for MS8 x RF3 *Brassica napus*
October 1, 2019 – September 30, 2020

Final Report

Data or Guideline Requirement

Explanatory note on literature searching
conducted in the context of GMO applications for (renewed) market authorization
and annual post-market environmental monitoring reports on GMOs authorised in the EU market.
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Report	[redacted]

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MS8 x RF3 *Brassica napus* (*B. napus*) is a stacked trait product generated through conventional breeding of MS8 *B. napus* and RF3 *B. napus*. MS8 *B. napus* (male sterile line) was produced by means of *Agrobacterium*-mediated transformation using vector pTHW107. MS8 *B. napus* contains the *barnase* gene (origin *Bacillus amyloliquefaciens*), coding for the Barnase proteins. The *barnase* gene is driven by the Pta29 promoter that restricts gene expression to the tapetal cells during anther development. Expression of Barnase in the tapetal cells of MS8 *B. napus* results in lack of viable pollen and male sterility. MS8 *B. napus* also contains the *bar* gene (origin *Streptomyces hygroscopicus*) coding for phosphinothricin acetyltransferase (PAT/*bar*) conferring tolerance to glufosinate-ammonium. The *bar* gene is driven by the PssuAt plant promoter that is active in all green tissues of the plant. RF3 *B. napus* (fertility restorer line) was produced by means of *Agrobacterium*-mediated transformation using vector pTHW118. RF3 *B. napus* contains the *barstar* gene (origin *Bacillus amyloliquefaciens*), coding for the Barstar protein, which is an inhibitor of the Barnase protein. The *barstar* gene is driven by the Pta29 promoter that restricts gene expression to the tapetal cells during anther development. Expression of the Barstar protein in the tapetal cells leads to restoration of fertility after crossing to a male sterile (MS) *B. napus* line. RF3 *B. napus* also contains the *bar* gene (origin *Streptomyces hygroscopicus*) coding for phosphinothricin acetyltransferase (PAT/*bar*) conferring tolerance to glufosinate-ammonium. The *bar* gene is driven by the PssuAt plant promoter that is active in all green tissues of the plant. MS8 x RF3 *B. napus* plants are fully fertile hybrids and express the PAT/*bar* protein which confers tolerance to glufosinate-ammonium. The OECD identifier of MS8 x RF3 *B. napus* is ACS-BNØØ5-8 x ACS-BNØØ3- 6.

A scoping review was performed for MS8 x RF3 *B. napus* and its newly expressed proteins, Barnase, Barstar and PAT/*bar*. The objective of this scoping review was to determine if there were studies about the molecular characterization of MS8 x RF3 *B. napus*, its effect on food and feed safety, or on environmental safety that might require in-depth examination. A set of broad literature searches was performed using several bibliographic databases covering scientific literature from October 1, 2019 to September 30, 2020. Additional sources of information, such as web pages of food safety, agriculture, and biotechnology-related authorities were searched for the same time window, along with the bibliographies of relevant reviews. The references identified were evaluated for potential relevance to the scoping review questions according to pre-defined criteria.

These literature searches identified a total of 122 unique publications, which were subject to rapid assessment to exclude obviously irrelevant publications. A total of 4 publications were progressed for detailed assessment. One of the 4 was previously included in the 2019 Post-Market Environmental Monitoring literature review report and considered non-relevant. None of the remaining 3 publications were relevant after detailed review.

No new publications were found that contained new data on the molecular characterization of the MS8 x RF3 *B. napus* and its newly expressed proteins, Barnase, Barstar and PAT/*bar*. Similarly, no new publications were found that suggested any potential adverse effects of this stacked trait product on human health, animal health, or the environment.

In summary, these literature searches and review of the retrieved publications identified no relevant publication that would contradict the existing safety assessment of the MS8 x RF3 *B. napus* and its newly expressed proteins Barnase, Barstar and PAT/*bar*.

1. INTRODUCTION

MS8 x RF3 *Brassica napus* (*B. napus*) is a stacked trait product generated through conventional breeding of MS8 *B. napus* and RF3 *B. napus*. MS8 *B. napus* (male sterile line) was produced by means of *Agrobacterium*-mediated transformation using vector pTHW107. MS8 *B. napus* contains the *barnase* gene (origin *Bacillus amyloliquefaciens*), coding for the Barnase proteins. The *barnase* gene is driven by the Pta29 promoter that restricts gene expression to the tapetal cells during anther development. Expression of Barnase in the tapetal cells of MS8 *B. napus* results in lack of viable pollen and male sterility. MS8 *B. napus* also contains the *bar* gene (origin *Streptomyces hygroscopicus*) coding for phosphinothricin acetyltransferase (PAT/*bar*) conferring tolerance to glufosinate-ammonium. The *bar* gene is driven by the PssuAt plant promoter that is active in all green tissues of the plant. RF3 *B. napus* (fertility restorer line) was produced by means of *Agrobacterium*-mediated transformation using vector pTHW118. RF3 *B. napus* contains the *barstar* gene (origin *Bacillus amyloliquefaciens*), coding for the Barstar protein, which is an inhibitor of the Barnase protein. The *barstar* gene is driven by the Pta29 promoter that restricts gene expression to the tapetal cells during anther development. Expression of the Barstar protein in the tapetal cells leads to restoration of fertility after crossing to a male sterile (MS) *B. napus* line. RF3 *B. napus* also contains the *bar* gene (origin *Streptomyces hygroscopicus*) coding for phosphinothricin acetyltransferase (PAT/*bar*) conferring tolerance to glufosinate-ammonium. The *bar* gene is driven by the PssuAt plant promoter that is active in all green tissues of the plant. MS8 x RF3 *B. napus* plants are fully fertile hybrids and express the PAT/*bar* protein which confers tolerance to glufosinate-ammonium. The OECD identifier of MS8 x RF3 *B. napus* is ACS-BNØØ5-8 x ACS-BNØØ3- 6.

The objective of the literature searches described here was to determine if there were publications published between October 1, 2019 and September 30, 2020 that mention the molecular characterization of the MS8 x RF3 *B. napus*, and/or any adverse effect of MS8 x RF3 *B. napus* in food, feed or the environment. In that context, a broad and inclusive literature search was performed and the articles retrieved were reviewed in a comprehensive and transparent manner. This was intended as a scoping review. The literature review was performed as recommended in the European Food Safety Authority (EFSA) explanatory note on literature searching conducted in the context of Genetically Modified Organisms (GMO)[1] applications and post-market environmental monitoring activities (2019).

The literature searches were performed for the MS8 x RF3 *B. napus* and its newly expressed proteins Barnase, Barstar and PAT/*bar*. The search terms also included relevant synonyms, trade name, intended trait, plant species and general GMO terms.

2. OVERALL METHODS

2.1. Objective of the scoping review

The objective of the scoping review was to survey the evidence base for the MS8 x RF3 *B. napus* and its newly expressed proteins Barnase, Barstar and PAT/*bar*, in order to identify any specific issues related to food or feed safety, molecular characterization or environmental safety that might require in-depth examination.

2.2. Review questions

Review questions were formulated to conform to PECO structure (Population, Exposure, Comparators, Outcome) if possible, and to address data requirements. They were modeled after the review question examples provided in the EFSA 2019 explanatory note[1].

Question 1: Were any studies published during the reporting period that describe adverse effects on human or animal health or the environment of the MS8 x RF3 *B. napus* and its newly expressed proteins Barnase, Barstar and PAT/*bar*?

Key elements:

Population: Human health; animal health; environmental safety
Exposure: MS8 x RF3 *B. napus*, derived food/feed products, newly expressed proteins in MS8 x RF3 *B. napus*
Comparators: When applicable, comparable populations or subjects exposed to appropriate controls (e.g., vehicle only, innocuous control proteins, non-GM comparator) or conventional counterpart used for comparative analysis of plant material
Outcome: Adverse effects

Question 2: Were any studies published during the reporting period that focus on molecular characterization of the MS8 x RF3 *B. napus* and its newly expressed proteins Barnase, Barstar and PAT/*bar*?

Key elements:

Population: MS8 x RF3 *B. napus* and newly expressed proteins in MS8 x RF3 *B. napus*
Outcome: Molecular characterization (which would indicate the information/data requirement for molecular characteristics)

2.3. Criteria for relevance

Criteria for establishing the relevance of retrieved publications were defined prior to conduct of the search. These criteria were modeled after those given in the EFSA 2019 explanatory note[1] and are described in Table 1.

Table 1: Eligibility/inclusion criteria to establish the relevance of retrieved publications

Concepts	Criteria	Comment
Key elements of review questions with PECO structure		
Intervention/ exposure	The publication addresses the GMO, derived food/feed products, and/or the intended trait(s) (e.g., newly expressed proteins(s)) that are identical or like those under regulatory review	This enables the selection of publications that address the GMO, derived food/feed products, and/or the intended trait(s) under consideration
Population	The publication addresses human and animal health, and/or the environment (including biodiversity, ecosystem services, service providing units, and endangered species) as general protection goals	From the publications that address the GMO under consideration, those that address protection goals relevant to the risk assessment of the GMO are eligible

Concepts	**Criteria**	**Comment**
Outcome	The publication addresses effects/impacts on human and animal health, and/or the environment	Publications that address the GMO under consideration also need to address effects/impacts on entities of concern, and potential determinants of exposure that place these entities at risk, in order to be relevant to the risk assessment of the GMO
Comparator	If the publication reports a comparative study that uses plant material as test material, eligible publications must report a non-GM variety as comparator	In those cases where the publication addresses the GMO under consideration, reports a comparative analysis study and uses plant material as test material, eligible publications also need to include an appropriate non-GM line as comparator
Additional concepts		
Information/data requirements	The publication reports information pertaining to one or more information/data requirement(s) outlined in Appendix A for the GMO and derived food/feed products under consideration, including the intended trait(s)	Publications that potentially contribute to the knowledge informing the risk assessment of the GMO under consideration, and thus the risk hypotheses addressed, taking account of both hazard and exposure, can be considered relevant according to this eligibility/inclusion criterion. Publications addressing other issues such as benefits, socio-economics, ethics, crop protection, detection methods, efficacy, public perception and risk communication can be excluded, as they are not necessarily relevant to the risk assessment of GMOs
Plant species	The publication addresses the same plant species as the GMO under consideration	This eligibility/inclusion criterion permits the exclusion of publications on GMOs that contain the same intended trait(s) as the GMO under consideration, but which are introduced in another plant species

Concepts	**Criteria**	**Comment**
Scope of GMO application	The publication addresses pathways and levels of exposure to the GMO, derived food/feed products, and the intended trait(s) that are relevant for the intended uses of the GMO and derived food/feed products under regulatory review	From the publications that address the GMO under consideration, those that consider pathways and levels of exposure relevant to the scope of the GMO application (i.e., import and processing for food/feed uses, cultivation) are eligible
Target pests/organisms	The publication addresses target pests/organisms that are established in the EU	This permits the exclusion of publications that address interactions between the GMO and target pests/organisms that do not occur in the EU
Stacked trait products obtained by conventional crosses/subcombinations	The publication addresses the higher stacked trait product and/or a subcombination or subcombinations of the single events of the higher stacked trait product, independently of its/their origin	This permits the selection of publications on the higher stacked trait product and/or subcombinations of the single events of the higher stacked trait product that are in the scope of the GMO application(e), independently of their origin. This permits the exclusion of publications on the single events of the higher stacked trait product, because the risk assessment of GMO applications for stacked trait products covers only the products in the scope of the GMO application – i.e., the higher stacked trait product and subcombinations of the singles involved, independently of their origin

Concepts	Criteria	Comment
Molecular stacks	The publication addresses: the molecular stack; all newly expressed proteins in the molecular stack; and/or one or several of the newly expressed proteins in the molecular stack that has/have not been previously risk assessed by EFSA and/or its GMO Panel and for which no safe use has been determined yet by EFSA and/or its GMO Panel	This permits the exclusion of publications that address one or several (not all) of the newly expressed proteins in the molecular stack that has/have been previously risk assessed by EFSA and/or its GMO Panel and for which the safe use has been determined by EFSA and/or its GMO Panel
Previously risk assessed publications	The publication has not been previously risk assessed by EFSA and/or its GMO Panel and is not cited/referenced in an EFSA/GMO Panel output	This permits the exclusion of publications that have been previously risk assessed by EFSA and/or its GMO Panel and cited/referenced in an EFSA/GMO Panel output
Access	Full-text document is accessible	If potentially relevant full-text documents cannot be obtained, they should be listed in a table with a description of the (unsuccessful) methods that have been used to try to obtain a copy
Reporting format	The publication presents original/primary data, or it is a risk assessment from a relevant key organisation (such as regulatory agencies and risk assessment bodies involved in the risk assessment of GMOs)	This permits the exclusion of publications that do not present original/primary data (e.g., editorials, position papers), and the inclusion of relevant risk assessments performed and reported by relevant key organisations. Reviews should only be included if they present data that are not available from a primary research study
Reporting format	A study in a publication should only be presented once, but if it is presented in more than one publication, all publications should be listed and grouped	Duplicate publications should be excluded at the screening stage. Only one copy of a study is required even if it is reported in different publications, and identified in more than one database

Table adapted from EFSA, 2019: 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.

2.4. Reference publication

No relevant publications for MS8 x RF3 *B. napus* were known before starting the search, therefore, two related publications were used as reference publications::

- Zhang CJ; Yook MJ; Park HR; Lim SH; Kim JW; Nah G; Song HR; Jo BH; Roh KH; Park S; Kim DS (2018). Assessment of potential environmental risks of transgene flow in smallholder farming systems in Asia: *Brassica napus* as a case study in Korea. The Science of the total environment Vol 640-641, pp 688-695

- Gupta PK; Balyan HS; Gahlaut V; Saripalli G; Pal B; Basnet BR; Joshi AK Hybrid wheat: past, present and future (2019). Hybrid wheat: past, present and future. Theoretical and applied genetics Vol. 132, No. 9, pp. 2463-2

These two publicatios were selected because one of them mentions one of the traits of MS8 x RF3 *B. napus* (glufosinate resistance) in the same crop (canola), and the one refers to the second trait (male sterility system using barnase-barstar) but in a different crop. Since these two articles were published outside the search period of this report, the search profile was tested without applying the time filters used in the final profile (UP>=20191001 and UP<=20200930).

3. SEARCH METHODS AND OUTCOMES

The search strategies used here followed the 2019 EFSA explanatory note on literature searching conducted in the context of GMO applications and post-market environmental monitoring activities[1]. The search strategies were designed to be broad and sensitive enough to capture any relevant publications, if available.

An information specialist with background in plant biotechnology selected the databases, identified relevant search terms, developed search profiles, designed search strategies and conducted the searches.

3.1. Time window and date of the literature search

The database searches were performed on October 15, 2020. Only documents updated between October 1, 2019 and September 30, 2020, were considered in the search. The dates of most recent database updates are provided in Table 3.

3.2. Databases used in the literature search

All searches were performed in the host STN (Scientific and Technical Information Network), an online database service operated jointly by CAS and FIZ Karlsruhe. STN provides access to a broad range of databases from the most renowned database producers worldwide.

The searches described here were performed in five databases: three multidisciplinary/large databases (Biosis, Medline and CA-Plus) and two subject-specific databases focused on agriculture-related topics (Agricola and CABA).

See Appendix 1 for detailed database descriptions.

3.3. Search strategy

The search profiles were designed to cover event name, trade name, newly expressed proteins and intended traits. Since the 'intended trait' profile produced too many results when used on their own, it was combined with additional profiles: a 'general GMO' profile and a 'plant species' profile. See Table 2 for a detailed search profile.

All searches were performed in the Basic Index (BI) field, which includes the following subject headings/field names:

- **Agricola**: title (TI), controlled term (CT), supplementary term (ST), abstract (AB), named person (NA), corporate name (CO), note (NTE), geographic term, CABA and other fields (GT)
- **Biosis**: title (TI), abstract (AB), biosystematic codes (BC), chemical name (CN), controlled term (CT), gene name (GEN), geographic term (GT), organism (ORGN) and supplementary term (ST); as well as CAS Registry Numbers (RN)
- **CA-Plus**: title (TI), supplementary term (ST), index term (IT) and abstract (AB); as well as CAS Registry Numbers
- **CABA**: title (TI), controlled term (CT), supplementary term (ST), broader term (BT), abstract (AB), organism name (ORGN) and geographic term (GT); as well as CAS Registry Numbers
- **Medline**: title (TI), chemical name (CN), gene name (GEN), controlled term (excluding MeSH numbers) (CT), supplementary term (ST), named person (NA), other source (OS), and abstract (AB), as well as CAS Registry Numbers and GenBank Numbers

The search results were limited to documents updated between October 1, 2019 and September 30, 2020 (UP>=20191001 and UP<=20200930), and to non-patent documents (not P/DT). To ensure that documents with indexing errors where two DTs (one eligible and one ineligible) were attached to a single record were not missed, documents with both 'journal' and 'patent' as *document type* were also kept. These putative documents would be identified with (P/DT AND J/DT) in CABA and CAPlus.

Table 3 summarizes the number of results obtained from each of the databases searched.

See Appendix 2 for a complete search history.

Table 2: Search profile for database search

Set	Search string	Concepts
1	MS8 or MS8x or MS-8 or MS-8x or ACS(w)BNØØ5-8 or ACS(w)BN005-8 or ACS(w)BNOO5-8 or ACSBNØØ5-8 or ACSBN005-8 or ACSBNOO5-8 or ACS(w)BNØØ5-8x or ACS(w)BN005-8x or ACS(w)BNOO5-8x or ACSBNØØ5-8x or ACSBN005-8x or ACSBNOO5-8x	Event name MS8
2	RF3 or xRF3 or RF-3 or xRF-3 or ACS(w)BNØØ3-6 or ACS(w)BN003-6 or ACS(w)BNOO3-6 or ACSBNØØ3-6 or ACSBN003-6 or ACSBNOO3-6 or xACS(w)BNØØ3-6 or	Event name RF3

	xACS(w)BN003-6 or xACS(w)BNOO3-6 or xACSBNØØ3-6 or xACSBN003-6 or xACSBNOO3-6	
3	MS8XRF3 or MS(w)8XRF-3 or MS8.time#.RF3 or ACS(w)BNØØ5(w)8xACS(w)BNØØ3-6 or ACS(w)BN005(w)8xACS-BN003-6 or ACS(w)BNOO5(w)8xACS(w)BNOO3-6	Event name MS8 x RF3
4	(1 and 2) or 3	Event name all
5	invigor or invigorr or invigortm invigorrtm or in(w)vigor or in(w)vigorr or in(w)vigortm or in(w)vigorrtm	Trade name
6	barnase or RNase(w)Ba or (bacterial(w)RiboNuclease and ((Bacillus or b)(w)amyloliquefaciens)) or P00648 or IPR001887	Newly expressed protein MS8
7	barstar or barnase(w)inhibitor or IPR000468	Newly expressed protein RF3
8	((bar or pat)(2a)(gene# or protein# or enzyme#)) or ppt(2w)acetyltransferase or ppt(2w)acetyl(w)transferase or pt(w)n(2w)acetyltransferase or pt(w)n(2w)acetyl(w)transferase phosphinothricin(w)n(w)acetyltransferase or phosphinothricin(2w)acetyltransferase or phosphinothricin(2w)acetyl(w)transferase or phosphinothricinacetyl(w)transferase	Newly expressed protein MS8 and RF3
9	(5 and 6) or (5 and 7) or (6 and 7)	Newly expressed proteins all
10	(herbicid? or bialaphos or basta or glufosinate or phosphinothricin or liberty)(5a)(resist? or toleran? or protect?) or male(3a)steril? or (fertil?(3a)restor?) or restor?(w)line or pollination(w)control	Intended traits
11	((BRASSICA or B)(w)napus) OR RAPE? or CANOLA# OR OILSEED(w)RAPE OR oil(w)seed(w)rape or colza	Plant species
12	GMO OR GMOs OR LMO OR LMOs OR GM OR GE OR transgen? OR (genetic?(3w)(modif? OR transform? OR manipulat? OR improv? OR engineer?)) or (stacked(w)(gene# or trait# or event#))	GMO general
13	10 and 11 and 12	Intended trait AND Plant species AND GMO general
14	4 or 5 or 9 or 13	Event name all OR Trade name OR Newly expressed proteins all OR (Intended traits AND Plant species AND GMO general)

Table 3: Overview of the selected databases and summary of search results from each database

Database	AGRICOLA	BIOSIS	CAB Abstracts	CAPLUS	MEDLINE
Database Provider	STN International	STN International	STN International	STN International	STN International
Coverage	1970-present	1926-present	1973-present	1907-present	1946-present
Date of search	15 Oct 2020	15 Oct 2020	15 Oct 2020	15 Oct 2020	15 Oct 2020
Datespan of the search	1 Oct 2019 – 30 Sept 2020	1 Oct 2019 – 30 Sept 2020	1 Oct 2019 – 30 Sept 2020	1 Oct 2019 – 30 Sept 2020	1 Oct 2019 – 30 Sept 2020
Latest database update	24 Aug 2020	14 Oct 2020	14 Oct 2020	14 Oct 2020	14 Oct 2020
Number of records retrieved	13	19	37	30	46
Number of records after duplicate removal	11	15	31	19	46
Number of *relevant* records after rapid assessment	0	0	3	0	1

4. MANUAL SEARCHES

4.1. Manual searches of web pages of food safety, agriculture, and biotechnology-related authority webpages

In accordance with the EFSA 2019 explanatory note[1] the search in electronic bibliographic databases was complemented with an internet search in webpages of relevant key organisations involved in the risk assessment of GM plants. Of the 13 key organisations cited in the EFSA 2019 explanatory note[1], two (Environment and Climate Change Canada and CIBIOGEM) are not involved in the risk assessment of GM plants, and US-EPA regulates only GM plants with Plant-Incorporated Protectants (PIPs). The US Environmental Protection Agency (EPA), US Department of Agriculture (USDA), US Food and Drug Administration (FDA), Canadian Food Inspection Agency (CFIA), Health Canada, Food Standards Australia New Zealand (FSANZ), and Ministry of Agriculture, Forestry and Fisheries (MAFF) do not regulate stacked trait products. Argentina (CONABIA and SENASA), Brazil (CTNBio), and India (GEAC) do not require submissions for GM canola. Therefore, the internet search focused on only one key organisation as listed below in Table 4.

Search results were manually examined for relevant records that were either published during the time period under consideration (date span of search: October 1, 2019 to September 30, 2020) or refer to relevant records published during this time frame. Relevance of results were determined based on the criteria listed in Table 1 and they were summarized in Table 4. All web pages searched were justified by their recommendation in the EFSA 2019 explanatory note[1]. Search terms consisted MS8 CANOLA OR MS8 OILSEED OR MS8 BRASSICA OR RF3 CANOLA OR RF3 OILSEED OR RF3 BRASSICA OR ACS-BN005-8 OR ACS-BN003-6 for MS8 x RF3 *B. napus* and Barnase, Barstar, PAT/*bar* proteins in MS8 x RF3 *B. napus* (all searched singly, with no search limits applied).

Table 4: Results of search of food safety, agriculture, and biotechnology-related authority websites

Source Site Name	Website URL	Date of Most Recent Site Update	Date of Search	No. of Relevant Records
Office of the Gene Technology Regulator (OGTR)	http://www.ogtr.gov.au/	October 15, 2020	November 2, 2020	0

4.2. Manual searches of reference lists of recent review articles

Recent review articles as sources of reference lists to search for potentially relevant studies were identified via searches of PubMed.gov for general terms such as “GMO” or “GM crops” in the titles and abstracts. The search of PubMed.gov was also restricted to recent reviews published between October 1, 2019 and September 30, 2020. The resulting number of relevant studies found within the bibliographies of these review articles is given in Table 5.

Table 5: Documents for which reference lists were scanned for relevant studies

No	Author(s) and Year	Title	Source	Number of relevant bibliographic references retrieved
1	Ansari WA, Chandanshive SU, Bhatt V, Nadaf AB, Vats S, Katara JL, Sonah H, Deshmukh R. 2020	Genome Editing in Cereals: Approaches, Applications and Challenges	Int J Mol Sci. 2020 Jun 5;21(11):4040. doi: 10.3390/ijms21114040.	0
2	Arpaia S, Christiaens O, Giddings K, Jones H, Mezzetti B, Moronta-Barrios F, Perry JN, Sweet	Biosafety of GM Crop Plants Expressing dsRNA: Data Requirements and EU Regulatory Considerations	Front Plant Sci. 2020 Jun 24;11:940. doi: 10.3389/fpls.2020.00940. eCollection 2020.	0

	JB, Taning CNT, Smagghe G, Dietz-Pfeilstetter A. 2020			
3	Babar U, Nawaz MA, Arshad U, Azhar MT, Atif RM, Golokhvast KS, Tsatsakis AM, Shcerbakova K, Chung G, Rana IA. 2020	Transgenic crops for the agricultural improvement in Pakistan: a perspective of environmental stresses and the current status of genetically modified crops	GM Crops Food. 2020;11(1):1-29. doi: 10.1080/21645698.2019.1680078. Epub 2019 Nov 3.	0
4	Bachtarzi H, Farries T. 2019	The Genetically Modified Organism Medicinal Framework in Europe, United States, and Japan: Underlying Scientific Principles and Considerations Toward the Development of Gene Therapy and Genetically Modified Cell-Based Products	Hum Gene Ther Clin Dev. 2019 Sep;30(3):114-128. doi: 10.1089/humc.2019.042. Epub 2019 Jun 21.	0
5	Bedair M, Glenn KC. 2020	Evaluation of the use of untargeted metabolomics in the safety assessment of genetically modified crops	Metabolomics. 2020 Oct 9;16(10):111. doi: 10.1007/s11306-020-01733-8.	0
6	Feng XJ, Yi HM, Ren XX, Ren JL, Ge JR, Wang FG. 2020	[Digital PCR and its application in biological detection]	Yi Chuan. 2020 Apr 20;42(4):363-373. doi: 10.16288/j.yczz.19-351.	0
7	Giraldo PA, Shinozuka H, Spangenberg GC, Cogan NOI, Smith KF. 2019	Safety Assessment of Genetically Modified Feed: Is There Any Difference From Food?	Front Plant Sci. 2019 Dec 11;10:1592. doi: 10.3389/fpls.2019.01592. eCollection 2019.	0
8	Hameed A, Mehmood MA, Shahid M, Fatma S, Khan A, Ali S. 2020	Prospects for potato genome editing to engineer resistance against viruses and cold-induced sweetening	GM Crops Food. 2020 Oct 1;11(4):185-205. doi: 10.1080/21645698.2019.1631115. Epub 2019 Jul 6.	0

9	Holme IB, Gregersen PL, Brinch-Pedersen H. 2019	Induced Genetic Variation in Crop Plants by Random or Targeted Mutagenesis: Convergence and Differences	Front Plant Sci. 2019 Nov 14;10:1468. doi: 10.3389/fpls.2019.01468. eCollection 2019.	0
10	Jyoti A, Kaushik S, Srivastava VK, Datta M, Kumar S, Yugandhar P, Kothari SL, Rai V, Jain A. 2019	The potential application of genome editing by using CRISPR/Cas9, and its engineered and ortholog variants for studying the transcription factors involved in the maintenance of phosphate homeostasis in model plants	Semin Cell Dev Biol. 2019 Dec;96:77-90. doi: 10.1016/j.semcdb.2019.03.010. Epub 2019 Apr 7.	0
11	Kadoić Balaško M, Mikac KM, Bažok R, Lemic D. 2020	Modern Techniques in Colorado Potato Beetle (Leptinotarsa decemlineata Say) Control and Resistance Management: History Review and Future Perspectives	Insects. 2020 Sep 1;11(9):581. doi: 10.3390/insects11090581.	0
12	Kamle M, Mahato DK, Devi S, Soni R, Tripathi V, Mishra AK, Kumar P. 2020	Nanotechnological interventions for plant health improvement and sustainable agriculture	3 Biotech. 2020 Apr;10(4):168. doi: 10.1007/s13205-020-2152-3. Epub 2020 Mar 14.	0
13	Kauffmann F, Van Damme P, Leroux-Roels G, Vandermeulen C, Berthels N, Beuneu C, Mali S. 2019	Clinical trials with GMO-containing vaccines in Europe: Status and regulatory framework	Vaccine. 2019 Sep 30;37(42):6144-6153. doi: 10.1016/j.vaccine.2019.08.018. Epub 2019 Sep 4.	0
14	Kenter MJH, Clevers JC, Cornelissen J, Medema RH. 2019	[Environmental regulations impede cancer research and treatment]	Ned Tijdschr Geneeskd. 2019 Dec 5;163:D4267.	0
15	Keshani P, Sharifi MH, Heydari MR, Joulaei H. 2020	The Effect of Genetically Modified Food on Infertility Indices: A Systematic Review Study	ScientificWorldJournal. 2020 Aug 13;2020:1424789. doi: 10.1155/2020/1424789. eCollection 2020.	0

16	Kumar K, Gambhir G, Dass A, Tripathi AK, Singh A, Jha AK, Yadava P, Choudhary M, Rakshit S. 2020	Genetically modified crops: current status and future prospects	Planta. 2020 Mar 31;251(4):91. doi: 10.1007/s00425-020-03372-8.	0
17	Papadopoulou N, Devos Y, Álvarez-Alfageme F, Lanzoni A, Waigmann E. 2020	Risk Assessment Considerations for Genetically Modified RNAi Plants: EFSA's Activities and Perspective	Front Plant Sci. 2020 Apr 21;11:445. doi: 10.3389/fpls.2020.00445. eCollection 2020.	0
18	Pottinger SE, Innes RW. 2020	RPS5-Mediated Disease Resistance: Fundamental Insights and Translational Applications	Annu Rev Phytopathol. 2020 Aug 25;58:139-160. doi: 10.1146/annurev-phyto-010820-012733. Epub 2020 Apr 13.	0
19	Rumin J, Nicolau E, Junior RGO, Fuentes-Grünewald C, Picot L. 2020	Analysis of Scientific Research Driving Microalgae Market Opportunities in Europe	Mar Drugs. 2020 May 18;18(5):264. doi: 10.3390/md18050264.	0
20	Woźniak E, Waszkowska E, Zimny T, Sowa S, Twardowski T. 2019	The Rapeseed Potential in Poland and Germany in the Context of Production, Legislation, and Intellectual Property Rights	Front Plant Sci. 2019 Nov 5;10:1423. doi: 10.3389/fpls.2019.01423. eCollection 2019.	0

5. RESULTS OF THE STUDY IDENTIFICATION AND SELECTION PROCESS

The database searches (Section 3) identified a total of 145 references, which were reduced to 122 after removal of duplicates (Table 3). No additional studies were identified in the manual searches (Section 4).

5.1. Screening of titles and abstracts to exclude obviously irrelevant references (Stage 1)

All references identified in the database searches described in Section 3 were assessed for relevance based on information in their title and abstract by two reviewers independently. If opinions of relevance differed, the discrepancies were discussed between the reviewers and if a disagreement persisted, the publication under the discussion was transferred to Stage 2 for detailed evaluation by the experts. In this search, both stage 1 reviewers agreed in 100% of the evaluations.

Clearly irrelevant records were tagged as “Not Relevant”. These included:

- Duplicated entries
- Secondary literature (reviews), other than assessments from Regulatory Agencies

- Articles on non-relevant topics like detection methods, socio-economic implications of GM crops, GM policy, agronomical performance, other herbicide resistant GM crops, other male sterility systems, unrelated topics, etc.

Publications which appear to be relevant and those of unclear relevance were tagged as “Relevant” and progressed to Stage 2 (detailed assessment; see Section 5.2).

The number of publications excluded after rapid assessment for relevance is presented in Table 6 documenting the selection process.

5.2. Detailed assessment of eligible references (Stage 2)

Publications tagged as “Relevant” in Stage 1 were assessed in detail independently by two scientific experts in each of three corresponding areas (i.e., Molecular Biology, Food and Feed Safety, Environmental Safety), based on the full text of the publications.

If opinions of relevance differed between reviewers within each area, the initial reviewers discussed the discrepancy as necessary and consulted additional reviewers to resolve the discrepancy if needed. All eligible references were assessed in detail. This detailed assessment included evaluation of the scope of the article and the study quality and reliability. Categorization of reliability (as described in the EFSA 2019 explanatory note[1] and reported in Table 11) was dependent upon the following:

- appropriateness of methodology
- whether the description of methodology would allow independent repetition of the study
- extent of characterization of test materials
- reporting of evidence of reproducibility

Table 6 gives an overview of the reference selection process and results of the detailed assessment.

Table 6: Results of the publication selection process

Total number of publications retrieved after all searches of the scientific literature (excluding duplicates)	122
Number of publications excluded from the search results after rapid assessment for relevance (Stage 1)	118
Total number of full-text documents assessed in detail	4*
Number of publications excluded from further consideration after detailed assessment for relevance (Stage 2)	4*
Total number of unobtainable/unclear publications	0
Total number of relevant publications	0

*A total of 4 publications were progressed for detailed assessment. One of the four was previously included in the 2019 Post-Market Environmental Monitoring literature review report and is not included in Table 8.

Table 7 lists the publications determined to be relevant along with their potential impact on the safety assessment based on detailed evaluation. Publications that were clearly not relevant after a detailed assessment are listed in Table 8. Table 9 lists the publications for which full-text documents were unobtainable for detailed assessment or for which relevance was unclear after detailed assessment.

Table 7: Report of all relevant publications retrieved after detailed assessment of full-text documents for relevance: ordered by category of information/data requirement(s)

Main category of information/data requirement	Study (Author(s) and year)	Title	Source
No publications in this category.			

Table 8: Report of publications excluded from the risk assessment after detailed assessment of full-text documents

Study (Author(s) and year)	Title	Source	Reason(s) for exclusion based on eligibility/inclusion criteria listed in Table 1
Naegeli Hanspeter, Bresson Jean-Louis, Dalmay Tamas, Dewhurst Ian Crawford Epstein Michelle M, Firbank Leslie George, Guerche Philippe, Hejatko Jan, Moreno Francisco Javier, Mullins Ewen, Nogue Fabien, Rostoks Nils, Sanchez Serrano Jose Juan, Savoini Giovanni, Veromann Eve, Veronesi Fabio, Ardizzone Michele, Lanzoni Anna, Paraskevopoulos Konstantinos	Statement complementing the EFSA Scientific Opinion on application (EFSA-GMO-NL-2009-75) for placing on the market of genetically modified oilseed rape Ms8 .times . Rf3 .times. GT73 and subcombinations, which have not been authorised previously (i.e. Ms8 .times. GT73 and Rf3 .times. GT73) independently of their origin, for food and feed uses, import and processing, with the exception of isolated seed protein for food, under Regulation (EC) No 1829/2003), taking into consideration additional information.	EFSA journal. European Food Safety Authority, (2020 Jul) Vol. 18, No. 7, pp. e06200. Electronic Publication Date: 30 Jul 2020 Journal code: 101642076. E-ISSN: 1831-4732. L-ISSN: 1831-4732. Report No.: PMC-PMC7391000.	Report is not specific to the (MS8 x RF3) Canola.
Naegeli, H., Bresson, J. L., Dalmay, T. Dewhurst, I. C., Epstein, M. M., Firbank, L. G., Guerche, P., Hejatko, J., Moreno, F. J., Mullins, E., Nogue, F., Rostoks, N., Serrano, J. J. S., Savoini, G., Veromann, E., Veronesi, F., Alvarez, F., Ardizzone, M. Sanctis, G. de, Devos, Y., Fernandez, Dumont, A., Gennaro, A., Ruiz, J. A. G., Lanzoni, A., Neri, F. M., Papadopoulou, N., de Sanctis, G.	Assessment of genetically modified oilseed rape ms 11 for food and feed uses, import and processing, under regulation (EC) no 1829/2003 (application EFSA -GMO -BE -2016-138).	EFSA Journal (2020), Volume 18, Number 5 DOI: 10.2903/j.efsa.2020.6112 Published by: Wiley, Oxford	Study does not include (MS8 x RF3) Canola.

Study (Author(s) and year)	Title	Source	Reason(s) for exclusion based on eligibility/inclusion criteria listed in Table 1
Tang Tang, Chen GuiMin, Liu FuXia, Bu CuiPing, Liu Lei, Zhao XiangXiang, Tang, T., Chen, G. M., Liu, F. X., Bu, C. P., Liu, L., Zhao, X. X.	Effects of transgenic glufosinate -tolerant rapeseed (*Brassica napus* L.) and the associated herbicide application on rhizospheric bacterial communities.	PMPP Physiological and Molecular Plant Pathology (2019), Volume 106, pp. 246-252, 36 refs. ISSN: 0885-5765 DOI: 10.1016/j.pmpp.2019.03.004 Published by: Elsevier Ltd, Oxford	Effects of Z7B10 rapeseed on soil microbial communities. No ERA related to MS8 x RF3 canola.

Table 9: Report of unobtainable/unclear publications

Study (Author(s) and year)	Title	Source	Description of (unsuccessful) methods used to try and obtain a copy of the publication
No publications in this category.			

6. NARRATIVE SYNTHESIS/SUMMARY OF RELEVANT STUDIES

A total of four publications were selected during Stage 1 evaluation (rapid assessment based on title and abstract). One of the four was previously included in the 2019 Post-Market Environmental Monitoring literature review report and considered non-relevant. After Stage 2 evaluation (detailed review based on full text), it was determined that none of the remaining three publications were relevant for the safety assessment of the MS8 x RF3 *B. napus* and its newly expressed proteins Barnase, Barstar and PAT/*bar*.

Table 10 and Table 11 list the relevant publication along with a summary of any adverse effects reported and the reliability of the publications.

Table 10: Report of the summary of all relevant publications retrieved after detailed assessment of full-text documents for relevance: ordered by category of information/data requirement(s)

Main category of information/data requirement	Study (Author(s) and year)	Intervention/ test materials used	Adverse effects reported	Which adverse effect reported
No publications in this category.				

Table 11: Report of the reliability and implications for the risk assessment of all relevant publications retrieved after detailed assessment of full-text documents for relevance: ordered by category of information/data requirement(s)

Main category of information/data requirement	Study (Author(s) and year)	Summary of reliability appraisal	Implications for risk assessment
No publications in this category.			

7. CONCLUSION

The literature searches performed for the MS8 x RF3 *B. napus* and its newly expressed proteins Barnase, Barstar and PAT/*bar* for the period from October 1, 2019 to September 30, 2020, identified a total of 122 unique publications (after duplicate removal). A total of 4 publications were progressed for detailed assessment after excluding 118 obviously irrelevant publications during Stage 1 evaluation (rapid assessment based on title and abstract). One of the 4 publications was previously included in the 2019 Post-Market Environmental Monitoring literature review report. The 3 publications that progressed to Stage 2 were evaluated in detail, based on full text, for potential relevance, following the pre-established criteria listed in Table 1. None of the remaining 3 publications were relevant after detailed review. No relevant publications with bearing on molecular characterization, human and animal safety, or environmental safety were identified. No issues or topics were identified that would trigger or warrant more specific question formulation.

8. REFERENCES

No.	Author(s), title, source, edition, year, pages
1.	Devos Y, Guajardo IM, Alvarez F and Glanville J. 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 2019:EN-1614. 62 pages. doi:10.2903/sp.efsa.2019.EN-1614.

9. APPENDICES

Appendix 1 Database descriptions

Host	File	Description
STN	AGRICOLA	Agriculture Online Access is a bibliographic database containing selected worldwide literature of agriculture and related fields. AGRICOLA is the locator and bibliographic access and control system of the National Agricultural Library (NAL) collections and also includes records from other cooperating institutions. Coverage of the database includes agricultural economics and rural sociology, agricultural production, animal sciences, chemistry, entomology, food and human nutrition, forestry, natural resources, pesticides, plant science, soils and fertilizers, and water resources. Also covered are related areas such as biology and biotechnology, botany, ecology, and natural history. The database draws on bibliographies, serial articles, book chapters, monographs, computer files, serials, maps, audiovisuals, and reports. Bibliographic information, abstracts, geographic terms, controlled terms, and supplementary terms are searchable.
STN	BIOSIS	BIOSIS Previews® is the largest and most comprehensive life science database in the world. Amongst others subject coverage includes Agriculture, Biochemistry, Biophysics, Botany, Environmental Biology, Physiology, Toxicology. Sources include periodicals, journals, conference proceedings, reviews, reports, patents, and short communications. Nearly 6,000 life source journals, 1,500 international meetings as well as review articles, books, and monographs are reviewed for inclusion. Bibliographic information, indexing terms, abstracts, and CAS Registry Numbers are all searchable.
STN	CABA/CAB	The CAB Abstracts database covers worldwide literature from all areas of agriculture and related sciences including Agriculture, Agricultural chemicals, Animal sciences and production, Crop protection, Crop sciences and production, Environment, Soils and fertilizers. Sources for CABA include journals, books, reports, published theses, conference proceedings, and patents. Bibliographic information, indexing terms, abstracts, and CAS Registry Numbers are searchable.

Host	File	Description
STN	CAS-CA/CAPLUS	The Chemical Abstracts (CA) database covers all areas of Biochemistry, Chemistry and Chemical engineering, and related sciences. Sources include over 8,000 journals, patents from 38 national patent offices and two international patent organizations, technical reports, books, conference proceedings, and dissertations. Electronic only journals and Web preprints are also covered. Bibliographic terms, indexing terms, roles, CAS Registry Numbers, International Patent Classification, and abstracts are searchable.
STN	MEDLINE	MEDLINE contains information on every area of medicine. The MEDLINE database corresponds to Index Medicus, Index to Dental Literature, and International Nursing Index; OLDMEDLINE, with data from NLM's from the Cumulated Index Medicus (1960-1965) and Current List of Medical Literature (1958-1959); and, since August 2001, IN-PROCESS records, the latest documents before they have been completely indexed for inclusion on MEDLINE. Sources include journals and chapters in books or symposia. Bibliographic information, indexing terms, abstracts, chemical names, and CAS Registry Numbers are all searchable. Online thesauri are available for the Medical Subject Headings (/MN), Controlled Terms (/CT) and Chemical Name (/CN) fields.

Appendix 2 Search history

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      FILE 'MEDLINE' ENTERED AT 11:31:00 ON 15 OCT 2020
L1          295 SEA MS8 OR MS8X OR MS-8 OR MS-8X OR ACS(W)BNØØ5-8 OR ACS(W)BN00
                5-8 OR ACS(W)BNOO5-8 OR ACSBNØØ5-8 OR ACSBN005-8 OR ACSBNOO5-8
                OR ACS(W)BNØØ5-8X OR ACS(W)BN005-8X OR ACS(W)BNOO5-8X OR
                ACSBNØØ5-8X OR ACSBN005-8X OR ACSBNOO5-8X
L2          268 SEA RF3 OR XRF3 OR RF-3 OR XRF-3 OR ACS(W)BNØØ3-6 OR ACS(W)BN00
                3-6 OR ACS(W)BNOO3-6 OR ACSBNØØ3-6 OR ACSBN003-6 OR ACSBNOO3-6
                OR XACS(W)BNØØ3-6 OR XACS(W)BN003-6 OR XACS(W)BNOO3-6 OR
                XACSBNØØ3-6 OR XACSBN003-6 OR XACSBNOO3-6
L3            7 SEA MS8XRF3 OR MS(W)8XRF-3 OR MS8.TIME#.RF3 OR ACS(W)BNØØ5(W)8X
                ACS(W)BNØØ3-6 OR ACS(W)BN005(W)8XACS-BN003-6 OR ACS(W)BNOO5(W)8
                XACS(W)BNOO3-6
L4           12 SEA (L1 AND L2) OR L3
L5          149 SEA INVIGOR OR INVIGORR OR INVIGORTM INVIGORRTM OR IN(W)VIGOR
                OR IN(W)VIGORR OR IN(W)VIGORTM OR IN(W)VIGORRTM
L6          616 SEA BARNASE OR RNASE(W)BA OR (BACTERIAL(W)RIBONUCLEASE AND
                ((BACILLUS OR B)(W)AMYLOLIQUEFACIENS)) OR P00648 OR IPR001887
L7          356 SEA BARSTAR OR BARNASE(W)INHIBITOR OR IPR000468
L8         1390 SEA ((BAR OR PAT)(2A)(GENE# OR PROTEIN# OR ENZYME#)) OR
                PPT(2W)ACETYLTRANSFERASE OR PPT(2W)ACETYL(W)TRANSFERASE OR
                PT(W)N(2W)ACETYLTRANSFERASE OR PT(W)N(2W)ACETYL(W)TRANSFERASE
L9          202 SEA PHOSPHINOTHRICIN(W)N(W)ACETYLTRANSFERASE OR PHOSPHINOTHRICI
                N(2W)ACETYLTRANSFERASE OR PHOSPHINOTHRICIN(2W)ACETYL(W)TRANSFER
                ASE OR PHOSPHINOTHRICINACETYL(W)TRANSFERASE
L10        1464 SEA (L8 OR L9)
L11         209 SEA L6 AND L7
L12           3 SEA L6 AND L10
L13           2 SEA L7 AND L10
L14         212 SEA (L11 OR L12 OR L13)
L15        3079 SEA (HERBICID? OR BIALAPHOS OR BASTA OR GLUFOSINATE OR
                PHOSPHINOTHRICIN OR LIBERTY)(5A)(RESIST? OR TOLERAN? OR
                PROTECT?)
L16        8801 SEA MALE(3A)STERIL? OR (FERTIL?(3A)RESTOR?) OR RESTOR?(W)LINE
                OR POLLINATION(W)CONTROL
L17       11839 SEA (L15 OR L16)
L18       20721 SEA ((BRASSICA OR B)(W)NAPUS) OR RAPE? OR CANOLA# OR OILSEED(W)
                RAPE OR OIL(W)SEED(W)RAPE OR COLZA
L19     3599069 SEA GMO OR GMOS OR LMO OR LMOS OR GM OR GE OR TRANSGEN? OR
                (GENETIC?(3W)(MODIF? OR TRANSFORM? OR MANIPULAT? OR IMPROV? OR
                ENGINEER?)) OR (STACKED(W)(GENE# OR TRAIT# OR EVENT#))
L20         337 SEA L17 AND L18 AND L19
L21         702 SEA L4 OR L5 OR L14 OR L20
L22          86 SEA L21 AND PY>=2018
L23          46 SEA L22 AND UP>=20191001 AND UP<=20200930

     FILE 'BIOSIS' ENTERED AT 11:31:41 ON 15 OCT 2020
L24         315 SEA MS8 OR MS8X OR MS-8 OR MS-8X OR ACS(W)BNØØ5-8 OR ACS(W)BN00
                5-8 OR ACS(W)BNOO5-8 OR ACSBNØØ5-8 OR ACSBN005-8 OR ACSBNOO5-8
                OR ACS(W)BNØØ5-8X OR ACS(W)BN005-8X OR ACS(W)BNOO5-8X OR
                ACSBNØØ5-8X OR ACSBN005-8X OR ACSBNOO5-8X
L25         361 SEA RF3 OR XRF3 OR RF-3 OR XRF-3 OR ACS(W)BNØØ3-6 OR ACS(W)BN00
                3-6 OR ACS(W)BNOO3-6 OR ACSBNØØ3-6 OR ACSBN003-6 OR ACSBNOO3-6
                OR XACS(W)BNØØ3-6 OR XACS(W)BN003-6 OR XACS(W)BNOO3-6 OR
                XACSBNØØ3-6 OR XACSBN003-6 OR XACSBNOO3-6
L26           6 SEA MS8XRF3 OR MS(W)8XRF-3 OR MS8.TIME#.RF3 OR ACS(W)BNØØ5(W)8X
                ACS(W)BNØØ3-6 OR ACS(W)BN005(W)8XACS-BN003-6 OR ACS(W)BNOO5(W)8
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                XACS(W)BNOO3-6
L27          18 SEA (L24 AND L25) OR L26
L28          58 SEA INVIGOR OR INVIGORR OR INVIGORTM INVIGORRTM OR IN(W)VIGOR
                OR IN(W)VIGORR OR IN(W)VIGORTM OR IN(W)VIGORRTM
L29         742 SEA BARNASE OR RNASE(W)BA OR (BACTERIAL(W)RIBONUCLEASE AND
                ((BACILLUS OR B)(W)AMYLOLIQUEFACIENS)) OR P00648 OR IPR001887
L30         346 SEA BARSTAR OR BARNASE(W)INHIBITOR OR IPR000468
L31        2749 SEA ((BAR OR PAT)(2A)(GENE# OR PROTEIN# OR ENZYME#)) OR
                PPT(2W)ACETYLTRANSFERASE OR PPT(2W)ACETYL(W)TRANSFERASE OR
                PT(W)N(2W)ACETYLTRANSFERASE OR PT(W)N(2W)ACETYL(W)TRANSFERASE
L32         326 SEA PHOSPHINOTHRICIN(W)N(W)ACETYLTRANSFERASE OR PHOSPHINOTHRICI
                N(2W)ACETYLTRANSFERASE OR PHOSPHINOTHRICIN(2W)ACETYL(W)TRANSFER
                ASE OR PHOSPHINOTHRICINACETYL(W)TRANSFERASE
L33        2849 SEA (L31 OR L32)
L34         230 SEA L29 AND L30
L35          13 SEA L29 AND L33
L36           6 SEA L30 AND L33
L37         239 SEA (L34 OR L35 OR L36)
L38        9424 SEA (HERBICID? OR BIALAPHOS OR BASTA OR GLUFOSINATE OR
                PHOSPHINOTHRICIN OR LIBERTY)(5A)(RESIST? OR TOLERAN? OR
                PROTECT?)
L39       15803 SEA MALE(3A)STERIL? OR (FERTIL?(3A)RESTOR?) OR RESTOR?(W)LINE
                OR POLLINATION(W)CONTROL
L40       25117 SEA (L38 OR L39)
L41       40170 SEA ((BRASSICA OR B)(W)NAPUS) OR RAPE? OR CANOLA# OR OILSEED(W)
                RAPE OR OIL(W)SEED(W)RAPE OR COLZA
L42      427689 SEA GMO OR GMOS OR LMO OR LMOS OR GM OR GE OR TRANSGEN? OR
                (GENETIC?(3W)(MODIF? OR TRANSFORM? OR MANIPULAT? OR IMPROV? OR
                ENGINEER?)) OR (STACKED(W)(GENE# OR TRAIT# OR EVENT#))
L43         422 SEA L40 AND L41 AND L42
L44         725 SEA L27 OR L28 OR L37 OR L43
L45          49 SEA L44 AND PY>=2018
L46          19 SEA L45 AND UP>=20191001 AND UP<=20200930

     FILE 'AGRICOLA' ENTERED AT 11:32:20 ON 15 OCT 2020
L47          82 SEA MS8 OR MS8X OR MS-8 OR MS-8X OR ACS(W)BNØØ5-8 OR ACS(W)BN00
                5-8 OR ACS(W)BNOO5-8 OR ACSBNØØ5-8 OR ACSBN005-8 OR ACSBNOO5-8
                OR ACS(W)BNØØ5-8X OR ACS(W)BN005-8X OR ACS(W)BNOO5-8X OR
                ACSBNØØ5-8X OR ACSBN005-8X OR ACSBNOO5-8X
L48          96 SEA RF3 OR XRF3 OR RF-3 OR XRF-3 OR ACS(W)BNØØ3-6 OR ACS(W)BN00
                3-6 OR ACS(W)BNOO3-6 OR ACSBNØØ3-6 OR ACSBN003-6 OR ACSBNOO3-6
                OR XACS(W)BNØØ3-6 OR XACS(W)BN003-6 OR XACS(W)BNOO3-6 OR
                XACSBNØØ3-6 OR XACSBN003-6 OR XACSBNOO3-6
L49           3 SEA MS8XRF3 OR MS(W)8XRF-3 OR MS8.TIME#.RF3 OR ACS(W)BNØØ5(W)8X
                ACS(W)BNØØ3-6 OR ACS(W)BN005(W)8XACS-BN003-6 OR ACS(W)BNOO5(W)8
                XACS(W)BNOO3-6
L50          10 SEA (L47 AND L48) OR L49
L51         114 SEA INVIGOR OR INVIGORR OR INVIGORTM INVIGORRTM OR IN(W)VIGOR
                OR IN(W)VIGORR OR IN(W)VIGORTM OR IN(W)VIGORRTM
L52         101 SEA BARNASE OR RNASE(W)BA OR (BACTERIAL(W)RIBONUCLEASE AND
                ((BACILLUS OR B)(W)AMYLOLIQUEFACIENS)) OR P00648 OR IPR001887
L53          48 SEA BARSTAR OR BARNASE(W)INHIBITOR OR IPR000468
L54         727 SEA ((BAR OR PAT)(2A)(GENE# OR PROTEIN# OR ENZYME#)) OR
                PPT(2W)ACETYLTRANSFERASE OR PPT(2W)ACETYL(W)TRANSFERASE OR
                PT(W)N(2W)ACETYLTRANSFERASE OR PT(W)N(2W)ACETYL(W)TRANSFERASE
L55         240 SEA PHOSPHINOTHRICIN(W)N(W)ACETYLTRANSFERASE OR PHOSPHINOTHRICI
                N(2W)ACETYLTRANSFERASE OR PHOSPHINOTHRICIN(2W)ACETYL(W)TRANSFER
                ASE OR PHOSPHINOTHRICINACETYL(W)TRANSFERASE
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L56          802 SEA (L54 OR L55)
L57           31 SEA L52 AND L53
L58            4 SEA L52 AND L56
L59            0 SEA L53 AND L56
L60           35 SEA (L57 OR L58 OR L59)
L61         7715 SEA (HERBICID? OR BIALAPHOS OR BASTA OR GLUFOSINATE OR
                 PHOSPHINOTHRICIN OR LIBERTY)(5A)(RESIST? OR TOLERAN? OR
                 PROTECT?)
L62         7319 SEA MALE(3A)STERIL? OR (FERTIL?(3A)RESTOR?) OR RESTOR?(W)LINE
                 OR POLLINATION(W)CONTROL
L63        14970 SEA (L61 OR L62)
L64        22852 SEA ((BRASSICA OR B)(W)NAPUS) OR RAPE? OR CANOLA# OR OILSEED(W)
                 RAPE OR OIL(W)SEED(W)RAPE OR COLZA
L65        93167 SEA GMO OR GMOS OR LMO OR LMOS OR GM OR GE OR TRANSGEN? OR
                 (GENETIC?(3W)(MODIF? OR TRANSFORM? OR MANIPULAT? OR IMPROV? OR
                 ENGINEER?)) OR (STACKED(W)(GENE# OR TRAIT# OR EVENT#))
L66          267 SEA L63 AND L64 AND L65
L67          423 SEA L50 OR L51 OR L60 OR L66
L68           27 SEA L67 AND PY>=2018
L69           13 SEA L68 AND UP>=20191001 AND UP<=20200930

     FILE 'CABA' ENTERED AT 11:33:02 ON 15 OCT 2020
L70          239 SEA MS8 OR MS8X OR MS-8 OR MS-8X OR ACS(W)BNØØ5-8 OR ACS(W)BN00
                 5-8 OR ACS(W)BNOO5-8 OR ACSBNØØ5-8 OR ACSBN005-8 OR ACSBNOO5-8
                 OR ACS(W)BNØØ5-8X OR ACS(W)BN005-8X OR ACS(W)BNOO5-8X OR
                 ACSBNØØ5-8X OR ACSBN005-8X OR ACSBNOO5-8X
L71          250 SEA RF3 OR XRF3 OR RF-3 OR XRF-3 OR ACS(W)BNØØ3-6 OR ACS(W)BN00
                 3-6 OR ACS(W)BNOO3-6 OR ACSBNØØ3-6 OR ACSBN003-6 OR ACSBNOO3-6
                 OR XACS(W)BNØØ3-6 OR XACS(W)BN003-6 OR XACS(W)BNOO3-6 OR
                 XACSBNØØ3-6 OR XACSBN003-6 OR XACSBNOO3-6
L72           17 SEA MS8XRF3 OR MS(W)8XRF-3 OR MS8.TIME#.RF3 OR ACS(W)BNØØ5(W)8X
                 ACS(W)BNØØ3-6 OR ACS(W)BN005(W)8XACS-BN003-6 OR ACS(W)BNOO5(W)8
                 XACS(W)BNOO3-6
L73           27 SEA (L70 AND L71) OR L72
L74          229 SEA INVIGOR OR INVIGORR OR INVIGORTM INVIGORRTM OR IN(W)VIGOR
                 OR IN(W)VIGORR OR IN(W)VIGORTM OR IN(W)VIGORRTM
L75          144 SEA BARNASE OR RNASE(W)BA OR (BACTERIAL(W)RIBONUCLEASE AND
                 ((BACILLUS OR B)(W)AMYLOLIQUEFACIENS)) OR P00648 OR IPR001887
L76           61 SEA BARSTAR OR BARNASE(W)INHIBITOR OR IPR000468
L77         1482 SEA ((BAR OR PAT)(2A)(GENE# OR PROTEIN# OR ENZYME#)) OR
                 PPT(2W)ACETYLTRANSFERASE OR PPT(2W)ACETYL(W)TRANSFERASE OR
                 PT(W)N(2W)ACETYLTRANSFERASE OR PT(W)N(2W)ACETYL(W)TRANSFERASE
L78          368 SEA PHOSPHINOTHRICIN(W)N(W)ACETYLTRANSFERASE OR PHOSPHINOTHRICI
                 N(2W)ACETYLTRANSFERASE OR PHOSPHINOTHRICIN(2W)ACETYL(W)TRANSFER
                 ASE OR PHOSPHINOTHRICINACETYL(W)TRANSFERASE
L79         1582 SEA (L77 OR L78)
L80           58 SEA L75 AND L76
L81           19 SEA L75 AND L79
L82            7 SEA L76 AND L79
L83           70 SEA (L80 OR L81 OR L82)
L84        17371 SEA (HERBICID? OR BIALAPHOS OR BASTA OR GLUFOSINATE OR
                 PHOSPHINOTHRICIN OR LIBERTY)(5A)(RESIST? OR TOLERAN? OR
                 PROTECT?)
L85        23829 SEA MALE(3A)STERIL? OR (FERTIL?(3A)RESTOR?) OR RESTOR?(W)LINE
                 OR POLLINATION(W)CONTROL
L86        40995 SEA (L84 OR L85)
L87        58372 SEA ((BRASSICA OR B)(W)NAPUS) OR RAPE? OR CANOLA# OR OILSEED(W)
                 RAPE OR OIL(W)SEED(W)RAPE OR COLZA
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L88      170455 SEA GMO OR GMOS OR LMO OR LMOS OR GM OR GE OR TRANSGEN? OR
                (GENETIC?(3W)(MODIF? OR TRANSFORM? OR MANIPULAT? OR IMPROV? OR
                ENGINEER?)) OR (STACKED(W)(GENE# OR TRAIT# OR EVENT#))
L89         675 SEA L86 AND L87 AND L88
L90         979 SEA L73 OR L74 OR L83 OR L89
L91          72 SEA L90 AND PY>=2018
L92          37 SEA L91 AND UP>=20191001 AND UP<=20200930
L93          37 SEA L92 NOT P/DT
L94           0 SEA L92 AND (P/DT AND J/DT)
L95          37 SEA L93 OR L94

     FILE 'HCAPLUS' ENTERED AT 11:33:42 ON 15 OCT 2020
L96         379 SEA MS8 OR MS8X OR MS-8 OR MS-8X OR ACS(W)BNØØ5-8 OR ACS(W)BN00
                5-8 OR ACS(W)BNOO5-8 OR ACSBNØØ5-8 OR ACSBN005-8 OR ACSBNOO5-8
                OR ACS(W)BNØØ5-8X OR ACS(W)BN005-8X OR ACS(W)BNOO5-8X OR
                ACSBNØØ5-8X OR ACSBN005-8X OR ACSBNOO5-8X
L97        1059 SEA RF3 OR XRF3 OR RF-3 OR XRF-3 OR ACS(W)BNØØ3-6 OR ACS(W)BN00
                3-6 OR ACS(W)BNOO3-6 OR ACSBNØØ3-6 OR ACSBN003-6 OR ACSBNOO3-6
                OR XACS(W)BNØØ3-6 OR XACS(W)BN003-6 OR XACS(W)BNOO3-6 OR
                XACSBNØØ3-6 OR XACSBN003-6 OR XACSBNOO3-6
L98          13 SEA MS8XRF3 OR MS(W)8XRF-3 OR MS8.TIME#.RF3 OR ACS(W)BNØØ5(W)8X
                ACS(W)BNØØ3-6 OR ACS(W)BN005(W)8XACS-BN003-6 OR ACS(W)BNOO5(W)8
                XACS(W)BNOO3-6
L99          30 SEA (L96 AND L97) OR L98
L100          9 SEA INVIGOR OR INVIGORR OR INVIGORTM INVIGORRTM OR IN(W)VIGOR
                OR IN(W)VIGORR OR IN(W)VIGORTM OR IN(W)VIGORRTM
L101       1244 SEA BARNASE OR RNASE(W)BA OR (BACTERIAL(W)RIBONUCLEASE AND
                ((BACILLUS OR B)(W)AMYLOLIQUEFACIENS)) OR P00648 OR IPR001887
L102        609 SEA BARSTAR OR BARNASE(W)INHIBITOR OR IPR000468
L103       6894 SEA ((BAR OR PAT)(2A)(GENE# OR PROTEIN# OR ENZYME#)) OR
                PPT(2W)ACETYLTRANSFERASE OR PPT(2W)ACETYL(W)TRANSFERASE OR
                PT(W)N(2W)ACETYLTRANSFERASE OR PT(W)N(2W)ACETYL(W)TRANSFERASE
L104        761 SEA PHOSPHINOTHRICIN(W)N(W)ACETYLTRANSFERASE OR PHOSPHINOTHRICI
                N(2W)ACETYLTRANSFERASE OR PHOSPHINOTHRICIN(2W)ACETYL(W)TRANSFER
                ASE OR PHOSPHINOTHRICINACETYL(W)TRANSFERASE
L105       7183 SEA (L103 OR L104)
L106        429 SEA L101 AND L102
L107         49 SEA L101 AND L105
L108         25 SEA L102 AND L105
L109        461 SEA (L106 OR L107 OR L108)
L110      26446 SEA (HERBICID? OR BIALAPHOS OR BASTA OR GLUFOSINATE OR
                PHOSPHINOTHRICIN OR LIBERTY)(5A)(RESIST? OR TOLERAN? OR
                PROTECT?)
L111      22544 SEA MALE(3A)STERIL? OR (FERTIL?(3A)RESTOR?) OR RESTOR?(W)LINE
                OR POLLINATION(W)CONTROL
L112      38733 SEA (L110 OR L111)
L113      95553 SEA ((BRASSICA OR B)(W)NAPUS) OR RAPE? OR CANOLA# OR OILSEED(W)
                RAPE OR OIL(W)SEED(W)RAPE OR COLZA
L114     596327 SEA GMO OR GMOS OR LMO OR LMOS OR GM OR GE OR TRANSGEN? OR
                (GENETIC?(3W)(MODIF? OR TRANSFORM? OR MANIPULAT? OR IMPROV? OR
                ENGINEER?)) OR (STACKED(W)(GENE# OR TRAIT# OR EVENT#))
L115       1178 SEA L112 AND L113 AND L114
L116       1644 SEA L99 OR L100 OR L109 OR L115
L117        383 SEA L116 AND PY>=2018
L118         61 SEA L117 AND UP>=20191001 AND UP<=20200930
L119         30 SEA L118 NOT P/DT
L120          0 SEA L118 AND (P/DT AND J/DT)
L121         30 SEA L119 OR L120
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     FILE 'MEDLINE, BIOSIS, AGRICOLA, CABA, HCAPLUS' ENTERED AT 11:34:22 ON 15
     OCT 2020
L122        122 DUP REM L23 L46 L69 L95 L121 (23 DUPLICATES REMOVED)
                    ANSWERS '1-46' FROM FILE MEDLINE
                    ANSWERS '47-61' FROM FILE BIOSIS
                    ANSWERS '62-72' FROM FILE AGRICOLA
                    ANSWERS '73-103' FROM FILE CABA
                    ANSWERS '104-122' FROM FILE HCAPLUS
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