Title

Summary of the Literature Review for FG72 soybean
October 1, 2020 – September 30, 2021

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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STUDY PERSONNEL

Electronic database search	[redacted]
Agency website search	GRM
Manual search **(reference list from review articles)**	[redacted]
Stage 1 assessment	[redacted]
Stage 2 assessment	Food and Feed safety [redacted] Molecular characterization [redacted] Environmental safety [redacted]
Report	[redacted]

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SUMMARY

FG72 (OECD unique identifier: MST-FGØ72-2) is a genetically modified (GM) soybean designed to provide new options for weed control in the crop. FG72 soybean expresses the 5-enolpyruvyl-shikimate-3-phosphate synthase protein (2mEPSPS) and the 4-hydroxyphenylpyruvate dioxygenase protein (HPPD W336), which confer tolerance to glyphosate and HPPD inhibiting herbicides, respectively.

A scoping review was performed for FG72 soybean and its newly expressed proteins, 2mEPSPS and HPPD W336. The objective of this scoping review was to determine if there were studies about the molecular characterization of FG72 soybean, its effect on food and feed safety or environmental safety, that might require an in-depth examination. A set of broad literature searches was performed using several bibliographic databases covering the scientific literature from October 1, 2020 to September 30, 2021. Additional sources of information, such as web pages of food safety, agriculture, and biotechnology-related regulatory 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 177 unique publications, which were subject to rapid assessment to exclude obviously irrelevant publications. A total of 20 publications were progressed for detailed assessment.

None of the 20 publications was determined to be relevant after the detailed review. No new articles or data on molecular characterization of FG72 soybean, or the 2mEPSPS and HPPD W336 proteins, that would suggest any potential adverse effects on human and animal health or on the environment were found. No evidence was identified that would warrant conducting a systematic review.

In summary, these literature searches and review of the retrieved articles did not identify any relevant publications regarding the safety assessment of FG72 soybean.

1. INTRODUCTION

FG72 (OECD unique identifier: MST-FGØ72-2) is a genetically modified (GM) soybean designed to provide new options for weed control in the crop. FG72 soybean expresses the 5-enolpyruvyl-shikimate-3-phosphate synthase protein (2mEPSPS) and the 4-hydroxyphenylpyruvate dioxygenase protein (HPPD W336), which confer tolerance to glyphosate and HPPD inhibiting herbicides, respectively.

The objective of the literature searches described here was to determine if there were studies published between October 1, 2020 and September 30, 2021 that mention the molecular characterization of the of FG72 soybean, and/or any adverse effect of FG72 soybean in food, feed or the environment. In that context, a broad and inclusive literature search was performed as a scoping review, and the articles retrieved were reviewed in a comprehensive and transparent manner. 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 FG72 soybean and its newly expressed proteins, 2mEPSPS and HPPD W336. The search terms also included relevant synonyms, trade names and intended traits, 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 FG72 soybean and its newly expressed proteins, 2mEPSPS and HPPD W336, in order to identify any specific issues related to food or feed safety, molecular characterization or environmental safety that might require an in-depth examination.

2.2. Review questions

Review questions were formulated to conform to PE(I)CO structure (Population, Exposure (Intervention), 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 FG72 soybean and its newly expressed proteins 2mEPSPS and HPPD W336?

Key elements:

Population: Human health; animal health; environmental safety

Exposure: FG72 soybean, derived food/feed products, newly expressed proteins in FG72 soybean

Comparators: When applicable, comparable populations or subjects exposed to appropriate controls (e.g., vehicle only, innocuous control protein, 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 FG72 soybean and its newly expressed proteins 2mEPSPS and HPPD W336 in soybean?

Key elements:

Population: FG72 soybean and newly expressed proteins in FG72 soybean
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		
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
Exposure (Intervention)	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
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
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

Concepts	Criteria	Comment
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
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

Concepts	Criteria	Comment
Stacked events obtained by conventional crosses/ subcombinations	The publication addresses the higher stacked event and/or a subcombination or subcombinations of the single events of the higher stacked event, independently of its/their origin	This permits the selection of publications on the higher stacked event and/or subcombinations of the single events of the higher stacked event that are in the scope of the GMO application(s), independently of their origin. This permits the exclusion of publications on the single events of the higher stacked event, because the risk assessment of GMO applications for stacked events covers only the products in the scope of the GMO application – i.e., the higher stacked event and subcombinations of the singles involved, independently of their origin
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

Concepts	Criteria	Comment
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

Two publications relevant for FG72 soybean were previously identified and used to test and validate the search strategy:

- Dreesen R; Capt A; Oberdoerfer R; Coats I; Pallett KE (2018). Supplementary data on the characterization and safety evaluation of HPPD W336, a modified 4-hydroxyphenylpyruvate dioxygenase protein, which confers herbicide tolerance, and on the compositional assessment of field grown MST-FGØ72-2 soybean expressing HPPD W336. *Data in brief,* Vol. 21, pp. 111-121
- Dreesen R; Capt A; Oberdoerfer R; Coats I; Pallett KE (2018). Characterization and safety evaluation of HPPD W336, a modified 4-hydroxyphenylpyruvate dioxygenase protein, and the impact of its expression on plant metabolism in herbicide-tolerant MST-FGØ72-2 soybean. *Regulatory Toxicology and Pharmacology*, Vol. 97, pp. 170-185.

These two articles were selected as reference publications because they mention the event name (FG72), one of the newly expressed proteins (HPPD W336), the intended trait (herbicide tolerance) and the crop (soybean). 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>=20201001 and UP<=20210930).

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 6, 2021. Only documents updated between October 1, 2020 and September 30, 2021, 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, newly expressed proteins and intended traits. The reference publications (Section 2.4) were identified by the search profiles confirming the validity of the applied search strategy. Since the 'newly expressed proteins' profiles and the 'intended trait' profiles produced too many results when used on their own, they were combined with additonal profiles: the 'newly expressed proteins' profiles were combined with a 'plant species' profile while the 'intended trait' profiles were combined with a 'general GMO' profile as well as with the 'plant species' profile. See Table 2 for a detailed search profile.

Table 2: Search profile for database search

Set	Search string	Concepts
1	FG72 or FG(w)72 or MST(w)FGØ72 or MST(w)FG072 or MST(w)FGO72	Event name
2	GT27 or GT27TM	Trade name
3	(2MEPSPS or 2(w)MEPSPS or 2M(w)EPSPS or 2(w)M(w)EPSPS or EPSPS OR EPSP(W)SYNTHASE OR (ENOL(W)PYRUVYLSHIKIMATE OR ENOL(W)PYRUVYL(W)SHIKIMATE OR ENOLPYRUVYLSHIKIMATE OR ENOLPYRUVOYLSHIKAMATE or ENOYLPYRUVOYLSHIKIMATE OR ENOLPYRUVYLSHIKIMIC)(4W)(PHOSPHATE OR PHOSPHORIC)(2W)(SYNTHASE OR SYNTHETASE) or (ENOLPYRUVYL OR ENOLPYRUYL OR ENOLPYRUVOYL)(W)(PHOSPHOSHIKIMATE OR PHOSPHOSHIKIMIC or ENOLPYRUVYLSHIKIMATEPHOSPHATE)(2W)(SYNTHASE OR SYNTHETASE) or (ENOL(W)PYRUVOYLSHIKIMATE OR ENOLPYRUVYLSHIKIMATE OR ENOLPYRUVYLSHIKIMIC OR ENOL(W)(PYRUVYL OR PYRUVOYL)(W)SHIKIMATE)(3W)PHOSPHATE(W)(SYNTHASE OR SYNTHETASE) or (PHOSPHOSHIKIMATE(2W)CARBOXYVINYLTRANSFERASE OR	Newly expressed proteins

	PHOSPHOSHIKIMATE(2W)CARBOXYVINYL(W)TRANSFERASE OR ENOLPYRUVOYL(W)SHIKIMIC(3W)PHOSPHOSYNTHASE) (s) ((DOUBL# or DOBL#)(W)(MUTANT# OR MUTAT?) OR 2M)) or (HPPDW336 or HPPD(w)W336 or HPPD(w)W(w)336 or HPPDW(w)336 or ((hydroxyphenylpyruvate or hydroxy(w)phenylpyruvate or hydroxyphenyl(w)pyruvate or hydroxy(w)phenyl(w)pyruvate)(w)(dehydrogenase or dioxygenase) or hppd)(s)(modif? or MUTANT# OR MUTAT?))	
4	(herbicid? or HPPD(w)inhibitor# or isoxaflutole# or diketonitrile# or pyrazolone# or triketone# or GL!PHOSATE# or GL!FOSATE# OR G360 or g(w)360 or roundup? or round(w)up?)(5a)(resist? or toleran? or protect?)	Intended trait
5	soy or soya or soja or soybean# or soyabean# or sojabean# or glycine(w)max or g(w)max	Plant species
6	GMO OR GMOs OR LMO OR LMOs OR GM OR GE OR transgen? OR (genetic?(3a)(modif? OR transform? OR manipulat? OR improv? OR engineer?))	GMO general
7	4 and 5 and 6	Intended trait AND Plant species AND GMO general
8	1 or 2 or 3 or 7	Event name OR Trade name OR Newly expressed proteins OR (Intended trait AND Plant species AND GMO general)

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

Relevant controlled terms (Table 3) were not searched separately because they are included in the Basic Index and were captured by the free-text searches.

Table 3: Relevant controlled terms (CT) and index terms (IT) in each database

Database	Event	New proteins	Intended traits	Plant species	GM plants
Agricola	None	None	"HERBICIDE RESISTANCE"	"GLYCINE MAX"	"TRANSGENIC PLANTS"
Biosis	None	None	No terms for herbicide resistance	none	None
CABA	None	None	"HERBICIDE RESISTANCE"	SOYABEANS	"TRANSGENIC PLANTS"
CAS	None	None	"HERBICIDE RESISTANCE"	"GLYCINE MAX"	"GENETICALLY MODIFIED PLANTS"
Medline	None	None	"HERBICIDE RESISTANCE"	SOYABEANS/CT	"PLANTS, GENETICALLY MODIFIED"

The search results were limited to documents updated between October 1, 2020 and September 30, 2021 (UP>=20201001 and UP<=20210930), and to non-patent documents (not P/DT). To ensure that documents with indexing errors where two document types (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 4 summarizes the number of results obtained from each of the databases searched.

See Appendix 2 for a complete search history.

Table 4: 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	6 Oct 2021	6 Oct 2021	6 Oct 2021	6 Oct 2021	6 Oct 2021
Datespan of the search	1 Oct 2020 – 30 Sept 2021	1 Oct 2020 – 30 Sept 2021	1 Oct 2020 – 30 Sept 2021	1 Oct 2020 – 30 Sept 2021	1 Oct 2020 – 30 Sept 2021
Latest database update	14 Sept 2021	29 Sept 2021	21 Sept 2021	4 Oct 2021	5 Oct 2021

Database	AGRICOLA	BIOSIS	CAB Abstracts	CAPLUS	MEDLINE
Number of records retrieved	30	46	70	58	34
Number of records after duplicate removal	28	29	52	34	34
Number of *relevant* records after rapid assessment	5	2	5	4	4

4. INTERNET and MANUAL SEARCHES

4.1. Internet Searches of food safety, agriculture, and biotechnology-related authority webpages

A search of the web pages of food safety, agriculture, and biotechnology-related authorities was conducted. Search results were manually examined for relevant records that were either published during the time period under consideration (date span of search: October 1, 2020 to September 30, 2021) or that referred to relevant records published during this time frame. Relevance of results was determined based on the criteria listed in Table 1 and are summarized in Table 5. All web pages searched were justified by their recommendation in the EFSA 2019 explanatory note[1]. Of the thirteen key organisations cited in the EFSA 2019 explanatory note[1], Environment and Climate Change Canada and Intersecretarial Commission on Biosafety of GMOs (CIBIOGEM) were excluded, since they are not involved in the risk assessment of GM plants. The US-EPA website was excluded, since FG72 soybean does not contain an insect-resistant trait. The GEAC website was excluded, since this agency has only regulated GM cotton products. Therefore, the internet search was limited to nine key organisations relevant for FG72 soybean. Search terms consisted of FG72 or MST-FGØ72-2, HPPD W336 or modified -hydroxyphenylpyruvate dioxygenase, 2mEPSPS OR double mutant 5-enolpyruvyl shikimate-3-phosphate synthase enzyme (all searched singly, with no search limits applied).

Table 5: 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
US Department of Agriculture (USDA)	https://www.usda.gov/	Oct. 22, 2021	Oct. 22, 2021	0
US Food and Drug Administration (FDA)	https://www.fda.gov/	Oct. 22, 2021	Oct. 22, 2021	0
Health Canada	https://www.canada.ca/en/health-canada.html	Sept. 2021	Oct. 21, 2021	0

Source Site Name	Website URL	Date of Most Recent Site Update	Date of Search	No. of Relevant Records
Canadian Food Inspection Agency (CFIA)	https://www.canada.ca/en/food-inspection-agency.html	Sept. 2021	Oct. 21, 2021	0
Food Standards Australia New Zealand (FSANZ)	http://www.foodstandards.gov.au/Pages/default.aspx	Oct. 10, 2021	Oct. 10, 2021	0
Office of the Gene Technology Regulator (OGTR) Australia	http://www.ogtr.gov.au/	Oct. 10, 2021	Oct. 10, 2021	0
National Technical Commission on Biosafety (CTNBio) Brazil	http://ctnbio.mcti.gov.br/en	Oct. 2021	Oct. 13-15, 2021	0
National Advisory Commission on Agricultural Biotechnology (CONABIA) Argentina	https://www.argentina.gob.ar/agroindustria/bioeconomia/biotecnologia	Oct. 1, 2021	Oct. 18, 2021	0
Ministry of Agriculture, Forestry and Fisheries (MAFF) Japan	http://www.maff.go.jp/	Oct. 14, 2021	Oct. 14, 2021	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 published between October 1, 2020 and September 30, 2021. The resulting number of relevant studies found within the bibliographies of these review articles is given in Table 6.

Table 6: Documents for which reference lists were scanned for relevant studies

No	Author(s) and Year	Title	Source	Number of relevant bibliographic references retrieved
1	Golnar AJ, Ruell E, Lloyd AL, Pepin KM. 2021	Embracing Dynamic Models for Gene Drive Management.	Trends Biotechnol. 2021 Mar;39(3):211-214. doi: 10.1016/j.tibtech.2020.08.011. Epub 2020 Sep 30. PMID: 33010965.	0
2	Gupta S, Kumar A, Patel R, Kumar V. 2021	Genetically modified crop regulations: scope and opportunity using the CRISPR-Cas9 genome editing approach.	Mol Biol Rep. 2021 May;48(5):4851-4863. doi: 10.1007/s11033-021-06477-9. Epub 2021 Jun 10. PMID: 34114124.	0

No	Author(s) and Year	Title	Source	Number of relevant bibliographic references retrieved
3	Hadrup N, Frederiksen M, Wedebye EB, Nikolov NG, Carøe TK, Sørli JB, Frydendall KB, Liguori B, Sejbaek CS, Wolkoff P, Flachs EM, Schlünssen V, Meyer HW, Clausen PA, Hougaard KS. 2021	Asthma-inducing potential of 28 substances in spray cleaning products-Assessed by quantitative structure activity relationship (QSAR) testing and literature review.	J Appl Toxicol. 2021 Jul 11. doi:10.1002/jat.4215. Epub ahead of print. PMID: 34247391.	0
4	Kumar V, Guleria P. 2020	Application of DNA-Nanosensor for Environmental Monitoring: Recent Advances and Perspectives.	Curr Pollut Rep. 2020 Dec 12:1-21. doi: 10.1007/s40726-020-00165-1. Epub ahead of print. PMID: 33344145; PMCID: PMC7732738.	0
5	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. PMID: 31280681; PMCID: PMC7518746.	0
6	Leska A, Nowak A, Nowak I, Górczyńska A. 2021	Effects of Insecticides and Microbiological Contaminants on *Apis mellifera*.	Health. Molecules. 2021 Aug 22;26(16):5080. doi: 10.3390/molecules26165080. PMID: 34443668; PMCID: PMC8398688	0
7	Madzak C. 2021	*Yarrowia lipolytica* Strains and Their Biotechnological Applications: How Natural Biodiversity and Metabolic Engineering Could Contribute to Cell Factories Improvement.	J Fungi (Basel). 2021 Jul 10;7(7):548. doi: 10.3390/jof7070548. PMID: 34356927; PMCID: PMC8307478.	0
8	Menz J, Modrzejewski D, Hartung F, Wilhelm R, Sprink T.	Genome Edited Crops Touch the Market: A View on the Global Development and Regulatory Environment.	Front Plant Sci. 2020 Oct 9;11:586027. doi: 10.3389/fpls.2020.586027. PMID:33163013; PMCID: PMC7581933.	0

No	Author(s) and Year	Title	Source	Number of relevant bibliographic references retrieved
	2020			
9	Mushtaq M, Ahmad Dar A, Skalicky M, Tyagi A, Bhagat N, Basu U, Bhat BA, Zaid A, Ali S, Dar TU, Rai GK, Wani SH, Habib-Ur-Rahman M, Hejnak V, Vachova P, Brestic M, Çığ A, Çığ F, Erman M, El Sabagh A. 2021	CRISPR-Based Genome Editing Tools: Insights into Technological Breakthroughs and Future Challenges.	Genes (Basel). 2021 May 24;12(6):797. doi: 10.3390/genes12060797. PMID: 34073848; PMCID: PMC8225059.	0
10	Okoli AS, Blix T, Myhr AI, Xu W, Xu X. 2021	Sustainable use of CRISPR/Cas in fish aquaculture: the biosafety perspective.	Transgenic Res. 2021 Jul 25. doi:10.1007/s11248-021-00274-7. Epub ahead of print. PMID: 34304349.	0
11	Teferra TF. 2021	Should we still worry about the safety of GMO foods? Why and why not? A review.	Food Sci Nutr. 2021 Jul 27;9(9):5324-5331. doi: 10.1002/fsn3.2499. PMID: 34532037; PMCID: PMC8441473.	0
12	Turnbull C, Lillemo M, Hvoslef-Eide TAK. 2021	Global Regulation of Genetically Modified Crops Amid the Gene Edited Crop Boom - A Review. .	Front Plant Sci. 2021 Feb 24;12:630396. doi: 10.3389/fpls.2021.630396. PMID: 33719302; PMCID: PMC7943453	0
13	Woźniak E, Tyczewska A, Twardowski T. 2021	A Shift Towards Biotechnology: Social Opinion in the EU.	Trends Biotechnol. 2021 Mar;39(3):214-218. doi: 10.1016/j.tibtech.2020.08.001. Epub 2020 Sep 4. PMID: 32896439.	0
14	Zhang Y, Restall J, Crisp P, Godwin I, Liu G. 2021	Current status and prospects of plant genome editing in Australia.	In Vitro Cell Dev Biol Plant. 2021 May 24:1-10. doi: 10.1007/s11627-021-10188-y. Epub ahead of print. PMID: 34054265; PMCID: PMC8143062.	0

5. RESULTS OF THE STUDY IDENTIFICATION AND SELECTION PROCESS

The database searches (Section 3) identified a total of 238 references, which were reduced to 177 after removal of duplicates (Table 4). 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 had persisted, the publication in question was transferred to Stage 2 for a detailed evaluation by the experts. In this search, both evaluators were in 100 % agreement.

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

- Duplicate entries
- Secondary literature (reviews), other than assessments from regulatory authorities
- Articles on non-relevant topics like detection methods, socio-economic implications of GM crops, GM policy, agronomical performance, other herbicide resistant GM crops, other insect resistant GM crops, unrelated topics, etc.

Publications which appeared 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 7 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 the experts within each area, the discrepancy were discussed as necessary and additional reviewers were consulted to resolve the discrepancy, if needed.

Table 7 gives an overview of the reference selection process and results of the detailed assessment.

Table 7: Results of the publication selection process

Total number of publications retrieved after all searches of the scientific literature (excluding duplicates)	177
Number of publications excluded from the search results after rapid assessment for relevance (Stage 1)	157
Total number of full-text documents assessed in detail	20
Number of publications excluded from further consideration after detailed assessment for relevance (Stage 2)	20
Total number of unobtainable/unclear publications	0
Total number of relevant publications	0

Table 8 lists the publications determined to be relevant along with their potential impact on the safety assessment based on the detailed evaluation. Publications that were clearly not relevant after a detailed assessment are listed in Table 9. Table 10 lists the publications for which full-text documents were unobtainable for detailed assessment or for which relevance was unclear after detailed assessment.

Table 8: 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 9: 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
Almeida, Guilherme Pires D'avila de Mendes, Kassio Ferreira Regitano, Jussara Borges Piccolomini Dias, Nivea Maria Dias Guimaraes, Ana Carolina Tornisielo, Valdemar Luiz 2021	Using ^{14}C-glyphosate to investigate the distribution of two formulations in transgenic glyphosate -resistant .	Journal of Environmental Science and Health, Part B: Pesticides, Food Contaminants, and Agricultural Wastes	The publication is not relevant to the risk assessment of GMOs.

Study (Author(s) and year)	Title	Source	Reason(s) for exclusion based on eligibility/inclusion criteria listed in Table 1
Almeida Mauricelia F Tavares Clebson S Araujo Euires O Picanco Marcelo C Oliveira Eugenio E Pereira Eliseu Jose G 2021	Plant Resistance in Some Modern Soybean Varieties May Favor Population Growth and Modify the Stylet Penetration of Bemisia tabaci (Hemiptera: Aleyrodidae).	Journal of economic entomology, (20210413) Vol. 114, No. 2, pp. 970-978. Journal code: 2985127R. E-ISSN: 1938-291X. L-ISSN: 0022-0493.	The authors aimed to evaluate the potential effects of a transgenic soybean variety (event MON87701 x MON89788) on the life-history traits and the stylet penetration activities of the whitefly *Bemisia tabaci*. The investigation was extended to the field, where the population density of whiteflies during the growing season was found to vary among the GE soybean varieties, most likely due to varietal features that may increase host-plant susceptibility to whiteflies. Not related to the environmental risk assessment of FG72, hence, not relevant.
Du Yan Chen FuSheng Bu GuanHao Zhang LiFen Du, Y. Chen, F. S. Bu, G. H. Zhang, L. F. 2021	Distribution and degradation of DNA from non-genetically and genetically modified soybean (Roundup ready): impact of soybean protein concentrate and soybean protein isolate preparation.	Food Chemistry (2021), Volume 335 ISSN: 0308-8146. Published by: Elsevier Ltd, Oxford	The publication is not relevant to the risk assessment of GMOs.
Fast Brandon J Shan Guomin Herman Rod A Gampala Satyalinga Srinivas 2020	Transgene expression in sprayed and non-sprayed herbicide - tolerant genetically engineered crops is equivalent.	Regulatory toxicology and pharmacology : RTP, (2020 Mar) Vol. 111, pp. 104572. Electronic Publication Date: 26	FG72 soybean was not included in the study of this publication.

Study (Author(s) and year)	Title	Source	Reason(s) for exclusion based on eligibility/inclusion criteria listed in Table 1
Girgan, Chantelle Claassens, Sarina [Reprint Author] Fourie, Hendrika 2020	Nematode assemblages and soil microbial communities in soils associated with glyphosate -resistant soybean .	South African Journal of Plant and Soil, (JAN 1 2020) Vol. 37, No. 1. http://www.tandfonline.com/loi/tjps20. CODEN: SAJSEV. ISSN: 0257-1862. E-ISSN: 2167-034X.	Abundance and diversity of plant-parasitic and non-parasitic nematodes, as well as microbial community structure in the rhizosphere of glyphosate-resistant (GR) and conventional soybean (CS) plants as well as native plants (mainly grasses) that grew in natural veld (NV), were investigated during one growing season. No significant differences ($p \geq 0.05$) existed for microbial community structures among the GR, CS and NV ecosystems with soils from all three primarily dominated by bacteria. Not related to the environmental risk assessment of FG72, hence, not relevant.
Kim, Hye Jin Kim, Do Young Moon, Ye Seul Pack, In Soon Park, Kee Woong Chung, Young Soo Kim, Young Joong Nam, Kyong-Hee Kim, Chang-Gi 2019	Gene flow from herbicide resistant transgenic soybean to conventional soybean and wild soybean.	Applied Biological Chemistry (2019), 62(1), 1-8 CODEN: ABCPCW; ISSN: 2468-0842	The authors conducted the study to determine gene flow rates from glyphosate- and glufosinate-resistant transgenic soybeans to five commercial soybean cultivars and three accessions of wild soybeans in South Korea. A transgenic line (Bert-4-3) of soybean was developed from the cultivar 'Bert'. Seeds of this transgenic soybean and Bert were provided by one of the authors (YS Chung). Not related to the environmental risk assessment of FG72, hence, not relevant.
Liu, Jin Yue Sheng, Ze Wen Hu, Yu Qi Liu, Qi Qiang, Sheng Song, Xiao Ling [Reprint Author] Liu, Biao 2021	Fitness of F1 hybrids between 10 maternal wild soybean populations and transgenic soybean	Transgenic Research, (FEB 2021) Vol. 30, No. 1. http://www.springerlink.com/content/100225/. ISSN: 0962-8819. E-ISSN: 1573-9368.	The authors aimed to predict the risk and consequences of gene flow from transgenic soybean to different wild soybeans and the potential risk without competition and under competition with weeds. The glyphosate-resistant (GR) soybeans, T14R 1251–70, provided by the National Soybean Improvement Center of Nanjing Agricultural University was used in the study together with ten wild soybean populations collected from six different provinces of China. Not related to the environmental risk assessment of FG72, hence, not relevant.

Study (Author(s) and year)	Title	Source	Reason(s) for exclusion based on eligibility/inclusion criteria listed in Table 1
Mbatyoti, Akhona De Beer, Annelie Daneel, Mieke Stefanie Swart, Antoinette Marais, Mariette De Waele, Dirk Fourie, Hendrika 2021	Host status of glyphosate - tolerant soybean genotypes to *Meloidogyne* incognita and *Pratylenchus* infection.	Tropical plant pathology (Jun 2021), Volume 46, Number 3, pp. 336-349, 14 p. ISSN: 1983-2052 Source Note: 202106, v. 46, no. 3	The authors had as objectives of this study to examine the host status of (i) the commercially cultivated GM glyphosate-tolerant soybean genotypes in South Africa to the most common plant-parasitic nematodes present in the local soybean production areas where the National Soybean Cultivar Trials were conducted and (ii) 36 soybean genotypes (including 31 GM glyphosate-tolerant genotypes that are commercially available in South Africa) to *Meloidogyne incognita*. Not related to the environmental risk assessment of FG72, hence, not relevant.
Mbatyoti, A Daneel, MS Swart, A Marais, M De Waele, D Fourie, H 2020	Plant-parasitic nematode assemblages associated with glyphosate tolerant and conventional soybean cultivars in South Africa	African zoology (2 Jan 2020), Volume 55, Number 1, pp. 93-107, 15 p. ISSN: 1562-7020; 2224-073X; 2224-073X Source Note: 20200102, v. 55, no. 1	The objectives of the current study were to (i) identify the plant-parasitic nematode assemblages in commercial soybean fields in South Africa where glyphosate has been applied regularly vs not applied for at least five years prior to the study, as well as in adjacent natural vegetation sites, and (ii) determine whether the plant-parasitic nematode assemblages had shifted with different soybean cultivars grown over time. Not related to the environmental risk assessment of FG72, hence, not relevant.

Study (Author(s) and year)	Title	Source	Reason(s) for exclusion based on eligibility/inclusion criteria listed in Table 1
Pan Guang Yang Fan Zhang GuiMing Liu XinJiao Lu XiaoYu Xiang CaiYu Ling XingYuan Pan, G. Yang, F. Zhang, G. M. Liu, X. J. Lu, X. Y. Xiang, C. Y. Ling, X. Y. 2020	Event detection and analysis of imported genetically modified soybean.	Chinese Journal of Oil Crop Sciences (2020), Volume 42, Number 2, pp. 298-305, 11 refs. ISSN: 1007-9084 Published by: Editorial Department of Chinese Journal of Oil Crop Sciences, Wuchang	Batches of soybean imported from the United States, Brazil, Canada and Argentina were tested with the event-specific detection method for 17 genetically modified (GM) soybean events. The analyzed results showed that out of 17 GM soybean events, only 7 approved ones were detected in all batches of imported soybeans (including FG72). According to the authors the results could be useful for China to detect and identify import ed GM soybeans, and improve superveillance of imported GM soybean. Not related to the environmental risk assessment of FG72, hence, not relevant. In addition, the publication does not contain primary data.
Pereira, J. L. Pereira, R. R. Resende-Silva, G. A. Jakelaitis, A. Silva, A. A. Picanco, M. C. 2020	Glyphosate impact on arthropods associated to Roundup Ready and conventional soybean (Glycine max L.).	Planta Daninha (2020), Volume 38, Number e020171361, 25 refs. ISSN: 0100-8358; 1806-9681 Published by: Sociedade Brasileira da Ciencia das Plantas Daninhas, Vicosa	The authors aimed to identify and analyze the impacts of use of glyphosate and the variations in weed population diversity and density on aerial arthropod communities in glyphosate-resistant soybean crops in Brazil. Soybean varieties used were BRS Favorita RR (Roundup Ready®) soybean, and MG/BR-46 Conquista, a non-GM soybean. Not related to the environmental risk assessment of FG72, hence, not relevant.
Qin Wen Wang Li-yuan Yang Zhuo Wang Jing-bo Zhuo Qin Li Yan 2020	Digestive stability of G2-EPSPS and GAT-encoded recombinant proteins in transgenic soybean in simulated gastric and intestinal fluid	Huanjing Yu Jiankang Zazhi (2020), 37(7), 50-54 CODEN: HYJZAR; ISSN: 1001-5914 URL:	Neither the G2-EPSPS nor GAT proteins are in FG72.

Study (Author(s) and year)	Title	Source	Reason(s) for exclusion based on eligibility/inclusion criteria listed in Table 1
Rodrigues, N. R. Ferreira Souza, A. P. de Morais, P. P. P. Braga, D. P. V. Crivellari, A. C. Favoretto, L. R. G. Berger, G. U. de Ferreira Souza, A. P. 2021	Residues of glyphosate and aminomethylphosphonic acid (AMPA) in genetically modified glyphosate tolerant soybean, corn and cotton crops.	Ciencia Rural (2021), Volume 51, Number 1, 23 refs. ISSN: 0103-8478 Published by: Centro de Ciencias Rurais, Universidade Federal de Santa Maria, Santa Maria	The aim of the paper was to monitor glyphosate and its metabolite (AMPA) residues in crops and compare with ANVISA MRLs and Codex. Not directly related with FG72 soybean safety.
Sahin, O. Karlik, E. Meric, S. Ari, S. Gozukirmizi, N. 2020	Genome organization changes in GM and non-GM soybean [Glycine max (L.) Merr.] under salinity stress by retro-transposition events.	Genetic Resources and Crop Evolution (2020), Volume 67, Number 6, pp. 1551-1566, many ref. ISSN: 0925-9864;	FG72 soybean was not included in the study of this publication.
Seralini, Gilles-Eric 2020	Update on long-term toxicity of agricultural GMOs tolerant to roundup.	Environmental Sciences Europe (Dec 2020), Volume 32, Number 1, pp. 18-18, 1 p. ISSN: 2190-4707 Source Note: 202012, v. 32, no. 1	No primary data related to the food and feed assessment of FG72 soybean, hence, not relevant.
Sieradzki Zbigniew Mazur Malgorzata Krol Beata Kwiatek Krzysztof 2021	Prevalence of Genetically Modified Soybean in Animal Feedingstuffs in Poland.	Journal of Veterinary Research, (2021 Mar) Vol. 65, No. 1, pp. 93-99. Electronic Publication Date: 29 Jan 2021	The publication is not relevant to the risk assessment of GMOs.

Study (Author(s) and year)	Title	Source	Reason(s) for exclusion based on eligibility/inclusion criteria listed in Table 1
Shi, Zongyong Zou, Shiying Lu, Chao Wu, Boze Huang, Kunlun Zhao, Changhui He, Xiaoyun 2019	Evaluation of the effects of feeding glyphosate - tolerant soybeans (CP4 EPSPS) on the testis of male Sprague-Dawley rats.	GM crops + food (3 Jul 2019), Volume 10, Number 3, pp. 181-190, 10 p. ISSN: 2164-5698; 2164-5701; 2164-5701 Source Note: 20190703, v. 10, no. 3	FG72 soybean is not considered.
Swatkoski Stephen J Croley Timothy R 2020	Screening of Processed Foods for Transgenic Proteins from Genetically Engineered Plants Using Targeted Mass Spectrometry.	Analytical chemistry, (20200218) Vol. 92, No. 4, pp. 3455-3462. Electronic Publication Date: 31 Jan 2020 Journal code: 0370536. E-ISSN: 1520-6882. L-ISSN: 0003-2700.	The publication is not relevant to the risk assessment of GMOs.
Xia, Yimiao Chen, Fusheng Liu, Kunlun Zhang, Lifen Duan, Xiaojie Zhang, Xin Zhu, Zhenya 2019	Compositional differences between conventional Chinese and genetically modified Roundup Ready soybeans.	Crop and Pasture Science (2019), 70(6), 526-534 CODEN: CPSRCY; ISSN: 1836-0947	The publication is not relevant to the risk assessment of GMOs.

Study (Author(s) and year)	Title	Source	Reason(s) for exclusion based on eligibility/inclusion criteria listed in Table 1
Xu, Junyi Cao, Jijuan Li, Xin Luo, Jia Bai, Jinglian Zheng, Qiuyue Yang, Lili Wang, Yong 2020	Detection and analysis of stacked-trait transgenic events in imported practical soybean.	Oil crop science (21 Sep 2020) ISSN: 2096-2428 Source Note: 20200921	The authors performed a survey using the real-time qPCR to detect and analyze seven batches of imported practical transgenic soybean samples in China, in which eight mixed events have been detected (FG72 - approved in China, was one of them). Based on that, practical soybean single-seed was extracted for single-seed multi-target detection analysis to detect the stacked-trait transgenic soybean MON87708 × MON89788 event (not approved in China) and to further make relative content estimations. Not related to the environmental risk assessment (ERA) of FG72, hence, not relevant. In addition, the publication does not contain primary data.

Table 10: 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 20 publications were selected during Stage 1 evaluation (rapid assessment based on title and abstract). After Stage 2 evaluation (detailed review based on full text), it was determined that none of the publications were relevant to the safety assessment of FG72 soybean and its newly expressed proteins 2mEPSPS and HPPD W336.

Table 11 lists the relevants publication along with a summary of any adverse effects reported and the reliability of the publications.

Table 11: Summary report for all relevant publications retrieved after detailed assessment of full-text documents for relevance and report of the reliability and implications for the risk assessment: 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	Summary of reliability appraisal	Implications for risk assessment
No publications in this category.						

7. CONCLUSION

The literature searches performed for FG72 soybean and its newly expressed proteins, 2mEPSPS and HPPD W336, for the period from October 1, 2020 to September 30, 2021, identified a total of 177 unique publications (after duplicate removal). A total of 20 publications were progressed for detailed assessment after excluding 157 obviously irrelevant publications during Stage 1 evaluation (rapid assessment based on title and abstract).

The 20 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. No relevant references with bearing on molecular characterization, environmental safety, or food and feed safety were identified. No issues or topics were identified that would trigger or warrant a 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.
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.

Host	File	Description
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 10:19:29 ON 06 OCT 2021
L1             7 SEA FG72 OR FG(W)72 OR MST(W)FG072 OR MST(W)FGO72
L2             5 SEA GT27 OR GT27TM
L3            14 SEA 2MEPSPS OR 2(W)MEPSPS OR 2M(W)EPSPS OR 2(W)M(W)EPSPS
L4          4215 SEA EPSPS OR EPSP(W)SYNTHASE OR (ENOL(W)PYRUVYLSHIKIMATE OR
                   ENOL(W)PYRUVYL(W)SHIKIMATE OR ENOLPYRUVYLSHIKIMATE OR ENOLPYRUV
                   OYLSHIKAMATE OR ENOYLPYRUVOYLSHIKIMATE OR ENOLPYRUVYLSHIKIMIC)(
                   4W)(PHOSPHATE OR PHOSPHORIC)(2W)(SYNTHASE OR SYNTHETASE)
L5             0 SEA (ENOLPYRUVYL OR ENOLPYRUYL OR ENOLPYRUVOYL)(W)(PHOSPHOSHIKI
                   MATE OR PHOSPHOSHIKIMIC OR ENOLPYRUVYLSHIKIMATEPHOSPHATE)(2W)(S
                   YNTHASE OR SYNTHETASE)
L6           382 SEA (ENOL(W)PYRUVOYLSHIKIMATE OR ENOLPYRUVYLSHIKIMATE OR
                   ENOLPYRUVYLSHIKIMIC OR ENOL(W)(PYRUVYL OR PYRUVOYL)(W)SHIKIMATE
                   )(3W)PHOSPHATE(W)(SYNTHASE OR SYNTHETASE)
L7           481 SEA (PHOSPHOSHIKIMATE(2W)CARBOXYVINYLTRANSFERASE OR PHOSPHOSHIK
                   IMATE(2W)CARBOXYVINYL(W)TRANSFERASE OR ENOLPYRUVOYL(W)SHIKIMIC(
                   3W)PHOSPHOSYNTHASE)
L8         24400 SEA ((DOUBL# OR DOBL#)(W)(MUTANT# OR MUTAT?) OR 2M)
L9            20 SEA L3 OR (((L4 OR L5 OR L6 OR L7))(S)L8)
L10            5 SEA HPPDW336 OR HPPD(W)W336 OR HPPD(W)W(W)336 OR HPPDW(W)336
L11           41 SEA ((HYDROXYPHENYLPYRUVATE OR HYDROXY(W)PHENYLPYRUVATE OR
                   HYDROXYPHENYL(W)PYRUVATE OR HYDROXY(W)PHENYL(W)PYRUVATE)(W)(DEH
                   YDROGENASE OR DIOXYGENASE) OR HPPD)(S)(MODIF? OR MUTANT# OR
                   MUTAT?)
L12           42 SEA (L10 OR L11)
L13           59 SEA L9 OR L12
L14         3534 SEA (HERBICID? OR HPPD(W)INHIBITOR# OR ISOXAFLUTOLE# OR
                   DIKETONITRILE# OR PYRAZOLONE# OR TRIKETONE# OR GL!PHOSATE# OR
                   GL!FOSATE# OR G360 OR G(W)360 OR ROUNDUP? OR ROUND(W)UP?)(5A)(R
                   ESIST? OR TOLERAN? OR PROTECT?)
L15        67123 SEA SOY OR SOYA OR SOJA OR SOYBEAN# OR SOYABEAN# OR SOJABEAN#
                   OR GLYCINE(W)MAX OR G(W)MAX
L16      3818987 SEA GMO OR GMOS OR LMO OR LMOS OR GM OR GE OR TRANSGEN? OR
                   (GENETIC?(3A)(MODIF? OR TRANSFORM? OR MANIPULAT? OR IMPROV? OR
                   ENGINEER?))
L17          310 SEA L14 AND L15 AND L16
L18          362 SEA L1 OR L2 OR L13 OR L17
L19           67 SEA L18 AND PY>=2019
L20           34 SEA L19 AND UP>=20201001 AND UP<=20210930

     FILE 'BIOSIS' ENTERED AT 10:20:09 ON 06 OCT 2021
L21            8 SEA FG72 OR FG(W)72 OR MST(W)FG072 OR MST(W)FGO72
L22            5 SEA GT27 OR GT27TM
L23           12 SEA 2MEPSPS OR 2(W)MEPSPS OR 2M(W)EPSPS OR 2(W)M(W)EPSPS
L24         5034 SEA EPSPS OR EPSP(W)SYNTHASE OR (ENOL(W)PYRUVYLSHIKIMATE OR
                   ENOL(W)PYRUVYL(W)SHIKIMATE OR ENOLPYRUVYLSHIKIMATE OR ENOLPYRUV
                   OYLSHIKAMATE OR ENOYLPYRUVOYLSHIKIMATE OR ENOLPYRUVYLSHIKIMIC)(
                   4W)(PHOSPHATE OR PHOSPHORIC)(2W)(SYNTHASE OR SYNTHETASE)
L25            0 SEA (ENOLPYRUVYL OR ENOLPYRUYL OR ENOLPYRUVOYL)(W)(PHOSPHOSHIKI
                   MATE OR PHOSPHOSHIKIMIC OR ENOLPYRUVYLSHIKIMATEPHOSPHATE)(2W)(S
                   YNTHASE OR SYNTHETASE)
L26          718 SEA (ENOL(W)PYRUVOYLSHIKIMATE OR ENOLPYRUVYLSHIKIMATE OR
                   ENOLPYRUVYLSHIKIMIC OR ENOL(W)(PYRUVYL OR PYRUVOYL)(W)SHIKIMATE
                   )(3W)PHOSPHATE(W)(SYNTHASE OR SYNTHETASE)
L27           27 SEA (PHOSPHOSHIKIMATE(2W)CARBOXYVINYLTRANSFERASE OR PHOSPHOSHIK
                   IMATE(2W)CARBOXYVINYL(W)TRANSFERASE OR ENOLPYRUVOYL(W)SHIKIMIC(
                   3W)PHOSPHOSYNTHASE)
L28        26859 SEA ((DOUBL# OR DOBL#)(W)(MUTANT# OR MUTAT?) OR 2M)
L29           19 SEA L23 OR (((L24 OR L25 OR L26 OR L27))(S)L28)
L30            3 SEA HPPDW336 OR HPPD(W)W336 OR HPPD(W)W(W)336 OR HPPDW(W)336
L31           59 SEA ((HYDROXYPHENYLPYRUVATE OR HYDROXY(W)PHENYLPYRUVATE OR
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                HYDROXYPHENYL(W)PYRUVATE OR HYDROXY(W)PHENYL(W)PYRUVATE)(W)(DEH
                YDROGENASE OR DIOXYGENASE) OR HPPD)(S)(MODIF? OR MUTANT# OR
                MUTAT?)
L32           59 SEA (L30 OR L31)
L33           77 SEA L29 OR L32
L34        11078 SEA (HERBICID? OR HPPD(W)INHIBITOR# OR ISOXAFLUTOLE# OR
                DIKETONITRILE# OR PYRAZOLONE# OR TRIKETONE# OR GL!PHOSATE# OR
                GL!FOSATE# OR G360 OR G(W)360 OR ROUNDUP? OR ROUND(W)UP?)(5A)(R
                ESIST? OR TOLERAN? OR PROTECT?)
L35       168243 SEA SOY OR SOYA OR SOJA OR SOYBEAN# OR SOYABEAN# OR SOJABEAN#
                OR GLYCINE(W)MAX OR G(W)MAX
L36       465529 SEA GMO OR GMOS OR LMO OR LMOS OR GM OR GE OR TRANSGEN? OR
                (GENETIC?(3A)(MODIF? OR TRANSFORM? OR MANIPULAT? OR IMPROV? OR
                ENGINEER?))
L37         551 SEA L34 AND L35 AND L36
L38         628 SEA L21 OR L22 OR L33 OR L37
L39          86 SEA L38 AND PY>=2019
L40          46 SEA L39 AND UP>=20201001 AND UP<=20210930

     FILE 'AGRICOLA' ENTERED AT 10:20:46 ON 06 OCT 2021
L41           4 SEA FG72 OR FG(W)72 OR MST(W)FG072 OR MST(W)FGO72
L42           1 SEA GT27 OR GT27TM
L43           4 SEA 2MEPSPS OR 2(W)MEPSPS OR 2M(W)EPSPS OR 2(W)M(W)EPSPS
L44         651 SEA EPSPS OR EPSP(W)SYNTHASE OR (ENOL(W)PYRUVYLSHIKIMATE OR
                ENOL(W)PYRUVYL(W)SHIKIMATE OR ENOLPYRUVYLSHIKIMATE OR ENOLPYRUV
                OYLSHIKAMATE OR ENOYLPYRUVOYLSHIKIMATE OR ENOLPYRUVYLSHIKIMIC)(
                4W)(PHOSPHATE OR PHOSPHORIC)(2W)(SYNTHASE OR SYNTHETASE)
L45           0 SEA (ENOLPYRUVYL OR ENOLPYRUYL OR ENOLPYRUVOYL)(W)(PHOSPHOSHIKI
                MATE OR PHOSPHOSHIKIMIC OR ENOLPYRUVYLSHIKIMATEPHOSPHATE)(2W)(S
                YNTHASE OR SYNTHETASE)
L46         306 SEA (ENOL(W)PYRUVOYLSHIKIMATE OR ENOLPYRUVYLSHIKIMATE OR
                ENOLPYRUVYLSHIKIMIC OR ENOL(W)(PYRUVYL OR PYRUVOYL)(W)SHIKIMATE
                )(3W)PHOSPHATE(W)(SYNTHASE OR SYNTHETASE)
L47         237 SEA (PHOSPHOSHIKIMATE(2W)CARBOXYVINYLTRANSFERASE OR PHOSPHOSHIK
                IMATE(2W)CARBOXYVINYL(W)TRANSFERASE OR ENOLPYRUVOYL(W)SHIKIMIC(
                3W)PHOSPHOSYNTHASE)
L48        6578 SEA ((DOUBL# OR DOBL#)(W)(MUTANT# OR MUTAT?) OR 2M)
L49           9 SEA L43 OR (((L44 OR L45 OR L46 OR L47))(S)L48)
L50           0 SEA HPPDW336 OR HPPD(W)W336 OR HPPD(W)W(W)336 OR HPPDW(W)336
L51          37 SEA ((HYDROXYPHENYLPYRUVATE OR HYDROXY(W)PHENYLPYRUVATE OR
                HYDROXYPHENYL(W)PYRUVATE OR HYDROXY(W)PHENYL(W)PYRUVATE)(W)(DEH
                YDROGENASE OR DIOXYGENASE) OR HPPD)(S)(MODIF? OR MUTANT# OR
                MUTAT?)
L52          37 SEA (L50 OR L51)
L53          46 SEA L49 OR L52
L54        8634 SEA (HERBICID? OR HPPD(W)INHIBITOR# OR ISOXAFLUTOLE# OR
                DIKETONITRILE# OR PYRAZOLONE# OR TRIKETONE# OR GL!PHOSATE# OR
                GL!FOSATE# OR G360 OR G(W)360 OR ROUNDUP? OR ROUND(W)UP?)(5A)(R
                ESIST? OR TOLERAN? OR PROTECT?)
L55        92386 SEA SOY OR SOYA OR SOJA OR SOYBEAN# OR SOYABEAN# OR SOJABEAN#
                OR GLYCINE(W)MAX OR G(W)MAX
L56       103176 SEA GMO OR GMOS OR LMO OR LMOS OR GM OR GE OR TRANSGEN? OR
                (GENETIC?(3A)(MODIF? OR TRANSFORM? OR MANIPULAT? OR IMPROV? OR
                ENGINEER?))
L57         438 SEA L54 AND L55 AND L56
L58         485 SEA L41 OR L42 OR L53 OR L57
L59          51 SEA L58 AND PY>=2019
L60          30 SEA L59 AND UP>=20201001 AND UP<=20210930

     FILE 'CABA' ENTERED AT 10:21:26 ON 06 OCT 2021
L61          10 SEA FG72 OR FG(W)72 OR MST(W)FG072 OR MST(W)FGO72
L62           6 SEA GT27 OR GT27TM
L63          14 SEA 2MEPSPS OR 2(W)MEPSPS OR 2M(W)EPSPS OR 2(W)M(W)EPSPS
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L64         1117 SEA EPSPS OR EPSP(W)SYNTHASE OR (ENOL(W)PYRUVYLSHIKIMATE OR
                 ENOL(W)PYRUVYL(W)SHIKIMATE OR ENOLPYRUVYLSHIKIMATE OR ENOLPYRUV
                 OYLSHIKAMATE OR ENOYLPYRUVOYLSHIKIMATE OR ENOLPYRUVYLSHIKIMIC)(
                 4W)(PHOSPHATE OR PHOSPHORIC)(2W)(SYNTHASE OR SYNTHETASE)
L65            0 SEA (ENOLPYRUVYL OR ENOLPYRUYL OR ENOLPYRUVOYL)(W)(PHOSPHOSHIKI
                 MATE OR PHOSPHOSHIKIMIC OR ENOLPYRUVYLSHIKIMATEPHOSPHATE)(2W)(S
                 YNTHASE OR SYNTHETASE)
L66          429 SEA (ENOL(W)PYRUVOYLSHIKIMATE OR ENOLPYRUVYLSHIKIMATE OR
                 ENOLPYRUVYLSHIKIMIC OR ENOL(W)(PYRUVYL OR PYRUVOYL)(W)SHIKIMATE
                 )(3W)PHOSPHATE(W)(SYNTHASE OR SYNTHETASE)
L67          172 SEA (PHOSPHOSHIKIMATE(2W)CARBOXYVINYLTRANSFERASE OR PHOSPHOSHIK
                 IMATE(2W)CARBOXYVINYL(W)TRANSFERASE OR ENOLPYRUVOYL(W)SHIKIMIC(
                 3W)PHOSPHOSYNTHASE)
L68         7304 SEA ((DOUBL# OR DOBL#)(W)(MUTANT# OR MUTAT?) OR 2M)
L69           21 SEA L63 OR (((L64 OR L65 OR L66 OR L67))(S)L68)
L70            4 SEA HPPDW336 OR HPPD(W)W336 OR HPPD(W)W(W)336 OR HPPDW(W)336
L71           63 SEA ((HYDROXYPHENYLPYRUVATE OR HYDROXY(W)PHENYLPYRUVATE OR
                 HYDROXYPHENYL(W)PYRUVATE OR HYDROXY(W)PHENYL(W)PYRUVATE)(W)(DEH
                 YDROGENASE OR DIOXYGENASE) OR HPPD)(S)(MODIF? OR MUTANT# OR
                 MUTAT?)
L72           63 SEA (L70 OR L71)
L73           81 SEA L69 OR L72
L74        19070 SEA (HERBICID? OR HPPD(W)INHIBITOR# OR ISOXAFLUTOLE# OR
                 DIKETONITRILE# OR PYRAZOLONE# OR TRIKETONE# OR GL!PHOSATE# OR
                 GL!FOSATE# OR G360 OR G(W)360 OR ROUNDUP? OR ROUND(W)UP?)(5A)(R
                 ESIST? OR TOLERAN? OR PROTECT?)
L75       194201 SEA SOY OR SOYA OR SOJA OR SOYBEAN# OR SOYABEAN# OR SOJABEAN#
                 OR GLYCINE(W)MAX OR G(W)MAX
L76       184643 SEA GMO OR GMOS OR LMO OR LMOS OR GM OR GE OR TRANSGEN? OR
                 (GENETIC?(3A)(MODIF? OR TRANSFORM? OR MANIPULAT? OR IMPROV? OR
                 ENGINEER?))
L77          916 SEA L74 AND L75 AND L76
L78          996 SEA L61 OR L62 OR L73 OR L77
L79          122 SEA L78 AND PY>=2019
L80           70 SEA L79 AND UP>=20201001 AND UP<=20210930
L81           70 SEA L80 NOT P/DT
L82            0 SEA L80 AND (P/DT AND J/DT)
L83           70 SEA L81 OR L82

     FILE 'HCAPLUS' ENTERED AT 10:22:11 ON 06 OCT 2021
L84           14 SEA FG72 OR FG(W)72 OR MST(W)FG072 OR MST(W)FGO72
L85            7 SEA GT27 OR GT27TM
L86           28 SEA 2MEPSPS OR 2(W)MEPSPS OR 2M(W)EPSPS OR 2(W)M(W)EPSPS
L87         4388 SEA EPSPS OR EPSP(W)SYNTHASE OR (ENOL(W)PYRUVYLSHIKIMATE OR
                 ENOL(W)PYRUVYL(W)SHIKIMATE OR ENOLPYRUVYLSHIKIMATE OR ENOLPYRUV
                 OYLSHIKAMATE OR ENOYLPYRUVOYLSHIKIMATE OR ENOLPYRUVYLSHIKIMIC)(
                 4W)(PHOSPHATE OR PHOSPHORIC)(2W)(SYNTHASE OR SYNTHETASE)
L88            9 SEA (ENOLPYRUVYL OR ENOLPYRUYL OR ENOLPYRUVOYL)(W)(PHOSPHOSHIKI
                 MATE OR PHOSPHOSHIKIMIC OR ENOLPYRUVYLSHIKIMATEPHOSPHATE)(2W)(S
                 YNTHASE OR SYNTHETASE)
L89         1075 SEA (ENOL(W)PYRUVOYLSHIKIMATE OR ENOLPYRUVYLSHIKIMATE OR
                 ENOLPYRUVYLSHIKIMIC OR ENOL(W)(PYRUVYL OR PYRUVOYL)(W)SHIKIMATE
                 )(3W)PHOSPHATE(W)(SYNTHASE OR SYNTHETASE)
L90           83 SEA (PHOSPHOSHIKIMATE(2W)CARBOXYVINYLTRANSFERASE OR PHOSPHOSHIK
                 IMATE(2W)CARBOXYVINYL(W)TRANSFERASE OR ENOLPYRUVOYL(W)SHIKIMIC(
                 3W)PHOSPHOSYNTHASE)
L91        74620 SEA ((DOUBL# OR DOBL#)(W)(MUTANT# OR MUTAT?) OR 2M)
L92           40 SEA L86 OR (((L87 OR L88 OR L89 OR L90))(S)L91)
L93            4 SEA HPPDW336 OR HPPD(W)W336 OR HPPD(W)W(W)336 OR HPPDW(W)336
L94          206 SEA ((HYDROXYPHENYLPYRUVATE OR HYDROXY(W)PHENYLPYRUVATE OR
                 HYDROXYPHENYL(W)PYRUVATE OR HYDROXY(W)PHENYL(W)PYRUVATE)(W)(DEH
                 YDROGENASE OR DIOXYGENASE) OR HPPD)(S)(MODIF? OR MUTANT# OR
                 MUTAT?)
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L95         206 SEA (L93 OR L94)
L96         243 SEA L92 OR L95
L97       29154 SEA (HERBICID? OR HPPD(W)INHIBITOR# OR ISOXAFLUTOLE# OR
                DIKETONITRILE# OR PYRAZOLONE# OR TRIKETONE# OR GL!PHOSATE# OR
                GL!FOSATE# OR G360 OR G(W)360 OR ROUNDUP? OR ROUND(W)UP?)(5A)(R
                ESIST? OR TOLERAN? OR PROTECT?)
L98      411020 SEA SOY OR SOYA OR SOJA OR SOYBEAN# OR SOYABEAN# OR SOJABEAN#
                OR GLYCINE(W)MAX OR G(W)MAX
L99      692230 SEA GMO OR GMOS OR LMO OR LMOS OR GM OR GE OR TRANSGEN? OR
                (GENETIC?(3A)(MODIF? OR TRANSFORM? OR MANIPULAT? OR IMPROV? OR
                ENGINEER?))
L100       6340 SEA L97 AND L98 AND L99
L101       6494 SEA L84 OR L85 OR L96 OR L100
L102       1577 SEA L101 AND PY>=2019
L103        502 SEA L102 AND UP>=20201001 AND UP<=20210930
L104         58 SEA L103 NOT P/DT
L105          0 SEA L103 AND (P/DT AND J/DT)
L106         58 SEA L104 OR L105

     FILE 'MEDLINE, BIOSIS, AGRICOLA, CABA, HCAPLUS' ENTERED AT 10:22:56 ON 06
     OCT 2021
L107        177 DUP REM L20 L40 L60 L83 L106 (60 DUPLICATES REMOVED)
                    ANSWERS '1-34' FROM FILE MEDLINE
                    ANSWERS '35-64' FROM FILE BIOSIS
                    ANSWERS '65-92' FROM FILE AGRICOLA
                    ANSWERS '93-144' FROM FILE CABA
                    ANSWERS '145-177' FROM FILE HCAPLUS
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