

Title

**Summary of the Literature Review for FG72 x A5547-127 Soybean
July 1, 2022 – June 30, 2023**

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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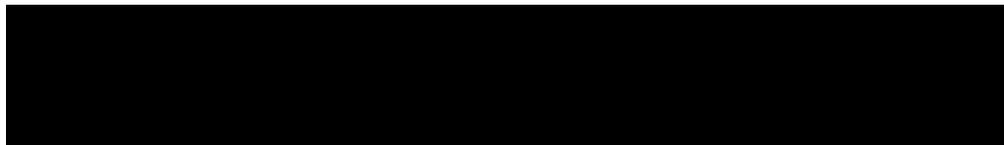
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SUMMARY

FG72 x A5547-127 is a genetically modified (GM) soybean designed to provide new options for weed control in the crop. FG72 x A5547-127 soybean was obtained by traditional breeding of two parental lines—one derived from FG72 and one derived from A5547-127. FG72 soybean expresses the 5-enolpyruvylshikimate-3-phosphate synthase protein (2mEPSPS) as well as the 4-hydroxyphenylpyruvate dioxygenase protein (HPPD W336), which confer tolerance to glyphosate and HPPD inhibitors such as isoxaflutole herbicides, respectively. A5547-127 soybean expresses the phosphinothricin acetyltransferase (PAT/pat) protein, which confers tolerance to glufosinate herbicides. FG72 x A5547-127 expresses all three proteins conferring tolerance to all three herbicides. The OECD identifier is MST-FGØ72-2 x ACS-GMØØ6-4.

A scoping review was performed for the FG72 x A5547-127 Soybean and its newly expressed proteins, 2mEPSPS, HPPD W336 and PAT/pat. The objective of this scoping review was to determine if there were studies about the molecular characterization of FG72 x A5547-127 Soybean, its effect on food and feed safety or environmental safety, that might require in-depth examination. A set of broad literature searches was performed using several bibliographic databases covering scientific literature from July 1, 2022 to June 30, 2023. 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 123 unique publications, which were subject to rapid assessment to exclude obviously irrelevant publications. A total of 8 publications were progressed for detailed assessment.

No new relevant publications were found that contained new data on the molecular characterization of the FG72 x A5547-127 soybean and its newly expressed proteins, 2mEPSPS, HPPD W336 and PAT/pat. Similarly, no new publications were found that suggested any potential adverse effects of FG72 x A5547-127 soybean on human health, animal health, or the environment. No issues or topics were identified that would warrant conducting a systematic review.

1. INTRODUCTION

FG72 x A5547-127 is a genetically modified (GM) soybean designed to provide new options for weed control in the crop. FG72 x A5547-127 soybean was obtained by traditional breeding of two parental lines—one derived from FG72 and one derived from A5547-127. FG72 soybean expresses the 5-enolpyruvylshikimate-3-phosphate synthase protein (2mEPSPS) as well as the 4-hydroxyphenylpyruvate dioxygenase protein (HPPD W336), which confer tolerance to glyphosate and HPPD inhibitors such as isoxaflutole herbicides, respectively. A5547-127 soybean expresses the phosphinothricin acetyltransferase (PAT/pat) protein, which confers tolerance to glufosinate herbicides. FG72 x A5547-127 expresses all three proteins conferring tolerance to all three herbicides. The OECD identifier is MST-FGØ72-2 x ACS-GMØØ6-4.

The objective of the literature searches described here was to determine if there were publications published between July 1, 2022 and June 30, 2023 that mention the molecular characterization of the FG72 x A5547-127 Soybean, and/or any adverse effect of FG72 x A5547-127 Soybean 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 FG72 x A5547-127 Soybean and its newly expressed proteins, 2mEPSPS, HPPD W336 and PAT/pat. The search terms also included relevant synonyms, the trade name and intended trait. When needed, plant species and general GMO terms were used to limit the search results (described in section 3.3).

2. OVERALL METHODS

2.1. Objective of the scoping review

The objective of the scoping review was to survey the evidence base for the FG72 x A5547-127 Soybean and its newly expressed proteins, 2mEPSPS, HPPD W336 and PAT/pat, 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 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 note¹.

Question 1: Were any studies published during the reporting period that describe adverse effects on human or animal health or the environment of the FG72 x A5547-127 Soybean and its newly expressed proteins 2mEPSPS, HPPD W336 and PAT/pat?

Key elements:

Population: Human health; animal health; environmental safety

Exposure: FG72 x A5547-127 Soybean, derived food/feed products, newly expressed proteins in FG72 x A5547-127 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 the FG72 x A5547-127 Soybean and its newly expressed proteins 2mEPSPS, HPPD W336 and PAT/pat in soybean?

Key elements:

Population: FG72 x A5547-127 Soybean and newly expressed proteins in FG72 x A5547-127 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 note¹ 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

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
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

Concepts	Criteria	Comment
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 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 related to FG72 x A5547-127 soybean were previously identified and used to test and validate the search strategy:

- 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-FGO72-2 soybean. Regulatory toxicology and pharmacology 97:170-185
- Naegeli, H.; Bresson, J. L.; Dalmay, T.; Dewhurst, I. C.; Epstein, 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.; Dumont, A. F.; Papadopoulou, N.; Ardizzone, M.; Devos, Y.; Gennaro, A.; Gomez, J. A. R.; Lanzoni, A.; Neri, F. M.; Paraskevopoulos, K. (2019). Assessment of genetically modified soybean MON 87708 x MON 89788 x A5547-127, for food and feed uses, under regulation (EC) no 1829/2003 (application EFSA-GMO-NL-2016-135). EFSA Journal 17(7):e05733

These two articles are not directly relevant to FG72 x A5547-127 soybean, but they were selected because they mention the event names (FG72 and A5547-127), one of the newly expressed proteins (HPPD W336), the intended traits (herbicide resistance) and the crop (soybean). Since these references were published outside the searched time, the profile was tested without applying the time limits used in the final search profile (UP>=20220701 and UP<=20230630).

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 activities¹.

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 August 15, 2023. Only documents updated between July 1, 2022 and June 30, 2023, 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 stack 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 as well as a 'plant species' profile. The reference publication ([Section 2.4](#)) was identified by the search profiles, confirming the validity of the applied search strategy. See [Table 2](#) for a detailed search profile.

Table 2: Search profile for database search

Set	Search string	Concepts
1	FG72 or MST(w)FG072 or MST(w)FG072 or or MST(w)FG072x or MST(w)FG072x	Event FG72
2	LL55 or A5547(w)127 or A(w)5547(w)127 or ACS-GM006-4 or ACS-GMO06-4 or ACSGM006(w)4 or ACSGM006(w)4 or xA5547(w)127 or xA(w)5547(w)127 or xACS-GM006-4 or xACS-GMO06-4 or xACSGM006(w)4 or xACSGMO06(w)4	Event A5547-127
3	FG72? or ?FG72 or LL55? or ?LL55 or FG72.time#.LL55 or MST(w)FG072-3xA5547(w)12 or MSTFG072-3xA5547(w)12 or MST(w)FG072-3xA(w)5547(w)12 or MSTFG072-3xA(w)5547(w)12	Event FG72 x A5547-127
4	(1 and 2) or 3	Event all
5	GT27 or GT27TM	Trade name FG72

6	libertylink? or liberty(w)link or liberty(w)linktm or liberty(w)linkrtm or LL or LLTM or LLRTM	Trade name A5547-127
7	5 and 6	Trade name all
8	((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 ENOLPYRUVYOYLSHIKAMATE or ENOYLPYRUVYOYLSHIKIMATE 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)PYRUVYOYLSHIKIMATE OR ENOLPYRUVYLSHIKIMATE OR ENOLPYRUVYLSHIKIMIC OR ENOL(W)(PYRUVYL OR PYRUVOYL)(W)SHIKIMATE)(3W)PHOSPHATE(W)(SYNTHASE OR SYNTHETASE) or (PHOSPHOSHIKIMATE(2W)CARBOXYVINYLTRANSFERASE OR 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?))	Newly expressed proteins FG72
9	((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 or phosphinothricin(w)n(w)acetyltransferase or phosphinothricin(2w)acetyltransferase or phosphinothricin(2w)acetyl(w)transferase or phosphinothricinacetyl(w)transferase	Newly expressed protein A5547-127
10	8 and 9	Newly expressed proteins all
11	(herbicid? or HPPD(w)inhibitor# or isoxaflutole# or diketonitrile# or pyrazolone# or triketone# or GLIPHOSATE# or GLIFOSATE# OR G360 or g(w)360 or roundup? or round(w)up?)(5a)(resist? or toleran? or protect?)	Intended trait FG72
12	(herbicid? or bialaphos or basta or glufosinate or phosphinothricin or liberty?)(5a)(resist? or toleran? or protect?)	Intended trait A5547-127
13	11 and 12	Intended trait all
14	soy or soya or soja or soybean# or soyabean# or sojabean# or glycine(w)max or g(w)max	Plant species

15	GMO OR GMOs OR LMO OR LMOs OR GM OR GE OR transgen? OR (genetic?(3w)(modif? OR transform? OR manipul? OR improv? OR engineer?)) or (stacked(w)(gene# or trait# or event#))	GMO general
16	13 and 14 and 15	Intended trait AND Plant species AND GMO general
17	4 or 7 or 10 or 16	Event name all OR Trade name all OR Newly expressed proteins all OR (Intended traits all 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"

Database	Event	New proteins	Intended traits	Plant species	GM 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 July 1, 2022 and June 30, 2023 (UP>=20220701 and UP<=20230630), 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	CABA	CA-Plus	Medline
Database Provider	STN International				
Coverage	1970-present	1926-present	1973-present	1907-present	1946-present
Date of search	15 Aug 2023				
Datespan of the search	1 Jul 2022 – 30 Jun 2023				
Latest database update	10 Aug 2023	9 Aug 2023	14 Aug 2023	14 Aug 2023	14 Aug 2023
Number of records retrieved	7	22	57	39	21
Number of records after duplicate removal	7	20	48	27	21
Number of relevant records after rapid assessment	0	1	6	1	0

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: July 1, 2022 to June 30, 2023) 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 5](#). All web pages searched were justified by their recommendation in the EFSA 2019 explanatory note¹. Of the 13 key organisations cited in the EFSA 2019 explanatory note¹, 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 the FG72 x A5547-127 soybean does not contain an insect-resistant trait. The USDA, FDA, CFIA, Health Canada, FSANZ and MAFF websites were excluded, since these agencies do not regulate GM stacked products obtained by conventional breeding techniques. The GEAC website was excluded, since this agency has only regulated GM cotton products. Therefore, the internet search was limited to 3 key organisations relevant for FG72 x A5547-127 Soybean. Search terms consisted of FG72 x A5547-127 or MST-FGØ72-2xACS-GMØØ6-4 or 2mEPSPS or double mutant 5-enolpyruvyl shikimate-3-phosphate synthase enzyme or HPPD W336 or modified-hydroxyphenylpyruvate dioxygenase or PAT/pat or Phosphinothricin in FG72 x A5547-127 soybean (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
Office of the Gene Technology Regulator (OGTR) Australia	http://www.ogtr.gov.au/	06/04/2023	10/07/2023	0
National Technical Commission on Biosafety (CTNBio) Brazil	http://ctnbio.mcti.gov.br/en	24/07/2023	7/17/2023 to 7/24/2023	0
National Advisory Commission on Agricultural Biotechnology (CONABIA) Argentina	https://www.argentina.gob.ar/agroindustria/bioeconomia/biotecnologia	17/07/2023	17/07/2023	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 July 1, 2022 and June 30, 2023. 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	Bhattacharjee S, Bhowmick R, Kant L, Paul K. 2023	Strategic transgene-free approaches of CRISPR-based genome editing in plants.	Mol Genet Genomics. 2023 May;298(3):507-520	0
2	Cermakova E, Lencova S, Mukherjee S, Horka P, Vobruba S, Demnerova K, Zdenkova K. 2023	Identification of Fish Species and Targeted Genetic Modifications Based on DNA Analysis: State of the Art.	Foods. 2023 Jan 3;12(1):228.	0
3	Connolly JB, Romeis J, Devos Y, Glandorf DCM, Turner G, Coulibaly MB. 2023	Gene drive in species complexes: defining target organisms.	Trends Biotechnol. 2023 Feb;41(2):154-164.	0
4	Eckerstorfer MF, Dolezel M, Engelhard M, Giovannelli V, Grabowski M, Heissenberger A, Lener M, Reichenbecher W, Simon S, Staiano G, Wüst Saucy AG, Zünd J, Lüthi C. 2023	Recommendations for the Assessment of Potential Environmental Effects of Genome-Editing Applications in Plants in the EU.	Plants (Basel). 2023 Apr 25;12(9):1764.	0
5	Ghidoli M, Ponzoni E, Araniti F, Miglio D, Piliu R. 2023	Genetic Improvement of <i>Camelina sativa</i> (L.) Crantz: Opportunities and Challenges.	Plants (Basel). 2023 Jan 27;12(3):570.	0
6	Krasnodębski C, Sawuła A, Kaźmierczak U, Żuk M. 2023	Oligo-Not Only for Silencing: Overlooked Potential for Multidirectional Action in Plants.	Int J Mol Sci. 2023 Feb 24;24(5):4466.	0
7	Křížkovská B, Viktorová J, Lipov J. 2022	Approved Genetically Modified Potatoes (<i>Solanum tuberosum</i>) for Improved Stress Resistance and Food Safety.	J Agric Food Chem. 2022 Sep 28;70(38):11833-11843.	0
8	Liang J, Yang X, Jiao Y, Wang D, Zhao Q, Sun Y, Li Y, Wu K. 2022	The evolution of China's regulation of agricultural biotechnology.	aBIOTECH. 2022 Dec 5;3(4):237-249.	0
9	Platani M, Sokefun O, Bassil E, Apidianakis Y. 2023	Genetic engineering and genome editing in plants, animals, and humans: Facts and myths. Gene.	2023 Mar 10; 856:147141.	0
10	Pott A, Bundschuh M, Otto M, Schulz R. 2023	Assessing Effects of Genetically Modified Plant Material on the Aquatic Environment Using higher-tier Studies.	Bull Environ Contam Toxicol. 2023 Jan 2;110(1):35.	0
11	Rai GK, Kumar P, Choudhary SM, Kosser R, Khanday DM, Choudhary S, Kumar B, Magotra I, Kumar RR, Ram C.	Biomimetic Strategies for Developing Abiotic Stress-Tolerant Tomato Cultivars:	An Overview. Plants (Basel). 2022 Dec 23;12(1):86	0

No	Author(s) and Year	Title	Source	Number of relevant bibliographic references retrieved
	Rouphael Y, Corrado G, Behera TK. 2022			
12	Rozas P, Kessi-Pérez EI, Martínez C. 2022	Genetically modified organisms: adapting regulatory frameworks for evolving genome editing technologies.	Biol Res. 2022 Oct 20;55(1):31.	0
13	Spök A, Sprink T, Allan AC, Yamaguchi T, Dayé C. 2022	Towards social acceptability of genome-edited plants in industrialised countries? Emerging evidence from Europe, United States, Canada, Australia, New Zealand, and Japan.	Front Genome Ed. 2022 Aug 31;4:899331.	0
14	Tatineni S, Hein GL. 2023	Plant Viruses of Agricultural Importance: Current and Future Perspectives of Virus Disease Management Strategies.	Phytopathology. 2023 Feb;113(2):117-141.	0
15	Tripathi S, Purchase D, Chandra R, Nadda AK, Bhargava PC. 2022	Mitigation of hazards and risks of emerging pollutants through innovative treatment techniques of post methanated distillery effluent - A review.	Chemosphere. 2022 Aug;300:134586. doi: 10.1016/j.chemosphere.2022.134586.	0
16	Wang M, Wang H, Li K, Li X, Wang X, Wang Z. 2023	Review of CRISPR/Cas Systems on Detection of Nucleotide Sequences.	Foods. 2023 Jan 19;12(3):477.	0
17	Zimny T. 2023	Regulation of GMO field trials in the EU and new genomic techniques: will the planned reform facilitate experimenting with gene-edited plants?	BioTechnologia (Pozn). 2023 Mar 27;104(1):75-83.	0

5. RESULTS OF THE STUDY IDENTIFICATION AND SELECTION PROCESS

The database searches (Section 3) identified a total of 146 references, which were reduced to 123 references 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 persisted, the publication under discussion was transferred to Stage 2 for detailed evaluation by the experts. In this search, both evaluators were in 100 % agreement.

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 tolerant 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 reviewers within each area, the initial reviewers discussed the discrepancy as necessary and consulted additional reviewers to resolve the discrepancy if needed.

In the relevance assessment of the literature review for the FG72 x A5547-127 Soybean, reviewers agreed in 100% of the Stage 2 evaluations.

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)	123
Number of publications excluded from the search results after rapid assessment for relevance (Stage 1)	115
Total number of full-text documents assessed in detail	8
Number of publications excluded from further consideration after detailed assessment for relevance (Stage 2)	8
Total number of unobtainable/unclear publications	0
Total number of relevant publications	0

Table 8 lists the publications determined to be relevant 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
Mullins, E., Bresson, J. L., Dalmay, T., Dewhurst, I. C., Epstein, M. M., Firbank, L. G., Guerche, P., Hejatkó, J., Moreno, F. J., Naegeli, H., Nogue, F., Rostoks, N., Serrano, J. J. S., Savoini, G., Veromann, E., Veronesi, F., Ardizzone, M., Fernandez, A., Kagkli, D. M., Lewandowska, A., Raffaello, T., Streissl, F. 2022	Assessment of genetically modified soybean A5547-127 for renewal authorisation under Regulation (EC) No 1829/2003 (application EFSA-GMO -RX-020).	EFSA Journal (2022), Volume 20, Number 6, 12 refs. ISSN: 1831-4732 DOI: https://doi.org/10.2903/j.efsa.2022.7340 Published by: Wiley, Oxford	EFSA evaluation of A5547-127. Single events are not considered relevant for stacked events.
Sieradzki, Z. Mazur, M. Krol, B. Kwiatek, K. 2021	Prevalence of genetically modified soybean in animal feedingstuffs in Poland.	Journal of Veterinary Research (2021), Volume 65, Number 1, pp. 93-99, 32 refs. ISSN: 2450-7393; 2450-8608 DOI: https://doi.org/10.2478/jvetres-2021-0012 Published by: Sciendo, Warsaw	The paper pertains to the prevalence and labeling of GM soybean. There is no relevant information for a safety assessment.

Study (Author(s) and year)	Title	Source	Reason(s) for exclusion based on eligibility/inclusion criteria listed in Table 1
Lee, S. Moschini, G. Perry, E. D. 2023	Genetically engineered varieties and applied pesticide toxicity in U.S. maize and soybeans : heterogeneous and evolving impacts.	Ecological Economics (2023), Volume 211, 59 refs. ISSN: 0921-8009; 1873-6106 DOI: https://doi.org/10.1016/j.ecolecon.2023.107873 Published by: Elsevier Ltd, Oxford	The authors analyzed applied pesticide toxicity using farm-level fixed effects models, estimated with rich plot-level data on >200,000 seed and pesticide choices by U.S. maize and soybean farmers during the 1998–2016 period. There is no primary data and no information related to FG72 x A5547-127 soybean.
Sharkey, S. M. Williams, B. J. Parker, K. M. 2021	Herbicide drift from genetically engineered herbicide -tolerant crops.	Environmental Science + Technology (2021), Volume 55, Number 23, pp. 15559-15568, 107 refs. ISSN: 0013-936X; 1520-5851 DOI: https://doi.org/10.1021/acs.est.1c01906 Published by: American Chemical Society, Washington	The paper focus on herbicide drift and the impacts of dicamba and 2,4-D to non-target vegetation in herbicide tolerant traits. There is no data related to the safety assessment of FG72 x A5547-127.
Yook MinJung, Park HaeRim, Zhang ChuanJie, Lim SooHyun, Jeong SoonChun, Chung YoungSoo, Kim DoSoon, Yook, M. J., Park, H. R., Zhang, C. J., Lim, S. H., Jeong, S. C., Chung, Y. S., Kim, do S. 2021	Environmental risk assessment of glufosinate -resistant soybean by pollen-mediated gene flow under field conditions in the region of the genetic origin.	Science of the Total Environment (2021), Volume 762 ISSN: 0048-9697 DOI: https://doi.org/10.1016/j.scitotenv.2020.143073 Published by: Elsevier Ltd, Oxford	FG72 x A5547-127 soybean was not considered in this publication.
Liu, Laipan Zhang, Li Fu, Jianmei Shen, Wenjing Fang, Zhixiang Dai, Ying Jia, Ruizong Liu, Biao Liang, Jingang 2022	Fitness and Ecological Risk of Hybrid Progenies of Wild and Herbicide -Tolerant Soybeans With EPSPS Gene.	Frontiers in Plant Science, (JUN 9 2022) Vol. 13, pp. Article No.: 922215. http://www.frontiersin.org/Plant_Science . ISSN: 1664-462X. E-ISSN: 1664-462X.	FG72 x A5547-127 soybean was not considered in this publication.

Study (Author(s) and year)	Title	Source	Reason(s) for exclusion based on eligibility/inclusion criteria listed in Table 1
Liang, Rong Ji, Xueqin Sheng, Zewen Liu, Jinyue Qiang, Sheng Song, Xiaoling 2022	Fitness and Rhizobacteria of F2, F3 Hybrids of Herbicide - Tolerant Transgenic Soybean and Wild Soybean	Plants (2022), 11(22), 3184 CODEN: PLANCD; ISSN: 2223-7747 URL: https://www.mdpi.com/journal/plants	FG72 x A5547-127 soybean was not considered in this publication.
Liu JinYue, Sheng ZeWen, Hu YuQi, Liu Qi, Qiang Sheng, Song XiaoLing, Liu Biao, Liu, J. Y., Sheng, Z. W., Hu, Y. Q., Liu, Q., Qiang, S., Song, X. L., Liu, B. 2021	Fitness of F1 hybrids between 10 maternal wild soybean populations and transgenic soybean .	Transgenic Research (2021), Volume 30, Number 1, pp. 105-119, many ref. ISSN: 0962-8819; 1573-9368 DOI: https://doi.org/10.1007/s11248-020-00230-x Published by: Springer, Dordrecht	FG72 x A5547-127 soybean was not considered in this publication.

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 8 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 no publications were relevant for the safety assessment of the FG72 x A5547-127 Soybean and its newly expressed proteins, 2mEPSPS, HPPD W336 and PAT/pat.

Table 11 lists the relevant publication along with a summary of any adverse effects reported.

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

7. CONCLUSION

The literature searches performed for the FG72 x A5547-127 Soybean and its newly expressed proteins, 2mEPSPS, HPPD W336 and PAT/pat, for the period from July 1, 2022 to June 30, 2023, identified a total of 123 unique publications (after duplicate removal). A total of 8 publication(s) were progressed for detailed assessment after excluding 115 obviously irrelevant publications during Stage 1 evaluation (rapid assessment based on title and abstract).

The 8 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 new relevant publications were found that contained new data on the molecular characterization of the FG72 x A5547-127 soybean and its newly expressed proteins, 2mEPSPS, HPPD W336 and PAT/pat. Similarly, no new publications were found that suggested any potential adverse effects of FG72 x A5547-127 soybean on human health, animal health, or the environment. No issues or topics were identified that would warrant conducting a systematic review.

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	<p>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.</p> <p>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.</p>
STN	BIOSIS	<p>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.</p> <p>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.</p> <p>Bibliographic information, indexing terms, abstracts, and CAS Registry Numbers are all searchable.</p>
STN	CABA/CAB	<p>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.</p> <p>Sources for CABA include journals, books, reports, published theses, conference proceedings, and patents.</p> <p>Bibliographic information, indexing terms, abstracts, and CAS Registry Numbers are searchable.</p>
STN	CAS/CAPLUS	<p>The Chemical Abstracts (CA) database covers all areas of Biochemistry, Chemistry and Chemical engineering, and related sciences.</p> <p>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.</p> <p>Bibliographic terms, indexing terms, roles, CAS Registry Numbers, International Patent Classification, and abstracts are searchable.</p>

Host	File	Description
STN	MEDLINE	<p>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.</p> <p>Sources include journals and chapters in books or symposia. Bibliographic information, indexing terms, abstracts, chemical names, and CAS Registry Numbers are all searchable.</p> <p>Online thesauri are available for the Medical Subject Headings (/MN), Controlled Terms (/CT) and Chemical Name (/CN) fields.</p>

Appendix 2: Search history

FILE 'MEDLINE' ENTERED AT 09:44:03 ON 15 AUG 2023

L1 6 SEA FG72 OR MST(W)FG072 OR MST(W)FGO72 OR MST(W)FG072X OR
MST(W)FGO72X

L2 8 SEA LL55 OR A5547(W)127 OR A(W)5547(W)127 OR ACS-GM006-4 OR
ACS-GMO06-4 OR ACSGM006(W)4 OR ACSGMO06(W)4

L3 0 SEA XA5547(W)127 OR XA(W)5547(W)127 OR XACS-GM006-4 OR
XACS-GMO06-4 OR XACSGM006(W)4 OR XACSGMO06(W)4

L4 10 SEA FG72? OR ?FG72 OR LL55? OR ?LL55 OR FG72.TIME#.LL55 OR
MST(W)FG072-3XA5547(W)12 OR MSTFG072-3XA5547(W)12 OR MST(W)FG07
2-3XA(W)5547(W)12 OR MSTFG072-3XA(W)5547(W)12

L5 10 SEA (L1 AND (L2 OR L3)) OR L4

L6 0 SEA (GT27 OR GT27TM) AND (LIBERTYLINK? OR LIBERTY(W)LINK OR
LIBERTY(W)LINKTM OR LIBERTY(W)LINKRTM OR LL OR LLTM OR LLRTM)

L7 14 SEA 2MEPSPS OR 2(W)MEPSPS OR 2M(W)EPSPS OR 2(W)M(W)EPSPS

L8 4351 SEA EPSPS OR EPSP(W)SYNTHASE OR (ENOL(W)PYRUVYLSHIKIMATE OR
ENOL(W)PYRUVYL(W)SHIKIMATE OR ENOLPYRUVYLSHIKIMATE OR ENOLPYRUV
OYLSHIKAMATE OR ENOYLPYRUVYOYLSHIKIMATE OR ENOLPYRUVYLSHIKIMIC) (4
W) (PHOSPHATE OR PHOSPHORIC) (2W) (SYNTHASE OR SYNTHETASE)

L9 0 SEA (ENOLPYRUVYL OR ENOLPYRUYL OR ENOLPYRUVOYL) (W) (PHOSPHOSHIKI
MATE OR PHOSPHOSHIKIMIC OR ENOLPYRUVYLSHIKIMATEPHOSPHATE) (2W) (S
YNTHASE OR SYNTHETASE)

L10 422 SEA (ENOL(W)PYRUVYOYLSHIKIMATE OR ENOLPYRUVYLSHIKIMATE OR
ENOLPYRUVYLSHIKIMIC OR ENOL(W) (PYRUVYL OR PYRUVOYL) (W)SHIKIMATE
) (3W)PHOSPHATE(W) (SYNTHASE OR SYNTHETASE)

L11 514 SEA (PHOSPHOSHIKIMATE(2W)CARBOXYVINYLTRANSFERASE OR PHOSPHOSHIK
IMATE(2W)CARBOXYVINYL(W)TRANSFERASE OR ENOLPYRUVOYL(W)SHIKIMIC (3
W)PHOSPHOSYNTHASE)

L12 25956 SEA ((DOUBL# OR DOBL#) (W) (MUTANT# OR MUTAT?) OR 2M)

L13 21 SEA L7 OR ((L8 OR L9 OR L10 OR L11)) (S)L12)

L14 5 SEA HPPDW336 OR HPPD(W)W336 OR HPPD(W)W(W)336 OR HPPDW(W)336

L15 47 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?)

L16 48 SEA (L14 OR L15)

L17 66 SEA L13 OR L16

L18 1593 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

L19 208 SEA PHOSPHINOTHRICIN(W)N(W)ACETYLTRANSFERASE OR PHOSPHINOTHRICI
N(2W)ACETYLTRANSFERASE OR PHOSPHINOTHRICIN(2W)ACETYL(W)TRANSFER
ASE OR PHOSPHINOTHRICINACETYL(W)TRANSFERASE

L20 1668 SEA (L18 OR L19)

L21 8 SEA L17 AND L20

L22 4062 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?)

L23 3837 SEA (HERBICID? OR BIALAPHOS OR BASTA OR GLUFOSINATE OR
PHOSPHINOTHRICIN OR LIBERTY?) (5A) (RESIST? OR TOLERAN? OR
PROTECT?)

L24 3548 SEA L22 AND L23

L25 74382 SEA SOY OR SOYA OR SOJA OR SOYBEAN# OR SOYABEAN# OR SOJABEAN#
OR GLYCINE(W)MAX OR G(W)MAX

L26 4187458 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#))

L27 271 SEA L24 AND L25 AND L26

L28 282 SEA L5 OR L6 OR L21 OR L27

L29 45 SEA L28 AND PY>=2021

L30 21 SEA L29 AND UP>=20220701 AND UP<=20230630

FILE 'BIOSIS' ENTERED AT 09:44:13 ON 15 AUG 2023

L31 6 SEA FG72 OR MST(W)FG072 OR MST(W)FG072 OR MST(W)FG072X OR
MST(W)FG072X

L32 16 SEA LL55 OR A5547(W)127 OR A(W)5547(W)127 OR ACS-GM006-4 OR
ACS-GM006-4 OR ACSGM006(W)4 OR ACSGM006(W)4

L33 0 SEA XA5547(W)127 OR XA(W)5547(W)127 OR XACS-GM006-4 OR
XACS-GM006-4 OR XACSGM006(W)4 OR XACSGM006(W)4

L34 13 SEA FG72? OR ?FG72 OR LL55? OR ?LL55 OR FG72.TIME#.LL55 OR
MST(W)FG072-3XA5547(W)12 OR MSTFG072-3XA5547(W)12 OR MST(W)FG07
2-3XA(W)5547(W)12 OR MSTFG072-3XA(W)5547(W)12

L35 13 SEA (L31 AND (L32 OR L33)) OR L34

L36 0 SEA (GT27 OR GT27TM) AND (LIBERTYLINK? OR LIBERTY(W)LINK OR
LIBERTY(W)LINKTM OR LIBERTY(W)LINKRTM OR LL OR LLTM OR LLRTM)

L37 12 SEA 2MEPSPS OR 2(W)MEPSPS OR 2M(W)EPSFS OR 2(W)M(W)EPSFS

L38 5185 SEA EPSPS OR EPSP(W)SYNTHASE OR (ENOL(W)PYRUVYLSHIKIMATE OR
ENOL(W)PYRUVYL(W)SHIKIMATE OR ENOLPYRUVYLSHIKIMATE OR ENOLPYRUV
OYLSHIKIMATE OR ENOYLPYRUVOYLSHIKIMATE OR ENOLPYRUVYLSHIKIMIC) (4
W) (PHOSPHATE OR PHOSPHORIC) (2W) (SYNTHASE OR SYNTHETASE)

L39 0 SEA (ENOLPYRUVYL OR ENOLPYRUYL OR ENOLPYRUVOYL) (W) (PHOSPHOSHIKI
MATE OR PHOSPHOSHIKIMIC OR ENOLPYRUVYLSHIKIMATEPHOSPHATE) (2W) (S
YNTHASE OR SYNTHETASE)

L40 767 SEA (ENOL(W)PYRUVOYLSHIKIMATE OR ENOLPYRUVYLSHIKIMATE OR
ENOLPYRUVYLSHIKIMIC OR ENOL(W) (PYRUVYL OR PYRUVOYL) (W)SHIKIMATE
) (3W) PHOSPHATE (W) (SYNTHASE OR SYNTHETASE)

L41 29 SEA (PHOSPHOSHIKIMATE (2W) CARBOXYVINYLTRANSFERASE OR PHOSPHOSHIK
IMATE (2W) CARBOXYVINYL (W) TRANSFERASE OR ENOLPYRUVOYL (W) SHIKIMIC (3
W) PHOSPHOSYNTHASE)

L42 28161 SEA ((DOUBL# OR DOBL#) (W) (MUTANT# OR MUTAT?) OR 2M)

L43 21 SEA L37 OR ((L38 OR L39 OR L40 OR L41)) (S)L42)

L44 3 SEA HPPDW336 OR HPPD(W)W336 OR HPPD(W)W(W)336 OR HPPDW(W)336

L45 69 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?)

L46 69 SEA (L44 OR L45)

L47 89 SEA L43 OR L46

L48 2994 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

L49 338 SEA PHOSPHINOTHRICIN (W) N (W) ACETYLTRANSFERASE OR PHOSPHINOTHRICI
N (2W) ACETYLTRANSFERASE OR PHOSPHINOTHRICIN (2W) ACETYL (W) TRANSFER
ASE OR PHOSPHINOTHRICINACETYL (W) TRANSFERASE

L50 3101 SEA (L48 OR L49)

L51 8 SEA L47 AND L50

L52 11951 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?)

L53 10645 SEA (HERBICID? OR BIALAPHOS OR BASTA OR GLUFOSINATE OR
PHOSPHINOTHRICIN OR LIBERTY?) (5A) (RESIST? OR TOLERAN? OR
PROTECT?)

L54 10213 SEA L52 AND L53

L55 178977 SEA SOY OR SOYA OR SOJA OR SOYBEAN# OR SOYABEAN# OR SOJABEAN#
OR GLYCINE (W)MAX OR G(W)MAX

L56 474422 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#))

L57 430 SEA L54 AND L55 AND L56

L58 447 SEA L35 OR L36 OR L51 OR L57

L59 43 SEA L58 AND PY>=2021

L60 22 SEA L59 AND UP>=20220701 AND UP<=20230630

FILE 'AGRICOLA' ENTERED AT 09:44:23 ON 15 AUG 2023

L61 5 SEA FG72 OR MST(W)FG072 OR MST(W)FG072 OR MST(W)FG072X OR
MST(W)FG072X

L62 7 SEA LL55 OR A5547(W)127 OR A(W)5547(W)127 OR ACS-GM006-4 OR
ACS-GM006-4 OR ACSGM006(W)4 OR ACSGM006(W)4

L63 0 SEA XA5547(W)127 OR XA(W)5547(W)127 OR XACS-GM006-4 OR
XACS-GM006-4 OR XACSGM006(W)4 OR XACSGM006(W)4

L64 4 SEA FG72? OR ?FG72 OR LL55? OR ?LL55 OR FG72.TIME#.LL55 OR
MST(W)FG072-3XA5547(W)12 OR MSTFG072-3XA5547(W)12 OR MST(W)FG07
2-3XA(W)5547(W)12 OR MSTFG072-3XA(W)5547(W)12

L65 4 SEA (L61 AND (L62 OR L63)) OR L64

L66 0 SEA (GT27 OR GT27TM) AND (LIBERTYLINK? OR LIBERTY(W)LINK OR
LIBERTY(W)LINKTM OR LIBERTY(W)LINKRTM OR LL OR LLTM OR LLRTM)

L67 4 SEA 2MEPSPS OR 2(W)MEPSPS OR 2M(W)EPSPS OR 2(W)M(W)EPSPS

L68 742 SEA EPSPS OR EPSP(W)SYNTHASE OR (ENOL(W)PYRUVYLSHIKIMATE OR
ENOL(W)PYRUVYL(W)SHIKIMATE OR ENOLPYRUVYLSHIKIMATE OR ENOLPYRUV
OYLSHIKIMATE OR ENOYLPYRUVOYLSHIKIMATE OR ENOLPYRUVYLSHIKIMIC ((
4W) (PHOSPHATE OR PHOSPHORIC) (2W) (SYNTHASE OR SYNTHETASE)

L69 0 SEA (ENOLPYRUVYL OR ENOLPYRUYL OR ENOLPYRUVOYL) (W) (PHOSPHOSHIKI
MATE OR PHOSPHOSHIKIMIC OR ENOLPYRUVYLSHIKIMATEPHOSPHATE) (2W) (S
YNTHASE OR SYNTHETASE)

L70 337 SEA (ENOL(W)PYRUVOYLSHIKIMATE OR ENOLPYRUVYLSHIKIMATE OR
ENOLPYRUVYLSHIKIMIC OR ENOL(W) (PYRUVYL OR PYRUVOYL) (W) SHIKIMATE
) (3W) PHOSPHATE (W) (SYNTHASE OR SYNTHETASE)

L71 271 SEA (PHOSPHOSHIKIMATE (2W) CARBOXYVINYLTRANSFERASE OR PHOSPHOSHIK
IMATE (2W) CARBOXYVINYL (W) TRANSFERASE OR ENOLPYRUVOYL (W) SHIKIMIC ((
3W) PHOSPHOSYNTHASE)

L72 7076 SEA ((DOUBL# OR DOBL#) (W) (MUTANT# OR MUTAT?) OR 2M)

L73 10 SEA L67 OR ((L68 OR L69 OR L70 OR L71)) (S) L72)

L74 1 SEA HPPDW336 OR HPPD(W)W336 OR HPPD(W)W(W)336 OR HPPDW(W)336

L75 45 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?)

L76 45 SEA (L74 OR L75)

L77 55 SEA L73 OR L76

L78 830 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

L79 258 SEA PHOSPHINOTHRICIN (W) N (W) ACETYLTRANSFERASE OR PHOSPHINOTHRICI
N (2W) ACETYLTRANSFERASE OR PHOSPHINOTHRICIN (2W) ACETYL (W) TRANSFER
ASE OR PHOSPHINOTHRICINACETYL (W) TRANSFERASE

L80 912 SEA (L78 OR L79)

L81 5 SEA L77 AND L80

L82 9439 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?)

L83 8897 SEA (HERBICID? OR BIALAPHOS OR BASTA OR GLUFOSINATE OR
PHOSPHINOTHRICIN OR LIBERTY?) (5A) (RESIST? OR TOLERAN? OR
PROTECT?)

L84 8703 SEA L82 AND L83

L85 101081 SEA SOY OR SOYA OR SOJA OR SOYBEAN# OR SOYABEAN# OR SOJABEAN#
OR GLYCINE (W) MAX OR G (W) MAX

L86 111825 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#))

L87 405 SEA L84 AND L85 AND L86

L88 410 SEA L65 OR L66 OR L81 OR L87

L89 17 SEA L88 AND PY>=2021

L90 7 SEA L89 AND UP>=20220701 AND UP<=20230630

FILE 'CABA' ENTERED AT 03:44:31 ON 15 AUG 2023

L91 10 SEA FG72 OR MST(W)FG072 OR MST(W)FGO72 OR MST(W)FG072X OR
MST(W)FGO72X

L92 18 SEA LL55 OR A5547(W)127 OR A(W)5547(W)127 OR ACS-GM006-4 OR
ACS-GM006-4 OR ACSGM006(W)4 OR ACSGMO06(W)4

L93 0 SEA XA5547(W)127 OR XA(W)5547(W)127 OR XACS-GM006-4 OR
XACS-GM006-4 OR XACSGM006(W)4 OR XACSGMO06(W)4

L94 11 SEA FG72? OR ?FG72 OR LL55? OR ?LL55 OR FG72.TIME#.LL55 OR
MST(W)FG072-3XA5547(W)12 OR MSTFG072-3XA5547(W)12 OR MST(W)FG07
2-3XA(W)5547(W)12 OR MSTFG072-3XA(W)5547(W)12

L95 11 SEA (L91 AND (L92 OR L93)) OR L94

L96 2 SEA (GT27 OR GT27TM) AND (LIBERTYLINK? OR LIBERTY(W)LINK OR
LIBERTY(W)LINKTM OR LIBERTY(W)LINKRTM OR LL OR LLTM OR LLRTM)

L97 14 SEA 2MEPSPS OR 2(W)MEPSPS OR 2M(W)EPSPS OR 2(W)M(W)EPSPS

L98 1282 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)

L99 0 SEA (ENOLPYRUVYL OR ENOLPYRUYL OR ENOLPYRUVOYL) (W) (PHOSPHOSHIKI
MATE OR PHOSPHOSHIKIMIC OR ENOLPYRUVYLSHIKIMATEPHOSPHATE) (2W) (S
YNTHASE OR SYNTHETASE)

L100 480 SEA (ENOL(W)PYRUVOYLSHIKIMATE OR ENOLPYRUVYLSHIKIMATE OR
ENOLPYRUVYLSHIKIMIC OR ENOL(W) (PYRUVYL OR PYRUVOYL) (W)SHIKIMATE
) (3W)PHOSPHATE(W) (SYNTHASE OR SYNTHETASE)

L101 204 SEA (PHOSPHOSHIKIMATE(2W)CARBOXYVINYLTRANSFERASE OR PHOSPHOSHIK
IMATE(2W)CARBOXYVINYL(W)TRANSFERASE OR ENOLPYRUVOYL(W)SHIKIMIC(
3W)PHOSPHOSYNTHASE)

L102 7819 SEA ((DOUBL# OR DOBL#) (W) (MUTANT# OR MUTAT?) OR 2M)

L103 24 SEA L97 OR ((L98 OR L99 OR L100 OR L101)) (S)L102)

L104 4 SEA HPPDW336 OR HPPD(W)W336 OR HPPD(W)W(W)336 OR HPPD(W)336

L105 77 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?)

L106 77 SEA (L104 OR L105)

L107 98 SEA L103 OR L106

L108 1641 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

L109 387 SEA PHOSPHINOTHRICIN(W)N(W)ACETYLTRANSFERASE OR PHOSPHINOTHRICI
N(2W)ACETYLTRANSFERASE OR PHOSPHINOTHRICIN(2W)ACETYL(W)TRANSFER
ASE OR PHOSPHINOTHRICINACETYL(W)TRANSFERASE

L110 1747 SEA (L108 OR L109)

L111 10 SEA L107 AND L110

L112 20705 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?)

L113 19884 SEA (HERBICID? OR BIALAPHOS OR BASTA OR GLUFOSINATE OR
PHOSPHINOTHRICIN OR LIBERTY?) (5A) (RESIST? OR TOLERAN? OR
PROTECT?)

L114 19467 SEA L112 AND L113

L115 209971 SEA SOY OR SOYA OR SOJA OR SOYBEAN# OR SOYABEAN# OR SOJABEAN#
OR GLYCINE(W)MAX OR G(W)MAX

L116 202021 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#))

L117 829 SEA L114 AND L115 AND L116

L118 842 SEA L95 OR L96 OR L111 OR L117

L119 78 SEA L118 AND PY>=2021

L120 57 SEA L119 AND UP>=20220701 AND UP<=20230630

L121 57 SEA L120 NOT P/DT

L122 0 SEA L120 AND (P/DT AND J/DT)

L123 57 SEA L121 OR L122

FILE 'HCAPLUS' ENTERED AT 03:44:48 ON 15 AUG 2023

L124 18 SEA FG72 OR MST(W)FG072 OR MST(W)FGO72 OR MST(W)FG072X OR
MST(W)FGO72X

L125 27 SEA LL55 OR A5547(W)127 OR A(W)5547(W)127 OR ACS-GM006-4 OR
ACS-GMO06-4 OR ACSGM006(W)4 OR ACSGMO06(W)4

L126 0 SEA XA5547(W)127 OR XA(W)5547(W)127 OR XACS-GM006-4 OR
XACS-GMO06-4 OR XACSGM006(W)4 OR XACSGMO06(W)4

L127 29 SEA FG72? OR ?FG72 OR LL55? OR ?LL55 OR FG72.TIME#.LL55 OR
MST(W)FG072-3XA5547(W)12 OR MSTFG072-3XA5547(W)12 OR MST(W)FG07
2-3XA(W)5547(W)12 OR MSTFG072-3XA(W)5547(W)12

L128 31 SEA (L124 AND (L125 OR L126)) OR L127

L129 0 SEA (GT27 OR GT27TM) AND (LIBERTYLINK? OR LIBERTY(W)LINK OR
LIBERTY(W)LINKTM OR LIBERTY(W)LINKRTM OR LL OR LLTM OR LLRTM)

L130 31 SEA 2MEPSPS OR 2(W)MEPSPS OR 2M(W)EPSPS OR 2(W)M(W)EPSPS

L131 4638 SEA EPSPS OR EPSP(W)SYNTHASE OR (ENOL(W)PYRUVYLSHIKIMATE OR
ENOL(W)PYRUVYL(W)SHIKIMATE OR ENOLPYRUVYLSHIKIMATE OR ENOLPYRUV
OYLSHIKIMATE OR ENOYLPYRUVOYLSHIKIMATE OR ENOLPYRUVYLSHIKIMIC) (4
W) (PHOSPHATE OR PHOSPHORIC) (2W) (SYNTHASE OR SYNTHETASE)

L132 9 SEA (ENOLPYRUVYL OR ENOLPYRUYL OR ENOLPYRUVOYL) (W) (PHOSPHOSHIKI
MATE OR PHOSPHOSHIKIMIC OR ENOLPYRUVYLSHIKIMATEPHOSPHATE) (2W) (S
YNTHASE OR SYNTHETASE)

L133 1137 SEA (ENOL(W)PYRUVOYLSHIKIMATE OR ENOLPYRUVYLSHIKIMATE OR
ENOLPYRUVYLSHIKIMIC OR ENOL(W) (PYRUVYL OR PYRUVOYL) (W)SHIKIMATE
) (3W) PHOSPHATE (W) (SYNTHASE OR SYNTHETASE)

L134 90 SEA (PHOSPHOSHIKIMATE (2W) CARBOXYVINYLTRANSFERASE OR PHOSPHOSHIK
IMATE (2W) CARBOXYVINYL (W) TRANSFERASE OR ENOLPYRUVOYL (W) SHIKIMIC (3
W) PHOSPHOSYNTHASE)

L135 77349 SEA ((DOUBL# OR DOBL#) (W) (MUTANT# OR MUTAT?) OR 2M)

L136 46 SEA L130 OR ((L131 OR L132 OR L133 OR L134)) (S) L135)

L137 4 SEA HPPDW336 OR HPPD(W)W336 OR HPPD(W)W(W)336 OR HPPDW(W)336

L138 234 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?)

L139 234 SEA (L137 OR L138)

L140 277 SEA L136 OR L139

L141 5722 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

L142 810 SEA PHOSPHINOTHRICIN (W) N (W) ACETYLTRANSFERASE OR PHOSPHINOTHRICI
N (2W) ACETYLTRANSFERASE OR PHOSPHINOTHRICIN (2W) ACETYL (W) TRANSFER
ASE OR PHOSPHINOTHRICINACETYL (W) TRANSFERASE

L143 6039 SEA (L141 OR L142)

L144 31 SEA L140 AND L143

L145 32432 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?)

L146 31119 SEA (HERBICID? OR BIALAPHOS OR BASTA OR GLUFOSINATE OR
PHOSPHINOTHRICIN OR LIBERTY?) (5A) (RESIST? OR TOLERAN? OR
PROTECT?)

L147 30500 SEA L145 AND L146

L148 448764 SEA SOY OR SOYA OR SOJA OR SOYBEAN# OR SOYABEAN# OR SOJABEAN#
OR GLYCINE (W) MAX OR G (W) MAX

L149 674796 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#))

L150 6780 SEA L147 AND L148 AND L149

L151 6823 SEA L128 OR L129 OR L144 OR L150

L152 1453 SEA L151 AND PY>=2021

L153 451 SEA L152 AND UP>=20220701 AND UP<=20230630

L154 39 SEA L153 NOT P/DT



Report

We create chemistry

Summary of the Literature Review for FG72 x A5547-127 Soybean

July 1, 2022 – June 30, 2023

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L155 0 SEA L153 AND (P/DT AND J/DT)
L156 39 SEA L154 OR L155

FILE 'MEDLINE, BIOSIS, AGRICOLA, CABA, HCAPLUS' ENTERED AT 03:44:59 ON 15
AUG 2023

L157 123 DUP REM L30 L60 L90 L123 L156 (23 DUPLICATES REMOVED)
 ANSWERS '1-21' FROM FILE MEDLINE
 ANSWERS '22-41' FROM FILE BIOSIS
 ANSWERS '42-48' FROM FILE AGRICOLA
 ANSWERS '49-96' FROM FILE CABA
 ANSWERS '97-123' FROM FILE HCAPLUS