Title

Summary of the Literature Review for A5547-127 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.
EFSA supporting publications 2019:EN-1614

Completion date

November 24, 2021

Principal author

[redacted]

Report number
21-RSSB0078

Activity ID
RSSB0078

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SIGNATURE PAGE

Principal author: [redacted] Date 2021-11-24
(YYYY-MM-DD)

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

Glycine max (soybean) plants were transformed by direct gene transfer using transformation vector pB2/35SAcK. The vector contains a *pat* gene cassette conferring tolerance to the herbicide glufosinate-ammonium and the betalactamase (*bla*) antibiotic resistance gene. Prior to transformation, the vector was digested with the *Pvu*I restriction enzyme to disrupt the coding sequence of the *bla* gene and thereby removing any remote possibility of its expression. The OECD identifier is ACS-GMØØ6-4.

A scoping review was performed for A5547-127 soybean and its newly expressed protein, PAT/*pat*. The objective of this scoping review was to determine if there were studies about the molecular characterization of 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 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 150 unique publications, which were subject to rapid assessment to exclude obviously irrelevant publications. A total of 13 publications were progressed for detailed assessment.

None of the thirteen publications was determined to be relevant after detailed review. There was no data on molecular characterization of A5547-127 soybean, or the PAT/*pat* protein that would suggest any potential adverse effects on human and animal health or on the environment. 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 A5547-127 soybean.

1. INTRODUCTION

Glycine max (soybean) plants were transformed by direct gene transfer using transformation vector pB2/35SAcK. The vector contains a *pat* gene cassette conferring tolerance to the herbicide glufosinate-ammonium and the betalactamase (*bla*) antibiotic resistance gene. Prior to transformation, the vector was digested with the *Pvu*I restriction enzyme to disrupt the coding sequence of the *bla* gene and thereby removing any remote possibility of its expression. The OECD identifier is ACS-GMØØ6-4.

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 A5547-127 soybean, and/or any adverse effect of A5547-127 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 A5547-127 soybean and its newly expressed protein, PAT/*pat*. The search terms also included relevant synonyms, trade name and intended trait, plant species and general GMO terms.

2. OVERALL METHODS

2.1. Objective of the scoping review

The objective of the scoping review was to survey the evidence base for A5547-127 soybean and its newly expressed protein, PAT/*pat*, 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 A5547-127 soybean and its newly expressed protein PAT/*pat*?

Key elements:

Population: Human health; animal health; environmental safety

Exposure: A5547-127 soybean, derived food/feed products, newly expressed protein in 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 A5547-127 soybean and its newly expressed protein PAT/*pat* in soybean?

Key elements:

Population: A5547-127 soybean and newly expressed protein in 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 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 protein(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 publications

Two publications relevant for A5547-127 soybean were previously identified and used to test and validate the search strategy:

- Federici, S.; Paraskevopoulos, K. (2018). Risk assessment of new sequencing information for genetically modified soybean A5547-127. *EFSA Journal* **16(11):**e05496.
- 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.; Ardizzone, M.; Papadopoulou, N.; Paraskevopoulos, K. (2019). Assessment of genetically modified soybean A5547-127 for renewal of authorisation under Regulation (EC) No 1829/2003 (application EFSA-GMO-RX-009). *EFSA Journal* **17(1):**e05523

These articles selected as reference publications because they mention the event name (A5547-127), the intended trait (herbicide tolerance) and the crop (soybean). Since these reference were published outside the searched time, the profile was tested without applying the time limits used in the final search 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 12, 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 profile was designed to cover event name, newly expressed protein and intended traits. The reference publications (Section 2.4) were identified by the search profile, confirming the validity of the applied search strategy. Since the 'trade name', 'newly expressed protein' and the 'intended trait' profiles produced too many results when used on their own, they were combined with additonal profiles: the 'trade name' and 'newly expressed protein' profiles were combined with a 'plant species' profile while the 'intended trait' profile was 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	LL55 or A5547-127 or A5547(w)127 or A(w)5547(w)127 or ACS-GM006-4 or ACS-GMOO6-4 or ACS(w)GM006(w)4 or ACS(w)GMOO6(w)4 or ACSGM006(w)4 or ACSGMOO6(w)4	Event name
2	libertylink or libertylinktm or libertylinkrtm or liberty(w)link or liberty(w)linktm or liberty(w)linkrtm or LL or LLTM or LLRTM	Trade name
3	((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
4	(herbicid? or bialaphos or basta or glufosinate or phosphinothricin or liberty?)(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	2 and 5	Trade name AND Plant species

8	3 and 5	Newly expressed protein AND Plant species
9	4 and 5 and 6	Intended trait AND Plant species AND GMO general
10	1 or 7 or 8 or 9	Event name OR (Trade name AND plant species) OR (Newly expressed protein AND Plant species) 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 protein	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	12 Oct 2021	12 Oct 2021	12 Oct 2021	12 Oct 2021	12 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	11 Oct 2021	6 Oct 2021	5 Oct 2021	11 Oct 2021	11 Oct 2021
Number of records retrieved	20	25	61	63	19
Number of records after duplicate removal	17	19	46	49	19
Number of *relevant* records after rapid assessment	4	0	2	2	5

4. INTERNET and MANUAL SEARCHES

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

A search of the web pages of food safety, agriculture, and biotechnology-related regulatory 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 13 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 A5547-127 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 A5547-127 soybean. Search terms consisted of LL55 or A5547-127, or LibertyLink soy 55, or ACS-GMØØ6-4, PAT/*pat* or Phosphinothricin (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
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
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

No	Author(s) and Year	Title	Source	Number of relevant bibliographic references retrieved
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. 2020	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
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

No	Author(s) and Year	Title	Source	Number of relevant bibliographic references retrieved
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 188 references, which were reduced to 150 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 in question 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:

- 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 initial reviewers discussed the discrepancy as necessary and consulted additional reviewers 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)	150
Number of publications excluded from the search results after rapid assessment for relevance (Stage 1)	137
Total number of full-text documents assessed in detail	13
Number of publications excluded from further consideration after detailed assessment for relevance (Stage 2)	13
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 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
Albrecht, Alfredo Junior P. De Brito, Ivana Paula F. S. Albrecht, Leandro P. Silva, Andre Felipe M. De Matos, Ana Karollyna A. Carbonari, Caio Antonio Velini, Edivaldo D. 2020	Metabolic Changes, Agronomic Performance, and Quality of Seeds in Soybean with the Pat Gene after Application of Glufosinate	Weed science (2 Oct 2020), Volume 68, Number 6, pp. 594-604, 11 p. ISSN: 0043-1745; 0043-1745 Source Note: 20201002, v. 68, no. 6.	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 Dec 2019 Journal code: 8214983. E-ISSN: 1096-0295. L-ISSN: 0273-2300.	A5547-127 soybean was not included in the study.

Study (Author(s) and year)	Title	Source	Reason(s) for exclusion based on eligibility/inclusion criteria listed in Table 1
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 aimed to determine gene flow rates from glyphosate- and glufosinate-resistant transgenic soybeans (transgenic line Bert-4-3 developed from the cultivar 'Bert') to five commercial soybean cultivars and three accessions of wild soybeans in South Korea. Not related to the risk assessment of A5547-127 soybean.
Meyer, Chris J. Norsworthy, Jason K. 2020	Timing and Application Rate for Sequential Applications of Glufosinate are Critical for Maximizing Control of Annual Weeds in LibertyLink ® Soybean.	International journal of agronomy (4 Jul 2020), Volume 2020, 7 p. ISSN: 1687-8167; 1687-8167; 1687-8159 Source Note: 20200704, v. 2020.	The authors aimed to evaluate single and sequential post applications of glufosinate on large weeds (*Palmer amaranth*, barnyardgrass, and broadleaf signalgrass) and determine the optimum application window for sequential applications. Not related to the risk assessment of A5547-127.
Oh, Sung-Dug Min, Seok-Ki Kim, Jae Kwang Park, Jung-Ho Kim, Chang-Gi Park, Soo Yun 2020	Risk assessment and evaluation of epidermal growth factor (EGF) transgenic soybean : responses of Cyprinus carpio fed on EGF transgenic soybean.	Korean Journal of Agricultural Science (2020), 47(4), 815-827 CODEN: KJASAP; ISSN: 2466-2410 URL: http://kjoas.org/	A5547-127 soybean was not considered.

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	Animal and Plant Inspection and Quarantine Technology Center, Shenzhen Customs, Shenzhen 518045, China. EMAIL: Fpg0101@126.com Flxy6421@qq.com	Chinese Journal of Oil Crop Sciences (2020), Volume 42, Number 2, pp. 298-305, 11 refs. ISSN: 1007-9084 DOI: https://doi.org/10.19802/j.issn.1007-9084.2019093 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 A5547-127). According to the authors the results could be useful for China to detect and identify imported GM soybeans, and improve surveillance of imported GM soybean. Not related to the risk assessment of A5547-127, hence, not relevant.
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; 1573-5109 DOI: https://doi.org/10.1007/s10722-020-00928-1 Published by: Springer, Dordrecht	A5547-127 soybean was not included in the study
Schulz Ralf Bub Sascha Petschick Lara L Stehle Sebastian Wolfram Jakob 2021	Applied pesticide toxicity shifts toward plants and invertebrates, even in GM crops.	Science (New York, N.Y.), (20210402) Vol. 372, No. 6537, pp. 81-84. Journal code: 0404511. E-ISSN: 1095-9203. L-ISSN: 0036-8075.	The authors assessed 381 pesticides from 1992 to 2016 by 1591 regulatory threshold levels (thresholds indicative of potential biodiversity impacts) for eight different groups of non-target species. They claimed some correlations with GM crops adoption in the US (Bt corn and HT soybeans). The publication does not contain primary data. Not related to the environmental risk assessment of A5547-127.

Study (Author(s) and year)	Title	Source	Reason(s) for exclusion based on eligibility/inclusion criteria listed in Table 1
Sieradzki, Zbigniew Mazur, Malgorzata Krol, Beata Kwiatek, Krzysztof 2021	Prevalence of genetically modified soybean in animal feedingstuffs in Poland.	Journal of Veterinary Research (29 Jan 2021), Volume 65, Number 1, pp. 93-99, 7 p. ISSN: 2450-8608; 2450-8608 Source Note: 20210129, v. 65, no. 1	The publication is not relevant to the risk assessment of GMOs.
Soga Keisuke Kimata Shinya Narushima Jumpei Akiyama Hiroshi Kondo Kazunari Nakamura Kosuke Sato Sakiko Sato Emi Kawakami Hiroshi Mano Junichi Takabatake Reona Kitta Kazumi 2020	Development and Testing of an Individual Kernel Detection System for Genetically Modified Soybean Events in Non-identity-preserved Soybean Samples.	Biological + pharmaceutical bulletin, (2020) Vol. 43, No. 8, pp. 1259-1266. Journal code: 9311984. E-ISSN: 1347-5215. L-ISSN: 0918-6158.	The authors evaluated a GM soybean kernel detection system using combination of DNA preparation of individual soybean kernels and event-specific real-time PCR detection for detecting all GM soybeans authorized in Japan. Soybean samples brought to Japan in 2017 from the U.S.A. and Brazil were examined. HT events, MON89788, GTS 40-3-2 and A2704-12 were detected in U.S.A. lots. In the Brazilian lot, GTS 40-3-2 and MON87701 X MON89788 were detected. There were no unauthorized GM soybeans comingled, and the ratio of GM soybean events detected was consistent with statistical reports on the cultivated GM soybean events in both countries. Not related to the risk assessment of A5547-127.
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 (A5547-127 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 risk assessment of A5547-127, hence, not relevant.

Study (Author(s) and year)	Title	Source	Reason(s) for exclusion based on eligibility/inclusion criteria listed in Table 1
Yook Min-Jung Park Hae-Rim Lim Soo-Hyun Zhang Chuan-Jie Jeong Soon-Chun Chung Young Soo Kim Do-Soon 2021	Environmental risk assessment of glufosinate-resistant soybean by pollen-mediated gene flow under field conditions in the region of the genetic origin.	The Science of the total environment, (2021 Mar 25) Vol. 762, pp. 143073. Electronic Publication Date: 17 Oct 2020 Journal code: 0330500. E-ISSN: 1879-1026. L-ISSN: 0048-9697.	Two-year field experiments were conducted to quantify the gene flow from GM soybean (event AtSIZ #6, *Glycine max* L. cv. Kwangankong) glufosinate resistant to wild soybean (*Glycine soja* Sieb. and Zucc., IT 182932) and model the potential gene flow under field conditions in Korea. In addition, field performance of hybrids resulted from gene flow was evaluated and compared with parent soybeans (GM and wild soybean) to estimate the potential weed risk of hybrids. Not related to the risk assessment of A5547-127.
Zhang Li Li Shu-Fei Zhou Qing-Hong Liu Ying-Hua Zhang Jing Qian Zhi-Yong 2021	Subchronic toxicity study in rats evaluating herbicide-tolerant soybean DAS-68416-4.	Regulatory toxicology and pharmacology : RTP, (2021 Feb) Vol. 119, pp. 104833. Electronic Publication Date: 28 Nov 2020 Journal code: 8214983. E-ISSN: 1096-0295. L-ISSN: 0273-2300.	A5547-127 soybean was not considered.

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 thirteen 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 for the safety assessment of A5547-127 soybean and its newly expressed protein PAT/*pat*.

Table 11 lists the relevant 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		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 A5547-127 soybean and its newly expressed protein, PAT/*pat*, for the period from October 1, 2020 to September 30, 2021, identified a total of 150 unique publications (after duplicate removal). A total of thirteen publications were progressed for detailed assessment after excluding 137 obviously irrelevant publications during Stage 1 evaluation (rapid assessment based on title and abstract).

The thirteen 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 more specific question formulation.

8. REFERENCES

No.	Author(s), title, source, edition, year, pages
1.	Devos Y, Guajardo IM, Alvarez F and Glanville J. Explanatory note on literature searching conducted in the context of GMO applications for (renewed) market authorisation and annual post-market environmental monitoring reports on GMOs authorised in the EU market. EFSA supporting publications 2019:EN-1614. 62 pages. doi:10.2903/sp.efsa.2019.EN-1614.

9. APPENDICES

Appendix 1 Database descriptions

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

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

Appendix 2 Search history

FILE 'MEDLINE' ENTERED AT 10:33:23 ON 12 OCT 2021

L1 6 SEA LL55 OR A5547-127 OR A5547(W)127 OR A(W)5547(W)127 OR ACS-GM006-4 OR ACS-GMOO6-4 OR ACS(W)GM006(W)4 OR ACS(W)GMOO6(W)4 OR ACSGM006(W)4 OR ACSGMOO6(W)4

L2 13847 SEA LIBERTYLINK OR LIBERTYLINKTM OR LIBERTYLINKRTM OR LIBERTY(W)LINK OR LIBERTY(W)LINKTM OR LIBERTY(W)LINKRTM OR LL OR LLTM OR LLRTM

L3 1461 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

L4 203 SEA PHOSPHINOTHRICIN(W)N(W)ACETYLTRANSFERASE OR PHOSPHINOTHRICIN(2W)ACETYLTRANSFERASE OR PHOSPHINOTHRICIN(2W)ACETYL(W)TRANSFERASE OR PHOSPHINOTHRICINACETYL(W)TRANSFERASE

L5 1535 SEA (L3 OR L4)

L6 3350 SEA (HERBICID? OR BIALAPHOS OR BASTA OR GLUFOSINATE OR PHOSPHINOTHRICIN OR LIBERTY?)(5A)(RESIST? OR TOLERAN? OR PROTECT?)

L7 67179 SEA SOY OR SOYA OR SOJA OR SOYBEAN# OR SOYABEAN# OR SOJABEAN# OR GLYCINE(W)MAX OR G(W)MAX

L8 3821807 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?))

L9 49 SEA L2 AND L7

L10 51 SEA L5 AND L7

L11 236 SEA L6 AND L7 AND L8

L12 319 SEA L1 OR L9 OR L10 OR L11

L13 49 SEA L12 AND PY>=2019

L14 19 SEA L13 AND UP>=20201001 AND UP<=20210930

FILE 'BIOSIS' ENTERED AT 10:33:53 ON 12 OCT 2021

L15 15 SEA LL55 OR A5547-127 OR A5547(W)127 OR A(W)5547(W)127 OR ACS-GM006-4 OR ACS-GMOO6-4 OR ACS(W)GM006(W)4 OR ACS(W)GMOO6(W)4 OR ACSGM006(W)4 OR ACSGMOO6(W)4

L16 14750 SEA LIBERTYLINK OR LIBERTYLINKTM OR LIBERTYLINKRTM OR LIBERTY(W)LINK OR LIBERTY(W)LINKTM OR LIBERTY(W)LINKRTM OR LL OR LLTM OR LLRTM

L17 2837 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

L18 332 SEA PHOSPHINOTHRICIN(W)N(W)ACETYLTRANSFERASE OR PHOSPHINOTHRICIN(2W)ACETYLTRANSFERASE OR PHOSPHINOTHRICIN(2W)ACETYL(W)TRANSFERASE OR PHOSPHINOTHRICINACETYL(W)TRANSFERASE

L19 2939 SEA (L17 OR L18)

L20 9902 SEA (HERBICID? OR BIALAPHOS OR BASTA OR GLUFOSINATE OR PHOSPHINOTHRICIN OR LIBERTY?)(5A)(RESIST? OR TOLERAN? OR PROTECT?)

L21 168368 SEA SOY OR SOYA OR SOJA OR SOYBEAN# OR SOYABEAN# OR SOJABEAN# OR GLYCINE(W)MAX OR G(W)MAX

L22 465984 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?))

L23 116 SEA L16 AND L21

L24 119 SEA L19 AND L21

L25 407 SEA L20 AND L21 AND L22

L26 611 SEA L15 OR L23 OR L24 OR L25
L27 58 SEA L26 AND PY>=2019
L28 25 SEA L27 AND UP>=20201001 AND UP<=20210930

FILE 'AGRICOLA' ENTERED AT 10:34:20 ON 12 OCT 2021
L29 7 SEA LL55 OR A5547-127 OR A5547(W)127 OR A(W)5547(W)127 OR ACS-GM006-4 OR ACS-GMOO6-4 OR ACS(W)GM006(W)4 OR ACS(W)GMOO6(W)4 OR ACSGM006(W)4 OR ACSGMOO6(W)4
L30 3247 SEA LIBERTYLINK OR LIBERTYLINKTM OR LIBERTYLINKRTM OR LIBERTY(W)LINK OR LIBERTY(W)LINKTM OR LIBERTY(W)LINKRTM OR LL OR LLTM OR LLRTM
L31 779 SEA ((BAR OR PAT)(2A)(GENE# OR PROTEIN# OR ENZYME#)) OR PPT(2W)ACETYLTRANSFERASE OR PPT(2W)ACETYL(W)TRANSFERASE OR PT(W)N(2W)ACETYLTRANSFERASE OR PT(W)N(2W)ACETYL(W)TRANSFERASE
L32 252 SEA PHOSPHINOTHRICIN(W)N(W)ACETYLTRANSFERASE OR PHOSPHINOTHRICIN(2W)ACETYLTRANSFERASE OR PHOSPHINOTHRICIN(2W)ACETYL(W)TRANSFERASE OR PHOSPHINOTHRICINACETYL(W)TRANSFERASE
L33 858 SEA (L31 OR L32)
L34 8217 SEA (HERBICID? OR BIALAPHOS OR BASTA OR GLUFOSINATE OR PHOSPHINOTHRICIN OR LIBERTY?)(5A)(RESIST? OR TOLERAN? OR PROTECT?)
L35 92479 SEA SOY OR SOYA OR SOJA OR SOYBEAN# OR SOYABEAN# OR SOJABEAN# OR GLYCINE(W)MAX OR G(W)MAX
L36 103308 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 77 SEA L30 AND L35
L38 44 SEA L33 AND L35
L39 391 SEA L34 AND L35 AND L36
L40 497 SEA L29 OR L37 OR L38 OR L39
L41 38 SEA L40 AND PY>=2019
L42 20 SEA L41 AND UP>=20201001 AND UP<=20210930

FILE 'CABA' ENTERED AT 10:34:53 ON 12 OCT 2021
L43 17 SEA LL55 OR A5547-127 OR A5547(W)127 OR A(W)5547(W)127 OR ACS-GM006-4 OR ACS-GMOO6-4 OR ACS(W)GM006(W)4 OR ACS(W)GMOO6(W)4 OR ACSGM006(W)4 OR ACSGMOO6(W)4
L44 5355 SEA LIBERTYLINK OR LIBERTYLINKTM OR LIBERTYLINKRTM OR LIBERTY(W)LINK OR LIBERTY(W)LINKTM OR LIBERTY(W)LINKRTM OR LL OR LLTM OR LLRTM
L45 1540 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
L46 378 SEA PHOSPHINOTHRICIN(W)N(W)ACETYLTRANSFERASE OR PHOSPHINOTHRICIN(2W)ACETYLTRANSFERASE OR PHOSPHINOTHRICIN(2W)ACETYL(W)TRANSFERASE OR PHOSPHINOTHRICINACETYL(W)TRANSFERASE
L47 1641 SEA (L45 OR L46)
L48 18325 SEA (HERBICID? OR BIALAPHOS OR BASTA OR GLUFOSINATE OR PHOSPHINOTHRICIN OR LIBERTY?)(5A)(RESIST? OR TOLERAN? OR PROTECT?)
L49 194201 SEA SOY OR SOYA OR SOJA OR SOYBEAN# OR SOYABEAN# OR SOJABEAN# OR GLYCINE(W)MAX OR G(W)MAX
L50 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?))
L51 149 SEA L44 AND L49

L52 110 SEA L47 AND L49
L53 775 SEA L48 AND L49 AND L50
L54 984 SEA L43 OR L51 OR L52 OR L53
L55 108 SEA L54 AND PY>=2019
L56 61 SEA L55 AND UP>=20201001 AND UP<=20210930
L57 61 SEA L56 NOT P/DT
L58 0 SEA L56 AND (P/DT AND J/DT)
L59 61 SEA L57 OR L58

FILE 'HCAPLUS' ENTERED AT 10:35:23 ON 12 OCT 2021
L60 21 SEA LL55 OR A5547-127 OR A5547(W)127 OR A(W)5547(W)127 OR ACS-GM006-4 OR ACS-GMOO6-4 OR ACS(W)GM006(W)4 OR ACS(W)GMOO6(W)4 OR ACSGM006(W)4 OR ACSGMOO6(W)4
L61 19972 SEA LIBERTYLINK OR LIBERTYLINKTM OR LIBERTYLINKRTM OR LIBERTY(W)LINK OR LIBERTY(W)LINKTM OR LIBERTY(W)LINKRTM OR LL OR LLTM OR LLRTM
L62 5210 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
L63 783 SEA PHOSPHINOTHRICIN(W)N(W)ACETYLTRANSFERASE OR PHOSPHINOTHRICIN(2W)ACETYLTRANSFERASE OR PHOSPHINOTHRICIN(2W)ACETYL(W)TRANSFERASE OR PHOSPHINOTHRICINACETYL(W)TRANSFERASE
L64 5510 SEA (L62 OR L63)
L65 27984 SEA (HERBICID? OR BIALAPHOS OR BASTA OR GLUFOSINATE OR PHOSPHINOTHRICIN OR LIBERTY?)(5A)(RESIST? OR TOLERAN? OR PROTECT?)
L66 411292 SEA SOY OR SOYA OR SOJA OR SOYBEAN# OR SOYABEAN# OR SOJABEAN# OR GLYCINE(W)MAX OR G(W)MAX
L67 692714 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?))
L68 229 SEA L61 AND L66
L69 489 SEA L64 AND L66
L70 6092 SEA L65 AND L66 AND L67
L71 6607 SEA L60 OR L68 OR L69 OR L70
L72 1604 SEA L71 AND PY>=2019
L73 510 SEA L72 AND UP>=20201001 AND UP<=20210930
L74 63 SEA L73 NOT P/DT
L75 0 SEA L73 AND (P/DT AND J/DT)
L76 63 SEA L74 OR L75

FILE 'MEDLINE, BIOSIS, AGRICOLA, CABA, HCAPLUS' ENTERED AT 10:35:55 ON 12 OCT 2021
L77 150 DUP REM L14 L28 L42 L59 L76 (38 DUPLICATES REMOVED)
ANSWERS '1-19' FROM FILE MEDLINE
ANSWERS '20-38' FROM FILE BIOSIS
ANSWERS '39-55' FROM FILE AGRICOLA
ANSWERS '56-101' FROM FILE CABA
ANSWERS '102-150' FROM FILE HCAPLUS