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(54) **COMPUTER-IMPLEMENTED METHOD FOR MONITORING THE EXPIRATION DATES OF GENETICALLY MODIFIED ORGANISM PRODUCTS AND SYSTEM IMPLEMENTING THE SAME**

(57) The invention relates to a computer-implemented method and system for monitoring the authorisation expiration dates of genetically modified organism, GMO, products, wherein the method comprising the steps of providing a list of GMO products, requesting information about at least one GMO product of the list, and retrieving said information to a database configured in a computer terminal. Advantageously, the method further comprises: processing, in the computer terminal, the sequence of components, splitting said sequence into a plurality of single transformation-event components; generating a plurality of sub-combinations of the split components of the sequence; updating, in the computer terminal, the authorisation expiration date of the GMO products in case that any of the expiration dates of their corresponding sub-combinations is closer to the current date than the expiration date of the GMO products in the remote data repository.

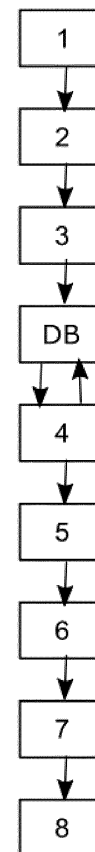


FIG. 1

EP 4 167 177 A1

Description**FIELD OF THE INVENTION**

[0001] The present invention belongs to the field of health safety, food safety and computer data analysis. More specifically, the invention relates to a method for extracting, processing, and analysing data associated to the authorisation/expiration dates of biological products, understood as products comprising genetically modified organisms. The invention also relates to a system implementing said method, which comprises means for triggering alarm events to control the expiration dates of said biological products.

BACKGROUND OF THE INVENTION

[0002] Food and feed generally originate from plants and animals that have been grown and bred by humans for several thousands of years. However, in recent times, it has become possible to modify the genetic make-up of living cells and organisms using techniques of modern biotechnology, called gene technology. Thus, the genetic material of food/feed products can be artificially modified to provide it with improved properties (e.g., a plant's resistance to a disease, insect or drought, a plant's tolerance to an herbicide, improving a food's quality or nutritional value, increased crop productivity, etc.). Such organisms are called "genetically modified organisms" (GMOs). Food and feed which contain or consist of such GMOs, or are produced from GMOs, are called "genetically modified (GM) food or feed".

[0003] GMOs are regulated by government agencies. This applies to research as well as the release of genetically modified organisms, including crops and food. As an example, the European Union (EU) policies applied regarding GMOs impose a pre-market authorisation for any GMO to be placed on the market, and a post-market environmental monitoring for any authorised GMO. This approach ensures a high level of protection of human and animal health, as well as of the environment. The GMO legislation lays down specific procedures for assessing and authorising GMOs that are time-limited and transparent. The assessment of GMO risks is performed on the basis of harmonised criteria which are recognised as being amongst the most stringent in the world.

[0004] The assessment of GM food and feed risks is also of uttermost importance and, as a result, any company interested in placing a new GM food and feed on the EU market has to submit a request demonstrating the safety for human and animal health and the environment of the product in question. Studies to be performed in order to demonstrate the safety of the GM food and feed to be placed on the market have to comply with Regulation EC 503/2013 on applications for authorisation of GM food and feed. This Regulation provides the requirements to be fulfilled when submitting a GM food and feed application, including the studies to be performed and the protocol to be followed in conducting these studies, as well as the environmental monitoring conducted for all authorised GMOs to identify any adverse effect to the consumers or to the environment.

[0005] Besides cultivation, the placing on the EU market of GMOs and the use of their derived products in the food and feed chain is subject to an administrative authorisation, conditional upon the demonstration of an absence of risk for human and animal health and for the environment, following a thorough assessment by the European Food Safety Authority in collaboration with Member States' scientific bodies. As of today, fifty-eight GMOs are authorised in the EU for food and feed uses (covering maize, cotton, soybean, oilseed rape, sugar beet). Fifty-eight application files are pending, out of which seventeen have a positive opinion by the European Food Safety Authority (EFSA) and one has an inconclusive opinion. The list of authorised GM plants and the precise scope of their authorisation, as well as the products subject to EC decisions on withdrawal from the market, is available in the EU register of GM food and feed.

[0006] The consumer expiration dates of current GMO products (i.e., the periods during which they can be consumed safely) are assigned automatically based on the relative date of their production, as it happens with most of non-GMO products. However, this process does not consider the deadlines and time limitations of the gene transformation components associated with their GMO authorisations. Thus, in case that a given component is withdrawn from the market due to a GMO-related rejection or an absence of renewal, it can happen that the products containing that component in the market cannot be easily identified or traced.

[0007] Moreover, it must be understood that various components or sub-combinations of these biological products can form a new product that has a different authorisation date, just like the different products that contain it. As an example, the GMO identified as BCS-GHØØ2-5 (GlyTol™ Cotton GHB614) contains a stably integrated gene 2mepsps. The 2mepsps gene was generated by introducing mutations into the wild type epsps ("wt epsps") gene from maize, leading to a double mutant EPSPS protein with two amino acid substitutions (2mEPSPS). This modification confers the protein a decreased binding affinity for glyphosate, allowing it to maintain sufficient enzymatic activity in the presence of the herbicide. Therefore, the plants bearing this gene are tolerant to glyphosate herbicides.

[0008] When checking the component BCS-GHØØ2-5 in the list of authorised GMOs, it can be found as part of three different cotton products, as shown in Table 1 below:

Table 1

Transformation event / Unique ID / Company	Genes introduced / Characteristics	Authorisation Expiration date
Cotton (GHB614) / BCS-GHØØ2-5 ("A") / Bayer	Genetically modified cotton that expresses: 2mepsps gene inserted to confer tolerance to the glyphosate herbicides.	Renewal ongoing
Cotton (GHB614xLLCotton25) / BCS-GHØØ2-5xACS-GHØØ1-3 ("AxB") / Bayer	Genetically modified cotton which expresses: - pat gene which confers tolerance to glufosinate-ammonium herbicides. - cp4 epsps gene which confers tolerance to glyphosate herbicides.	26/04/2025
Cotton (GHB614 × T304-40 × GHB119) / BCS-GHØØ2-5 × BCS-GHØØ7-7 × BCS-GHØØ5-8 ("AxCxD") / BASF	Genetically modified cotton that expresses: - 2mepsps gene, which confers tolerance to glyphosate-based herbicides. - bar gene, which confers tolerance to glufosinate-ammonium based herbicides. - cry1Ab and the cry2Ae genes, which confer resistance to certain lepidopteran pests.	17/08/2031

[0009] As illustrated in Table 1, the component (or "transformation event") BCS-GHØØ2-5 identified as "A" can be found alone, or in combination with other components in the forms: A, AxB, or AxCxD. And, as also shown, each combination will be in general subject to a different expiration date.

[0010] Given the complexity of the composition of the GMO products, there is a need for a method that allows analysing data associated to a list of authorised GMOs and extracting corresponding authorisation expiration dates of one or more GM components of a food or feed product, thereby enabling the generation of alarm events related to those products which include a component whose production expiration date is later than the extracted authorisation expiration date. As a result, the method can issue an alert when a particular component's authorisation needs to be renewed, or when a given authorisation period is lapsed.

[0011] The present invention proposes a solution to overcome the above problem, by means of a method and a system that enable the extraction, analysis and update of the authorisation date of the products depending on the ulterior changes undergone by said products, for instance, combination of different GMO-based products or anticipated authorisation date for a product due to a legislation modification. The invention provides a computer-aided system useful for controlling and keeping an inventory of biological products up to date, particularly those ones which may require a quality control and inspection independent from the owner or manufacturer of such products.

BRIEF DESCRIPTION OF THE INVENTION

[0012] A first object of the present invention relates to a computer-implemented method for monitoring the authorisation expiration dates of genetically modified organism, GMO, products, said method comprising the steps of:

- providing, in a remote data repository configured in a computer server, a list of GMO products, each GMO product in the list comprising one or more unique identifiers, a sequence of components associated to a plurality of genetical transformation events of the product, and an authorisation expiration date of said sequence;
- requesting, by a computer terminal connected to the computer server through a communication network, information about at least one GMO product of the list of the remote data repository, and retrieving said information to a database configured in the computer terminal; and
- storing at least one identifier of the GMO product, its corresponding sequence of components and its authorisation expiration date in the database of the computer terminal.

[0013] Advantageously in the invention, the method further comprises the following steps:

d) processing, in the computer terminal, the sequence of components, splitting said sequence into a plurality of single transformation-event components;

e) generating a plurality of sub-combinations of the split components of the sequence, wherein said sub-combinations are smaller than the sequence and comprise at least one component;

f) searching, in the remote data repository, existing GMO product sequences that match one or more of the sub-combinations generated in step e);

g) retrieving, for the matched GMO products found in step f), their corresponding authorisation expiration dates to the database of the computer terminal, storing said expiration dates and the matching sub-combinations of the sequence processed in step d);

h) updating, in the database of the computer terminal, the authorisation expiration date of the GMO products retrieved in step b) in case that any of the expiration dates of their corresponding sub-combinations is closer to the current date than the expiration date of the GMO products in the remote data repository, wherein the updated expiration date is set as the closest expiration date of said corresponding sub-combinations.

[0014] The method of the invention splits each biological product into all the possible component combinations (e.g., gene transformation events), and each of them can be accorded an authorisation date individually. For example, for the product "A x B x C", the unpermuted combinations of components would be the following four: "A x B", "A x C", "B x C", "A x B x C". In this case, the order of components in the sequence is assumed to be of no relevance. Note also that the more components the product has, the more combinations that must be considered.

[0015] One example of biological product is a cell culture containing the gene MON-ØØØ21-9, according to the GMO Register of the Directorate-General for Health and Food Safety of the European Commission. Depending on whether such a gene is used isolated or in combination with others, the product is authorised for certain uses (e.g., as a food ingredient for humans or as a feed material for animals) and/or during a certain time period. For instance, this gene transformation event is authorised in genetically modified maize to confer tolerance to herbicide glyphosate until 2028 in combination with maize GA21, whereas it is only authorised until 2026 in combination with SYN-BTØ11-1, SYN-IR162-4 and SYN-IR6Ø4-5.

[0016] In a preferred embodiment of the invention, an alarm notification information is generated by the computer terminal after step d), displaying said alarm notification information through a user interface configured in the computer terminal.

[0017] In a further preferred embodiment of the invention, the method further comprises:

- storing the alarm notification information in the database of the computer terminal; and
- displaying said alarm notification information at the updated authorisation expiration date.

[0018] In a further preferred embodiment of the invention, the sub-combinations generated in step e) are unpermuted sub-combinations.

[0019] In a further preferred embodiment of the invention, the request of step b) is launched in a plurality of time intervals.

[0020] In a further preferred embodiment of the invention, the step b) of requesting, by the computer terminal, information about at least one GMO product of the list of the remote data repository, and retrieving said information to a database configured in the computer terminal, is performed through database query language commands executed by the computer terminal, and/or through web scraping scripts executed by the computer terminal.

[0021] A second object of the invention relates to a system for monitoring the authorisation expiration dates of genetically modified organism, GMO, products, the system comprising:

- a computer server configured with a remote data repository, wherein the data repository comprises a list of GMO products, each GMO product in the list comprising one or more unique identifiers, a sequence of components associated to a plurality of genetical transformation events of the product, and an authorisation expiration date of said sequence; and
- a computer terminal connected to the computer server through a communication network, wherein the computer terminal is configured with a database.

[0022] Advantageously in the invention, the computer server and the computer terminal are configured with hardware and software means adapted to implement a method according to any of the embodiments described in the present document.

[0023] In a preferred embodiment of the invention, and the computer terminal further comprises visualisation means

for displaying alarm notification information.

[0024] As a summary, the invention enables tracking and updating the expiration date assigned to the GMO products, considering subsequent modifications and sub-combinations thereof, so that the updated date gives a better estimate of the duration of the product in acceptable health safety conditions.

[0025] In the context of this patent, the term "biological product" would refer a genetically modified organism comprised in a food or feed product, a drug or chemical product, or any other product in which the composition depends on the time lapsed from their manufacturing, or whether said product has been mixed or treated in combination with others.

[0026] Within the scope of the invention, the expression "authorisation expiration date" will refer to a validity date (in case that the product requires government or public administration licenses), a control date, a renewal date, an expiration date or any other date in which the biological product must be checked and, depending on its composition, at least some of its components may be updated to guarantee the chemical properties of said product. The authorisation date can be indicated as a deadline or a period during which the product is validly authorised for a certain use.

[0027] Moreover, a "third-party information repository" may comprise a website, an archive, or any other structure for storing information organized hierarchically about a plurality of biological products. More preferably, the third-party information repository is a public or official source of information provided by a product manufacturer or public administration that can be trusted. One example of third-party information repository is the GMO Register of the Directorate-General for Health and Food Safety of the European Commission. The authorisation date is awarded, for each product, by the authority or Commission in charge of the information repository.

[0028] Finally, in the description of the invention, the different components or elements of a biological product are labelled in a sequence containing capital letters separated by the symbol "x". For instance, the product "A x B" comprises the components "A" and "B" (e.g., such components can be genes).

DESCRIPTION OF THE FIGURES

[0029] Figure 1 shows the main steps of a method according to the invention, from the connection with a public website to the presentation of data requested by the user and eventually, the triggering of an alarm event.

NUMERICAL REFERENCES USED IN THE DRAWINGS

[0030] In order to provide a better understanding of the invention, the referred Figure 1 is accompanied of a series of numerical references which, with an illustrative and non-limiting character, are hereby represented:

1	Establishing a connection with a website (first information repository)
2	Tracking the product information on the website
3	Retrieving the product information from the website and storing it into the database as a set of product sequences
4	Retrieving the product sequences from the database and apply extraction rules
5	Processing the product sequences and splitting them into individual components
6	Generating unpermuted combinations of product components
7	Searching for existing combinations in the database that match the unpermuted combinations
8	Presentation of the information to the user and, in case of upcoming product expiration, alarm triggering.

DETAILED DESCRIPTION OF THE INVENTION

[0031] As described in the preceding paragraphs, the present invention belongs to the field of information technology, and specifically to the technologies for extracting, processing and analysing data to obtain useful information of GMO products' authorisation dates. Particularly, the invention comprises a method and a system advantageously adapted to identify authorisation dates and expiration dates on biological products wherein one or more of their components is subject to GMO authorisation. Thus, said expiration and authorisation dates can be controlled independently of the owner of the biological component product, in a secure and reliable way. The system of the invention performs the method of the invention, the latter being based on the identification of components and the calculation of unpermuted combination thereof with other product components.

[0032] As aforementioned, the invention is particularly useful for monitoring biological products that exhibit time sensitive authorisation dates. As described in the background section, GM biological products generally comprise a plurality of GMO component combinations. When the components are combined with others, they may form new products subject

to different authorisation dates. For those products, the system of the invention is configured to store those dates, processing them and establishing one or more alarm events when the authorisation date of one component is close (e.g., below a certain time threshold, for example in days, or months). For instance, if the authorisation date of a component "A" (for example, Cotton GHB614 / BCS-GHØØ2-5) expires in 3 months but the combination of components "A x B" (for example, Cotton (GHB614xLLCotton25) / BCS-GHØØ2-5 x ACS-GHØØ1-3) expires in 6 months, the former is considered for triggering the alarm, as it is closer. As the number of components grows, so does the number of combinations that can be generated for a particular product. As a result, the method of the invention is based, essentially, on distinguishing a plurality of individual GMO components of a GMO product, establishing a plurality of existing combinations of one or more of said components, verifying the existence of an authorisation expiration date for each combination, and identifying one or more subsets of those combinations according to their authorisation expiration date (for example, when said expiration date is comprised in a given time period).

[0033] Preferably, the method of the invention comprises analysing and processing the information of a third-party information repository (for instance, a database or a website) for monitoring different products and modifications thereof, said modifications comprising updating expiration dates or renewal dates of authorisations. In this way, the method involves gathering from the database or the website all the necessary information for the control of products and their different dates that will be stored and organised in a local information repository (e.g., an inventory managed by a user). The analysis and processing of the information repository can be performed through database queries, or through web data extraction techniques, such as through web scraping scripts. The information repository can be for instance, a list of authorised GMOs and corresponding authorisation expiration dates of a plurality of GM components of food or feed products.

[0034] Once the information about the composition of the new product and their component combinations is extracted, and their relevant expiration dates are obtained, the method of the invention further comprises issuing one or more alert events according to one or more conditions defined on said dates, for example when a component of a product needs the renewal of its authorisation.

[0035] Preferably, the method of the invention is adapted for managing GMO product data at two different information levels:

1) Extraction and standardisation of product information, obtained from a remote third-party information repository (for example, a third-party website).

2) Processing of the standardised product information in a local information repository (for example, a database).

[0036] These two levels of information management are analysed as follows. The first level (standardisation of the GMO product information) consists of populating a local information repository (for example, a local database) of the system by automatically retrieving data from a remote third-party information repository (e.g., a public website containing legit information of a plurality of GMO products provided by official authorities). For instance, the information can be retrieved by filling search forms on a website, or executing query commands and storing the information returned by the website on a local database. The information retrieval process allows obtaining the requested information to identify the GMO product composition, treating the key fields of the forms on the website as identifiers for their standardisation and further processing. During the extraction of information, the essential data needed for the method can be searched in the HTML (Hypertext Markup Language) code of the website, or in other structured information source of the web page, selecting the information considered as useful in the retrieval process, such as:

- Unique product identifiers. Since some products may comprise several information fields to identify the GMO product, the method of the invention may comprise searching those fields as unique identifiers (for example, lot identifiers, product name identifier, company identifier, etc.).
- Relevant dates, like authorisation dates, expiration dates and/or the reasons motivating the expiration of an authorisation date (for instance, certain uses of a biological product can be authorised, but others can be denied depending on its effects on the human body, according to results obtained from experiments through time, or from periodic monitoring of the GMO products).

[0037] The rest of the information extracted can be processed as description data of the product, and can also be retrieved from the third-party website. Once the information has been extracted and standardised, it is stored in the local information repository (for example, a database) of the system according to the invention.

[0038] The second level of data management in the method of the invention comprises the comprehensive processing of the collected information of the local information repository. As discussed above, the GM biological products to be analysed are made up of several components ("transformation events") and combinations thereof that, in turn, form other products with an expiration date that can be different from the whole product. As a result, if the product being analysed consists of subproducts with expiration dates prior to its own expiration date, the system must store and activate

an alarm system so that the closest public authorization expiration date is considered for the generation of alarm events. The analysis of this information and the generation of alarms comprises performing the following steps for a given product:

- Splitting the product composition into a sequence comprising a plurality of individual GMO components, as standardised by the first level of information management. For instance, from a product defined by the sequence "A x B x C x D", the different components are extracted as "A", "B", "C" and "D".
- Generation of combinations of sequence components. A plurality of individual components or of sub-combinations of components are computed. Depending on the complexity of the sequence, more or fewer component combinations are analysed. For example, in the case of the product sequence "A x B x C x D", the whole set of components (which is denoted as A x B x C x D) or combinations containing a subset thereof (like "A x B", "B x C", "B x D", "A x B x C", "B x C x D", etc.) will be generated. By identifying those combinations, the system can detect upcoming authorisation dates which require the renewal of certain components or combinations thereof (e.g., "B x C" and, also, of the individual product "B") even if other individual components ("A" or "D") are still valid, and vice versa. In different embodiments of the method of the invention, the permutation order of the components can be also considered for the generation of combinations in case that said order is relevant in the analysed GMO data repository.
- Running cross-database queries to search the combinations of the product query existing in the third-party repository. The component combinations generated in the previous step are searched in the third-party repository, based on their authorisation expiration date. In particular embodiments, this search is run regardless the particular order of the components in the sequence of the product. Then, the authorisation expiration date of the whole product is updated by replacing it with the authorisation expiration date of the combination which is closest to expire. For instance, if after a search the system retrieves the combination "B x C" having an authorisation date until 2022, while the isolated component "C" expires by 2025, then the authorisation date of the entire product "A x B x C" is updated to the first authorisation date of any of its combinations of components, in this case, 2022. If the authorisation date turns out to be updated, then the system provides a notification message and finishes the search.
- Optionally, all the generated combinations are incorporated into the local database repository for enhancing visualisation and control thereof. In this way, the register of each product preferably comprises a description, a plurality of component combinations and an authorisation date or status of its expiration date for each combination, among other fields.

[0039] To achieve optimal operation of its search method, the method of the invention may comprise the application of web scraping techniques for the extraction and manipulation of web data (e.g., based on HTML) in order to retrieve the information of the website and to populate the local database. Likewise, databases can be used to store relational information (e.g., databases using Structured Query Language, henceforth abbreviated as SQL). Regardless of the particular programming language used to implement the method of the invention, the system can comprise a web server (for example, a cloud-based server) for remote user access and internet access, and a connection with the public/official website on which the necessary information of authorisation dates is tracked and collected.

[0040] A particular embodiment of the method of the invention is summarised in Figure 1, which shows the following steps:

- Establishing (1) a connection with a third-party web repository and filling a search form or running a search routine to launch a product query comprising information of one or more GMO products.
- Tracking (2) the required information of the GMO products and standardising it as one or more sequences of GMO transformation events.
- Retrieving (3) the information and storing it into a database (DB). Said database serves not only for storing and processing the information, but also for providing the user with the processed information.

[0041] Once the previous steps (1), (2) and (3) have been performed, the database (DB) is populated with the raw information of a plurality of product sequences, including lists of components for each product, along with a corresponding authorisation date for every sequence.

[0042] Next, the following steps rely on the local DB content as a source of information to update or track authorisation expiration dates of a GMO product query requested by the user from the raw information retrieved from the remote third-party website:

- Retrieving (4) a plurality of product sequences from the local database (DB) based on a plurality of extraction rules and filters established by the user, said rules being associated with the product query of the user. The product

sequences comprise the description of the product and corresponding identifier fields (product name, company name, etc.), as well as their authorisation expiration dates.

- Processing (5) the product sequences retrieved in the previous step, by splitting them into their corresponding individual components or transformation events.
- Generating (6) one or more combinations of one or more GMO components for the product sequences (wherein those combinations can be permuted or unpermuted, depending on the relevance or meaning of the component order in the sequence for the third-party repository).
- Searching (7) existing combinations in the third-party repository that match the combinations generated in the previous step and, in case of an occurrence, analysing the authorisation date of the product and updating it if needed in the local database (DB).
- Presentation (8) of the information to the system user in a structured way, along with filtering and sorting information tools for analysing it. In this step, an alarm is triggered if the expiration date for any of the combinations is closer to the current date than the expiration date of the product sequences processed.

[0043] In preferred embodiments of the invention, the updating step of the product authorisation date may take place automatically, launched by the time monitoring means of the system, in predetermined regular time intervals without a human user request to the system. The time monitoring means are configured to monitor elapsed time and the authorisation date of different components of the products in the database.

[0044] The method described above is performed by a system which is also an object of the invention, and that comprises both the third-party remote repository and a local computer configured with the product combination database (DB), wherein the remote repository and the local computer are connected through a computer network. With regard to the visualisation of the information, the system of the invention comprises means for graphical representation (for instance, the screen of a computer means) adapted to show a user interface for updating and tracking authorisation expiration dates of different GMO products. Furthermore, the system preferably comprises information filtering means adapted to run automated or computerised searches prior to presentation of the information to a user, such that useful GMO information is extracted from the raw data obtained from a website and then filtered and/or sorted by authorisation date ranges on the local database. Finally, for a certain product query, the system returns a list of combinations, each one associated with an authorisation date and displays them, along with their corresponding authorisation expiration date, to the user.

[0045] For tracking or updating the authorisation date of a product within the local database, the following steps are performed by the system of the invention, each time a user of the queries the system about a certain product:

- The system verifies whether the GMO product exists in the third-party repository or not.
- If the product exists, the system retrieves the information of the third-party repository to the local database, splits the product into its event components, and searches all possible combinations of one or more of said components in the third-party repository, retrieving them in the local database, along with their corresponding authorisation expiration date.
- For each combination searched and retrieved, the system displays its corresponding identifiers, product information and authorisation date. In case that, for any of the combinations, the authorisation date is exceeded or satisfies a predefined alarm rule, the system may generate a warning alarm to the user to request immediate attention. The alarms can be delivered by any technical means, comprising visual and audio feedback to the user (e.g., through a screen, a voice message, etc.). The user of the system can set the alarm notifications at a desired time, and/or program them at desired periods prior to the expiration date.
- If requested by the user, the system displays and groups the data in a structured and understandable way (a list of product combinations sorted in descending order, wherein those with an authorisation date closest to the expiration are placed at the top of the list).
- Optionally, the system can export the obtained data in a format requested by the user (as a spreadsheet, a plot, etc.).

[0046] Additional advantages and modifications will readily occur to those skilled in the art. Therefore, the invention in its broader aspects is not limited to the specific details and representative embodiments shown and described herein. Accordingly, various modifications may be made without departing from the spirit or scope of the general inventive concept as defined by the appended claims and their equivalents.

Claims

1. Computer-implemented method for monitoring the authorisation expiration dates of genetically modified organism, GMO, products, the method comprising the steps of:

- a) providing, in a remote data repository configured in a computer server, a list of GMO products, each GMO product in the list comprising one or more unique identifiers, a sequence of components associated to a plurality of genetical transformation events of the product, and an authorisation expiration date of said sequence;
- b) requesting, by a computer terminal connected to the computer server through a communication network, information about at least one GMO product of the list in the remote data repository, and retrieving said information to a database configured in the computer terminal;
- c) storing at least one identifier of the GMO product, its corresponding sequence of components, and its authorisation expiration date in the database of the computer terminal;

wherein the method is **characterised in that** it further comprises the following steps:

- d) processing, in the computer terminal, the sequence of components, splitting said sequence into a plurality of single transformation-event components;
- e) generating a plurality of sub-combinations of the split components of the sequence, wherein said sub-combinations are smaller than the sequence and comprise at least one component;
- f) searching, in the remote data repository, existing GMO product sequences that match one or more of the sub-combinations generated in step e);
- g) retrieving, for the matched GMO products found in step f), their corresponding authorisation expiration dates to the database of the computer terminal, storing said expiration dates and the matching sub-combinations of the sequence processed in step d);
- h) updating, in the database of the computer terminal, the authorisation expiration date of the GMO products retrieved in step b) in case that any of the expiration dates of their corresponding sub-combinations is closer to the current date than the expiration date of the GMO products in the remote data repository, wherein the updated expiration date is set as the closest expiration date of said corresponding sub-combinations.

2. Method according to the preceding claim, wherein an alarm notification information is generated by the computer terminal after step d), displaying said alarm notification information through a user interface configured in the computer terminal.

3. Method according to the preceding claim, further comprising:

- storing the alarm notification information in the database of the computer terminal; and
- displaying said alarm notification information at the updated authorisation expiration date in a computer display.

4. Method according to any of the preceding claims, wherein the sub-combinations generated in step e) are unpermuted sub-combinations.

5. Method according to any of the preceding claims, wherein the request of step b) is launched in a plurality of time intervals.

6. Method according to any of the preceding claims, wherein the step b) of requesting, by the computer terminal, information about at least one GMO product of the list of the remote data repository, and retrieving said information to a database configured in the computer terminal, is performed through database query language commands executed by the computer terminal, and/or through web scraping scripts executed by the computer terminal.

7. System for monitoring the authorisation expiration dates of genetically modified organism, GMO, products, the system comprising:

- a computer server configured with a remote data repository, wherein the data repository comprises a list of GMO products, each GMO product in the list comprising one or more unique identifiers, a sequence of components associated to a plurality of genetical transformation events of the product, and an authorisation expiration date of said sequence;
- a computer terminal connected to the computer server through a communication network, wherein the computer terminal is configured with a database;

characterised in that the computer server and the computer terminal are configured with hardware and software means adapted to implement a method according to any of the preceding claims.

8. System according to the preceding claim, wherein the computer terminal further comprises visualisation means for displaying alarm notification information.

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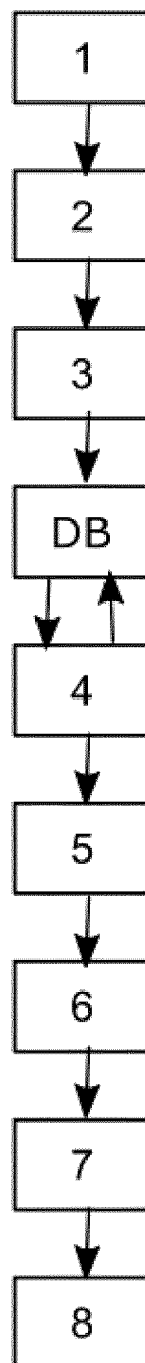


FIG. 1



EUROPEAN SEARCH REPORT

Application Number

EP 21 38 2936

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2021/304297 A1 (AL-SINAN MAZEN [SA] ET AL) 30 September 2021 (2021-09-30) * paragraphs [0080], [0090], [0172] - [0174], [0180]; figures 8,22 * -----	1-8	INV. G06Q90/00
			TECHNICAL FIELDS SEARCHED (IPC)
			G06Q
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 3 March 2022	Examiner Stratford, Colin
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.

EP 21 38 2936

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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03-03-2022

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2021304297 A1	30-09-2021	US 2021304297 A1	30-09-2021
		WO 2021195167 A1	30-09-2021

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82