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Published:

- with international search report (Art. 21(3))
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))
- with sequence listing part of description (Rule 5.2(a))

(88) Date of publication of the international search report:

18 July 2024 (18.07.2024)

(54) Title: MODIFIED PLANTS AND PLANT CELLS

(57) Abstract: The present invention relates to modified plants, methods of preparing same, and methods of reducing methane emissions in animals, in particular in ruminant livestock. Provided are plants and plant cells comprising nucleic acid constructs for inducing expression of a polypeptide comprising a vanadate-dependent haloperoxidase (VHPO), or a functional fragment or homologue thereof.



INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2023/083234

A. CLASSIFICATION OF SUBJECT MATTER

INV. C07K14/415 C12N15/82
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

C07K C12N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data, BIOSIS, Sequence Search, EMBASE**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2020/243792 A1 (UNIV MACQUARIE [AU]) 10 December 2020 (2020-12-10) cited in the application the whole document -----	1 - 25
T	OHSHIRO T ET AL: "Expression of the vanadium-dependent bromoperoxidase gene from a marine macro-alga Corallina pilulifera in Saccharomyces cerevisiae and characterization of the recombinant enzyme", PHYTOCHEMISTRY, ELSEVIER, AMSTERDAM , NL, vol. 60, no. 6, 1 July 2002 (2002-07-01), pages 595-601, XP004370318, ISSN: 0031-9422, DOI: 10.1016/S0031-9422(02)00160-7 the whole document ----- - / - -	



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance;; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance;; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

4 April 2024

Date of mailing of the international search report

20/06/2024

Name and mailing address of the ISA/

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INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2023/083234

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X,P	WO 2022/266723 A1 (COMMW SCIENT IND RES ORG [AU]) 29 December 2022 (2022-12-29) the whole document	1-10,17, 20,23-25
T	----- THAPA HEM R. ET AL: "Genetic and Biochemical Reconstitution of Bromoform Biosynthesis in Asparagopsis Lends Insights into Seaweed Reactive Oxygen Species Enzymology", ACS CHEMICAL BIOLOGY, vol. 15, no. 6, 19 June 2020 (2020-06-19), pages 1662-1670, XP093019152, ISSN: 1554-8929, DOI: 10.1021/acschembio.0c00299 Retrieved from the Internet: URL:https://www.ncbi.nlm.nih.gov/pmc/artic les/PMC7306000/pdf/nihms-1597901.pdf> the whole document	
T	----- Deb R.: "GENETICALLY MODIFIED (GM) CROPS LIFELINE FOR LIVESTOCK", , 1 January 2012 (2012-01-01), XP093135307, Retrieved from the Internet: URL:https://www.cabidigitallibrary.org/doi /pdf/10.5555/20123278630 [retrieved on 2024-02-27] the whole document -----	

INTERNATIONAL SEARCH REPORT

International application No.

PCT/EP2023/083234

Box No. I Nucleotide and/or amino acid sequence(s) (Continuation of item 1.c of the first sheet)

1. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international search was carried out on the basis of a sequence listing:
 - a. ☒ forming part of the international application as filed.
 - b. ☐ furnished subsequent to the international filing date for the purposes of international search (Rule 13^{ter}.1(a)).
☐ accompanied by a statement to the effect that the sequence listing does not go beyond the disclosure in the international application as filed.
2. ☐ With regard to any nucleotide and/or amino acid sequence disclosed in the international application, this report has been established to the extent that a meaningful search could be carried out without a WIPO Standard ST.26 compliant sequence listing.
3. Additional comments:

INTERNATIONAL SEARCH REPORT

International application No.
PCT/EP2023/083234

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims;; it is covered by claims Nos.:
1 - 25 (partially)

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-25(partially)

A vanadate-dependent haloperoxidase (VHPO) encoded by SEQ ID No 47 vectors and transgenic plants comprising the same as well as the use of said plants for reducing methane production in an animal.

2-29. claims: 1-25(partially)

A vanadate-dependent haloperoxidase (VHPO) encoded by SEQ ID No 48-54, 57-60, 71-74, 77-80 (each SEQ ID representing a single invention) vectors and transgenic plants comprising the same as well as the use of said plants for reducing methane production in an animal.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2023/083234

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2020243792	A1	10-12-2020	NONE

WO 2022266723	A1	29-12-2022	AR 126235 A1 04-10-2023
		AU 2022298331	A1 18-01-2024
		CA 3223665	A1 29-12-2022
		EP 4358732	A1 01-05-2024
		UY 39831	A 31-01-2023
		WO 2022266723	A1 29-12-2022
