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BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM,
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GW, KM, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

- as to applicant's entitlement to apply for and be granted a
patent (Rule 4.17(ii))
- as to the applicant's entitlement to claim the priority of the
earlier application (Rule 4.17(iii))
- of inventorship (Rule 4.17(iv))

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:

15 December 2016

(54) Title: ANIMAL FEED COMPOSITIONS AND METHODS OF USE

(57) Abstract: The invention provides an animal feed composition comprising microbial a-amylase. The invention further provides methods of increasing the growth (weight gain), the average daily weight gain or the efficiency of feed utilization by an animal or reducing the number of days needed to achieve a desired weight in an animal, comprising feeding to the animal an animal feed composition of the present invention.



INTERNATIONAL SEARCH REPORT

International application No.

PCT/US16/26656

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - A23K 1/00, 3/00; C12N 15/31, 15/09, 15/56; C12P 19/14 (2016.01)

CPC - C12N 9/246, 9/2414, 15/09; C12P 19/14

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)

IC: A23K 1/00, 3/00, 35/64, 38/46, 38/47; C12N 15/31, 15/09, 15/56; C12P 19/14 (2016.01)

CPC: A61K 35/64, 38/46, 38/47; C12N 9/246, 9/2414, 15/09; C12P 19/14

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)

PatSeer (US, EP, WO, JP, DE, GB, CN, FR, KR, ES, AU, IN, CA, INPADOC Data); EBSCO Discovery; PubMed; Google; Google Scholar; Google Patents; KEYWORDS: animal, feed, composition, alpha amylase, recombinant, transgenic

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X ----- Y	US 2003/0135885 A1 (LANAHAN, MB et al.) July 17, 2003; paragraphs [0017], [0020], [0023], [0026], [0033], [0080], [0185]; claim 11	1-5 --- 6, 7/5-6
Y	US 2007/0243236 A1 (CERDA, CI et al.) October 18, 2007; abstract; paragraph [0016]; claim 3	6, 7/5-6
A	US 2009/0324571 A1 (STEINBERG, W et al.) December 31, 2009; entire document	1-6, 7/5-6
A	US 2014/0234279 A1 (MILLAN, LFR) August 21, 2014; entire document	1-6, 7/5-6

☐ 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

13 September 2016 (13.09.2013)

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US16/26656

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.: 8-11, 16-29
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:

.-***-Please See Supplemental Page-***-

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 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.:

1-6, 7/5-6

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.

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/US16/26656

-Continued from Box No. III: Observations where unity of invention is lacking-

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Groups I+, Claims 1-10, 12-15, 30, 31 and SEQ ID NO: 2 are directed toward an animal feed composition, optionally a corn ration, comprising plant material, wherein the plant material comprises a recombinant α -amylase.

The feed compositions and corn ration will be searched to the extent they encompass an alpha-amylase encoded by a sequence encompassing SEQ ID NO: 2 (first exemplary nucleic acid sequence). Applicant is invited to elect additional alpha amylase(s) with specified encoding nucleic acid SEQ ID NO: for each, or with specified substitution(s) at specified site(s) of an encoding SEQ ID NO: and/or with a specified amino acid SEQ ID NO: or with specified substitution(s) at specified site(s) of an amino acid SEQ ID NO: to be searched. Additional alpha amylase sequence(s) will be searched upon the payment of additional fees. It is believed that claims 1, 2 (in-part), 3, 4 (in-part), 5 (in-part), 6 (in-part), 7 (in-part), . encompass this first named invention and thus these claims will be searched without fee to the extent that they encompass SEQ ID NO: 2 (nucleic acid sequence). Failure to clearly identify how any paid additional invention fees are to be applied to the "+" group(s) will result in only the first claimed invention to be searched/examined. An exemplary election would be an alpha amylase encoded by a nucleic acid encompassing SEQ ID NO: 3 (first exemplary elected nucleic acid sequence).

No technical features are shared between the alpha amylase sequences of Groups I+ and, accordingly, these groups lack unity a priori.

Groups I+ share the technical features including: an animal feed composition comprising plant material from a transgenic plant or plant part, wherein the plant material comprises a recombinant microbial α -amylase encoded by a nucleotide sequence having at least 80% identity to the nucleotide sequence of SEQ ID NO: 2, SEQ ID NO: 3, SEQ ID NO: 4 and/or SEQ ID NO: 5 or comprising a polypeptide having at least 80% homology to an amino acid sequence of SEQ ID NO: 1; and a corn ration comprising plant material from a transgenic corn plant or plant part stably transformed with a recombinant α -amylase encoded by a nucleotide sequence having at least 80% identity to the nucleotide sequence of SEQ ID NO: 2, SEQ ID NO: 3, SEQ ID NO: 4 and/or SEQ ID NO: 5 or comprising a polypeptide having at least 80% identity to an amino acid sequence of SEQ ID NO: 1.

However, these shared technical features are previously disclosed by US 2003/0135885 A1 to Lanahan et al. (hereinafter 'Lanahan').

Lanahan discloses an animal feed composition (improved animal feed (an animal feed composition); paragraph [0185]) comprising plant material from a transgenic plant or plant part (comprising proteins and polysaccharides from a plant comprising an exogenous recombinant processing enzyme (comprising plant material from a transgenic plant or plant part; paragraph [0185]), wherein the plant material comprises a recombinant microbial α -amylase (wherein the plant material comprises a recombinant microbial α -amylase; paragraph [0017]) encoded by a nucleotide sequence having at least 80% identity to the nucleotide sequence of SEQ ID NO: 2 (encoded by a nucleotide sequence having at least 80% identity to the nucleotide sequence of SEQ ID NO: 2 (SEQ ID NO: 2); paragraph [0017], SEQ ID NO: 2, wherein SEQ ID NO: 2 is 100% identical to Applicants' SEQ ID NO: 2); and a corn ration (improved animal feed comprising corn (a corn ration); paragraphs [0033], [0185]) comprising plant material from a transgenic corn plant or plant part (comprising plant material from a transgenic corn plant or plant part; paragraphs [0033], [0185]) stably transformed (stably transformed; paragraph [0020]) with a recombinant α -amylase (with a recombinant α -amylase; paragraph [0017]) encoded by a nucleotide sequence having at least 80% identity to the nucleotide sequence of SEQ ID NO: 2, (encoded by a nucleotide sequence having at least 80% identity to the nucleotide sequence of SEQ ID NO: 2 (SEQ ID NO: 2); paragraph [0017], SEQ ID NO: 2, wherein SEQ ID NO: 2 is 100% identical to Applicants' SEQ ID NO: 2).

Since none of the special technical features of the Groups I+ inventions is found in more than one of the inventions, and since all of the shared technical features are previously disclosed by the Lanahan reference, unity of invention is lacking.