

(12) PATENT
(19) AUSTRALIAN PATENT OFFICE

(11) Application No. AU 200071443 B2
(10) Patent No. 742362

(54) Title
Dry yeast compositions

(51)⁷ International Patent Classification(s)
C12N 001/18 A21D 010/00
A21D 002/22 C12N 001/16
A21D 008/04

(21) Application No: **200071443**

(22) Application Date: **2000.11.06**

(43) Publication Date : **2001.02.08**

(43) Publication Journal Date : **2001.02.08**

(44) Accepted Journal Date : **2002.01.03**

(62) Divisional of:
199481731

(71) Applicant(s)
DSM N.V.

(72) Inventor(s)
Jan Willem Groenendaal

(74) Agent/Attorney
**PHILLIPS ORMONDE and FITZPATRICK,367 Collins Street,MELBOURNE VIC
3000**

(56) Related Art
US 3959494
FR 1509676

ABSTRACT

A dry granular yeast composition having a moisture content of not more than about 8% (w/w) and containing about 0.1 to 8%(w/w) of a bread-improving agent wherein the dry yeast and the bread-improving agent is present in granular form, and wherein the bread-improving agent includes one or more enzymes and/or ascorbic acid, and wherein said bread-improving agent present in a form selected form

5

(a) a granulate having substantially the same granule size as the dry yeast; and

10

(b) a coating on the dry yeast granules in the form of a film or adhered particles.



AUSTRALIA

Patents Act

**COMPLETE SPECIFICATION
(ORIGINAL)**

Class Int. Class

Application Number:
Lodged:

Complete Specification Lodged:
Accepted:
Published:

Priority

Related Art:

Name of Applicant:

DSM N.V.

Actual Inventor(s):

Jan Willem Groenendaal

Address for Service:

PHILLIPS ORMONDE & FITZPATRICK
Patent and Trade Mark Attorneys
367 Collins Street
Melbourne 3000 AUSTRALIA

Invention Title:

DRY YEAST COMPOSITIONS

Our Ref : 630207
POF Code: 255815/255815

The following statement is a full description of this invention, including the best method of performing it known to applicant(s):

GIST-BROCADES B.

2678S

DRY YEAST COMPOSITIONS

The present application is a Divisional from Australian Application 676406 (81751/94) the entire disclosure of which is incorporated herein by reference.

The present invention relates to dry yeast compositions, the production thereof and their use in bakery products and beverages.

The manufacture of a yeast composition starts with a small sample of a pure culture. This sample is used to inoculate the first of a series of fermentations in fermenters of successively increasing size. The first few are mildly aerated batch fermentations. Only the last two (or sometimes three) stages are performed using full aeration and incremental feeding of molasses. These fed-batch fermentations are carried out in fermenters having a volume of 100m³ or more. Fermentation is typically carried out for a total of 12-20 hours during which time about 10,000-30,000 kg of compressed yeast is produced.

Further processing includes separating the yeast from the broth by centrifugation and washing which results in a yeast cream (17-23% (w/w) dry matter content).

The yeast cream may be processed into compressed yeast (27-33% (w/w) dry matter content) which is either sold as such or extruded and dried to produce active dry yeast (ADY) or instant dry yeast (IDY) with moisture contents of 6-8% (w/w) and 2-8% w/w), respectively.

In the case of ADY, drying usually takes place in belt or rotolouvre (drum) dryers. For IDY production, fluidized-bed drying is commonly used. Drying of the yeast to a level of about 20% w/w water content involves only the evaporation of free water. Further reduction of the moisture content requires removal of a portion of the bound water from the yeast which may cause damage to the yeast cell

membrane. US patents 3,843,800 and 4,248,420 describe use in such a drying process of a wetting agent such as a glycerol ester and/or fatty acid ester of propylene glycol so as to preserve the desired high direct leavening activity of the yeast.

Dry yeast loses part of its leavening activity during both drying and rehydration. Dry yeasts are still commonly used in the bakery trade because of their extended stability and because refrigeration is unnecessary. Dry yeasts are used in wine making to obtain a fast and reproducible fermentation thereby avoiding the risk of failure of natural fermentation. Moreover, the yeast is immediately available throughout the year.

Instant dry yeast (IDY) is the latest type of baker's yeast, which was introduced in the early 1970s (see for example US patent 3,843,800). This was followed a few years later by introduction of instant dry wine yeast (IWY), which can be regarded as a special form of instant dry yeast. To obtain a high quality IDY, compressed yeast of relatively high protein content (42-60% (w/w)) must be dried in a quick drying process. The leavening activity of IDY under conditions of application is about 75-85% that of compressed yeast. The shelf life in a vacuum-sealed package is comparable to that of ADY.

IDY is presented typically in the form of very small rods that are highly porous and easy to rehydrate. On the one hand, this allows immediate use, without prior rehydration. On the other hand, the high porosity gives easy access to water and oxygen (from air) which results in a rather rapid loss of activity upon exposure to atmospheric conditions. For satisfactory results, IDY should be used within 3-5 days of opening the package. Moreover, the high porosity of IDY makes it sensitive to extreme rehydration conditions.

IDY usually has a moisture content of 2-8% (w/w) and a protein content between 42 and 60% (w/w) on a dry matter basis.

In baking, besides bakers' yeast, processing aids such as bread improvers are used, including oxidising and reducing agents, enzymes such as redox enzymes, α -amylases, amyloglucosidases, hemicellulases, cellulases and proteases, lipases and phospholipases, emulsifiers and fatty materials. Yeast, enzymes and redox agents are added separately to doughs. Yeast may be added in cream, compressed, active dry or instant dry form. Enzymes may be added in dry powder or in dissolved form. Redox agents are in most cases used in powder form.

Separate weighing and dosing of these various ingredients increases the number of actions which have to be performed by the operators of the production process. Inherent in this increased number of actions is a greater chance of introducing errors resulting in negative impact on the quality of the end product. Moreover, working with dusty materials may initiate allergic reactions.

Mixing of ingredients with dry granular yeast or instant dry yeast may result in homogeneous products directly after mixing. However, during transport and storage prior to use, this type of product tends to lose homogeneity (see Example 1). To solve these problems various solutions have been proposed.

J-73040748 describes the mixing of granular semi-dry yeast (moisture content of 35-45% w/w) with a wheat flour improving agent for use in breadmaking. In such a mixture, the stability of both the flour improving agent and yeast is very limited due to the high water content. Thus, special attention has to be paid to storage and transport conditions.

DE-2515029 describes the production of active dry yeast by vacuum drying and coformulation of the dry yeast with spray dried malt extract or maltodextrins. Malt extract or maltodextrins are added as a dewatering agent. However, this vacuum drying technique cannot be applied economically on a commercial scale due to unacceptable loss in leavening activity. In general, a yeast composition produced by this

technique will in powder or dust form, which may result in allergy.

5 The above discussion of documents, acts, materials, devices, articles and the like is included in this specification solely for the purpose of providing a context for the present invention. It is not suggested or represented that any or all of these matters formed part of the prior art base or were common general knowledge in the field relevant to the present invention as it existed in Australia before the priority date of each claim of this application.

10 The present invention provides a dry yeast composition which has the advantage of provision of dry yeast with a bread-improving agent, but which has none of the above-mentioned disadvantages such as dust formation and loss of homogeneity of the composition during transport.

15 Thus in one aspect the present invention provides a dry granular yeast composition having a moisture content of not more than about 8% (w/w) and containing about 0.1 to 8% (w/w) of a bread improving agent, wherein the dry yeast is present in granular form and wherein the bread-improving agent includes one or more enzymes and/or ascorbic acid, and wherein said bread-improving agent is present in a form selected from

20 (a) a granulate having substantially the same granula size as the dry yeast, and

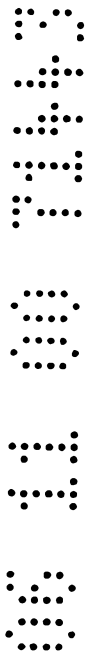
(b) a coating on the dry yeast granules in the form of a film or adhered particles.

25 In principle, a dry yeast composition of the present invention may have substantially the same granule size or not a greatly increased granule size compared to the starting dry yeast before the bread-improving agent is added. Additionally, a composition of the invention has the same convenience of use as dry yeast, which makes application possible without adapting operational procedures or equipment.

30 Preferably, the bread-improving agent is added to the dry yeast at 1 to 4% (w/w). Enzymes for this purpose can be selected from carbohydrases such as a-amylase, ayloglucosidase, hemicellulase, cellulase and glucanase, protein modifying enzymes such as proteases and peptidases, redox enzymes such as glucose oxidase, sulfhydryloxidase and lipoxidase (lipoxygenase), peptidyl

4 A

enzymes such as glucose oxidase, sulfhydryloxidase and lipoxidase (lipoxygenase), peptidyl transferases such as γ -glutamyl transferase and lipid modifying enzymes such as lipases and phospholipases.



In one embodiment of the invention, the bread-improving agent is present as a granulate having substantially the same granule size as the dry yeast. Where the bread-improving agent comprises more than one component, 5 the components may be produced together as a homogeneous granular form or each component may be produced separately in granular form. The latter is especially preferred since this enables the ratio of the components of the bread-improving agent to be varied prior to mixing with the dry 10 yeast. Mixing of the bread-improving agent and the dry yeast can be carried out using conventional mixing methods. Any known mixing method can be applied, provided attention is paid to preventing substantial damage to the granules, which may lead to loss of activity or dust formation.

15 In another embodiment of the invention, the bread-improving agent is coated on to the dry yeast granules. The coating may be in the form of very small adhered particles or a film. If a bread-improving agent is employed to provide a particle coating, preferably at least 50% of the particles 20 will have a size smaller than $50\mu\text{m}$. It has been found advantageous for at least 80% of the particles to have a smaller size than $50\mu\text{m}$. Particles of a bread-improving agent which are too large for direct use in a composition of the invention can be reduced to appropriate size using suitable 25 equipment known in the art such as a milling apparatus.

The bread-improving agent particles are stuck on to the dry yeast using suitable adhesives. These will be in general foodgrade adhesives, preferably have a keeping quality of at least two years when applied on dry yeast and 30 will not influence the taste or flavour of the dry yeast, the dough prepared with the yeast or the final bread product. The adhesive is preferably added to a mixture of yeast granules and microfine bread-improving particles, e.g. at 0.5 to 1.0% (w/w). During application of the adhesive, 35 continuous mixing is preferably carried out. The adhesive is preferably slowly supplied either continuously or batch-wise using small portions each time. After completion of addition

of the adhesive, the mixing will continue until substantially all the bread-improving particles are stuck on to the dry yeast granules. While the adhesive can be poured on to the mixture, preferably the adhesive is sprayed on to the mixture to obtain a more uniform distribution. An in-line mixing process may be used (see Example 6).

Suitable adhesives are e.g. oils such as soy oil, cotton seed oil, rape seed oil, sunflower oil, corn oil, peanut oil, olive oil, paraffin oil, triglycerides, liquid fats and mixtures thereof. Fractionated oils can be used. The adhesive may include one or more additives which are beneficial in improving the sticking characteristics. Thus, for example, lecithin may be advantageously mixed with soy oil.

For formation of dry yeast granules with a film coating of a bread-improving agent, the bread-improving agent will be prepared in the form of a suspension or solution. Subsequently, the suspension or solution will be coated on to the dry yeast granules by using coating apparatus known per se, e.g. a fluidized bed or coating pan. Excess water will be removed so as to provide a dry film of bread-improving agent around each dry yeast granule. A binding agent may be advantageously added to the suspension or solution of the bread-improving agent to promote binding to the yeast granules, e.g. hydroxypropyl cellulose.

In further aspects, the present invention additionally provides use of a dry granular yeast composition of the invention for incorporation into a dough or for fermentation of a beverage and doughs and beverage compositions incorporating such a dry yeast composition.

The following examples illustrate the invention.

Example 1 (comparative example)

2,700 g Fermipan™ (dry yeast of Gist-brocades) were
5 homogeneously mixed with 36 g ascorbic acid, 6 g fungal α -
amylase Fermizyme™ P₂₀₀ (Gist-brocades, 4740 PU/g) and 48g
hemicellulase Fermizyme™ H₁₀₀₀ (Gist-brocades, hemicellulase
activity 13,500 HU/g and α -amylase activity 942 PU/g) in a
Hobart mixer. Directly after mixing, portions of 450 g were
10 weighed and packed in aluminium bags, which were closed at
reduced pressure.

The homogeneity of the contents of three packs was
tested directly after packing by opening each pack at three
places, near the top, in the middle, and near the bottom,
15 and withdrawing samples of 25 g from each opening. In these
samples, the levels of ascorbic acid, fungal α -amylase and
hemicellulase were analyzed according to the following
methods:

- ascorbic acid analysis was carried out
20 according to the conventional method of Boehringer.

- fungal α -amylase activity was determined using
Phadebas™ tablets from Pharmacia. In this method,
solubilization of dye-labelled starch by α -amylase over 15
minutes in a buffer at pH 5.5 and 30°C is measured
25 spectrophotometrically. α -amylase activity is expressed in
Phadebas Units (PU) using an Aspergillus oryzae fungal α -
amylase preparation of 10,000 PU/g as an internal standard.
One Phadebas Unit defined in this way equals about 10 SKB
units, used in the baking industry.

30 - fungal hemicellulase activity was determined
by measuring the amount of reducing sugars produced over a
predetermined time period in the micro-assay as described by
Leathers T.D., Kurtzman, C.P. and Detroy, R.W. in
Biotechnol. Bioeng. Symp., (1984) 14, 225. In this paper,
35 the hemicellulase unit (HU) is also defined.

The results are summarised in Table 1.

Another three packs prepared as described above were stored for two weeks in a refrigerator at 4°C. Afterwards, these packs were placed in a conventional carton for instant yeast packs and surrounded by conventional instant yeast packs. This case was transported by a heavy goods vehicle over about 2500 km such that the packs were in a vertical position. Afterwards, the three test packs were stored in a refrigerator again for another four weeks. The homogeneity was then tested in the above described way. The analysis results are summarised in Table 1.

TABLE 1

Homogeneous mix			Relative Amount recovered (%)	
			directly	after transport
Top	ascorbic acid	0.013 g/g	101.5	85.2
	α -amylase	26 PU/g	93.5	91.4
	hemicellulase	232 HU/g	100.8	92.5
Middle	ascorbic acid	0.013 g/g	102.0	89.2
	α -amylase	26 PU/g	98.1	94.6
	hemicellulase	232 HU/g	99.6	91.4
Bottom	ascorbic acid	0.013 g/g	99.1	112.3
	α -amylase	26 PU/g	101.7	108.6
	hemicellulase	232 HU/g	93.7	106.9

From these results, it is clear that during storage and transport, the mixture of yeast, ascorbic acid and enzymes lost homogeneity.

Example 2

Mixing process for 1 kg dry yeast composition

a) The following components were weighed:

5	-	Fermipan™ (dry yeast of Gist-brocades having dry matter content of	975.700g+97.57%
		Vitamin C microfine	16.873g= 1.69%
	-	Hemicellulase 25,690 HU/g	0.856g= 0.08%
		a-amylase 11,400 PU/g	1.632g= 0.16%
10	-	Kriskol 3000 (fractionated fat, Loders, Croklaan)	<u>5,000g= 0.50%</u>
			1,000g 100%

b) A premix was prepared consisting of 100 g Fermipan™ combined with the total amount of vitamin C and enzymes by mixing the components with a spoon in a 250ml beaker.

c) The premix was put in the mixing beaker of a Hobart planetary mixer together with the remaining part of the Fermipan.

d) Mixing was started and the Kriskol 3000 was added in 30 sec. The total mixing time was 10 mins.

e) The final product was vacuum packed in aluminium bags and stored at 5 °C.

Example 3

Mixing process for 30 kg dry yeast composition

a) The following components were weighed:

5	- Fermipan™	29,121	g =	97.07 %
	- Vitamin C microfine	506.2	g =	1.69 %
	- Hemicellulase 25,690 HU/g	25.7	g =	0.08 %
	- α-amylase 11,400 PU/g	49.0	g =	0.16 %
	- Durkex 500 (mixture of soy	300	g =	1.00 %
10	oil and cotton seed oil,			
	Otto Aldag, Hamburg	_____	_____	
		30,000	g	100 %

b) A premix was prepared by combining 4,367g Fermipan™, the total amount of Vitamin C and enzymes and
15 99g of Durkex 500 in a Hobart planetary mixer.

c) The premix was put in a Nauta conical mixer together with the remaining part of the Fermipan.

d) Mixing was started and the remaining part of the Durkex 500 was added in 40 sec. The total mixing time
20 was 10 mins.

e) The final product was vacuum packed in aluminium bags and stored at 5°C.

Example 4

Granulating process for 500 kg of Vitamin C and enzymes prepared in a Multi-Stage spray-dryer and mixing process to produce 10,000 kg of dry yeast composition.

5

a) The following components were weighed:

-	Vitamin C	15.6 kg	=	3.12%
-	Vitamin C sodium	420.2 kg	=	84.04%
-	Hemicellulase 25,690 HU/g	22.1 kg	=	4.42%
10	-	α -amylase 11,400 PU/g	42.1 kg	= 8.42%
			<hr/>	
			500 kg	= 100 %
-	water	750 kg		

15

b) A solution was prepared by mixing the Vitamin C and enzymes with the water in a vessel of 1500 l equipped with a turbine stirrer.

c) Directly after preparation of the solution, it was fed to a Stork Multi-Stage spray-dryer and dried with
20 fine return at an inlet temperature of about 160°C and an outlet temperature of about 90°C.

d) 197 kg of the MSD-granulate was transported to a conical Nauta mixer with a capacity of 15 m³ together with 9,803 kg of FermipanTM. The total mixing time was 20 mins.

25

e) The dried product was vacuum packed in aluminium bags and stored at 5°C.

Example 6

In-line mixing process for 10,000 kg dry yeast composition

a) The following components were weighed:

5	-	Fermipan™	9,706.4	kg =	97.07 %
	-	Vitamin C microfine	168.7	kg =	1.69 %
	-	Hemicellulase 25,690 HU/g	8.6	kg =	0.08 %
	-	α-amylase 11,400 PU/g	16.3	kg =	0.16 %
	-	Durkex 500	<u>100</u>	<u>kg =</u>	<u>1.00 %</u>
10			10,000	kg	100 %

b) A premix was prepared of 1,456 kg of Fermipan™ combined with the total amount of Vitamin C and enzymes and 33 kg of the Durkex 500 in a Nauta conical
15 mixer. The mixing time was 20 mins.

c) This premix was fed with the aid of pneumatic transport to an in-line mixer together with the remaining part of the Fermipan™ and the remaining part of the Durkex 500. The flow of Fermipan™, the premix and the Durkex 500
20 were adjusted to accord with the above-mentioned composition with the aid of automatic dosing units.

d) Directly following the in-line mixer, the product was vacuum packed in aluminium bags and stored at 5°C.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A dry granular yeast composition having a moisture content of not more than about 8% (w/w) and containing about 0.1 to 8% (w/w) of a bread-improving agent, wherein the dry yeast and the bread-improving agent is present in granular form, and wherein the bread-improving agent includes one or more enzymes and/or ascorbic acid, and wherein said bread-improving agent present in a form selected from

10 (a) a granulate having substantially the same granule size as the dry yeast; and

(b) a coating on the dry yeast granules in the form of a film or adhered particles.

2. A composition as claimed in claim 1 wherein said bread-improving agent is present as adhered particles on the dry yeast granules, at least 50%, preferably at least 80%, of said adhered particles having a diameter of less than 50 μ m.

3. A composition as claimed in claim 1 or 2 wherein said bread-improving agent is present in the form of particles adhered to the dry yeast granules by means of an adhesive comprising one or more of edible oils, triglycerides and liquid fats.

4. A composition as claimed in claim 3 wherein the bread-improving agent includes at least one of a hemicellulose and an α -amylase.

5. A process for the production of a composition as claimed in claim 1 wherein a bread improving agent in granular form is mixed with granules of dry yeast having a moisture-content of not more than about 8% (w/w).

6. A process for the production of a composition as claimed in claim 1 or claim 2 wherein dry yeast granules having a moisture content of not more than about 8% (w/w) are mixed with smaller particles of a bread-improving agent in the

presence of an adhesive so that said yeast granules become coated with particles of the bread-improving agent.

7. A process for the production of a composition as claimed in claim 1
- 5 wherein a suspension or a solution of the bread-improving agent is coated onto dry yeast granules having a moisture content of not more than about 8% (w/w) followed by removal of excess moisture.

8. A process as claimed in claim 7 wherein coating of the yeast granules is
10 carried out by a fluidized bed process or a coating pan process.

9. Use of a composition as claimed in any one of claims 1 to 4 for incorporation into a dough or for fermentation of a beverage.

10. A dough or beverage composition incorporating a composition as claimed
15 in any one of claims 1 to 4.

11. A composition according to claim 1 substantially as hereinbefore described with reference to the examples 2 to 6.

12. A process according to any one of claims 5 to 8 substantially as
20 hereinbefore described with reference to examples 2 to 6.

25 DATED: 6 November 2000

PHILLIPS ORMONDE & FITZPATRICK

Attorneys for:

DSM N.V.

David B Fitzpatrick