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(54) Title: DIETARY EXTRA-VIRGIN OLIVE OIL WITH OMEGA-3 FATTY ACIDS AND RELEVANT PRODUCTION TECHNIQUE

(57) Abstract: This invention relates to dietary extra-virgin olive oil with added omega-3 fatty acids (EPA and DHA), Vitamin B6 and Vitamin E, which help make this product a complete and pharmacologically active foodstuff for the overall protection of the body, in association with a regular intake of vegetable and animal proteins; an alternative embodiment of the present invention envisages the addition of Vitamin A, together with Vitamin E, which is capable of preventing the lipid peroxidation of the cell membranes, inhibiting the effects of the free radicals.



Description

Dietary extra-virgin olive oil with added omega-3
fatty acids and relevant production technique

Technical field

Extra-virgin ,olive oil is a well known natural product, obtained from the cold pressing of the fruit of the olive tree.

5 This food product plays a primary role in the Mediterranean diet, which is already very well balanced, with regard to the intake of carbohydrates, vegetable fats and vegetable and animal proteins.

Among vegetable oils, extra-virgin olive features the
10 highest natural content of monounsaturated fatty acids (MUFAs), which vary between 60 and 80%, in weight, of total fatty acid content, depending on the species of olives.

This characteristic ensures that extra-virgin olive
15 oil is stable against oxidation and attack by free radicals.

The content of polyunsaturated fatty acids (PUFAs, essentially, linoleic a linolenic acids, a.k.a. essential fatty acids, or EFAs) varies, in the case of olive oil from the Mediterranean Region, between 5 and

19%, with an average of approx. 8%, in the case of Italian oil.

5 The importance of the PUFA intake for nutritional purposes, which in the Mediterranean diet occurs with both extra-virgin olive oil and other vegetable oils, resides in the fact that they cannot be bio-synthesized by the body and that they are essential
10 for growth.

Summary of the invention

Among its micro-components, extra-virgin olive oil contains a large amount of polyphenols, anti-oxidant compounds and free radical receptors, which are very
15 valuable for both stabilising oil and preventing cell ageing.

Among the vitamin compounds present in extra-virgin olive oil are α - Tocopherol (Vitamin E) and β -Carotene (a precursor of Vitamin A), which
20 synergically prevent lipid peroxidation.

Like all vegetable oils normally used for nutritional purposes, extra-virgin olive oil does not contain unsaturated fatty acids of the Omega-3 type with a number of carbon atoms in excess of 18.

The unsaturated fatty acids contained in extra-virgin olive oil are:

Palmitoleic Acid - a MUFA with 16 carbon atoms and

double bond (unsaturation) in the Omega-7 position.

5 Oleic Acid - a MUFA with 18 carbon atoms and unsaturation in the Omega-9 position.

Linoleic Acid - a PUFA with 18 carbon atoms and 2 unsaturations in the Omega-6 and Omega-9 positions.

10 Linolenic Acid - a PUFA with 18 carbon atoms and 3 unsaturations, in the Omega 3, Omega-6 and Omega-9 positions.

Eicosenoic Acid - a MUFA with 20 carbon atoms and unsaturation in the Omega-9 position.

15 Among the vitamin micro-components, it does not contain Pyridoxine (Vitamin B6) and has a medium-to-low content of Vitamin E.

The omega 3 fatty acids, which have a considerable nutritional importance, are: Eicosapentaenoic Acid (EPA), which has 20 carbon atoms and 5 unsaturations, 20 and Docosahexaenoic Acid (DHA), which has 22 carbon atoms and 6 unsaturations.

These fatty acids, which are present in the form of triglycerids in fish oils, play a very important role vis-à-vis a number of disorders affecting the cardiovascular system, nervous system, skin and the osteoarticular system.

Moreover, omega-3 acids are considered essential nutrients for cell and tissue metabolism, with

5 beneficial effects on the transportation of cholesterol and triglycerids, platelet aggregation, inflammatory processes, the fluidity and elasticity of the endothelium membranes and on the nerve cells.

Recent studies have also detected beneficial effects
10 with regard to hypertriglyceridaemia, hypercholesterinaemia, cardiovascular disorders, high blood pressure, vein insufficiency and micro-circulation, psoriasis and dermatosis, rheumatoid arthritis, pregnancy and breast feeding, dementia and
15 nervous system disorders, retinopathies and sight disorders, inflammatory enteritis, mental disorders and depression, neoplasias, autoimmune disorders and diabetes.

Thanks to its anti-oxidant action, vitamin E is
20 considered the best friend of the heart and arteries. Individuals with high plasma levels of vitamin E are protected, within certain limits, from arrythmias, angina pectoris and heart attack.

Being fat-soluble, it helps protect the lipid molecules from oxidation and is capable of hindering the chain reaction that ends with the oxidation of the cell membranes; LDL cholesterol, in fact, contains vitamin E, which helps prevent oxidation and,
5 therefore, the formation of a compound that is toxic

for the artery walls.

Vitamin B6, which is also known as Adermine, plays an important role in the body, taking part (as a co-enzyme) in over sixty reactions, in particular, in the
10 synthesis of adrenaline and noradrenaline. It is also fundamental for metabolising proteins and lipids, favouring the transformation of unsaturated fatty acids, participating in regulating cholesterol levels in the blood and acting on the metabolism of
15 glucosides.

The addition of omega-3 fatty acids (EPA and DHA), vitamin B6 and vitamin E to extra-virgin olive oil, which is in itself a fundamental component of a balanced Mediterranean-style diet, helps make this
20 product a complete and pharmacologically active foodstuff for the overall protection of the body, in association with a regular intake of vegetable and animal proteins.

An alternative embodiment of the present invention envisages the addition of Vitamin A, together with Vitamin E, which is capable of preventing the lipid peroxidation of the cell membranes, inhibiting the effects of the free radicals.

5 This alternative embodiment also has different biological functions, promoting the nutrition and

resistance of the skin and the mucous membranes, especially of the eyes, intestine and lungs. It also helps synthesize proteins, the growth of new cells and the formation of visual pigments at the increase of resistance to infections.

Example

A specific embodiment of the invention will now be described, by way of example, with reference to the accompanying drawings in which:

Figure 1 shows the production process of the dietary extra-virgin olive oil with added omega-3 fatty acids.

Figure 2 shows the above-mentioned production process in the embodiment featuring the addition of vitamin A.

Detailed description of the invention

Referring to figure 1, the production of dietary extra-virgin olive oil with added omega-3 fatty acids requires the following ingredients:

- Extra-virgin olive oil;
- EPA;
- DHA;
- Vitamin E Acetate;
- Vitamin B Pyroxidine Dipalmitate.

According to the preferred embodiment of the present invention, the production of dietary extra-virgin olive oil with added omega-3 fatty acids is produced

in two stages:

- a) preparation of an extra-virgin olive oil stock solution with the ingredients;
- b) dilution of the stock solution in a suitable amount of extra-virgin olive oil, to obtain the desired concentration.

The attached figure shows the preferred embodiment:

In the first production stage (a), consisting in the preparation of the stock solution, the Vitamin B is heated to the fluidization temperature of approx. 70-80° C, by means of a cylindrical reactor heated with hot water at 80-90° C, agitating the vitamin with a forced draught of nitrogen.

Once the complete fluidization of the vitamin B has been achieved, with the help of extra-virgin olive oil for its full recovery, the compound is transferred into a homogenising reactor, preventively filled with extra-virgin olive oil maintained at the preferred temperature of 40°, in an inert atmosphere.

While the STOCK solution of vitamin B6 is continuously agitated, suitable quantities of EPA, DHA and Vitamin E Acetate are added, according to the desired concentration.

In phase two of the production process (b), consisting in the dilution of the stock solution, this is pumped from the homogenising reactor into the underground tank, which contains the necessary amount of extra-

virgin olive oil sufficient to obtain the finished
10 product. The complete homogenisation process takes
place, (i) by agitation (with a forced draught of
nitrogen) inside the underground tank, and (ii) by
recirculation inside the reactor used to prepare the
stock solution.

15 From the experiments carried out it has been found
that a formulation such as the one described
hereinafter, prepared according to the procedure
described above, allows the achievement of the
following results:

20 extra-virgin olive oil, EPA 60-120 mg/100 g of oil,
added in the form of triglycerids and/or ethyl esters
and/or ethyls, DHA 40-80 mg/100 g of oil added in the
form of triglycerids and/or methyl esters and/or
ethyls, vitamin E 60-90 mg/100 g of oil, added in the
form of tocopherol acetate, and vitamin B6 4-8 mg/100
g of oil added as pyroxidine dipalmitate.

As mentioned above, an alternative embodiment of the
present invention is envisaged, described in figure 2;
5 referring to which the production of dietary extra-
virgin olive oil with added omega-3 fatty acids,
according to this embodiment, requires the following
ingredients:

- Extra-virgin olive oil;

- 10 - EPA;
- DHA;
- Vitamin E Acetate;
- Vitamin A Palmitate.

According to the alternative embodiment of the present
15 invention, the production of dietary extra-virgin
olive oil with added omega-3 fatty acids is produced
in two stages:

- a) preparation of an extra-virgin olive oil stock
solution with the ingredients;
20 b) dilution of the stock solution in a suitable
amount of extra-virgin olive oil, to obtain the
desired concentration.

The attached figure (2) shows the production process
relating to the alternative embodiment:

In the first production stage (a), consisting in the preparation
of the stock solution, the Vitamin A is heated to the
fluidization temperature of approx. 50-60° C, by means of a
cylindrical reactor heated with hot water at 80-90° C, agitating
the vitamin with a forced draught of nitrogen.

- 5 Once the complete fluidization of the vitamin A has
been achieved, with the help of extra-virgin olive oil
for its full recovery, the compound is transferred
into a homogenising reactor, preventively filled with
extra-virgin olive oil maintained at the preferred
10 temperature of 40°, in an inert atmosphere.

While the STOCK solution of vitamin A is continuously agitated, suitable quantities of EPA, DHA and Vitamin E Acetate are added, according to the desired concentration.

15 In phase two of the production process (b), consisting in the dilution of the stock solution, this is pumped from the homogenising reactor into the underground tank, which contains the necessary amount of extra-virgin olive oil sufficient to obtain the finished
20 product. The complete homogenisation process takes place, (i) by agitation (with a forced draught of nitrogen) inside the underground tank, and (ii) by recirculation inside the reactor used to prepare the stock solution.

From the experiments carried out it has been found that a formulation such as the one described hereinafter, prepared according to the procedure described above, allows the achievement of the
5 following results:

extra-virgin olive oil, EPA 60-120 mg/100 g of oil, added in the form of triglycerids and/or ethyl esters and/or ethyls, DHA 40-80 mg/100 g of oil added in the form of triglycerids and/or methyl esters and/or
10 ethyls, vitamin E 60-90 mg/100 g of oil, added in the form of tocopherol acetate, and vitamin A 1-3 mg/100 g

of oil added as retinol palmitate.

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Claims

1. Dietary extra-virgin olive oil with added omega-3 fatty acids and preparation method consisting of the following ingredients: extra-virgin olive oil, EPA, DHA, Vitamin E Acetate, Vitamin B Pyridoxine Dipalmitate; wherein the preparation method comprises two stages, (1) the preparation of a stock solution, and (2) the dilution of the stock solution.
2. Dietary extra-virgin olive oil with added omega-3 fatty acids and preparation method as claimed in Claim 1, wherein the formulation is as follows: extra-virgin olive oil, EPA 60-120 mg/100 g of oil, added in the form of triglycerids and/or ethyl esters and/or ethyls, DHA 40-80 mg/100 g of oil added in the form of triglycerids and/or methyl esters and/or ethyls, vitamin E 60-90 mg/100 g of oil, added in the form of tocopherol acetate, and vitamin B₆ 4-8 mg/100 g of oil added as pyroxidine dipalmitate.
3. Dietary extra-virgin olive oil with added omega-3 fatty acids and preparation method as claimed in Claims 1 and 2, wherein the method of preparation of the stock solution provides for: the heating of the vitamin B₆ to the fluidization temperature of approx. 70-80° C, by means of a cylindrical reactor heated

with hot water at 80-90° C, agitating the vitamin with
15 a forced draught of nitrogen; once the complete
fluidization of the vitamin B has been achieved, with
the help of extra-virgin olive oil for its full
recovery, the compound is transferred into a
homogenising reactor, preventively filled with extra-
20 virgin olive oil maintained at the preferred
temperature of 40°, in an inert atmosphere; while the
stock solution of vitamin B6 is continuously agitated,
suitable quantities of EPA, DHA and Vitamin E Acetate
are added, according to the desired concentration; and
wherein the dilution of the stock solution consists
in: pumping the stock solution from the homogenising
reactor into the underground tank, which contains the
necessary amount of extra-virgin olive oil sufficient
5 to obtain the finished product, in which the complete
homogenisation process takes place, (i) by agitation
(with a forced draught of nitrogen) inside the
underground tank, and (ii) by recirculation inside the
reactor used to prepare the stock solution.

10 4. Dietary extra-virgin olive oil with added omega-3
fatty acids and preparation method wherein the
ingredients of an alternative embodiment are as
follows: extra-virgin olive oil, EPA, DHA, Vitamin E
Acetate, Vitamin A Palmitate; wherein the preparation

15 method comprises two stages, (1) the preparation of a
stock solution, and (2) the dilution of the stock
solution.

5. Dietary extra-virgin olive oil with added omega-3
fatty acids and preparation method as claimed in Claim
20 4, wherein the formulation is as follows: extra-virgin
olive oil, EPA 60-120 mg/100 g of oil, added in the
form of triglycerids and/or ethyl esters and/or
ethyls, DHA 40-80 mg/100 g of oil added in the form of
triglycerids and/or methyl esters and/or ethyls,
vitamin E 60-90 mg/100 g of oil, added in the form of
tocopherol acetate, and vitamin A 1-3 mg/100 g of oil
added as retinol palmitate.

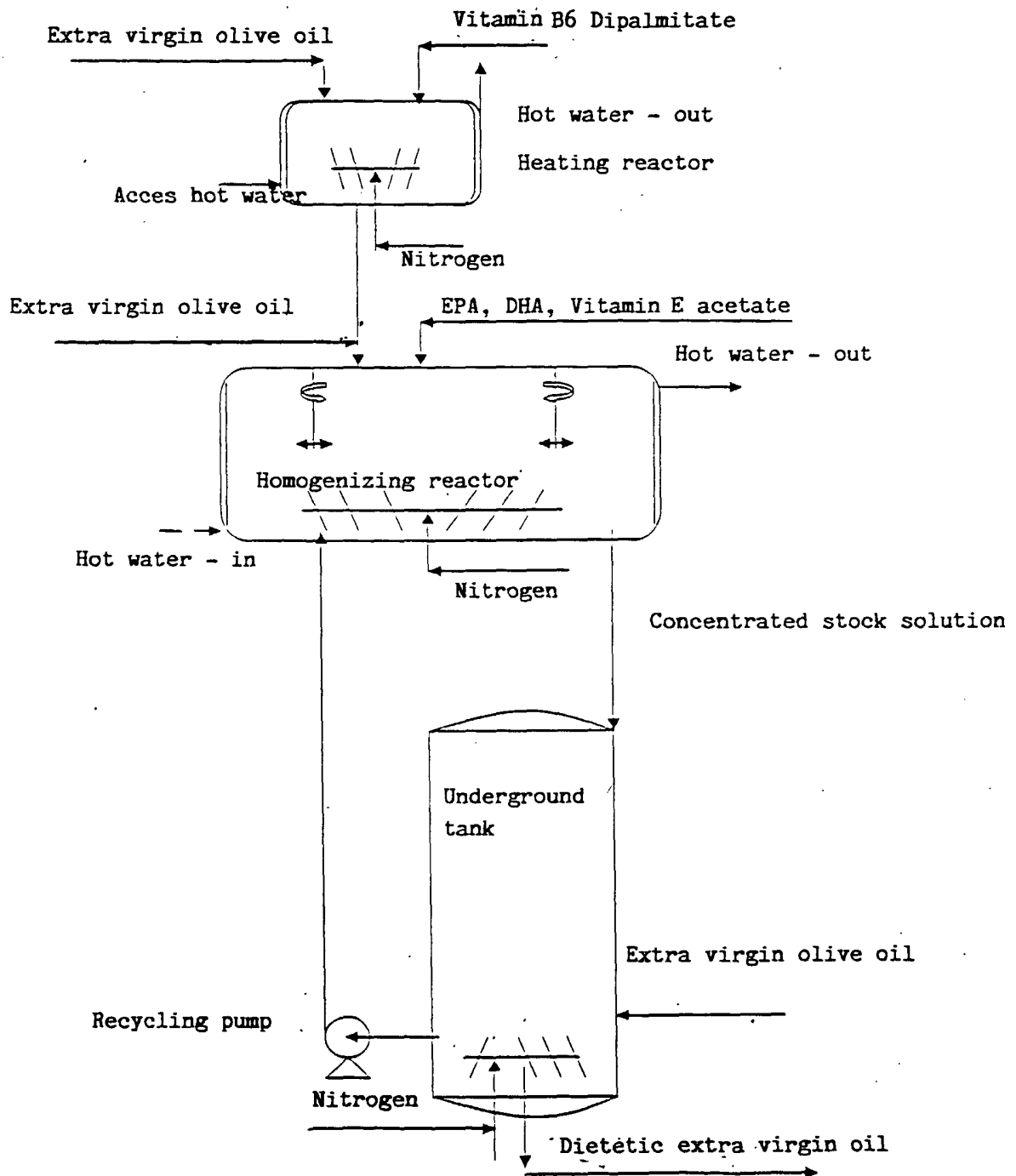
6. Dietary extra-virgin olive oil with added omega-3
5 fatty acids and preparation method as claimed in
Claims 4 and 5, wherein the method of preparation of
the stock solution provides for: the heating of the
vitamin A to the fluidization temperature of approx.
50-60° C, by means of a cylindrical reactor heated
10 with hot water at 80-90° C, agitating the vitamin with
a forced draught of nitrogen; once the complete
fluidization of the vitamin A has been achieved, with
the help of extra-virgin olive oil for its full
recovery, the compound is transferred into a
15 homogenising reactor, preventively filled with extra-

virgin olive oil maintained at the preferred temperature of 40°, in an inert atmosphere; while the stock solution of vitamin A is continuously agitated, suitable quantities of EPA, DHA and Vitamin E Acetate are added, according to the desired concentration; and wherein the dilution of the stock solution consists in: pumping the stock solution from the homogenising reactor into the underground tank, which contains the necessary amount of extra-virgin olive oil sufficient to obtain the finished product, in which the complete homogenisation process takes place, (i) by agitation (with a forced draught of nitrogen) inside the underground tank, and (ii) by recirculation inside the reactor used to prepare the stock solution.

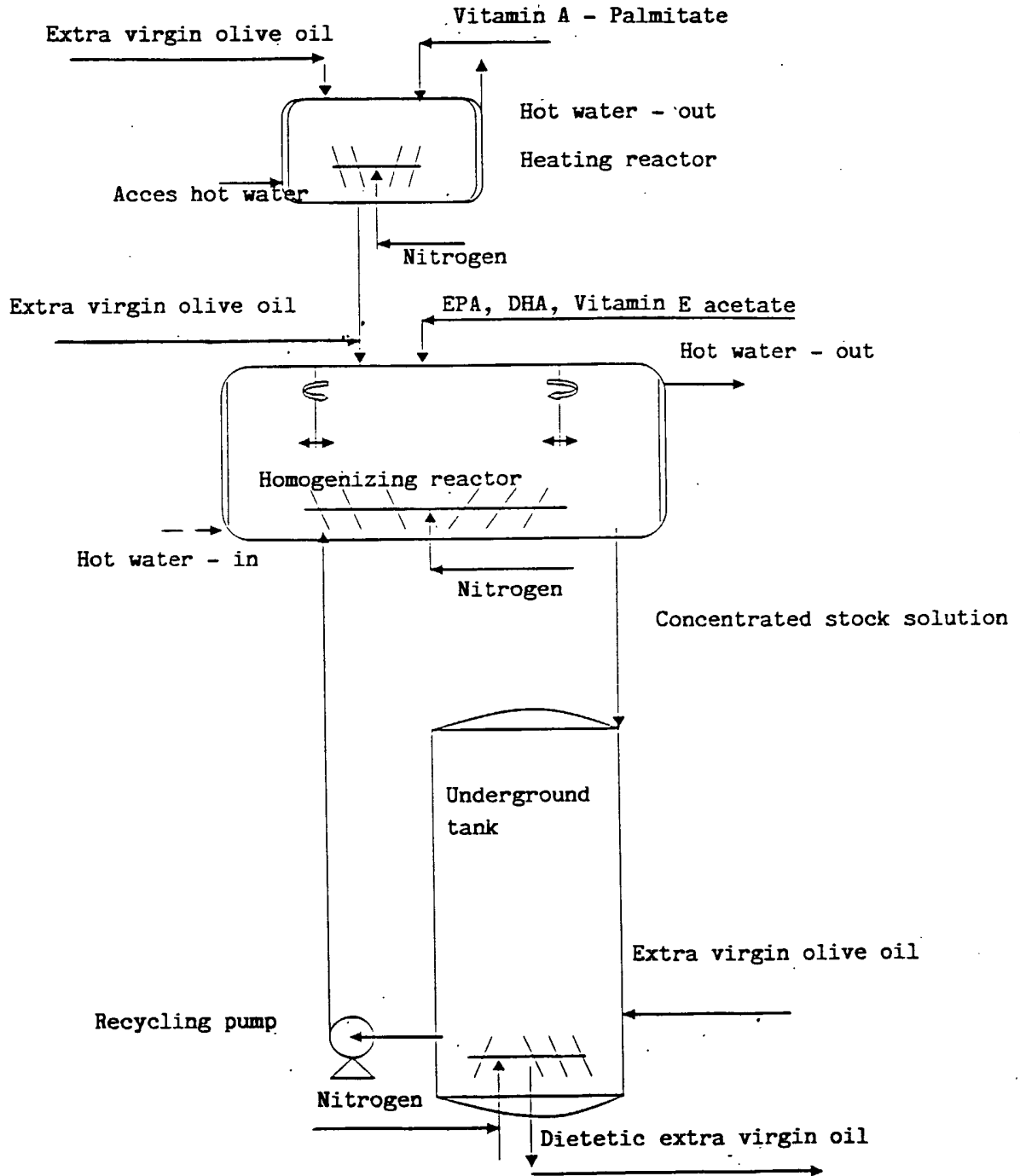
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PRODUCTION PLAN



PRODUCTION PLAN



INTERNATIONAL SEARCH REPORT

International Application No.
PCT/IT 03/00391

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 A23D9/007 A23D9/02 A23L1/30

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)
IPC 7 A23D A23L

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 practical, search terms used)

EPO-Internal, PAJ, WPI Data, FSTA, CHEM ABS Data, BIOSIS

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Y	WO 97 32947 A (VINCIERI FRANCO FRANCESCO ;MULINACCI NADIA (IT); ROMANI ANNALISA () 12 September 1997 (1997-09-12) page 9, line 2 -page 10, line 21 claims 1-3,10,14,15,20	4-6
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Further documents are listed in the continuation of box C:

Patent family members are listed in 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 document but published on or after the international filing date
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- *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
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INTERNATIONAL SEARCH REPORT

International Application No

PCT/IT 03/00391

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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Information on patent family members

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