Title: EXTRACTION OF VITAMIN E FROM PLANT MATTER

Abstract: A process for the extraction of Vitamin E from annatto plant matter is disclosed wherein annatto seed matter is subjected, before extraction, to acidification using amla fruit matter. After the acidification, the mixture of the two plant matters is extracted by water. The acidification converts the vitamin E compounds in the plant matter into more water-soluble forms thus enhancing the vitamin yield: More of the vitamin is obtained in the ester form than in the form of vitamin alcohols. Processing time is reduced.


Declarations under Rule 4.17:
— of inventorship (Rule 4.17(iv))

Published:
— without international search report and to be republished upon receipt of that report (Rule 48.2(g))
Extraction of Vitamin E from plant matter

This invention relates to a process for extracting vitamins from plant matter and more particularly to a process of extracting vitamin E from Annatto plant matter.

Vitamin E refers to a group of fat-soluble compounds that are found in plants, and plant-derived matter such as, for example, vegetable oils. It is also found in some oils/fats of animal origin.

Vitamin E appears to have multiple roles in human metabolism. The main biological activity of vitamin E is understood to be as a powerful antioxidant. It is also reported to reduce free radicals and inhibit the production of reactive oxygen species (ROS). Said group of compounds play a role in the immune system, in the regulation of gene expression, in the regulation of some enzymatic activities, as an anti-carcinogenic and in other functions.

Said group comprises four tocopherol and four tocotrienol compounds which are identified by the prefixes alpha, beta, gamma and delta. Wheat germ oil, sunflower seeds and oil, safflower seeds and oil, palm oil, fish oils, soyabean seeds and oil, annatto seeds and almonds are some of the sources rich in these compounds. Some of the said sources are rich in the tocotrienols while the others contain more of the tocopherols.

The vitamin in these sources is mostly in the form of esters that are referred to herein collectively as vitamin esters. A small quantity of the vitamin is found in the form of alcohols which is referred to herein collectively as vitamin alcohols.

A generalised process for the recovery of fat-soluble vitamins (such as vitamin E) found dissolved in natural vegetable oils comprises saponifying the oil. During saponification the oil gets converted to a soap while some of the vitamin esters get converted to vitamin alcohols. The vitamin esters and alcohols and some other compounds such as phytosterols and squalene in the oil separate out being immiscible in the soap layer. This layer is separated from the soap and is referred to herein as the semi-concentrate.
in addition to vitamin E esters and alcohols, said semi-concentrate contains esters and alcohols of
other oil-soluble vitamins such as A and D. Through a process of solution partitioning the
vitamin E component is isolated, purified and formulated into capsules or other forms. Before
formulation, it may be dissolved in some suitable bland oil such as for example, corn oil and the
solution packaged. The semi-concentrate may be concentrated and the concentrate packaged into
appropriate doses.

In a variant of the above process, the concentrate is esterified. The vitamin alcohols get
converted to the ester form which is then separated.

In another prior art process the original vitamin containing oil is subjected to high vacuum
distillation to distill off the vitamin in the ester form. The vitamin ester distillate is subjected to
purification steps and then packaged.

US 2 380 409 by Buxton L O discloses a process wherein a marine oil is contacted with a liquid
aliphatic organic solvent at an elevated temperature. The extract is cooled to a low temperature
at which the solution of the vitamin esters and alcohols in the solvent separates out. This solution
is also referred to as the semi-concentrate. The solvent is removed from the semi-concentrate
which is then contacted with a highly polar solvent that is substantially immiscible with the semi-
concentrate at low temperatures.

The solution containing the polar solvent and the said esters and alcohols is cooled. The polar
solvent phase containing the vitamin alcohols separates out. The non-solvent layer is the ester
concentrate and contains the natural vitamin esters originally present in the oil. It is stated to be
substantially free of free-fatty acids and the disagreeable odour and colouring components present
in the oil. In a variant, the marine oil is directly treated with the polar solvent and the residual oil
treated with the said aliphatic organic solvent to obtain the vitamin esters.

US 7 575 767 B2 by May C Y, discloses a process wherein palm oil is treated with a low alkyl
alcohol. An acid or alkaline catalyst is provided which causes esterification and trans-
esterification of the vitamin alcohols and esters. The vitamin alcohols get converted to esters and
a part of the vitamin esters originally present in the oil gets transesterified. The esterified mass is
subjected to three stages of short path vacuum distillation to give a vitamin E enriched fraction, a fraction containing the phytosterols and one containing squalene.

A similar process wherein triple distillation is adopted has been reported for extraction of vitamin E, squalene and sterols from condensates obtained during vegetable oil refining and/or the distillates obtained during the deodorisation of plant oils. The process employs bioethanol, glycerol and hydrocarbons generated in the process and does not require any external solvent of petroleum or other origin.

Processes using extraction by several different solvents such as 96% ethanol and hexane, petroleum ether, ethyl acetate, methanol and NaOH and EDTA, n-hexane and others have been reported. In one process, the solvent extraction is assisted by ultrasound inputs.

Super critical extraction with carbon-dioxide is also practised in the prior art. Other methods based on chromatography, enzyme catalysis etc are also known.

The drawbacks in the solvent extraction processes of prior art reported above are:

(i) The presence of vitamin alcohols in the vitamin product. Vitamin alcohols make the product unstable and reduce the shelf life. In some processes the product is mostly all in the form vitamin alcohols with very little of the original natural vitamin esters.

(ii) In some processes, synthetic vitamin esters are produced which come into the product. Such synthetic esters appear to have lesser efficacy than the natural vitamin esters contained in vitamin E containing oils.

(iii) Where vitamin alcohols are present in the product, the disagreeable odour factors in the oil come out into product along with the vitamin alcohols. Similarly, disagreeable taste and colouring factors also come out in the product extract.

(iv) The employment of solvents of petroleum origin.

(v) In the processes employing esterification and trans-esterification operations, the said operations are not complete and some vitamin alcohols tend to remain unconverted.
These drawbacks are removed in the process of the invention for making vitamin E from plant matter.

(i) The problem of residual vitamin alcohols in the vitamin product is substantially eliminated in the process of the invention through the acidification of the plant matter to be extracted. Said acidification is by means of the addition of a second plant matter that comprises one or more acidic components. The acidification ensures that substantially all the vitamin alcohol matter is converted into ester form.

(ii) As the esterification is by means of naturally-occurring plant-based acids, there is substantially no production of synthetic esters and no loss in efficacy.

(iii) Solvents of petroleum origin are totally avoided in the process of the invention wherein water is used as the solvent.

(iv) Because of the substantial absence of vitamin alcohols in the vitamin E product of the invention, problems of undesirable odours, taste and discolouration are substantially absent.

In addition to removing the above drawbacks, the process of the invention offers the following advantages:

(i) a vitamin E product of greater efficacy and one that is more assimilable;

(ii) the use of a low cost solvent such as water;

(iii) the extract product of the invention is substantially in dosage form and easily converted into any of the other known dosage forms;

(iv) the extract product of the invention is a suitable intermediate for easy conversion into other pharmaceutical forms such as any of the known pharmaceutical salts or carried on any of the known pharmaceutical carriers;

(v) the extract product of the invention is a suitable interest for any of the downstream processes such enhancing activity and efficacy; topping-up operations; addition of other vitamins, minerals and other nutrients; incorporation of additives for colour, texture, bulk, flavour, odour and others; conversion into food, pharmaceutical and nutraceutical compositions;

(vi) minimising/substantially preventing the presence of said vitamin alcohols in the extract product;
(vii) cost savings through the elimination of solvent handling and recovery systems; and
(viii) a higher extraction efficiency and better yield of the vitamin E product.

Other advantages will be apparent from the description and claims herein. The objects of the invention will also be apparent from the description and claims herein.

The process of the invention is based on solvent extraction of the vitamin E containing oil.

The process of the invention employs a naturally occurring solvent namely water. Attention is drawn to a co-pending application of patent No. 2677/CHE/201 I dated 4th Aug 201 I by the present inventors/applicants, which deals with the extraction of plant matters by water. The entire disclosure therein is incorporated herein by reference.

In the said invention by the present inventors, the plant matter to be extracted is mixed with a second plant matter that comprises one or more acidic components such as citric, tartaric, ascorbic, succinic or other acids. The mixture of the two plant matters is contacted with water which is the extraction solvent. The plant acids convert the nutrients (vitamins and minerals) in the first plant matter that are water-insoluble into water-soluble compounds that are then easily extracted by the water solvent.

Said first plant matter may comprise a single plant species or a mixture of plant species and likewise said Second plant matter. This extended scope is intended to be conveyed by the terms 'first plant matter(s)' and 'second plant matter(s)' used herein. This scope is intended even where references to plant matter herein are not given in the said forms for the sake of convenience.

Said addition of acidic components thus serves to increase the range of extraction by the water solvent. In fact, in the process of extraction disclosed therein, substantially all the said nutrients are extracted and come out into the extract, irrespective of whether said nutrients were originally water-soluble or otherwise. A further advantage of the disclosed process of extraction is that the application of said acidic components considerably increases the yield of the said nutrients over that obtained by prior art processes. Not only water-insoluble nutrients are converted into soluble forms but some of the water-soluble nutrients are converted into forms that are more water-soluble resulting in increased yield of the vitamin.
In the process of extraction of the present invention, the role of said acidic components is enlarged. Said acidic components not only enhance the yield of the vitamin E product but also suppress the amount of the vitamin alcohols appearing in the product. Said acidification treatment converts much of the vitamin alcohols into other forms.

The acidic constituents employed to for the esterification of the vitamin E alcohols in the process of the invention are naturally occurring compounds. In the process of the invention the vitamin E containing annatto seeds are mixed with amla fruit before extraction. This mixture is extracted by means of water in the process of the invention. It will be observed that esterification of the vitamin alcohols present in the annatto seeds is caused by the citric and tartaric acid constituents of amla fruit matter. Some said esterification also occurs through other routes. These inventors believe some increase in the vitamin yield arises from the formation of water-soluble adduct formation and complex formation between the different forms of the vitamin and the acidic matter. The major advantage of the process of the invention, established by the investigations of the present inventors, is that higher contents of vitamin E, as compared to prior art processes, are obtained in the extract which leads to considerable savings in energy and processing times such as in the concentration operations in the process of the invention. A final product having up to about 15% by wt. of vitamin E is obtained in the process. Another advantage is that the solvent and the treatment agents are naturally occurring compounds rather than synthetic.

These inventors also observe that the use of acidic plant matter helps rupture the plant cells. Said cell rupture contributes to the increase in the vitamin yield.

As the said second plant matter has been traditionally used as foods and also for the medicinal value thereof the resulting extract product is non-toxic. The use of water solvent also ensures that the extract is non-toxic.

According to the invention, therefore, there is provided a process for extracting vitamin E, and optionally other nutrients and plant constituents, from annatto plant matter(s) comprising the steps of:

(i) providing annatto plant matter(s), preferably seed matter;
(ii) converting the plant matter(s) of step (i) into a form having increased contact area, such as, for example, a pulp;

(iii) providing amla plant matter(s), preferably fruit matter,

(iv) converting the plant matter(s) of step (iii) into a form having increased contact area such as, for example, a pulp;

(v) mixing the materials of steps (ii) and (iv),

(vi) extracting the said mixture of step (v) with water or a dilute extract coming from another extraction stage if any, or mixtures of such extracts, at a predetermined temperature and for a predetermined period of time to obtain a first extract and spent plant matter,

(vii) optionally successively extracting the spent plant matter of step (vi) according to step (vi) to obtain a plurality of said extracts,

(viii) individually or collectively concentrating one or more extracts of step (vi) and/or (vii) and optionally using a weak extract(s) of step (vii) as solvent for extraction in step (vi), and

(ix) drying the extract(s) from step (viii) to yield the vitamin E product.

In this process, the annatto seeds constitute said first plant matter and the amla fruits constitute said second plant matter. Within the scope of the invention, said first plant matter may comprise one or more further plant species that are sources of vitamin E or of any other desired plant principle. In addition, one or more of the plant species forming part of said first plant matter may comprise acidic components) that may participate in the acidification of the vitamin E forms present in the first plant matter. It will be observed that the process of the invention is easily and simply extendable to extraction of other nutrients and constituents in plant matter, in addition to vitamin E.

The said second plant matter may also comprise a plurality of plant species within the scope of the invention. Within the scope of the invention, the species in the said second plant matter may be a source of said acidic compound(s) and/or vitamin E or both. Thus, within the scope of the invention, said first and second plant matters may each play a single role of being the source of the vitamin E or of the acidic compound(s) or a dual role of being a source of both. Within the scope of the invention, both said plant matters may be sources of other desired nutrients and principles. A said species of the second plant matter may comprise one acidic compound or a
plurality thereof. Higher yields are achieved when the second plant matter adopted comprises a
greater number of said acidic compounds. The option of different combinations of said acidic
compounds offered by the invention is an important tool in optimising the process yield, product
profile and securing cost benefits in capital and operating costs.

The process of the invention is applicable to plant matter other than annatto seeds, containing
vitamin E. Within the scope of the invention, annatto plant matter may be substituted partly or
fully by other suitable plant matter containing vitamin E. Any mixture of such plant matter may
be extracted by the process of the invention. The amla plant matter may also be replaced by
other plant matter containing one or more plant acids within the scope of the invention. The use
of mixtures of such plant matters as said first and/or second plant matters is also within the scope
of the invention.

Preferably, the annatto plant matter comprises annatto seeds. Within the scope of the invention,
the annatto and amla plant matters may be pre-treated by any optional preparatory process or
operation such as crushing, grinding, screening, mixing, drying, milling, homogenising, washing,
cleaning, blanching or others as required for better and cost effective processing as would be
suggestible to a person in the art. Within the scope of the invention, the said first and second
plant matter(s) may comprise any plant part such as leaves, fruits, flowers, stems, bark, seeds,
roots, rhizomes or others, or mixtures thereof.

Adoption of conventional operations such as filtration, separation in the interests of better and
more cost-effective processing as would be suggested to a person in the art is within the scope of
the invention.

For contacting the first and second plant matters, any of the known contacting processes may be
adopted within the scope of the invention. Said contacting may be in the solid state or the plant
matters may be contacted in slurry phase wherein they are slurried in a suitable liquid medium.
Preferably, said liquid medium is water, the solvent adopted in the process of the invention.

Adoption of heating, stirring, agitating, cooking and other such operations to increase the yield
and reduce the processing time are within the scope of the invention. Use of pressure in the
cooking operation is within the scope of the invention.
Said contacting may be individualised in that individual species of the said first and second plant
matter(s) are contacted or may be collectivised in that groups of said species are contacted. Such
options are useful tools for securing processing and cost benefits, in particular, increased vitamin
yields.

Different methods of extraction are known in the art and any one or more thereof may be adopted
in the process of the invention. The extraction operation may comprise a plurality of stages and
different combinations of material flows (streams) such as of the spent matter and the extracts
within the scope of the invention. The process of the invention is suited for single stage
extraction or multiple stage extraction. It is also suited for batch operation or for continuous or
semi-continuous operation.

Preferably the extract is spray dried. The product may be subjected to any of the known
finishing operations such as crushing, grinding, milling, screening, sifting, mixing, blending,
homogenising, agglomerating (pelletising, tabletting and others) for better product features within
the scope of the invention. The product of the invention may be in the form of a dilute solution,
or a concentrated solution or in the form of a solid or semi-solid. Within the scope of the
invention, the vitamin E product of the invention may be adsorbed on suitable excipient(s). Such
process modifications that would be suggested to a person in the art are within the scope of the
invention.

The terms 'spent matter' and 'spent plant matter' are intended to mean the same and refer to the
extracted plant matter at any stage in the extraction process such that the 'spent matter' may be
fully spent or partly spent. The term 'extract' may be understood to mean the product arising at
any stage in the process of the invention or in the optional steps mentioned.

References to 'enlarged surface area' is to the breaking down of the plant matter so as to
encourage the reaction between the vitamin matter and the acidic compound(s) by increasing the
contact area. Such enlargement of surface area may be achieved by operations such as size
reduction through crushing, grinding, powdering, milling and others or by pulping, macerating,
chipping, cutting, slicing and/or other similar operations. All such possible operations are within
the scope of the invention.
Within the scope of the invention, said first and second plant matters may comprise any part of the one or more species forming part thereof. For example, the said annatto seed matter may be replaced by another part of the annatto plant, such as for example, leaves, fruits, flowers, roots, stems, branches and others. Use of mixtures of plant parts are also within the scope of the invention. Similarly, other parts of the amla plant may be adopted as said second plant matter. This invention has observed that adoption of annatto seeds and amla fruit matter gives higher yields of the vitamin than other combinations of plant matters.

The term 'extract' is used to refer to the process of the invention as a whole and also to the operation of extraction which forms one of the steps thereof. The meaning appropriate to the context may be taken.

As would be observed, a number of variants of the process of the invention are feasible and are within the scope of the invention. For example, changes in the order of the steps enumerated above are feasible which would result in several such variants. Various procedures of extraction such as co-current, counter-current and hybrid and various flow arrangements of the extracts and spent matter are also feasible. All such variants are within the scope of the invention. Further variants arise by adopting different methods of extract concentration and solvent removal and by adopting different procedures for operations such as filtration, separation, centrifugation and others. All such variants are within the scope of the invention.

In order to provide a clearer understanding of the invention, and without limitation to the scope thereof, an embodiment thereof is described hereinbelow.

(i) Fresh annatto seeds were collected, crushed in a stainless steel multimill to get seed pulp.
(ii) Fresh amla fruits were collected, crushed in a stainless steel multimill to get amla pulp.
(iii) About 495 kgs of annatto seed pulp with about 5 kg of amla fruit pulp were charged into an extractor.
(iv) The extractor comprised a stainless steel vessel of about 5000 L capacity provided with an agitator system and a surrounding jacket for heating by steam.
(v) About 2000 L of water were charged into the extractor.
(vii) The extractor contents were maintained at about 50-65 deg C by heating with steam.

(viii) The extraction was carried out for a period of about 6 hours.

(ix) During the extraction, the extract was recirculated across the bed containing the annatto and amla pulp mixture in the extractor.

(x) At the end of the extraction period, the extract was collected in a tank. The extract was denoted A. About 1500 L of extract was obtained.

(xi) The spent pulp was subjected to another extraction by the procedure as outlined herein. The extract was withdrawn at the end of the extraction period and collected in a tank. This extract was denoted B. About 1500 L extract was obtained.

(xii) The spent pulp after the two extractions mentioned herein was further extracted in a third extraction with about 1500 L water. The temperature was maintained at about 50-65 deg C during extraction.

(xiii) About 500 L extract was obtained. This extract is denoted C.

(xiv) Extracts A and B were both separately concentrated in concentrators at about 50-65 deg C down to a volume of about 150 L each. Falling film evaporators were used. The two extracts contained the tocopherols in aqueous solution.

(xv) Extract C was used as solvent and charged into extractor for extracting said pulp mixture as mentioned herein.

(xvi) The two concentrated extracts A and B were combined giving about 300 L of concentrated extract. This was filtered in a stainless steel Nutsche type filter using 'HyflosuperceP' as filter aid.

(xvii) The clear filtrate obtained from step (xvi) was spray dried in a stainless steel spray dryer at about 170 to 180 deg C to yield the vitamin E tocopherols in a powder form.

(xviii) The vitamin E powder was ground in a stainless steel multimill and then sifted in a stainless steel sifter to a particle size of about 40-80 mesh. The sifted material was blended in an octagonal blender for about one hour to get a homogeneous powder material. The quantity of the product(yield) was about 50 kgs.

The analysis of the vitamin E powder product is given below.
Table I - Comparison of the extract of the embodiment of the invention with the required specifications.

5 Certificate of Analysis

<table>
<thead>
<tr>
<th>Physical Analysis</th>
<th>Specification</th>
<th>Actual Values</th>
<th>Testing method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance and Color</td>
<td>Orange brown powder</td>
<td>Complies</td>
<td>Visual</td>
</tr>
<tr>
<td>Identification</td>
<td>Positive</td>
<td>Complies</td>
<td>HPTLC</td>
</tr>
<tr>
<td>Odor</td>
<td>Characteristic</td>
<td>Complies</td>
<td>Organoleptic</td>
</tr>
<tr>
<td>Taste</td>
<td>Characteristic</td>
<td>Complies</td>
<td>Organoleptic</td>
</tr>
<tr>
<td>Particle size</td>
<td>NLT 98% thro’ 20 mesh</td>
<td>Complies</td>
<td>USP XXIII</td>
</tr>
<tr>
<td>Loss on Drying</td>
<td>NMT 6% w/w</td>
<td>3.1%</td>
<td>USP XXIII (IR)</td>
</tr>
</tbody>
</table>

**Assay of Actives**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Result</th>
<th>Testing method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assay of Vitamin E</td>
<td>15.8%</td>
<td>HPLC</td>
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</table>

**Chemical Impurities**

<table>
<thead>
<tr>
<th>Specification</th>
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<th>Testing method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Heavy Metals</td>
<td>NMT 10 ppm</td>
<td>Complies</td>
</tr>
<tr>
<td>Lead</td>
<td>NMT 5 ppm</td>
<td>Less than 0.01PPM</td>
</tr>
<tr>
<td>Cadmium</td>
<td>NMT 1 ppm</td>
<td>Less than 0.01PPM</td>
</tr>
<tr>
<td>Arsenic</td>
<td>NMT 3 ppm</td>
<td>Less than 0.01PPM</td>
</tr>
<tr>
<td>Mercury</td>
<td>NMT 1 ppm</td>
<td>Less than 0.001PPM</td>
</tr>
<tr>
<td>Residual pesticides</td>
<td>Absent</td>
<td>Absent</td>
</tr>
</tbody>
</table>

**Microbiology**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Result</th>
<th>Testing method</th>
</tr>
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<tbody>
<tr>
<td>Total Plate Count</td>
<td>1000 cfu/gram max</td>
<td>Complies</td>
</tr>
<tr>
<td>Yeast and Mold</td>
<td>100 cfu/g max</td>
<td>Complies</td>
</tr>
<tr>
<td>E.coli</td>
<td>Absent</td>
<td>Absent</td>
</tr>
<tr>
<td>Coliforms</td>
<td>Absent</td>
<td>Absent</td>
</tr>
<tr>
<td>Salmonella</td>
<td>Absent</td>
<td>Absent</td>
</tr>
<tr>
<td>Pseudomonas aeruginosa</td>
<td>Absent</td>
<td>Absent</td>
</tr>
<tr>
<td>Staphylococcus aureus</td>
<td>Absent</td>
<td>Absent</td>
</tr>
</tbody>
</table>

**Remarks**
The extract complies with the required specifications.

The process of the invention is simply and easily adapted for batch, continuous or semi-continuous operation.

Embodiments and variations other than described herein above are feasible by persons skilled in the art and the same are within the scope and spirit of this invention.
Claims:

1. A process for extracting vitamin E from annatto plant matter(s), and optionally other nutrients and plant constituents, comprising the steps of:
   (i) providing annatto plant matter(s), preferably seed matter;
   (ii) converting the plant matter(s) of step (i) into a form having increased contact area, such as, for example, a pulp;
   (iii) providing amla plant matter(s), preferably fruit matter,
   (iv) converting the plant matter(s) of step (iii) into a form having increased contact area such as, for example, a pulp;
   (v) mixing the materials of steps (ii) and (iv),
   (vi) extracting the said mixture of step (v) with water or a dilute extract coming from another extraction stage if any, or mixtures of such extracts, at a predetermined temperature and for a predetermined period of time to obtain a first extract and spent plant matter,
   (vii) optionally successively extracting the spent plant matter of step (vi) according to step (vi) to obtain a plurality of said extracts,
   (viii) individually or collectively concentrating one or more extracts of step (vi) and/or (vii) and optionally using a weak extract(s) of step (vii) as solvent for extraction in step (vi), and
   (ix) drying the extract(s) from step (viii) to yield the vitamin E product.

2. The process for extracting vitamin E from annatto plant matter(s) as claimed in the preceding claim 1 wherein both annatto seed and amla fruit matters are converted into pulps for the purposes of said acidification.

3. The process for extracting vitamin E from annatto plant matter(s) as claimed in the preceding claim 2 wherein both said pulp matters are contacted for the purpose of said acidification for a length of time before subjecting them to extraction by water, said contacting being preferably promoted by an intermixing process.
4. The process for extracting vitamin E from annato plant matter(s) as claimed in any of the preceding claims 1 to 3 wherein vitamin E product is optionally further processed according to one or more of the following additional steps:

(i) conversion of said product into other forms such as any of the known pharmaceutically acceptable salts;
(ii) dissolution of the said product in a suitable solvent to give a liquid form product;
(iii) conversion such as to associate the said product with any of the known pharmaceutically acceptable carriers;
(iv) conversion into any of the known dosage forms;
(v) conversion into an of the known forms offering improved efficacy and/or assimilability;
(vi) conversion by adsorbing the solid, semi-solid or liquid form extract on a suitable excipient,
(vii) the operation of topping-up of any constituent or of addition of new constituents;
(viii) conversion by compounding or other processes into a food, nutraceutical or medicinal formulation;
(ix) finishing of the said product by any known processing operations such as for example, crushing, grinding, milling, sifting, mixing, homogenising and others; and
(x) incorporation of additives for colour, texture, taste, bulk, flavour, odour, preservation and others, and
(xi) any other known processing operation.

5. The process for extracting vitamin E from annatto plant matter as claimed in any of the preceding claim 1 to 4, wherein one or more additional vitamin, mineral or other constituent present in the annatto seed matter or the amla fruit matter, or both are extracted.

6. The process for extracting vitamin E from annatto plant matter as claimed in any of the preceding claim 1 to 5, wherein the starting materials namely, the said annatto plant matter(s) and/or amla plant matter(s) are subjected any of the known preparatory operations such as cutting, chopping, dicing, crushing, grinding, pulverising, milling, screening, sifting, washing, blanching, sifting and others.
7. A process for extracting vitamin E from annato plant matters substantially as hereindescribed.

8. An extract product made by the process as claimed in any of the preceding claims 1 to 7.