

United States Patent

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[54] **VITAMIN E POWDER**
4 Claims, No Drawings

[52] U.S. Cl. **424/284**
[51] Int. Cl. **A61k 15/10**
[50] Field of Search **424/284,**
360; 167/81 E, 344; 260/117, 999

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ABSTRACT: High potency vitamin E powders, suitable for use in tablets and capsules are produced by spray drying an emulsion of a vitamin E active compound and a gelatin hydrolysate having very low Bloom.

VITAMINE POWDER

SUMMARY OF THE INVENTION

This invention relates to vitamin E powders with good tableting characteristics suitable for incorporation into multivitamin tablets and capsules and high potency vitamin E tablets. The powders are composed of a vitamin E active compound, preferably dl- α -tocopheryl acetate, and a gelatin hydrolysate having a molecular weight of from about 9,000 to about 11,000 and a 0 Bloom.

BACKGROUND OF THE INVENTION

Vitamin E comprises a group of natural substances known as tocopherols. They are fat-soluble, closely related chemical compounds found in vegetable oils such as wheat germ oil, rice oil, soybean oil and the like. α -Tocopherol has the greatest biological activity while its isomers, beta, gamma, delta, epsilon, zeta and eta tocopherols have vitamin E activity to a lesser extent. The tocopherols and their esters such as tocopheryl acetate, tocopheryl palmitate, tocopheryl succinate and the like are normally water-insoluble and oily, waxy or low melting, which properties make them unsuitable for certain pharmaceutical applications, particularly, those in which a powder is required, e.g., vitamin tablets and capsules.

DETAILED DESCRIPTION OF THE INVENTION

According to this invention, a powder containing from about 40 percent to about 60 percent by weight of vitamin E is provided. This powder contains besides the vitamin E component, a gelatin hydrolysate of very low Bloom. The amount of hydrolyzed gelatin in the powder generally varies from about 60 percent to about 40 percent by weight. The gelatin hydrolysate suitable for use in this invention has no Bloom or jelly strength, since it does not gel under the conditions of the conventional gelatin test. It also has a molecular weight of from about 9,000 to about 11,000. The jelly strength of gelatin or gelatin hydrolysate is determined with a 6% percent solution. The solution is cooled down until gelation occurs and then the strength of the gel is measured in grams. This strength is called the Bloom or jelly strength. Thus, the hydrolyzed gelatins useful in this invention have 0 Bloom since no gelation occurs. When the concentration of the test solution is doubled to about 12½ percent then gelation takes place forming a gel with a jelly strength of about 20 to 30 grams. A gelatin hydrolysate which is representative of those suitable for use in this invention is marketed under the name "Byco" soluble protein Type E by D. Young and Company of America Ltd., New York, N.Y. While this "Byco" soluble protein Type E is representative of the hydrolyzed gelatins useful in this invention, the invention is not limited to this particular gelatin hydrolysate since other hydrolyzed gelatins with a very low Bloom and a molecular weight of about 9,000 to about 11,000 are also suitable. The very low Bloom hydrolyzed gelatins are suitable for use in this invention since they are relatively stable to heat and can be kept warm for as long as 8 hours without any off-odor developing. This relative heat stability is important since it permits the use of this material in granulation and tableting procedures without odor problems. This is in contrast to other hydrolyzed gelatins which develop unpleasant off-odors when used in granulation and tableting operations. Furthermore, the low Bloom hydrolyzed gelatins have good tableting characteristics and compositions containing these gelatins are readily granulated and/or compressed.

The hydrolyzed gelatins are made by a controlled hydrolysis of edible gelatin which results in materials with the required Bloom and molecular weight.

The vitamin E active compounds suitable for use in this invention are any of the tocopherols, however, in order to insure the desired amount of vitamin E activity in the powder on a weight basis, it is preferred to use tocopheryl esters. Suitable esters are the acetate, palmitate, succinate and the like. The preferred ester used according to this invention is dl- α -tocopheryl acetate. Sufficient tocopheryl acetate is utilized to

insure that the spray-dried powder contains from about 40 percent to about 60 percent by weight of vitamin E, i.e., the amount of vitamin E activity present in the powder is that which would be present if the vitamin E activity is present as pure vitamin E.

The vitamin-E-containing powders of this invention can contain a flow agent to improve flow, increase bulk density and remove electrostatic charges. The amount of flow agent present is generally from about 1 percent to about 3 percent by weight. The flow agent is added to the powders prior to their use in tableting and encapsulating procedures. Suitable flow agents are, for example, bulky silicic acid products such as Syloid 65, silicic acid-Mallinckrodt Special Bulky, Santocel FRC, XP-50 (Huber), Zeothix 90, and Cabosil M7.

The vitamin E powders of this invention are formed by emulsifying the vitamin E compound and the gelatin hydrolysate and then spray drying the emulsion. The conditions of the spray drying are not critical just so long as the temperatures utilized are not so hot that the vitamin E or gelatin hydrolysate is decomposed. Thus, inlet temperatures of about 350° F. to about 400° F. and outlet temperatures of about 190° F. to about 220° F. are suitable.

Since gelatin hydrolysate solutions readily support microbiological growth, it is preferred to add preservatives to protect the emulsion during preparation and holding prior to spray drying. The preservatives are added to the water used to prepare the gelatin solution so that a level of about 0.4 percent to about 0.6 percent, preferably about 0.5 percent, of, for example, sodium benzoate and about 0.15 percent to about 0.25 percent, preferably about 0.2 percent, of, for example, sorbic acid, result in a final 45 percent by weight hydrolyzed gelatin solution. This provides a level of about 0.20 percent-0.24 percent, preferably about 0.22 percent, of, for example, sodium benzoate and about 0.08 percent to about 0.10 percent, preferably about 0.09 percent, of, for example, sorbic acid in the final emulsion and about 0.4 percent to about 0.6 percent, preferably about 0.5 percent, of, for example, sodium benzoate and about 0.15 percent to about 0.25 percent, preferably about 0.2 percent, of, for example, sorbic acid in the spray-dried powder.

The moisture content of the spray-dried material is about 1 percent to about 6 percent, usually about 3 percent. The powders produced according to this invention are cold water soluble materials and pick up some atmospheric moisture, however, they have very little tendency to cake, for example, the product does not cake until stored at 79 percent humidity for from 9 to 16 days, and the cake thus formed is easily broken.

The powders according to this invention are white, have a particle size range of from about 20 to 40 microns, of which at least about 90 percent pass through a 20-mesh screen. The bulk density of the powders is from about 15 to about 22 lb./cu. ft. As used herein, "20-mesh" refers to a screen with 20 meshes per linear inch.

The following examples illustrate the preparation of the powders of this invention.

Example 1

5 grams of sodium benzoate and 2 grams of sorbic acid are dissolved in 550 grams of distilled water and heated to 60°-70° C. 450 grams of gelatin hydrolysate ("Byco" soluble protein Type E) are added and dissolved with constant agitation. 550 grams dl- α -tocopheryl acetate are emulsified in the hydrolyzed gelatin solution with a Homo-rod Mixer. The emulsion is diluted with water, about 650 grams, to about 45 percent solids to give a proper spray viscosity. The material is spray dried in a laboratory model Bowen Spray Dryer using a rotating disc at an inlet temperature of about 375° F. and an outlet temperature of about 210° F. The resulting white powder is then blended with a flow agent, e.g., Cabosil M7 (finely divided silica). The product, prior to the addition of the flow agent, contains 50 percent by weight of vitamin E, 3 percent water, 0.5 percent sodium benzoate and 0.2 sorbic acid with the remainder being hydrolyzed gelatin.

Example 2

A 200-gallon jacketed Pfaudler kettle is charged with 50 gallons of distilled water, 1.75 kg. of sodium benzoate and 0.70 kg. of sorbic acid hand heated to 65° to 70° C. 153 kg. of gelatin hydrolysate ("Byco" soluble protein Type E) are slowly added with constant agitation. 30 kg. of warm (35°-40° C.) dl- α -tocopheryl acetate are slowly added to 50 kg. of the hydrolyzed gelatin solution at 50°-60° C. and with stirring, using a Homo-rod Mixer, until the emulsification is complete. Sufficient distilled water is then added to provide a proper spraying viscosity, e.g., about 45 percent solids.

The emulsion is then spray dried using either a 7½-foot Nichols Spray Dryer or a Bowen 7½-foot Spray Dryer with an inlet temperature of about 300° F. and an outlet temperature of about 200° F. The resulting product is white, has particles of from about 20 to about 30 microns, a bulk density of about 18.5 lb./cu. ft. and a moisture content of about 1 percent.

The product is blended with about 3 percent by weight Mal-linckrodt bulky silicic acid, prior to use in a tabletting operation.

Example 3

The powder formed in example 1 is used as an ingredient in a multivitamin tablet in the following formulation:

	Parts by Weight
Riboflavin	2.75
Pyridoxin HCl	1.10
Niacinamide	21.00
Ascorbic Acid	77.00
Vitamin E—50%—hydrolyzed gelatin (Product of example 1)	42.00
Pregelatinized starch binder (Amigel Boll)	16.00
Tricalcium Phosphate	94.70
Dry vitamin A acetate, 500,000	

Table — Continued

units/g.	12.50
d-calcium pantothenate	1.50
Thiamine mononitrate	2.20
Vitamin B ₁₂ —0.1% in gelatin	1.20
Calcium stearate	1.25
Silica (Cabosil M7)	1.20
Dry vitamin D ₃ 850,000 units/g.	0.60
Tablet Weight (mg.)	275

The riboflavin, pyridoxin, niacinamide, ascorbic acid, vitamin E, Amigel and tricalcium phosphate were passed through a Fitzpatrick mill equipped with a No. 1 screen, then granulated with water. The granules were dried overnight at 115° F. and then passed through a Fitzpatrick mill, equipped with a No. 1-B screen operating at medium speed, with knives forward.

The granulation was then admixed with the remaining ingredients listed in the preceding formulation. Thereafter, the mixture was compressed into tablets using a 15/32 inches flat faced beveled-edge punch and the tablets, weighing between 240 and 360 mg., were sealed and sugar coated by sealing with shellac, subcoating with syrup and dusting powder, coloring and smoothing with syrup, and waxing and polishing.

What is claimed is:

1. A powder comprising from about 40 percent to about 60 percent by weight of a vitamin E active compound and from about 60 percent to about 40 percent by weight of a gelatin hydrolysate, said hydrolysate having a 0 Bloom and a molecular weight of from about 9,000 to about 11,000.

2. The powder of claim 1 wherein the amount of the vitamin E active compound present is 50 percent by weight.

3. The powder of claim 1 wherein the vitamin E active compound is dl- α -tocopheryl acetate.

4. The powder of claim 1 containing from about 0.5 to about 0.9 percent of an antimicrobial preservative.

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,608,083 Dated September 21, 1971

Inventor(s) Bunnell and Cannalunga

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 4, line 36 of Claim 4

"0.9 percent of an antimicrobial"

should be

0.9 percent by weight of an antimicrobial

Signed and sealed this 25th day of April 1972.

(SEAL)
Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents