

New Formulation of a Plant Extract

The present invention relates to a new formulation of a specific plant extract.

The specific plant extract is the leaf extract of the white mulberry tree.

White mulberry (Latin name is *Morus alba*), is a fast-growing, small to medium-sized mulberry tree which grows to 10–20 m tall.

The species is originally native to northern China, and is now widely cultivated and naturalized in many other countries (such as i.e. United States, Mexico, Australia, Kyrgyzstan, Argentina, Turkey, Iran, etc.)/

Mulberry leaves have a long history of medicinal use in Asian countries, in particular China. In recent years, phytochemists have isolated a number of imino sugar constituents from mulberry leaves, such as 1 -deoxynojirimycin (DNJ), fagomine, and N- methyl-DNJ. The chemical structures of the imino sugars are similar to that of monosaccharides, being mostly polyhydroxyl heterocyclics with a 5 to 6-membered ring.

It has been shown that the imino sugar constituents from mulberry leaves exhibit certain inhibitory activity on α -glucosidase I and II, among which DNJ showed the strongest activity. Further pharmacological experiments revealed that DNJ acted on melanocyte inhibiting the maturing process of TYR, which resulted in the reduction of melanin production. (Genji Imokawa, Analysis of Carbohydrate Properties Essential for Melanogenesis in TYRs of Cultured Malignant Melanoma Cells by Differential Carbohydrate Processing Inhibition. The Journal of Investigative dermatology, 1990,

95(1):39-49; Ju Young Park, hyunjung Choi, Jae Sung hwang, Junoh Kim, Ih-Seop Chang, Enhanced depigmenting effects of N-glycosylation inhibitors delivered by pH-sensitive liposomes into HM3KO melanoma cells, Journal of Cosmetic Science, 2008, 59:139-150.)

There many commercially available supplements (in various forms) containing white mulberry leaf extract.

The white mulberry leaf extract is known

- to support healthy sugar levels and blood circulation
- to improve the overall digestive health
- to lower glucose levels and stabilizes blood sugar in the body by managing appetite and reducing cravings
- to support healthy weight loss by helping to control your appetite, sugar cravings and its absorption.

To produce such supplements, it is necessary to provide a formulation of the white mulberry leaf extract, which is then incorporated into the desired end market product.

There are also commercially available formulations of white mulberry leaf extracts (such as i.e. Reducose® 1% and Reducose® 5% from DSM Nutritional Products Ltd).

Due to the importance of the leaf extract of the white mulberry, there is always a need for improved formulations of such an extract.

The problem of the white mulberry leaf extracts is the strong hygroscopicity. This has for example a negative effect on the flowability property of the formulation. The flowability is a very important property of a powderous formulation.

It was now found that the when the leaf extract of the white mulberry is formulated with a specific (high amount) of maltodextrin (and optionally other ingredients) the flowability of the obtained powder is improved significantly.

Therefore the present invention relates to a powderous formulation (PF) comprising

- (i) a leaf extract of the white mulberry tree and
- (ii) at least 50 weight-% (wt-%), based on the total weight of the powderous formulation of maltodextrin.

It is clear that all the percentages always add up to 100.

Surprisingly such a powderous formulation has excellent flowability properties.

Preferably the powderous formulation according to the present invention comprises at least 55wt-% of maltodextrin.

Therefore the present invention relates to a powderous formulation (PF1), which is powderous formulation (PF), wherein the powderous formulation comprises at least 55 wt-%, based on the total weight of the powderous formulation of maltodextrin.

Preferably, the formulation according to the present invention comprises up to 99 wt-% of maltodextrin.

Therefore the present invention relates to a powderous formulation (PF2), which is powderous formulation (PF) or (PF1), wherein the powderous formulation comprises up to 99 wt-%, based on the total weight of the powderous formulation of maltodextrin.

Therefore the present invention relates to a powderous formulation (PF3), which powderous formulation (PF), (PF1) or (PF3) comprising 50 to 99 wt-%, based on the total weight of the powderous formulation of maltodextrin.

The formulation according to the present invention can optionally comprise further ingredients, which could added to such formulation, but which are not essential for the excellent property of the powderous formulation according to the present invention. Such ingredients can be vitamins, minerals, fillers, dyestuff, flavours, fibers, etc.

Therefore the present invention relates to a powderous formulation (PF4) comprising

- (i) a leaf extract of the white mulberry tree and
- (ii) at least 50 wt-%, based on the total weight of the formulation of maltodextrin and
- (iii) at least one further ingredient.

The formulation according to the present invention can be used as such (as dietary supplement, food supplement, feed, feed supplement or any further possible use).

The formulation according to the present invention can also be used to be formulated into other product forms. This means the powderous formulation according to the present invention can serve as a premix.

Therefore the present invention also related to the use of a powderous formulation (PF5), (PF1), (PF2), (PF3) or (P4) as dietary supplement, food supplement, feed, feed supplement.

Therefore the present invention also related to the use of a powderous formulation (PF5'), (PF1), (PF2), (PF3) or (P4) as premix.

The formulation according to the present invention can be produced according to commonly known methods.

It is possible that the powderous formulation according to the present invention is single particle. This means that all components (i), (ii) and (iii) are part of one particle. The size and the shape of such a particle is not essential to the invention. It should be in a suitable form to be used for the desired use.

It is possible that the powderous formulation according to the present invention is a mixture of more than one specific particle. This means that components (i), (ii) and (iii) are all different particles, which are then mixed together.

This means that components (i) and (ii) form one particle, which is mixed with (iii) or any other variation thereof.

When the ingredients of the powderous formulation according to the present invention are mixed the sequence of mixing is no essential. All ingredients can be added all at once and the mixed or they can be added one after the other, or in any possible combination.

A preferred method is that the leaf extract of the white mulberry tree is produced (usually by spray drying and the mixed and then mix it with component (ii) and optionally with (iii)/ As stated the sequence of mixing is not essential for the invention.

It is also possible to use commercially available leaf extract of the white mulberry tree such as Reducose ® 1% or Reducose ® 5% or a mixture of them, (these products are available from DSM Nutritional Products Ltd) and mix it with Maltodextrin and optionally and other ingredients (component (iii)).

The following examples serve to illustrate the invention.

Examples

Example 1

200 g of Reducose 5% (from DSM Nutritional Products Ltd) and 1800 g Maltodextrin were mixed in a double action tumbler (sieve: 0.5 mm).

The mixing time was 5 min and the temperature was 20°C (humidity: 50% RH).

The so obtained powderous formulation was then tested in view of flowability. This was done by determining the desorption as well as the adsorption. This was done by the Dynamic Vapor Sorption (DVS) test Performed using Aqualab Vapor Sorption Analyzer.

The DVS method for static or equilibrium isotherms consists of tracking sample weight change as the sample is exposed to deferent controlled humidities.

The sample is held at each humidity for a preset time interval or until a steady state weight change is achieved, the goal being to achieve equilibrium between the sample water activity and the controlled humidity.

eight change versus time data is recorded allowing for determining kinetics of sorption for each humidity level.

Effective Relative Humidity = $a_w \times 100$ (i.e 0.1 a_w = 10% RH)

In the following table the results can be seen

Pulse of water activity	Reducose 5% Control	Reducose 5% (10%) + Maltodextrin (90%)	Reducose 5% (20%) + Maltodextrin 80%	Reducose 5% (10%) + TMC 5%+ Maltodextrin (85%)	Reducose 5% (20%) + TMC 5%+ Maltodextrin (75%)	Reducose 5% (50%) + Maltodextrin 50%	Reducose 5% (80%) + Maltodextrin (20%)
0.1	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.3	0.43	1.73	0.67	0.66	1.50	0.98	0.33
0.4	4.08	2.67	2.17	2.13	2.84	3.21	3.08
0.5	6.28	4.04	3.84	3.57	4.45	5.93	7.00
0.6	15.18	7.10	7.10	8.63	7.65	9.50	13.02
0.7	23.61	11.55	11.73	12.73	12.55	15.76	20.28
0.8	39.04	15.33	14.97	16.20	16.90	25.02	NT

Claims

1. Powderous formulation comprising
 - (i) a leaf extract of the white mulberry tree and
 - (ii) at least 50 wt-%, based on the total weight of the formulation, of maltodextrin.
2. Powderous formulation according to claim 1, which comprises at least 55wt-%, based on the total weight of the formulation, of maltodextrin.
3. Powderous formulation according to claim 1 or 2, which comprises up to 99 wt-%, based on the total weight of the formulation, of maltodextrin.
4. Powderous formulation according to any of the preceding claims, wherein the formulation comprises further ingredients.
5. Use of a powderous formulation according to any of claims 1 – 4 as dietary supplement, food supplement, feed, feed supplement or any further possible use).
6. Use of a powderous formulation according to any of claims 1 – 4 as a premix.
7. Process of production of a powderous formulation according to any of claims 1 – 4 wherein the components (i) and (ii) and optionally (iii) are mixed.