From Oil to Powder to Capsules – The Natural Way

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Introduction

Industries are looking to add natural high-sources of vitamins, probiotics, omega 3-6-9 fatty acids, antioxidants, amino acids and hemp to their natural supplement products. Often in form of an oil or oily powder. Talking about the latter, manufacturers can achieve some benefits when using microencapsulation for oil powders. Especially if the oil powder is then filled into hard gelatin capsules, precision dosing of exact amounts of ingredients or nutrients can be achieved. Flavor and odor masking can minimize unpleasant tastes and smells associated with certain nutrients. Protection from moisture, acids, heat and oxygen. It enhances stability, bio-availability and delivery. As well as ease of handling due to dry and free flowing.

This evaluation examines whether it is possible to incorporate oily substances in powder with purely natural ingredients and to encapsulate the product in a simple way.

The following three applications are to be simulated – using sunflower oil as an oil substitute:
- 30 mg of hemp in a size 0 capsule
- 12.5 I.U. of Vitamin E, ca. 15 mg of Vitamin D3 in a size 1 capsule
- 30 mio CFU of probiotics in a size 0 capsule

Flow aid
- CC MAB (oil 25%w/w, fast 25%w/w)

Powder blend CC MAB by using a high shear mixer. The absorbance material is based on only natural and organic ingredients. The oil was added step by step into the CC MAB to guarantee a homogeneous distribution and to avoid clumping. The ratio was 1:3 oil:powder.

Materials and Methods

To incorporate the sunflower oil into powder (CompactCel® MAB, BIOGRUND) the oil was blended into the CompactCel® MAB process of hard gelatin capsules. The right speed, tamping pin height and formulation of the oil powder blend is crucial for the success of the encapsulation process of hard gelatin capsules.

Three different trials using two different formulations were performed with the oil powder. For the encapsulation process a Syntegon (formerly Bosch) GKF 705 was used, with different tamping pin heights, bowl fill heights and machine speeds (rpm). The right speed, tamping pin height and formulation of the oil powder blend is crucial for the success of the encapsulation process of hard gelatin capsules.

Results and Discussion

As mentioned at the beginning, the following three applications serve as a base for the orientation of our simulation:

1. Hemp
2. Vitamin E
3. Probiotics

In the pharmaceutical industry a relative standard deviation (RSD) below 5% of filled capsules is acceptable. The results of Set 1: 30 mg of hemp in a size 0 capsule showed an RSD of 14%. This means a good powder flow in combination with the right process parameters was given to achieve the desired result.

In the pharmaceutical industry a relative standard deviation (RSD) below 3% of filled capsules is acceptable. The results of Set 2: 22.5 I.U. of Vitamin E, ca. 15 mg of Vitamin D3 in a size 1 capsule showed an RSD of 2.23%. This means a good powder flow in combination with the right process parameters was given to achieve the desired result.

As a result, a hard gelatin capsule can be filled with the natural powder blend CC MAB that can take 12.5% (Set 1) and 9.5% (Set 2) oil in total per hard gelatin capsule. This is much more than the assumed amount in one capsule of our underlying applications (Hemp 6%, Vitamin E 4%, probiotics 6%).

Comparing these results with the underlying applications, it can be said that the goal of filling oil to powder into hard gelatin capsules is a straight forward process. Thus, this process is a viable alternative to liquid-filled capsules and soft gels or pure oil as a dosage form if the right equipment, parameters and ingredients are used.