Honey Spray Drying

Funders/Collaborators: ABC & AB Agriculture and Forestry Bio Industrial Opportunities Section
Total Project Value: $5200 ABC Contribution: $5200
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Background

Honey is consumed because of it's unique taste and aroma as well as its numerous health-promoting properties. However, industrial application of honey is restricted due to its highly viscous nature which causes difficulties in transportation and handling. These problems may be overcome by converting liquid honey into powder form, resulting in an increase in its stability and ease in handling of the product.

Methodology

Spray drying is a method for convective drying of liquid which has application in varied fields including food and dairy industries, pharmaceutical, agrochemical, light and heavy chemicals, detergent pigment, biotechnology and ceramics. During spray drying, evaporation occurs at a higher rate due to the increased surface area of liquid feed during atomization. It is a continuous process with high production rates which makes it economical and also the product is produced in the desired powdered from thereby requiring no additional grinding. However, the production of sugar-rich powders like honey by spray drying may present some problems such as stickiness and hygroscopicity, mainly contributed by low glass transition temperature (Tg). The problem of stickiness could be overcome through two approaches: low drying temperature (if possible lower than honey's Tg and addition of high molecular weight carrier material to increase Tg. The carrier materials involved in this study are gum Arabic, pea starch, corn starch, and maltodextrin.

Summary of Phase 1 study

A number of carriers (i.e., Arabic gum, maltodextrin, corn starch and pea starch) were evaluated in order to encapsulate honey to make honey powder. The ratio of carrier and honey, spray drying temperatures and drying cylinder configuration were the main parameters that were adjusted to optimize the process. The spray-dried products were white powders with no perceived odour, assessed in terms of physical appearance, particle morphology and glass transition temperature. During this phase of the project, a number of observations were made.

Figure 1: The physical appearance of encapsulated honey powders

Figure 2: The Physical Appearance of honey powders made with corn starch

Summary of Phase 1 study

In conclusion, 2:1 is a good ratio of carrier and honey to produce honey encapsulated particles. Honey powder could be formed using BUCHI spray dryer with a traditional drying cylinder, inlet air temperature of 180oC and outlet air temperature of 80oC. GA could introduce irregular particles without honey encapsulated, but produce particles with thinner shell; while MD-Honey particles were perfect spherical but with thick particle shell. Also, no matter which carrier material was used, there were always un encapsulated honey particles.

Phase 2 Objectives

- Spray drying of Honey using various protein powders as Canola Protein, Hemp protein and Faba bean protein at bench scale
- Scale-up of successful formulation using larger scale spray dryer unit.
- Sensory testing upon successful scale-up of right formulation

Phase 2 Objectives

- Our team has tried Canola protein, Hemp protein and Faba bean protein.
- Initial trial runs with Hemp, Canola and Faba bean protein powders shown no significant processing challenges at very low Honey to Carrier ratio (1:0.5)
- Honey spray drying was conducted at 180C inlet and 80C outlet temperature using lab scale Buchi spray dryer unit.
- Spray drying honey with Faba bean protein isolate looks very promising in terms of texture, solubility and flavor.

Recommendations

- Optimize the process parameter using Faba bean protein isolate / concentrate as a carrier for honey spray drying.
- Scale-up the process with Faba bean protein as a carrier using larger spray dryer unit.
- Conduct the sensory study upon successful production of right formulation.
- Similar study should be done on other protein powders in future.

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