Encapsulation of lycopene to increase its bioavailability

Identification

Key words: encapsulation, lycopene, spray drying, freeze drying
Latest version: 2010/12/20
Completed by: FRIP

How does it work?

Primary objective: Stabilization, protection during digestion
Working principle: Example: lycopene protection during digestion. Lycopene protection is done mostly by chemical encapsulation of prepared mixture of lycopene or tomato extract with some protection substances. Mostly used protection substances are gelatine, gelatine with sucrose, starch, maltodextrin, poly(γ-glutamic acid) and cyclodextrins including beta-cyclodextrin. The most used processes are spray drying and freeze drying [1,2,3,4,5,6,7].

Images

Additional effects: better storage stability, stability during further processing
Important process parameters: Level of temperature during processing, shear rate limit causing damage of the protective substance structure.
Important product parameters: Concentration of protective substance, method of encapsulation, stability of cover.

What can it be used for?

Products: Bioactive components from vegetables, powders, liquid nutraceuticals
Operations: Drying, pasteurisation, sterilisation
Solutions for short comings: This technology answers to the potential need coming from industry like: “methods of stabilizing or protection of lycopene during digestion to increase its bioavailability”

What can it NOT be used for?

Products: Products without lycopene or products that contain acids and enzymes that might destroy the capsule
Operations: The operations that destroy the layer of protecting substance (enzymes, acids): e.g. enzymatic treatment of encapsulated lycopene powder when added as ingredient into formulation of some functional food.
Other limitations: The encapsulating layer has to be digestible in the human digestion system. Otherwise it will leave the body unused. This problem can be solved by verification experiment that mimics digestion.
Risks or hazards  
Accumulation of lycopene in the body.

Implementation

Maturity  
Spray drying encapsulation is the mature process applied in industrial conditions.

Modularity

Modularity

Consumer aspects

No problems expected in food supplements, it is not clear how it would be accepted in normal food formulations

Legal aspects

None known up to now.

Environmental aspects

Not known.

Facilities that might be interesting for you

<table>
<thead>
<tr>
<th>Title</th>
<th>Institute/company</th>
</tr>
</thead>
<tbody>
<tr>
<td>B-290- Mini spray dryer-HES-SO Valais-HEI</td>
<td>University of Applied Sciences and Arts Western Switzerland Valais</td>
</tr>
<tr>
<td>GPCG1-Fluidized bed dryer-HES-SO Valais-HEI</td>
<td>University of Applied Sciences and Arts Western Switzerland Valais</td>
</tr>
<tr>
<td>IRTAsim</td>
<td>IRTA</td>
</tr>
<tr>
<td>MP41/60, Zs240- Drum dryer- HES-SO Valais-HEI</td>
<td>HES-SO Valais-HEI</td>
</tr>
<tr>
<td>Microwave vacuum drying pilot system KEKI</td>
<td>NAIK EKI</td>
</tr>
<tr>
<td>QDS system IRTA</td>
<td>IRTA</td>
</tr>
<tr>
<td>Spray Dryer - TTZ</td>
<td>TTZ</td>
</tr>
<tr>
<td>Spray dryer - HES-SO Valais-HEI</td>
<td>University of Applied Sciences and Arts Western Switzerland Valais</td>
</tr>
</tbody>
</table>

Further Information

Institutes  
CSIC - Instituto de Fermentaciones Industriales, Agriculture and Agri-food Canada

Companies  
Niro Atomiser, CENTIV

Source: