

Improving gel formulation Against liquifying

Context

The goal of the seeker is to register a biocide product and avoid complain from customer:

- To register a biocide dossier PT 18, a product must be stable during the shelve life, 2-3 years.
- This stability includes:
 - Concentration of active ingredient
 - pH
 - And Viscosity

What is the problem?

- The seeker wants to
 - Eliminate the decrease of the viscosity (less than 15%) during storage at ambient temperature relative humidity 55% around
- While keeping the same basic formulation of gel bait, containing:
 - (the current formulation is based on a high viscosity gel - gelling agent is based on cellulose food matrix, including fat, sugar, proteins)
 - Water
 - Proteins
 - Polyols
 - Carbohydrates
 - Sugars
 - Preservatives
 - Flavor components
 - Mild acid (pH 5.5)

Some tests already performed indicate that the issue of viscosity decrease is a multifactorial problem: enzymatic or bacteriological reactions are suspected, but not proven

- Current gelling agent: Akucell AF 3265 → lost viscosity during long term storage but not during the accelerated storage test (54°C 2 weeks)
- A problem with a protein reaction has been identified, the quality of the protein turned the gel in a liquid → Enzymatic activity was suspected, but not proven
- The sugar alcohol probably reacted with gelling agent and turned it into a liquid → probably again enzymatic activity, but microbiological activities was not proven (by the NF EN ISO 21149 + NF EN ISO 16212 methodology)

What is the context (in which the solution should work)? (Specific details)

Additional information will be communicated to the final solvers about the main ingredients and the minor ingredients

What are the desirable characteristics? (Price, Speed, compliance with standards ...)

- Financials:
 - Cost of the final gel per kg around 2,5 €
 - The total price should not increase more than 20%
- Technical:
 - Palatability for crawling insect should not decrease
 - Expected viscosity: greater than 500.000 centipoise
 - Final droplet during the application without filament forming → avoid “behavior of honey”. Low elasticity is desired
 - Viscosity check by this methodology: A 200 mg droplet placed on a vertical non porous surface (e.g. a tile) should not drip at room temperature and a rel. humidity of 55% after 2 years of storage at room temperature
 - Cold process is preferred
- Regulatory:
 - Minor change (if possible, only to the gelling agent):
 - Definition of minor change: modification of existing authorization not only administrative but with a need of limited re-evaluation of property or efficacy of the biocide product or biocide family product.
 - All substance has to be REACH and EPA approved.

Selection criteria - Level of achievement of the desired solutions (proof of concept, idea, finished product ...)

Proven solutions (test over 3 years) is a must:

- No accelerated test would be considered
 - As stated in the first sections “lost viscosity during long term storage but not during the accelerated storage test (54°C 2 weeks) “

3 options will be considered in this order:

1. A gel substitute that fits those constraints (Many classic gels on the market have been tested without success (see section on existing solutions)
 - Cold process
 - Stabilization of viscosity
 - No filament
 - And same insect palatability
2. Addition of inhibitors
 - Modeling or tests of raw materials that interact with the gelling agent to identify the component(s) responsible(s) for the loss of viscosity
 - For instance, identify enzymatic activity (that digest carbohydrate – cellulose which is destroyed over time)
 - Identify and propose the corresponding inhibitors
3. Gels with hot process (Current production methods, cold, are preferred - Gels involving a hot production method may be considered but these solutions are not preferred)
 - Possibility to add some ingredients after heat treatment at room temperature
 - Wax, ...
 - No honey

Existing Solutions that won't be considered for this challenge

Solutions already considered and not validated include:

We tested gelling agent from

- Algae:
 - Satialgin (S1600; S 1100; GCF 613)
 - Algogel RMB 650 → liquefy over time or not give the high viscosity
- Carbopol:
 - Not good for palatability. Acrylic base
- Xanthan:
 - Make filament
- Arbocel (microcrystalline cellulose):
 - Not stable over time.

- Carragenan:
 - Need hot process to mix in the formulation.
- ➔ These details are for guidance, not for exclusion of entire group of gelling agent

Proposed format for the writing of the solution

The solver should write a solution following the Frame described below:

- Choice of solution
 - A gel substitute
 - Addition of inhibitors
 - Gels with hot process
- Performances
 - Respected constraints
 - Cold process
 - Stabilization of viscosity
 - Details about the viscosity test over 3 years
 - No filament
 - Same insect palatability
- Business/Market potential
 - Costs of the total gel formulation around 2,5 cent € /kg
 - ...
- Detailed explanation of the solution
 - Free format

Rewards

	Theoretical product	Proven solution (3-year test on viscosity)
A gelling substitute	5 000	30 000
Addition of inhibitors	3 000	20 000
Gels with hot process		10 000

The maximum reward would be 30 000 €

- For selected theoretical solutions, the payment will be upfront
- For proven solutions, the payment will be as follows:
 - 50% of reward after accelerated test (12 weeks at 35°C) success
 - 50% at the end of the first 12 months of test at ambient room temperature storage

~~50% of reward after accelerated test (12 weeks at 35°C) success and 50% at the end of the 1 years at ambient room temperature storage.~~