

# 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

