ACTAZIN®

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Actazin® & Akkermansia: The Kiwifruit-Gut Synergy for Enhanced Mucin Production and Metabolic Health

Akkermansia muciniphila (A. muciniphila), a beneficial bacteria that has garnered significant research and development interest in recent years, has been linked to positive outcomes regarding obesity, diabetes, inflammation, and metabolic disorders.

A. muciniphila thrives in the mucus layer of the intestine and primarily feeds on mucin, a glycoprotein that constitutes a major part of the mucus layer lining the gastrointestinal tract.

Mucin forms a physical barrier and protects against pathogens and toxins. It also lubricates the gut, allowing for easier passage of stool.

Actazin Supports the Growth of *Akkermansia*

Actazin is a skinless, seedless, cold-processed green kiwifruit powder retaining the goodness of the whole fruit, such as maximum key bioactive enzyme activity, polyphenols, vitamins and dietary fibre.

In an artificial gut system called the SHIME (Simulator of the Human Intestinal Microbial Ecosystem), Actazin® was found to have a significant effect on gut microbial communities and the metabolites they produce (Goya-Jorge, et al., 2023). In particular, Actazin was shown to:

- Significantly increase key bacterial populations, including:
  - *Akkermansia muciniphila;*
  - *Bacteroides-Prevotella spp.;*
  - *Bifidobacterium spp.;* and,
  - Butyrate-producing species such as *Roseburia* spp.
- Significantly increase butyrate.

Similarly, in a clinical study, consumption of Actazin led to an increase in the relative abundance of *Akkermansia* (Graham et al., 2024). Whilst this increase was not statistically significant, the levels of *Akkermansia* at endpoint were significantly higher in those that consumed Actazin compared to those taking placebo.

Actazin helps to provide a favourable gut environment for *Akkermansia* to thrive through the following actions:

1. Increased mucin production;

   Actazin stimulates the production of mucin in the gut upon which *Akkermansia can* feed.

2. Microbiome modulation;

   Actazin acts as a food source for other bacteria, supporting their growth. Some of these bacteria may also feed on mucin, but as they prefer kiwifruit polysaccharides, this removes *Akkermansia's* competition for the mucin.

3. Improved bowel function and regularity;

   Actazin supports regular bowel movements which helps to promote diversity, and removes toxins and pathogens, thereby supporting a healthy gut microbiome.

How Actazin Promotes the Growth of *Akkermansia*

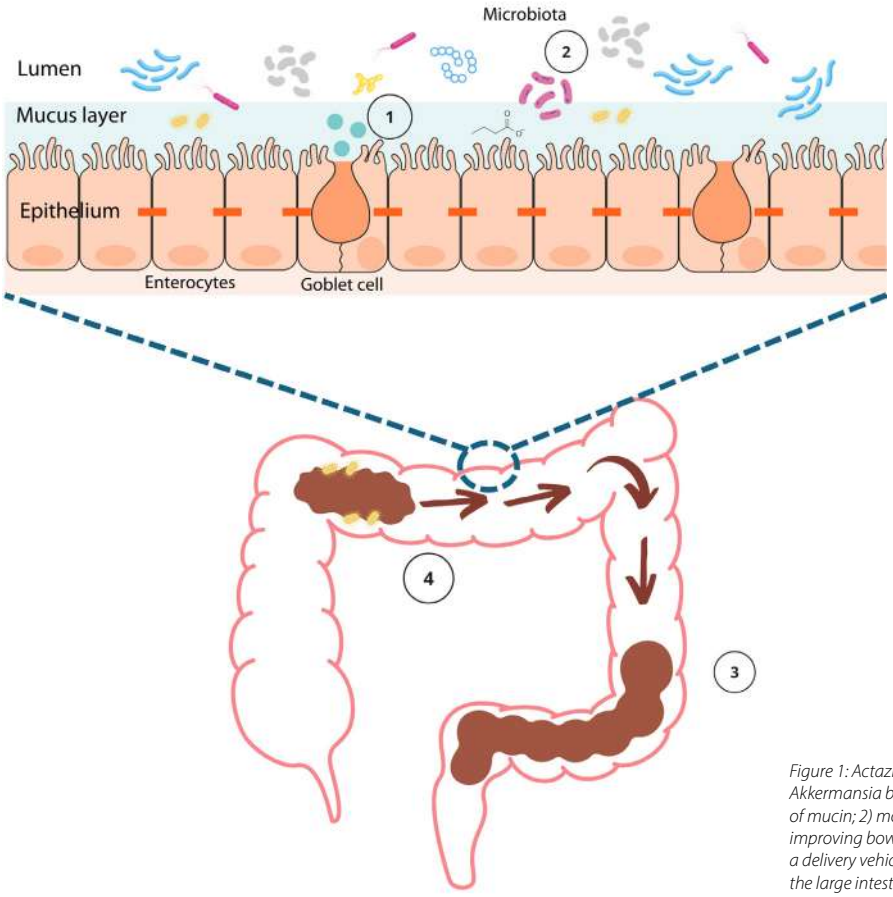

Figure 1: Actazin can support the growth of Akkermansia by: 1) stimulating the production of mucin; 2) modulating the microbiome; and 3) improving bowel function. Actazin fibre also provides a delivery vehicle to carry Akkermansia postbiotic to the large intestine where it is needed (4).

Actazin Increases Mucus Production

In an *in silico* study, Actazin has been shown to increase mucus (mucin 2) production (Cytosolve, confidential report, 2018). A single daily dose of 600 mg significantly impacts mucin production. A continual daily dose has a cumulative effect (Figure 2). This is consistent with how kiwifruit is expected to behave.

Green kiwifruit used as a partial replacement of psyllium **increased mucus production and goblet cell numbers** in the intestines of pigs (Montoya et al., 2021).

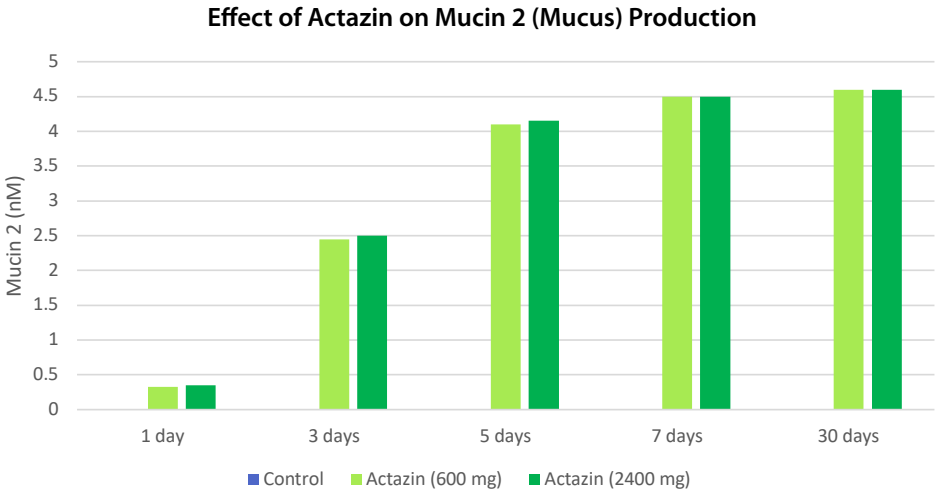

Figure 2: Effect of daily 600 mg and 2,400 mg doses of Actazin on mucin 2 production. A 600 mg dose is just as effective as 2,400 mg dose.

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Actazin Supports a Healthy Digestive System

Actazin has been shown in two separate clinicals to support healthy digestion, improving bowel regularity and positively modulating the microbiome (Ansell et al., 2015; Graham et al., 2024).

Gel-Forming Actazin Reaches the Colon and Provides a Delivery Vehicle for *Akkermansia*

Kiwifruit fiber's swelling capacity (the volume occupied by fiber in water after passively settling) (Robertson et al., 2000) is one and a half times higher than psyllium and greater than six times higher than commercially extracted apple fiber (Sims & Monro, 2013). Kiwifruit fiber also has high water retention capacity (volume of water bound to insoluble fiber and not separated by centrifugation) (Sims & Monro, 2013; Mishra and Monro, 2012). Kiwifruit fiber is fermentable (Parkar et al., 2012; Rosendale et al., 2012) and will contribute to colonic microbial biomass (Rosendale et al., 2017). Other constituents may survive intact to the colon (polyphenols, organic acids, other dietary fibers from the diet) and may contribute to water holding and act as microbial fermentation substrates. These attributes contribute to fecal bulking (Bayer et al., 2018).

Collectively, while these factors may contribute to daily Actazin consumption improving stool form and regularity of bowel movements, more importantly, they illustrate the **use of Actazin as a gel-forming, water-holding vehicle to carry other materials through to the large intestine** where it is needed, such as *Akkermansia* postbiotic compounds.

Synergistic and complementary benefits of Actazin with *Akkermansia*

Actazin

- Enhances protein digestion
- Improves bowel regularity
- Reduces digestive discomfort and bloating
- Acts as a delivery vehicle to transport other materials through the colon

Akkermansia muciniphila

- Has anti-inflammatory effects
- Supports a healthy gut barrier by:
  - feeding on mucus lining the gut which helps to keep the mucus layer healthy
  - producing compounds that strengthen tight junctions
- Is linked to various metabolic effects, such as glucose and lipid metabolism, and is correlated with a decreased risk of obesity, diabetes and metabolic disorders

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