

---

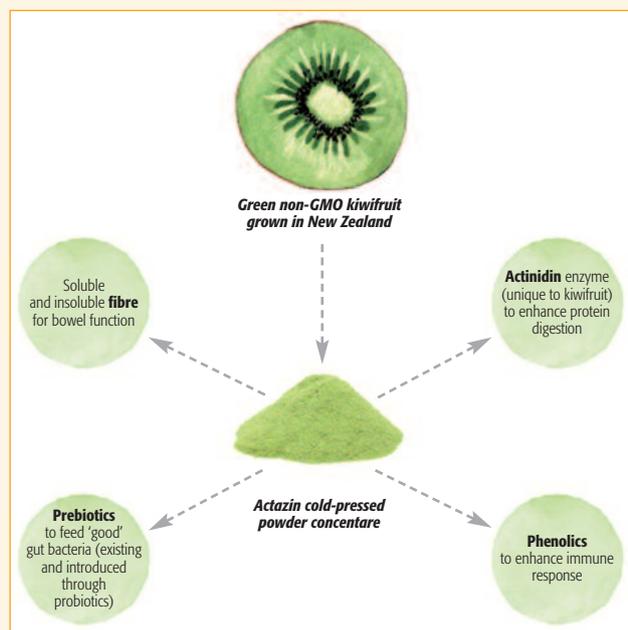
© Springer – CEC Editore 2015

The composition of the gut microflora has been found to play important roles in human health and disease. Some polysaccharides, which are slow or non-digestible by humans, are considered as prebiotics because they are selectively fermented by gut bacteria resulting in specific changes in the composition and/or activity of the gastrointestinal microbiota, thus conferring benefit(s) upon the host's health.

Kiwifruit (*Actinidia deliciosa*) have been found to enhance gut health by easing constipation, promoting laxation and modulating colonic microbiota. They represent an important source of dietary fibre promoting the adhesion of microorganisms as

probiotics to intestinal epithelial cells and subsequent colonization. Some dietary fibre is resistant to digestion in the upper digestive tract and can reach the colon largely intact, where it is broken down by microbial glycosidases to liberate oligo- and mono-saccharides, which are further metabolized by the microbiota ultimately to result in a mixture of organic acids, including short-chain fatty acids (SCFAs) that are a major source of metabolic fuel to the colon [1].

Protein is a minor but significant component of kiwifruit. Actinidin is an enzyme belonging to the cysteine protease family and shows partial sequence homology with papain and brome-



**Figure 1** Actazin™ activities and health benefits

lain. It catalyzes the hydrolysis of peptide bonds. *In vitro* studies suggest that actinidin enhances protein digestion in the stomach and the small intestine [2, 3]. Experimental data indicate that actinidin could hydrolyze collagen and fibrinogen perfectly at neutral and mild basic pH, while it could digest pure  $\alpha$ -casein and major subunits of micellar casein especially in acidic pH [4]. Scientists say that consuming actinidin may reduce the feeling of being overfull after a protein meal, increase the rate of protein absorption in the small intestine and allow faster and more complete digestion of food proteins.

Actazin™ is the pure kiwifruit extract from the New Zealand company Anagenix Ltd, developed to support better digestive health for people of all ages, and is made with high-quality kiwifruit cultivated in New Zealand (Zespri® green kiwifruit). The Zespri® system utilises ethical business practices, and environmentally friendly methods to grow, cultivate, store and ship the fruit, without genetic engineering (non-GMO).

Actazin™ is distributed by Giellepi S.p.A. for the Italian market.

### Composition and technical specifications

Actazin™ is a natural, cold-pressed powder concentrate made entirely in New Zealand from non-GMO kiwifruit. The kiwi pulp is gently processed into a seedless, skinless puree. The puree is carefully dried and finely milled. The proprietary processing and drying techniques used to produce Actazin™ ensure high levels of key nutrients and bioactives are retained (Fig. 1). Its technical specifications are described in Table 1.

Actazin™ includes soluble and insoluble fibres (14%) for bowel regularity; polyphenolics, which provide micronutrients needed for boosting the immune system; a proteolytic enzyme unique to kiwifruit that enhances protein digestion (actinidin, >7500

<i>Latin name</i>	<i>Actinidia deliciosa</i>
<i>Plant part used</i>	Fruit pulp
<i>Organoleptic properties</i>	
Appearance	Powder
Colour	Light green
<i>Physical and chemical properties</i>	
Actinidin	>7,500 AU/g*
Moisture	≤5%
Water activity	<0.25
<i>Heavy metals (ppm)</i>	
Arsenic	<1
Mercury	<0.1
Lead	<1
Cadmium	<1
<i>Microbiological properties</i>	
Total microbial count (cfu/g)	<100,000
Yeast and moulds (cfu/g)	<2,000
<i>Escherichia coli</i> (cfu/g)	<10
Enterobacteriaceae (cfu/g)	<10
<i>Salmonella</i>	Absent/25 g
<i>Listeria</i>	ND/25 g
<i>Storage</i>	
Store in a cool, dry place and away from direct sunlight	

\*Activity units per gram; substrate is N- $\alpha$ -CBZ-lys-p-nitrophenol, with digestion at 25°C.

**Table 1** Technical specifications of Actazin™

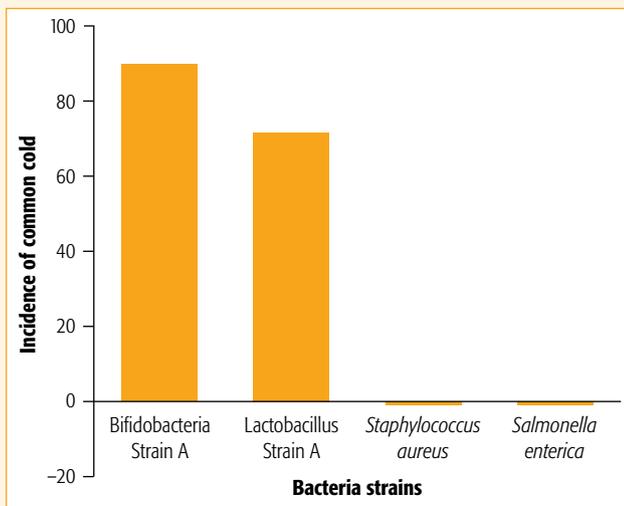
AU/g); and prebiotics, non-digestible carbohydrates (21%) that promote the survival and proliferation of intestinal bacteria. Actazin™ is gluten-free, non-GMO and free of preservatives; it contains only sugars naturally found in kiwifruit and is free of added sugars. Actazin™ is certified as a kosher and halal ingredient.

### Efficacy

#### Preclinical studies

Several *in vitro* assessments were carried out to investigate the efficacy of Actazin™. In an *in vitro* study, different bacterial strains (including *Escherichia coli*, *Staphylococcus aureus*, *Salmonella enterica*, *Bifidobacterium* and *Lactobacillus*) were incubated in the presence of Actazin™. Results showed that Actazin™ acts as a prebiotic, supporting the growth of bifidobacteria and lactobacilli, whilst it did not promote the growth of the other bacteria versus the control (Fig. 2).

In another *in vitro* study, different substrates (digested Actazin™, *Lactobacillus*, digested Actazin™ in combination with *Lactobacillus*, and control) and human faecal inoculum (from healthy donors) were added to a fermentation medium and allowed to ferment under anaerobic microbial growth conditions for 48 h, simulating *in situ* colonic fermentation. This mixed fermentation model showed an increase in butyrate production, suggesting one or more of the components in Actazin™ is being utilized as an energy source by the intestinal microorganisms.



**Figure 2** Actazin™ prebiotic activity

### Clinical studies

Several biological activities of kiwifruit have been scientifically documented. The efficacy of Actazin™ has been clinically proven by a randomized, double-blind, placebo-controlled, crossover study using two dosages of Actazin™ administered to healthy and functionally constipated individuals (n = 28; both females and males; aged 23–56 years). At a dose of 2400 mg daily, Actazin™ showed a statistically significant increase in the number of daily bowel movements in the healthy cohort (10.2% increase versus washout). A lower dose of 600 mg also showed a trend to increase (7.4% versus washout). While the number of stools increased, their form was not adversely affected (i.e., Actazin™ did not induce looser stool form). This study demonstrated that Actazin™ produced clinically meaningful increases in bowel movements in healthy individuals [5].

### Safety

Actazin™ is a high-quality, food-grade ingredient. Actazin™ is made from kiwifruit, which is a long-established human food, so a daily dose of Actazin™ is safe for people of all ages, including women who are pregnant or breastfeeding. No harmful solvents are used during manufacture; Actazin™ is free from added sugars and preservatives, and is non-GMO. Every batch of Actazin™ is tested to assure the quality and safety of the product. The kiwifruit used to make Actazin™ powder concentrate are supplied by Zespri® New Zealand, who have stringent safety, compliance and control systems in place with their growers to ensure the highest quality standards. Actazin™ should not be taken in case of known hypersensitivity or allergy to kiwifruit, latex, birch pollen or other related substances.

### Applications and dosage

Actazin™ may help to increase existing populations of enterobacteria. Lactobacilli and bifidobacteria are also commonly included in probiotic foods and supplements. So if Actazin™ is

included as an ingredient, probiotic effects may be enhanced. Actazin™ contains the kiwifruit enzyme actinidin, which is known to have a positive effect on the digestion of red meat, dairy foods and fish. Actazin™ could be used for the management of gastrointestinal disorders, as an ingredient for dietary supplements and functional foods (blended drinks, cereals, snack bars and juices). It can be easily formulated in capsules and tablets, alone or in combination with other active ingredients. Recommended dosage: 600–2400 mg daily. To alleviate digestive discomfort, Actazin™ can be taken up to 2400 mg/day until discomfort passes. For ongoing gut health, maintenance and care, 600 mg/day can be taken, providing nutrients on a consistent basis to help support a healthy gut environment.

### References

1. Stonehouse W, Gammon CS, Beck KL, Conlon CA, von Hurst PR, Kruger R (2013) Kiwifruit: our daily prescription for health. *Can J Physiol Pharmacol* 91:442–447
2. Kaur L, Rutherford SM, Moughan PJ, Drummond L, Boland MJ (2010) Actinidin enhances gastric protein digestion as assessed using an in vitro gastric digestion model. *J Agric Food Chem* 58:5068–5073
3. Kaur L, Rutherford SM, Moughan PJ, Drummond L, Boland MJ (2010) Actinidin enhances protein digestion in the small intestine as assessed using an in vitro digestion model. *J Agric Food Chem* 58:5074–5080
4. Chalabi M, Khademi F, Yarani R, Mostafaie A (2014) Proteolytic activities of kiwifruit actinidin (*Actinidia deliciosa* cv. Hayward) on different fibrous and globular proteins: a comparative study of actinidin with papain. *Appl Biochem Biotechnol* 172:4025–4037
5. Ansell J, Butts CA, Paturi G, Eady SJ, Wallace AJ, Hedderley D, Geary RB (2015) Kiwifruit derived supplements increase stool frequency in healthy adults: a randomized, double-blind, placebo-controlled study. *Nutr Res* 35(5):401–408.

### Giellepi in a nutshell

Giellepi is a medium-sized, privately owned company based in Italy. It has been operating for many years in the area of specialty ingredients; it has a well established international network and prestigious partnerships. Giellepi's core business concerns the study and development of innovative and science-based ready-to-market food supplements, medical devices and medical foods for different medical needs. Giellepi is made up of Ingredients and Health Science divisions. Giellepi's business model is based on the release of licences of its products, which can be marketed under either their own brand or the Giellepi brand. Giellepi S.p.A. is the official distributor of Anagenix Ltd for the Italian market.

For information  
Giellepi S.p.A.  
tel +39 0362 240 116  
email [anna.costa@giellepi.it](mailto:anna.costa@giellepi.it); [alessia.terruzzi@giellepi.it](mailto:alessia.terruzzi@giellepi.it)  
web [www.giellepi.it](http://www.giellepi.it)