

Microalgae from volcanic hot springs erupts as promising protein source

06 Apr 2023 --- A microalga species that grows in volcanic hot springs could unlock a new alternative protein source predicted to disrupt the spirulina market because of its natural blue pigment. The nutritional functionality of *Galdieria sulphuraria* is also hailed as superior to other microalgae and for the first time in F&B developments, it's being examined as a potential food source.

Researchers at Wageningen University & Research (WUR) in the Netherlands have successfully developed a method to produce a promising microalga species that grows in an unlikely environment.

"This is the first time the nutritional profile of this species has been accurately quantified and understood," says Pedro Moñino Fernández, Ph.D. student and lead researcher on the EU-funded ProFuture project.

"We are now closer to real applications of this interesting and unexploited microalga that could have a significant impact on how the world feeds itself."



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It is not yet known what food applications could best suit *Galdieria sulphuraria*. Still, it shows promise as a better source of blue pigment – something that could benefit the natural colors market.

Galdieria sulphuraria is an extremophile microalga species. It was initially isolated from volcanic springs in the Naples region of Italy and has all it takes to become the next "superfood" on the market, stresses WUR researchers.

Compared to spirulina – a similar organism that is popular as a food and feed supplement – *Galdieria* is cheaper, easier to grow, and has a range of nutritional qualities.

"Microalgae offer some key advantages compared to other microorganisms currently being studied as potential food sources. They are a natural source of essential fatty acids, and species such as *Galdieria sulphuraria* are among the few naturally occurring sources of blue pigment," adds Iago Dominguez Teles, the project manager at WUR.

Scaling a sustainable ingredient

The research results represent a crucial milestone for ProFuture, a project that scales up microalgae production as a sustainable, protein-rich food and feed ingredient.

As an extremophile species, *Galdieria sulphuraria* can live in extreme environments that are typically not conducive to life. Although the species has been studied for decades due to its resilience and adaptability, it has yet to be examined as a possible food source or produced at scale.

ProFuture studied the strain growing in the hot springs of Italy and found an excellent nutritional profile.

Galdieria sulphuraria biomass was found to have protein content in the 62-65% range, which is relatively high compared to other algal and fungal microorganisms with protein contents ranging from 30-70%.

In addition, *Galdieria sulphuraria* proteins have a good amino acid profile, including all essential amino acids. The proteins are especially rich in two amino acids rarely found in such high levels in non-animal-based proteins: cystine and methionine.

A better blue

Galdieria sulphuraria contains a high concentration of a natural blue pigment commonly used in food and cosmetics. This pigment has also been found to have antioxidant properties, as well as potential as a therapeutic agent.

The blue pigment extracted from *Galdieria sulphuraria* demonstrates greater stability than spirulina, increasing its potential in industrial applications. In addition, a mixotrophic production process can increase the concentration of the blue pigment.

The researchers have also developed a production process using mixotrophy which combines photosynthesis and sugar-based feedstock to stimulate microalgae growth. To further validate the process beyond the bench scale, they could successfully demonstrate pilot production in a 1300-liter (1.5 cubic meters) bioreactor at Wageningen University.

What's next?

WUR is now looking to exploit the promising results of *Galdieria sulphuraria* but stresses that additional research is needed to assess its digestibility and to identify any additional processing methods that may be required for commercial applications.

Meanwhile, the European Food Safety Authority is currently assessing the safety of *Galdieria sulphuraria* as a novel food for the general population and as a food supplement for adults. In addition, Blue Galdieria extract is evaluated as a food additive.

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