How Stable is the Phytochemical Composition of Open-pond and Outdoor-Grown Microalgae? Evidence from Earthrise

Amha Belay
Earthrise Nutritionals LLC
Irvine, California, USA
abelay@earthrise.com
What is “Quality”

- Quality is a complex notion and means different things to different people
- Cambridge Online dictionary “how good or bad something is.”
- Quality = more good stuff and less bad stuff
- Quality is what you think the competition thinks the standard is.
- Ask my neighbor she really knows quality food
Quality Defined

The totality of features and characteristics of a product or service that bears its ability to satisfy stated or implied needs

- Stated Needs:
  - Customer requirements
  - Regulatory requirements
  - Company policy
Stability Defined

A measure indicating the extent to which something is steady or consistent. Stability may refer to a biological, chemical or physical attribute.

Consistency is far better than rare moments of greatness (Scott Ginsberg)
Customer and Regulatory Standards

- **Quality Standards**
  - ✔ Nutrient content
  - ✔ Bioactives content
  - ✔ Organoleptic

- **Safety Standards**
  - ✔ Microbiological
  - ✔ Heavy metals
  - ✔ Pesticides and herbicides
  - ✔ Algal and other toxins
  - ✔ GMP
  - ✔ HACCP
Challenges of producing an algal product with consistent quality

- Grown in open ponds with varying environmental conditions
  - Light
  - Temperature
  - Rain
  - Others

- Biological phenomena like contamination by other algae and predation by zooplankton

- Chemical phenomena that are difficult to control in a highly alkaline environment, e.g. loss of nutrients to precipitation, detritus, etc.
Is it possible to produce a product with consistent quality under these circumstances?

YES WE CAN

“Success is neither magical nor mysterious. Success is the natural consequence of consistently applying basic fundamentals.”

Jim Rohn

“Consistency of product quality requires consistency of effort” Anonymous
Evidence from Earthrise

- **Business Name:** Earthrise Nutritional LLC
- **Head Office Location:** 2151 Michelson Drive, Suite 258, Irvine, CA 92612
  Tel: 949-623-0580
  Fax: 949-623-0990
- **Farm/Technology/R&D Location:** 113 E. Hoober Road, Calipatria, CA 92233
  Tel: 760-348-5027
  Fax: 760-348-2895
- **Website:** [www.earthrise.com](http://www.earthrise.com)
- **Founded:** 1982
- **Parent Company:** DIC Corporation, Tokyo, Japan
- **Number of Employees:** 70
- **Business Activities:**
  - Manufacturing, Sales & Marketing of Spirulina and Spirulina-based products
  - Technical Support and Consultation in the area of outdoor mass cultivation of microalgae
5-Year Average Temperature
3-Year Average PAR

The diagram shows the 3-year average of photosynthetic active radiation (PAR) over different months. The x-axis represents the months of the year, while the y-axis shows the average PAR in micromoles per square meter per second (µmol m\(^{-2}\) s\(^{-1}\)). The graph also includes a scatter plot with data points indicating the variation in PAR across different months.
Spirulina has the highest protein content of any bacterial, plant or animal origin.

- Amino acid profile close to the FAO standard.
- A non-allergenic protein source.
several potential health benefits: COX-2 and NADPH Oxidase inhibition, anti-oxidant/anti-inflammation, immunomodulation

Being a photosynthetic pigment its concentration is dependent on the light climate which we cannot control. Working with some controllable parameters it is possible to maintain higher levels through culture and process manipulation
Beta-carotene is an antioxidant that is implicated in several aspects of cellular protection. It serves as a photosynthetic pigment and perhaps as a photoprotector as well. Again it is possible to augment content through culture and process manipulation.
5-Year Average Moisture
Quality demands commitment and investment
Thank You