

Algae Natural Food SAS



Microalgae Potential in EU Food Market

EUBIA OPEN ALGAE WORKSHOP, 12 November 2014





„Conditio sine qua non“ in Food Production

- Absolute safety of food
- Unconditional spatial and temporal availability
- Lowest possible price



Essential Criteria for Food production

- Long shelf life
preferably outside the cooling chain
- High degree of naturalness
- Minimal processed
- High degree of convenience
- Additional healthy benefits
- Sustainable production



Additional demands on food from customers

- „clean label“
- Inherent technological functionalities of the ingredient
- If additives are used, they should be from natural source (e.g. Phycocyanin, Carotenoids)
- Non-allergic properties (see also vegetarian, vegan)



Microalgae: Components with technological functionalities

- Proteins, and essential amino acids
- Lipids, and essential fatty acids (PUFAs)
- Polysaccharides, oligosaccharides
- Colouring agents
- Anti-oxidants
- Anti-microbial components



Microalgae: Protein source

Cause of protein deficit in human nutrition

- growing world population
- changing consumers' habits
- Growing demand on protein
(animal <-> vegetable source, limited marine sources)
- Limited agricultural area

Development of new protein sources is necessary
(microalgae, insects)



Microalgae: Lipid source

- High unsaturated fat content
(omega-3 fatty acids DHA and EPA)
- Low saturated fat content
- Free from trans-fatty acids
- Free from cholesterol



Microalgae: food and dietary supplement?

- Health promoting and health protecting components
- Molecular configurations: numerous questions on functionality and bio-availability

More scientific studies are necessary



Why dietary supplements?

- To reduce risk of chronic age-related disease such as cancer, heart disease, degradation of retina, osteoporosis, type 2 diabetes
- To strengthen immune system
- To reduce symptoms of non-deficiency disease (depression, arthritis)
- Intake during periods of specific needs (illness, stress, while travelling, sports)



Market volume (Turnover)

Spirulina, Chlorella, Nannochloropsis, Dunaliella
each > 100 Mio US\$

Haematococcus 50...100 Mio US\$

Ulkenia, Schizochytrium < 50 Mio US\$

Chrypthecodinium 500 Mio US\$



Worldwide Production

Algae in total 15,8 Mio t/y
Microalgae in total < 36.000 t/y

Functional food 15.000 t/y
Dietary supplement 14.000 t/y

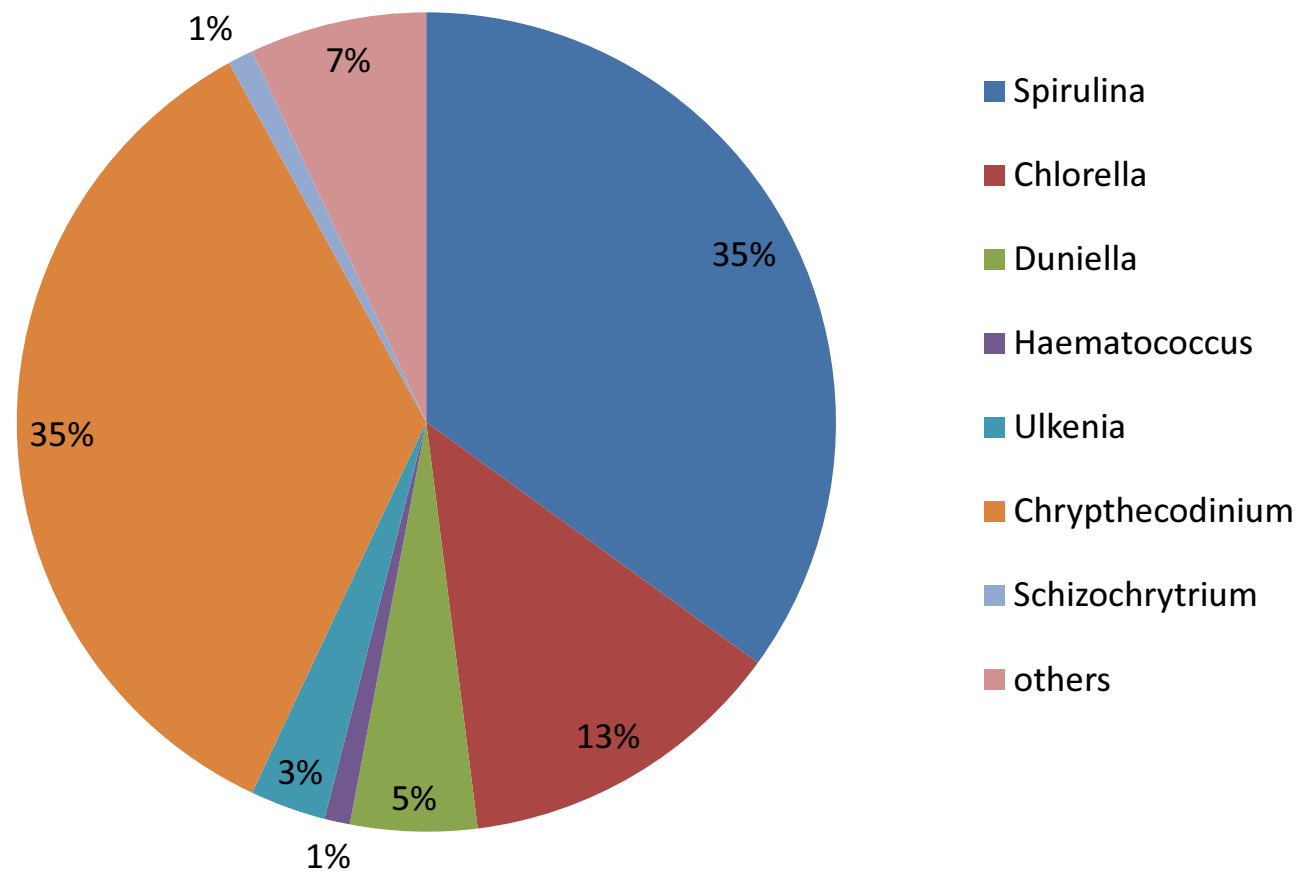
In **photobioreactors** (autotrophic)
Spirulina, Chlorella, Dunaliella, Haematococcus,
Nannochloropsis,

By **fermentation** mainly (heterotrophic)
Ulkenia, Chrythecodinium, Schizochrythium

Some high-added-value extracts mainly from algae sources already:
Astaxanthine, β -carotene, Phycocyanin, EPA/DHA



Part of World Production by Algae Strain



Production: Barriers to overcome

- Taste / apparence of products
- Legislation / approval of applications and claims
- Consciousness of markets and consumers
- Production costs / selling price: still very high
- Availability: still too low



Novel Food Reglementation: approved application

Approved are

As NONE-Novel Food (consumption before 1997)

Chlorella biomass,
Spirulina biomass,
Haematococcus,
Chrypthecodinium

As NOVEL FOOD

Haematococcus extract,
Odontella,
Ulkenia,
Schizochytrium
Tetraselmis (2014),
Nannochloropsis (2014)



Production: Challenging process conditions

Cultivation of Microalgae: Process parameters and process conditions to manage

Four essential parameters: mass, light, temperature, motion

Cope with features FRAGILITY:
avoid mechanical stress, shear forces

Reduce risk of BIOFILM:
enhance online cleaning system,
„higher“ velocities to avoid settlement



Bread Consumption in Europe: huge market potential

Consumption of bread in Europe-27: 30 Mt/y,
50 kg/person/year
(80% of total bakery products)

If in 1% of bread would be microalgae included:

This means a volume 300 kT of microalgae-bread,
if in this volume 1% microalgae used as ingredient:
3 kT/year demand of microalgae

But world annual production of Chlorella 3kT, Spirulina 6 kT

Added value in bread application:

Nutritional function and physical-chemical function during
process (reducing sodium and cholesterol in bread)



Markets study reveal future challenges

Role of Europe:

- Development of technology mainly
- Key will be to design integrated or large-scale production systems to sufficiently reduce costs

Main challenge and perspectives

- Increase production volume by de-bottlenecking
At present, algae companies typically focus on food supplements due to low volumes and high cost of production (rather than feed market)
- Cost-effective scale-up is needed for use of algae as a bulk food ingredient

***Better* cooperation between academia and industry is a very important challenge**



Thank you for your attention

