Unlocking the potential of using macroalgae for food purposes

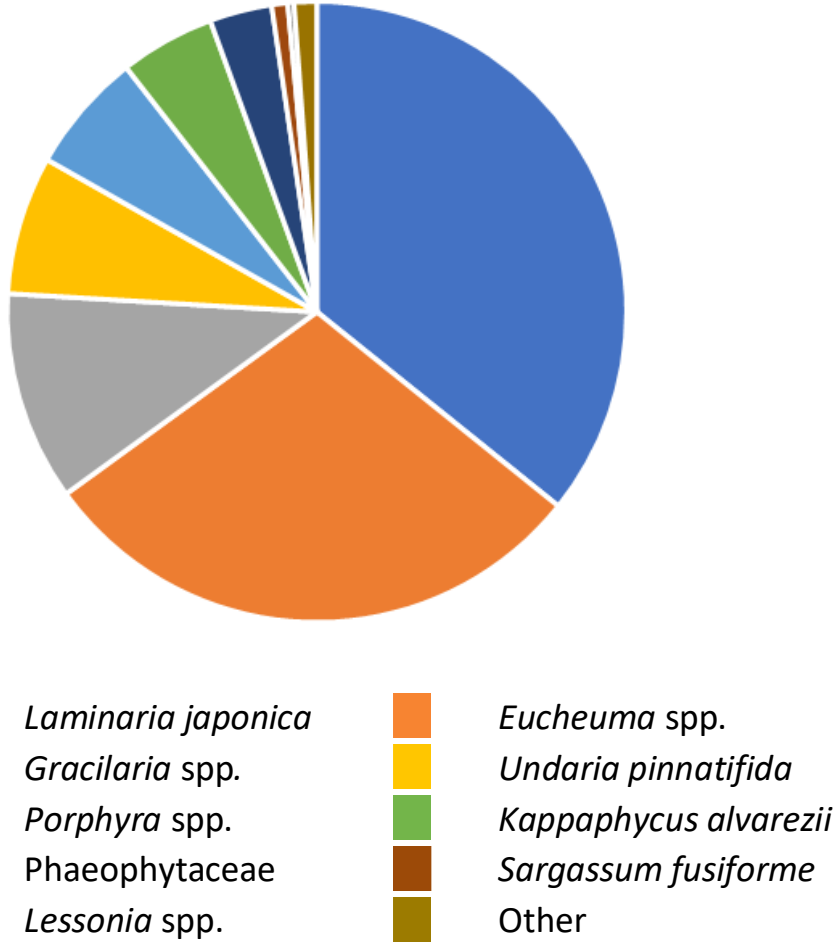
PhD Moona Rahikainen

University of Turku, Finland
Food Chemistry and Food Development

Baltic Macroalgae Conference 6.5.2021

Global macroalgae production

- Over 200 macroalgae species are used globally
- Total production reaches over 30 million tons
- Production dominated by few genera
  - *Laminaria, Eucheuma, Gracilaria, Undaria, Porphyra, Kappaphycus*

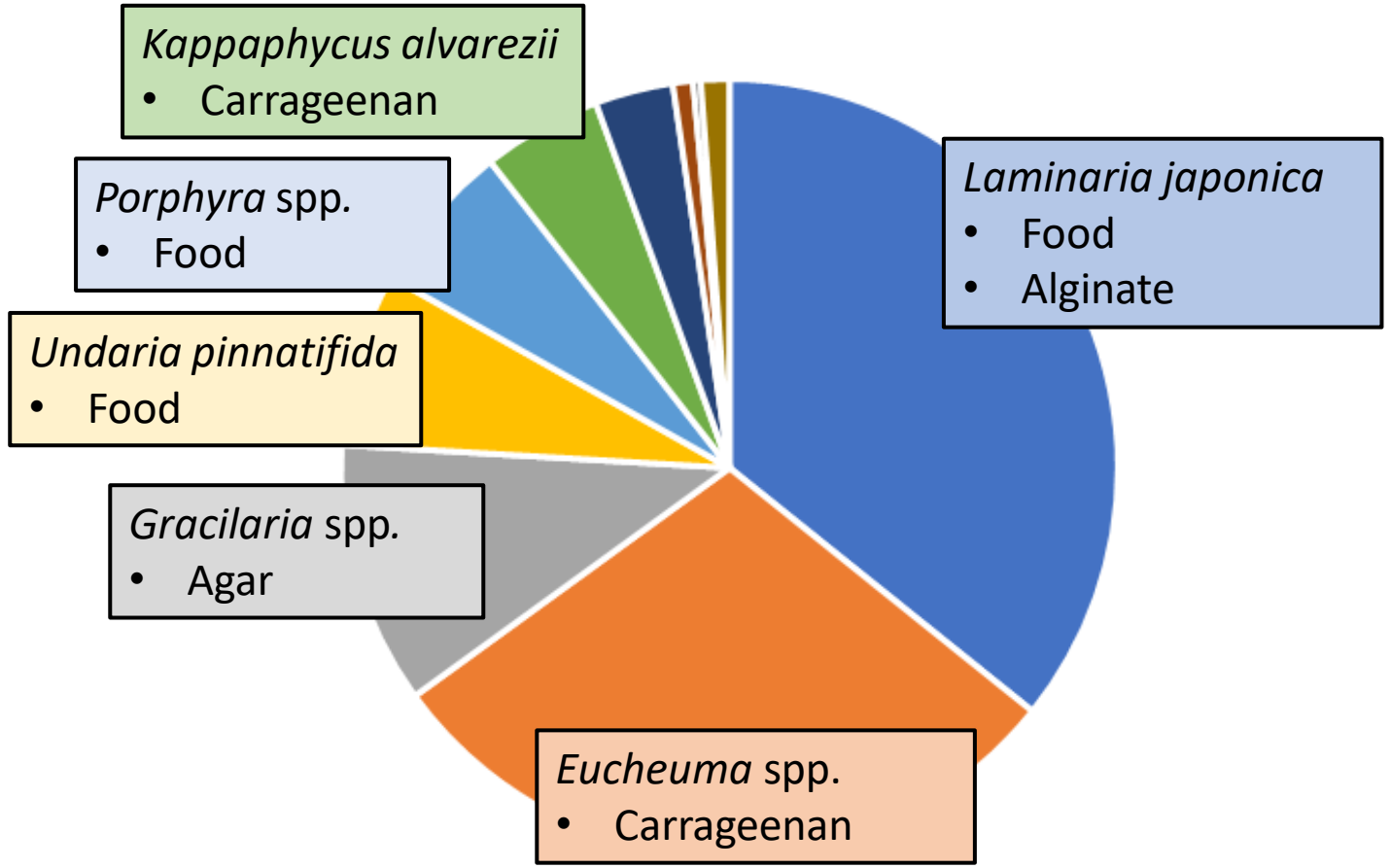


Global macroalgae production by species in 2018, FAO

Macroalgae in food industry

Macroalgae are used

- as food ingredients
- for production of gelling and thickening agents
  - Carrageenan (red algae)
  - Agar (red algae)
  - Alginic acid and alginates (brown algae)
- for food supplements



Global macroalgae production by species in 2018, FAO

Macroalgae in food industry

Need for research and product development

Bioactive compounds
- Fucoidan, laminarin, ulvan, phlorotannins, fucoxanthin
- Activity *in vivo*
- Bioavailability and metabolism

Macroalgal protein
- Red and green alga have high protein content
- Essential amino acids
- Extraction and product development

Novel species as food
- Composition
- Cultivation methods
- Regulatory barriers

Nutritional composition
- Effect of growth conditions
- Antinutrients and harmful compounds

Novel food additives
- Colorants
- Antioxidants

Macroalgae as food ingredients

EU food safety regulation

- ***EU Novel Food regulation***
- *Regulation of seaweed-based food additives*
- *Regulation of toxic contaminants in food*
- *Labeling of seaweed food products*

Novel macroalgae species and extracts may need authorization for food use

- The Novel Food Catalogue is available online (https://ec.europa.eu/food/safety/novel_food/catalogue_en)
- With ambiguous cases the national authorities can be consulted

Baltic species accepted for food in the EU

- E.g., *Fucus vesiculosus, Fucus serratus*

Macroalgae extracts authorized for food supplements (Regulation (EU) 2017/2470)

- Fucoidan extracts from *Fucus vesiculosus* or *Undaria pinnatifida*
- Phlorotannins from *Ecklonia cava*

Macroalgae as food ingredients

EU food safety regulation

- *EU Novel Food regulation*
- ***Regulation of seaweed-based food additives***
- *Regulation of toxic contaminants in food*
- *Labeling of seaweed food products*

E number	Food supplement	Origin of the Supplement in Commission Regulation (EU) No 231/2012
E400	Alginic acid	Brown seaweeds (Phaeophyceae)
E401	Sodium alginate	Not defined
E403	Ammonium alginate	Not defined
E404	Calcium alginate	Not defined
E405	Propane-1,2-diol alginate, Propylene glycol alginate	Not defined
E406	Agar	Gelidiaceae spp. and Gracilariaceae spp. and relevant red algae (Rhodophyceae)
E407	Carrageenan	Gigartinaceae spp., Solieriaceae spp., Hypneaceae spp. and Furcellariaceae spp.
E407a	Prosessed *Eucheuma* seaweed	*Eucheuma cottonii* and *Eucheuma spinosum*

Macroalgae as food ingredients
EU food safety regulation

- *EU Novel Food regulation*
- *Regulation of seaweed-based food additives*
- ***Regulation of toxic contaminants in food***
- *Labeling of seaweed food products*

Contaminant	Level	Food product	Regulation
Cadmium	3,0 mg/kg (weight as sold)	Food supplements consisting exclusively or mainly of dried seaweed or of products derived from seaweed	(EC) No 1881/2006
Lead	3,0 mg/kg (weight as sold)	Food supplements	(EC) No 1881/2006
Mercury	0,1 mg/kg (weight as sold)	Food supplements	(EC) No 1881/2006

Macroalgae as food ingredients

EU food safety regulation

- *EU Novel Food regulation*
- *Regulation of seaweed-based food additives*
- *Regulation of toxic contaminants in food*
- ***Labeling of seaweed food products***

Macroalgae are considered as fishery and aquaculture products (Regulation (EU) No 1379/2013)

Label must contain:

- scientific and designated market name of the species
- production method
- area wherein the product was harvested or cultured
- whether the product has been defrosted and the date of minimum durability

UNIVERSITY OF TURKU

Interreg Baltic Sea Region

EUROPEAN UNION

EUROPEAN REGIONAL DEVELOPMENT FUND

GRASS

University of Turku macroalgae team

Prof. Baoru Yang
PhD. Moona Rahikainen
MSc. Raphael Samson
Assoc. Prof. Maaria Kortesniemi

Contact

Moona Rahikainen
moona.rahikainen@utu.fi

Baoru Yang
baoru.yang@utu.fi