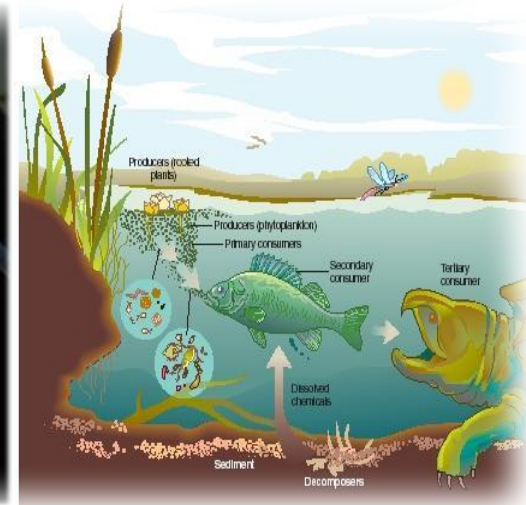
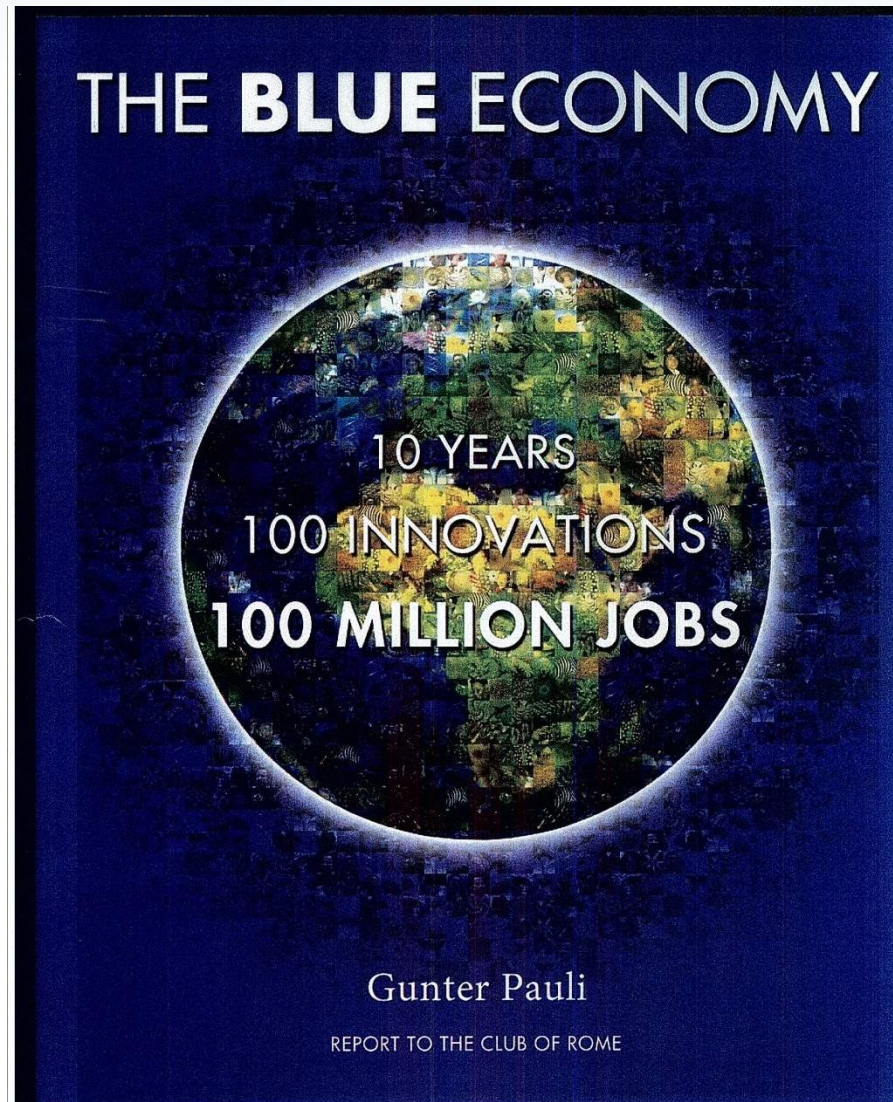


Marine Algal Biotechnology in Korea: present and future perspective

Taejun Han, Prof, Dr
Department of Marine Science,
Incheon National University



The Blue Economy



“The Blue Economy”

- ▷ Dr. Gunter Pauli
- ▷ Published in 2010

Ocean of the Earth

- ▷ 300,000 species
- ▷ 75% of the total O₂ production
- ▷ 50% of the total CO₂ storage

What is Blue Economy ?



The Red Economy
planned/based on what we do not
have



The Green Economy
invest more/save some

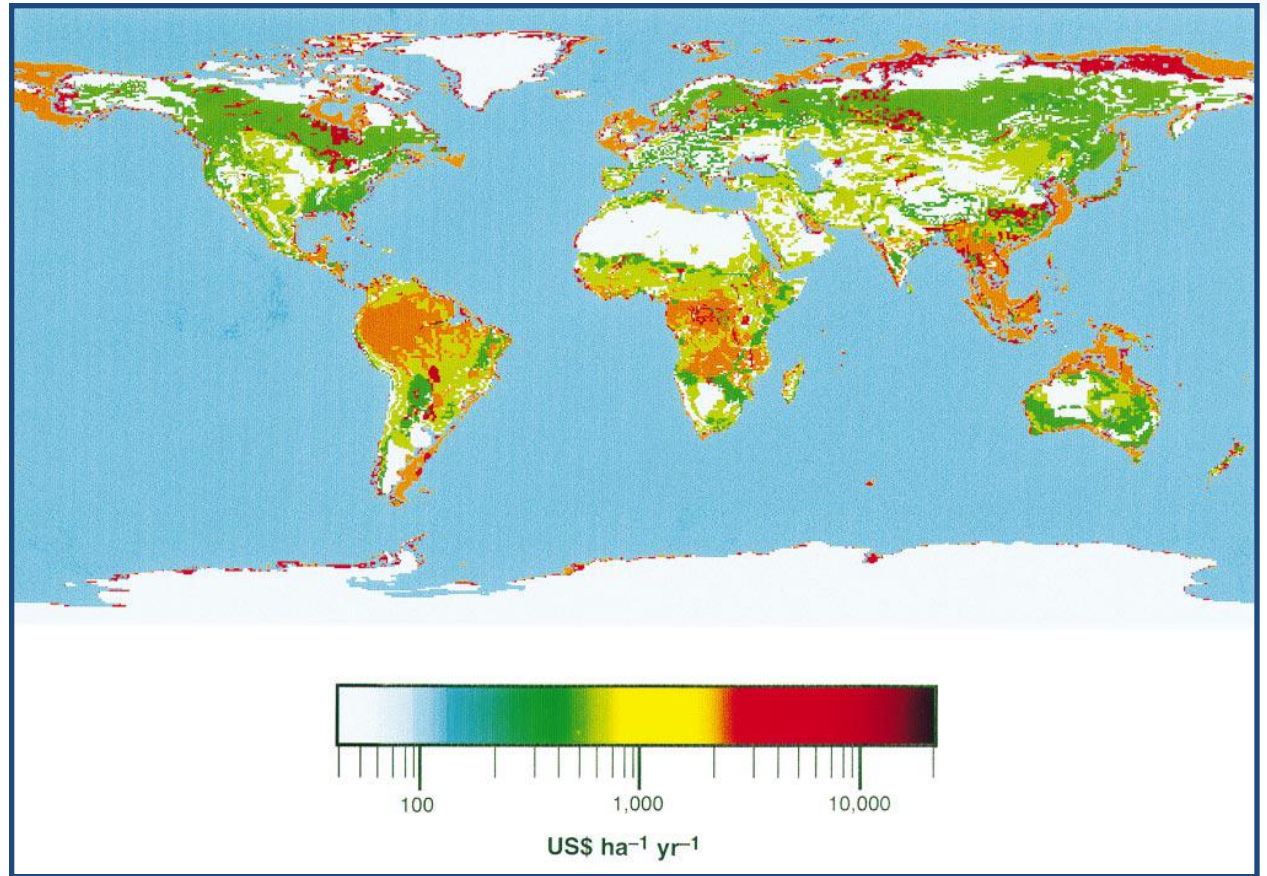


The Blue Economy
invest less/innovate more
/based on what we have

Ecosystem service

● Service market

- ▷ Total \$33,000 billion per year in 21st century
- ▷ Marine ecosystem (\$20,900 billion)
- ▷ Coastal ecosystem (\$10,600 billion)



Seaweed as Waste



Seaweed as Food



Hot issues



Canary and mine field



Biomonitoring of water quality

○ *Ulva pertusa*

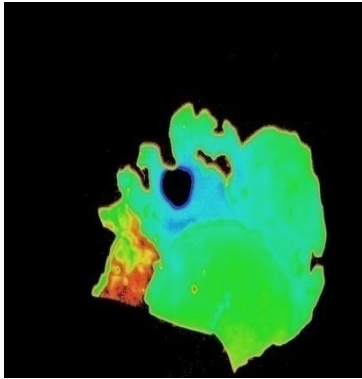
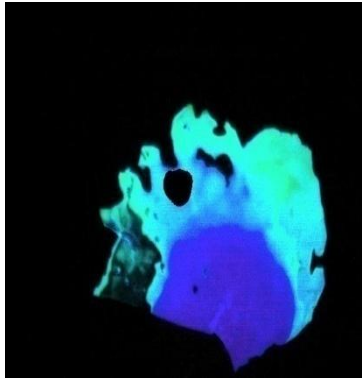


A principle of Ulva biotest



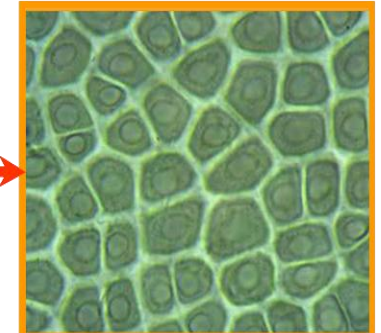
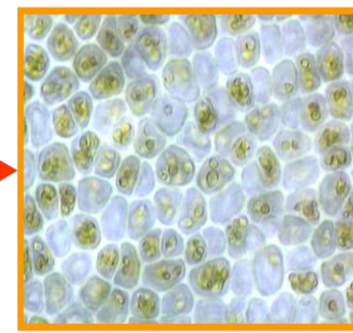
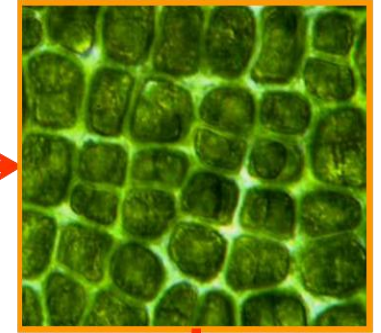
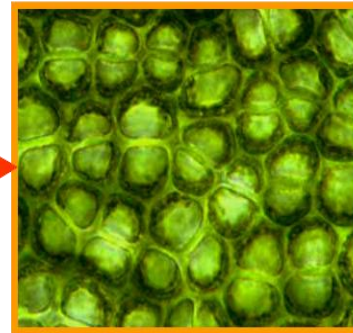
“sporulation”

A principle of Ulva biotest



vegetative cells

spore formation

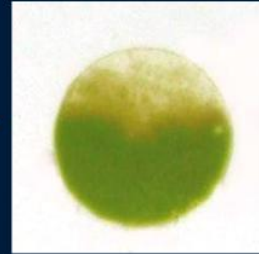
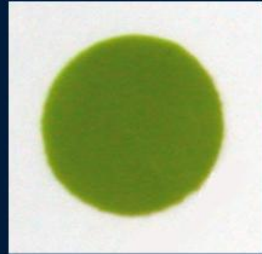


spore

emptied cells

A principle of Ulva biotest

in normal
seawater

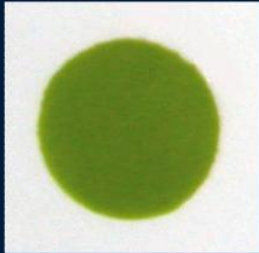
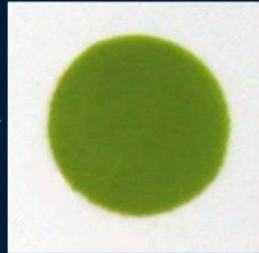
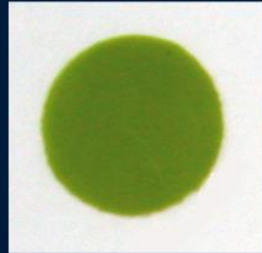


vs

Time lapse : 96 h

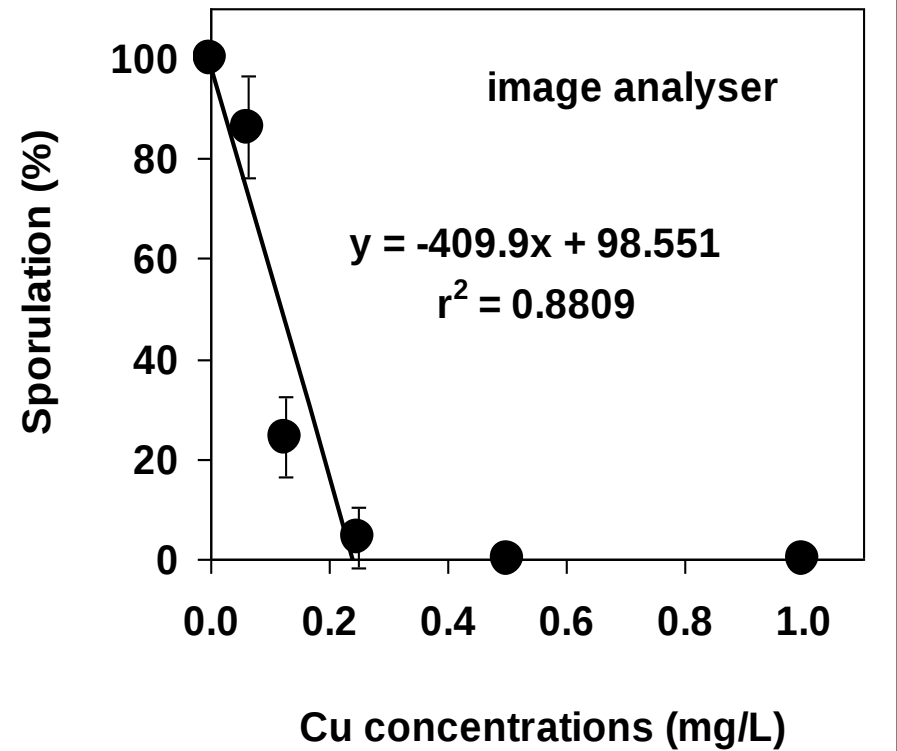


in contaminated
seawater



The Ulva biotest

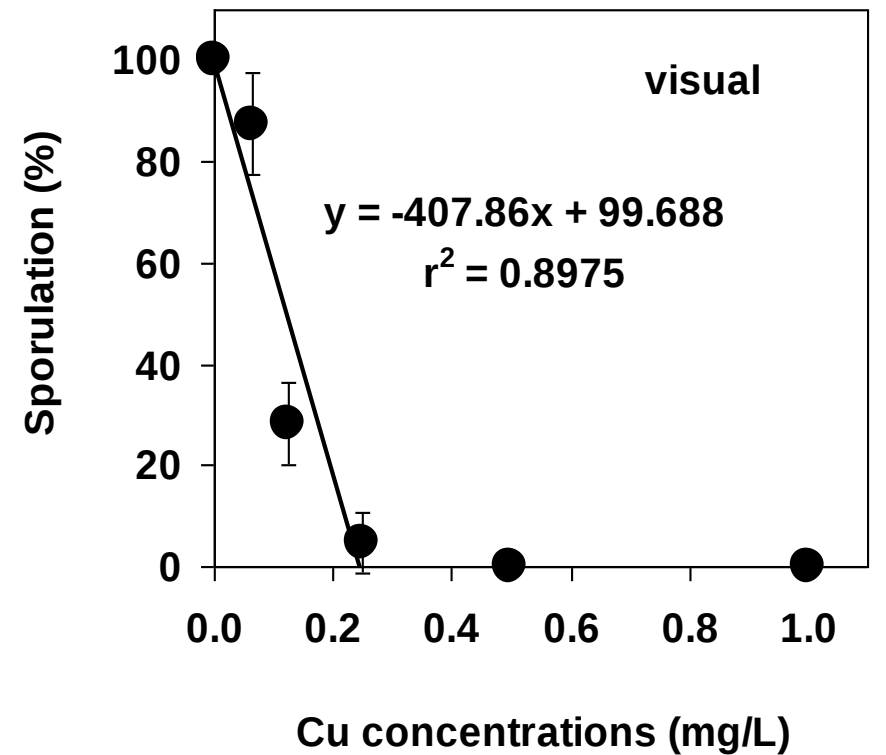
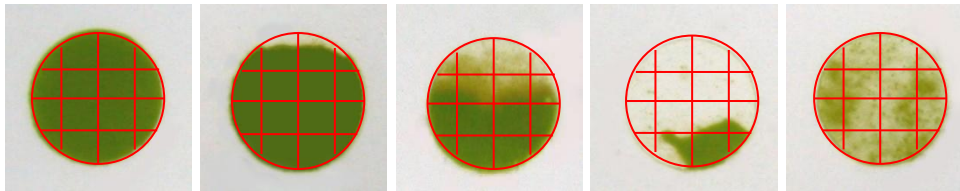
○ Image analysis method



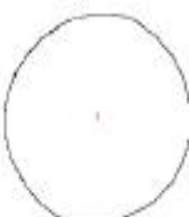
The Ulva biotest

○ Visual observation

	Con.	T1	T2	T3	T4	T5	NUMBER OF OBSERVED AREAS	PERCENTAGE OF AREA WITH COLOR CHANGE(%)
R1							0	0
R2							1	6
R3							2	13
R4							3	19
							4	25
							5	31
							6	38
							7	44
							8	50
							9	56
							10	63
							11	69
							12	75
							13	81
							14	88
							15	94
							16	100



The Ulva biotest-update

Analysis Method (Sporulation %)	Concentration of Cu ($\text{mg}\cdot\text{L}^{-1}$)					
	0	0.0156	0.0313	0.0625	0.125	0.250
Motic image analysis						
Before Staining	100	84.555	84.141	49.051	32.955	0
Image J						
	100	75.267	50.612	50.33	36.121	0

Tested samples by the Ulva biotest

Toxicants	No. of samples
Metals	13 species
VOCs	7 species
Herbicides	3 species
individual compounds	3 species
sludge elutriates	9 species
slag leaching water	4 species
Oil	1 species
Wastewater	4 species
Stream water	13 species
Sea water	17 species
Totals	74 species

Heavy
metals



Toxic
chemicals

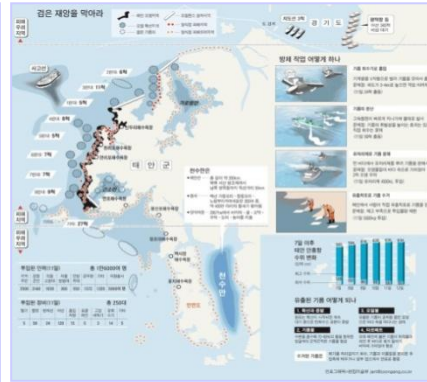
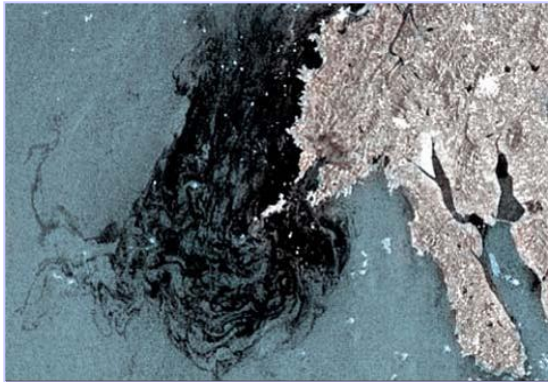


Waste
Waters

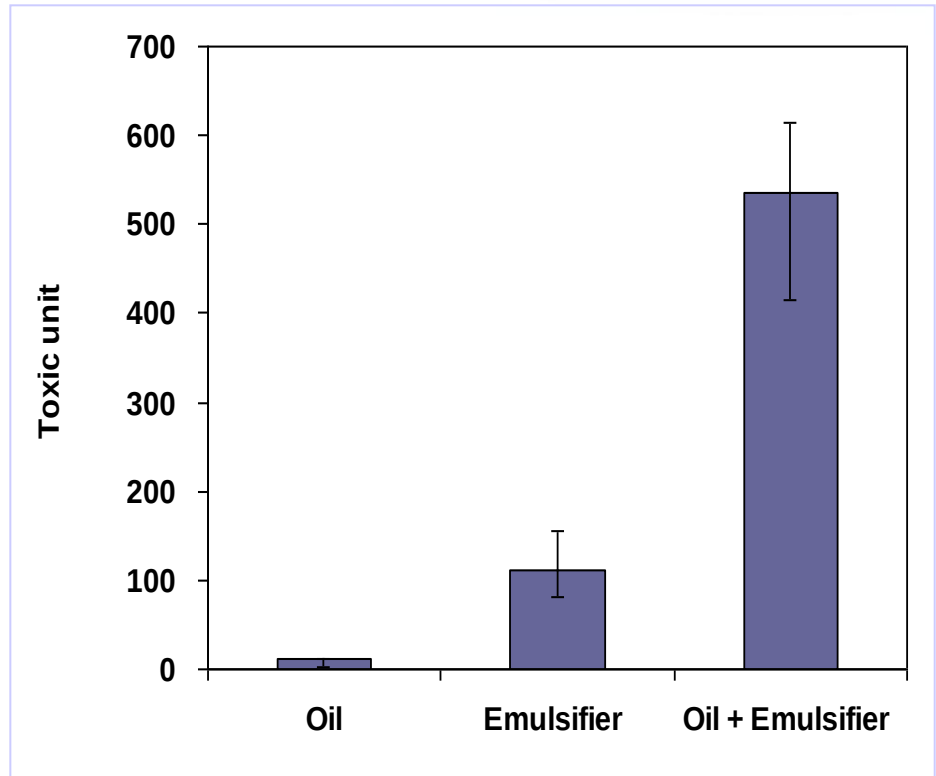


Oils

Biotesting oil pollution



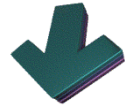
	TU	Min	Max	CV(%)
Oil	10.6	8.8	18.1	9.74
Emulsifier	111.1	66.6	141.5	12.79
Oil + Emulsifier	534.6	455.2	655.1	7.57



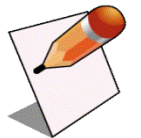
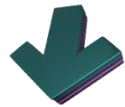
Ulva watch programme



Set point

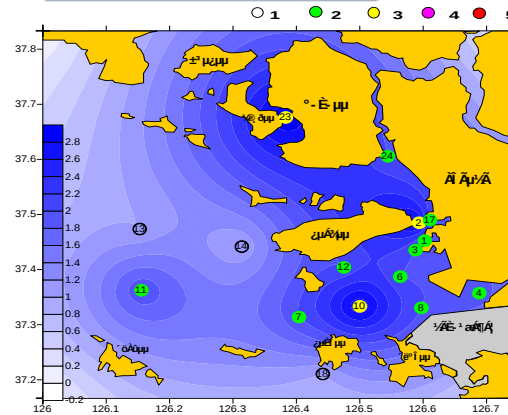


Data input
(Surfer 7.0 program)

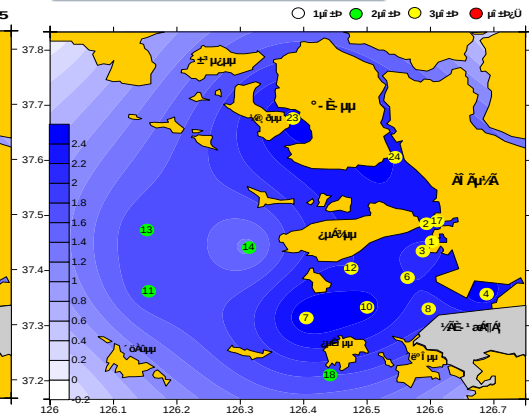


Mapping

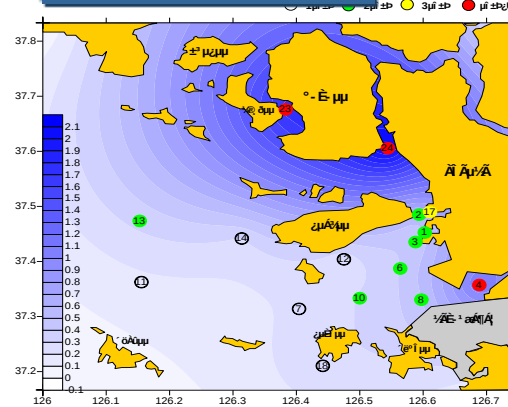
Ulva index



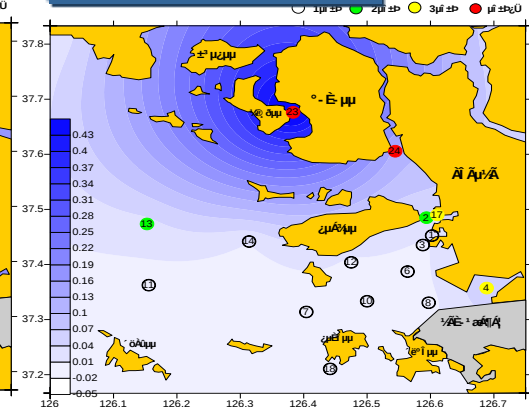
COD



T-N

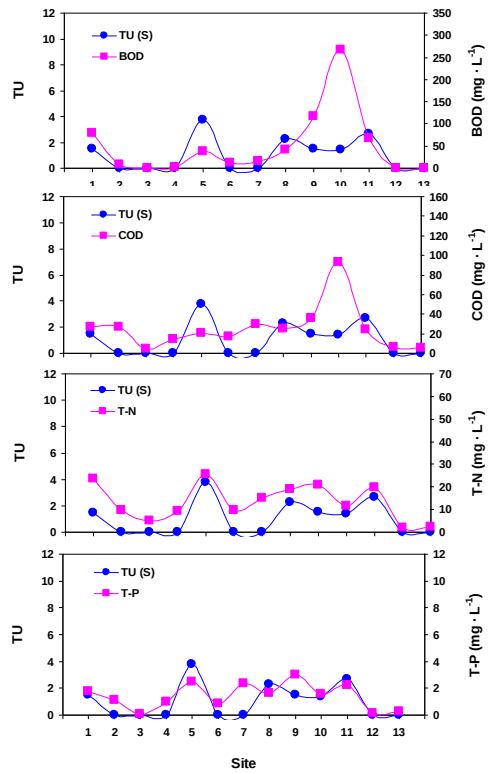


T-P

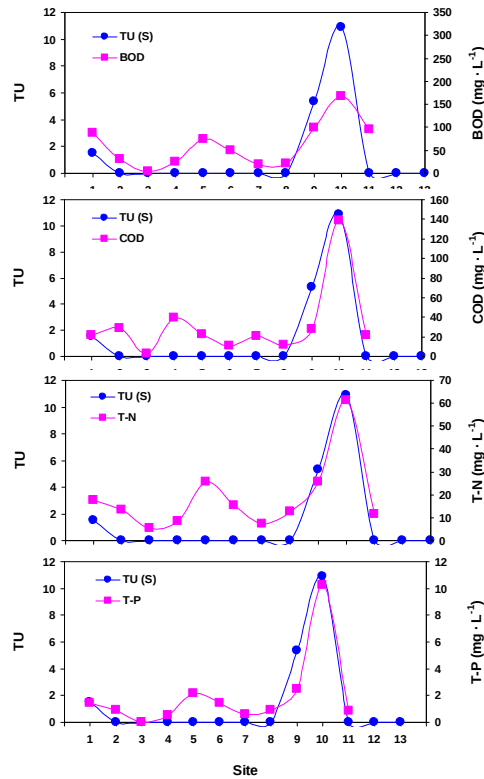


Ulva index vs BOD, COD, T-N, T-P

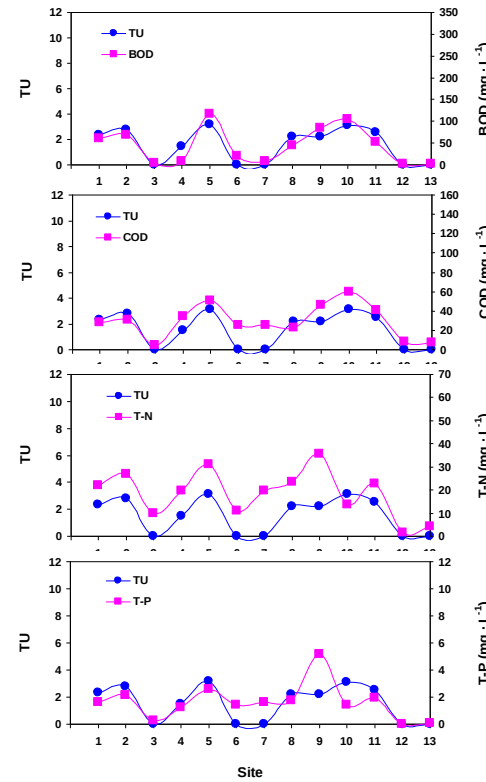
spring



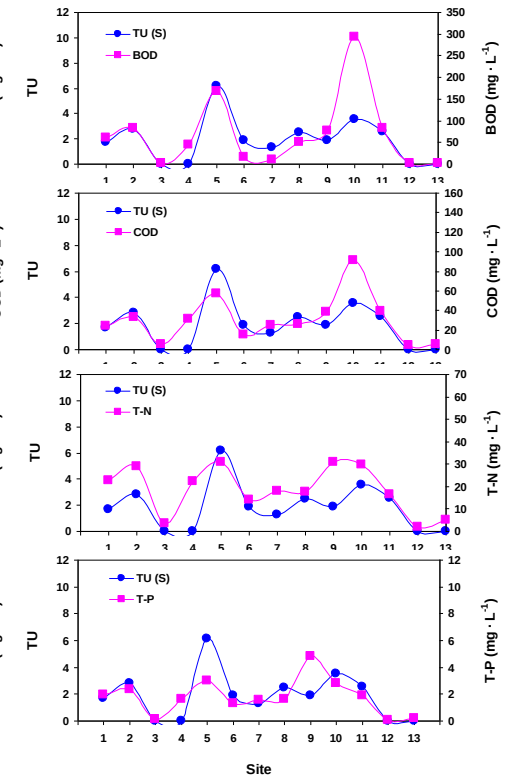
summer



autumn

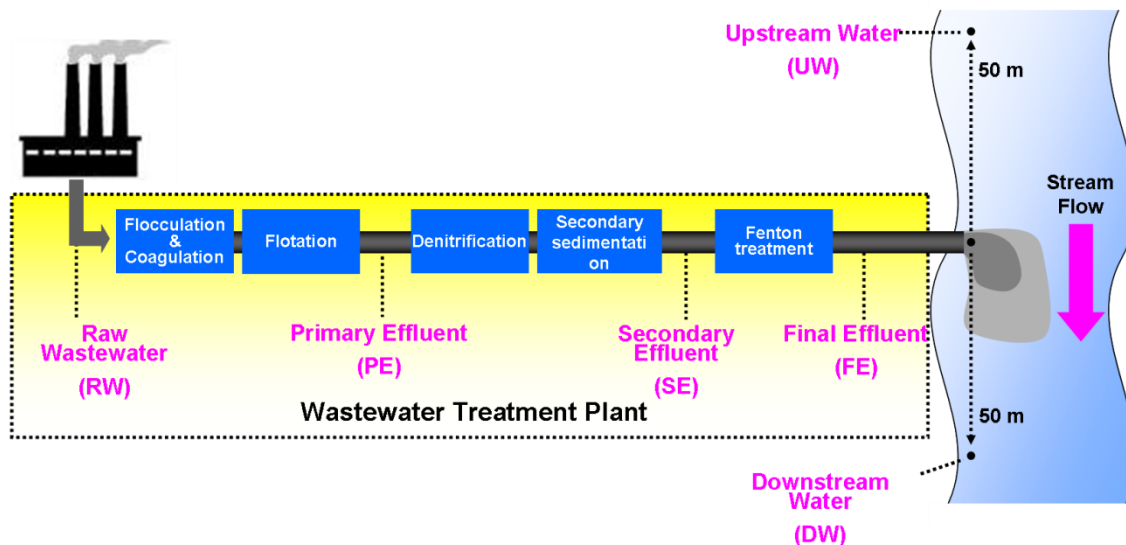


winter

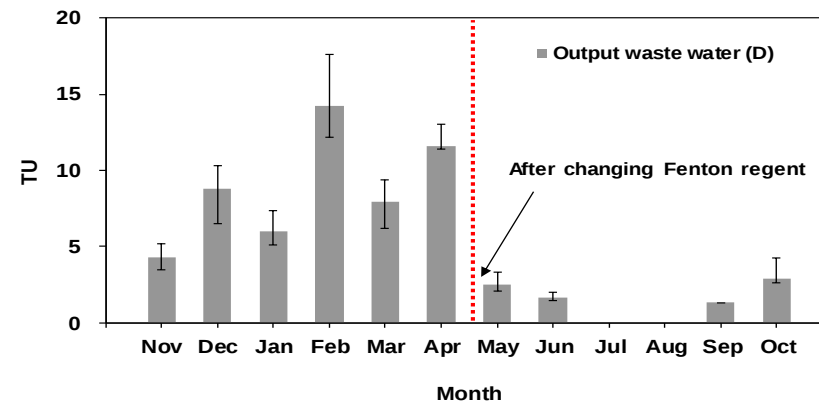
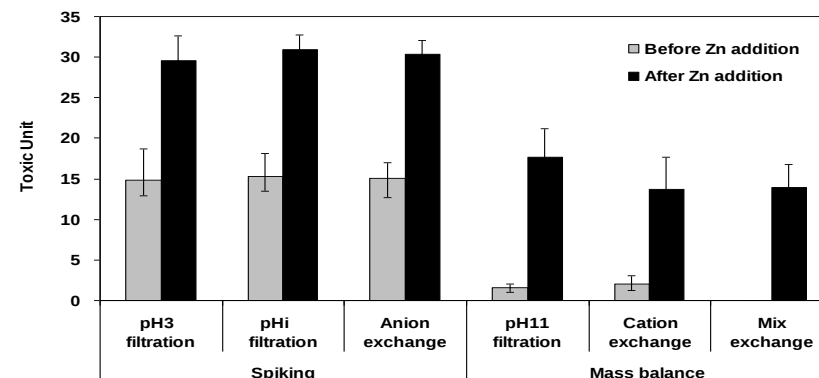


Toxicity identification by Ulva test

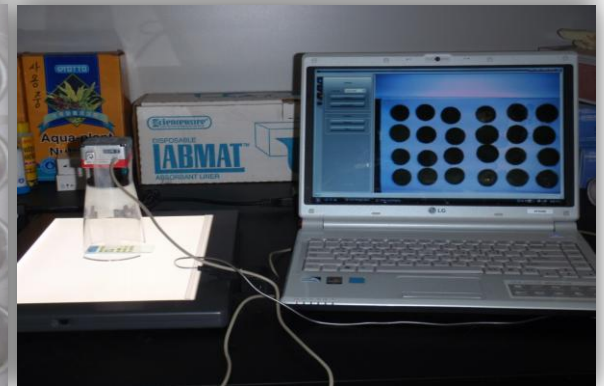
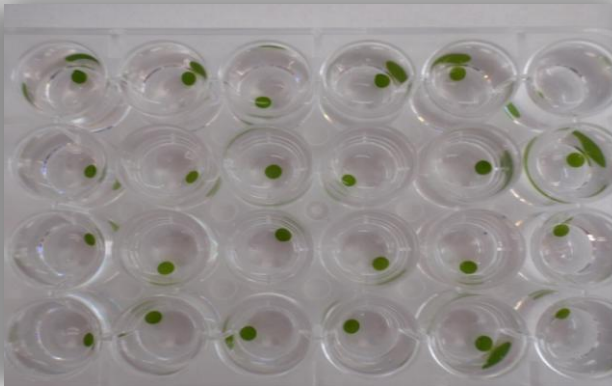
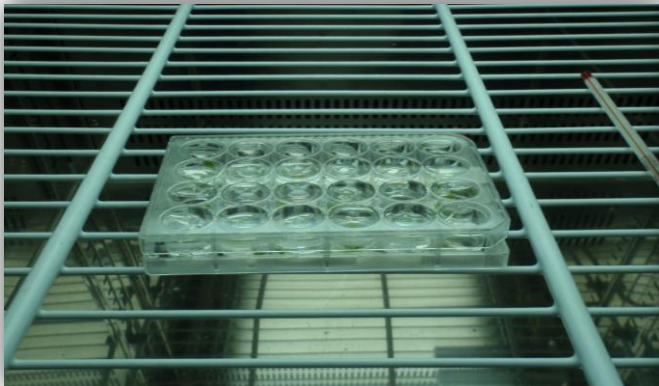
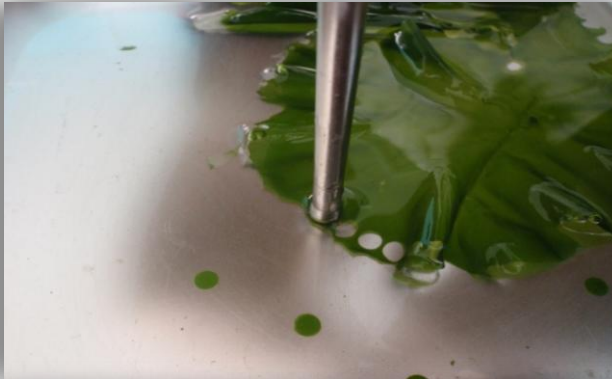
○ Toxicity test of wastewater effluent near Hantan river basin



독성평가생물	RW	PE	SE	FE	US	DS
물벼룩	4.10	1.00	< 1.00	3.70	<1.00	1.50
파래	4.75	2.65	<1.00	4.30	<1.00	2.51



Operational procedure



Space : $<1\text{m}^2$

Person : 1

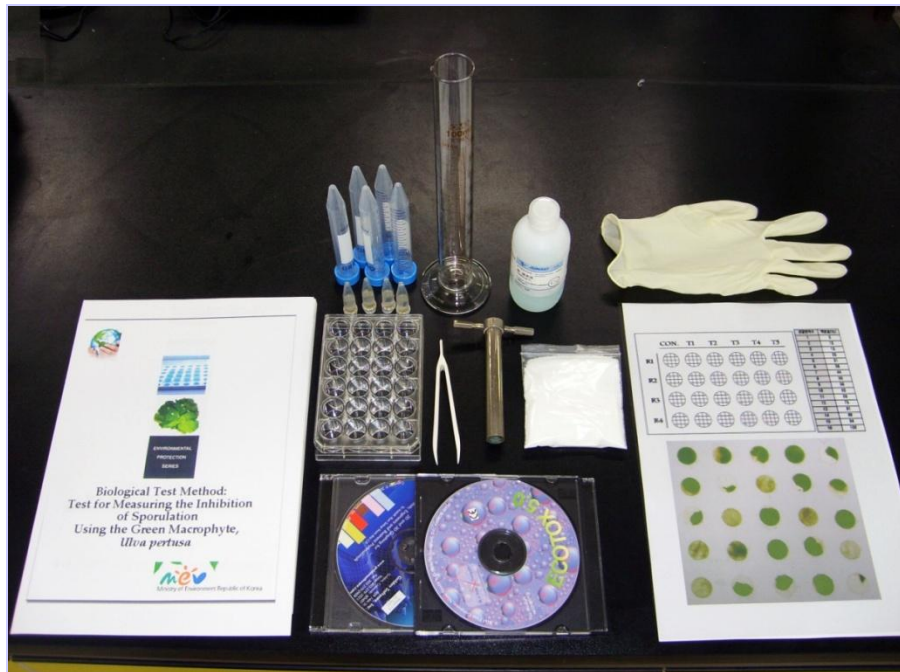
Time : 96 h

Facilities : temperature-controlled culture chamber, 24 well plates, pipets, tips, hole borer etc.

Measuring device : simple image analyzer

The Ulva kit

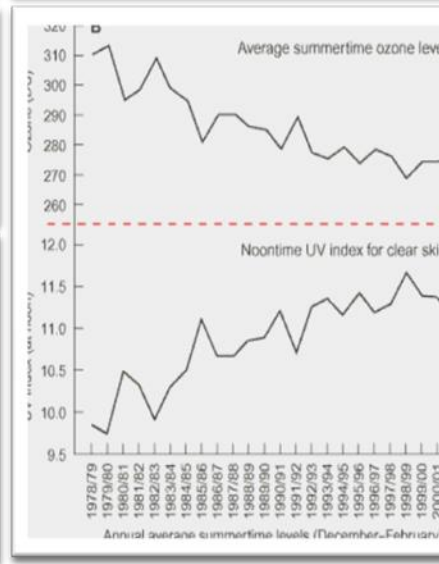
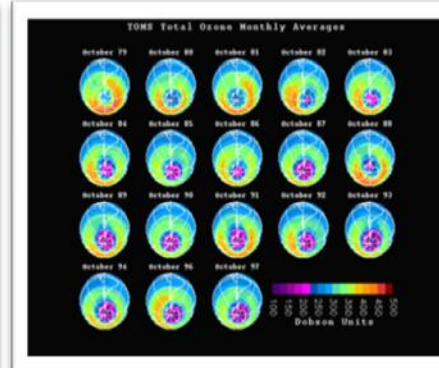
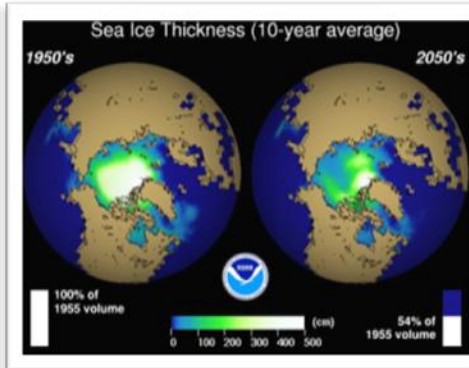
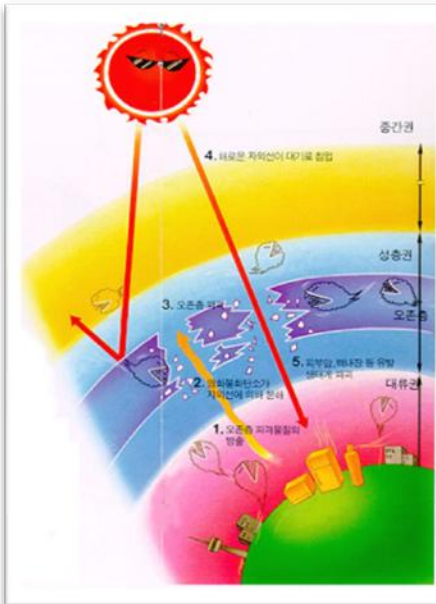
The new bioassay is simple to use, sensitive, economic, eco-relevant and has worldwide application



Solar UV radiation



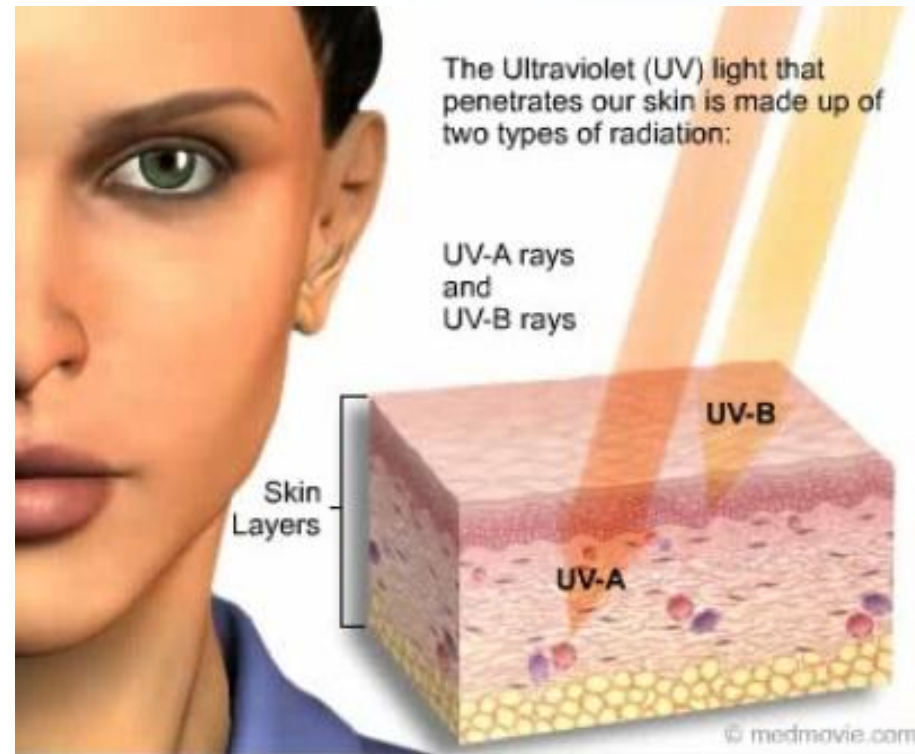
Climate change and UV radiation



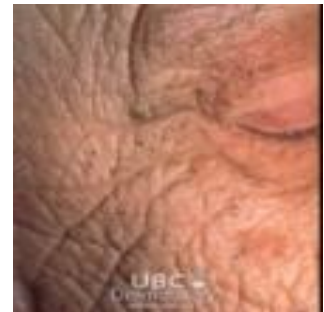
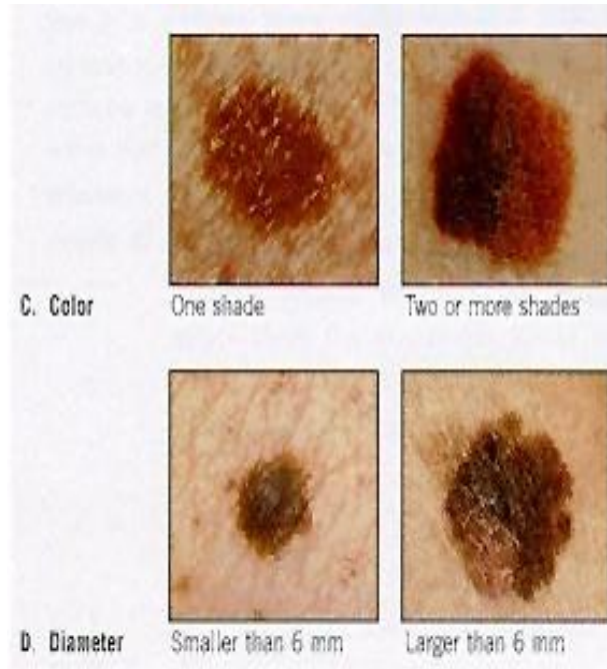
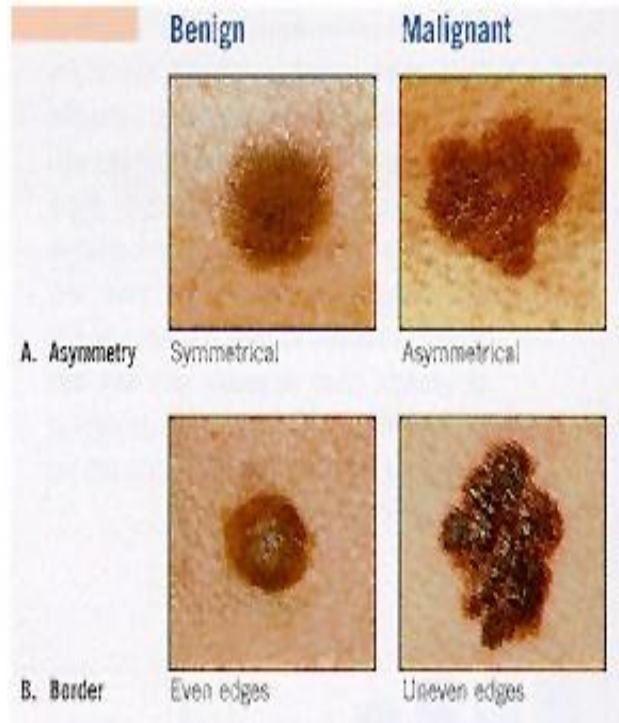
Harmful effects of UV on the skin



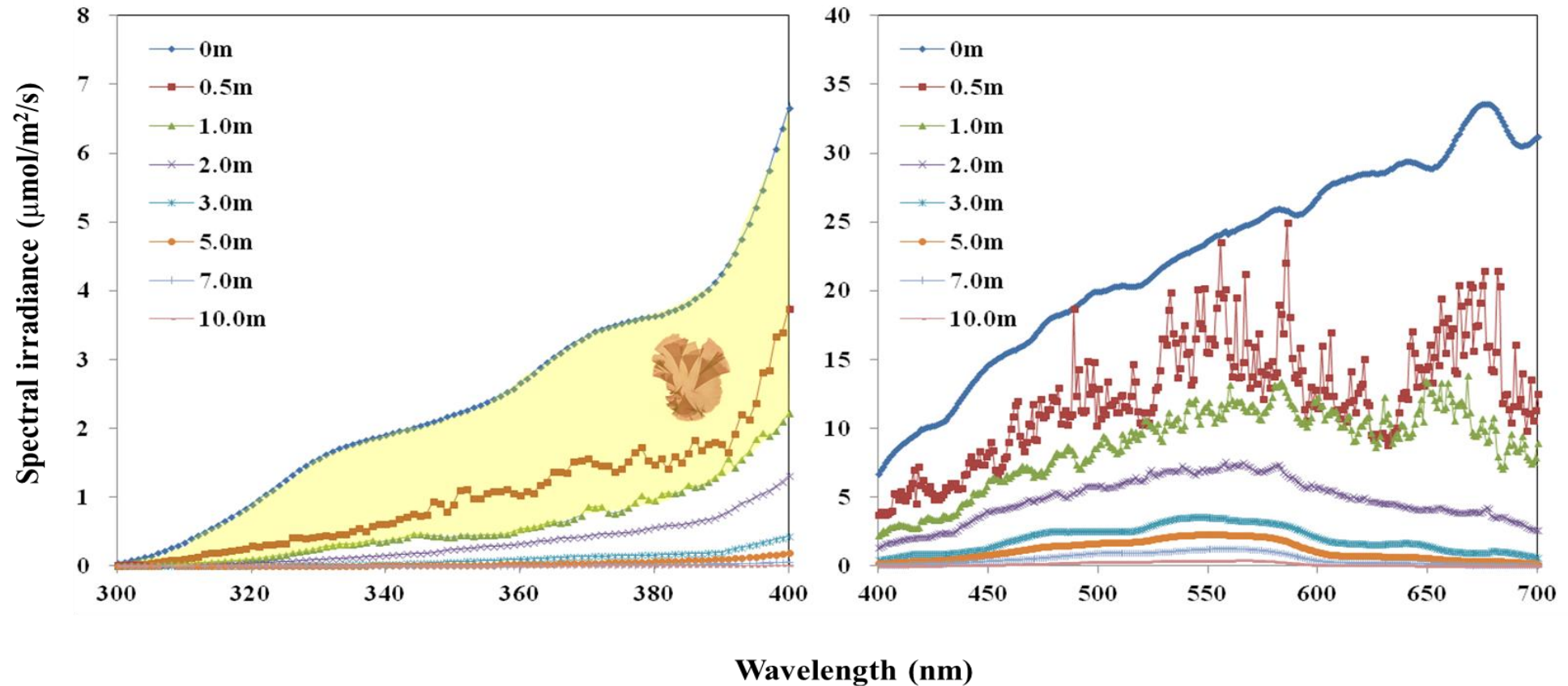
<Photo = jennifer R.S. Gordon, M.D>



Harmful effects of UV on the skin

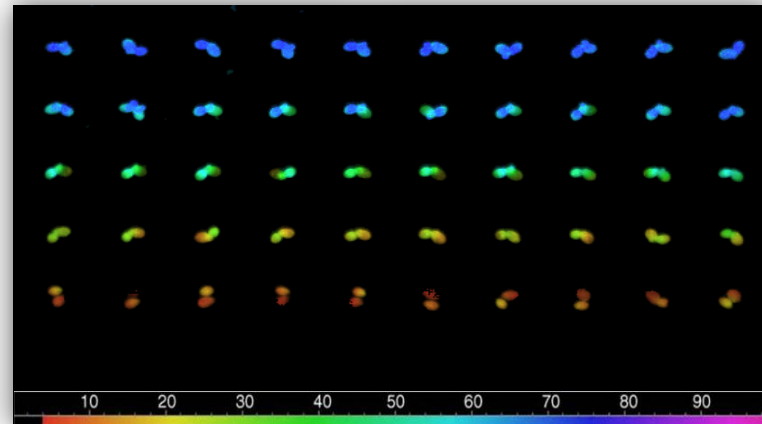
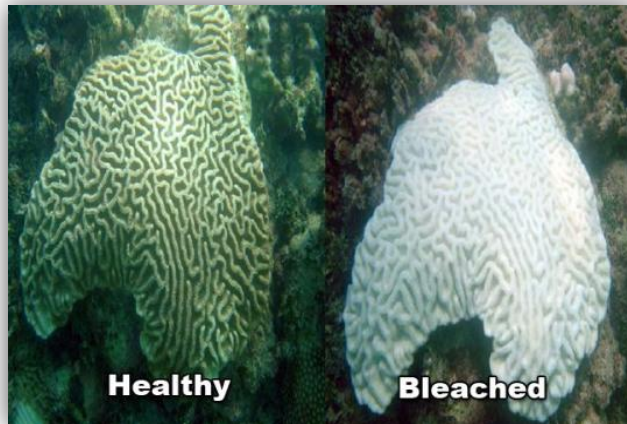


Underwater profile of solar radiation



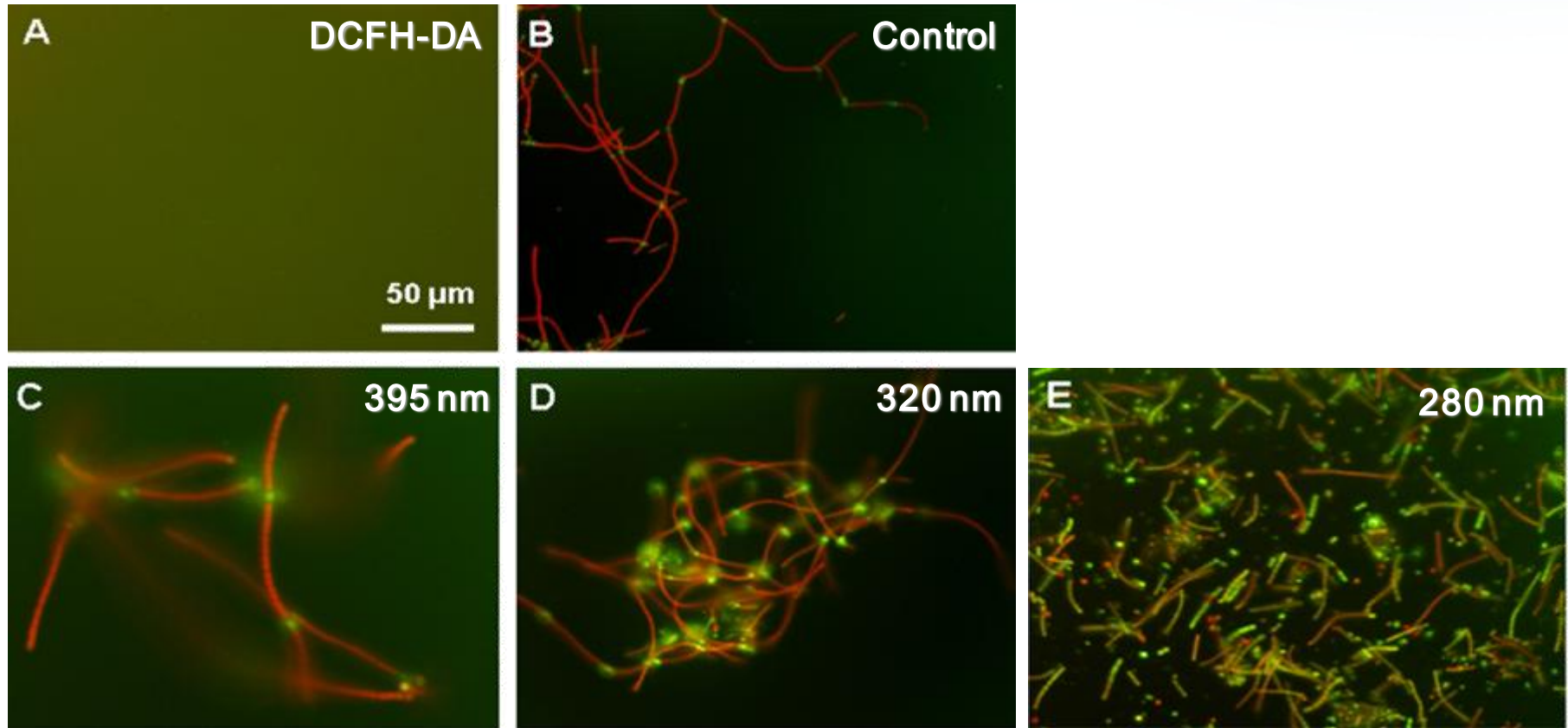
Harmful effects of UV on marine organisms

- Physiological and biochemical damage



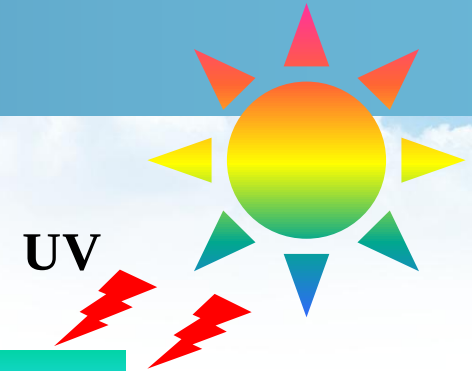
Harmful effects of UV

- Generation of reactive oxygen species (ROS)



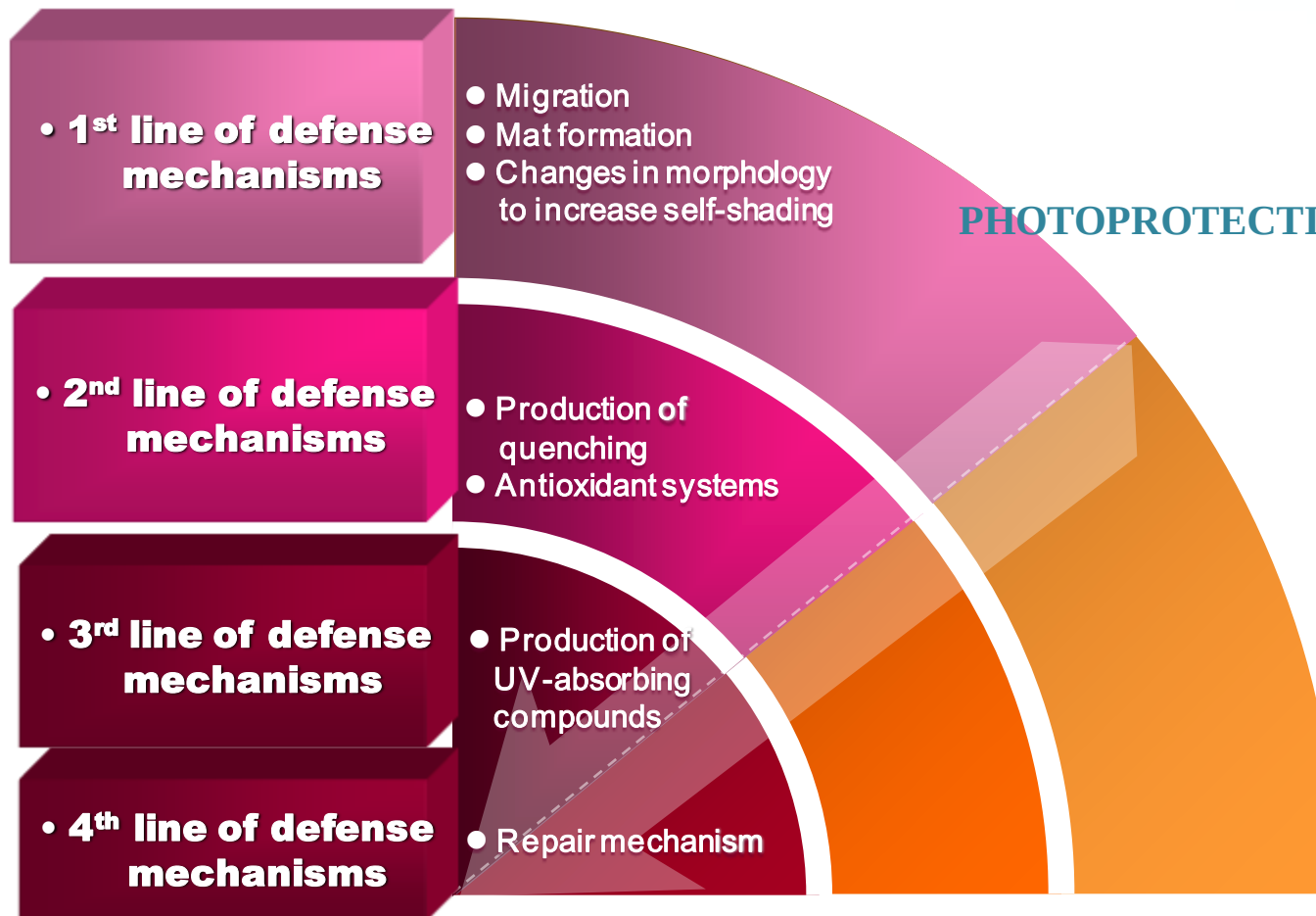
(Rastogi et al., BBRC, 2010)

UV protective mechanisms

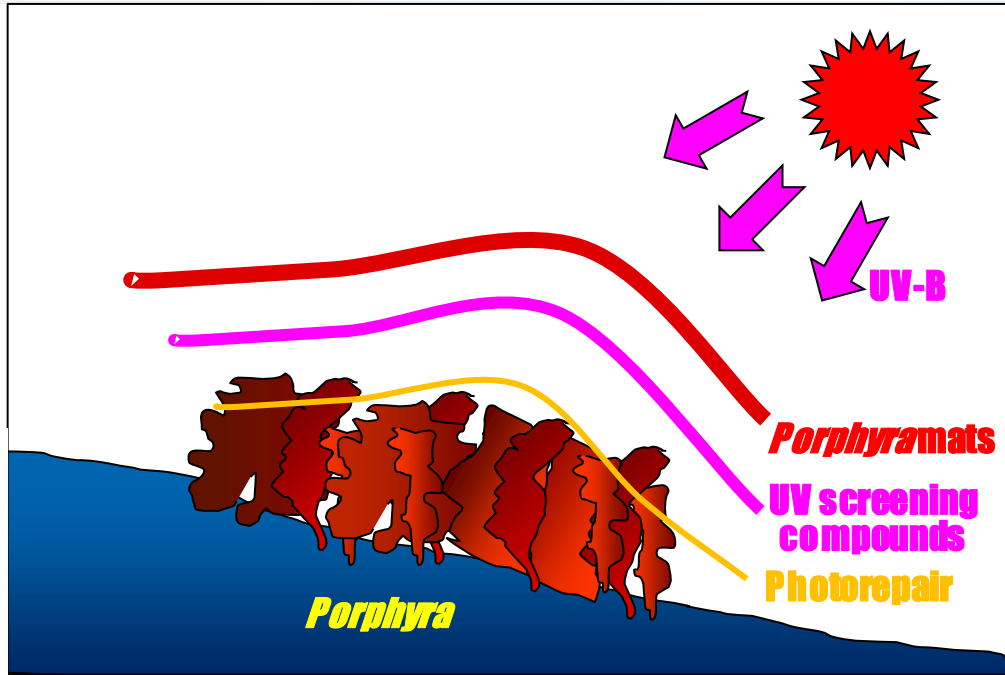


Seaweeds

PHOTOPROTECTIVE MECHANISMS



UV protection in seaweeds



UV-Screening Compounds



Porphyra yezoensis



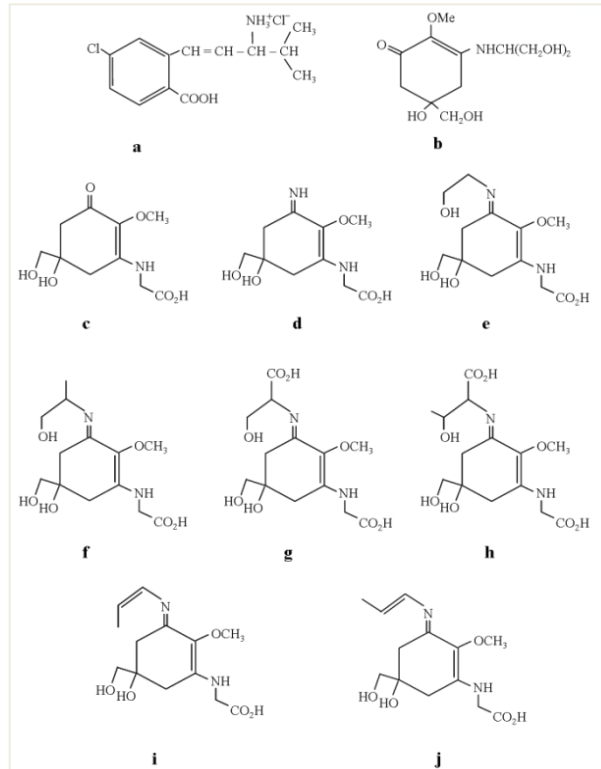
Dried seaweed



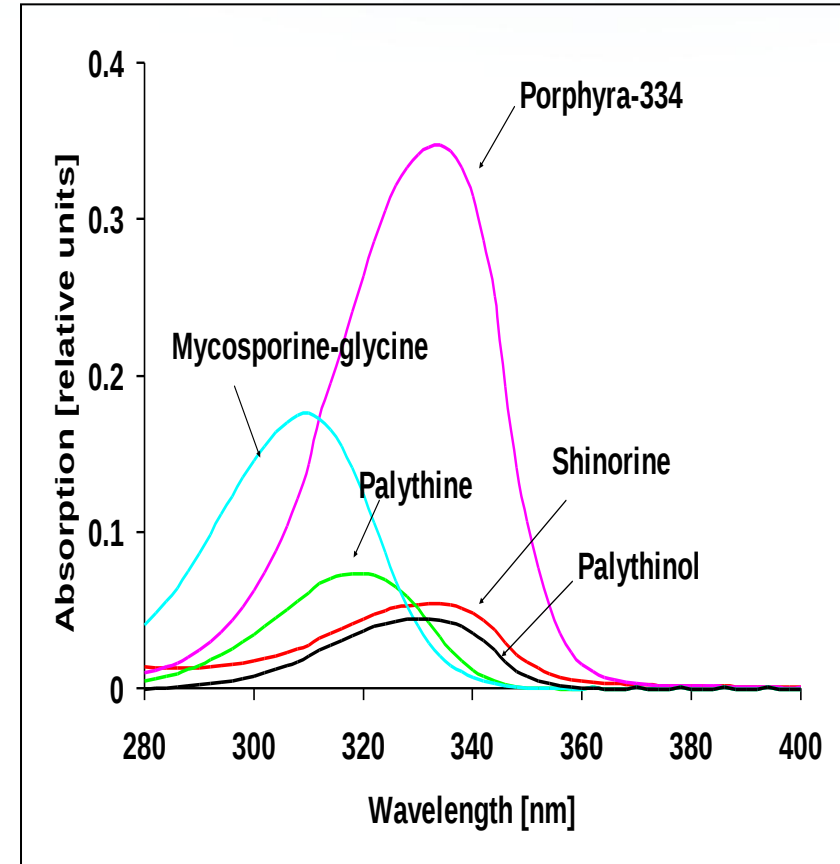
문헌조사 및
실험실 내부의 방법을
통한 추출방식



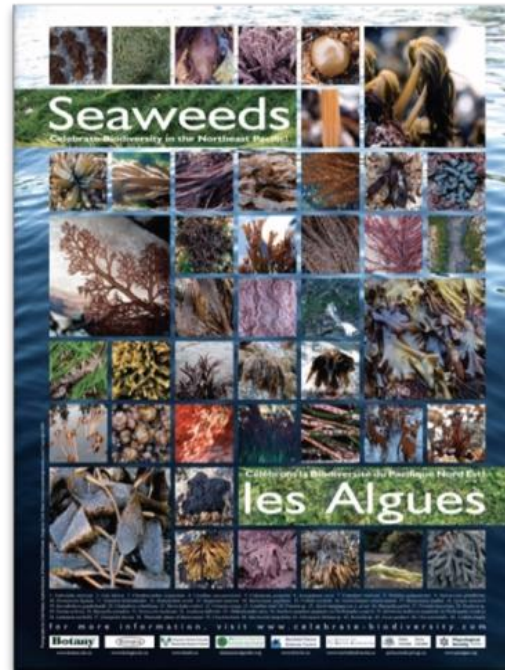
Final product



MAAs compounds



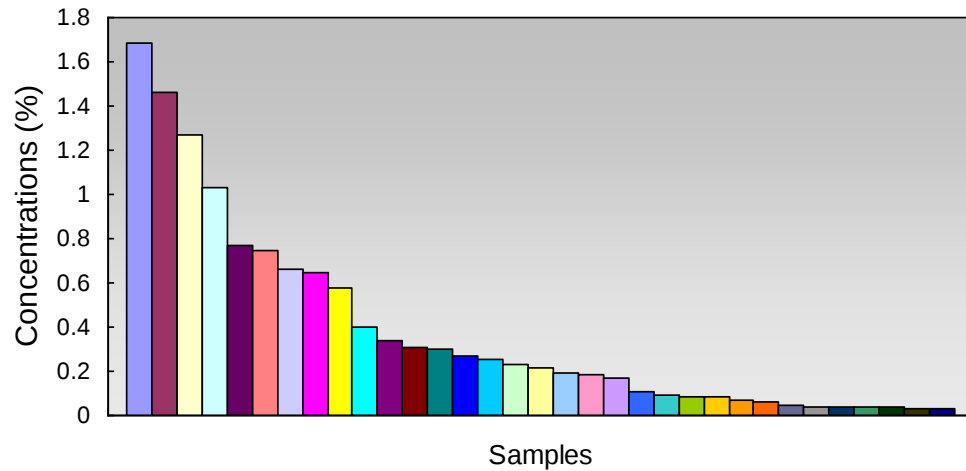
- 133 species of domestic algae (17 of green algae, 34 of brown algae, 82 of red algae)



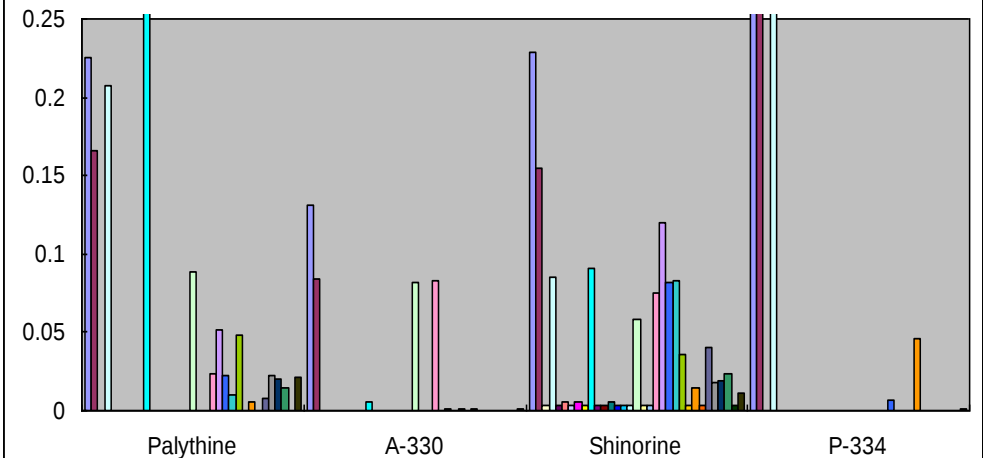

인천대학교
 University of Incheon


IGER
녹색환경과학센터
 Institute of Green Environmental Research

Ranking order of MAA contents in Korean seaweeds



- | | |
|--|----------------------------------|
| ■ Porphyra yezoensis (2001,1) | ■ Porphyra yezoensis (2001,3) |
| ■ Chondrus ocellatus (2001,7) | ■ Porphyra yezoensis (2001,2) |
| ■ Chondrus ocellatus (2000,1) | ■ Grateloupia filicina |
| ■ Chondrus ocellatus (2001,5) | ■ Gloiopeltis furcata (2000,1) |
| ■ Pachymeniopsis elliptica (1999,12) | ■ Carpopeltis affinis (2001,2) |
| ■ Carpopeltis affinis(2000,1) | ■ Grateloupia turuturu |
| ■ Gymnogongrus flabelliformis (2000,1) | ■ Gelidium amansii (2000,1) |
| ■ Gloiopeltis furcata (2001,5) | ■ Halymenia acuminata (2000,1) |
| ■ Pachymeniopsis elliptica (2001,1) | ■ Gigartina tenella |
| ■ Gelidium amansii (2000,1) | ■ Lomentaria catenata(2000,1) |
| ■ Gymnogongrus flabelliformis (2000,1) | ■ Champia parvula |
| ■ Corallina spp.(2001,5) | ■ Corallina officinalis |
| ■ Pelvetia wrightii | ■ Pachymeniopsis spp.(2001,5) |
| ■ Lomentaria catenata(2000,1) | ■ Carpopeltis affinis (2001,5) |
| ■ Grateloupia filicina(2001,5) | ■ Grateloupia yezoensis(2001,5) |
| ■ Hypnea saidana | ■ Corallina officinalis (2000,1) |
| ■ Corallina officinalis (2000,1) | |



- | | |
|--|--|
| ■ Porphyra yezoensis (2001,1) | ■ Porphyra yezoensis (2001,3) |
| ■ Chondrus ocellatus (2001,7) | ■ Porphyra yezoensis (2001,2) |
| ■ Chondrus ocellatus (2000,1) | ■ Grateloupia filicina |
| ■ Chondrus ocellatus (2001,5) | ■ Gloiopeltis furcata (2000,1) |
| ■ Pachymeniopsis elliptica (1999,12) | ■ Carpopeltis affinis (2001,2) |
| ■ Carpopeltis affinis(2000,1) | ■ Grateloupia turuturu |
| ■ Gymnogongrus flabelliformis (2000,1) | ■ Gelidium amansii (2000,1) |
| ■ Gloiopeltis furcata (2001,5) | ■ Schizymenia dubyi |
| ■ Halymenia acuminata (2000,1) | ■ Pachymeniopsis elliptica (2001,1) |
| ■ Gigartina tenella | ■ Gelidium amansii (2000,1) |
| ■ Lomentaria catenata(2000,1) | ■ Gymnogongrus flabelliformis (2000,1) |
| ■ Champia parvula | ■ Corallina spp.(2001,5) |
| ■ Corallina officinalis | ■ Pelvetia wrightii |
| ■ Pachymeniopsis spp.(2001,5) | ■ Lomentaria catenata(2000,1) |
| ■ Carpopeltis affinis (2001,5) | ■ Grateloupia filicina(2001,5) |
| ■ Grateloupia yezoensis(2001,5) | ■ Hypnea saidana |
| ■ Corallina officinalis (2000,1) | |

Introduction to *Porphyra* (or *Pyropia*)

● *Porphyra*

- ▷ Red algae (Rhodophyceae, Bangiales, Bangiaceae)
- ▷ Grows in the intertidal zone
- ▷ The most commonly eaten seaweed (ex. 'Nori' in Japan, 'Gim' in Korea)
- ▷ 60 to 70 species of *Porphyra* worldwide



Aquaculture technology of *Porphyra* (or *Pyropia*)



Habitats for *Porphyra*

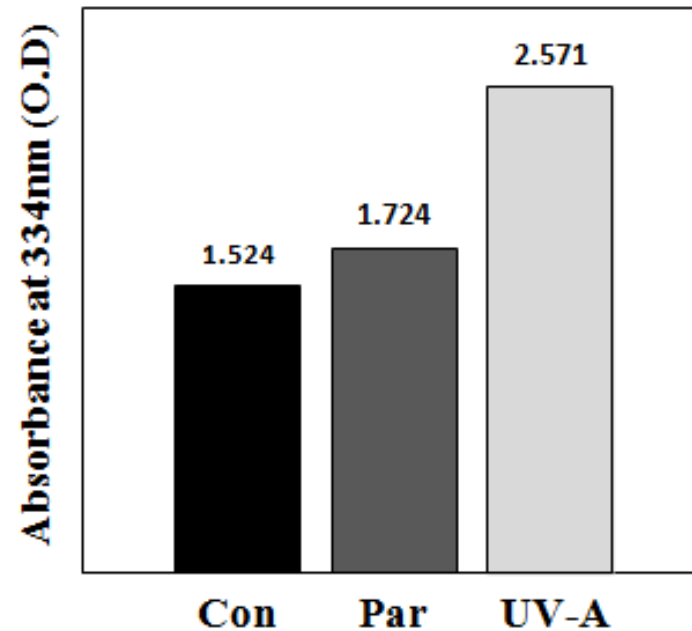


Response of *Porphyra* to UV radiation



Porphyra yezoensis

MAAs induction upon UV-A exposure



in vivo amplification

Side or negative effects of conventional sunscreens

UV absorber

Function

Absorb UV to inactive or intoxify

Type

PABA (P-aminobenzoic 2 hydroxy-4 methoxurocanic acid, urocanic acid & benzophenone derivatives)

Weakness

Severe side effects
Strictly regulated in most countries

UV scatter

Function

Reflect or scatter UV

Type

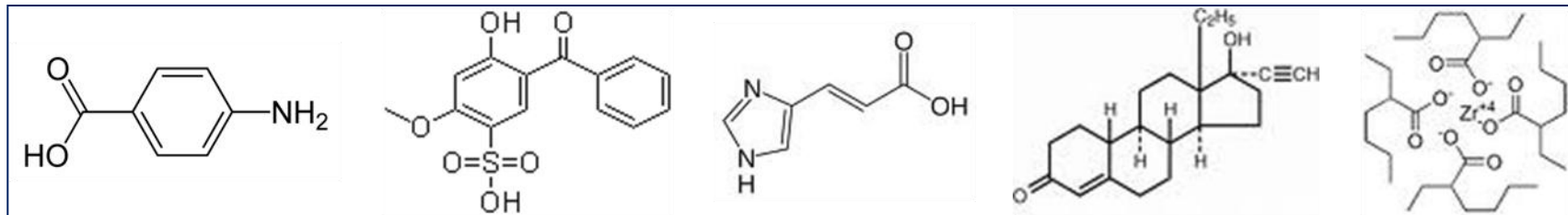
Titanium oxide

zirconia oxide

zinc oxide

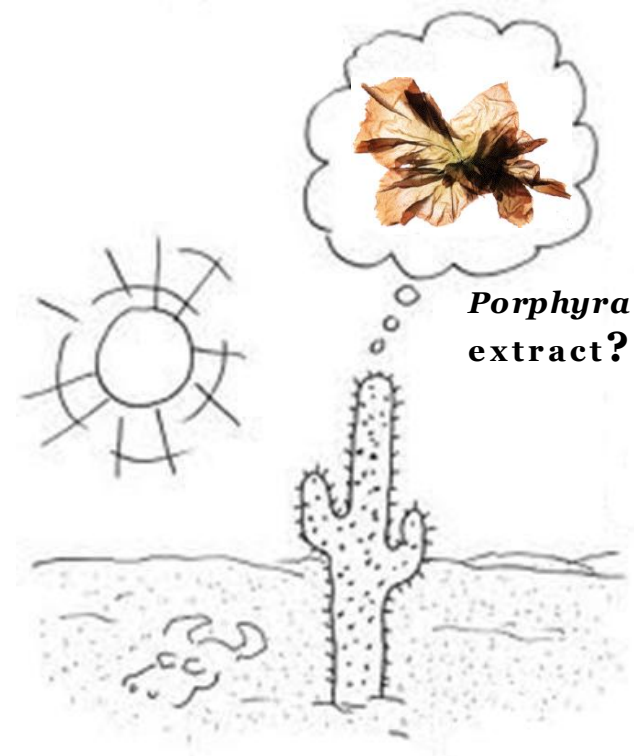
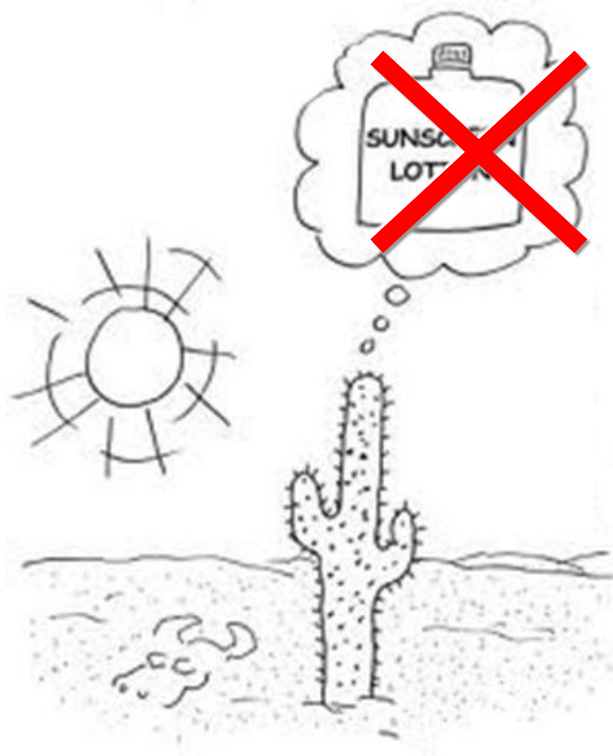
Weakness

Little side effects
Less comfortable to apply on the skin



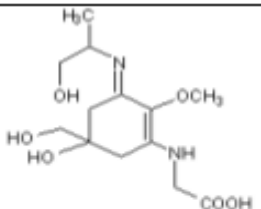
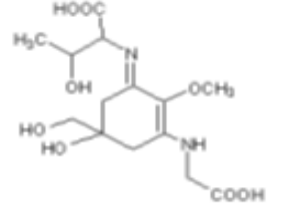
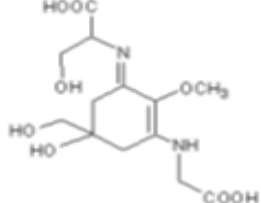
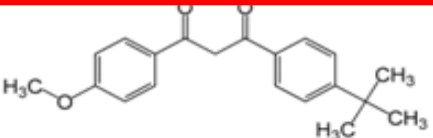
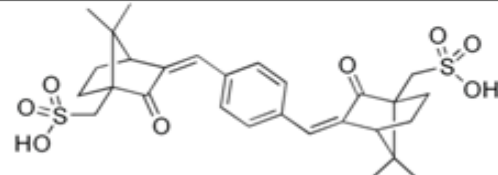
Question 1

- Are *Porphyra* extracts strong UV absorbers?



MAAs in *Porphyra* extracts

- Structure and extinction coefficients of MAAs and synthetic filters

MAAs	Structure	extinction coefficient ϵ ($M^{-1} cm^{-1}$)
Palythanol		43,500
Porphyra-334		42,300
Shinorine		44,700
Parsol 1789		40,000
Mexoryl SX		45,000

Commercially available MAA products

HELIONORI®

For a natural bioprotection against UVA

Ecocert Approved

Patent FR 9 916 785

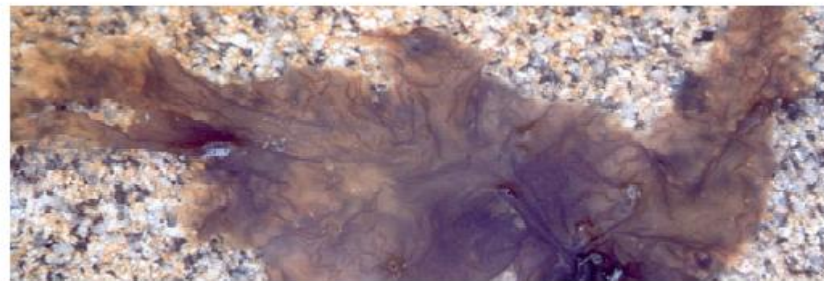


UVA rays are the main producers of free radicals which damage tissues as well as their components such as cellular membranes and DNA.

To prevent deteriorating, the answer has been found in the ocean, especially in certain macroalgae which contains powerful UVA-absorbing compounds, acting as natural sunscreens and known as "mycosporine-like amino acids" (MAAs).

PRESENTATION

HELIONORI® is a patented water and concentrated active ingredient prepared from the red seaweed *Porphyra umbilicalis* (L.) Kützinger known as "nori" in Japan.

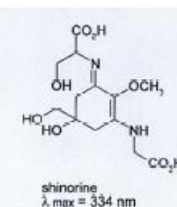
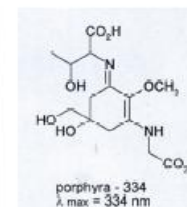
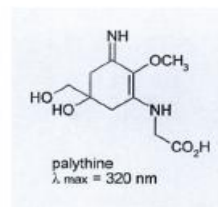


Porphyra umbilicalis (in situ)

Three different MAAs are extracted selectively from *Porphyra umbilicalis* :

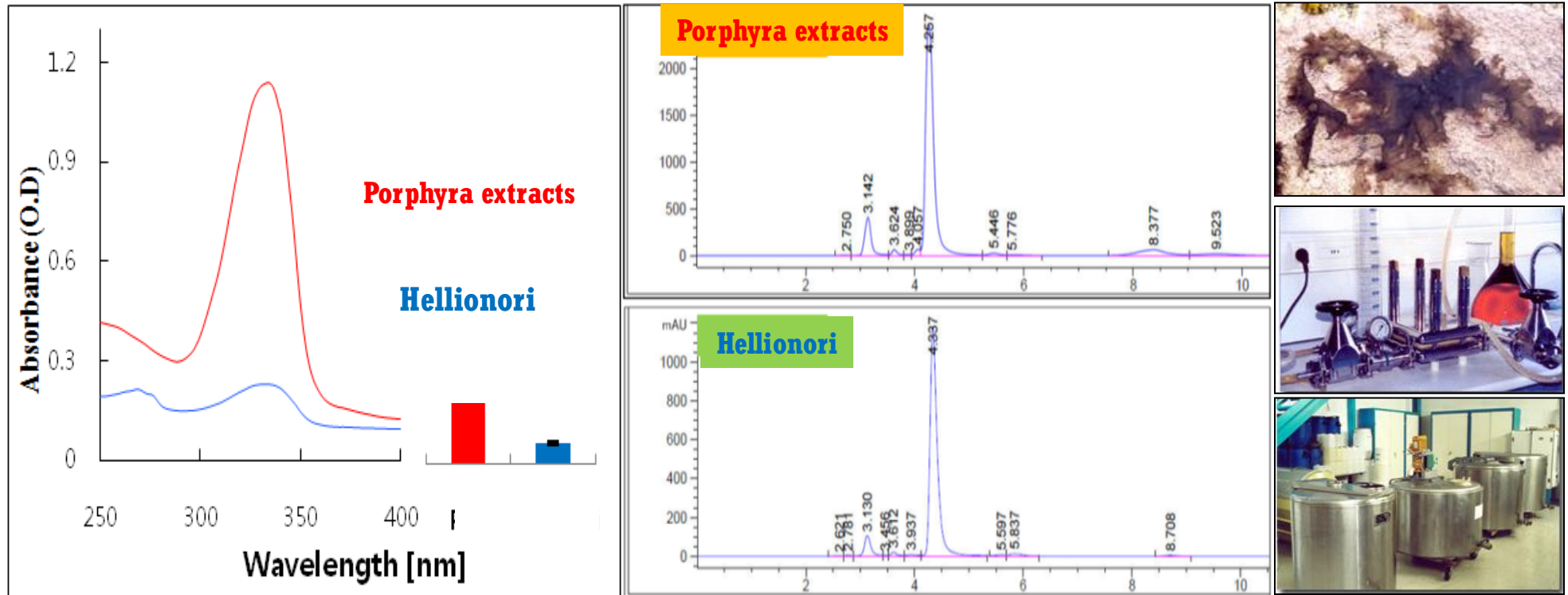


palythine
porphyra 334
shinorine.



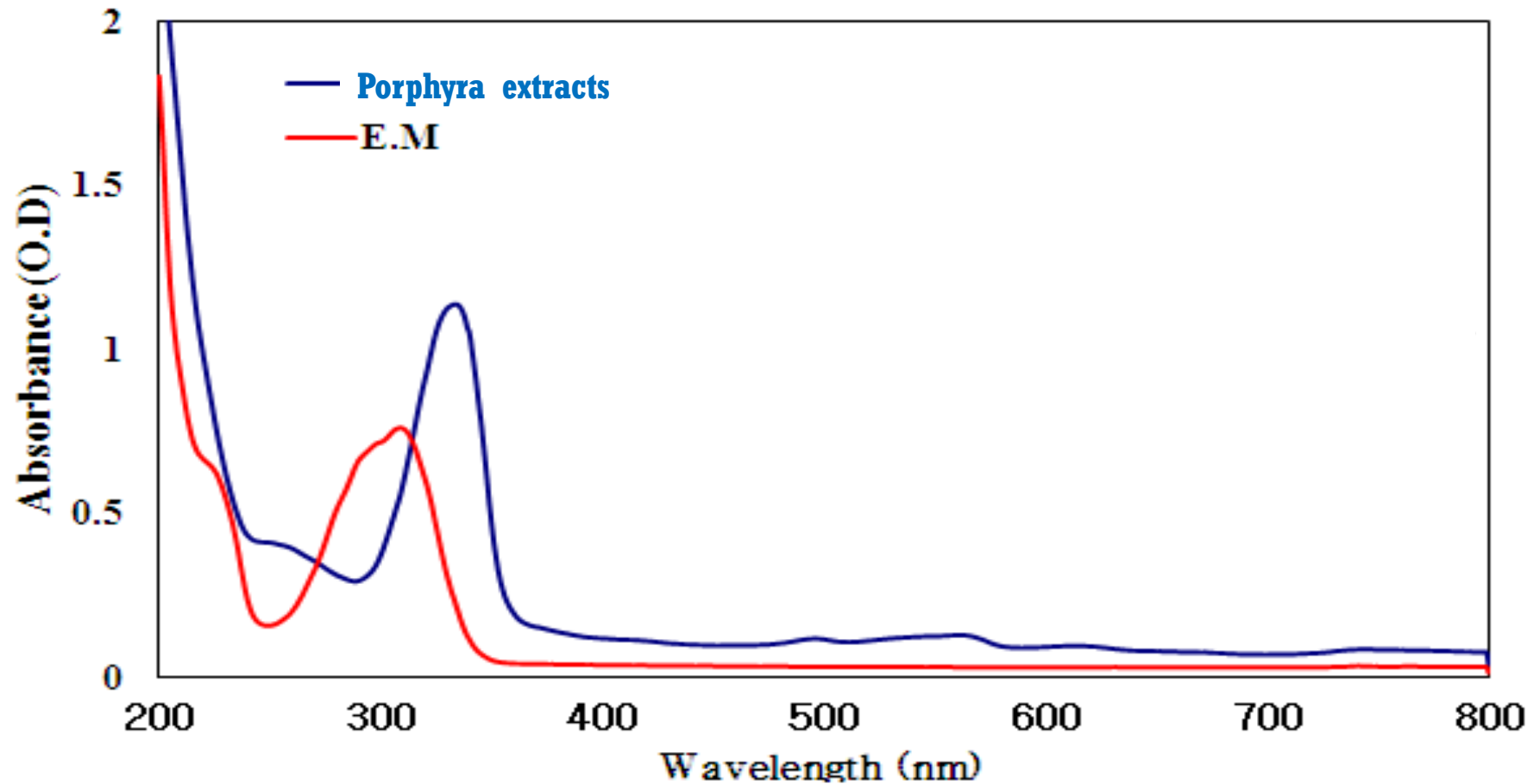
UV-absorbing capacity

● Comparative analysis of MAAs in between *Porphyra* extracts and Helionori



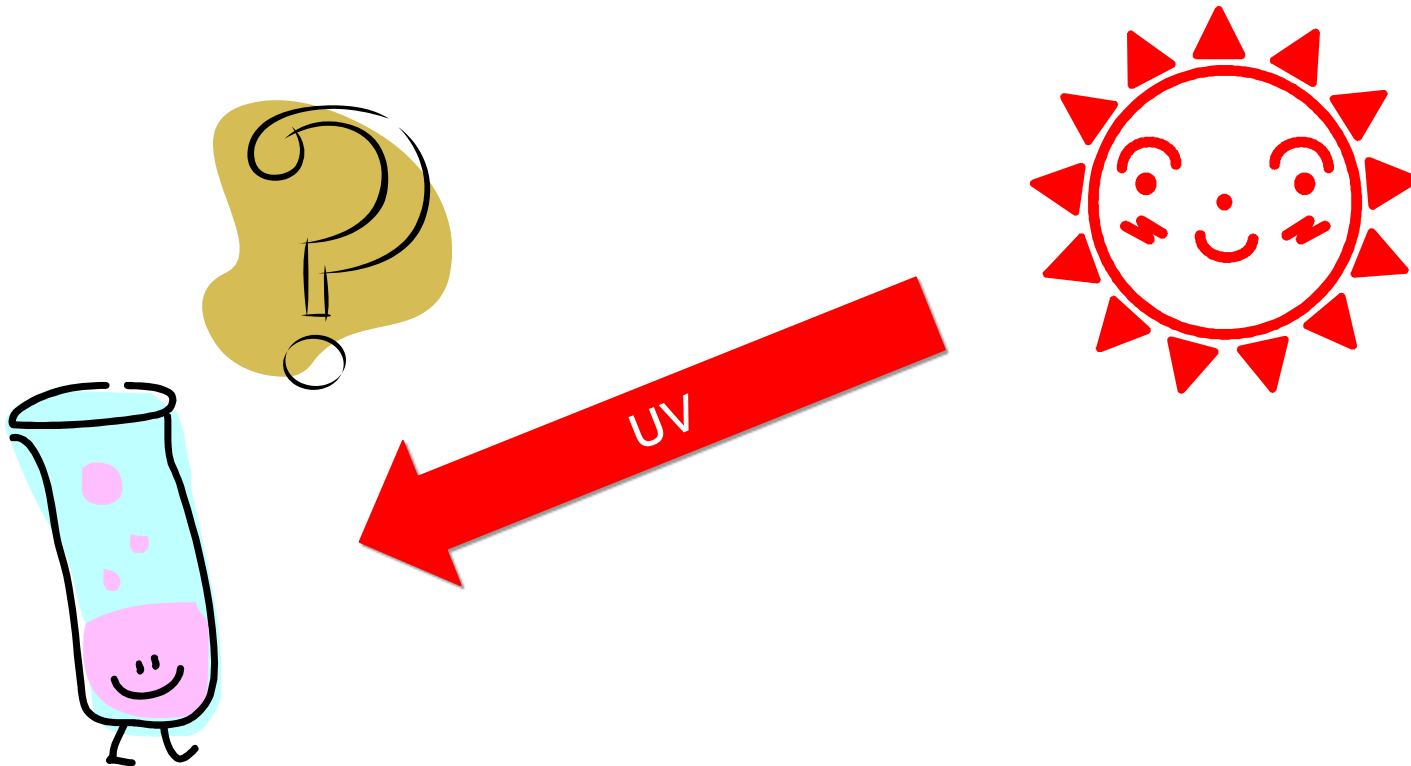
UV-absorbing characteristics

- Comparison of UV absorbance between *Porphyra* extracts and ethylhexyl methoxycinnamate

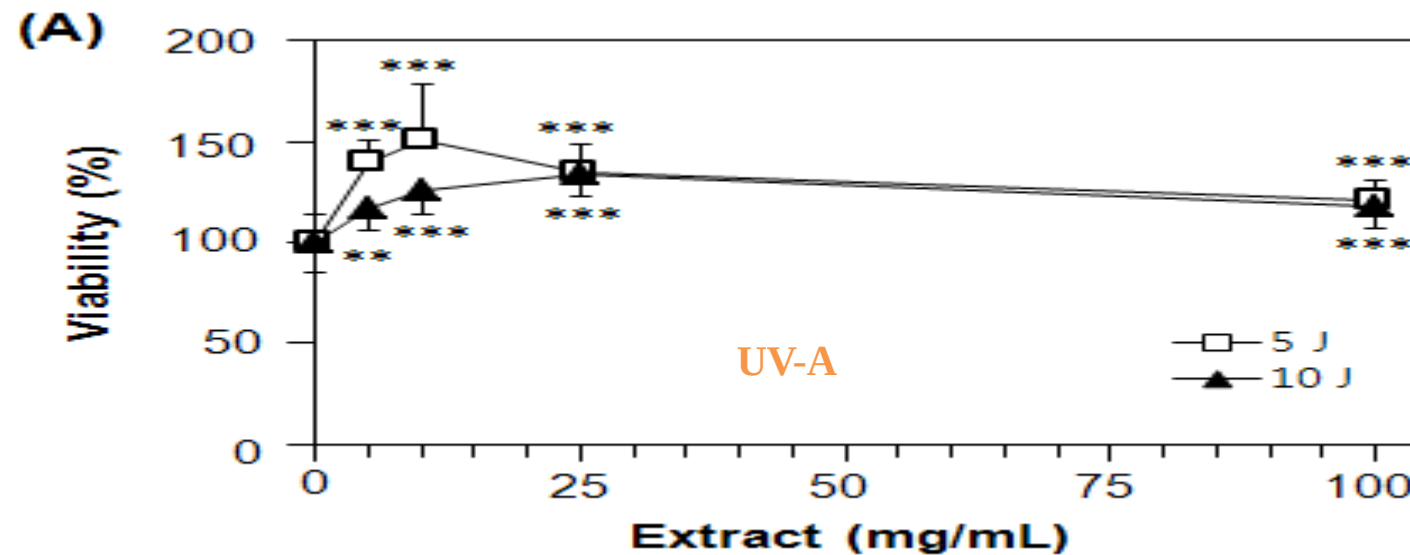
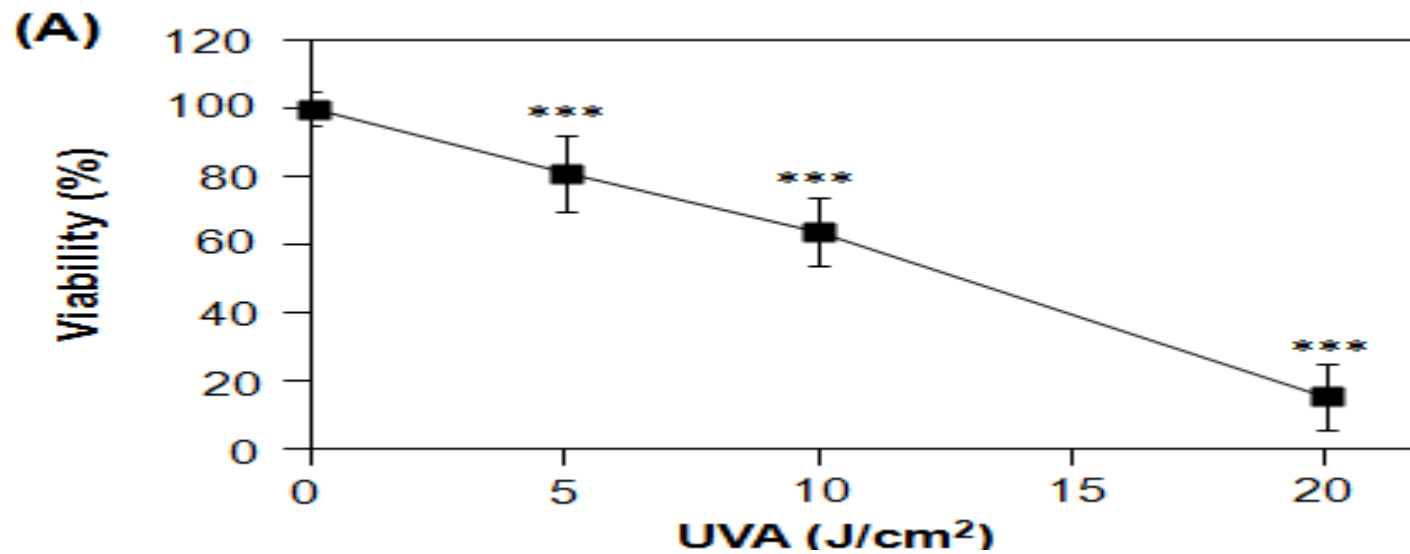


Question 2

- Do *Porphyra* extracts provide UV protection?

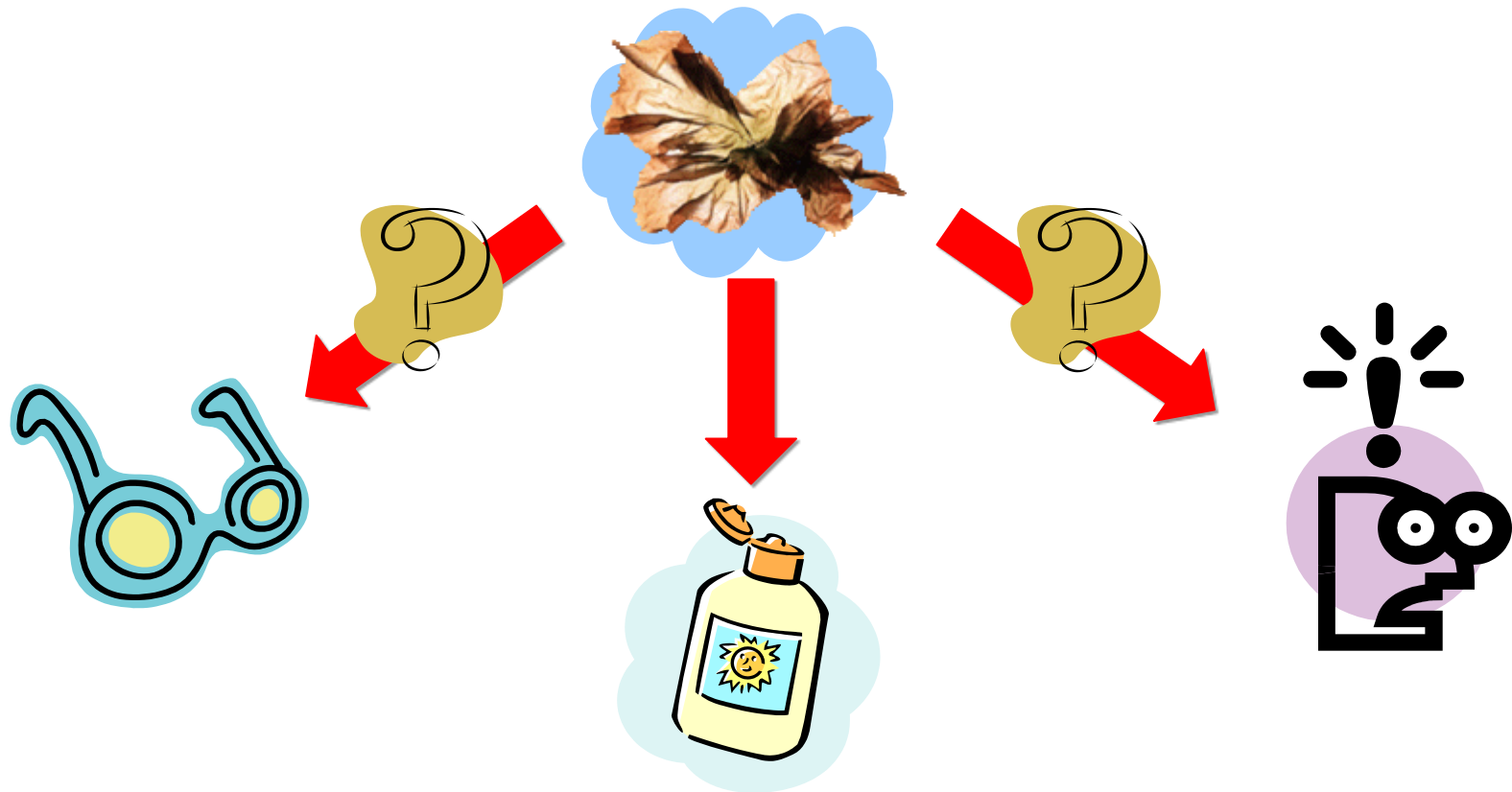


UV-protective effects



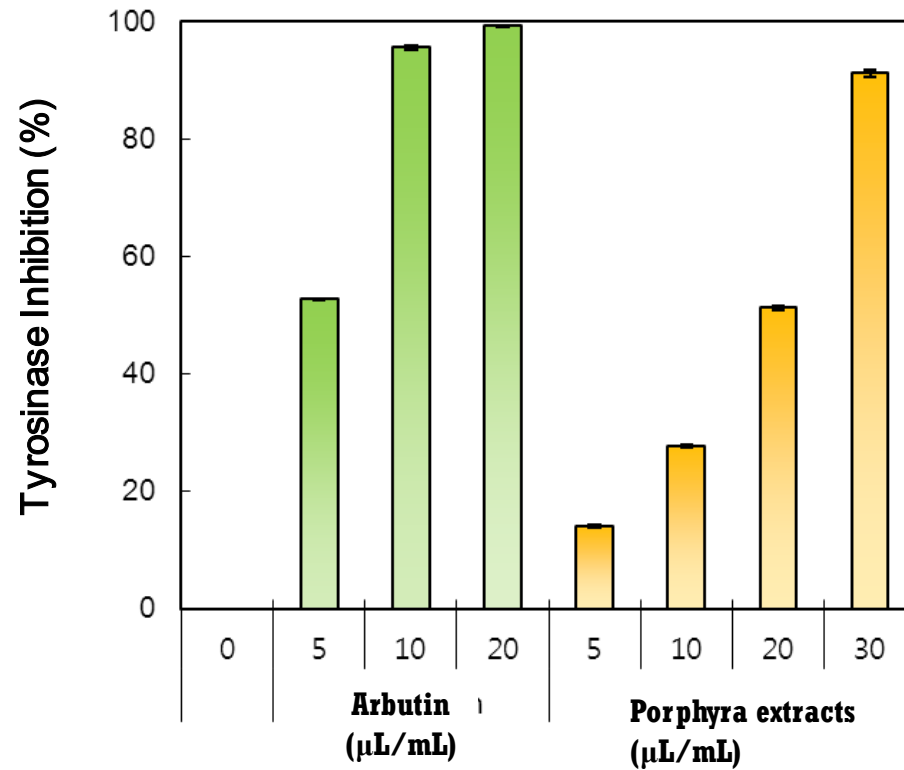
Question 3

- Are there any other novel functions in *Porphyra* extracts?

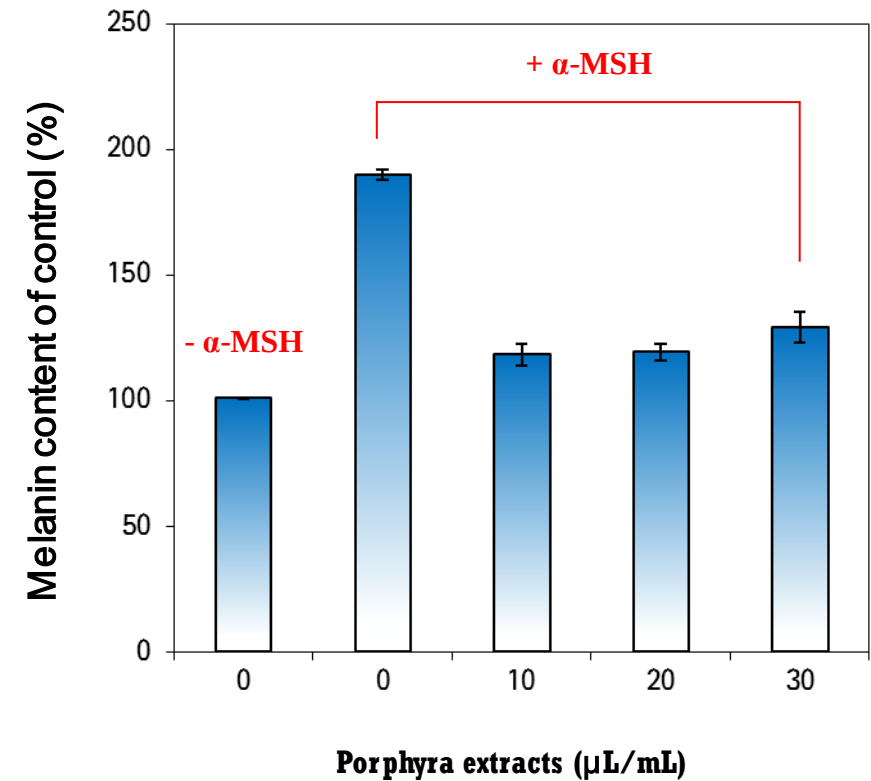


Whitening effects

● Tyrosinase inhibition assay

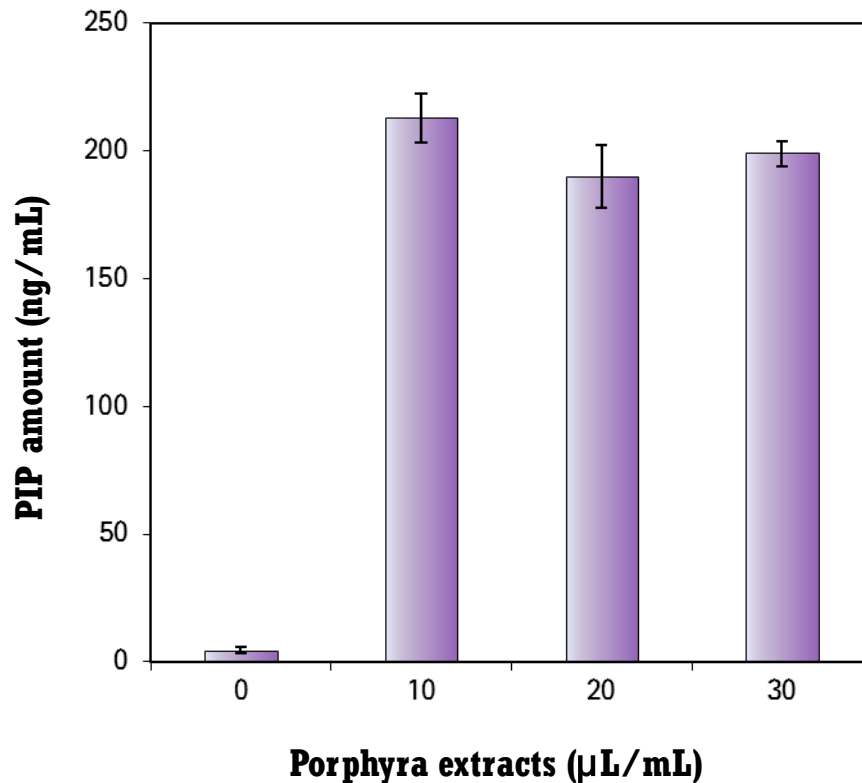


● Melanin synthesis

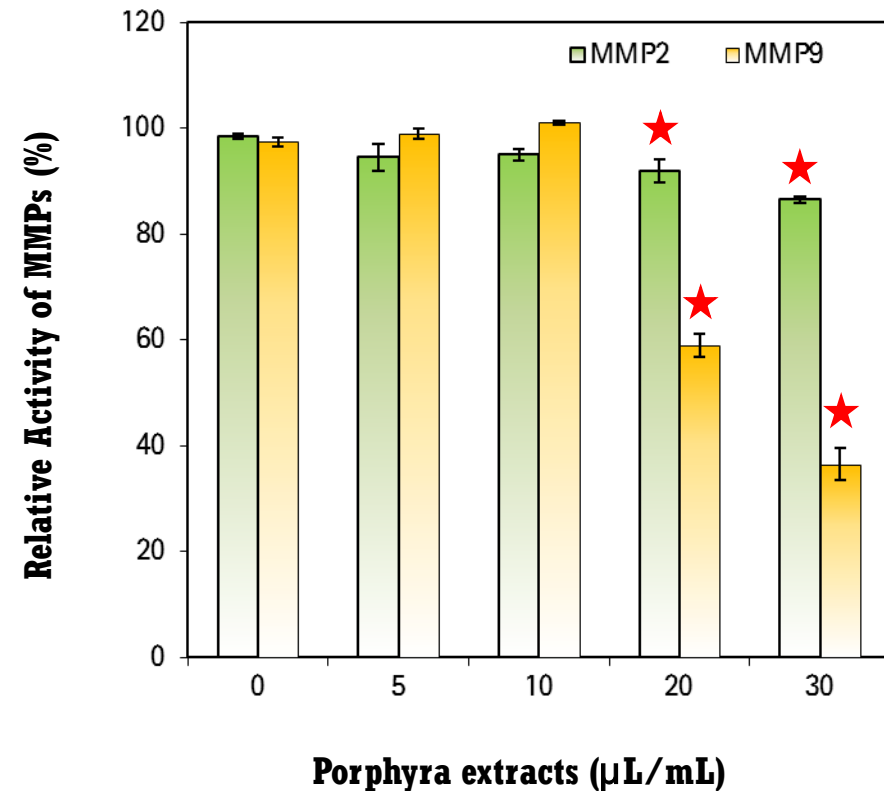


Anti-aging effects

● Collagen synthesis

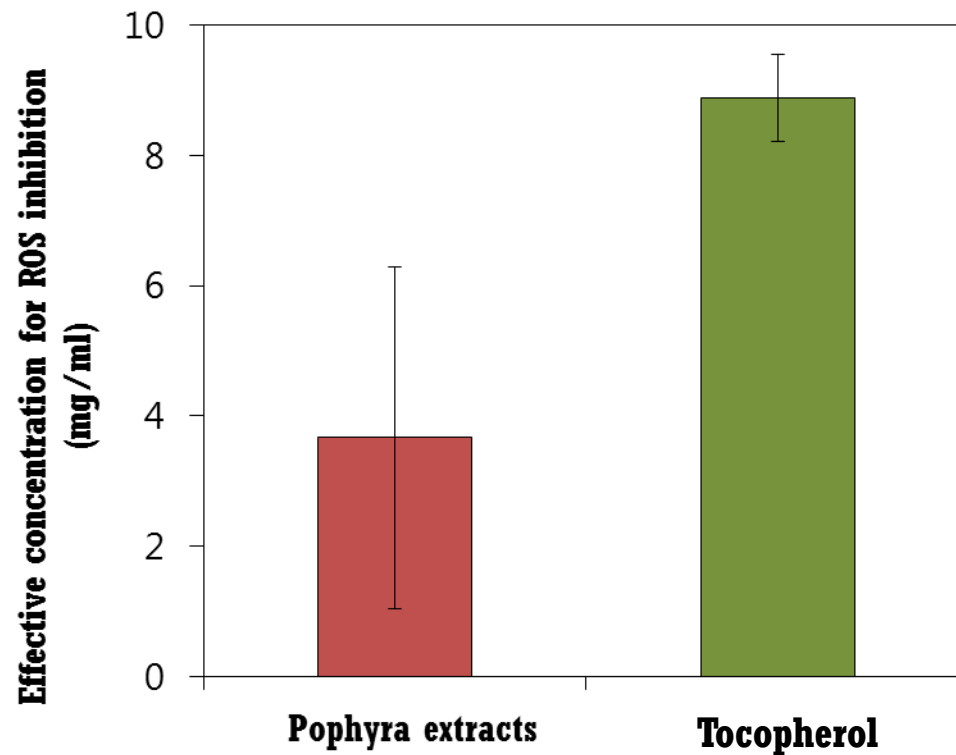


● Zymography for MMP2 & MMP9



Antioxidant activity

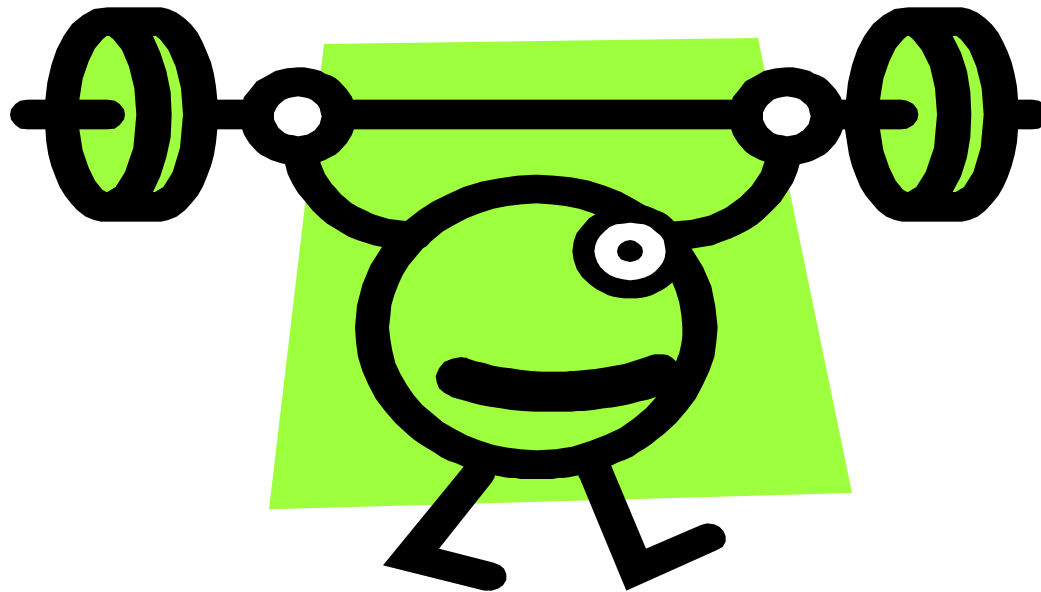
- Comparison of ROS reducing power between *Porphyra* extracts and tocopherol



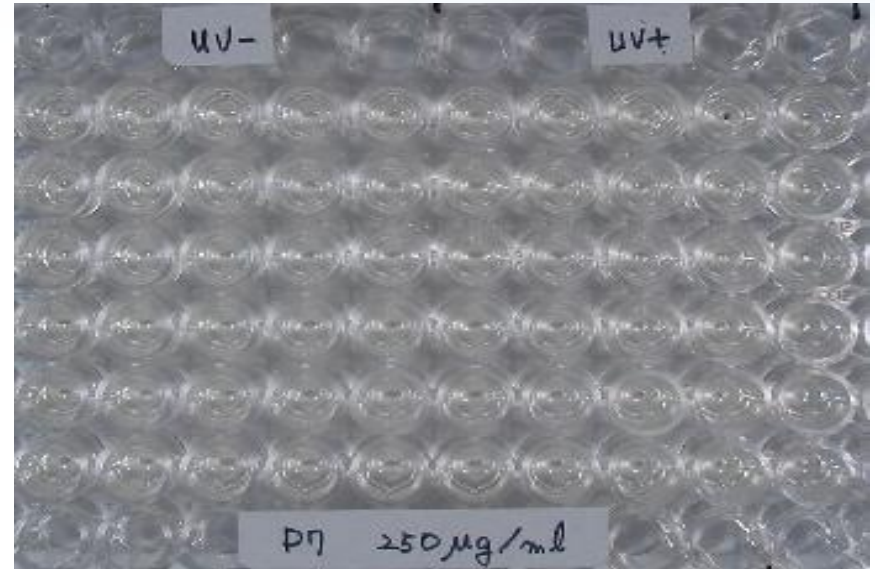
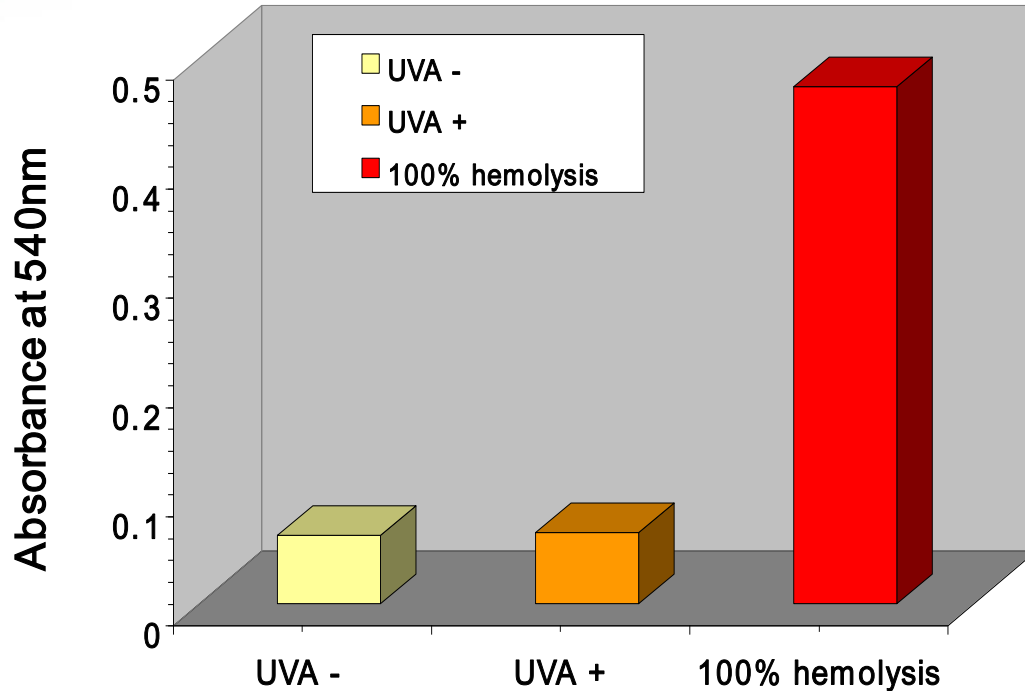
Product	EC ₅₀ (mg/mL)	EC ₅₀ CV (%)
Porphyra extracts	3.662	2.628
Tocopherol	8.879	0.663

Question 4

- Are *Phrphyra* extracts safe?



No photo- and cyto-toxicity of *Porphyra* extracts



Samples	3T3 NRU phototoxicity			
	Mean IC ₅₀ (UV-) (mg/mL)	Mean IC ₅₀ (UV+) (mg/mL)	PIF IC ₅₀ (UV-)/ IC ₅₀ (UV+)	Result
Porphyra extract	> 1,000	> 1,000	1	Non-phototoxic

Samples	IC ₅₀	Result
Porphyra extracts	>5,000µg/mL	Non-cytotoxic

Biochemical composition of *Porphyra*

● Per 100g *Porphyra*

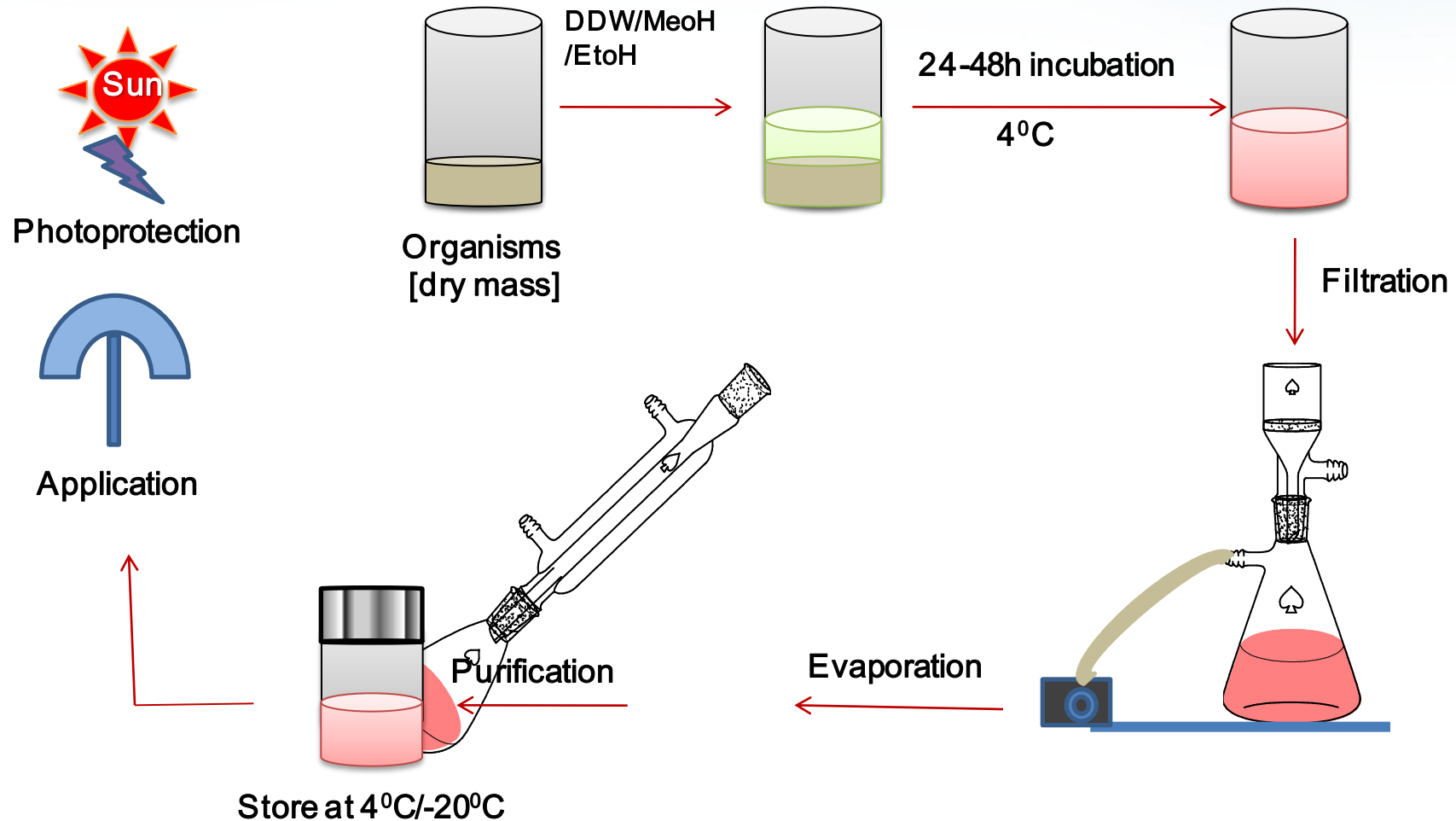
Component	Contents	Component	Contents	Component	Contents
Moisture	11.1g	Fiber	1.8g	Vitamin B2	3.4mg
Protein	38.8g	Potassium	2.1g	Vitamin C	100mg
Non-fibrous	39.5g	Calcium	390mg	Vitamin E	4.3mg
Ash	6.9g	Iron	12mg	Niacin	9.8mg
Lipid	1.9g	Vitamin B1	1.15mg	Carotene	25mg

Question 5

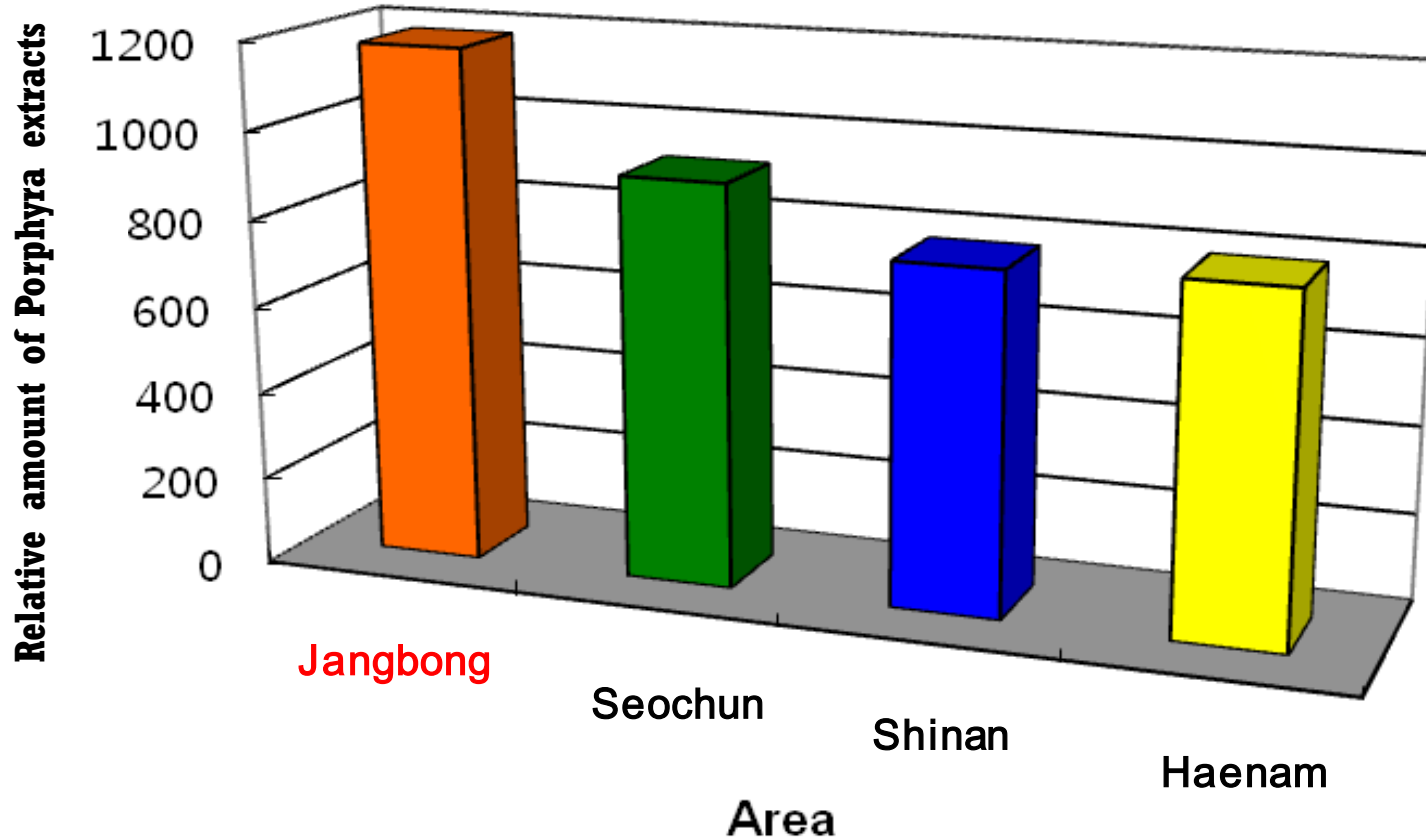
● Is it economic and sustainable to obtain *Porphyra* extracts containing MAAs?



Simple extraction procedure



Relative amounts of *Porphyra* extracts



Seaweed cultivation technology

- Floating-rafts method & Pole-type farming method

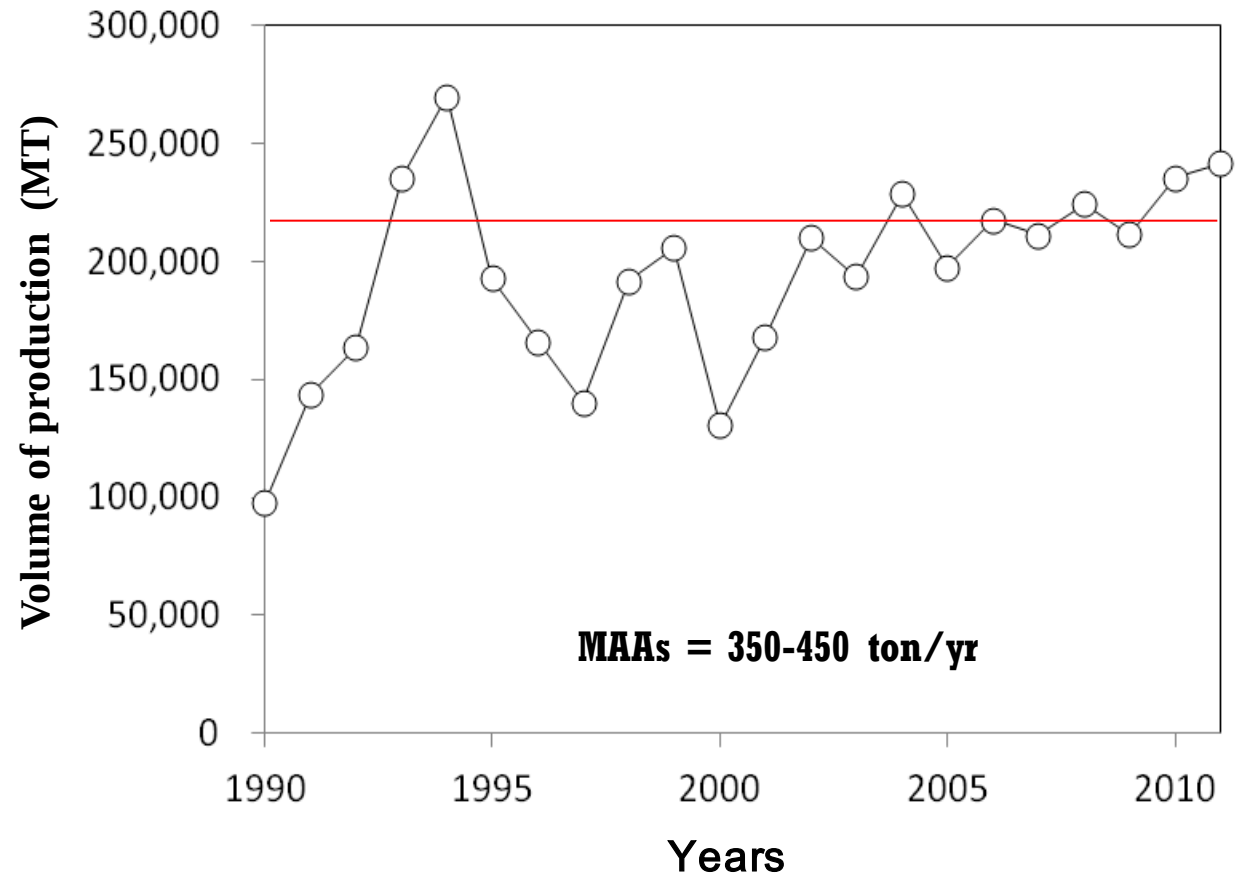


VS



Porphyra production

● Jangbong island



Seaweed cosmetic brands

2010

REVE



2011

SEALGAE



2012

m·ROSE
ALIVE SEAWEED COSMETIC



2013

fikia
COSMETIQUE MARINE



2015

해수
HAESUM

MarineZip
Cosmetique Marine



Seaweed cosmetics



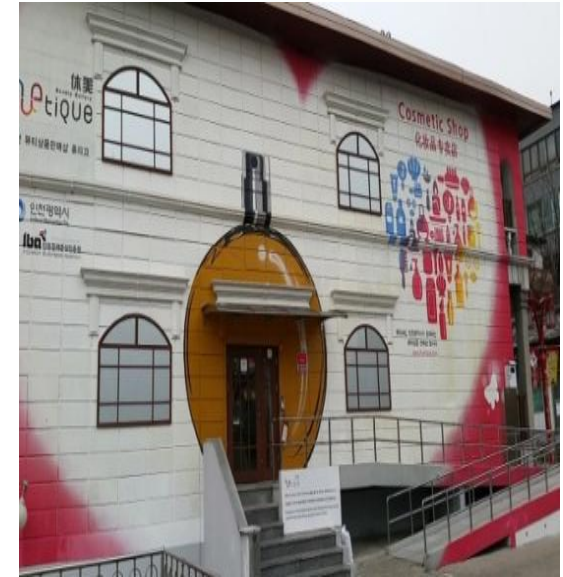
fikia
COSMETIQUE MARINE



M-ROSE
ALIVE SEAWEED COSMETIC

BeautyLine

Off-line shops



인천광역시



인천대학교
University of Incheon



신한은행 에스버드 여자농구단
Shinhan Bank S-Birds Women's Basketball Team



인천대학교
University of Incheon



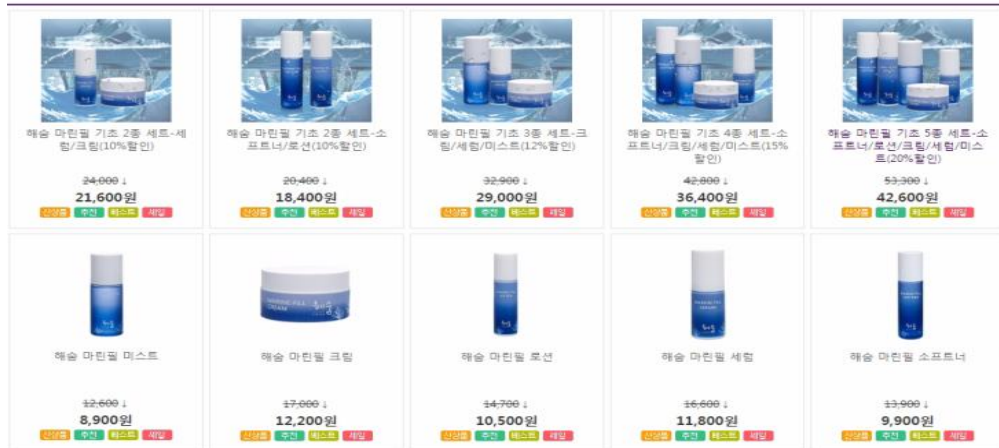
IGER
녹색환경과학센터
Institute of Green Environmental Research

E-marketing place

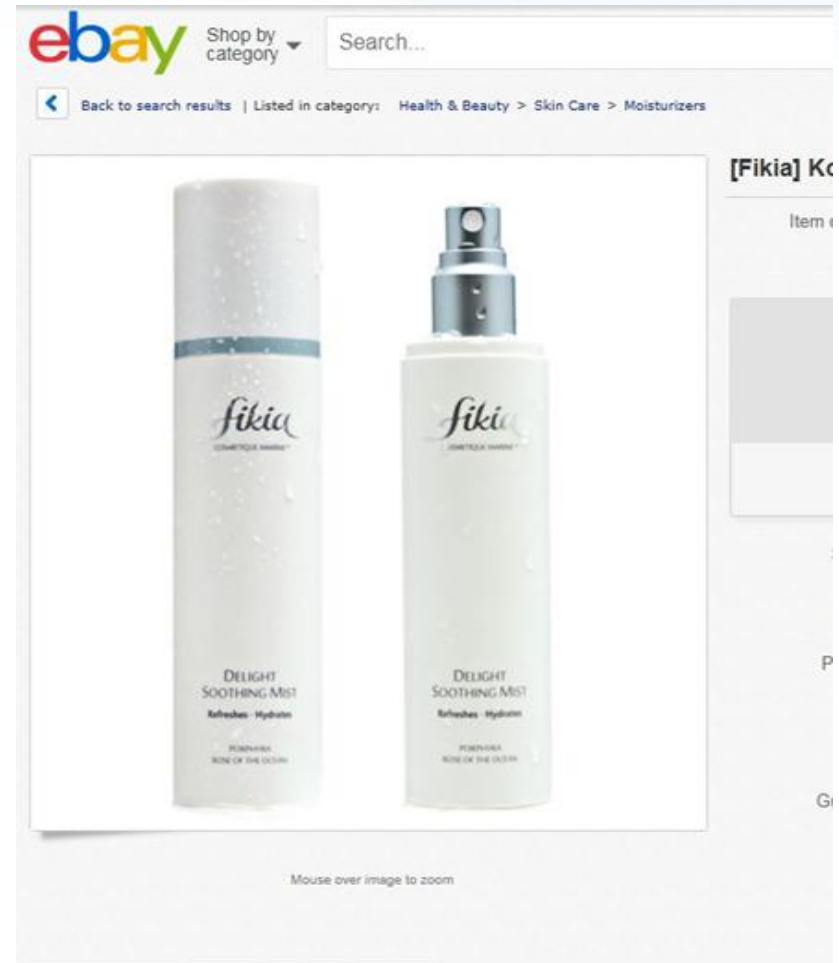
INcheon + COsmetic + BEAUTY; url : www.incobeauty.com connected to e-bay, Amazon, Yahoo, Rakuten, Taobao



New Brand



Hot Product



PR marketing

Viral marketing

SNS(Facebook)

INCO BEAUTY

페이지 | 메시지 | 알림 | 인사이드 | 게시물

해수 HAESUM

인코뷰티 화장품 및 미용용품 · 쇼핑몰

타일라인 | 정보 | 사진 | 리뷰 | 더 보기

좋아요 851개 · 이번 주 (+1)

방문 1회 · 이번 주 (0)

친구에게 페이지 좋아요 요청

이번 주 게시물 도달 587명

연전 근처에 있는 사람 최대 860,000명에게 도달하세요

배치시 정보보기

정보

인코뷰티님이 새로운 사진 3장을 추가했습니다. 5월 8일 오후 4:42 · 수정됨 · ♥

피부에 가득한 바다의 숨결... a breath of the ocean

소중한 20살 피부를 지켜주는 청정 바이오 해양화장품 해수!

입소문으로 행칭이 정해지는 위메이크뷰티 행칭차트에서 지금 해수 마린필 크림이 인기 급상승 1위! ... 더 보기

▶ 즐겨찾기 등록

제품 | 모든 입소문 | 사진 | QnA

11월~20월 | 21월~30월 | 31월~40월 | 41월~50월

[해수] 마린필 소프트너

★★★★☆ 8.4

랭킹 81.20p | 입소문 9건

[미노스프링] 그린더 폼이 스킨

★★★★☆ 8.2

랭킹 16.77p | 입소문 2건

가격: 200ml - 16,200원, 140ml - 12,900원

Beauty community network

WE MAKE BEAUTY

제품보기 | 뷰티칼 커뮤니티 | 쇼핑

> 기초화장품 > 스킨케어 > 크림

크림 ▶ 즐겨찾기 등록

랭킹 | 모든 제품 | 모든 입소문 | 사진 | QnA

11월~20월 | 21월~30월 | 31월~40월 | 41월~50월

1위 NEW

[해수] 마린필 크림

★★★★☆ 8.6

랭킹 73.76p | 입소문 8건

▶ 입소문 남기기 ▶ 즐겨찾기 등록

2위

[네이처리퍼블릭] 슈퍼 아쿠아 맥스 컴비네이션 수분크림

★★★★☆ 8.8

랭킹 27.20p | 입소문 3건

가격: 80ml - 21,900원

▶ 입소문 남기기 ▶ 즐겨찾기 등록

3위

[네이처리퍼블릭] 진생 로얄 실크 워터리 크림

★★★★☆ 7.8

랭킹 15.74p | 입소문 2건

가격: 60ml - 66,000원

▶ 입소문 남기기 ▶ 즐겨찾기 등록

4위

[해라] 에이지 어웨이 크림

★★★★☆ 10.0

랭킹 10.10p | 입소문 1건

가격: 50ml - 88,000원

▶ 입소문 남기기 ▶ 즐겨찾기 등록

5위

[더샘] 어반에코 하라케케 크림

★★★★☆ 10.0

랭킹 10.16p | 입소문 1건

PR marketing

Mass media

Major news papers (on-line and paper)

뷰티업-주말드라마 '여자를 올려'의 김정은이 쓰던 화장품 '공개'
- 김정은,이태란,하희라 등 여배우 화잘대 책임지는 화장품은 뭐야?
- 해알실출수로 만든 화장품 '해숨'

기사등록 2015-04-30 22:15:56



뷰티업beautyup-개공:뷰티라인

뷰티업beautyup 해숨-MBC 주말 드라마 <여자를 올려>에

MBC 주말 드라마 <여자를 올려>는 달달하고 컸어무엇의 이자 연기의 달인 이순재의 출연으로 화제를 모으고 있다. 이 달달하게 풀어낸 이 드라마이며, 방송 중 여배우의 화장대에서

해숨 마린필 기초 5종(소프트너,세럼,로션,크림,미스트)은 청정 해양생물에서 추출한 해알실출수가 청결함과 촉촉함을 유지 시켜 주는 고보

중앙일보 경제 전체보기

최신기사 경제 테크 증권 부동산 IT View 만화시대

인천시 화장품 브랜드 '어울', 인코뷰티몰에서 판
[뉴스] 입력 2015.02.27 16:36

① 댓글보기 0 ② 공유하기 0 ③ 트위터 0

어울 브랜드를 개발한 뷰티업beautyup은 'Moist-Harmonic' 브랜드를 소개한다. 'Oriental Tune Red Ginseng Toner&Emulsion' 홍삼 토너 & 에멀전

어울 브랜드를 개발한 뷰티업beautyup은 'Moist-Harmonic' 브랜드를 소개한다. 'Oriental Tune Red Ginseng Toner&Emulsion' 홍삼 토너 & 에멀전

어울 브랜드를 개발한 뷰티업beautyup은 'Moist-Harmonic' 브랜드를 소개한다. 'Oriental Tune Red Ginseng Toner&Emulsion' 홍삼 토너 & 에멀전

【서울=뉴스1】 유희연 기자 = 해양 화장품 전문기업 '뷰티라인'은 인천광역시와 화장품 제조사와 함께 만든 공동 브랜드 '어울(Oul)'을 자사가 운영하는 인코뷰티몰 (www.incobeauty.com)을 통해 판매하고 있다.

지난해 10월 출시된 어울은 3개월간 7억2000만원의 매출을 올렸다. 이 중 30%에 달하는 2억1000만원이 중국 판매 매출이다. 인천시가 글로벌 뷰티도시의 위상을 확립하기 위해 적극적인 마케팅을 펼친 결과다.

경향 비즈라이프

뉴스 라이프 마켓·비즈 부동산 자동차 테크 포토 뉴스보드

최신기사 경제일반 금융·재테크 산업·동향 기업소식 일자리

첨단 마린 바이오 기술로 탄생한 청정 해양 화장품 '해숨' 런칭

① 댓글보기 0 ② 공유하기 0 ③ 트위터 0

인천대학교 해알 R&S 사업단(단장 한태준 인천대학교 해양학과 교수)이 개발한 다



④ (속보)당일승인개인화장자 맞춤형 인천대출!
⑤ 저축은행"직장인대출 승인율 높은 곳에서"

인천대학교 해알 R&S 사업단(단장 한태준 인천대학교 해양학과 교수)이 개발한 다

서울경제 정치·사회 경제 | Life·엔에 | 오피니언 | 닥터머니 | 부동산비즈 | 핫이슈

정치 사회 전국 국제 피플

사회 | 정책·발견 | 사건사고 | 사회일반 | 교육산업 | 학교 | 법조 | 노사 | Job

인천대, 김 추출물 화장품 상용화
지역선 차단 피부 미백 효과

인천=경향기자 richang@sed.co.kr
입력시간 : 2013/02/19 18:05:15 수정시간 : 2013/02/19 18:05:16

④ 대명리조트입회금 100%반환형 특별보양제 ⑤ 신용제한없이 국민사채발급해주는 정부정책 ⑥ "요고"로고마크

인천대학교 해알 R&S(Regional Innovation System·지역연고산업육성사업) 사업단은 올진로 장봉도에서 생 산되는 김에서 **차단** 물질을 추출해 이를 화장품으로 상용화 하는데 성공했다고 19일 밝혔다.

인천대는 오는 22일 장봉도 김을 원료로 한 화장품 5종 세트인 '피키OK(Fika·사니)'출시 **기념행사**를 송도국

PR marketing

Mass media

Arirang TV and famous drama



Radio



CBS 박승화의 가요 속으로



SBS 이세준, 최재훈의 도시락 쇼



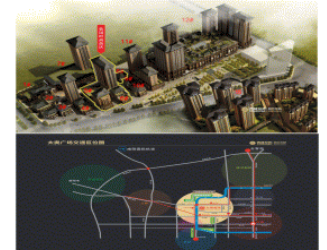
Exhibition



중국 산시 제1회 신 실크로드 패션주 상품전시회
2015. 5.16 ~ 6.19 / 중국 서안-대오국제광장



중국 첫 번째 한국 패션 문화 체험식 블록



중국 산시 제1회 신 실크로드 뷰티패션상품전

한국보세상품판매예술포럼전시오락체험을식체험문화교류

- 기간/장소
- 2015. 5.16~ 6.19 / 중국 서안-대오 국제광장
- 추진기구
- 주최: 산시성인민정부외사사무실
중국세계민족문화교류협회
산시성 상무청

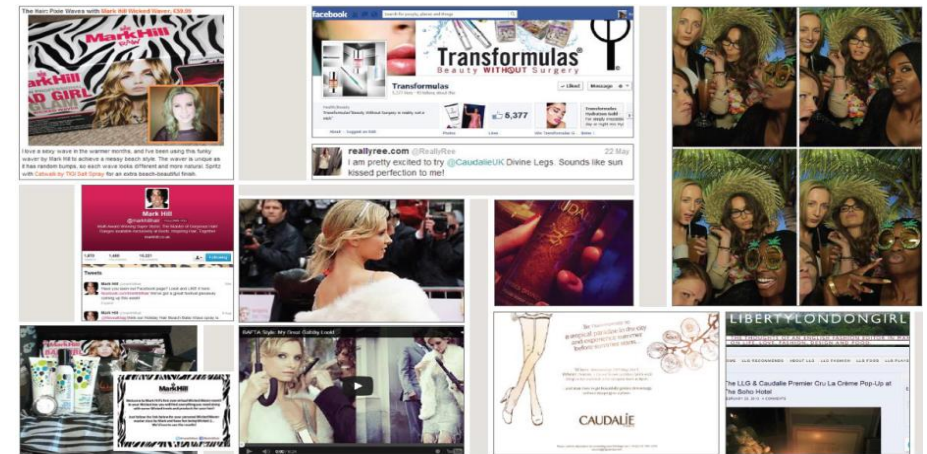
PR marketing

Working with British company (Kilpatrick) for global marketing

Magazine (COSMOPOLITAN, PRIMA)



Social Media



AWARD WINNING



Export to China and Hong-Kong

Opening brand shops in China and
entrance to Sasa in Hong Kong



Export to the USA

The 5th Avenue in New York and Korean on-line mall in the USA



영송 마틴 (Youngsong Martin | 송영숙) 파티플래너, 패션디자이너

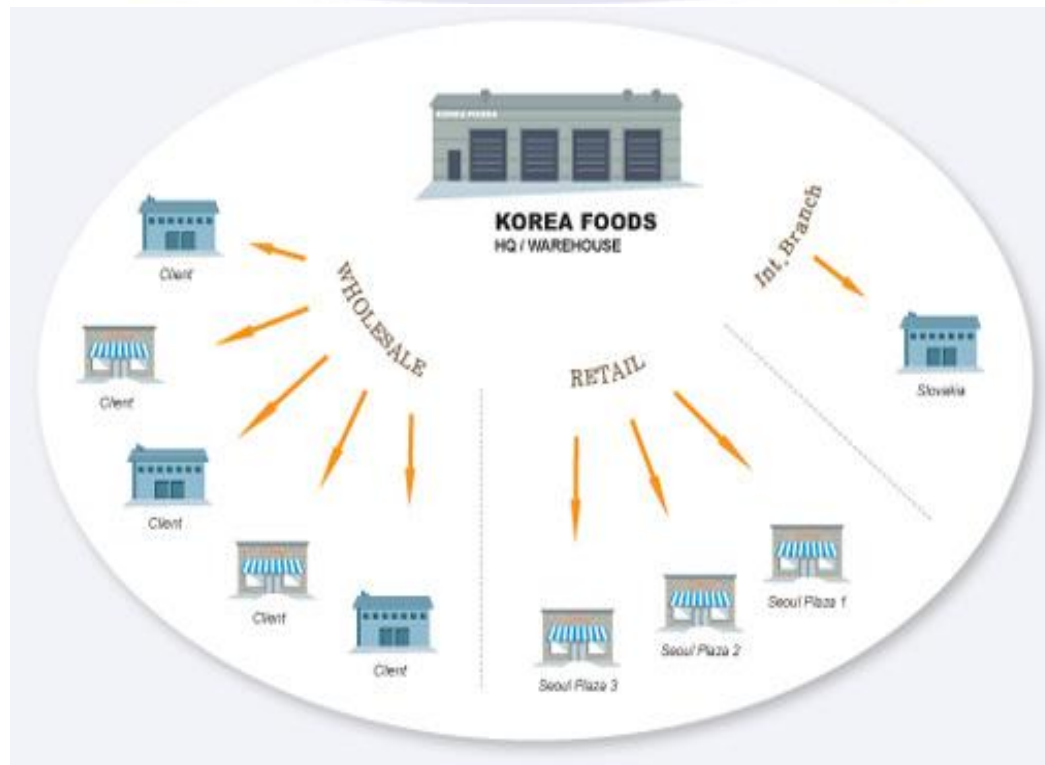
소속 와일드플라워 린넨 (대표, 수석디자이너)

경력 2001~ 와일드플라워 린넨 대표, 수석디자이너
미국 파슨스 디자인 스쿨 오티스미술대학 수석강사



Export to the UK

Department stores, Drugstores



International licensing

China

CFDA 国家食品药品监督管理总局
China Food and Drug Administration

UK



Delphic HSE Solutions Ltd

EU Cosmetic Regulation 1223/2009 services and support
Toxicological Risk Assessment
Effective health, safety and environmental
management systems

Halal



New product developments

Anti-acme

Why...?



Dark Circle

- ✓ 눈주위 피부가 약해졌을 때.
- ✓ 피로누적으로 인한 색소침착.
- ✓ 메이크업 잔여물로 인한 색소침착.



Pigmentation

- ✓ 자외선으로 인한 멜라닌 색소침착. DDDY 연구.
- ✓ 뽕루지가 지나간 자리.
- ✓ 호르몬변화로 인한 색소침착.



Telangiectasis

- ✓ 피부층이 얇아져 비춰보이는 혈관.
- ✓ 체온조절/신진대사에 의한 모세혈관 확장.
- ✓ 혈관수축으로 인한 붉어짐.

After-care

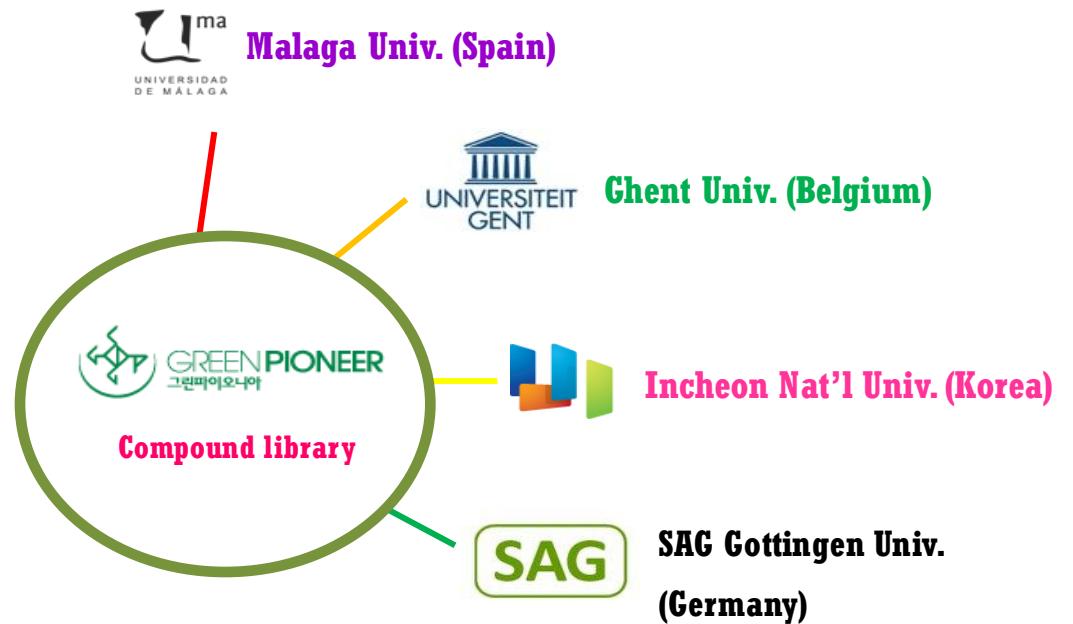
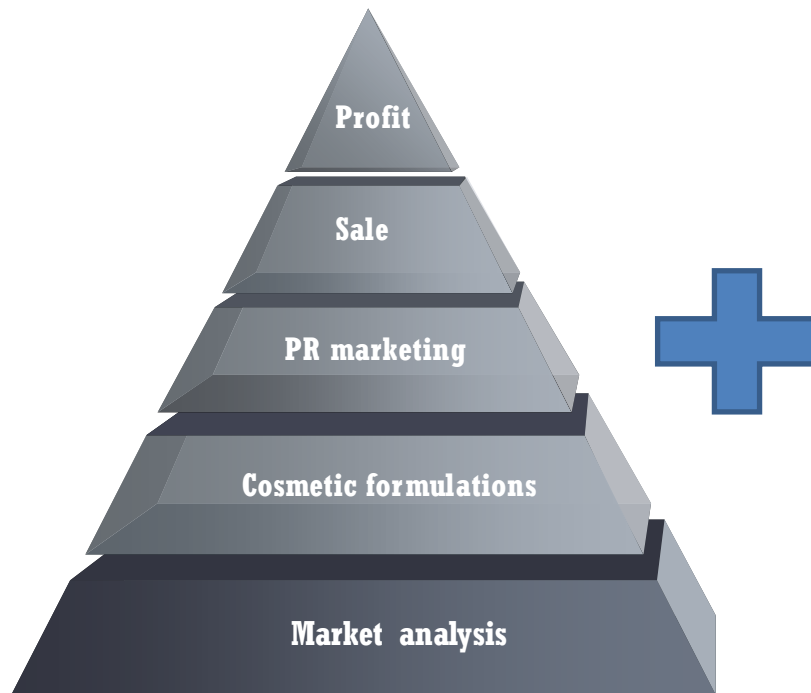


Upgrading the existing brands



International cooperation

BeautyLine



Functional compounds in green algae

Chlorophyta	Bioactivity
Order Bryopsidales	
<i>Avrainvillea</i>	Anticancer
<i>Bryopsis</i>	Antimicrobial
<i>Caulerpa</i>	Anti-hepatotoxicity ¹ ; antitumor ^{2,3} ; antinociceptive ⁴ ; anti-inflammatory ⁵ ; antiherpetic ⁶ ; antiviral ⁷
<i>Codium</i>	Antioxidative and antigenotoxic ¹ ; antiviral ² ; anticoagulant ³
<i>Derbesia</i>	Proliferation of thymus cells
<i>Halimeda</i>	Anticoagulant ¹ ; antimicrobial ² ; antioxidant ³ ;
<i>Penicillus</i>	Antimicrobial
<i>Tydemania</i>	Anticancer
Order Cladophorales	
<i>Chaetomorpha</i>	Anti-atherosclerotic
<i>Cladophora</i>	Antiprotozoal
<i>Cladophoropsis</i>	Cytotoxicity
Order Dasycladales	
<i>Cymopolia</i>	Antimicrobial ¹ ; antimutagenic ²
Order Ulotrichales	
<i>Acrosiphonia</i>	Antimicrobial
Order Ulvales	
<i>Ulva/Enteromorpha</i>	Antioxidant ¹ ; antiviral ² ; anti-inflammatory ^{3,10} ; antihyperlipidemic ⁵ ; antitumor ^{6,12} ; antimicrobial ^{7,8} ; antiprotozoal ⁹ ; antibacterial ¹¹ ; immunomodulating ¹² ;
<i>Monostroma</i>	Antithrombin ¹ ; antiherpetic ² ; anticoagulant ³ ;



Functional compounds in brown algae

Ochrophyta	Bioactivity
Order Dictyotales	
<i>Canistrocarpus</i>	Antivenom
<i>Dictyopteris</i>	Antimicrobial
<i>Dictyota/Dilophus</i>	Antivenom ¹ ; anticoagulant ² ; antiviral ³ ; antibacterial ⁴ ; antifungal ^{5,4} ; antioxidant ⁶
<i>Lobophora</i>	Anti-inflammatory
<i>Padina</i>	Antimicrobial ¹ ; antioxidant ² ; cytotoxicity ³ ; anticoagulant ⁴ ; anti-cancer ⁵
<i>Spatoglossum</i>	Antifungal ¹ ; antithrombotic ² ; hypoglycemic ³
<i>Stoechospermum</i>	Antiviral
<i>Stypopodium</i>	Antivenom ¹ ; antiproliferative ² ; antimitotic ² ; cytotoxic ³ ; antimicrobial ⁴
<i>Zonaria</i>	Antimicrobial
Order Ectocarpales	
<i>Adenocystis</i>	Antiviral
<i>Cladosiphon</i>	Induces apoptosis ¹ ; anticancer ² ; gastric mucosal protection ³
<i>Colpomenia</i>	Antimicrobial ¹ ; induction of apoptosis ²
<i>Dictyosiphon</i>	Antiviral
<i>Leathesia</i>	Antiviral
<i>Nemacystus</i>	Anticoagulant
<i>Punctaria</i>	Antitumor
Order Fucales	
<i>Ascophyllum</i>	Anti-inflammatory ¹ ; antithrombotic ² ; anticoagulant ³
<i>Bifurcaria</i>	Antifouling activity ¹ ; anti-proliferative effect ² ; antimitotic ³
<i>Caulocystis</i>	Anti-inflammatory
<i>Cystoseira</i>	Antimicrobial ^{1,6} ; antibacterial ² ; antifungal ³ ; antioxidant ⁴ ; antiviral ⁵
<i>Durvillaea</i>	Anticoagulant
<i>Fucus</i>	antioxidant ¹ ; antitumor; antimetastatic ² ; antivenom ³ ; anticoagulant ⁴ ; antithrombin ⁵
<i>Himanthalia</i>	Analgesic activity

Ochrophyta	Bioactivity
<i>Hizikia</i>	Anticoagulant ² ; antioxidant ² ; immunomodulating ³
<i>Myagropsis</i>	Hepatoprotective
<i>Notheia</i>	Anti-parasitic
<i>Pelvetia</i>	Anticoagulant ¹ ; antioxidant ² ; anti-diabetic ³
<i>Sargassum</i>	Anticancer ¹ ; antiviral ² ; antioxidant ^{3,5,10} ; antibacterial ⁴ ; anti-inflammatory ⁶ ; antiangiogenic ⁷ ; antitumoral ^{8,9} ; antiviral ¹⁰ ; antitherapeutic ¹¹
<i>Turbinaria</i>	Antioxidant ¹ ; anti-inflammatory ¹ ; cytotoxic ²
Order Ishigeales	
<i>Ishige</i>	Antiviral
Order Laminariales	
<i>Alaria</i>	Antiviral
<i>Ecklonia</i>	Antioxidant ^{1,6} ; antiviral ² ; antibacterial ^{3,6} ; anticoagulant ⁴ ; anti-tumor ⁵
<i>Egregia</i>	Antiviral
<i>Eisenia</i>	Antioxidant ¹ ; antiviral ² ; anti-allergic ³
<i>Kjellmaniella</i>	Antimicrobial
<i>Laminaria</i>	Anticancer ¹ ; anti-oxidative; anti-inflammatory ² ; anticoagulant ³ ; antithrombin ⁴ ; neuroprotective ⁵ ; antioxidant ⁶ ; antiproliferative ⁶
<i>Landsburgia</i>	Antifungal; cytotoxic
<i>Lessonia</i>	Anticoagulant activity
<i>Macrocystis</i>	Anticoagulant ¹ ; antioxidant ² ; antiproliferative ²
<i>Nereocystis</i>	Antioxidant ¹ ; antiproliferative ¹
<i>Undaria</i>	Anti-aging ¹ ; antiviral ^{2,3} ; antioxidant ⁴ ; anti-inflammatory ⁵ ; antitumor ⁶
Order Ralfsiales	
<i>Ralfsia</i>	Antiviral
Order Scytosiphonales	
<i>Analipus</i>	Antiviral
<i>Endarachne</i>	Antiviral
<i>Hydroclathrus</i>	Anti-cancer ¹ ; antiviral ²



Functional compounds in red algae

Rhodophyta	Bioactivity
Order Bangiales	
<i>Porphyra</i>	Anti-inflammatory ¹ ; anticancer ² ; induction of apoptosis ³ ; macrophage stimulation ⁴ ; antioxidant ⁵
Order Bonnemaisoniales	
<i>Asparagopsis</i>	Antiviral ¹ ; antibacterial ² ; antimicrobial ³ ; anti-HIV ⁴ ;
<i>Bonnemaisonia</i>	Angiotensin-I-converting enzyme (ACE) inhibitory activities
<i>Delisea</i>	Anti-phytopathogenic
Order Ceramiales	
<i>Acanthophora</i>	Antiviral
<i>Aglaothamnion</i>	Antioxidant
<i>Amansia</i>	Lymphocyte transformation ¹ ; antinociceptive ²
<i>Boergesenella</i>	Antiviral
<i>Bostrychia</i>	Antiprotozoal ¹ ; antifungal ² ; antiviral ³
<i>Bryothamnion</i>	Antioxidant ¹ ; antinociceptive ²
<i>Ceramium</i>	Antiviral ¹ ; antiprotozoal ² ; antibacterial ³
<i>Centroceras</i>	Antibacterial; anticancer
<i>Chondria</i>	Anthelmintic
<i>Cottoniella</i>	Mammalian insulin release modulator
<i>Cryptopleura</i>	Antiviral
<i>Delesseria</i>	Inhibit the release of inflammatory cytokines ² ; anticoagulant ³
<i>Drachiella</i>	Antibacterial
<i>Lithophyllum</i>	Angiotensin-I-converting enzyme (ACE) inhibitory activities
<i>Lithothamnion</i>	
<i>Marginisporum</i>	Antitumor
Order Gelidiales	
<i>Gelidiella</i>	Contraceptive
<i>Gelidium</i>	Antiviral ¹ ; growth-inhibitory effects of cells ² ; anticoagulant ³
<i>Pterocladia/Pterocladia</i>	Antiviral ¹ ; antihypertensive ²
Order Gigartinales	
<i>Agardhiella</i>	Anti-HIV ¹ ; antiviral ²
<i>Ahnfeltiopsis</i>	Angiotensin-I-converting enzyme (ACE) inhibitory activities
<i>(Callophycus)</i>	Antineoplastic
<i>Callophyllis</i>	Anti-HIV
<i>Chondrus</i>	Immunomodulatory ¹ ; antitumor ¹
<i>Dilsea</i>	Antifungal
<i>Eucheuma</i>	Anti-tumor
<i>Furcellaria</i>	Antioxidant
<i>Gigartina</i>	Antiviral ¹ ; anticoagulant ²
<i>Gloiopeltis</i>	Therapeutic potential in hepatoma cancer ¹ ; anti-tumor ² ; antiviral ³ ;
<i>Gymnogongrus</i>	Antiviral
<i>Hyalosiphonia</i>	Antiviral
<i>Hypnea</i>	Antiviral ¹ ; PPE elastase inhibition ²
<i>Kappaphycus</i>	Anti-tumor
<i>Meristiella</i>	Antiviral
<i>Meristotheca</i>	Cell stimulating activity
<i>Portieria</i>	Anti-tumor ¹ ; antimicrobial ² ;



Frame effects



J Appl Phycol
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Potential applications of nuisance microalgae blooms

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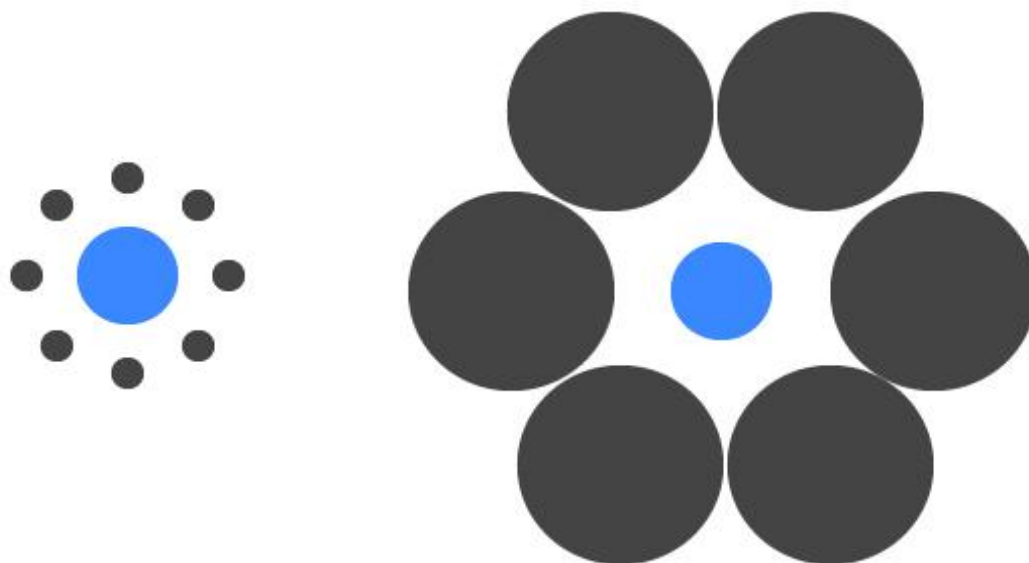
Abstract Algal blooms have become a major concern in coastal areas and the great lakes of the world. Because of their various consequences for aquatic ecosystems and resources, algal blooms are called “harmful algal blooms” (HABs). HABs often become severely detrimental when they involve one or more toxin-producing microalgae of various taxonomic origins. The accumulation of algal biomass also has deleterious effects on the ecological status of water. However, appropriate management strategies can allow the beneficial utilization of these events by consuming the biomass feedstock in the production of valuable biocommodities, including biofuels, functional food ingredients, UV-absorbing compounds, pharmaceutical products, etc. However, if the algal biomass can be harvested prior to the onset of their death phase, nutrients (carbon, nitrogen, and phosphorus) can also be removed from the ecosystem by harvesting the algal blooms. Great progress has been made in the last decade in monitoring and predicting HABs, and a demand is emerging for persuasive postevent management policies that focus on

the potential utilization of these blooms as natural renewable bioresources. This review summarizes various potential applications of nuisance algal blooms and the need for scientific research into their economic and industrial potential. Major algal products with great ecological and economic significance and their contemporary global utilization are analyzed.

Keywords Algal blooms · HABs · Renewable bioresources · Biomass

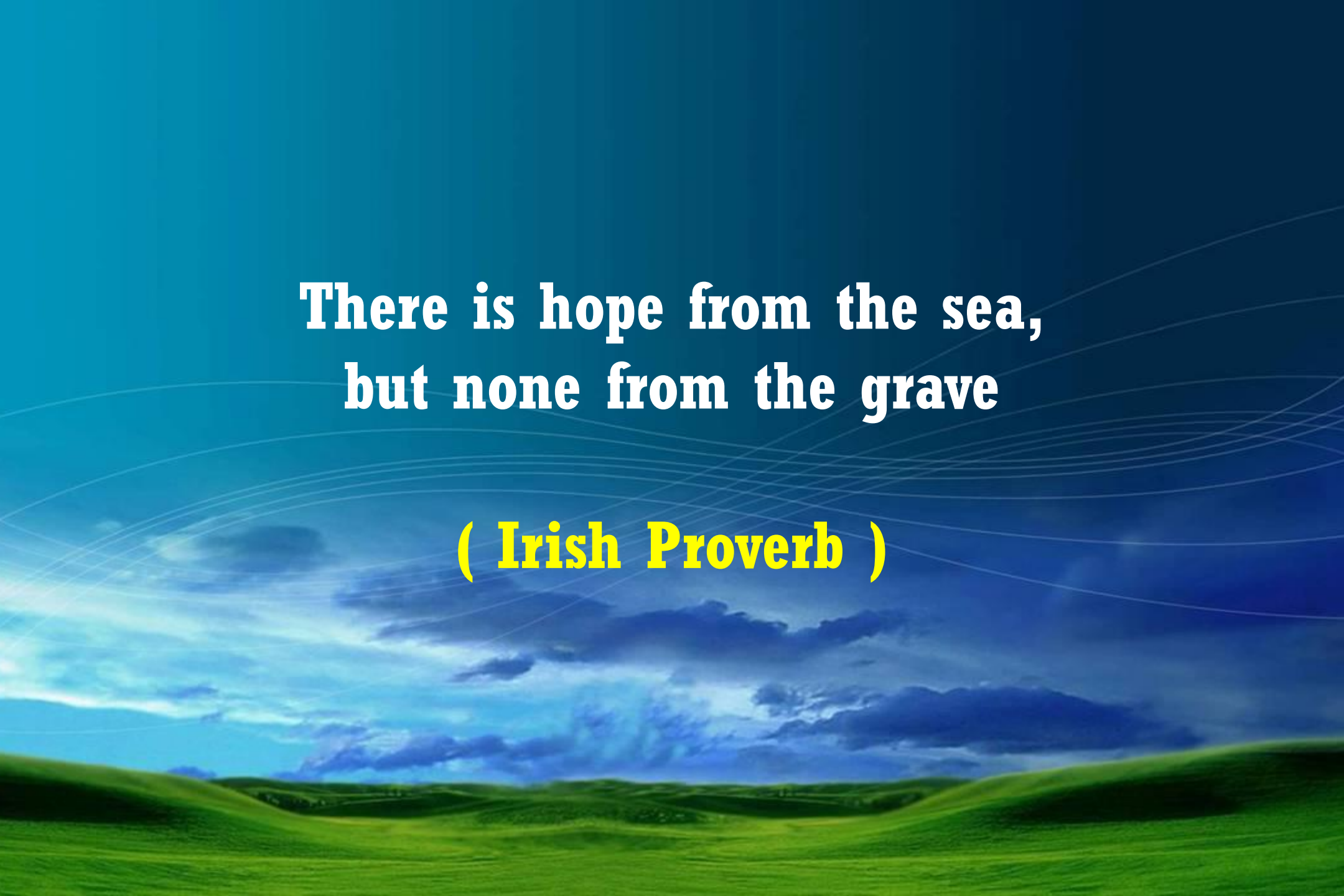
Introduction

Algal blooms have become a global epidemic, and the nature and frequency of harmful algal bloom (HAB) outbreaks has changed considerably over the last several decades (Anderson et al. 2012; Ferreira et al. 2011; O’Neil et al. 2012). Recently, countries including the USA, Canada, Greece, Norway, Spain, Portugal, Ireland, China, Japan, and Korea have invested



**There is hope from the sea,
but none from the grave**

(Irish Proverb)





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Thank you for your attention.