Demonstration of Innovative Functional food production systems based on more sustainable value chains of marine and freshwater raw materials for conscientious EU consumers

NOVAFOODIES

NOVAFOODIES PROJECT

Functional foods based on *Alaria esculenta* and *Gracilaria gracilis*, respectively

Constanta (Romania), 30th October 2025

Funded by the European Union

This project has received funding from the European Union under Grant Agreement N° 101084180.

NOVAFOODIES

General details & Partners

FUNDING PROGRAMME	Horizon Europe
GRANTING AUTHORITY	European Research Executive Agency
START-END DATE	1 May 2023 – 30 Apr 2026
TOTAL BUDGET	6,587,345.00 €
EU CONTRIBUTION	5,999,988.63 €
Nº PARTNERS	28 of 13 countries
PROJECT COORDINATOR	IDENER R&D

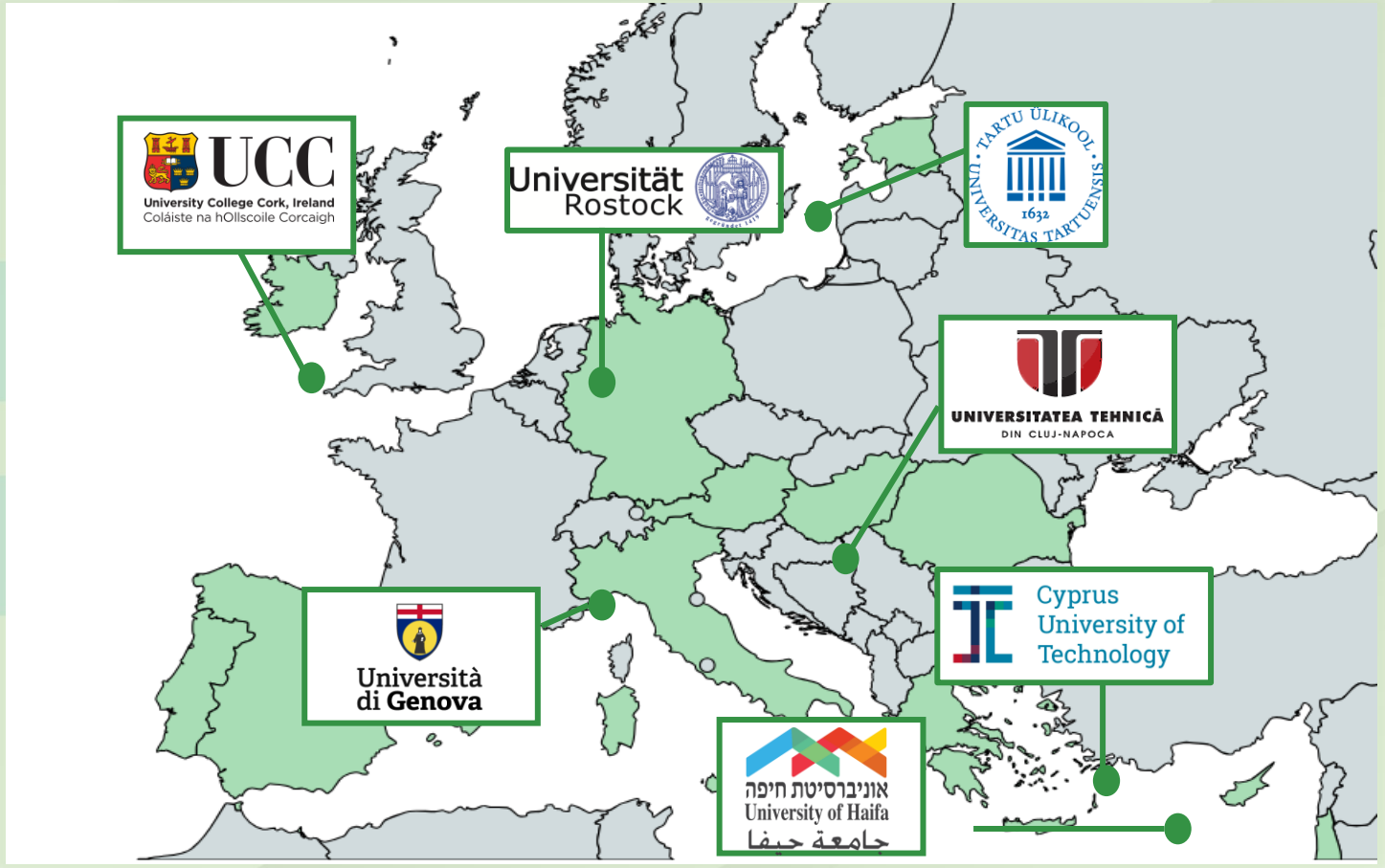
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NOVAFOODIES

General details & Partners

7 Universities



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NOVAFOODIES

General details & Partners

7 Universities

8 RTD centers



(China)

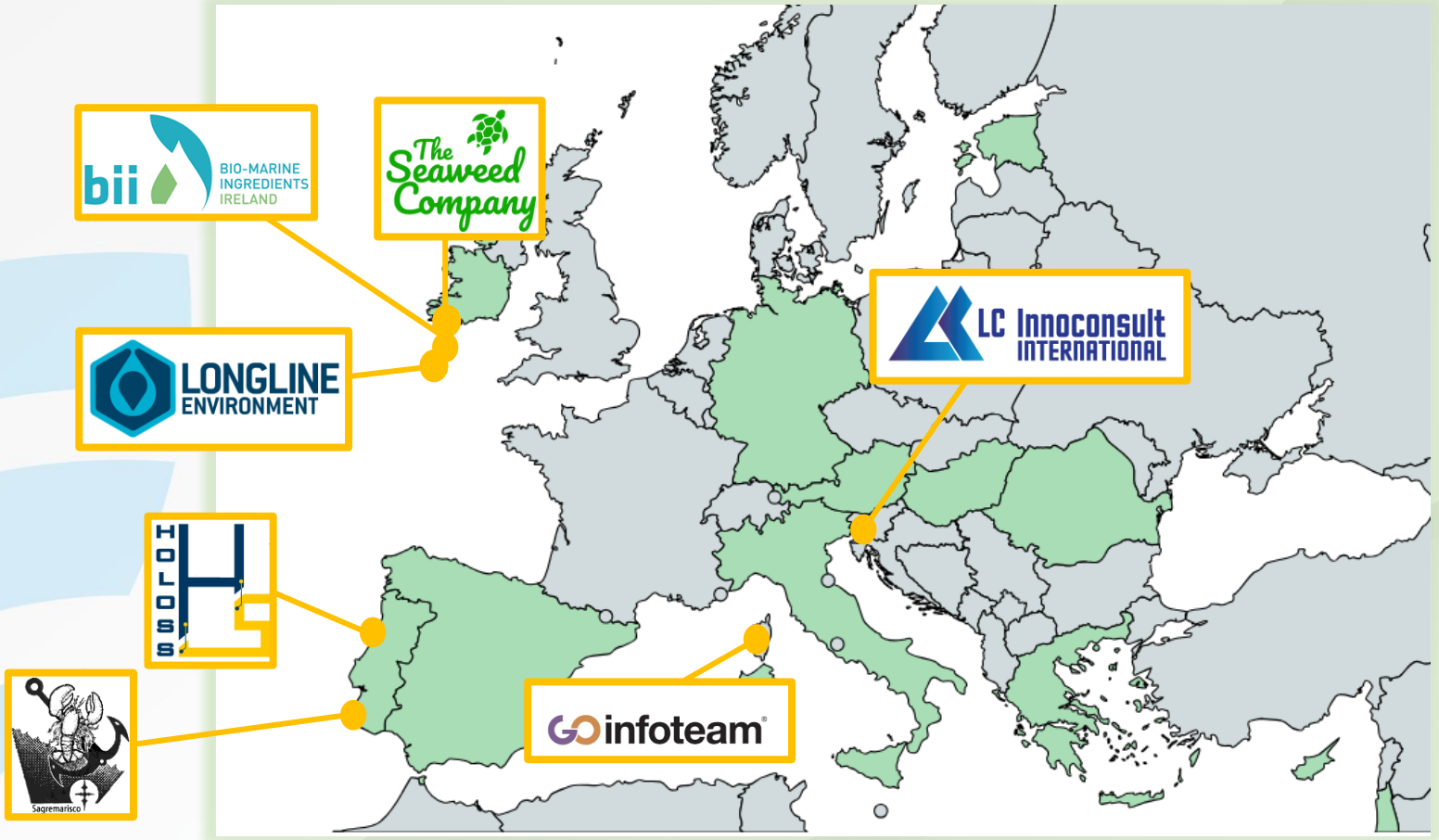
Funded by the European Union

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NOVAFOODIES

General details & Partners

- 7 Universities
- 8 RTD centers
- 7 SMEs



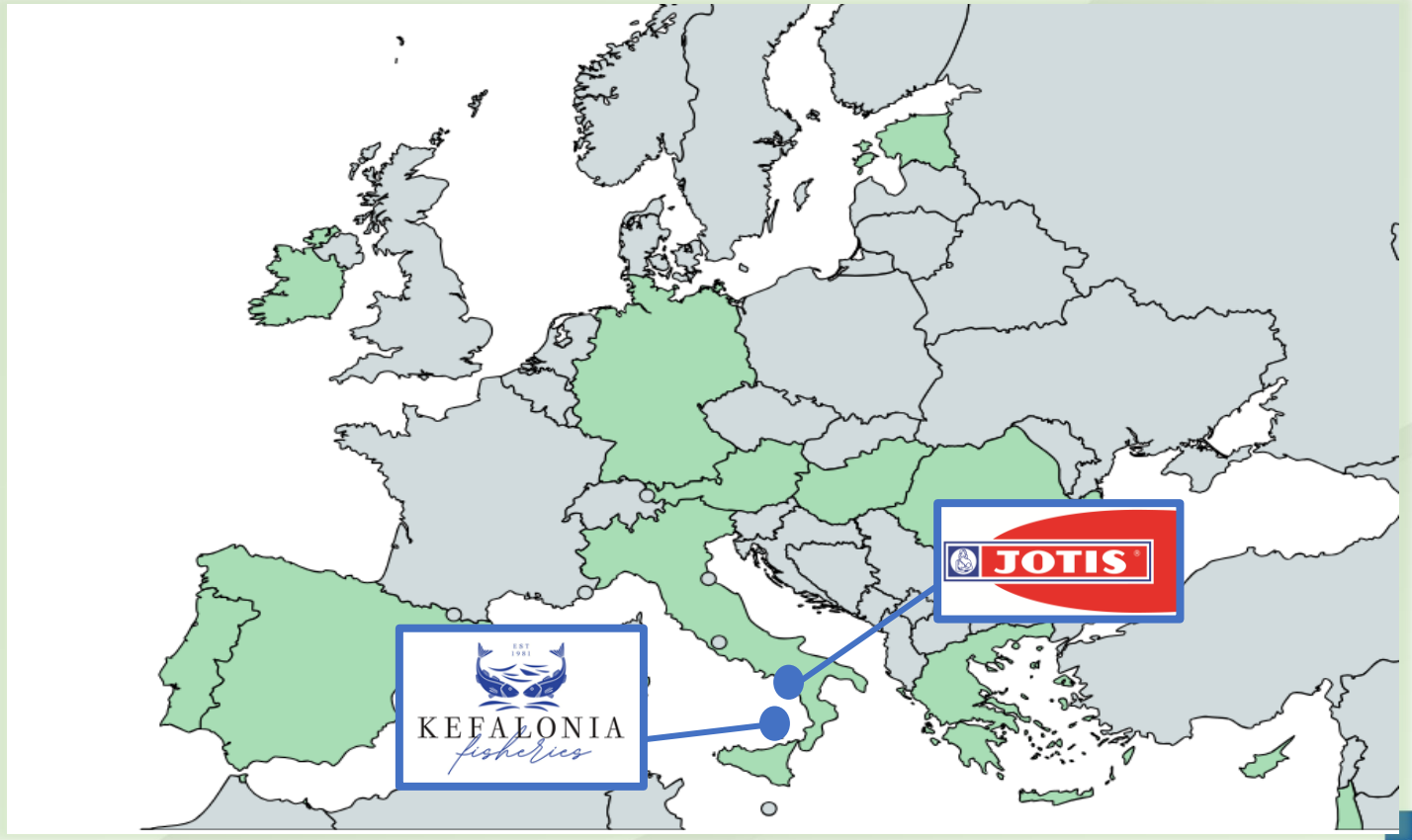
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NOVAFOODIES

General details & Partners

- 7 Universities
- 8 RTD centers
- 7 SMEs
- 2 Large companies



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NOVAFOODIES

General details & Partners

- 7 Universities
- 8 RTD centers
- 7 SMEs
- 2 Large companies
- 3 Associations



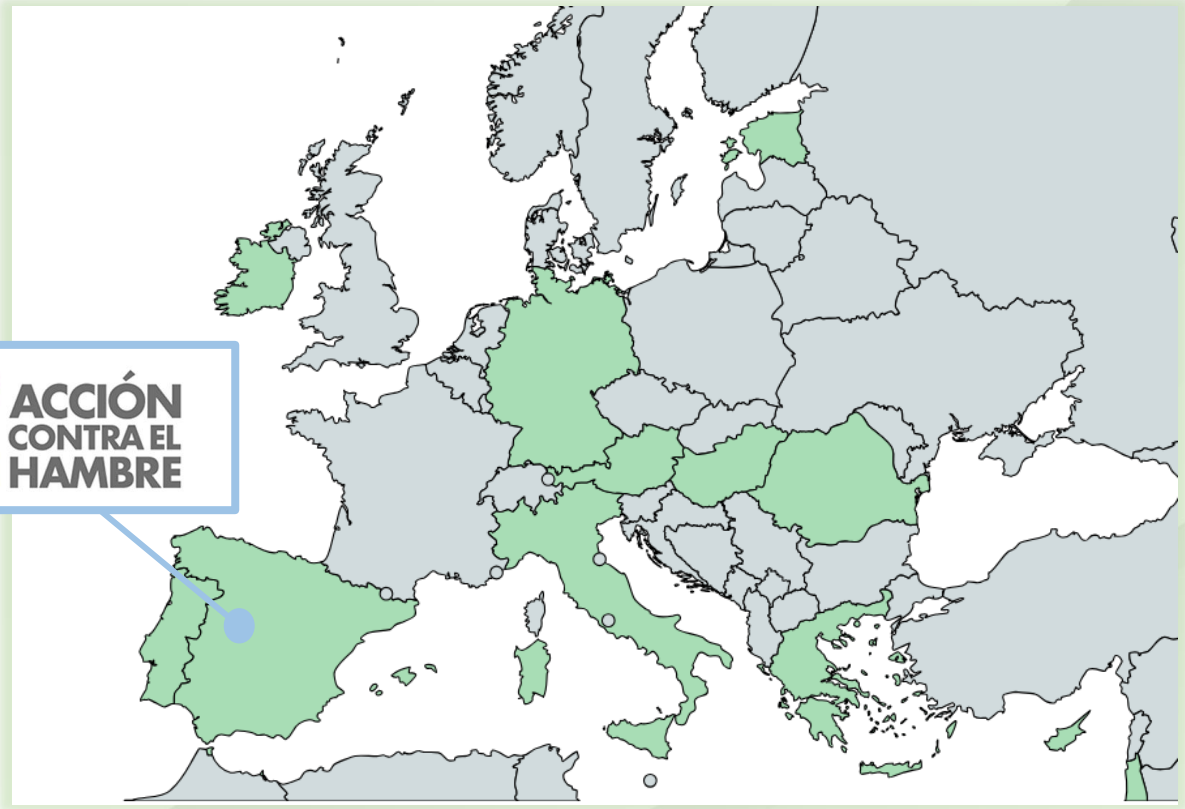
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NOVAFOODIES

General details & Partners

- 7 Universities
- 8 RTD centers
- 7 SMEs
- 2 Large companies
- 3 Associations
- 1 NGO



Funded by the European Union

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Demonstration of Innovative Functional food production systems based on more sustainable value chains of marine and freshwater raw materials for conscientious EU consumers

Main Objectives

Demonstrating
the sustainable production of macro and microalgae and other fish species, as a basis for novel functional food and feed production. Case studies will be performed in Europe, Israel and China, for a greater use of local resources and ecosystem services.

Working on
the valorization of wastes and fish biomass for a more circular and sustainable value chain. Innovation will focus on decreasing environmental impact of aquaculture, looking for more environmentally and economically friendly best practices.

Identifying
more sustainable processing and biorefinery concepts.

Formulating and developing
novel functional aquafeeds and food products for human consumption.

Ensuring
novel products entry to the market competitively, with consumers trust and confidence, with high quality and traceability, through transparency, and demonstrating greater value chain sustainability to stakeholders. This goal includes finding digital solutions to minimize loss of biomass and enhance shelf life.

Improving
workforce skills and competences, through the elaboration of training handbooks, online courses and workshops.

COVERING THE WHOLE VALUE CHAIN & SUSTAINABILITY

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Demonstration of Innovative Functional food production systems based on more sustainable value chains of marine and freshwater raw materials for conscientious EU consumers

NOVAFOODIES

Work Packages

- WP1. Optimisation and pilot scale designs of IMTA systems (M1-M12) — Università di Genova
- WP2. Operation and evaluation of IMTA upscaled designs — The Seaweed Company
- WP3. Finetuning of added-value eco-production systems and evaluation of pilot scale operation — AVI
- WP4. Verification of existing and new developments for processing algae and fish and extraction of compounds — idener
- **WP5. Evaluation of properties, formulation, novel functional products and biosecurity**
- WP6. IT tools development and monitoring for traceability and enhanced trust in the value chain — ITENE
- WP7. Value chain sustainability, socio-laboral inclusion and standardisation — HOLOS
- WP8. Dissemination, Exploitation, Clustering and Engagement — LC Innoconsult International
- WP9. Project Management — idener

Main developments & Expected results



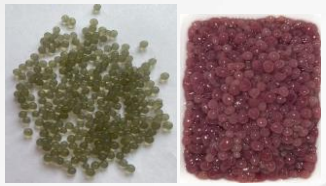
Spirulina-based Romanian Sarmale (Source: TUCN)



Pasta enriched with Chlorella (Source: TUCN)



Spirulina Pancakes (Source: TUCN)



Porphyra powders encapsulated for food subjected to termal treatment (Source: TUCN)



Red algae (Haematococcus pluviales)- based smoothie (Source: TUCN)

3) Novel foods for human consumption

UNIVERSITATEA TEHNICĂ DIN CLUJ-NAPOCA

JOTIS

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Is Gracilaria Gracilis compatible with incorporation into meat-based products?

9 steps Likert-scale evaluation (from “extremely unpleasant” to “extremely pleasant”)

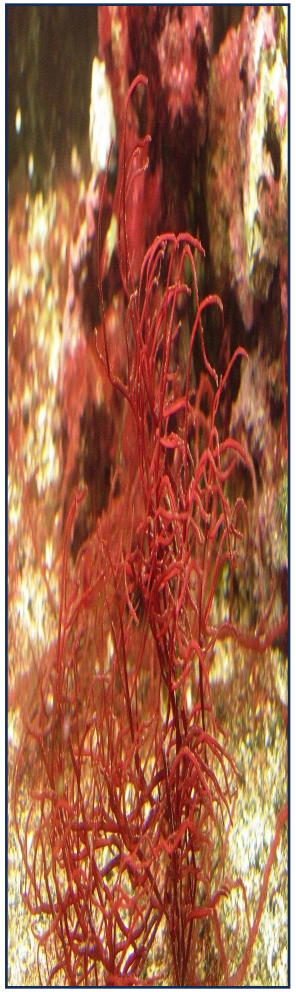
Recipe key variable: GRACILARIA GRACILIS (import from Aquaculture Technology Centre CTAQUA, Spain)

Minced pork fat 27.46%
Cold water 7.32%
Salt 0.5%
Garlic 0.27%
Pepper 0.12%
Nutmeg 0.10%
Paprika 0.08%
Carmine 0.08%

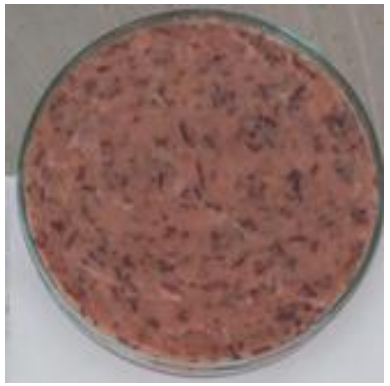
+

Minced pork meat 64.07%	0% Gracilaria (Sg0, reference sample)
Minced pork meat 63.07%	1% Gracilaria (Sg1 sample)
Minced pork meat 61.07%	3% Gracilaria (Sg3 sample)
Minced pork meat 59.07%	5% Gracilaria (Sg5 sample)

+



Product output: sausage composition and sausage appearance

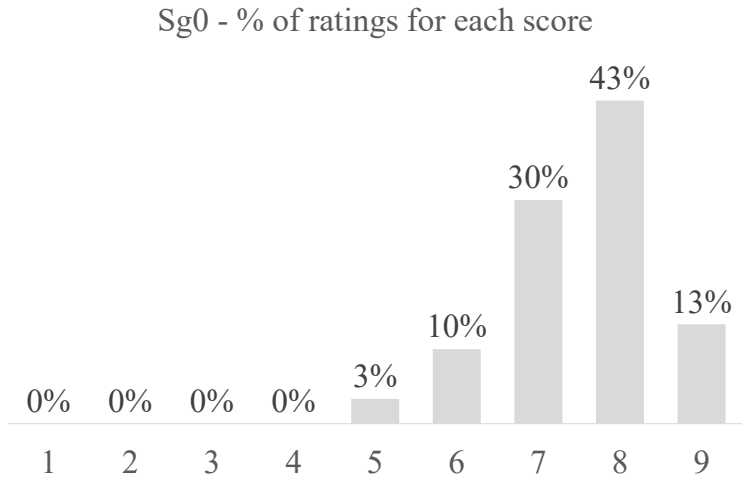
0% Gracilaria (Sg0, reference sample)	1% Gracilaria (Sg1 sample)	3% Gracilaria (Sg3 sample)	5% Gracilaria (Sg5 sample)
			
			

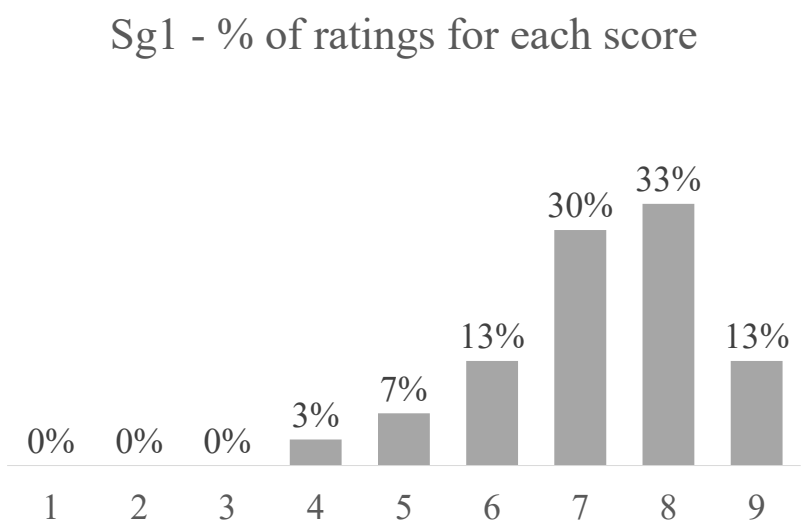
Research sample and key outcomes

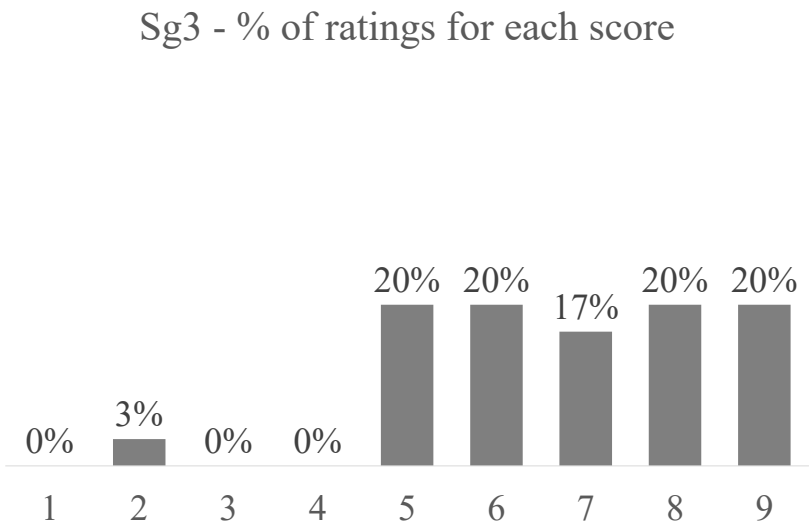
Age group		Gender		Urban	Rural
<18	7%	Female	7%	10%	0%
		Male	0%	0%	0%
18-30	70%	Female	50%	38%	78%
		Male	20%	19%	22%
31-50	10%	Female	3%	5%	0%
		Male	7%	10%	0%
50<	13%	Female	7%	10%	0%
		Male	7%	10%	0%
	100%		**100%**	**100%**	**100%**

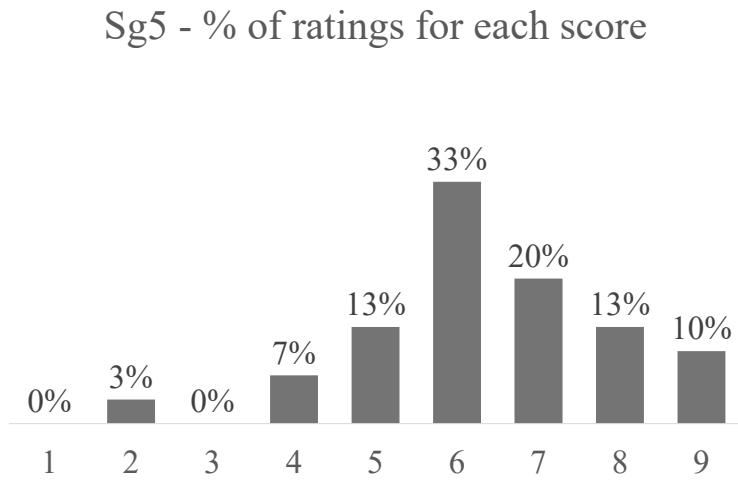
- **largely predominant positive (pleasant to extremely pleasant) product ratings**
- **especially taste, but also smell, could be subject to improvement, while largely positive ratings about the other product attributes**
- **strongly different ratings within the 18-30 age group, with no significant differentiation for all the other age groups**
- **overall positive ratings prevail, but a 15% smaller share of neutral ratings could easily turn either negative or positive**

Positive ratings (pleasant to extremely pleasant) prevail, but decline as the concentration of Gracilaria goes up

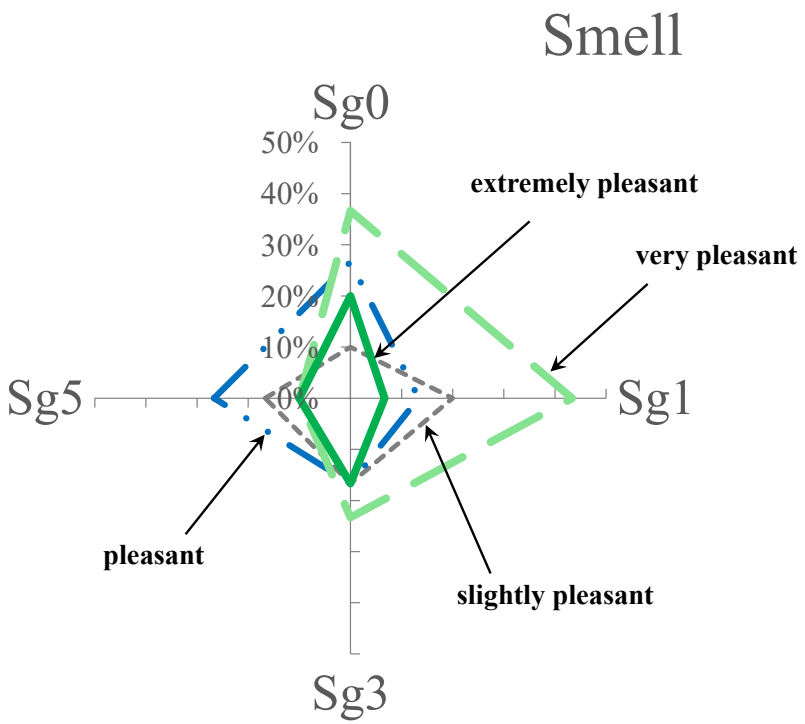




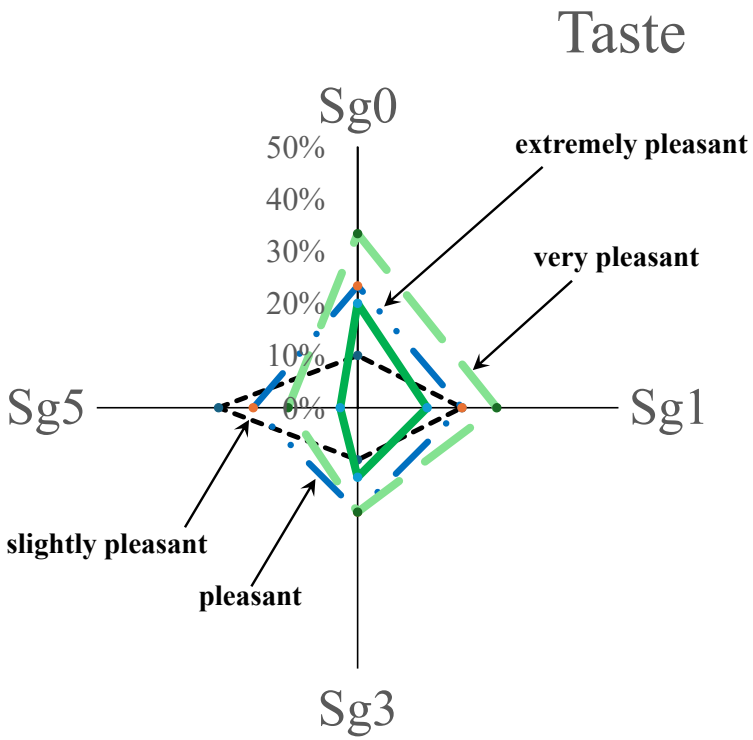




TASTE and SMELL trigger by far the consideration of all respondents



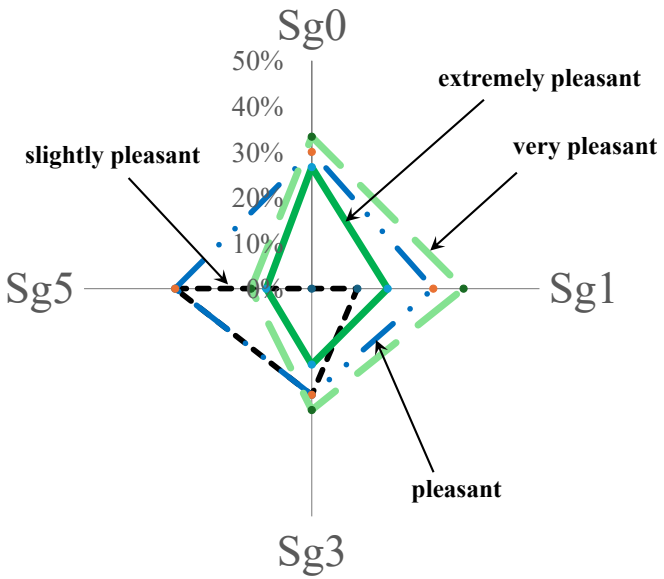
The almost smallest "extremely pleasant" ratings refer to SMELL … but, surprisingly, the highest "very pleasant" rating goes to Sg1



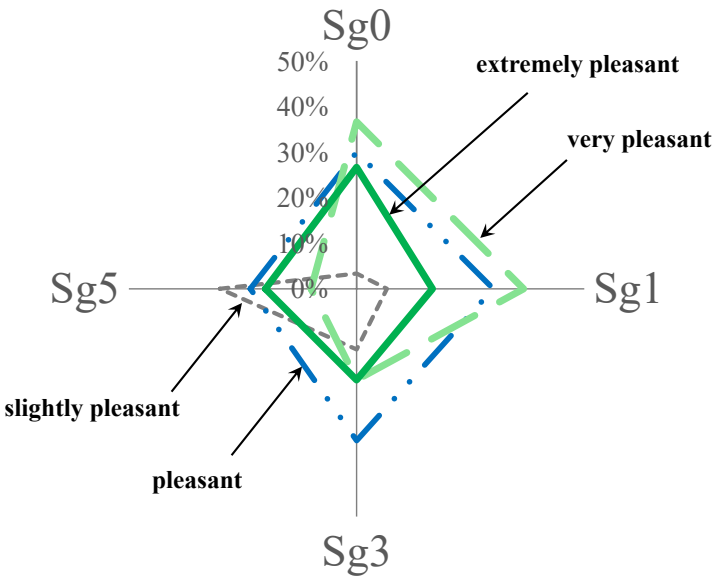
"Very pleasant" comes out assigned to Sg0, Sg1 and Sg3, while "extremely pleasant" ranks the lowest for all product varieties

Predominantly “very pleasant” attributes; less “slightly pleasant” as the concentration of algae goes up

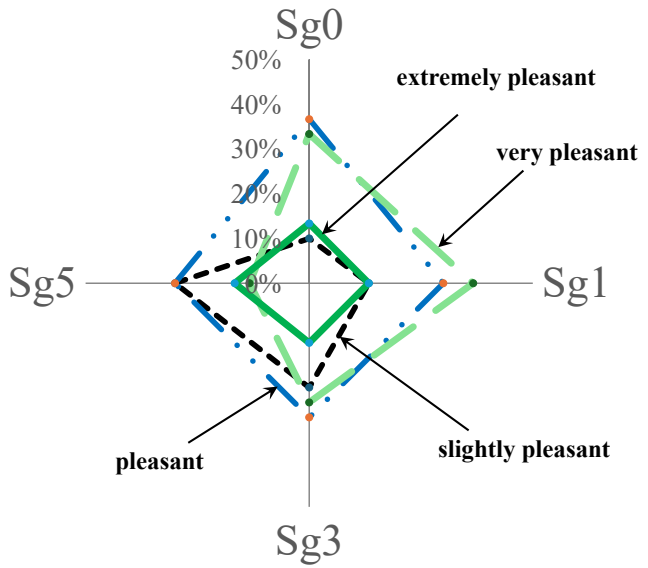
Cross section appearance and colour



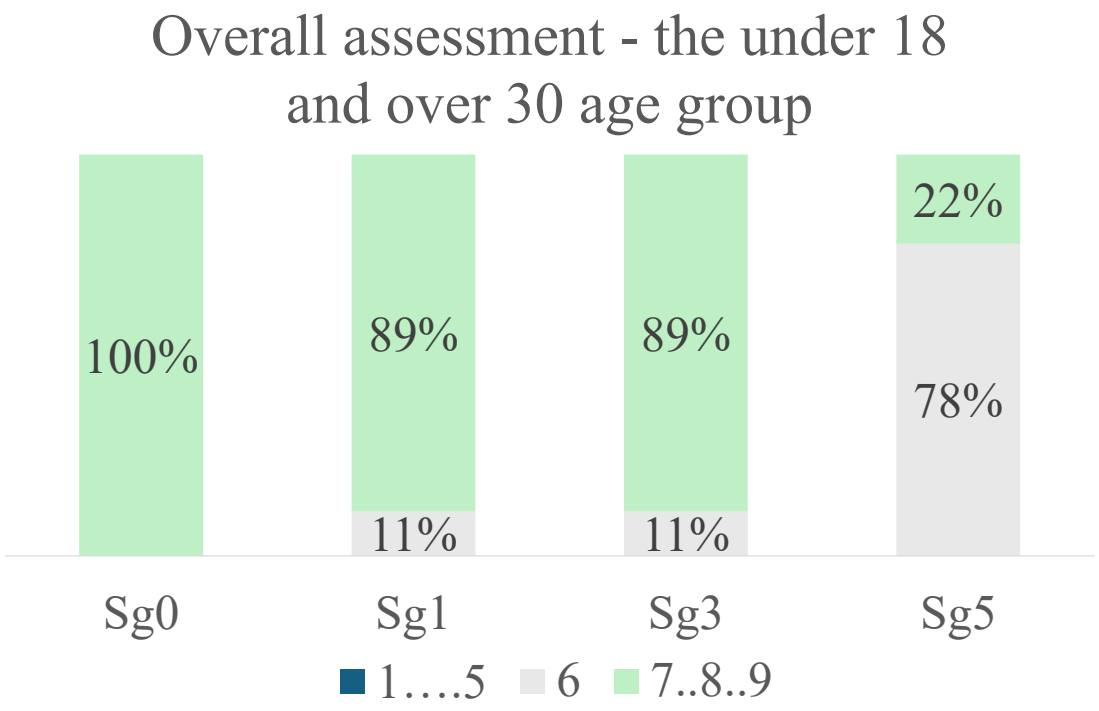
Appearance

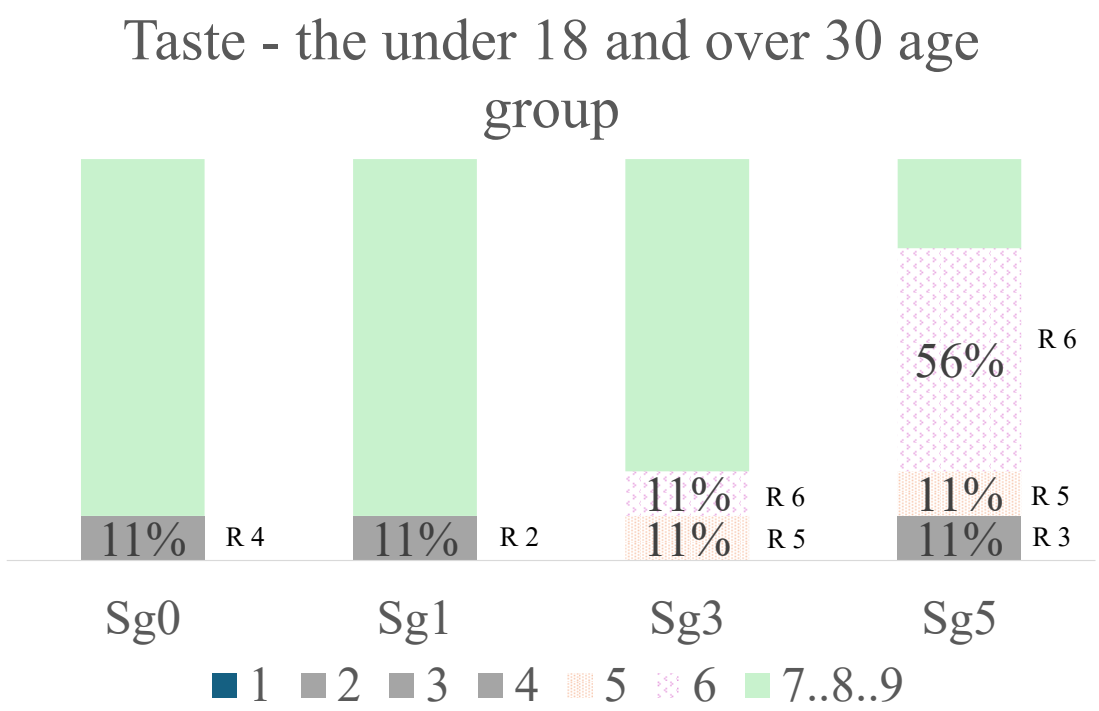


Richness



No significant differentiation between the under 18 and over 30 age group

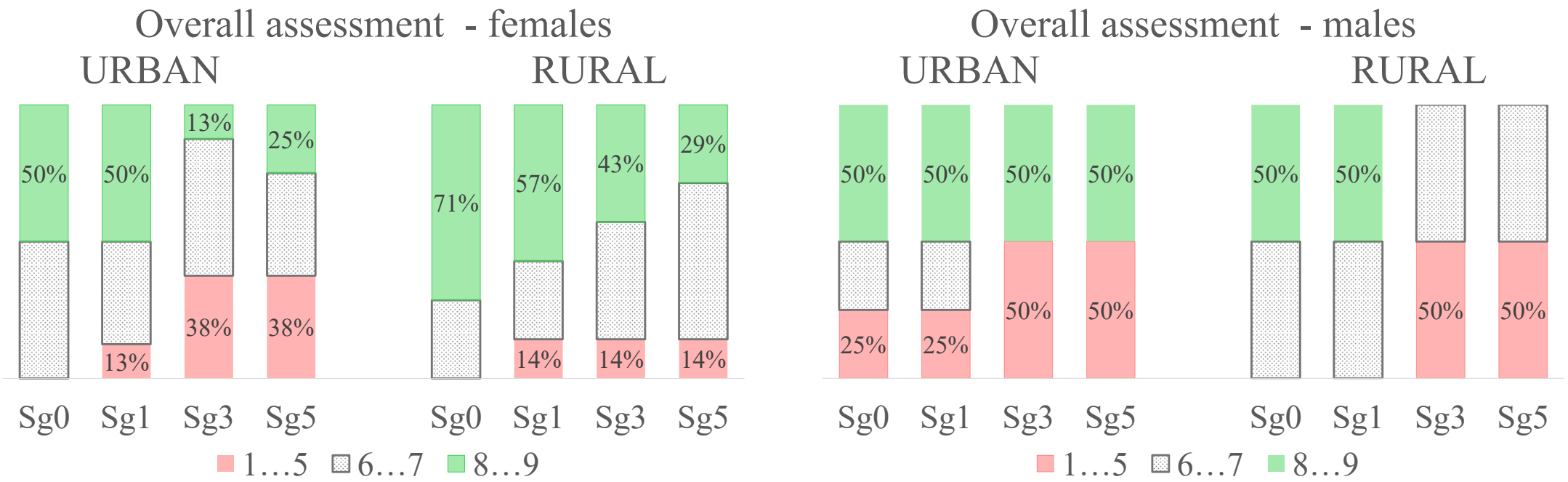




- **Almost identical ratings (overall assessment) for Sg0, Sg1 and Sg3, neutral evaluation for Sg5**

- **Taste is the sole product attribute about which some differentiation could be spotted (ex., SG3: 11% rate it as "neutral" (R5) and another 11% rate it "slightly pleasant")**

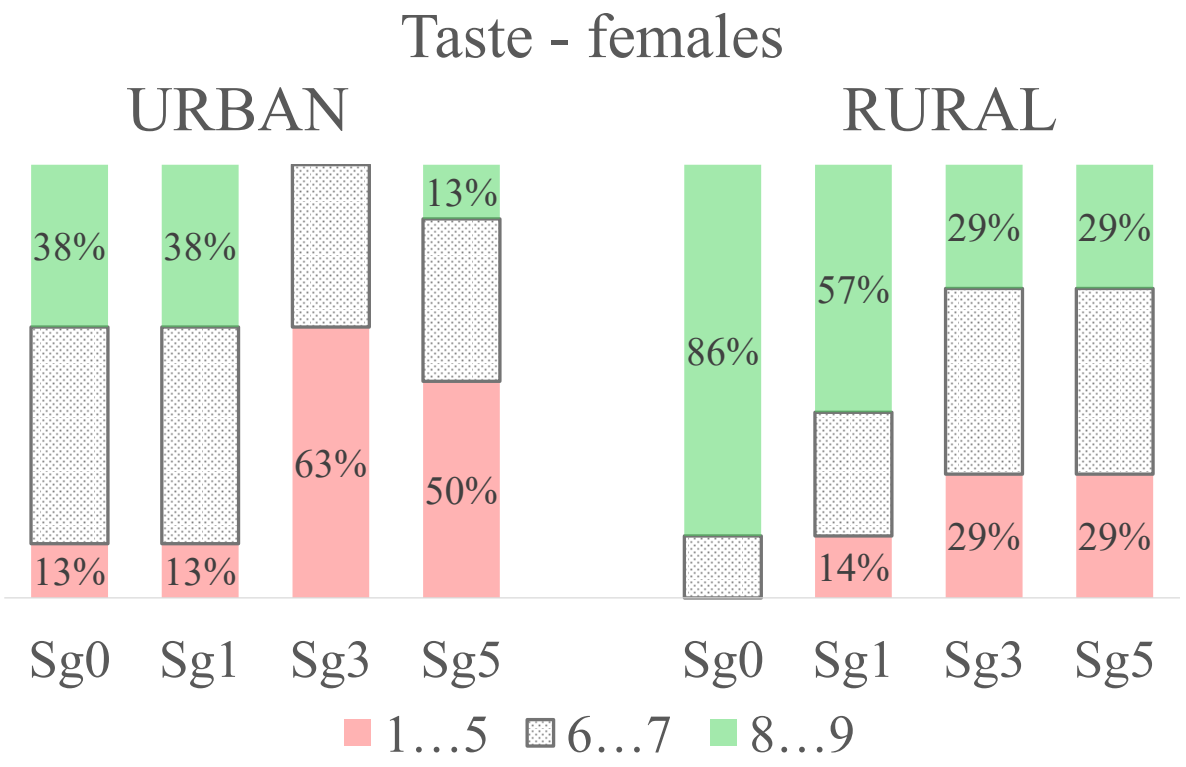
Considerably different perceptions within the 18 - 30 age group

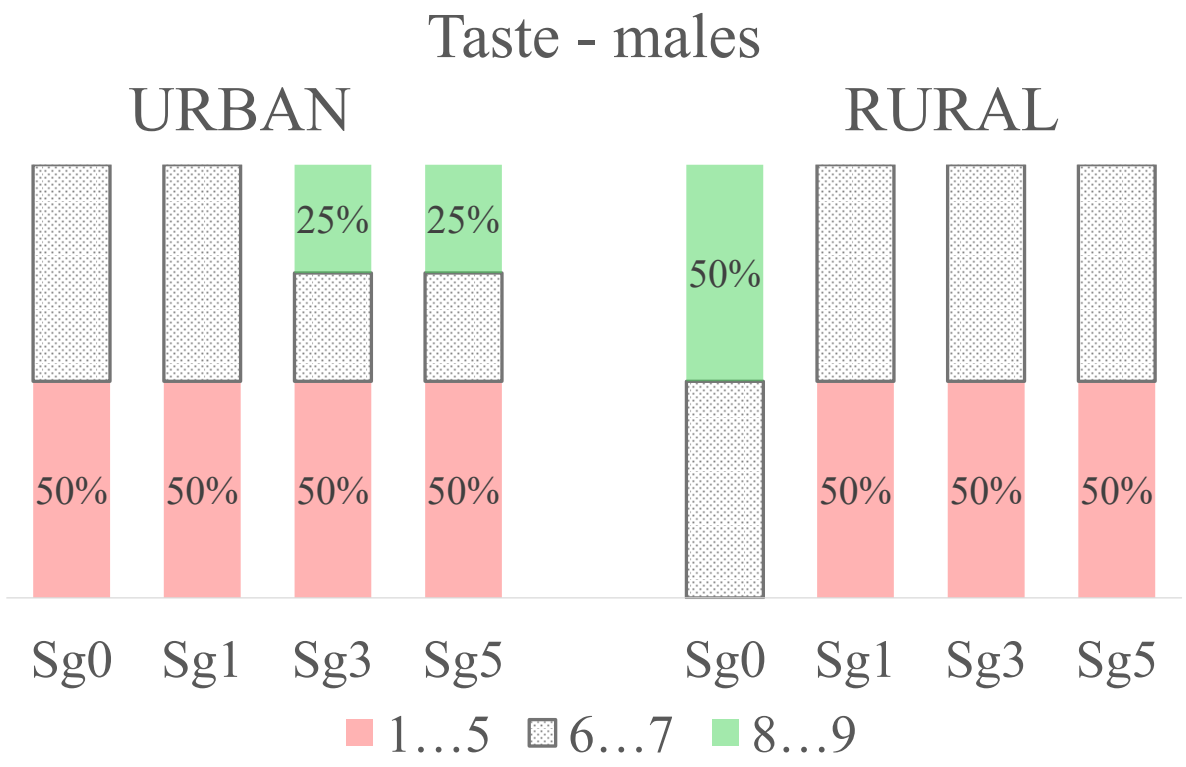


- **Urban males are divided equally between very positive ratings (8 and 9) and pleasant or less (7 or less). Females, both urban and rural, are predominantly positive even for Sg3 and Sg5.**

- **Some contrast appears between rural females (prevalently positive) and rural males (positive for Sg0 and Sg3, while positive and negative, in equal proportions for Sg3 and Sg5)**

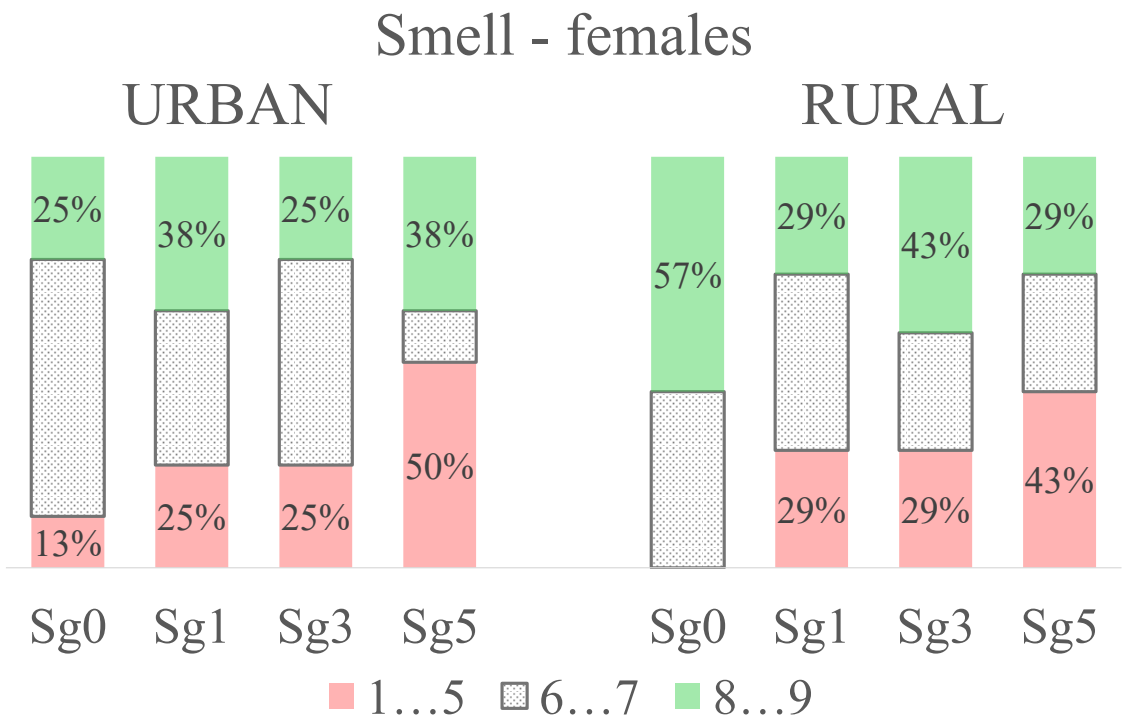
Considerably different perceptions within the 18 - 30 age group: the intense discord about TASTE

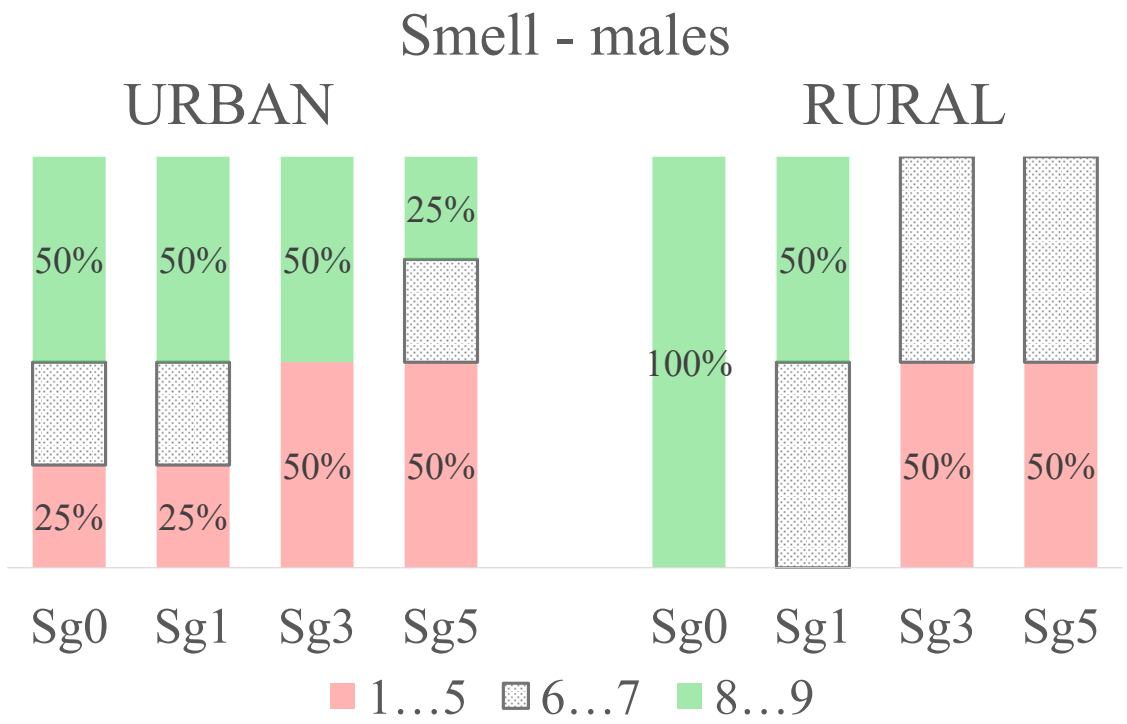




- **Good positive perception (6 and above) by rural females (while declining a little as the algae concentration grows)**
- **Prevailing negative evaluation by males, urban and rural, with a more positive perception about Sg0 only**

Considerably different perceptions within the 18 - 30 age group: the less intense discord about SMELL

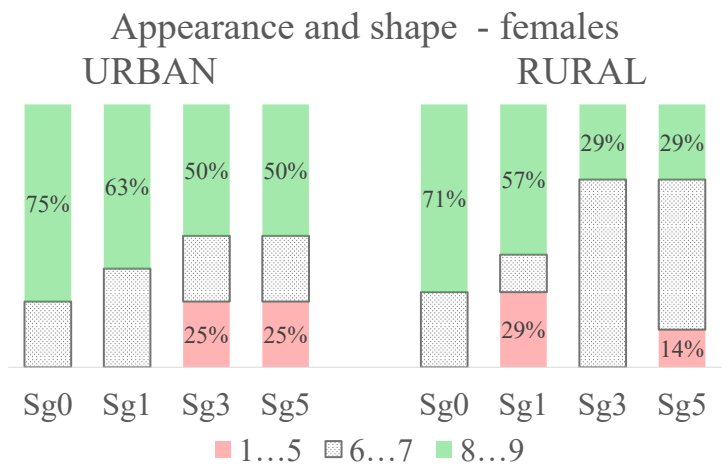


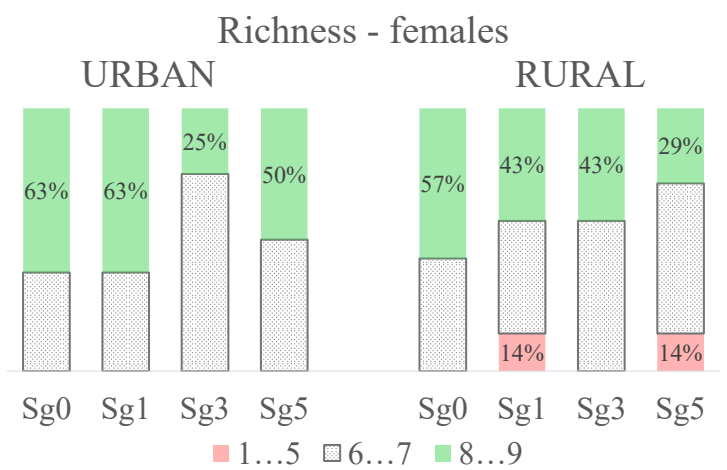


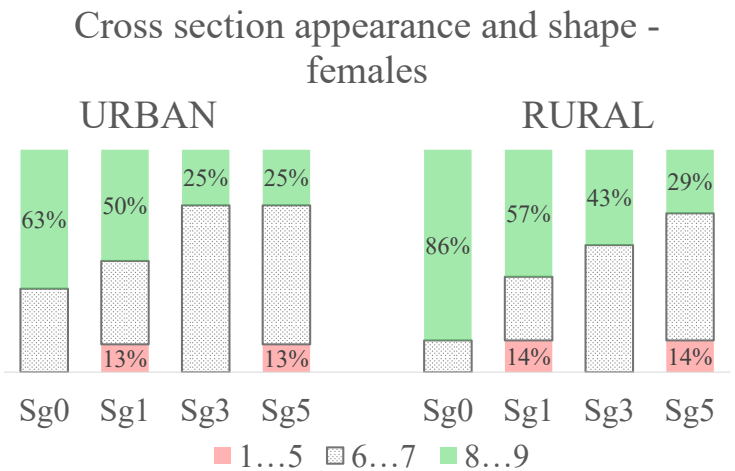
- **Very positive (8 and 9) and positive (6 and 7) evaluations are dominant or equal to negatives, both in terms of gender and residence**

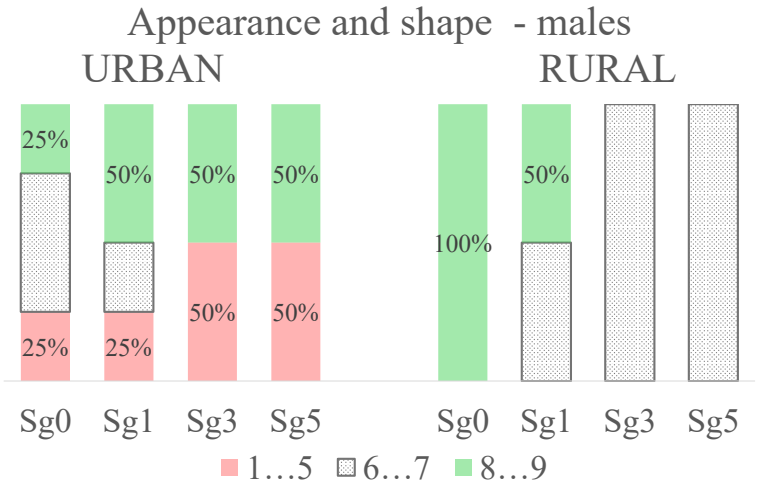
- **Negative evaluation by males, urban and rural, for Sg3 and Sg5, but at equal share to positive ratings**

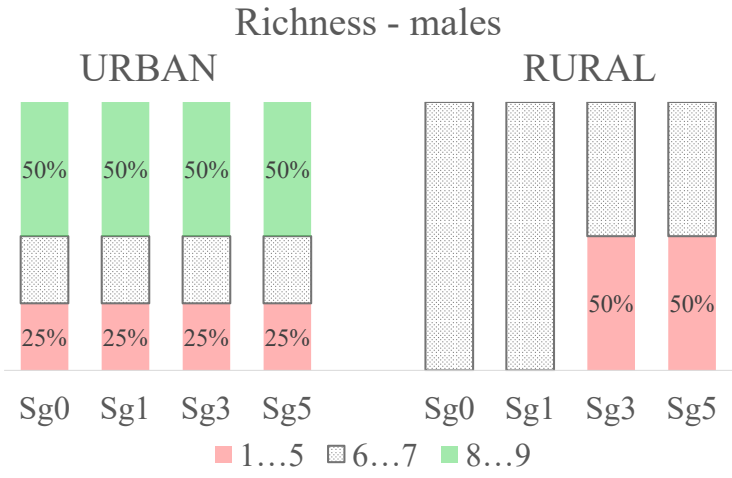
Considerably different perceptions within the 18 - 30 age group: the other product attributes

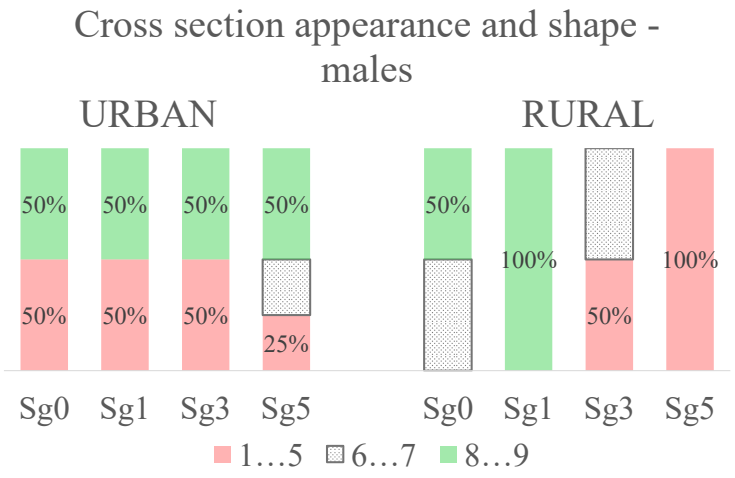












A lot of “females green” and frequent “males red”

Final qualitative decision: how much is “green”, how much is “grey” and how much could be improved



Alaria esculenta-based hamburgers

1. Hamburgers with *Alaria esculenta* addition in buns

a) Components and final product



Bun with 0% Alaria



Bun with 1% Alaria



Bun with 3% Alaria

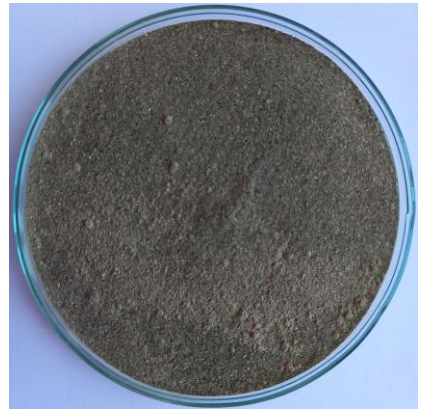


Bun with 5% Alaria


Meat before cooking


Meat after cooking


Sauce



Alaria esculenta powder and flakes

1. Hamburgers with *Alaria esculenta* addition in buns

a) Components and final product



Hamburger without Alaria



Hamburger with 1% Alaria in bun



Hamburger with 3% Alaria in bun



Hamburger with 5% Alaria in bun

1. Hamburgers with *Alaria esculenta* addition in buns

b) Sensory analysis

Gender:

Woman	34 %
Men	66 %

Age:

18-30 year	60 %
31 – 50 years	15 %
> 51 years	25 %

Education:

Academic level	96 %
Secondary level	4 %

Rezidence:

Village	43 %
City	57 %

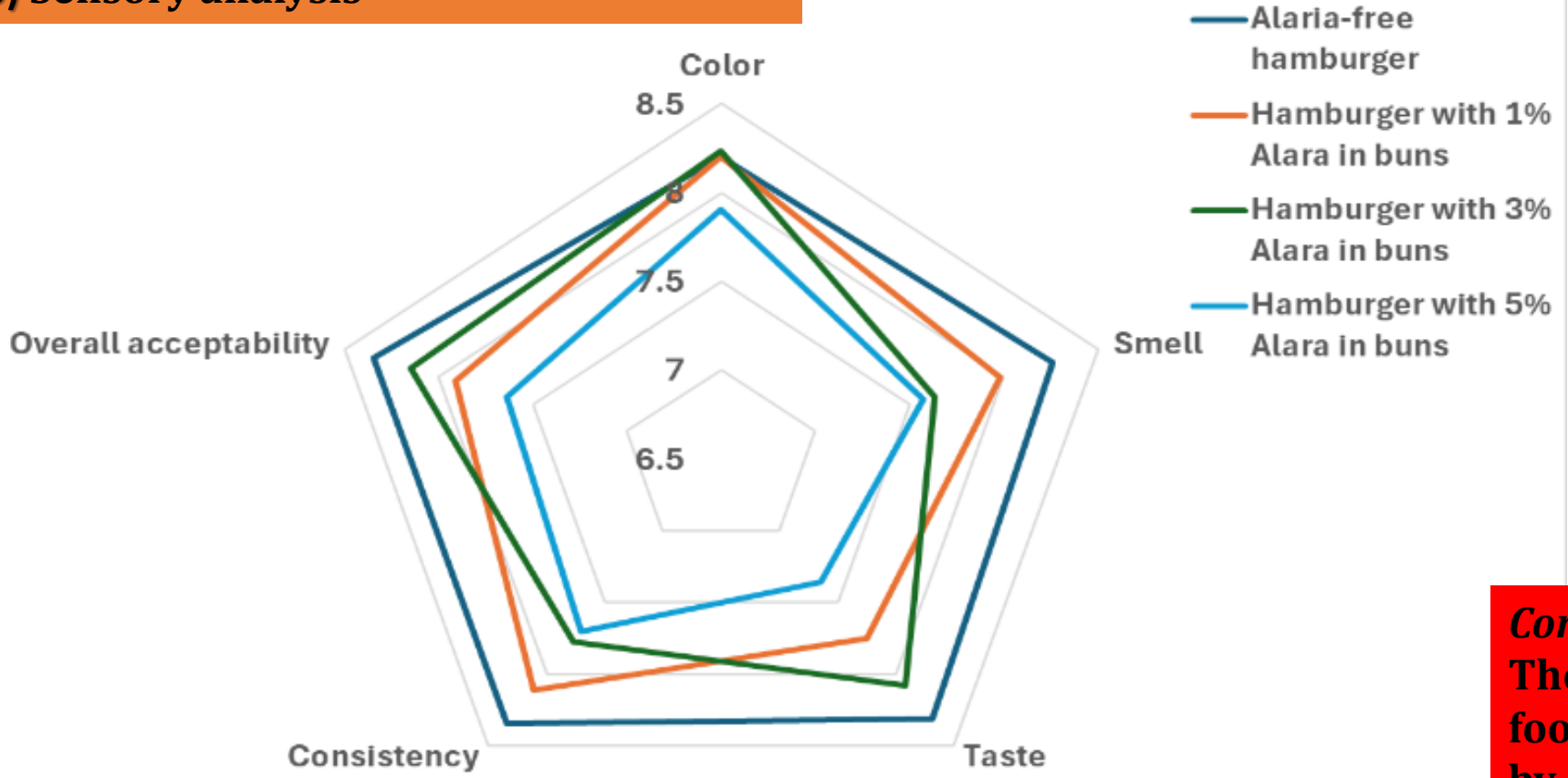






1. Hamburgers with *Alaria esculenta* addition in buns

b) Sensory analysis



Conclusions

The acceptability of the functional food was not significantly influenced by the increase in the content of *Alaria esculenta*, even if it was found in a mass percentage of 5% in the dough of the bun.

2. Hamburgers with *Alaria esculenta* addition in meat patty

a) Components and final product


Meat patty -free of Alaria


Meat patty with 1% Alaria


Meat patty with 3% Alaria


Meat patty with 5% Alaria


Meat patty with 10% Alaria




Bun


Sauce

2. Hamburgers with *Alaria esculenta* addition in meat patty

a) Components and final product



Hamburger without Alaria



Hamburger with 1% Alaria in meat patty



Hamburger with 3% Alaria in meat patty



Hamburger with 5% Alaria in meat patty



Hamburger with 10% Alaria in meat patty

2. Hamburgers with *Alaria esculenta* addition in meat patty

b) Sensory analysis

Gender:		
	Woman	39 %
	Men	61 %
Age:		
	18-30 year	58 %
	31 – 50 years	21 %
	> 51 years	21 %
Education:		
	Academic level	48 %
	Secondary level	52 %
Rezidence:		
	Village	39 %
	City	61 %

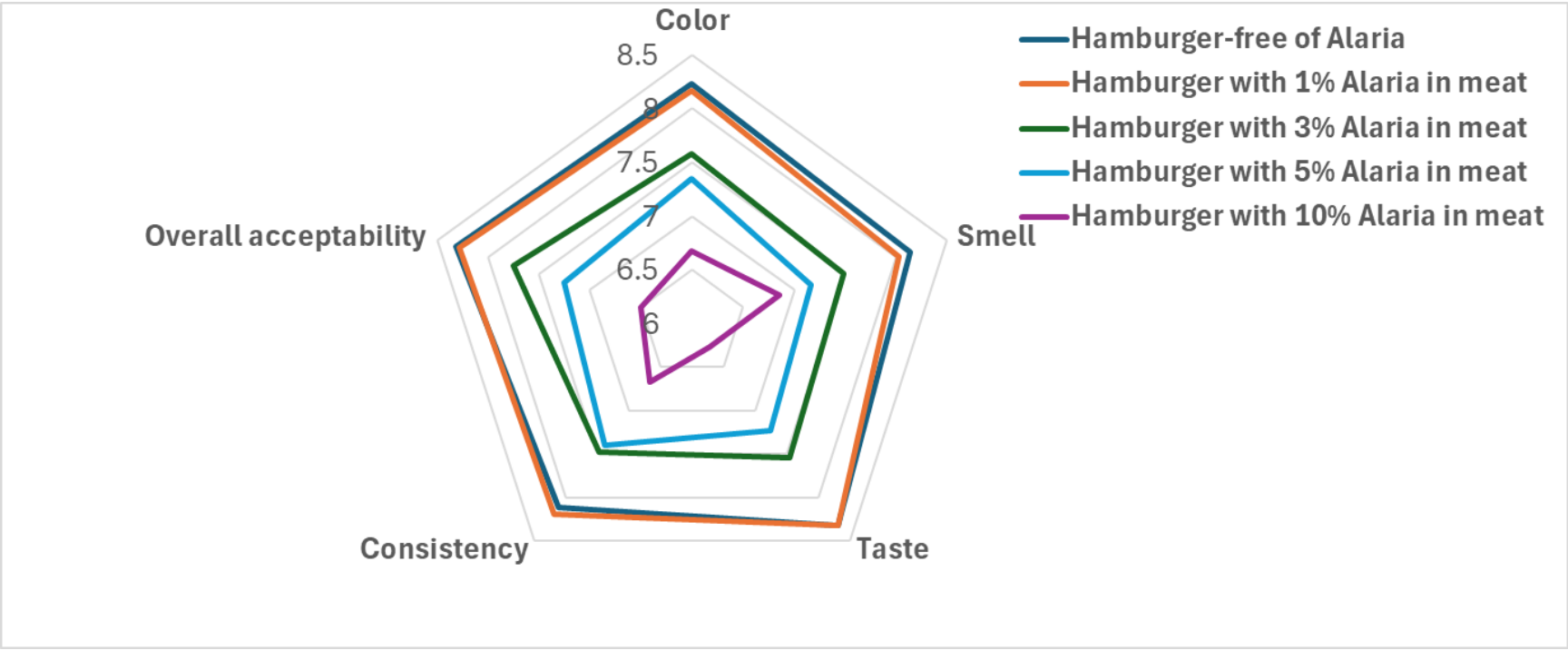






2. Hamburgers with *Alaria esculenta* addition in meat patty

b) Sensory analysis



Conclusion

Tasters accept a maximum content of Alaria in hamburger meat patty of 3%.

3. Hamburgers with *Alaria esculenta* addition in sauce

a) Components and final product



Sauce-free of Alaria



Sauce with 1% Alaria flakes

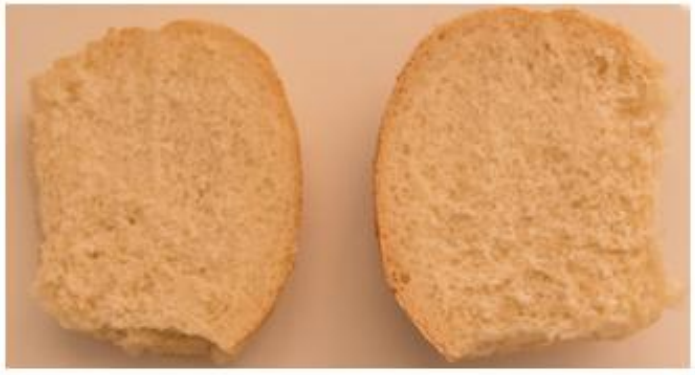


Sauce with 3% Alaria flakes



Sauce with 5% Alaria flakes





Bun





Meat patty

3. Hamburgers with *Alaria esculenta* addition in sauce

a) Components and final product



Hamburger without Alaria



Hamburger with 1% Alaria in sauce



Hamburger with 3% Alaria in sauce



Hamburger with 5% Alaria in sauce

3. Hamburgers with *Alaria esculenta* addition in sauce

b) Sensory analysis

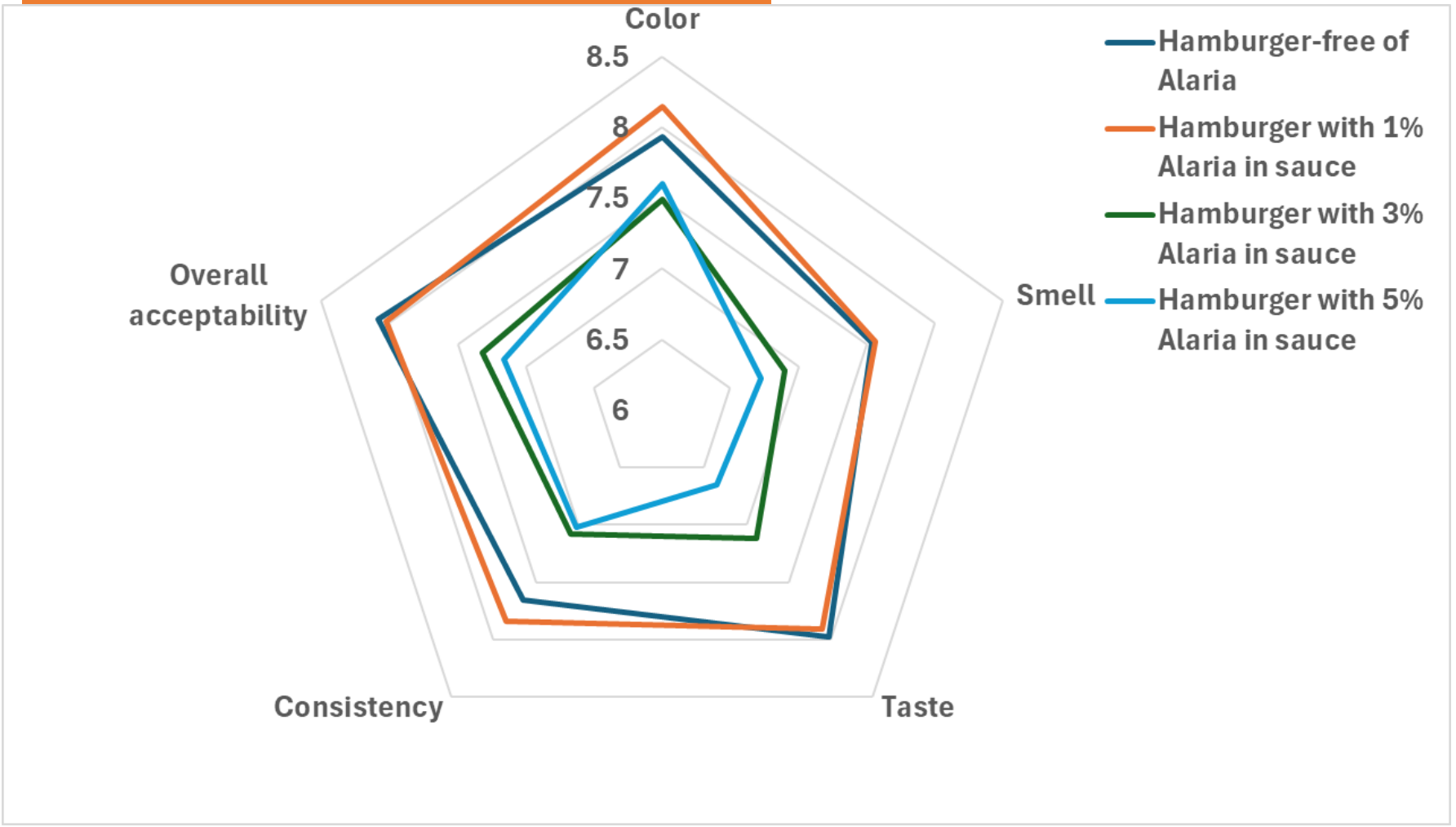
Gender:		
	Woman	76 %
	Men	24 %
Age:		
	18-30 year	70 %
	31 – 50 years	15 %
	> 51 years	15 %
Education:		
	Academic level	37 %
	Secondary level	63 %
Rezidence:		
	Village	48 %
	City	52 %





3. Hamburgers with *Alaria esculenta* addition in sauce

b) Sensory analysis



Conclusion

Tasters accept a maximum content of Alaria in hamburger sauce of 3%.

4. Hamburgers with *Alaria esculenta* addition in buns, meat patty and sauce

a) Components and final product



Hamburger with 0%
Alaria esculenta



Hamburger with 1%
Alaria esculenta



Hamburger with 3%
Alaria esculenta



Hamburger with 5%
Alaria esculenta

4. Hamburgers with *Alaria esculenta* addition in buns, meat patty and sauce

b) Sensory analysis

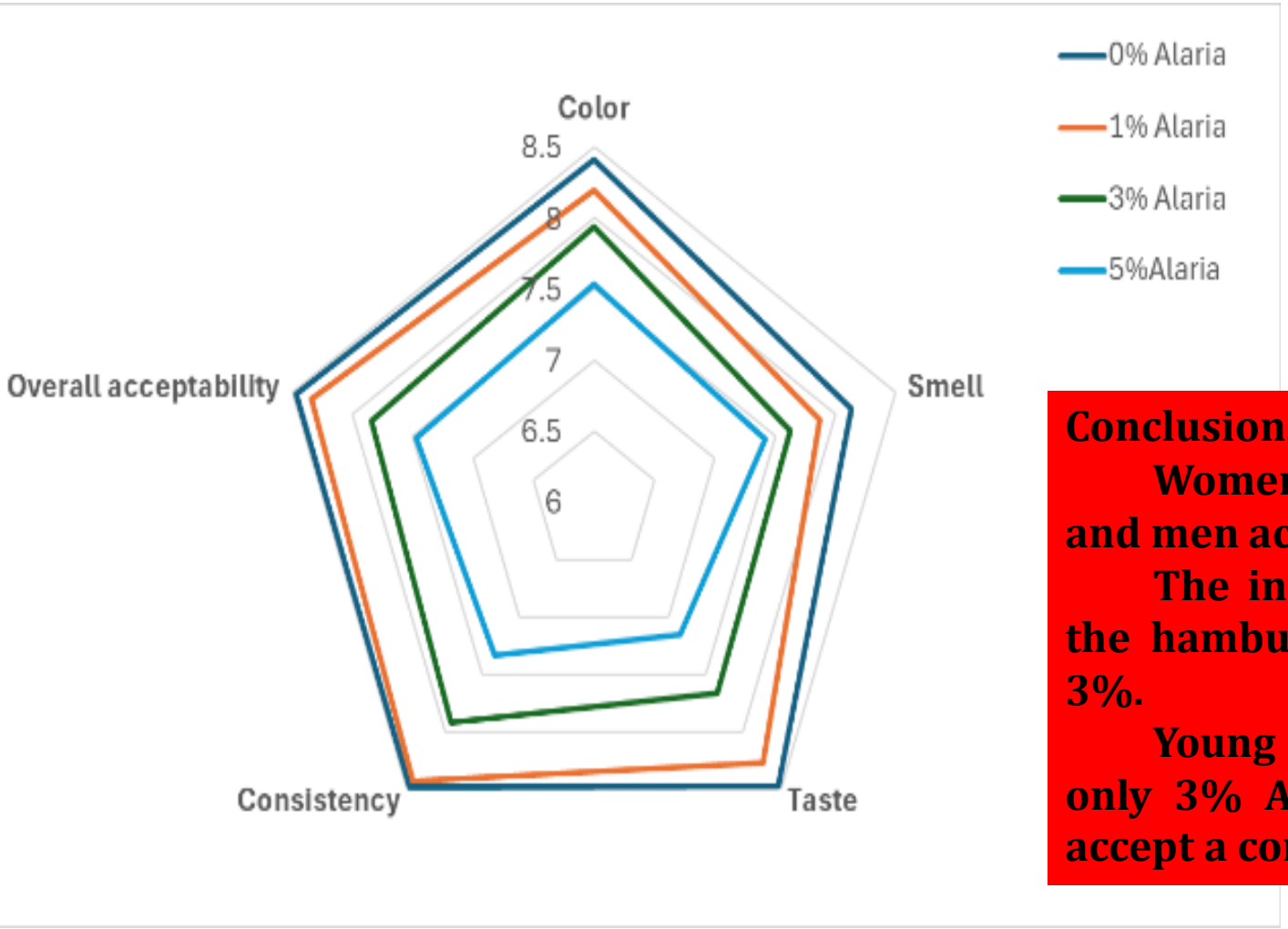
Gender:		
	Woman	73 %
	Men	27 %
Age:		
	18-30 year	41 %
	31 – 50 years	32 %
	> 51 years	27 %
Education:		
	Academic level	71 %
	Secondary level	29 %
Rezidence:		
	Village	34 %
	City	66 %





4. Hamburgers with *Alaria esculenta* addition in buns, meat patty and sauce

b) Sensory analysis



Conclusions

Women accept a maximum of 3% Alaria content, and men accept a 5% Alaria content.

The inhabitants of the city accept 5% of Alaria in the hamburger, while those of the village accept only 3%.

Young people between 18 and 30 years old accept only 3% Alaria, while people over 30 years old also accept a content of Alaria higher than 3%.

Alaria esculenta-based hamburgers

Concluding remarks

The hamburger accepted by consumers can contain 5% Alaria powder in the bun, 3% Alaria flakes in the meat patty and 3% Alaria flakes in the sauce.

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