Effect of fish oil replacement with algae oil on fillet quality: a new approach for a sustainable aquaculture.

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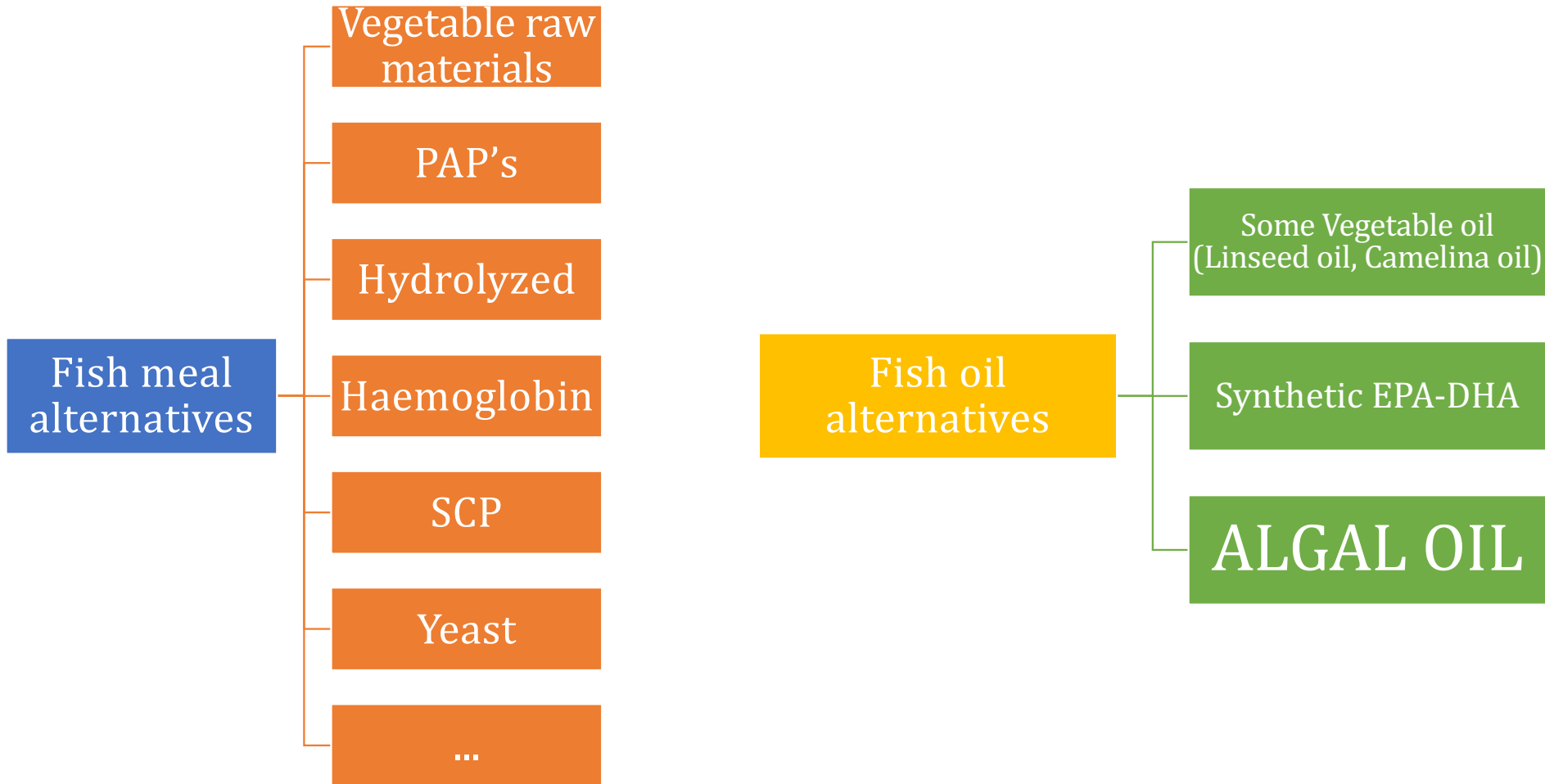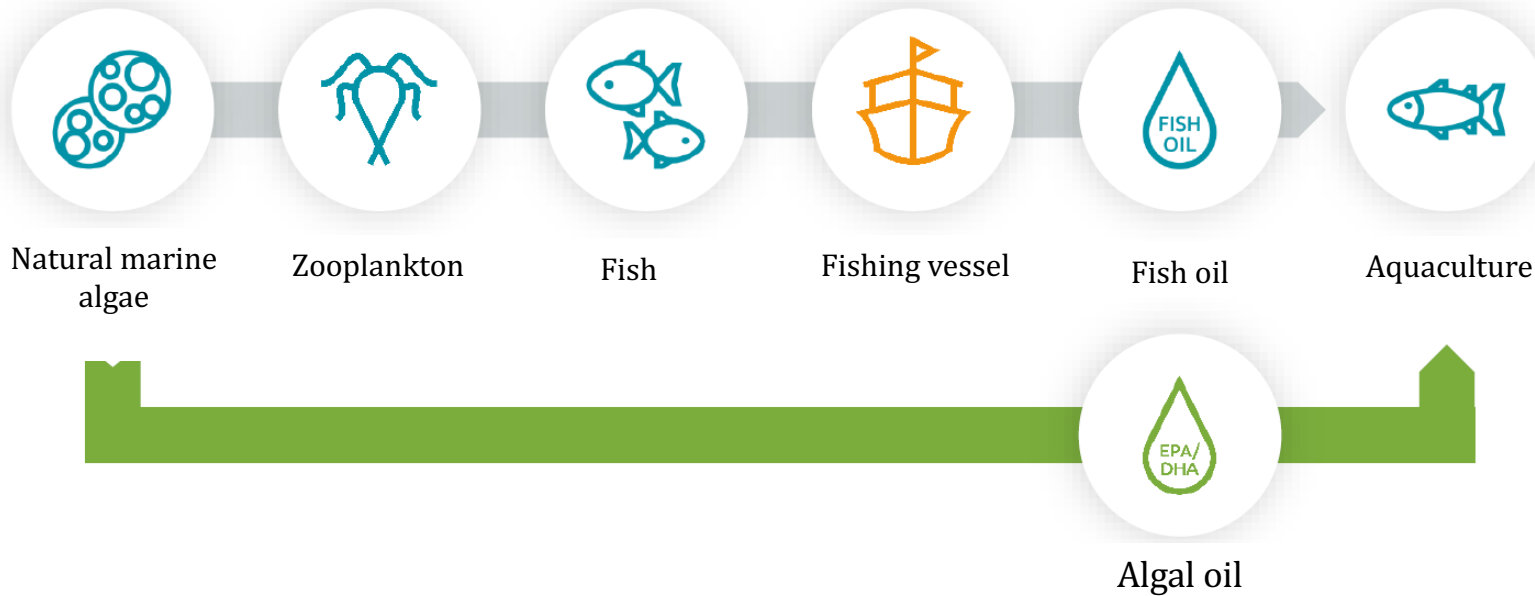http://linkedin.com/in/fabio-brambilla-049b4363

Seafood and Consumer 4.0
Pordenone, 19/02/2020

VRM guarantee a complete control of the productive cycle, from fish feed production up to final fish product.

Through feeding program and experience in fish farming, VRM ensure high quality of fish, satisfying the consumer demands.

Fish meal alternatives

- Vegetable raw materials
- PAP's
- Hydrolyzed
- Haemoglobin
- SCP
- Yeast
- ...

Fish oil alternatives

- Some Vegetable oil (Linseed oil, Camelina oil)
- Synthetic EPA-DHA
- ALGAL OIL

naturAlleva | Algal oil

AQUAFARM

Natural marine algae → Zooplankton → Fish → Fishing vessel → Fish oil → Aquaculture

Algal oil

Shortening the natural food chain

1 TON Omega-3 algal oil

=

60 TON wild-caught fish

BENEFIT

- Highest EPA and DHA concentrations (≈40% DHA, ≈10% EPA)

- No feed process modification

- Naturally pure

- Non-GMO product

- Reliable supply

- Stable high quality

- Flexibility in feed formulation (liquid product)

- Free from Ocean contaminants (e.g. dioxins, PCB's, mercury)

Effect of **TOTAL** fish oil replacement with algae oil on Sea bream (*S. aurata*) growth and fillet quality

| INGREDIENTS (%)	PC	V1	NC	V2
Fish meal, wheat, wheat gluten, guar meal, soybean meal, corn gluten, pea, vitamins and minerals	83.3	83.3	83.3	83.3
Fish oil	13.79	-	2.10	-
Algae oil	-	3.50	-	0.70
Camelina oil	-	4.20	3.22	5.60
Rapeseed oil	-	6.09	8.47	7.49
Theoric EPA	1.81	0.83	0.30	0.20
DHA	1.56	1.54	0.36	0.40
Omega 3	4.33	4.44	2.83	3.45
Omega 6	4.16	1.70	0.99	1.11

Omega 3 content (EPA+DHA) (g/100g feed)
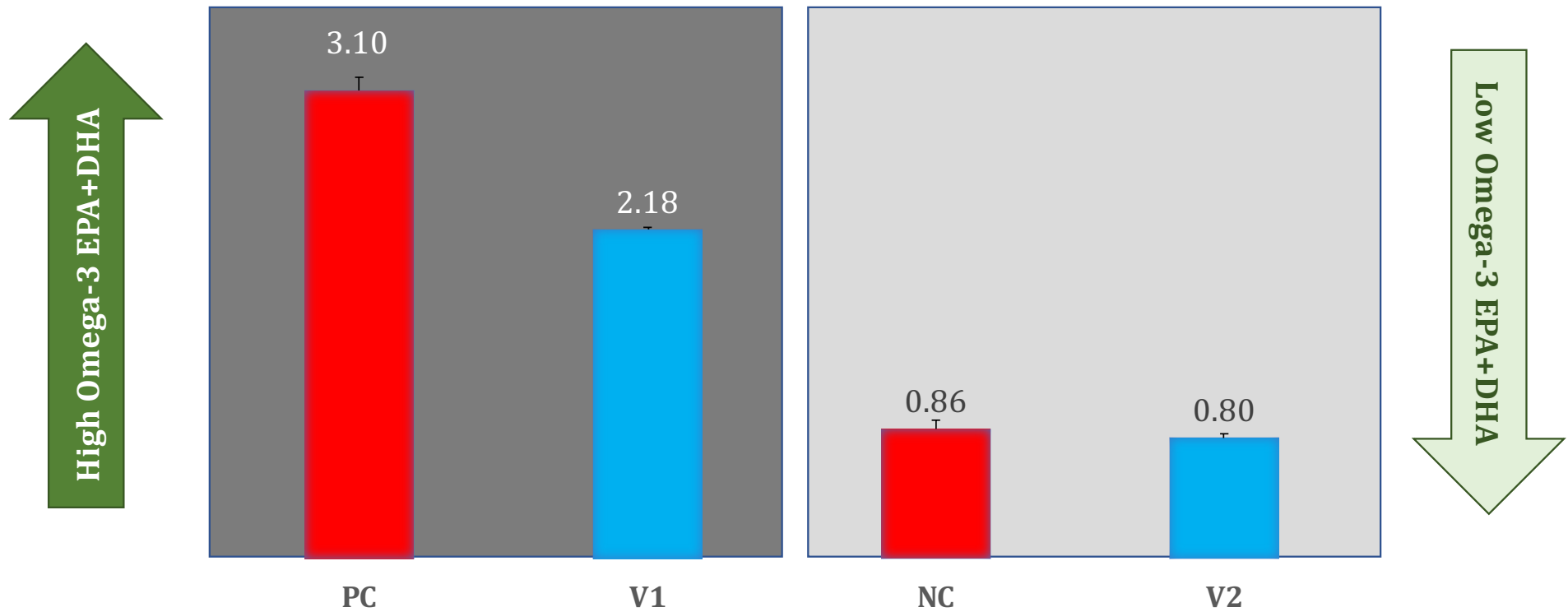
Trial condition

- Sea bream (i.w. 60g)

- Feeding *ad libitum*

- 3 replicate for each diet

- 90 days of feeding

- Water T (°C): 20.0±2.8

- Oxygen (mg/L): 8.5±0.8
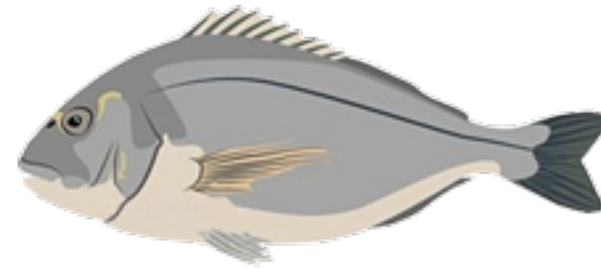
Protein	Fat	NFE	Ash	Fiber
43.0%	18.0%	22.0%	6.5%	2.0%

No difference in growth and conversion

Weight gain
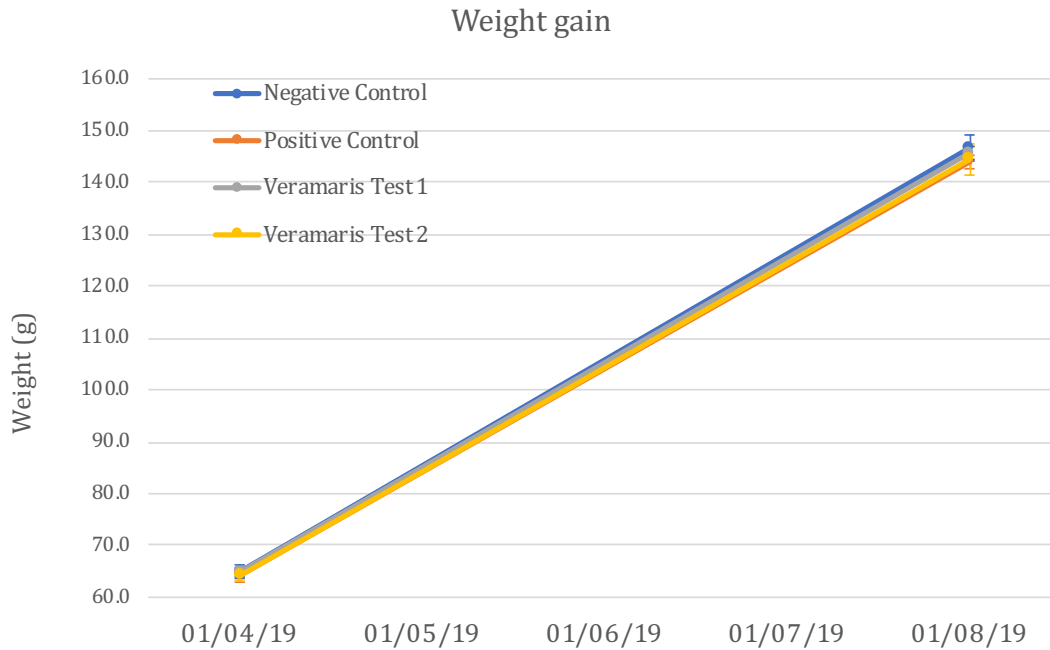
	FCR	SGR
PC	1.43±0.05	0.73±0.02
V1	1.43±0.04	0.74±0.01
NC	1.44±0.04	0.74±0.02
V2	1.44±0.04	0.74±0.01

Mortality (%)	
PC	0.41±0.06
V1	0.42±0.03
NC	0.42±0.05
V2	0.42±0.06

EPA+DHA content in the flesh (the higher the better)

	T0	PC	V1	NC	V2
Total Fat g/100g	4.6	4.8	5.0	5.0	4.0
EPA+DHA (mg/100kcal edible protion)	371.5±39.9	665.3±113.5	470.5±85.3	293.0±49.2	224.6±46.1
EPA+DHA (mg/100g edible portion)	460.2±49.5	892.3±152.2	617.0±111.8	387.3±65.5	269.0±55.3
Nutritional Contribution (NC %) weekly	19.7±2.1	38.2±6.5	26.4±4.8	16.6±2.8	11.5±2.4
Weekly portion (EPA + DHA 3.5g/week WHO)	5.1±0.6	2.7±0.4	3.9±0.6	6.2±1.1	8.9±1.4
Weekly portion (EPA e DHA 1.75g/week EFSA e FAO 2010)	2.6±0.3	1.3±0.2	1.9±0.3	3.1±0.5	4.5±0.7

Different colours $P<0.05$ (*ANOVA*)

Atherogenic index
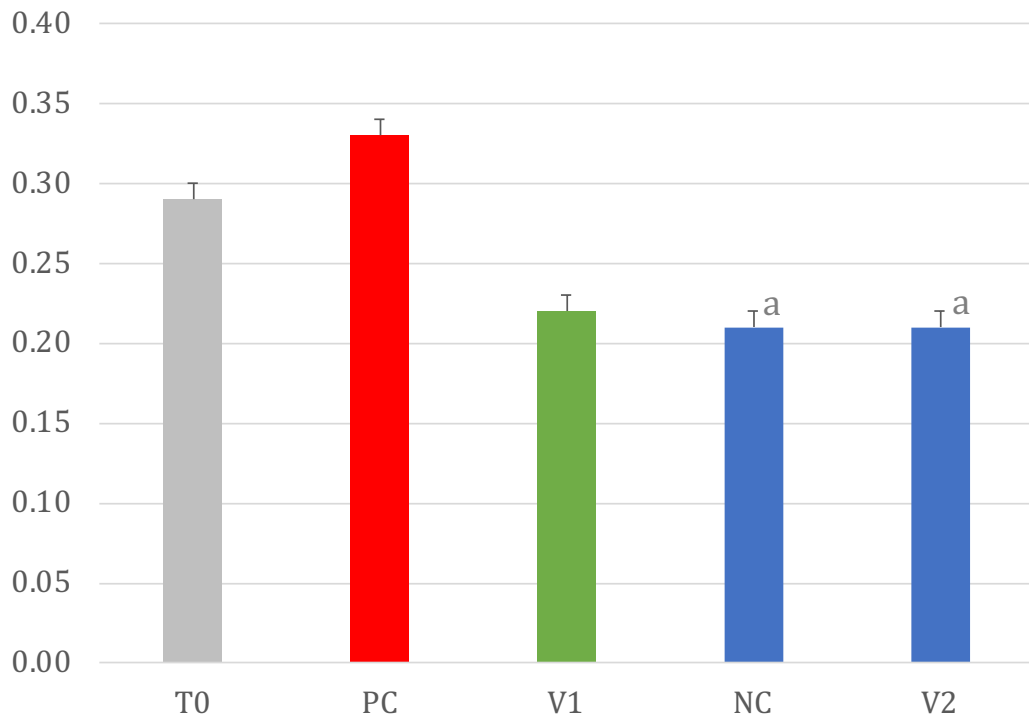
Thrombogenic index
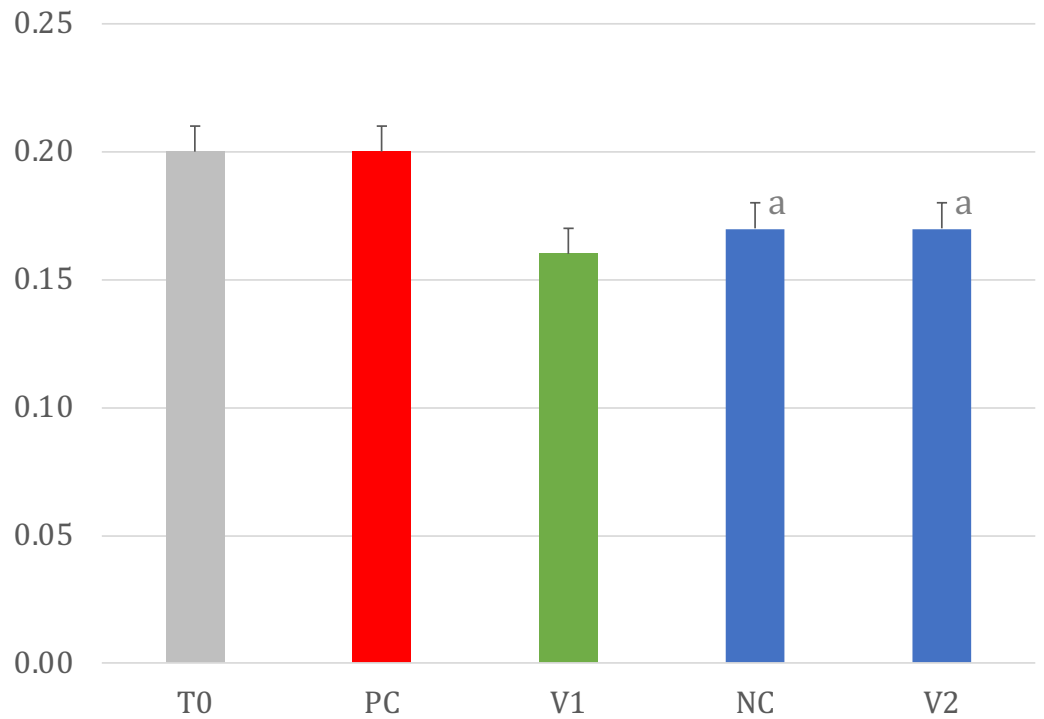
Different letters P<0.05 (*ANOVA*)

DESCRIPTIVE ANALYSIS:

- **Olfactory descriptors:** Overall odor, Typical fish odor and Freshness (Metadescrittore);

- **Texture descriptors:** Firmness, Fibrosity, Adhesiveness, Moisture and Greasiness;

- **Taste/Flavor descriptors:** Sweet, Bitter, Sour, Salty, Umami, Astringent, Overall Flavor and Typical fish flavor.

Consiglio Nazionale delle Ricerche
Istituto per la BioEconomia

No difference in taste

	ATTRIBUTES	Sea bream			STATISTICAL ANALYSIS		
		P/C	V1	V2	Fisher (F value)	Pr> F (p≤0,05)	Sign. Level (n.s. not significant,*95%, **99%, ***99,9%)
		mean	mean	mean			
cooked	Overall odor	6.0	5.7	6.1	1.4	0.25	n.s.
	Typical fish odor	6.3	6.1	6.2	0.94	0.39	n.s.
	Freshness	5.6	5.6	5.7	0.01	0.99	n.s.
	Firmness	4.3	4.2	4.2	0.25	0.78	n.s.
	Fibrosity	4.5	4.4	4.3	0.26	0.77	n.s.
	Adhesiveness	3.4	3.4	3.3	0.99	0.38	n.s.
	Moisture	4.3	4.3	4.4	1.02	0.36	n.s.
	Greasiness	3.7	3.7	3.5	0.24	0.79	n.s.
	Sweet	2.9	3.0	3.0	0.52	0.59	n.s.
	Salty	3.3	3.3	3.1	0.81	0.45	n.s.
	Sour	1.6	1.7	1.5	1.46	0.24	n.s.
	Bitter	2.0	2.1	2.0	0.22	0.81	n.s.
	Umami	2.6	2.7	2.8	0.66	0.52	n.s.
	Astringent	2.1	2.4	2.3	2	0.14	n.s.
	Overall Flavor	5.8	5.7	5.7	0.7	0.5	n.s.
	Typical fish flavor	6.1	5.9	6.2	1.3	0.28	n.s.
	Overall judgment	6.0	6.2	6.0	0.56	0.57	n.s.
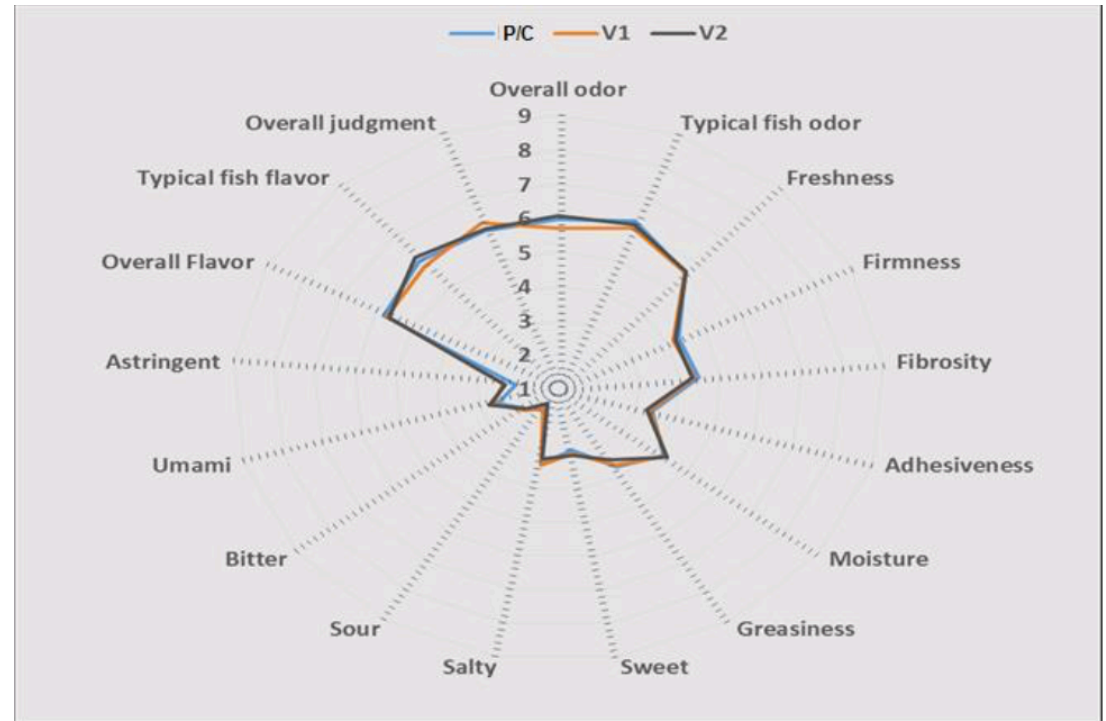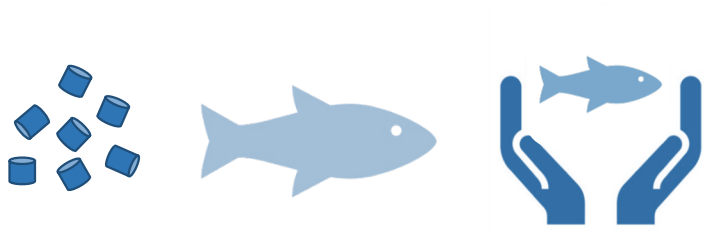
Feed, Growth and Fish health

Nutritional value of fish

Organoleptics

- **Lower variability** in the feed using algal oil
- **Lower contaminants** in the feed using algal oil
- No differences in **growth**
- No difference in **mortality**

- Fatty acid profile in the feed is **reflected in the flesh**
- Capacity to produce fish with some specific **EPA and DHA requirements**
- **Lower contaminants** in the fish using algal oil
- **Higher nutritional value** of the fillet in terms of heart/cardiovascular protection

- No difference in **taste profile**

Thanks for your attention!