Quality Ccharacteristics of Fish Sauce Produced from Anchovy (*Engraulis encrasicolus*)

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Fish Sauce

- Fish sauce, which has specific characteristic odor and taste, is a liquid hyrolyzate of salted fish.

- Fish sauce is based on ancient history. It was consumed by Romans in 2000 years ago.
- This product is a popular foodstuff that can be adapted to our changed nutritional understanding due to intensive work life.
- It can support the closure the deficit animal originated protein demand





- Fish sauces are generally used as sweetener, aroma concentrator and protein maximizing purposes.



- It is used mainly in salads, soups or as a part of dip sauces.

- The flavor of the sauce is generally fishy, cheesy and aroma of salted fish.





Ancvhovy *(Engraulis encrasicolus)*

- Anchovy is a pelagic, water filter fish species.
- It is the most produced fish species in Turkey. It is constituted 53 % of total fish production (approx. 200-250 000 tones) of Turkey per year.
- There are lots of unused anchovy and its wastes every year in Turkey.





Ancvhovy *(Engraulis encrasicolus)*

- Its produced with active haunting with fisher ships and consumed as fresh, marinated, salted or frozen.
- Processing anchovy to marinated or salted fish is caused to large quantity of wastes (40 %).
- Unconsumed anchovy also used as fishmeal and fish oil for pellet feed.
- However, fish sauce is a great way to turn unused or waste of anchovy to value added food products which is not only economical, but also tasteful and nutritive







Producing Fish Sauce from Anchovy



Anchovy

Heading-Gutting and Cleaning

WHOL E FISH

Head, Viscera and Gill

Mincing and Adding Spices

Mincing Head and Gill. Then adding Viscera to mince 1:1 (w/w)

Fermentation at 37 ^{o}C for 2 months

Filtration with cheesecloth

FISH SAUCE





Physico-chemical Properties

- Sauces colour were measured a Machine Vision (MV) System equipped with Nikon D300 digital camera and LensEye software.
- pH – measured with pH meter (Hanna) after samples diluted with distilled water 1:1 (v:v).
- Salt Level: measured with Mohr metod, results indicated as % salt in 100 ml sample.

Proximate Composition Analysis

- Water content was measured at dried samples. Drying process was done according to AOAC 200, with stove at 105 ^{o}C.
- Protein content was determined with Kjeldahl method according to AOAC 2000
- Fat analysis was done according to Folch method.
- Ash amount was determined with ash furnace at 600 ^{o}C for 6 hours (AOAC, 2000).

Safety of Anchovy Sauces

- All sauce samples analysed in point of presence of biogenic amines
  - Prepared samples loaded to HPLC equipped with Agilent column
- All samples analysed for bacterial load.
  - Total aerobic bacteria,
  - Total halophylic bacteria,
  - Lactobacillus
  - Bacillus

Sensory Analysis - 1

Sensory Analysis with trained people

- Sensory analysis were done with pre-trained 14 panelists, which are employee of our university.
- Asked panelist to evaluate sauce samples with using 1 to 9 point (1: none, 9: extremely strong)
- Color, odor, fluidity, aroma and taste properties of sauces were determined.
- All results were given as avarage points in responded area of sensory criteria.

Sensory Analysis - 2

Consumer Taste Analysis

- Consumer taste analysis was performed randomly selected 80 people.
  - Participants were 18-60 years old and at random socio-demographic status (mainly students and employees of our university).
- Asked panelist to evaluate sauce samples with using 1 to 9 point (1: Dislike exteremely, 5: Like extremely)
- General taste, aroma and liking parameters were asked panelist to evaluate.
- All results were given as avarage points in responded area of sensory criteria.

Nutritive Composition of Anchovy Sauces

	Whole	Waste (head, gill and viscera)
Water %	61.08	63.88
Protein %	**12.22**	8.62
Fat %	4.45	**5.61**
Ash %	19.24	19.16
Carbohydrate %	3.02	2.74

Physico-chemical properties of Anchovy Sauces

	Whole	Waste (head, gill and viscera)
L* value	56.74	**57.08**
a* value	**52.10**	39.67
b* value	**66.40**	65.48
pH	5.59	5.53
Saltness %	18.64	18.68

L* value: indicates black (dull) to White (shiny) from 1 to 100

a* value: indicates redness to greeny from 1 to 100

b* value: indicates yellow to blue from 1 to 100

These color values indicate that sauce obtained from wastes of anchovy is shinier and more characteristic color of a fish sauce

Safety of Anchoy Sauces

Biogenic Amines Levels In general biogenic amine levels were found to be higher than whole fish sauces (P<0,05). Both sauce groups were found under threshold levels.

mg / Kg	Whole	Waste (head, gill and viscera)
Tryptamine	ND	ND
Beta phenylethylamine	ND	ND
Putrescine	9.84	21.02
Cadaverine	55.22	84.33
Histamine	7.98	10.78
Tyramine	11.89	29.79
Spermidine	ND	ND
Total	84.94 mg / Kg	145.93 mg / Kg

Legal limit of histamin enforced by WHO/FAO is 400 mg / kg for fish sauces

In literature, histamin levels have been reported 200 – 355 mg / kg in sauces from various studies

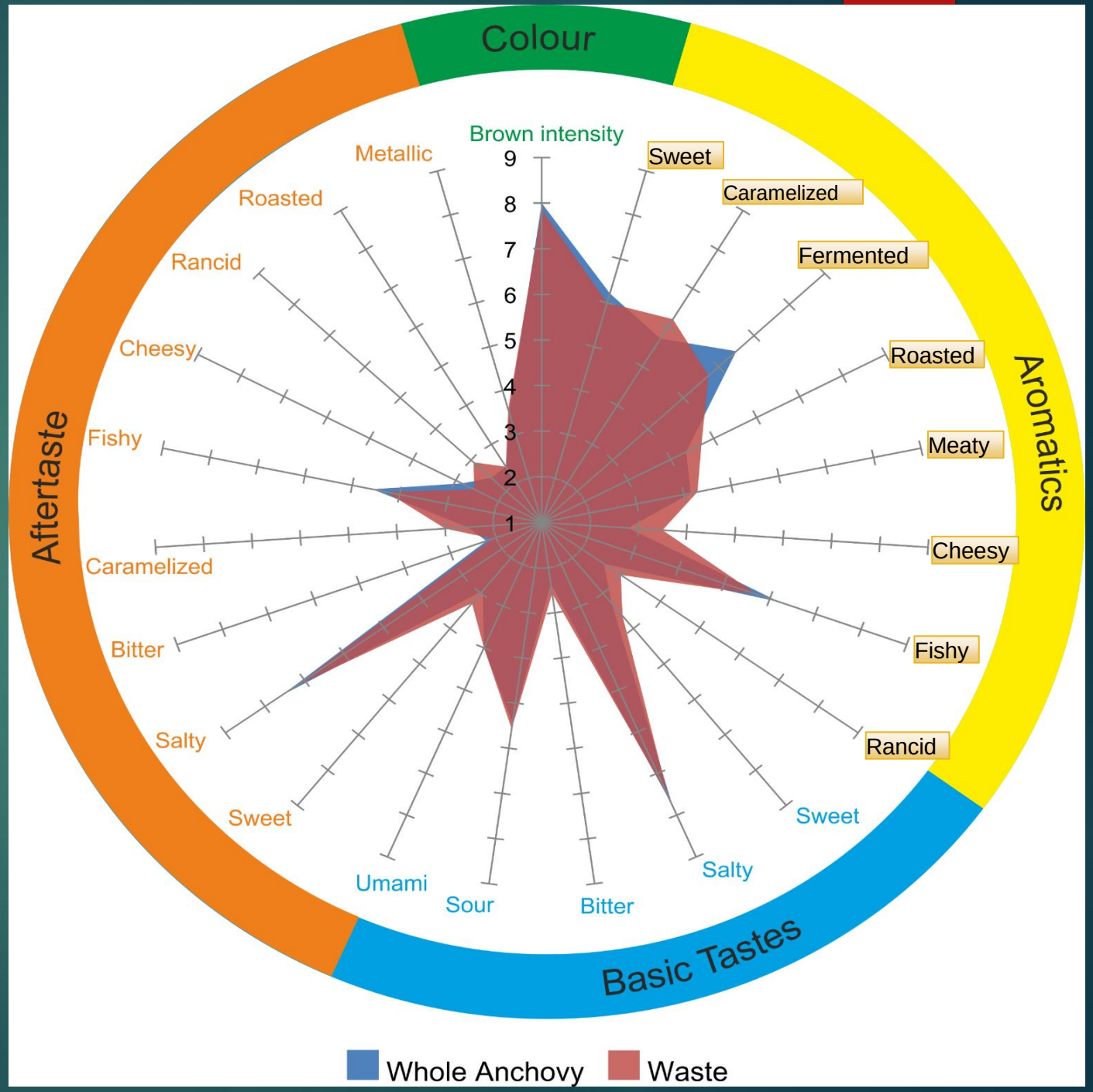
Safety of Anchovy Sauces

Microorganism Levels

	Whole	Waste
Total Aerobic Bacteria	$1.8x10^1$	$2.6x10^1$
Total Halophylic Bacteria	$<10^1$	$<10^1$
Lactobacillus	$<10^1$	$<10^1$
Bacillus	$<10^1$	$1.1x10^1$

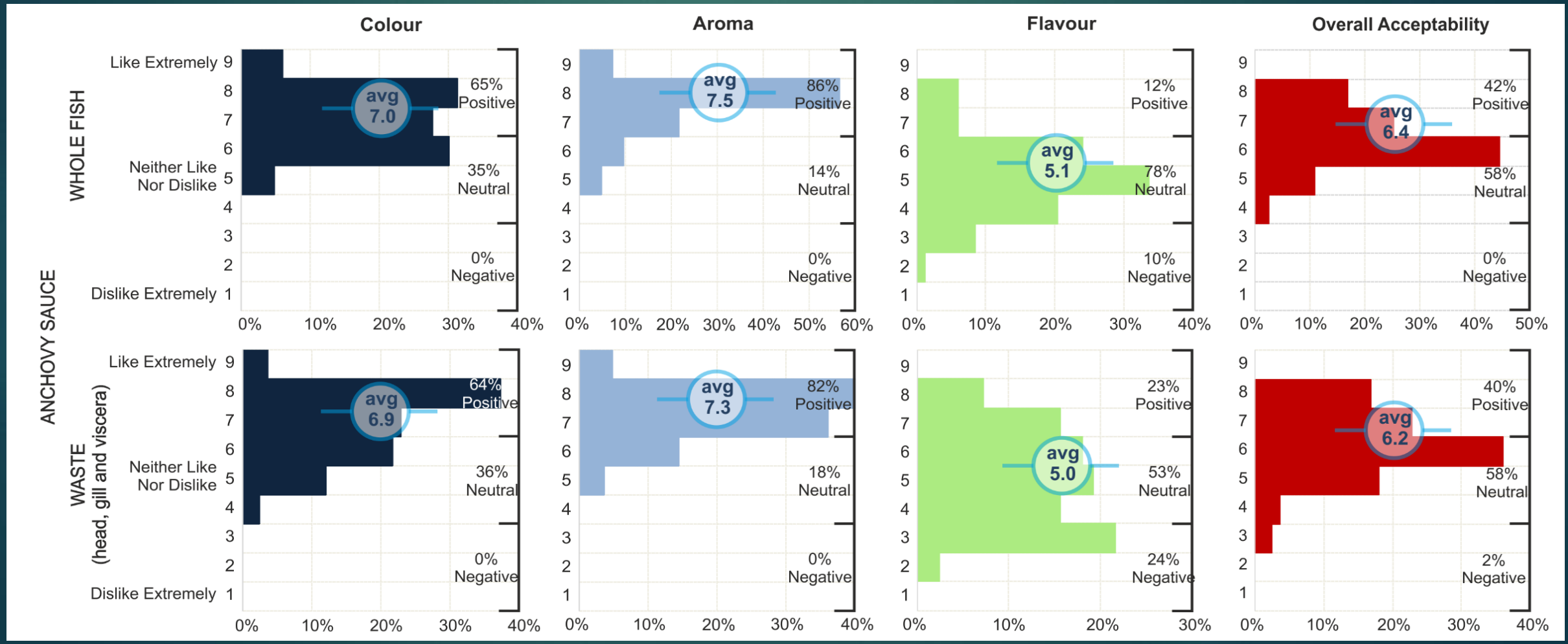
Did panelists and consumers like our Anchovy Sauces?

- **Panelists sensory evulation;**
- In taste category, the liking of panelist was low since sauces contain 18% salt.



Did panelists and consumers like our Anchovy Sauces?

- **Consumer like analysis;**



Conclusion

- Fish Sauce is nutritive, economical and easy-produce food stuff.
- It can be apply most seafood as well as Anchovy.
- Results have shown that whole fish or wastes sauces nearly same nutritive values as well as safety of consumption.
- Panelist and consumers have not found greater differences with whole or just discard-made fish sauces.
- This means; with application of fish sauce practice, there will be chance to evaluate wastes of fishes or non-economical fish species into economical, taste food stuffs.

Thank You
For Attention