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Sensory evaluation of bottled flying fish *Parexoetus branchypterus* in Spanish style enhance with the natural organic flavoring

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Abstract
Sensory evaluation was done in the bottled flying fish (*Parexoetus branchypterus*) in spanish style with organic plants as natural flavor enhancer such as oregano (*Oreganum vulgare*), lemon grass (C*ymbopogon spp.*) and turmeric (*Curcuma longa*). There were forty (40) panelist to evaluate the color, aroma, texture and taste of the product using the hedonic and semantic scales. Desirability composite index (DCI) shows the ranking of each organic plants used as natural flavoring. Flying fish with oregano is the best followed by turmeric, lemongrass and the least is the treatment without natural organic flavoring.

Keywords: sensory evaluation, marine species, organic plants

1. Introduction

Fish processing is the processing of fish and other seafood's delivered by commercial fisheries, which are the supplier of the fish products industry. It was investigated how formal contracts and value adding processes can stimulate sustainable production in developing country value chains. Over a decade, tawilis, a fresh water sardine, is processed into Spanish sardines in oil, more popularly known as bottled tawilis. It was conceptualized to investigate the potential impact of contracts on the sustainability of the bottled tawilis supply chain, i.e. sustainability in terms of protecting the environment, well-being of the people whose livelihood depends on tawilis production, processing and marketing; and enhanced economic gains from the chain (Almazan *et al.* 2011) [1].

Flying fish live in all of the oceans, particularly in tropical and warm subtropical waters. They are commonly found in the epipelagic zone. This area is the top layer of the ocean that extends 200 meters from surface down. It is open known as "sunlight zone" because it's where most of visible light exist. Nearly all primary production happens in this zone as there is enough light for photosynthesis to occur. Therefore the vast majority of plants and animals inhabit this area and can vary from plankton to the sharks. Although the epipelagic zone is an exceptional area for variety in life, it too has its drawbacks. Due to the vast variety of organism it holds, there is high number of prey and predation relationships. Small organisms such as the flying fish are targets for larger organism. They especially have a hard time escaping predators and living until they can reproduce, resulting in them having a lower fitness (Davenport, 1994) [3].

Oregano is an herb that is a member of the mint family. It is closely related to marjoram, even though the flavors differ widely. The common variety of oregano bears the scientific (Latin) name of *Organum vulgare*. Although it is a common ingredient in foods around the world, more is used in perfumes than is consumed. Oregano is a powerful antimicrobial, because it contains an essential compound called "carvacol". It is also a rich source of vitamin k (promotes bone growth, maintenance of bone density and production of blood clotting proteins and a dietary anti-oxidant (contains very high concentrations of antioxidants). It also protects our cells against free radicals (Harini, 2014) [6].

Lemongrass is cultivated around the world for a variety of reasons. It's mainly grown for its oils, which have a number of uses including for vitamin A, perfumes, insect spray, cosmetics, perfumes and food and drink. Lemongrass is also enjoyed as a tea throughout the world. Lemongrass has a refreshing lemon-lime taste with a tinge of mint and ginger. Fresh lemongrass has a delicate, floral rose-like fragrance mixed with a fresh and grassy aroma. It is a key ingredient in Asian cuisine, particularly Thai, at home in curries, stirs fries and noodles. It pairs beautifully with fish, chicken and coriander (http://www.gourmetgarden.com/en/herb/198/lemongras) [5].

Turmeric is a shallow-rooted crop and an herbaceous plant with thick and fleshy rhizomes. It belongs to the genus Curcuma and to the family, Zingiberaceae, and consists of many species. *Curcuma longa Linn* is the highest yielding turmeric of commercial value. Its origin has been traced to South and Southeast Asia. Turmeric is used as a spice and is the major component of curry powder. Among the several spices, turmeric ranks second with regard to its foreign exchange earning being next only to chilli (Babu, 2008) [2].

Flying fish *Cypselurus melanurus* is one of the pelagic species mostly found at coastal areas. Isabela Philippines have four coastal areas – Palanan, Dinapigue, Divilacan and Maconacon which are rich in aquatic resources such as fishes, molluscs, crustaceans, marine mammals and reptiles. In Palanan Isabela, fishing is the most common job of the community and one of the common problems they encountered is the post-harvest losses and low market value of the second class species especially during peak season. This may even discourages fisher folk to continue to venture in fishing industry. Thus different techniques and technologies in fish processing is one of the best solution to unravel the problem arises during the peak season of the pelagic fishes. Canning is one of the best example of fish processing techniques but this will always manufactured by big processing plants. Thus, in this study, bottling in supplant the canning may even introduced to the fisher folk to preserved there

fishes. Bottling in making sardines can always be done at home and served as additional source of income.

In this study, organic plants (oregano, lemon grass and turmeric) were added to enhance the flavor of the finished product. Hence, this study generally aims to determine the general acceptability and characteristics of the bottled flying fish *Parexoetus branchypterus* in spanish style enhance with organic plants such as oregano *Origanum vulgare*, lemon grass *Cymbopogon citratus* and turmeric *Curcuma longa*. Specifically, it aims to determine the acceptability and characteristics of the product in terms of criteria: color, aroma, texture and taste. It is also determine the descriptive rating of each treatment per criteria of evaluation both hedonic and semantic scale. The result of this study may be used by researchers from various academic and research institutions in its quest for natural flavor enhancer for fish and other fishery products.

2. Materials and methods

2.1 Experimental species

The study used the flying fish *Parexocoetus brachyptenus* and around ten (10) kilogram was purchased from the fisherman of Palanan, Isabela, Philippines. The fish was washed with clean seawater and immediately transported to the Fish Processing Laboratory of the Provincial Institute of Fisheries, Isabela State University, Roxas Campus, Roxas, Isabela, Philippines.

2.2 Experimental organic plants as natural flavoring

The study used the different organic plants as natural flavoring to the bottled flying fish *Parexocoetus brachyptenus.* These were the oregano *Origanum vulgare*, lemon grass *Cymbopogon citratus*., and turmeric *Curcuma longa*.

2.3 Experimental treatment

Table 1 shows the different treatment of this study.

Table 1: Different treatment for bottled flying fish *Parexocoetus brachyptenus* in Spanish style enhance with organic plants as natural flavoring.

Treatment	Description
Trt 1	Flying fish without organic flavoring
Trt 2	Flying fish with oregano leaves
Trt 3	Flying fish lemon grass leaves
Trt 4	Flying fish with turmeric

2.4 Materials and ingredients used

The experiment was prepared using the different materials such as weighing scale, frying pan, spoon, apron, electric stove, strainer, measuring spoon, plate, basin, glass jar, and knife and chopping board. All the needed ingredients were bought in the market before the start of the experiment. Thirty (30) grams of organic plant was finely chopped and then added to each treatment except in treatment 1 which is the control.

2.5 Schematic diagram

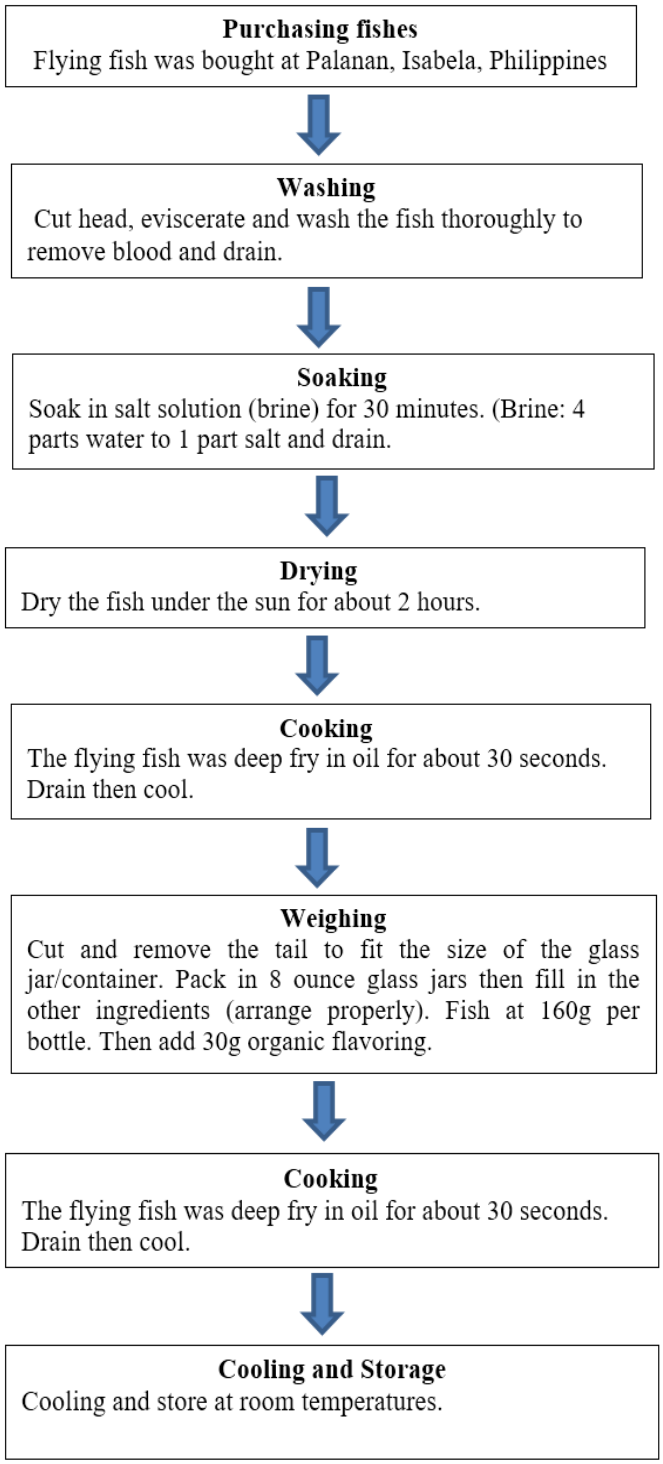

Fig 1: Schematic diagram of cooking method

2.6 Sensory and organoleptic evaluation

The product was prepared in bite-sized form for the sensory and organoleptic evaluation. There were forty (40) panellists that include the ten (10) professionals, Hotel and Restaurant Management (HRM) and Technology Livelihood Education (TLE) graduates, ten (10) housewives, ten (10) students and ten (10) cigarette smokers' farmers.

The panellists were asked to observe the color or appearance, savor the aroma/ odor, and determine the texture and taste. Each panelist was provided with water after tasting the product and was immediately asked to provide the rating for the treatment group before proceeding to the next. The acceptability and characteristics of the product were evaluated according to color, aroma, texture and taste, using the hedonic scale and semantic scale. Hedonic scale uses the 1 to 9 scale where in 1 denotes as dislike extremely (DE), 2 dislike very much (DVM), 3 dislike moderately (DM), 4 dislike slightly (DS), 5 neither like nor dislike (NLND), 6 like slightly (LS), 7 like moderately (LM), 8 like very much (LVM) and 9 like extremely (LE). Semantic scale 1 to 5 was used to rate the characteristics of the finished products in terms of color, aroma, texture and taste.

The table 2 shows the semantic description and its criteria.

Table 2: Semantic scale with its description

	Description			
Scale	**Color**	**Aroma**	**Texture**	**Taste**
1	Dull (D)	Mild (M)	Rough (R)	Not delicious (ND)
2	Moderately dull (MD)	Moderately mild (MM)	Moderately Rough (MS)	Moderately not delicious (MND)
3	Neither dull nor vibrant (NDNV)	Neither mild nor intense (NMNI)	Neither rough nor smooth (NSNR)	Neither not delicious nor delicious (NNDND)
4	Moderately vibrant (MV)	Moderately intense (MI)	Moderately Smooth (MS)	Moderately delicious (MD)
5	Vibrant (V)	Intense (I)	Smooth (S)	Delicious (D)

2.7 Statistical tool used in the study

Weighted mean of the finished product was determined and analysed using the one way Analysis of Variance (ANOVA). Student Neuman Keuls (SNK) was used to compare the difference among treatments. Descriptive statistics was used to determine the frequencies of each treatment per criteria of evaluation

3. Results

3.1 Product acceptability and characteristics based on criteria of evaluation

3.1.1 Color

There were no significant differences among treatment in hedonic and in semantic in terms of the color of the product. However, in hedonic score, the flying fish with turmeric got the highest average rating of 7.70 (LVM), followed by flying fish with lemon grass and flying fish without organic flavoring (control) both scored as 7.60 (LVM) and the least was the flying fish with oregano due to the darker coloration it imparted. Furthermore, based on semantic scale all treatments were described as "Moderately vibrant" and Trt 4 which is flying fish with turmeric got the highest score of 4.17, followed by Trt 2, Trt 3 and Trt 4 respectively. All treatment was characterized as "moderately vibrant "and it were accepted by the panelist as "Like very much"

Table 3: Color acceptability and characteristics of the different treatments

Treatment	Hedonic Scale	Semantic Scale
Trt 1- No flavor	7.60^{uvw} LVM	3.78^{d} MV
Trt 2- Oregano	7.53^{vw} LVM	4.00^{bcd} MV
Trt 3- Lemon grass	7.60^{uvw} LVM	3.88^{cd} MV
Trt 4- Turmeric	7.70^{uvw} LVM	4.17^{abcd} MV

3.1.2 Aroma

There were no significant differences among treatment in hedonic and in semantic against control in terms of the aroma of the product. This means that organic flavoring did not affect the odor or aroma of the product. However, based on hedonic score, Trt 2 got the highest score of 7.75, followed by Trt 1 (7.60), Trt 4 (Turmeric) and Trt 3 (Lemon grass), respectively. All treatments were described "Like Very Much" LVM. Furthermore, the aroma characteristics of all treatments based on semantic scale were described as "Moderately intense" where in Trt 1 which is flying fish without flavoring got the highest score of 4.35, followed by Trt 4 (4.18), Trt 3 (3.92) and Trt 2 (3.90), respectively. The aroma of the product was characterized as "Moderately intense "and it was accepted "Like very much" by the panellists.

Table 4: Aroma acceptability and characteristics of the different treatments

Treatment	Hedonic Scale	Semantic Scale
Trt 1- No flavor	7.60^{u} LVM	4.35^{ab} MI
Trt 2- Oregano	7.75^{u} LVM	3.90^{b} MI
Trt 3- Lemon grass	7.57^{u} LVM	3.92^{b} MI
Trt 4- Turmeric	7.58^{u} LVM	4.18^{b} MI

3.1.3 Texture

There were no significant differences among treatment in its hedonic scale and semantic scale with regards to its texture. This means that organic flavoring did not affect the texture of the product. However, based on hedonic, Trt 1 and Trt 3 both scored as 7.80 higher than Trt 2 (7. 75) and Trt 4 at 7.53. They were all described as "Like Very Much" LVM by the panelist. Furthermore, the texture characteristics of all treatments based on semantic scale were described as "Moderately rough" where

in Trt 3 which is flying fish without lemon grass got the highest score of 4.23, followed by Trt 2 (4.20), Trt 1 (4.03) and Trt 4 (3.93), respectively. This shows that the texture of all treatment were described as "Moderately Rough" and it was accepted "Like very much" by the panellists.

Table 5: Texture acceptability and characteristics of the different treatment

Treatment	Hedonic Scale	Semantic Scale
Trt 1- No flavor	7.80^{u} LVM	4.03^{b} MR
Trt 2- Oregano	7.75^{u} LVM	4.20^{b} MR
Trt 3- Lemon grass	7.80^{u} LVM	4.23^{b} MR
Trt 4- Turmeric	7.53^{u} LVM	3.93^{b} MR

3.1.4 Taste

There were no significant differences among treatment in its hedonic scale and semantic scale on regards in its taste. This means that organic flavoring did not affect the taste of the product. However, based on hedonic, Trt 1 and Trt 2 both scored as 7.68 higher than Trt 3 (7. 65) and Trt 4 at 7.58. They were all described as "Like Very Much" LVM by the panelist. Furthermore, the taste characteristics of all treatments based on semantic scale were described as "Moderately delicious" where in Trt 2 which is flying fish with Oregano got the highest score of 4.12, followed by Trt 1 and Trt 3 both at 4.00, and the least Trt 4 (3.97), respectively. The taste of the product was "Moderately delicious" as described by the panellists and accepted as "Like very much".

Table 5: Taste acceptability and characteristics of the different treatment

Treatment	Hedonic Scale	Semantic Scale
Trt 1- No flavor	7.68^{uv} LVM	4.00^{bc} MD
Trt 2- Oregano	7.68^{uv} LVM	4.12^{bc} MD
Trt 3- Lemon grass	7.65^{u} LVM	4.00^{bc} MD
Trt 4- Turmeric	7.58^{uv} LVM	3.97^{abc} MD

3.1.5 Desirability Composite Index (DCI) for general acceptability

The general acceptability of the product was determined using the desirability composite index (DCI). The DCI was the average percentage of each criterion given by the panellists. Among treatment, Trt 2 flying fish flavoured with oregano determined as rank 1 based on score of 8.65, followed by flying fish with turmeric (8.54), Trt 3 flying fish with lemon grass (7.43) and the least was the Trt 1 flying fish without organic flavoring (7.41). Table 6 shows the result of the DCI.

Table 6: Desirability composite index (DCI) for general acceptability of the product

Treatment	Color 17.5%	Aroma 17.5%	Texture 21%	Taste 40.5%	Total DCI	Rank
1- Flying fish without flavoring	1.33	1.33	1.64	3.11	7.41 LM	4
2- Flying fish with oregano	1.32	1.36	2.86	3.11	8.65 LVM	1
3- Flying fish with lemon grass	1.33	1.32	1.68	3.13	7.43 LM	3
4- Flying fish with turmeric	1.35	1.33	2.79	3.07	8.54 LVM	2

* LM –Like moderately, LVM- Like Very Much

4. Discussion

Effectiveness of the organic plants such oregano, lemon grass and turmeric as flavor enhancer were evaluated by the different group of panellists in terms of color, aroma, texture, taste and general acceptability. Hedonic scale was used to determine the acceptance of the product from dislike extremely to like extremely and DCI to determine the general acceptability. Furthermore, semantic scale was used to determine the characteristics of the products in its color, aroma, texture and taste.

Color has a drastic effect on the perception of flavor. The information receive from eyes will lead us to anticipate a flavor based on the color of a food, and that initial assumption can override the information we receive from our taste buds and olfactory system. While color and appearance may be initial quality attributes that attract us to a particular product, the flavor may have the largest impact on acceptability and desire to consume it again. In this study, the color of the bottled flying fish enhance with turmeric got the highest acceptability among treatments. The olfactory perception of the panellists may give great impact to the taste enhancement of the product. Turmeric color serves as good advantage to the different fishes in making sardines. Turmeric has an active ingredient known as curcumin and it serves as attractant because it makes the product yellow. Phytochemical components of turmeric include compounds called curcuminoids, such as curcumin (diferuloylmethane), demethoxycurcumin, and bisdemethoxycurcumin. Curcumin constitutes 3.14% (on average) of powdered turmeric, having variations in content among the species of *Curcuma longa* (Tayyem *et al.*, 2006) [11].

It can be noted that the aroma and taste of the flying fish with oregano got a highest acceptability among treatment. This is due to the intense aromatic characteristics of the oregano. Oregano is an important culinary herb, used for the flavour of its leaves, which can be more flavourful when dried than fresh. It has an aromatic, warm, and slightly bitter taste, which can vary in intensity. Good-quality oregano may be strong enough almost to numb the tongue, but cultivars adapted to colder climates often have a lesser flavor. Factors such as climate, season, and soil composition may affect the aromatic oils present, and this effect may be greater than the differences between the various species of plants. Among the chemical compounds contributing to the

flavour are carvacrol, thymol, limonene, pinene, ocimene and caryophyllene (Mockute *et al.*, 2001) [8].

Bottled flying fish without flavoring and with lemons grass received highest acceptability over the other treatment and both are not comparable with each other. Lemongrass is widely used as a culinary herb in Asian cuisines and also as medicinal herb in India. It has a subtle citrus flavor and can be dried and powdered, or used fresh. It is commonly used in teas, soups, and curries. It is also suitable for use with poultry, fish, beef, and seafood (Shadab *et al.*, 1992) [9]. The oral texture is the perception that arises when food interacts with teeth, saliva and tactile receptors in the oral cavity. During mastication, the texture of the food changes, the palatability of the food is assessed and the food converted to a form suitable for swallowing (Mishellany *et al.*, 2006) [7].

The subjective measurement of food texture and the objective measurement based on a rheological model are described to clarify the relationship between texture and taste.

The most important sensory property is texture in foods which have relatively low flavor intensity. Additionally, from the fact that the multidimensional evaluation of palatability of foods is strongly influenced by properties requiring physical measurement, they propose the introduction of a new concept, physical taste, for making effective evaluations of food palatability. More quantitative texture studies related to food quality are required as well as research on the traditional four or five basic tastes (Tadashi *et al.*, 1985) [10].

5. Conclusions

It was evaluated that the different organic flavoring has different effect to the bottled flying fish *Parexoetus branchypterus* in spanish style. The color of the product was commonly affected by the turmeric due to its attractive yellow color. The aroma and taste of the product was affected by the oregano due to its intense aroma and bitter taste. Furthermore, the texture was affected by the lemon grass. In general acceptability, the bottled flying fish with oregano received a highest acceptability among treatments and describes as Like very much.

6. References

1. Almazan C, Trienkens J, Bijiman J. Sustainable Contracts in the Bottled Tawilis Value Chain in Taal, Batangas, Philippines, 2011.
2. Babu V. Physiological studies on weed control efficiency in turmeric *Curcuma longa* L. M Sc. Agri. Thesis, Univ. Agric. Sci., Dharwad, Karnataka, India; 2008.
3. Davenport J. How and why do flying fish fly? Reviews in Fish Biology and Fisheries, 1994; 4(2):184-214.
4. Figiel Adam, Szumny Antoni, Gutiérrez-Ortíz Antonio and Carbonell-Barrachina Ángel A. Composition of oregano essential oil (*Origanum vulgare*) as affected by drying method. Journal of Food Engineering. 2010; 98(2):240-247.
5. Gourmet Garden. (http://www.gourmetgarden.com/en/herb/198/lemongras). Copyright 2014.
6. Harini NS. Oregano a Wonder Herb. Journal of Pharmaceutical Science and Research. 2014; 6(3):127-129.
7. Mishellany A, Woda A, Labas R, Peyron MA. The challenge of mastication: preparing a bolus suitable for deglutition. Dyspahia. 2006; 2(1):87-94.
8. Mockute, Danute, Bernotiene, Genovaite, Judzentiene, Asta. The essential oil of Origanum vulgare L. Ssp. Vulgare growing wild in Vilnius district Lithuania. Phytochemistry. 2001; 57(1):65-9. PMID 11336262. doi:10.1016/S0031-9422(00)00474-X.
9. Shadab Q, Hanif M, Chaudhary FM. Antifungal activity by lemongrass essential oils. Pak. J Sci. Ind. Res. 1992; 35:246-249.
10. Tadashi Izutsu, Kohmei Wani. Food Texture and Taste: A Review. Journal of Texture Studies. 1985; 16(1):1-28.
11. Tayyem RF, Heath DD, Al-Delaimy WK, Rock CL. Curcumin content of turmeric and curry powders. Nutr Cancer. 2006; 55(2):126-131. PMID 17044766. doi:10.1207/s15327914nc5502_2.